171

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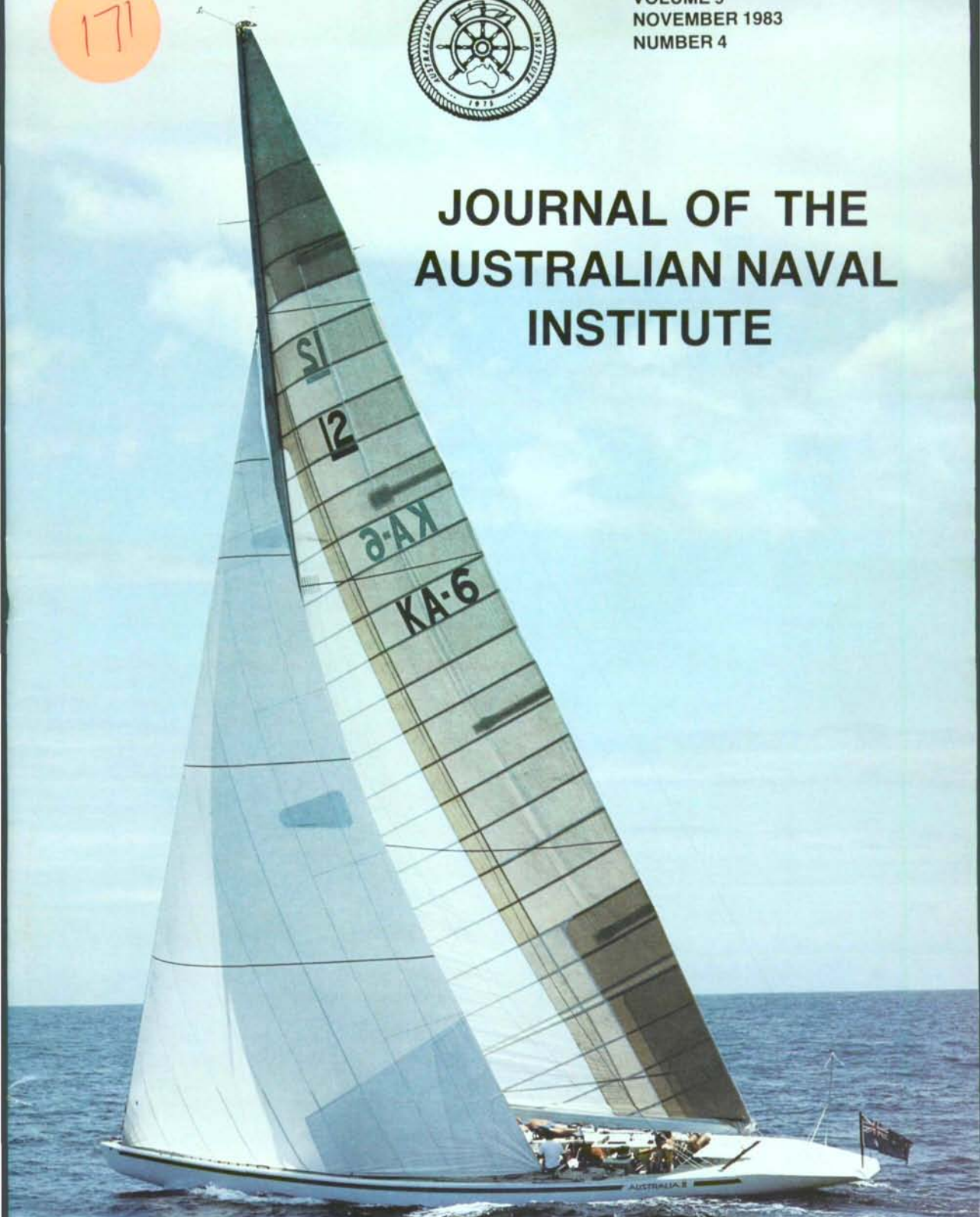
JOURNAL OF THE AUSTRALIAN NAVAL INSTITUTE



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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 if $5. Annual subscription for both is $15.
5. Inquiries and application for membership should be directed to:

   The Secretary,
   Australian Naval Institute,
   PO Box 18,
   DEAKIN, ACT 2600

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

JOURNAL OF THE AUSTRALIAN NAVAL INSTITUTE (INC.)

TITLE **CONTENTS** **PAGE**

The front cover: *AUSTRALIA II* Courtesy of the Bond Corporation

FROM THE EDITOR

The composite theme of this journal is oceanography, hydrography, meteorology, coastal surveillance and law of the sea. There is no one word to represent these various interests, but they are all closely related, as revealed by the cross references within the articles.

Overviews of the hydrographic, oceanographic and meteorological services are provided by Lieutenant Commander Leech and Commander Daw, whereas more specific articles have been provided by Lieutenant Commander Holliday on laser hydrography and Lieutenant Commander Low on current oceanographic research in the Western Tasman. An article on practical meteorology comes from Lieutenant Commander Hancock who provided advice to one of the America's Cup challengers, and he reveals in passing, a glimpse of the hard work those crews went through. Captain Bateman has written an update on where we stand with the latest conference on the law of the sea, and has concentrated especially on clauses relating to navigation.

Commander Brecht has written the first of two articles on the real Patrol Boat — naval coastal surveillance as he sees it after two years as CO of *HMAS CAIRNS*. The Department responsible for coastal surveillance was not in a position to provide an article as a Ministerial review of the service is currently underway; however, Transport and Construction did provide me with a selection of printed works and I chose an extract from their August 1983 Manual as a good summary for those unfamiliar with their work and roles. Institute members in Canberra are most welcome to visit the Australian Coastal Surveillance Centre at any time of the day or night, provided there is no major incident in progress; those interested should ring the senior coordinator on duty (870132).

Our correspondents in far flung places have provided interesting reading: Commander Pennock on details of South Australian shipwrecks, Vic Jeffery on ship movements in Western Australia, and Tom Friedmann on a pacesetting theme for the next Seapower Seminar (more details in this edition). I hope Washington Notes will provide some responses for the next edition of the journal.

Last but not least, two ships related to the theme rate a mention — *KIMBLA* and *KRAIT*. The article on the former by Sub-Lieutenant Mulready is a resume of recent activities; the latter, by Ross Gillett, is reprinted from the latest issue of the magazine of the Navy League — we do not usually reprint from other journals, but in this case we had been planning an article on the *KRAIT* for some five months, and it is in a good cause.

May I draw readers' attention to the need for some stimulating copy for the February edition. That will be the last issue before the Seminar and I would like some provocative pieces to set the scene; so if you will be unable to attend, or if you just wish to make sure your views are known — the deadline for copy is 23 January 1984. And please remember to provide a brief biography.

Geoff Cutts

SEAPOWER 84

Time: 27 and 28 April, 1984
Place: H.C. Coombs Lecture Theatre, Canberra

Since the last edition of the Journal, arrangements for Seapower 84 have been proceeding satisfactorily. The mail strike in Canberra didn't help matters but the lost time is being regained.

A draft outline of the programme is reproduced on the following page. Astute readers will notice a few gaps in speakers; this is because those particular arrangements are yet to be finalized — a function of the mail strike. In any event, the outline is there and although there may yet be some minor change in topics, the Seminar will have the overall shape as shown.

Brochures, with final details and registration requirements, will be distributed shortly.


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DIVISIONE DIFESA
Via Washington, 70 - 20146 Milano
Tel. 02 - 43891 - Telex 332067 BORMI - ITALY

SEAPOWER 84
AUSTRALIA'S MARITIME INTERESTS
DRAFT PROGRAMME

FRIDAY 27 APRIL, 1984

1400-1430	Introduction	ANI President
	Patron's Address and Official Opening	His Excellency the Governor-General
1430-1515	The Strategic Setting	Dr T.B. Millar, AO, Australian National University
1515-1600	A Legal and Diplomatic View	
1600-1630	Tea	
1630-1715	A Regional View	
1715-1800	A Defence View	
1830-2030	Dinner	
2030-2130	A Personal View	The Hon Sir Charles Court, AK, KCMG, OBE Former Premier of Western Australia

SATURDAY 28 APRIL, 1984

0900-0945	Industry View	Mr J.F. Kirk, Chairman and Chief Executive Esso Australia Ltd
0945-1030	An Economist's View	
1030-1145	Tea	
1100-1145	The Naval View	Vice Admiral D.W. Leach SO, CBE, MVO, RAN Chief of Naval Staff
1145-1230	A Decision Maker's View	The Rt Hon I.M. Sinclair, Opposition Spokesman on Defence
1230-1400	Lunch	
1400-1530	Open Forum	
1530-1555	Closing Address	Admiral Sir Anthony Synnot, KBE, AO, RAN (Rtd) Former Chief of Defence Force Staff
1555-1600	Closing Remarks	ANI President

ANI LIBRARY

The ANI Library is now located in Russell Building A, opposite room A-3-17. The library is in glass-fronted bookcases and loans can be made at any time. The librarian is located in A-3-17. Telephone 654760.

The following books have been added to the library:

- Who Dares Wins — Tony Geraghty. Arms and Armour Press, 1980
- The Battle for the Falklands — Max Hastings, Simon Jenkins. Michael Joseph 1983
- US Aircraft Carriers — Norman Friedman. Naval Institute Press, 1983 (Presented by Commander Robin Pennock RAN)
- Soldiers and Scholars — John Masland and Laurence Radway. Princeton University Press 1957.

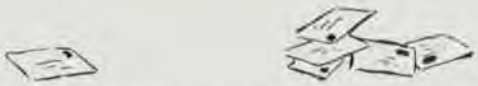
The following books are missing from the library and their return is requested:

- Lonely Vigil, Coastwatchers of the Solomons — Walter Lord
- The Coast Watchers — Eric Feldt
- Ultimost Tish — Hugh McCann
- Old Friends New Enemies — Arthur Marden
- Men of War — Geoff Vollmer

Robin Pennock is attempting to locate the following items:

- National Geographic Magazine of January 1933, (Vol LXIII);
- The Colonial Clippers, by Basil Lubbock;
- Naval History of South Australia, by H.M. Cooper;
- Ships in Australian Waters, by P.J. William; and
- The Tall Ships Pass, by W.L.A. Derby.

Anyone able to help should write to him as NOCSA, HMAS ENCOUNTER.



Correspondence

HMAS SUCCESS

Dear Sir,

The comments, by your predecessor, about the new *HMAS SUCCESS*, under construction at Vickers Cockatoo Dockyard, are both mischievous and incorrect.

The AOE, which project was cancelled in 1973, would have been in service by 1980. The AOR-01, its successor, was ordered only in October 1979, and laid down in August 1980. Delay and dislocation to the building programme, caused mainly by technical and contractual problems, has postponed planned delivery to February 1986.

Your correspondent's contribution does little justice to those many people, not only at VCD but also within Navy, whose tremendous efforts are producing a very fine ship.

Yours faithfully

R Humbley

Dear Sir,

In his article "MORE SUCCESS" in your August 1983 issue, Robin Pennock should have checked his information regarding delivery date for the RAN's new Fleet Underway Replenishment Ship, under construction at Vickers Cockatoo Dockyard.

It is bad enough that the press is inclined on occasions to publish misleading information on the subject of the construction of the AOR-01, to be named *HMAS SUCCESS*. That the ANI Journal should do so is the last straw!

Delivery is planned for early 1986.

Yours faithfully,

B.M. Ziegler
Commander RAN (Ret'd)

Comments on Commander Ziegler's letter by Commander Pennock:

Thank you for clarifying the date of delivery of *HMAS SUCCESS*. Telephone calls to the builder whilst I was writing the article subjected me to the old game of 'switchboard roulette'. In other words, I was passed from department to department and no-one could give a definite answer, let alone his name.

However, is Commander Zeigler protesting too much? In my article I stated that the delivery date, although still not firm, will probably not be until sometime in 1987.

As one of the original members of the AOR/PC Project way back in October 1975, I have kept an interested eye on the AOR project and would defend my statement *although still not firm*. After all, the difference between 1986 and 1987 is only one day.

WHO SANK THE SYDNEY?

Further to the correspondence in Vol. 8 No. 4, Robin Pennock has sent in this extract, which is published with the permission of Southdown Press. It comes from 'Signature', the magazine of Diners Club, June/July 1983, p. 23:

American adventure novelist and marine explorer Clive Cussler has issued a challenge to all Australians interested in solving the secrets beneath our coastal waters.

The author of the blockbuster Raise The Titanic wants to locate the Australian cruiser HMAS Sydney, sunk by the German raider Kormoran, 150 miles off Carnarvon, WA, in November, 1941.

"The Germans claimed the Sydney drifted off over the horizon, blew up and sank," says Cussler.

"We know what the raider's position was at the time, and if we find the Sydney nearby, the German explanation will look shaky. But if they were five or 10 miles apart, it will look valid."

But Clive Cussler needs financial help:

"It's a matter of chartering a boat to bring my men and equipment here."

"It would take about 60 days to complete the operation, and there are vast amounts of money involved. But if it were found we could perhaps start diving in late 1983 or early '84."

It has often been speculated that the Kormoran machine-gunned the Sydney's lifeboats so no one would learn she had fired under a neutral flag.

The raider was also damaged in the fray — with her 317 survivors escaping by boat. But all the 645 officers and men from the Sydney were lost: not a single survivor to tell the tale.

Cussler says his interest here is not in opening old war wounds, but solving another maritime mystery.

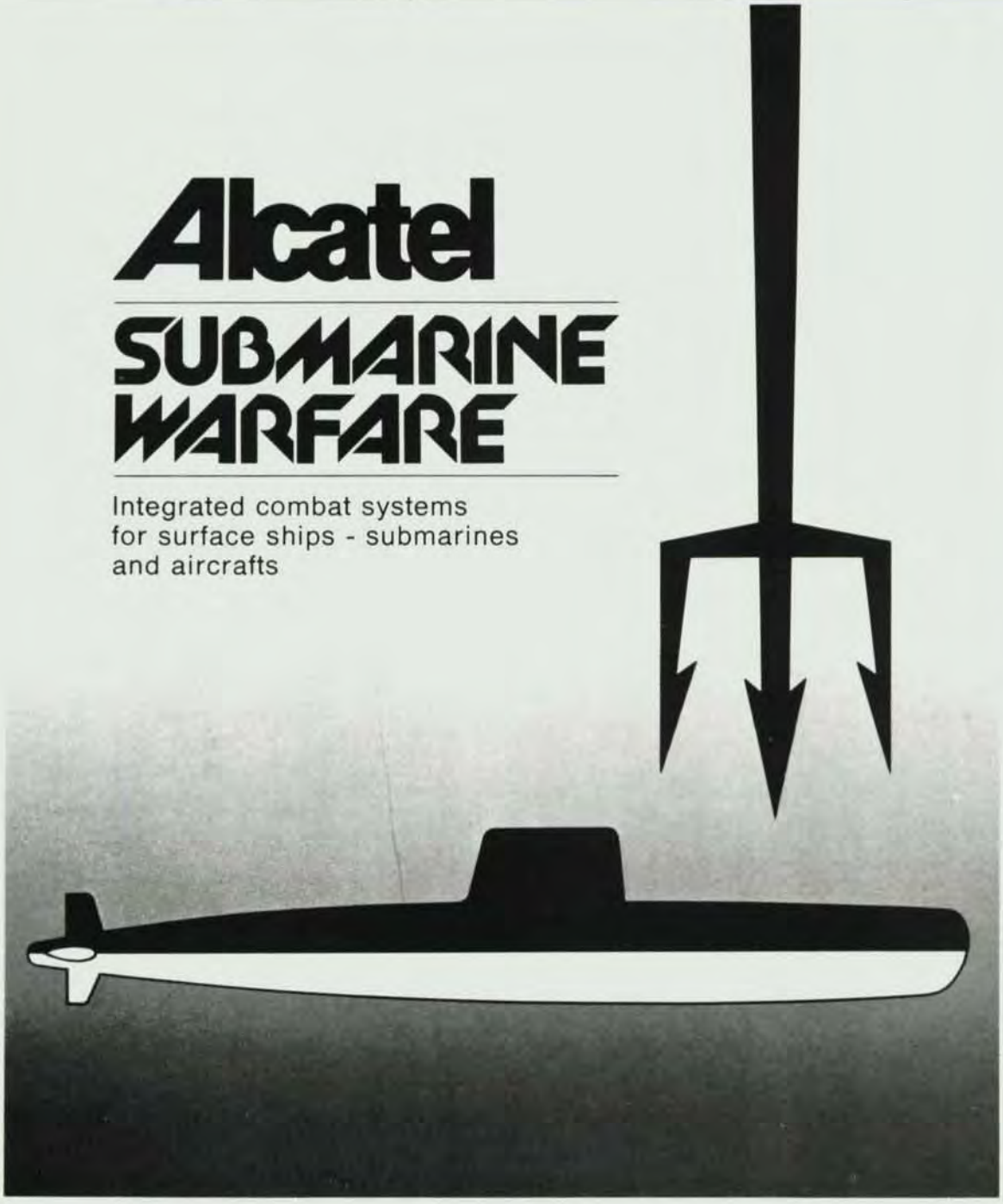
A sizeable slice of the author's book royalties go to fund the National Underwater Marine Agency, a non-profit organisation dedicated to searching for wrecks, founded by Cussler in 1978.

NUMA has 16 trustees, including marine archaeologists, engineers and oceanographers.

Alcatel

SUBMARINE WARFARE

Integrated combat systems
for surface ships - submarines
and aircrafts



SINTRA
Alcatel
GROUPE C.G.E.

Département D.S.M.
1, avenue Aristide Briand - 94117 Arcueil (France)
Tél. (1) 657.11.70

Delegation in Australia: C.G.E. ALSTHOM INTERNATIONAL
Box 2569 G.P.O. - SYDNEY, N.S.W. 2001 - Tel: 29.5121.22.23 - Tlx: AA 22532

1982 — 1983 PRESIDENT'S REPORT

1982 — 1983 has been a satisfactory year for the Australian Naval Institute with emphasis on further progress of administrative and other tasks. Planning for Seapower 84 has been a major activity.

Once again your Council adopted a set of objectives as a basis for continuing development of the Institute and longer term budgetary planning. The goals have provided the necessary focus for Council activities and an effective means of measuring achievement. Progress towards our principal objectives is summarised under the activities of each Sub-Committee.

Financially, the Institute has continued to consolidate its position, by achieving a further prudent surplus for 1982/83.

Operating expenses have been contained within income. In particular, the Institute's primary operating cost, that of publishing the Journal has again been substantially offset by advertising revenue.

A draft budget has been prepared for 1983/84, having regard to performance in 1982/83, the forthcoming major financial commitment to Seapower 84 and new Council initiatives to improve administration.

The Administrative Sub-Committee which is now established by the Council as a permanent body has had a particularly active year.

Terms of Reference for all Council Office Bearers and Sub-committees were drawn up and issued. An annual Schedule of Recurring Events was also completed. These two actions are expected to make it easier for new Councillors to take their places and for each newly elected Council to become effective more quickly.

A review of the work load of our Treasurer revealed that he was being overworked. As a result the Treasurer now has an assistant. Although in the long term other arrangements are likely to be necessary we consider the present arrangement should be adequate for a membership up to about 1000 financial members.

In an endeavour to streamline the operation of the Institute, the Council has decided that membership records should be maintained by computer and action has been taken to introduce such services by contract.

The Membership Sub-Committee's tasks this year have been of a routine nature. An on-going problem is that of keeping up to date with members' addresses; the onus is on members to inform the Secretary of any changes of name, rank or address.

Membership growth continues with a total of 620 Regular and Associate members on the books. This represents a modest growth rate of 6% annually.

The Council is optimistic that this trend will continue but we would like to see more younger members including sailors and an increase in the number of lady members.

The Journal has maintained a satisfactory standard with some good articles. The desired standard will be maintained only if Institute members contribute. The Journal exists to provide a forum for the expression of individual's views on any topic of maritime interest and there is a continuing need for contributions.

As further encouragement the Council has decided that from 1983 onwards the value of annual prizes awarded for the best contributions to the Journal would be increased substantially. Details are published in the Journal.

The ANI Library has grown to respectable size and the donations have so far been most generous. However if the collection is to be developed further it needs a continuing inflow of new material. As well as donations, advice for notable and out-of-print works available for purchase at a modest price would be appreciated.

Arrangements for storage and display of books in Canberra have been improved and this should increase the rate of borrowing. Arrangements for borrowing books will be notified in the Journal.

Chapters have been active in Canberra, Sydney and Perth but the Melbourne Chapter has been dormant. Money set aside for Chapter support has not been used.

Seapower 84 is to be held in Canberra on 27 and 28 April next year and the theme will be Australia's Maritime Interests. Planning is progressing satisfactorily and the initial response from prospective speakers has been encouraging. Subject to members showing sufficient interest and spreading word about the seminar it is hoped it can be equally as successful as its predecessors.

During the year ANI Silver Medals were presented to Lieutenant Commander M.K. Gahan RAN and Lieutenant Commander D.J. Farrell RAN, students at the RAN Staff College, for the best essays on Maritime Strategy.

Recently the Council canvassed members' views and endorsed the design of an Australian Naval Institute tie which will be on sale, at the modest price of $7.50, before or at the time of Seapower 84. This has been made possible by a most generous anonymous gift of the cost of development of the tie.

Next year, in addition to the major undertaking of Seapower 84 and continued publication of a regular journal, the Council wishes to encourage greater activity by the Chapters and to continue to improve our administrative arrangements.

For some time now it has been evident that the efforts of the Council and a few other volunteers are no longer adequate to cope with an increasing administrative load. The Institute already pays for some clerical support and we must expect an increased outlay in the future. This matter is under active consideration by your Council.

At the same time the membership could do more to help. Therefore the Council would like to encourage members including associates to become more active in the affairs of the Institute by volunteering their services in support of Institute, Chapter, Journal and Seapower 84 activities. Once again a significant amount of help will be needed from ANI members outside the Council if the Seminar is to succeed as its predecessors did.

In summary, whilst progress has been achieved during 1982-83 there have been difficulties in some areas. The Council looks forward to 1983-84 as a more active and productive year and in particular to Seapower 84 which will be a major event of national interest. I am hopeful that this important Seminar will be well supported by members and by many others with an interest in maritime affairs.

Before concluding, I would like to pay a tribute to Rear Admiral Swan whom the Council has elected an Honorary Life Member in recognition of his unparalleled service to the Institute, in particular during his four years as President.

I also take this opportunity to thank on my own behalf and on behalf of the members all those who have served on the Council, or performed other duties, for their contribution and time given to the Institute. Captain Orm Cooper our retiring Junior Vice President merits special mention. He has been a tireless worker behind the scenes and if it were not for him our administration would not be nearly as sound. I am also confident that you will agree with me if I specially mention Captain Les Fox — a foundation member, former Vice-President and until recently Canberra Chapter convenor. On your behalf, I thank him for his great contribution.

Finally may I express the Council's appreciation for the continuing support of all members.

CHANGED YOUR ADDRESS?

Did your last Journal turn up late, or come via another ship or establishment? If it did, then perhaps you have moved and forgotten to tell us. Similarly, if the rank was wrong then perhaps you may have forgotten to amend that too.

During the rush to distribute the Journal to members, a great number of the distribution team make comment on the obvious incorrect addresses that they are aware of, but in their efforts to get the job done they do not have the time to alter the address labels.

If you have changed your address, or rank, or intend to do one or the other, or both, before the next edition please let us know. Just drop a note to the **Membership Secretary** and advise him of:

your name,
membership number (top of the address label),
new address (or new title).

AUSTRALIAN NAVAL INSTITUTE

BALANCE SHEET

AS AT 30 SEPTEMBER 1983

ACCUMULATED FUNDS	1983	1982	ASSETS	1983	1982
Balance as at 1 October 1982	16,187.62	11,604.28	Sundry Debtors	3,334.00	1,684.00
ADD Surplus for Year	3,945.77	4,583.34	Commonwealth Bonds	15,000.00	10,500.00
	20,133.39	16,187.62	Savings Investment Account	3,456.60	4,000.00
Provision for Replacement			Cash at Bank	1,668.96	1,964.51
Medals	600.00	300.00	Stock on Hand		
Provision for Legal Fees	100.00	-	Insignia	364.95	617.15
LIABILITIES			Medals	246.18	292.81
Subscriptions in Advance			Medal Die	1.00	1.00
1982/83	-	332.00	Seapower 84 Advance	1,000.00	-
1983/84	875.00	45.00			
1984/85	45.00	30.00			
1985/86	105.00	60.00			
Sundry Creditors	3,213.30	2,104.85			
	$25,071.69	$19,059.47		$25,071.69	$19,059.47

AUSTRALIAN NAVAL INSTITUTE

INCOME AND EXPENDITURE ACCOUNT

FOR THE 12 MONTHS ENDED 30 SEPTEMBER 1983

EXPENDITURE	1983	1982	INCOME	1983	1982
Journal Operating Cost	3,960.63	3,852.24	Insignia Trading	45.80	78.55
Postage	381.68	140.28	Joining Fees	245.00	305.00
Audit Fees	130.00	130.00	Subscriptions	8,399.88	8,596.00
Company Fees	2.00	14.00	Interest	1,820.18	875.33
Donation to Legacy	100.00	100.00	Proceedings Sales	-	240.00
Advertising	29.88	91.14			
Stationery	1,003.61	595.48			
Engraving	17.50	10.90			
Library Additions	44.95	-			
Bank Charges	61.54	30.87			
Presentation Medals	46.63	46.63			
Chapter Support	-	200.00			
Provision for Replacement Medals	300.00	300.00			
Provision for Legal Fees	100.00	-			
Entertainment (VADAM Kennon)	42.37	-			
Gift	51.65	-			
Bank Accounts Debits Tax	1.85	-			
Secretary's Expenses	40.80	-			
VADAM Kennon's Lecture	250.00	-			
	6,565.09	5,511.54			
Surplus Transf to Accumulated Funds	3,945.77	4,583.34			
	$10,510.86	$10,094.88		$10,510.86	$10,094.88

AUSTRALIAN NAVAL INSTITUTE

INSIGNIA AND MEDAL TRADING ACCOUNT

FOR THE 12 MONTHS ENDED 30 SEPTEMBER 1983

INSIGNIA	1983	1982		1983	1982
Stock on Hand 30 September 82	617.15	1,064.50	Sales	298.00	525.90
Purchases	-	-	Stock on Hand 30 September 83	364.95	617.15
Profit Transferred to Income and Expenditure Account	45.80	78.55			
	$662.95	$1,143.05		$662.95	$1,143.05

MEDALS					
Stock on Hand 30 September 82	292.81	339.44	Presentations	46.63	46.63
Purchases	-	-	Stock on Hand 30 September 83	246.18	292.81
	$292.81	$339.44		$292.81	$339.44

AUSTRALIAN NAVAL INSTITUTE

JOURNAL OPERATING ACCOUNT

FOR THE 12 MONTHS ENDED 30 SEPTEMBER 1983

EXPENDITURE	1983	1982	INCOME	1983	1982
Printing November 1982	1,887.00	1,845.00	Journal Sales	123.50	92.50
Printing February 1983	2,602.00	1,845.00	Journal Subscriptions	1,047.00	987.80
Printing May 1983	2,502.00	1,926.00	Advertising	5,538.75	3,380.44
Printing August 1983	3,052.00	1,926.00	Net Operating Cost Transferred to Income & Expenditure Account	3,960.63	3,852.24
Photos	-	55.45			
Postage	470.00	584.90			
Prizes	95.00	95.00			
Editor's Expenses	61.88	18.70			
Corrigendum	-	16.93			
	$10,669.88	$ 8,312.98		$10,669.88	$ 8,312.98

WEST COAST REPORT

The RAN guided-missile destroyer *HMAS HOBART* recorded its name in *HMAS STIRLING's* history book for the second time when it berthed at the West coast base on 22 September. *HMAS HOBART* had the distinction of being the 100th visitor to the support facility since its commissioning on 28 July 1978. This total excluded patrol boats, home ported and base ported vessels. Ironically, this was *HMAS HOBART's* first visit to *HMAS STIRLING* since the base's commissioning. However, *HMAS HOBART* already holds the distinction of being the first ship to come alongside the newly completed wharves way back on 11th August, 1975 — three years before *HMAS STIRLING* was commissioned.

Accompanying *HMAS HOBART* when it berthed on 22 September were the guided-missile frigate *HMAS CANBERRA*, the two US Navy Knox-class frigates *USS LOCKWOOD* and *MARVIN SHIELDS*, and the New Zealand frigate *HMNZS CANTERBURY*. This was the first time there had been five destroyer-type ships alongside at one time. The ships were alongside only 36 hours before departing under the cover of darkness to participate in Exercise Kangaroo '83.

HMAS LEEUWIN, the west coast Junior Recruit training establishment held its 82nd Passing Out Parade of Junior Recruits on 20 September, 1983. Sixty-one recruits graduated, taking the total number of graduates since 1960 to 10,464. The reviewing officer for the parade was Commodore N.A. Ralph, AM, DSC, RAN.

The United States Navy nuclear-powered Los Angeles-class submarine *USS BOSTON* visited between 9-16 September, 1983, for rest and recreation purposes. Displacing 6,100 tonnes, *USS BOSTON* was the 39th US Navy submarine to visit the base since its commissioning five years ago.

HMAS ADROIT became the Fremantle Port Division Naval Reserve training patrol boat in a simple ceremony conducted at *HMAS STIRLING* on 26 August, 1983. *STIRLING*-based since 21 January, *ADROIT* was replaced as the Permanent Naval Force patrol boat on the West Coast by sister-ship *HMAS ASSAIL* on 1 July. Having just completed a pre-handover refit at *HMAS STIRLING* prior to its handover, the *ADROIT* has the distinction, prior to coming to *HMAS STIRLING*, of being the longest serving patrol boat at Darwin where it spent 14 1/2 years.

ADROIT joins sister-ships *ADVANCE*, *ARDENT*, *AWARE* and *BAYONET* as RAN Reserve training boats allocated to Port Divisions. In its new role, it will be used for fisheries patrols during annual continuous training periods. It will also provide valuable practical training in seamanship, navigational and technical training. It is the third Attack class vessel to serve with the Fremantle Port Division. The others, *HMAS ACUTE* which served between 1968-78 and *HMAS BARRICADE* (1981-82), have both been since transferred to Indonesia.

Wartime memories were recalled when the US Navy frigate *USS LOCKWOOD* visited the west coast last September. *USS LOCKWOOD* proudly carries the name of Vice Admiral Charles A. Lockwood, USN who commanded the Fremantle submarine base during 1942-43 whilst a Rear Admiral. On his promotion in 1943, he was the youngest Vice Admiral in the US Navy and was appointed Commander of the US Navy Pacific Fleet submarines at Pearl Harbour. In his memoirs, published in 1951, Lockwood wrote of the warmth of the Australian people. Another US Navy visitor which brought back memories of this dark-era was the *USS HOLLAND*, a submarine depot ship which visited Fremantle in September. Its predecessor of the same name served in Fremantle during World War Two.

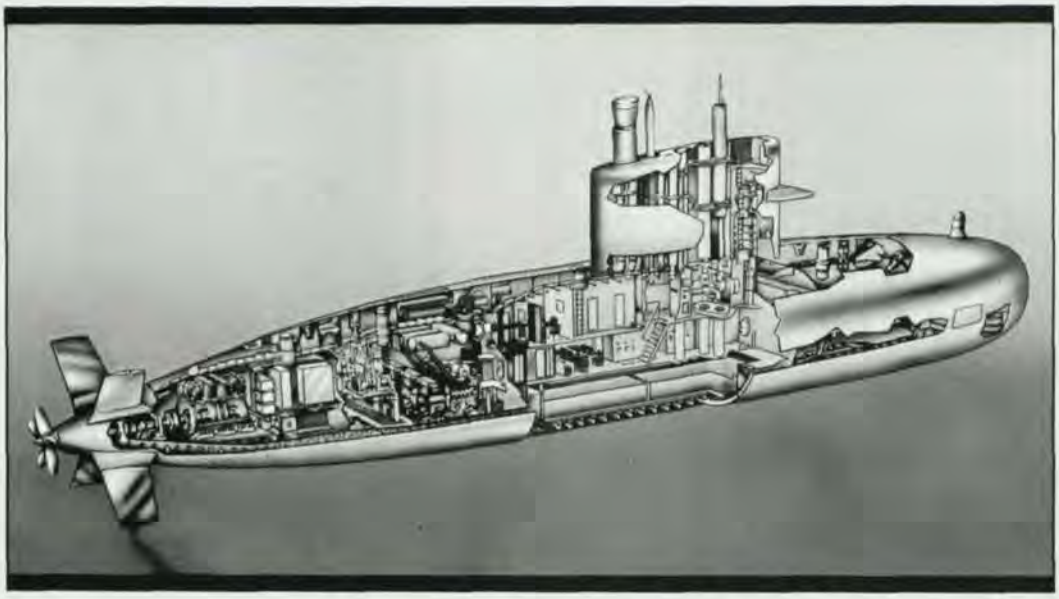
The visit by the Royal Navy task group led by *HMS INVINCIBLE* to Western Australia in November, 1983 was the first Royal Navy task group to visit the West Coast since July, 1979. It was more than a decade since a Royal Navy carrier had visited the port. Certainly a far cry from the 1950s and 60s when Royal Navy visits were regular. The last Royal Navy submarine seen on the west coast was *HMS ODIN*, way back in 1973. Since then, more than 40 US Navy submarines have visited Western Australia.

Vic Jeffery

The Author

Vic Jeffery is the Navy Public Relations Officer for Western Australia. He was appointed to this position in August,1981 and is a Lieutenant in the RANR attached to the Fremantle Port Division.

- Former Vice President of the WA Division of the Navy League of Aust.
- Member of the Naval Historical Society of Aust.
- Associate member of the Institute since 1979.
- Keen Naval Historian and a very parochial West Aussie.



'WALRUS'

The "new" submarine with 12 years at sea.

Platform:

'WALRUS' is the latest development from the proven 'ZWAARDVIS'-class, commissioned in 1972, with the following salient features:

- A teardrop shape hull for maximum hydrodynamic efficiency
- X-shape rudder configuration with individual foil operation to provide optimum control and manoeuvrability under all conditions
- Considerably increased diving depth
- High shock resistance
- Decreased ship's complement by automatic and remote control
- Minimum noise level
- High standard of accomodation.

Full scale mock-ups were used for layout design to ensure that operational efficiency and maintainability are maximised.

Combat System:

The 'WALRUS' combat system has been designed for ASW, ASUW, longrange surveillance and miscellaneous operations. Her modern sensors, weapons, integrated data handling and fire control system incorporate technology of the nineties.

Both flexibility and the most sophisticated subsystems are incorporated. The integration and layout of the Control Room in an ergonomic way extend crew efficiencies and maximise operational flexibility.

The 'ZWAARDVIS' at sea

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RAN OCEANOGRAPHIC AND METEOROLOGICAL SERVICE

By Commander Haydn L Daw RAN

In 1948, when the Naval Weather service was established, the role was clear. The new Fleet Air Arm required that a weather forecasting capability be established. Everyone recognized that aircraft operations ashore and at sea required weather observations and forecasts. This requirement was primarily to ensure the safe operation of aircraft. Because of the need to have this capability at sea, a uniformed Service resulted.

During the 1960s when I completed my training with the Royal Navy in Cornwall, the accent of the course was still oriented towards the development of forecasting skill to service the aviation requirement. It was about this time that the oceanographic component of the course was first developed. It was a very simple treatment based on present day standards and only really covered thermal structure of the ocean and elementary ray path diagrams for different seasonal thermal structures.

The seventies saw a change in focus of the Naval Weather Service. This change occurred on two fronts, both of which have continued into the eighties. Firstly, whilst the aviation requirement continued, the marine forecasting load increased and this trend continues today both in number of forecasts issued and the scope of the actual forecast itself. Secondly, the oceanographic role developed from nothing to a significant component of the organisational activity.

Officers qualifying in meteorology have always been drawn from the Instructor Branch of the Navy. The Director of the Naval Weather Service was a double hatted job for the Director of Naval Education. In the 'good old days' to qualify 'MET" was almost a requirement for promotion to commander, so it was not until the seventies that the Navy suddenly found itself with a Director of Naval Education (who was also Director of Naval Weather Service) who did not have a meteorological background. This dual hatted arrangement had never been satisfactory for a variety of reasons. One simply was the location of the Director in the Personnel Division. However, although the Director's name was changed to Director of Naval Meteorological and Oceanographical Services (DONMOS) in the mid seventies, it was not until the early eighties that a separate Director was created with, of course, the inevitable change of name to Director, Oceanography and Meteorology, or DOM.

The new Director was located in the Hydrographic Branch and the Hydrographer was persuaded to move from Sydney to Canberra to keep an eye on him. I have resisted the temptation to use the word Directorate as it seems a little ostentatious when only talking about one person. This new organisation and location has resulted in a much more effective arrangement. It is essential that the Director be located and be part of the DCNS Division to provide the service required by the users and to interact properly with the Naval Staff.

HMAS ALBATROSS

Personnel in the field are located in two major concentrations, although there are meteorological sailors in all major Fleet units where they fulfil the role of Navigator's Yeoman as well as doing the meteorological observing. The Meteorological Office at *HMAS ALBATROSS* is the largest concentration of personnel, where a staff of about 20, headed by a commander, provide all the meteorological and oceanographic analyses and forecasts required throughout the Navy and also complete all meteorological training with the exception of the Long Meteorological and Oceanographic course which is still completed in the UK.

All raw data used for plotting meteorological charts arrives from the Bureau of Meteorology via land line communications, both teletype and facsimile. Some readers would be aware that all observed meteorological data is transmitted in coded form in a number of five figure groups. Meteorological personnel have to rote-learn the literal description of the observation, the numerical code and the pictorial representation (for plotting). There are, for example, 100 different present weathers and this is only one of a large number of codes and types of messages.

The incoming observations are plotted on surface charts at three hourly periods and upper air and thickness charts twice a day. Standard

The Author:
Commander Daw is an Instructor Officer who qualified in meteorology in 1967. He has had experience forecasting for the Fleet Air Arm both at the RAN Air Station and at sea in *HMAS MELBOURNE*. Commander Daw is currently serving in Navy Office as Director, Oceanography and Meteorology.

forecasts for aviation and marine users are issued twice a day with special forecasts issued as required by the user.

In a separate article in this journal, Lieutenant Commander Low has described the oceanographic analysis of the East Australian Current in the West Tasman and the observations that are available for the analysis of the charts. This product is fairly new and contains very important information for Naval forces. It will be discussed later in this article.

The forecaster uses the observational information he has available to generate a three dimensional model of the atmosphere. As the atmosphere is a fluid, application of the laws of fluid dynamics allows the forecaster to prognosticate the future state of the atmosphere and produce a forecast based on it. Whilst this sounds simple, it is not, and large computers are now used by major meteorological services to make all the calculations required and produce a range of forecast charts. The UK meteorological office now has a Control Data CYBER 205 computer that performs 400 million calculations/second and produces forecast charts for the world in four minutes. The reader should be cautioned that this does not mean the computer produces the actual forecast in its final form.

Although computers can produce the forecast charts, the judgement of a forecaster is still required to monitor the weather and modify the computer forecasts when they are wrong. The hand produced forecast charts at *ALBATROSS* are not only required to supplement the computer products but also to give the forecaster a clear mental grasp of the three dimensional state of the atmosphere in order to make a better forecast.

The office at *ALBATROSS* is also a full surface and upper air observing station in the Bureau of Meteorology network. Surface observations are made three hourly, hourly when flying; upper winds are observed six hourly; and upper air soundings made twice a day. The forecasting and observing role continues round the clock for 365 days each year.

The Hydrographic Office

The second concentration of field forces occurs in the Hydrographic Office in North Sydney. Here Staff Officer Oceanography and the Australian Oceanographic Data Centre carry on their operations, both reporting direct to the Director Oceanography and Meteorology.

The Australian Oceanographic Data Centre (AODC) was set up by the Hydrographer over twenty years ago in a far sighted move to archive oceanographic data which would be required by the Navy and the nation in the future. For almost twenty years with a rather flattering name, the AODC was only a one man operation. In the last three or four years it has grown in stature, size and capability and is still expanding.

The major focus of AODC has been to archive bathythermal data. At present, this data bank is stored in a commercial computer and all additions, processing and products cost money. Following a study which indicated that long term savings and other benefits would accrue with an internal computing system, a mini computing system called HYDROCOMP is being acquired for AODC. In the interim, a data bank of nansen cast data is being established. Initially this data bank will contain 50,000 data stations, Each nansen cast contains measurements of more parameters than the typical bathy in the bathythermal data bank and is collected to a greater depth than is the bathythermal.

AODC also maintain a close quality control function over Fleet expandable bathythermograph (XBT), or bathy, operations. The development of expertise and establishment of good feedback procedures to Fleet units has resulted in the success rate of XBTs rising from 30% to 70%. That may not sound significant, but when the saving is translated into dollars it indicates a direct saving of $100,000 annually of the cost of less than half the time of a Leading Seaman

Most of the climatological briefings prepared for major events such as exercises and deployments are now prepared by AODC and that capability is being developed. Readers who have seen recent productions will have noted the increasing utility of them. These briefings are based on climatic averages and should be used for planning only and not for real time support. They contain a broad range of environmental information embracing both meteorology and oceanography.

AODC also executes the Hydrographer's responsibilities in International Oceanographic Data Exchange (IODE) under the auspices of the Intergovernmental Oceanographic Commission. As previously stated, AODC is the National Oceanographic Centre for Australia. The Hydrographer is also the national Integrated Global Ocean Services System (IGOSS) representative. This responsibility involves the real time transmission of oceanographic observations and products around the world. AODC plays a role here as all RAN XBTs are routed over the Global Telecommunications System via the Bureau of Meteorology, and oceanographic products from *ALBATROSS* are distributed nationally and internationally by AODC.

Before going on to look at some of the uses of meteorological and oceanographic products, a couple of points should be made. I would argue that meteorology and oceanography are closely

Enhanced Visual Image from Geostationary Meteorological satelite — 28 March 1983
Courtesy: Macquarie University

related. You can't have an oceanographic service without strong inputs from meteorology. For example, sea state is dependent on wind but is an important input into oceanographic products such as sonar range prediction. Similarly, meteorologists are now more concerned with the ocean and its interaction with weather and climate. There is a clearer recognition now of a need to more closely monitor the ocean, particularly the tropical ocean, in order to more properly understand its influence on weather and climate. To give a simple example of the connection, the warm eddies off the NSW coast described in Lieutenant Commander Low's article will often give rise to increased convective cloud, in the same way that it can develop over land during the day due to surface heating.

I think it's also worth making the point that the RAN Oceanographic and Meteorological Service does not duplicate other existing civil services. If necessary, I could go through and point this out function by function but I think it worth making readers aware that we complement the services offered by, say, the Bureau of Meteorology. In addition, the Service routinely performs other functions not normally part of other organizations' repertoires; for example, oceanographic analysis, range prediction, ballistic information and so on.

When thinking about this article I thought it may be worth going through each parameter of a particular product and talking about the tactical applications. There may be some merit in this as some readers may not be aware that a wind forecast, for example, has applications which range from positioning chaff, through determining the flying and replenishment course to laying smoke. I have resisted this temptation because it may be more profitable to take two examples and look at them in a little more detail.

Before doing so one more point should be developed. Early in this article I mentioned that the initial role of the developing Naval Weather Service related to the safe operation of naval aircraft. This has changed to include ship forecasts and oceanography. I think that there has been a slow but, I hope accelerating awareness, that the environment affects not just the platform and its capacity to operate, but also sensors and weapons systems and that the

tactical applications of the forecasts at this level have to be considered because ultimately this will affect the safety of us all. This is not to say that the early forecasters did not take account of Fleet Programmes and Exercise Programmes in writing their forecasts, but rather an increasing awareness by the astute user and the forecaster that the maximum benefit must be made of the environment, down to identifying and taking account of the effect the environment has on individual sensors and systems.

The West Tasman

The first example I wish to examine involves the West Tasman Analysis. If the reader were to consult the diagrams accompanying Lieutenant Commander Low's article elsewhere in the Journal he would note the following general conclusions:

- greatest layer depths are associated with the warm core of the eddies
- eddies are not necessarily clearly delineated by sea surface temperature
- geostrophic currents are associated with the eddies (anticlockwise around warm core eddies)
- horizontal temperature gradients at the boundary of eddies are associated with decreasing layer depths.

Whilst I do not intend to go into detail about the offensive/ defensive tactics that should be employed in using these analyses to maximum advantage, the following results are obvious:

- Better sonar ranges are likely in the centre of the eddy than the boundary.
- Sonar ranges at the eddy boundary are likely to be low and bearing errors are likely.
- Currents will move ships, submarines and buoys and have applications for ship routing, navigation and reducing self noise if sympathetic. The current strength depends on the thermal gradient at 250m and geostrophic currents as strong as 6 knots have been reported.
- Because the position of eddies cannot always be determined by SST alone, the 250 metre and mixed layer depth analysis are required as planning tools.

The oceanographic conditions in a region such as the West Tasman are complex. I can remember CASEXs in the sixties where, in hindsight, the location of the exercise must have been in a frontal region where surface and air units had about as much chance of locating the submarine as walking on water. Now planners have more flexibility and are able to increase or decrease submarine detection chances at will by varying the start position.

A lot of work has been done on the East Australian Current, but recent research on the Leeuwin Current which flows south along the West Australian Coast indicates that this coastal current may be as complex as the East Australian Current with its own eddy systems. It is also seasonal in nature and can be expected to have a marked effect on underwater sensors. At present, we have no capacity to monitor this current in real time and this may be required in the future if naval forces are to be deployed and operate regularly in this region. I mention the Leeuwin Current just to demonstrate the complexity of waters around Australia and the work that must be done in order for us to use this complex environment to our advantage.

Electromagnetic Refraction

A second example relates to electromagnetic refraction in the atmosphere. The effect of the atmosphere on electromagnetic propagation has been known for a long time. To produce good forecasts, detailed information of the vertical temperature and humidity structure of the atmosphere is required. In the same way that sound waves are refracted in the ocean, electromagnetic waves can be refracted in the atmosphere. Particularly important are regions where the atmosphere dries out rapidly and/or contains a temperature inversion. These conditions can cause unexpectedly long ranges or dangerously short ranges. This anomalous propagation, or anaprop, is caused by the presence of ducts which concentrate the electromagnetic energy in a narrow channel.

Australia is surrounded by ocean and there is no real-time atmospheric sounding information available over it from conventional radiosonde sources (apart from *HMAS COOK*). If the detailed temperature-humidity structure is not available, then the forcaster has to make a judgement about the airmass either by using the surface and upper air charts or by some form of extrapolation either downstream or upstream from the nearest radiosonde station, as the case may be.

Satellite derived atmospheric sounding information may be available within five years in a form which will greatly increase the capability of naval forecasters to forecast atmospheric effects on electomagnetic transmissions and allow greater precision than is presently available.

There are generally accepted to be three types of ducts, evaporative, surface and elevated. The evaporative duct is often found in the lower few metres of the ocean and is caused, as its name suggests, by evaporation causing high humidity near the sea surface with a rapid drying of the air above. If the transmitter and target are within the duct, then detection ranges can be greatly extended beyond the normal horizon. The existence and vertical extent of the evapora-

tive duct can be determined from accurate measurements of sea temperature, air temperature, humidity and surface wind. Because small relative changes in these elements can mean different conditions, it is preferable that individual units perform their own calculations based on local measurements

Surface and elevated ducts are caused by a temperature inversion which may sometimes be associated with a decrease in humidity, such as in an anticyclone.

The presence of a duct causes electromagnetic waves to be refracted down at a greater rate than the earth's curvature. In the case of a surface duct it is the refraction down and reflection from the sea surface that allows for detections far beyond the normal horizon. When hot, dry air is advected over the ocean, the increase in radar range can be prodigious. Ranges of over 1000 miles have been obtained under these conditions. These situations can develop off the NW coast of WA particularly in late spring and autumn with an offshore circulation established.

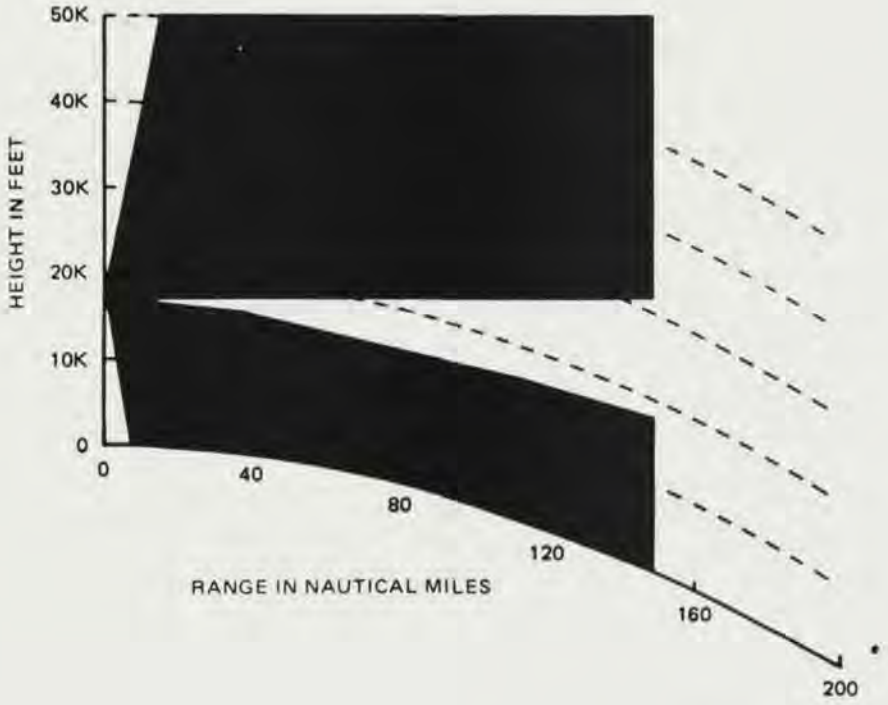
Whilst ducts can give rise to increased ranges, they can also cause gaps in coverage or 'radar holes'. Figure 1 illustrates the air to air situation with an elevated duct between 15-17000 ft. The Airborne Early Warning (AEW) radar located at the top of the duct has marked 'radar hole'. Targets in the 'radar hole' could remain undetected until about 15 miles distant. This 'radar hole' could be eliminated by tasking the AEW aircraft to fly at the base of the duct, that is 15000 ft.

Figure 2 indicates the situation for a surface transmission with an intense surface duct. For systems operating the surface to air mode, ranges are greatly extended but in the surface to surface mode, the range is reduced and a wedge shaped radar hole exists above the top of the duct. This hole could be exploited in a strike role or, in the defensive role, covering with an AEW aircraft operating well above the duct. The important lesson from these two examples is that just because a sensor is indicating increased detection ranges, this does not mean such coverage is enhanced in the three dimensions. In fact, quite the contrary situation exists in these two examples.

Systems do exist now which will visually indicate electromagnetic profiles for various sensors, given atmospheric sounding information and system characteristics, although they are not yet in the RAN inventory. Other important tactical considerations would be detection ranges of friendly systems relative to interception ranges by opposition systems and vice versa.

FIGURE 1[3]

Coverage Diagram for Typical Airborne Early-Warning Radar in the Presence of a 15 to 17 kft Elevated Duct. Radar Altitude is 17 kft.



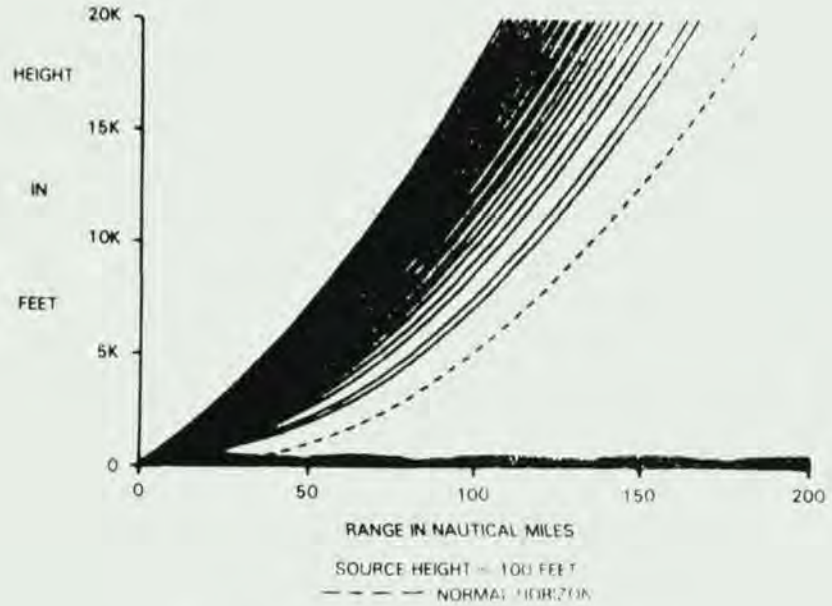


FIGURE 2[3]
Coverage diagram for a typical radar in the presence of an intense surface duct with top near 600 feet.

There is a strong demand for electromagnetic refraction forecasts and this need is now being partly met on a trial basis. More observed data is required to make the service better and probably an education programme to ensure the forecasts are properly applied.

Conclusion

In this article, I have attempted to provide a brief introduction to the RAN Oceanographic and Meteorological Service. Whilst the bread and butter weather forecasts for safety and planning purposes, which have been the output of the service since its inception, continue, there is a growing demand from the Fleet for environmental products which can be used tactically. While the lack of observed environmental data will prevent all demands from being met now, some products are available which can be used to build up expertise and test expectations. The requirement to maximise the value of our sensors and weapons systems and to limit their shortcomings will always mean that the complex air/ sea environment we operate in will have to be exploited to our advantage at all times.

Notes

1. The qualification is now 'METOC' to indicate that the training now includes both meteorology and oceanography.
2. Diagram from USN NAVOCEANCOMINST C3160.4A page 1-15 1981.
3. Diagram from USN Refractive Effects Guidebook 1976.

OCEANOGRAPHIC ANALYSIS OF THE WESTERN TASMAN — A PRACTICAL APPROACH

by Lieutenant Commander C.A. Low RAN

During the 1970s, the Royal Australian Navy Research Laboratory (RANRL), located at Rushcutters Bay, Sydney, produced a Western Tasman Oceanographic Analysis. Three charts were produced showing a detailed analysis of:

- sea surface temperatures (SST)
- 250m temperatures (T_{250}), and
- the mixed layer depth (MLD).

In early 1981, the responsibility of producing these charts was given to the Meteorological Office, RAN Air Station, Nowra. After several months, it was decided that the product could be produced on a weekly basis. This was mainly as a result of the considerable interest shown in the analyses by RAN Fleet Units. Currently, these charts are distributed weekly to the following addressees:

- various RAN departments
- the Australian Oceanographic Data Centre
- the RAN Research Laboratory
- the CSIRO, Division of Fisheries and Oceanography
- the Department of Primary Industry, Fisheries Division
- various commercial fishing organizations
- various USA oceanographic organizations
- the Bureau of Meteorology
- the World Meteorological Organisation (Geneva)
- the International Oceanographic Commissions (Paris)

The charts provide a valuable source of information for both the military oceanographer as well as the commercial fishing industry.

The remainder of the article provides a brief description of the general oceanographic conditions which exist in the western Tasman, followed by detail of the processes currently being employed in the production of the weekly analyses.

GENERAL OCEANOGRAPHIC CONDITIONS —WESTERN TASMAN

As shown in figure 1, the oceanographic conditions in the western Tasman Sea are dominated by the East Australian Current (EAC). Studies over several years have shown that the current leads to the formation of warm-core eddies and contrasting cold pools in the area. Having formed, these features drift along both the vertical and horizontal planes, and it is the monitoring of these changes which constitutes the weekly analyses. By using data from:

- RAN expendable bathythermographs (XBT),
- RAN and RAAF airborne expendable bathythermographs (AXBT),
- RANRL and CSIRO research cruises,
- infra-red satellite imagery,
- satellite tracked SST readings,
- satellite tracked buoys, and
- general shipping sea surface temperature observations,

it has been possible to provide a detailed forecast of the likely acoustic propagation characteristics and the commercial fishing potential of particular areas of the western Tasman.

Sea Surface Temperature (SST)

Because of the greater availability of raw data, the SST analysis has generally been the most detailed. As shown in figure 2, the EAC flows south along the New South Wales coast before being deflected east by the cooler southern ocean water. This Coral Sea water can break away from the general flow and form warm-core eddies within the cooler Tasman Sea water.

Frequently, during the summer months, surface temperatures to 26°C have been recorded at the centre of these eddies. The eddies can be identified as well defined features for several weeks, before dissipating.

250m Isotherms T_{250}

The accuracy of the T_{250} analysis is naturally determined by the number and scatter of observations. Frequently, new sub-surface data

Fig 1. The East Australia Current

is not available. The EAC can be identified as a feature detectable well below the surface. The interface between the Coral Sea and southern Tasman waters at 250m is known as the 'Tasman Front', and on the T_{250} analysis, is arbitrarily delineated by the 15°C isotherm.

The Tasman Front and warm-core eddies can give rise to anomolous acoustic propagation characteristics, as well as providing unseasonal fishing conditions, in well defined areas.

Mixed Layer Depth (MLD)

The MLD, within the Tasman analysis, is taken as the depth in metres from the surface to a point at which the temperature is 0.5 degrees Celcius below the surface, then this is taken as being the layer depth.

During the summer months, as a result of surface heating, layer depths tend to be relatively small. With the on-set of winter, the MLD gradually increases as the warm water gradually mixes down. Such conditions can also lead to anomolous acoustic propagation characteristics, or to the migration south, during the winter months, of Coral Sea marine life. These creatures, for example, have frequently been caught during winter, in a layer of warm Coral Sea water overlying the southwestern Tasman water.

AVAILABILITY OF DATA

Sea Surface Temperatures. SST readings are available from RAN Fleet Units, RANRL and CSIRO cruises, GMS and NOAA satellite data as well as merchant shipping. The coverage, accuracy and irregularity of these observations makes an accurate analysis difficult. The GMS data is particularly disappointing, even when the western Tasman is cloud-free. The discrimination of the 'grey-scale' format of the photographs appears too insensitive to facilitate a one degree Celcius interval analysis of the western Tasman.

250 Temperatures. T_{250} data is limited to the XBT and AXBT readings available from the RAN and RAAF as well as RANRL and CSIRO cruises. Infrequently, data from the Drifting Current Buoys of the CSIRO Division of Fisheries and Oceanography provide accurate temperature readings at 250m. The buoys also make it possible to accurately determine the currents associated with the eddies or the Tasman Front.

Mixed Layer Depth. The number of MLD observations is generally the same as the number of T_{250} observations. The actual layer depth is taken from either the graphical print-out of the bathy or from the coded message received at NAS Nowra. The second and more common means of obtaining MLD data is rather subjective.

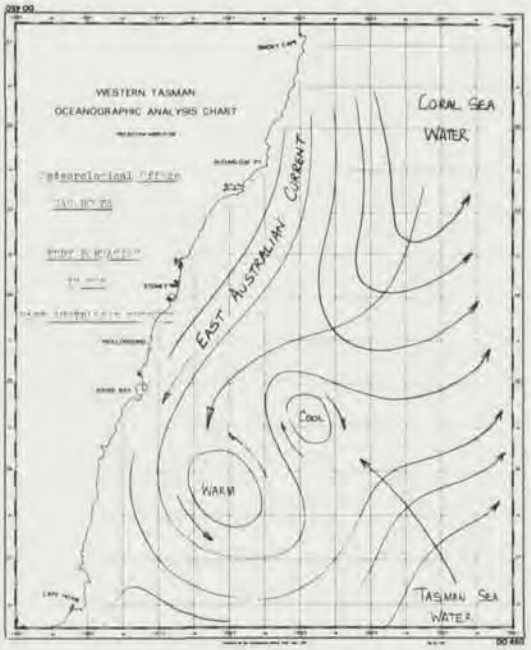


Fig 2. Eddy Formation in the East Australian Current

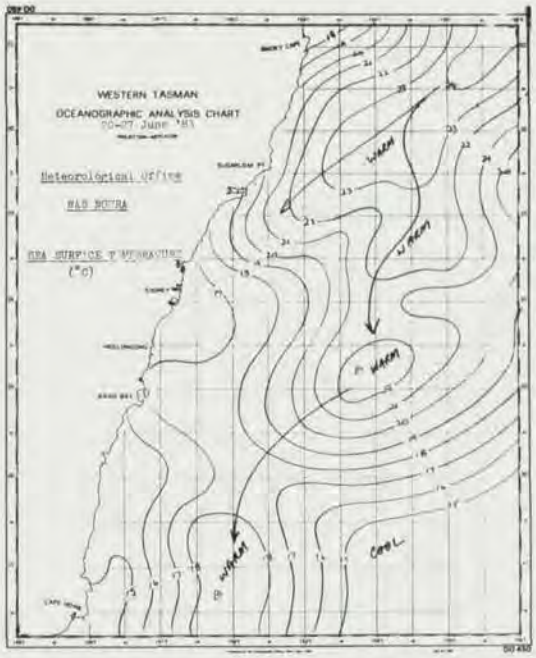


Fig 3. Sea Surface Temperature

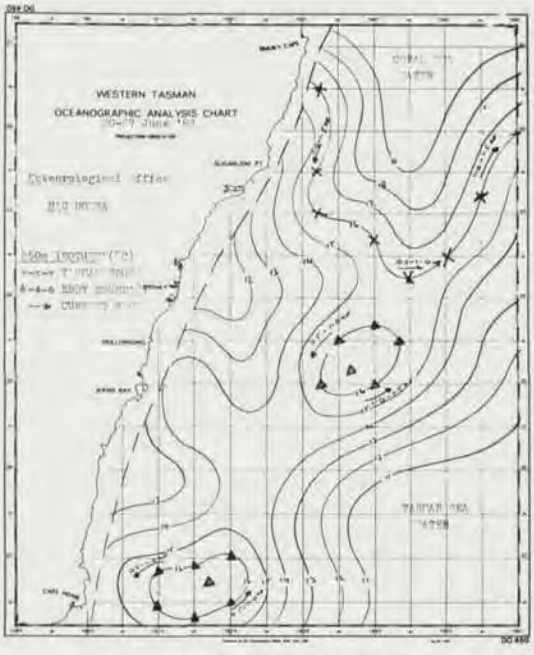


Fig 4. 250m Isotherm

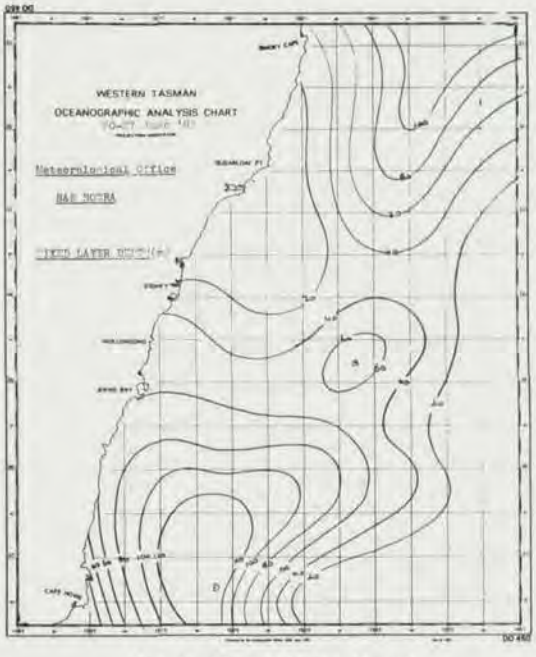


Fig 5. Mixed layer Depth

ANALYSIS PROCEDURE

In view of the military significance attached to the T_{250} profile, this chart is generally drawn up first. The analysis of the previous week is modified according to the new data available. On occasions, this can be supported by the SST satellite picture, although this must be applied with caution, particularly in summer where localised surface heating can occur.

In recent weeks, the availability of a limited number of AXBT drops by the RAN has led to a different approach to the analysis. Having decided upon a given track for the aircraft fo follow, the bathy data obtained will then support or cast doubt upon the previous analyses. Such an approach has also been used in the planning of RANRL or CSIRO cruises.

Frequently, subjective assessments have to be made as to the validity of some of the data, either with respect to its accuracy or its time of observation as compared to chart time. Lack of new data occasionally requires that two or three-week-old observations have to be plotted on a chart.

The sea surface temperature analysis, because of the generally greater number of observations compared with the other two parameters, has often to be completed first. During the winter months, this is, perhaps, an acceptable alternative. During fleet exercises and RANRL or CSIRO cruises, it is often possible to obtain a very detailed analysis of a very small area of the chart. As is the case for all three charts, the approach used is to assume that the previous analysis is accurate and will be changed only after careful consideration of any new data.

This approach does tend to lead to small and often insignificant changes in all three charts over a period of three or four weeks, followed by a radical change as a large number of observations becomes available.

Ocean Current Calculations

The surface currents associated with the EAC are of particular interest to:

- the submarine arm,
- military and commercial surface shipping,
- search and rescue organisations, and
- fishing fleets.

The strength of surface currents in the western Tasman has been directly related to the temperature gradient across the 100m or 250m isotherms. The 250m analysis is used to calculate the current near:

- eddy boundaries,
- the Tasman Front, and
- along the continental shelf.

The calculation is simply:

$$\text{current (knots)} = \frac{12}{\text{distance in nm between adjacent isotherms}}$$

Though rarely available, the drifting buoy data has proven a very accurate means of calculating ocean currents. This has been supported by actual reports from fleet units, both surface and sub-surface. Examples of recent analyses are shown at figures 3, 4, and 5.

FUTURE DEVELOPMENTS

The interest shown in the product so far has certainly made the effort involved in its preparation, worthwhile. Undoubtedly, however, a greater coverage of XBT drops has to be made to significantly improve the overall accuracy.

The ever-expanding field of anti-submarine warfare within the RAN and RAAF, and the great interest shown by the fishing industry, suggest that all parties have a vested interest in supporting these analyses. The support can best be given in the form of frequent and accurate observations from the western Tasman. With sufficient data, such analyses could be extended to encompass a much larger area of the Tasman Sea.

It is hoped that in the near future colour satellite imagery will be available to NAS Nowra to greatly facilitate the analysis process.

By virtue of their inherent speed of operation, aircraft, with AXBTs, must form an integral part of the overall programme. The regular and extensive coverage available from such drops would greatly improve the overall accuracy and coverage given by the 'Oceanographic Analysis of the Western Tasman Sea'.

SUMMARY

The western Tasman oceanographic analysis is developing rapidly, but in the future this can be further improved by increasing the amount of input information. Any form of thermal data from the western Tasman Sea would be most welcome, on a regular or irregular basis. Information, particularly from fishing vessels, could be forwarded to the Meteorological Office, RAN Air Station, Nowra, via the Department of Primary Industry, Fisheries Division (Resource Management). In turn, the Australian Oceanographic Data Centre, Sydney, can provide copies of the weekly analyses to any interested parties.

(This article is reprinted from *The Navy* Oct 83' by permission of the editor.)

SAVE THE KRAIT

By Ross Gillett

In The Beginning

KRAIT was launched as the *KOFUKU MARU* for a Singapore based fishing company. The style of construction suggests she was built by Chinese shipbuilders some time before 1920. About 70 feet long overall and with an 11 foot beam, *KRAIT* was constructed of Burmese teak and fitted with a 75 hp Deutz engine providing a speed of seven knots. Until the Japanese declaration of war in December, 1941, the *KOFUKU MARU* served as a 'go-fer' — taking supplies out to the fishing fleet and returning to base with the catch.

For more than 20 years, the little vessel roamed about the Rhio Archipelago, leading a fairly low key existence. However, all that changed on 7th December, 1941, when Japan attacked the American naval base at Pearl Harbour.

Back in Singapore *KOFUKU MARU*, towing two fish barges and with a crew of 17, began a voyage to Japan. Five days later, the vessel was intercepted by a Royal Australian Navy unit, *HMAS GOULBURN*, and instructed to return to Singapore. The Japanese crew were sent to Bombay as prisoners of war and the vessel impounded.

KOFUKU MARU thus became the first enemy ship captured by the Royal Australian Navy in the Pacific war zone of World War Two.

KOFUKU MARU was soon put to good use. During the three weeks preceding the fall of Singapore, the boat made ten trips to Sumatra, carrying refugees to short-lived safety from the advancing Japanese military.

On her tenth voyage, with 120 Chinese women and children hospital patients aboard and in the company of nine other refugee ships, she came under heavy aerial attack. Eight of the other vessels were sunk and the ninth ran aground. The unscathed *KOFUKU MARU* picked up as many survivors as possible, but on reaching Sumatra her crew discovered the island had been occupied by the Japanese.

The decision was then made to sail to Trincomalee, Ceylon, a distance of 2700km under the command of a retired naval commander, W.R. Reynolds. The crowded vessel averaged only 3.5 knots on the long journey, arriving three weeks later with no water left and sufficient fuel for just 12 more hours sailing. After disembarking her cargo of passengers, the vessel made for Bombay.

In Bombay when *Kofuku Maru* arrived was Captain Ivan Lyon of the Gordon Highlanders, who had escaped to India from Singapore.

Commando Vessel

It was to be Lyon who conceived the idea of a raid on Japanese shipping in Singapore, using the *KOFUKU MARU* to transport commando units to and from the area. He had, at the time, volunteered to join the Special Operations (later Z Force) section. Captain Lyon's scheme of utilising the craft in its old working ground was agreed to.

The failure of the vessel's engine prevented her from sailing to Sydney as planned so she was carried as deck cargo on a merchant ship. After arrival she underwent repairs at the Holmes Shipyard.

With training of volunteers to carry out the raid already underway the Japanese vessel was renamed *KRAIT*, after a particularly venomous Ceylonese snake of the cobra family. The Singapore operation was code-named 'Jaywick' and *KRAIT* transferred from Sydney Harbour to Refuge Bay, near the mouth of the Hawkesbury River, about 40km north of the city.

In this restricted military area, the commandos and crew underwent intensive and secret training to fit them for the arduous voyage and dangerous attack against the Japanese stronghold.

The chosen few then sailed aboard *KRAIT* to Cairns. During the voyage, the over-worked engine gave more trouble, necessitating *KRAIT* being towed into Brisbane for repairs. Subsequently, she was towed into Cairns for further work. The authorities obviously considered that these setbacks boded ill for the raid and there was much talk of the operation being totally abandoned.

The scheme was saved when Commander Long, Director of Naval Intelligence, arranged for the requisitioning of a Gardner 6L3 engine he had found which the army had been using for sawmilling in Tasmania's Huon Valley.

Getting the engine to Cairns was now the problem. Eventually a Dakota aircraft managed

to lift the heavy load off the Hobart runway and headed for the northern city. Despite the weight loss through fuel consumption, the plane's undercarriage still collapsed on landing at Cairns. The fuselage had to be hacked open to retrieve the engine, after which the Gardner was fitted into *KRAIT*. It is still performing almost as well nearly 40 years later.

From Cairns, *KRAIT* proceeded around the top of Australia to Exmouth Gulf in Western Australia, where she was re-provisioned and refuelled for the assault on Singapore. *KRAIT* was carrying sufficient fuel for almost 15,000km cruising. *KRAIT* slipped her moorings but only a minute later the propeller shaft broke. Fortunately, the United States submarine repair ship *USS CHANTICLEER* had entered the Gulf and repairs were quickly effected.

Towards Singapore

KRAIT, its volunteer crew and commandos, sailed toward Bali through the Lombok Strait on 2nd September, 1943. During the voyage, the vessel flew the Japanese ensign. While sailing through enemy waters, those onboard dyed their skins in an effort to resemble Malaysians. Strict security ensured that other vessels were seen before the *KRAIT* herself was detected.

Strong tides in the Lombok Strait plus heavy patrols by Japanese craft, restricted headway to tortoise pace. At one stage *KRAIT* made only 10km in four hours. She eventually cleared these hazardous waters and continued on her journey, playing a cat-and-mouse game with other shipping.

Not long after midnight on 18th September, the little ship dropped anchor off Panjang Island in the Rhio Archipelago, about 30km from Singapore, very near the place where she had been captured by a boarding party from the AMS, HMAS Goulburn some 19 months earlier.

The three two-man crews were Lyon and Huston, Lieutenant D.M. Davidson and Able Seaman W.G. Falls and Lieutenant R.C. Page and Able Seaman A.W. Jones. All crews made ready their folding canoes with limpet mines, food and other essential gear for the attack and left *KRAIT* to establish themselves on Panjang Island to rest and watch shipping movements into and out of Singapore's harbour.

With the commandos safely ashore, *KRAIT* retraced her voyage to the southwest coast of Borneo, where she spent the following 14 days waiting to return to retrieve her commandos. The waiting game of avoiding contact with other shipping proved a trying period for the ship's crew. They had no way of knowing if the operation was going to schedule, whether in fact it had taken place, or whether there would be any survivors at all from the raiding party to collect.

After two days' rest, the commandos paddled to Dongas Island, from where they could better observe activity in the harbour and roads, only a few miles distant.

In darkness on 24th September, the three teams set out to make their attack. However, strong tides forced them to abandon the attempt. They then shifted base to Subar Island, closer to Singapore.

The Attack

At 1900 on 26th September the six men set off once more in their canoes. By midnight they were bobbing about amidst an armada of enemy merchant ships. Lyon and Huston attached two limpet mines to the engine room of a tanker as a crewman looked on from a porthole just above them. Then they placed another on the propeller shaft.

Davidson and Falls did their work on three ships in the Roads while Page and Jones attacked two ships in Keppel Harbour and one at Bukum Island. The job completed, the three crews paddled toward the safety of the mangrove swamps on nearby islands to await the results of their handiwork. Right on time at 0515, with two crews already back at Dongas Island, the air was rent by explosions. Shipboard fires then spread to the wharves and other installations.

Of the estimated 70,000 tonnes of Japanese shipping in Singapore's Keppel Harbour and the Roads on that night of 26th September, 1943, only 30,000 tonnes escaped the devastation wrought by the three two-man commando parties which had set out from Australia aboard the *KRAIT* a few weeks before. Two of the fully-laden cargo ships sank and the other five were seriously damaged in the raid.

The Japanese military mounted a major search over the next few days in an attempt to find the saboteurs.

Satisfied with the result, the commandos, taking separate courses, paddled the 32km to the pick-up point at Pompong Island, scheduled for the night of 1st-2nd October. The only problem to affect the operation was a misunderstanding about the exact rendezvous by two of the crews, and they were not gathered up by *KRAIT* until the following night.

The return journey through hostile waters to Australia then began, but apart from one minor incident in the treacherous Lombok Strait, things went relatively smoothly. Sailing through the Strait in bright moonlight, *KRAIT* was approached by a Japanese destroyer.

The warship came alongside and paced the Nippon-flag-flying Australian vessel for about five minutes before turning away and sailing into the night. For some unknown reason, the

Japanese did not hail or challenge *KRAIT*, nor did they use a searchlight for a clearer view.

The Japanese ensign was finally hauled down on 12th October, shortly before the islands off the West Australian coast were sighted and Exmouth Gulf reached.

Subsequent Duties

Later *KRAIT* was engaged as a supply ship for coast watcher units on Timor, moving by night to avoid detection by enemy warships. As the Pacific war neared its close, she landed intelligence groups on Ambon and Morotai Islands to search for evidence of atrocities and war criminals. On 5th April, 1944, *KRAIT* was finally commissioned into the Royal Australian Navy as a special service vessel.

Manned by naval personnel, rather than the volunteers of Z Force, *KRAIT* sailed with *HMAS BUNDABERG* to attend the surrender of Japanese forces on Ambon Island.

At war's end, British occupation forces in North Borneo took *KRAIT* over and then sold her to understandably unknown buyers who during the ensuing years used her for smuggling heroin, hashish, guns and war surplus goods to various outlets in the South China Sea. Interpol eventually caught up with *KRAIT* and took the innocent victim to Bali, where she became a virtual derelict.

A North Borneo sawmiller named Barrett later purchased the old vessel and used her to haul logs in the rivers and to transfer logging crews around the North Borneo coast, an occupation which lasted some eight years.

Rediscovered

During September, 1962, two Australian timber merchants and former Z Force members were on a buying trip in Borneo. In Sandakan Harbour they saw a vessel closely resembling *KRAIT*, but carrying the name *PENANG*.

Steve Stevenson and Max Hayman, both of Sydney, made enquiries and found that the *PENANG* was, in fact, *KRAIT*. Its name had been altered because of its unsavoury connection with the drug-running trade.

Following protracted and sometimes difficult negotiations, the vessel was purchased by a specially-convened board of trustees with funds raised by public appeal through 'The Sun' newspaper, Sydney. Due to her poor condition, the ship was unable to sail under her own power to Australia. P & O came to the rescue and generously cargoed her to Brisbane free of charge. There the Army Water Transport Squadron, helped by volunteers from the Royal Volunteer Coastal Patrol and the Z Special Unit Association (Z Force), thoroughly cleaned, scraped, painted and mechanically repaired *KRAIT* in preparation for her voyage to Sydney.

In April, 1964, the vessel, again renamed *KRAIT*, anchored near Refuge Bay, from where she had set sail on Operation 'Jaywick' 21 years before. Her original Australian skipper, Lieut Ted Carse, had sailed her from Brisbane. Other originals on board were Horrie Young and Arthur Jones. Before leaving for Sydney on the final short leg of the trip, the ashes of the 'Jaywick' engineer, former Leading Stoker Paddy McDowell, were ceremoniously buried at sea.

Floating War Memorial

As she entered the Heads, Sydney gave *KRAIT* the type of marine welcome matched only by the attendance on departing yachts in the Sydney-Hobart race. On arrival at Man-O-War Steps she was dedicated as a war memorial and handed over to the safekeeping of the Royal Volunteer Coastal Patrol.

Retirement from 'active service' brought *KRAIT* into probably the busiest period of her life. Since Anzac Day, 1964, when she was handed in trust to the Royal Volunteer Coastal Patrol to administer and operate, the vessel has averaged around 80 trips per year.

Although the vessel was originally solidly built, and its Burmese Teak timbers were in excellent condition despite their age, *KRAIT* had, by the early 1980s, reached the stage where it was necessary to sail her from Sydney to Ballina, on the NSW north coast for major repairs. During the voyage she began taking water and had to be towed into Coffs Harbour. Eventually she reached Ballina under her own power, riding the bar in fine style.

The only major repair prior to this time was a new keel in 1972, accomplished with timber donated by Hayman and Ellis, the Sydney-based timber merchants.

A target of $250,000 was set in May, 1981, for the restoration of *KRAIT's* hull. The New South Wales Government opened the fund with $25,000. After that the appeal was kept moving by the devotion of Volunteer Coastal Patrol members. The Fraser Government matched the Wran Government's $25.000 donation and most of the $250.000 appeal target had been subscribed.

The Role of *KRAIT*

The floating war memorial *KRAIT* satisfies countless community and official requests in the service of the people of Australia.

Since 1964, KRAIT has been used mainly in the educational field for the public boating community. These duties involve radio training

courses, coastal navigation and celestial navigation. Seamanship courses are also demonstrated by instructors from the Royal Volunteer Coastal Patrol.

KRAIT is also well known as a regular participant in all water activities including the Sydney to Hobart yacht race and Great Sydney Ferry Race.

As a television star, *KRAIT* appeared in the first series of the ABC's 'Patrol Boat' (1980) and for the Simon Townsend Group. *KRAIT* has also steamed in the documentary of her own life in 'This is Your Life' and a number of movies.

At all times *KRAIT* is on stand-by for search and rescue operations. She also renders an annual service to the MS Society, the last occasion (in 1981) raising $28,000. Opportunities for fund raising are given to numerous community service and ex-service groups. As well, the Naval Reserve Cadets have employed *KRAIT* for annual navigational exercises in the Hawkesbury River and in recent times the vessel has participated in Navy Week displays at Garden Island.

KRAIT continually receives invitations to appear at all manner of public functions, from the Grafton Jacaranda Festival, to Kiama Anniversary, to the Festival of Wollongong. Requests as far afield as Adelaide and Exmouth, WA, have unfortunately been turned down due to the excessive distances involved. Three requests have also been made for *KRAIT* to star in a documentary re-enactment of her famous Singapore raid. Hopefully, remaining afloat, a film can be produced for Australian television.

KRAIT is now approaching 20 years' service to the Australian community, a fine record which must be allowed to continue.

At the Ballina Slipway and Engineering Company *KRAIT* was extensively restored with timber donated by the NSW Country Timber Sawmillers Association. The decks were renewed and extensive restoration effected on the hull and wheelhouse. Total restoration costs came to $170,000 by the time *KRAIT* was re-launched in September, 1982. After final fitting-out she sailed to Brisbane to join the escort for the Royal Yacht *BRITANNIA* to the Commonwealth Games.

Safe for the Future?

The present condition of *KRAIT* is excellent. New decks, new hull frames and planks have been fitted where required so the vessel is tight and seaworthy.

A proposal to send *KRAIT* to Canberra is being pursued by individuals who have very little, if any, knowledge of wooden ships or otherwise. There are no facilities to house *KRAIT* in the War Memorial, thereby necessitating her being left out in the open with only a temporary cover of some kind.

Expert opinion claims that unless the eighty ton ship is housed in an air conditioned building, the total lack of humidity in the ACT will not only cause the timber to shrink, but also cause splitting and consequent disintegration of the whole vessel.

It also seems ironical that without a valid reason *KRAIT* should prematurely end her days, when only in 1983 her lifetime was extended for further service to the community. It is recognised by many that when her life finally reaches an end *KRAIT* should eventually have a final resting place, but that the vessel should be allowed to serve the community for at least another fifteen or twenty years. What should be asked is why spend $170,000 of public monies just to put her in a museum, when the appeal was to restore her to her peacetime role, not just a museum piece. It should be noted that *KRAIT* is unique, being the only Operational Floating War Memorial in the world.

Anyone wishing to help keep the *KRAIT* afloat should write to: Mr Max Smith, 11 Bungan Place Mona Vale, NSW, 2103.

KRAIT crossing the bar at Ballina

KRAIT in January 1978

All photos by couresty M. Melliar-Phelps

At her moorings in the Pittwater — April 1975

METEOROLOGICAL SUPPORT FOR THE AMERICA'S CUP 1983

by Lieutenant Commander K.L. Hancock, RAN

The success of *AUSTRALIA 2* in the America's Cup was the result of the most concentrated effort by any one nation in the 132 year history of the Cup.

Seven syndicates, from four different nations, representing their respective yacht clubs, vied for the honour of challenging for the America's Cup. Three of these challengers, under a common banner of '*ADVANCE AUSTRALIA*', formed the Australian contingent attempting to wrest the 'auld mug' from its 132 year resting place. *ADVANCE, CHALLENGE 12* and *AUSTRALIA 2* formed a formidable challenge. The professional and dedicated manner in which the Australian crews approached the elimination series caused some trepidation, later justified, within the 'portals' of the New York Yacht Club.

In February 1983, Advance Australia America's Cup Challenge 1983 Ltd., an unwieldy name and more commonly referred to as 'Challenge 12 Syndicate', forwarded a written request to the Chief of Naval Staff for support in the form of an RAN meteorologist. *CHALLENGE 12* was the first America's Cup Challenge to represent Victoria and carried the insignia of the 130 year old Royal Yacht Club of Victoria. Mr. Richard Pratt, one of Australia's most successful businessmen, was the sole charterer of *CHALLENGE 12* and co-chairman, with Sir Peter Derham, of the Challenge 12 Syndicate. Mr. Malcolm Fraser was patron-in-chief.

As a result of the request to CNS, approval was given for an RAN forecaster to be seconded to *CHALLENGE 12*. The Challenge 12 Syndicate was to meet all travel and accommodation expenses, and the services of the forecaster was to be provided to the other Australian syndicates if required.

Thursday 19 May, notice of posting was received — 'loaned for duty with the America's Cup Challenge from 20 May 1983'. Monday 23 May I arrived at the *CHALLENGE 12* team accommodation, Newport, Rhode Island. The team accommodation, 'Nethercliffe', one of the numerous mansions within Newport, provided ample room to accommodate the 30 plus members of the *CHALLENGE 12* crew and support team. A four storey brick building in a large tree lined setting provided pleasant surroundings and comfortable accommodation.

The weather information required was of detailed forecasts specifying wind speed and direction, visibility, wind wave height, swell height and direction, and current flow. Emphasis was to be placed on expected changes to wind direction. Details of increases/decreases to wind speed, visibility and wind wave height were also to be emphasised.

Weather forecasts were formulated by reference to:

- Weather charts received via a radio facsimile receiver of the USA, Canada and the Western Atlantic Ocean area. This enabled interpretation of the large scale synoptic situation.
- Three hourly weather reports from coastguard stations around the area to determine conditions being experienced. These reports were received over a weather radio receiver.
- Raw meteorological data from a receiving station in Newport. By reference to the raw data it was possible to promulgate the forecast with the detail required.

The period from the time when it was possible to promulgate forecasts to the commencement of the first elimination series, 18 June, was a period of validation. Numerous hours were spent on the waters of Rhode Island Sound monitoring actual weather conditions and surface current flow. The development of a 'feel' for the local conditions, the bottom line in determining the accuracy of a weather forecast, was therefore possible.

The waters of Rhode Island Sound are relatively shallow, the mean depth of the waters of the race area being approximately 30 metres. The shallow depth of water resulted in a surface water chop in excess of that to be expected when compared to the waves generated from

The Author:
Lieutenant Commander Kevin Hancock joined the RAN in *HMAS CERBERUS* Electrical school and, in 1972, to *HMAS MELBOURNE* as Education Officer. He sub-specialised in meteorology in 1973 and, to the time of his present posting March 1983 as Quality control Officer, Air Training Department/Resettlement Officer, *HMAS ALBATROSS*, filled a number of meteorological billets either at *NAS NOWRA* or in *HMAS MELBOURNE*

similar strength winds over open ocean waters. Tidal currents of the order of 1 knot, when opposed to the wind flow also increased the chop.

The America's Cup race area, located approximately 8 nm from the coastline, was subject to sea breezes modifying the prevailing west to northwest flow. The predominant wind direction over the area was a south westerly sea breeze. Wind flow from the northeast or northwest quadrant was found to decrease as the land/sea temperature difference developed with insolation. The tendency was for winds with a northerly component to:

- decrease to calm prior to the southwesterly sea breeze becoming established. Under these conditions it was generally around 1400 local time before the sea breeze direction was steady and of sufficient strength to enable a warning of a race start to be signalled. Consequently a 2 hour postponement was not uncommon.
- decrease and back south westerly before strengthening. Under these conditions the southwest sea breeze generally was established by early afternoon. If a postponement was necessary it was usually of shorter duration.

Large air temperature differences over land when compared to over sea were at times recorded. These differences were of the order of 10 to 15 degrees Celcius. The strength of the sea breeze generated by these temperature differences was less than expected, being in the range of 10 to 13 knots. Sea breezes off the NSW coast associated with temperature differences of this magnitude would be expected to be around 25 to 30 knots. Sea breezes of 5 to 8 knots were predominant, being associated with the more general temperature differences between land and sea of less than 10 degrees Celcius.

A further peculiarity of the area was the shear in both speed and direction between the surface wind and the wind at 25 metres (top of the mast). The difference in speed was generally of the order of 6 to 12 knots while the difference in wind direction was at times as large as 50 degrees.

A southwest gradient flow, usually preceding a frontal passage, invariably caused a reduction in visibility. In dry air, haze resulted in visiblility being reduced to 1 to 3 nm. With moist air, as the temperature of the warm southerly flow decreased on moving over the colder northern waters, dense fog was frequently formed. The fog at times reducing the visibility to virtually zero, tended to persist until the passage of a front caused a change in air mass. Fog resulted in a number of races being postponed during the elimination series.

Weather briefings were issued three times daily. On completion of the evening meal, at the team meeting to analyse the day's racing and pre-planning of tactics for the next race, a twenty four hour forecast was issued. This forecast was an integral part of the tactics planned to be employed.

At 0700 local time, by reference to an analysed chart of the synoptic situation affecting the area, forecast winds, weather, visibility and sea state were covered in detail. Discussions with regard to main sail selection, the range of head sails and spinnakers required and pre-start tactics were then finalised.

A light air mainsail was selected if forecast maximum winds were 12 knots or less; for winds in the range of 10 to 20 knots the medium air mainsail was required and the heavy mainsail was used when maximum winds in excess of 20 knots were forecast. Different headsails and spinnakers were required for varying wind strength over a narrow range and also for different sea conditions.

Prior to race start, the actual weather conditions affecting the area were monitored. The final detailed forecast of wind speed and direction was then issued. During this briefing, the increase/ decrease in wind strength, the direction of movements of wind during the race and the side of the course with the more favourable wind pressure was emphasised.

No contact with a competing yacht was permissible once a race was underway.

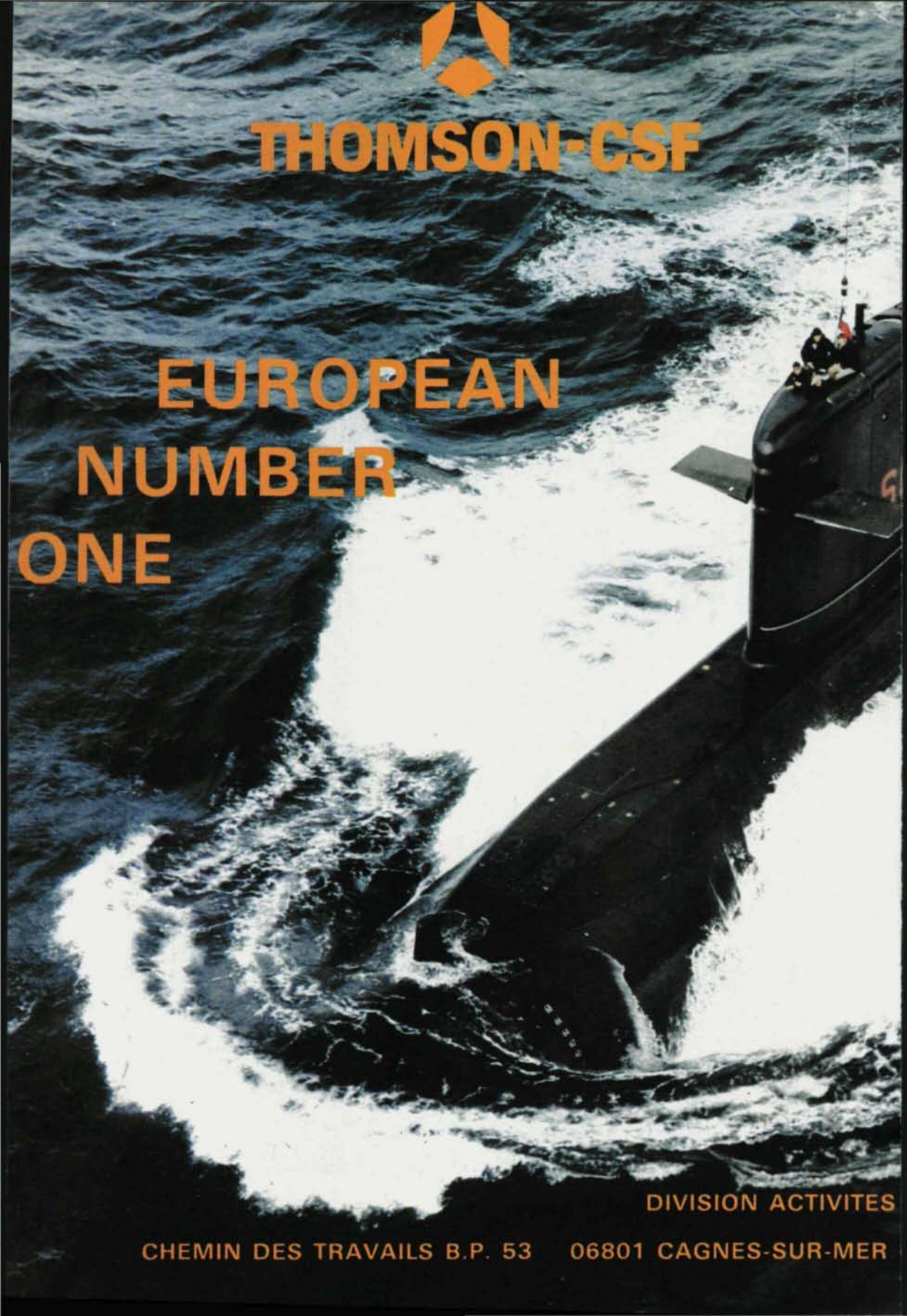
The daily routine of the 12 metre yacht crews varied little from day to day. On lay days, with no competitive racing, sail testing and crew training continued. A typical day consisted of 10 to 12 hours at sea, including the time required to get to and from the course, preceded and followed by physical training. Attendance at team meetings to analyse and pre-plan tactics extended the day's activities to around 16 hours each day of the week.

With the intense rivalry and competitiveness between the challengers, it was not possible to be closely associated with, or provide meteorological support to more than one syndicate. *AUSTRALIA 2* and *ADVANCE* syndicates arranged for meteorological support from US sources.

AUSTRALIA 2, with its radical keel, from the beginning of the elimination series stood out as the yacht to beat. The lower point of gravity compared to the conventional 12 metre yachts, enabled greater manoeuvrability and for *AUSTRALIA 2* to 'point higher' into wind. *AUSTRALIA 2* had marked superiority on the 'to windward' legs.

The technical achievement in the development of the 'winged keel' and the dedication of the crews of the Australian challengers culminated in *AUSTRALIA 2's* success in winning the America's Cup, the world's most coveted yachting trophy.

Challenge 12
By Courtesy: Challenge 12 America's Cup 1983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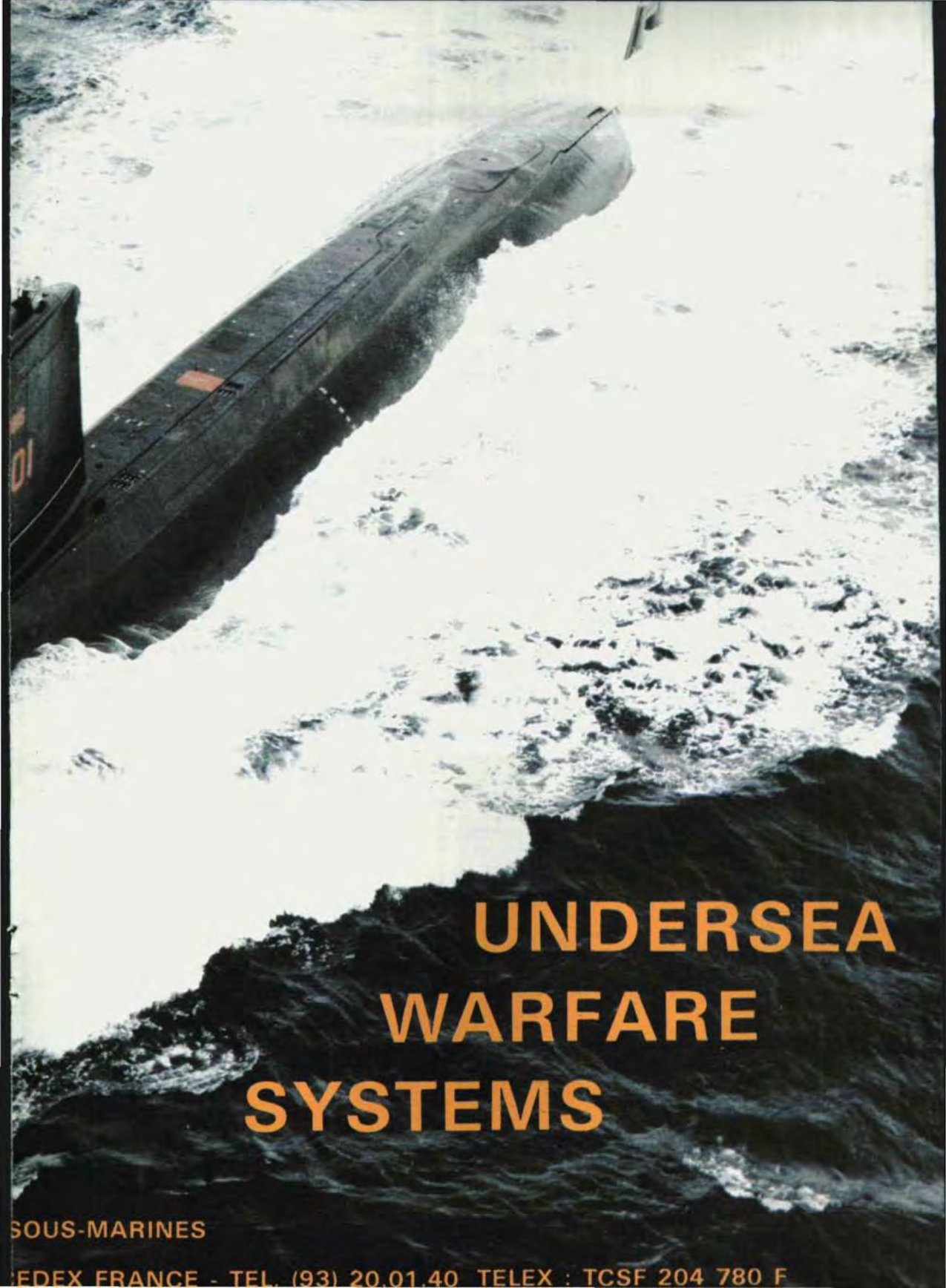

SOUS-MARINES

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HMAS KIMBLA OCEANOGRAPHIC OPERATIONS 1983

By Sub-Lieutenant P.L. Mulready RAN

Continuing oceanographic surveys have provided a busy programme for *HMAS KIMBLA* this year. The first half of 1983 saw the ship surveying and dredging underwater canyons, and conducting measurement of currents within the Tasman Sea and Bass Strait. This work was undertaken by scientists from the Royal Australian Navy Research Laboratory (RANRL) and the University of NSW. Further research work was continued within Bass Strait in conjunction with the Victorian Institute of Marine Science (VIMS) and the Warrnambool Institute of Technology. This work inivolved study of current flows and current characteristics within the Strait.

The ship's company enjoyed a welcome reprieve from the colder climes as research work in August and September was conducted in warm waters north of Cairns.

Scientists from the Australian Institute of Marine Science (AIMS) led by Dr. Edward A. Drew embarked in Cairns. The objective of the AIMS Cruise was to determine the quantity and species of living Halimeda on the inter-reefal seabed. (Halimeda is a calcareous algae which contributes to the sediment.) The trial was conducted in areas where geological surveys had revealed up to 80% of the sediment was composed of Halimeda debris. The Halimeda when seen in its living form grows on the seabed as a dark green plant like algae. Its frequency of growth varies within any given area.

KIMBLA departed Cairns in early August, laden with equipment designed to obtain samples from the seabed. A variety of diving equipment including SCUBA gear and a shark cage were stowed onboard as comprehensive surveys of certain defined areas of seabed were to be conducted by divers from AIMS.

Although prevailing winds were gale force at the first station near Lizard Island, the first grab and dredge deployed from the ship were encouraging, good harvests of Halimeda being obtained. Diving in the area was postponed until the following week when the weather had sufficiently improved. Halimeda collection continued in different areas of the inter-reefal seabed from the Second Three Mile Opening and Tijou Reef area, further north to the Flinders Island Group, and the Quoin Island Entrance area. Grab stations in the latter were temporarily delayed with the breakdown of the ship's hydrology winch. Further samples were obtained by lowering and raising the grab by hand from the starboard general purpose davit. This method proved very successful and allowed grabs to be completed in better time than by using the more conventional winching. It did require a lot of manpower, yet provided the opportunity for good humoured competition between messes who provided teams for each evolution. It would have been a formidable task had the winch become unserviceable during the early days of the cruise.

Unfortunately, strong to gale force winds were encountered and visibility was very poor on most days, thereby hindering navigation and ship station keeping on task. Some areas initially planned for survey could not be sampled due to the risk of mining conducted during the war (1941-45) in reef entrance areas. These areas are completely safe for surface navigation but could prove hazardous when conducting dredging operations on the seabed. AIMS did lose a grab and dredge from snagging during sample collection. These losses are accepted as a routine risk when operating in reefal areas.

Despite these problems, the cruise proved successful as three areas worked by the ship produced good quantities and varieties of Halimeda. Sample containers unloaded in Cairns were completely full and should ensure increased knowledge of the growth and effects of the sediment formed from Halimeda in inter-reefal areas.

The trip illustrates the variety of tasks and research cruises *HMAS KIMBLA*, originally a boom defence vessel, is required to undertake in a usual sea-going year. The ship has, since 1959, been continually involved in oceanographic research along the Australian coast, and continues to be an asset for many facets of military and scientific research of the ocean.

NAVAL IMPLICATIONS OF COASTAL SURVEILLANCE

By Commander A.H.R. Brecht, RAN

The quality of coastal surveillance has come a long way since the Defence Force first became involved in 1968, and the results now achieved in Australian waters are about as good as one could reasonably expect from the funds invested. But to many people in the community, and in the Navy as well, it is something of a black art; perceptions of what actually happens are often based as much upon 'Patrol Boat' television productions as upon fact. This article is the first of two planned to provide readers with information about the subject with the hope that an understanding of some of the organisation dedicated to achieving the surveillance task, its implications for the Defence Force and the RAN in particular, and its community impact, might stimulate debate in this journal.

The matter of coastal surveillance is important in its own right as a means to solving an important national requirement and responsibility, but it also raises some difficulties for the RAN in that scarce resources have to be dedicated to it and there are those who maintain that such resources could be better spent. The comments and opinions I shall give in these pages are based upon more than two years experience in operating *FREMANTLE* class patrol boats (FCPB) from the Cairns Naval Base, and of maintaining such boats in operational service; thus, there will be opportunity for readers to disagree if Bass Strait or other Australian area experiences differ. In general terms though, I believe that coastal surveillance is practised much the same in each part of the country, and in any case, the organisation for it is basically identical.

Most people are surprised to learn that the Australian Defence Force has no charter from government for coastal surveillance duties. This responsibility is given to the Department of Transport and Construction which co-ordinates the Australian Coastal Surveillance Organisation, better known as COASTWATCH. Today's arrangements have evolved over many years, but Australian surveillance techniques first began to become properly organised in September 1973 as far as the RAN is concerned, when the government decided that Defence and Customs should jointly address the problem of drug smuggling in northern Australia. The influx of refugee boats from Vietnam and other points north in 1977 next stirred public interest such that emotive media reports began to emerge of massive illegal immigration, and led to Navy Tracker patrols based in Darwin and to a resurgence of awareness in surveillance by partol boat. It was at about this time that plans to upgrade naval base facilities in Cairns and Darwin began to be taken seriously.

Role of Aircraft

Unfortunately, one of the most important misconceptions concerning coastal surveillance took root in these heady times when Tracker aircraft were being extremely successful in directing patrol boats to illegal refugees on the high seas, with subsequent wide publicity when ships discharged their helpless human cargo in Darwin. The idea grew that it was the apprehending patrol boat which held the answer to detection; the vital role of aircraft was largely overlooked then and is still much neglected today. Too many people believe that increasing the patrol boat force will also improve our surveillance effectiveness, and although time on patrol could undoubtedly be longer with more boats, the area covered would not necessarily grow proportionately. To illustrate this point let me draw upon an admittedly loose analogy. In a single day, one FCPB might cover a sea area about the size of the city of Sydney, whereas a good patrol aircraft such as a Tracker could cover most of New South Wales in the same time. An Orion P3C, for example, will do about 300,000 square miles in 12 hours and detect a steel hulled trawler up to 60 nm from 6,000 feet - no patrol boat can compete with this.

Existing aerial surveillance resources are fairly limited, particularly when one considers the length of Australia's coastline and the enormous sea areas generated by the 200 nautical mile Australian Fishing Zone. The area of Queensland and Northern Territory covered by Cairns based patrol boats comprises almost 2,500 miles of coastline and over 400,000 square miles of offshore ocean, yet this is only a fraction of the Australian total. With more than 12,000 miles of coast to protect, together with the entire AFZ, our surveillance resources have to cope with a maritime area of over 2½ million square miles, equivalent to 70% of the entire Australian landmass. If one accepts the argument that

patrol boats alone cannot cover such an area with any acceptable degree of effectiveness, then the onus falls very much upon aviation.

A point for debate here might be the question of how much of the surveillance dollar should the government invest in new aircraft? Or should Defence be asked to do more? Part of the government thinking which rejected the use of Trackers for surveillance after their impending RAN demise followed a line which argued an incorrect cost equation. Whilst I agree that hour for hour, a small civil charter aircraft has less operating cost than a Tracker or P3C Orion, such a view takes no account of times on task. The latter aircraft will complete any given surveillance task in far less time than a Nomad or similar platform would require; when detailed costings are done, the Service aircraft presents very competitively. Giving the Trackers a stay of execution and using them for northern aerial surveillance based at Townsville RAAF Base would certainly bolster the somewhat scarce resources government now has at its disposal for the task.

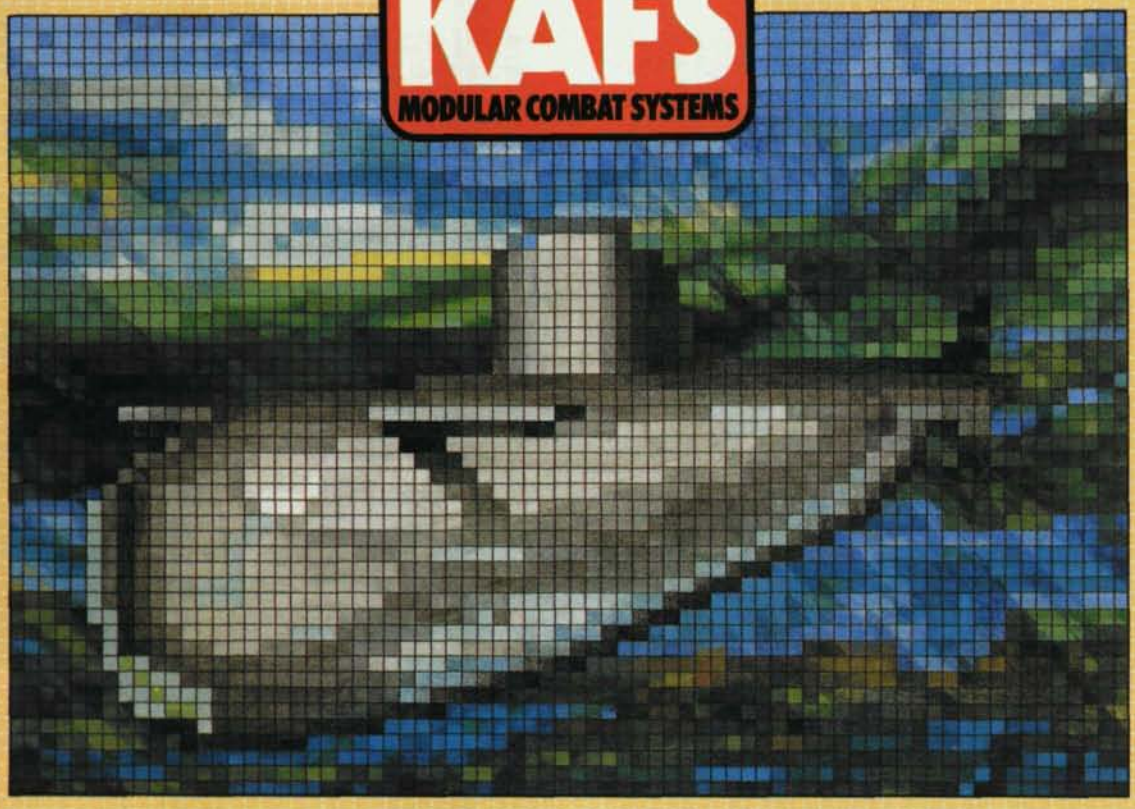
The heavy reliance upon civil charter aircraft for surveillance presently practised by COASTWATCH results in barely adequate coverage. Fourteen civil aircraft are involved in daily aerial surveillance between Karratha in Western Australia and Cairns in Queensland and these are supplemented by Navy Trackers flying Bass Strait sorties and a restricted RAAF P3C Orion programme. Participation by the latter two Service aircraft is governed very much by the point referred to earlier, that Defence has no charter for surveillance per se, and that the normal requirements of training and operations must be met. As far as the Orion is concerned, this means that patrolling the Queensland offshore areas is limited to not more than one sortie in 10 days, and I am sure that this frequency is indicative of the coverage in other areas as well.

COASTWATCH would no doubt benefit from increased aircraft surveillance which could greatly improve the degree of reliability placed upon sightings at present. Many surface sightings have to be verified by aircraft, but if none is available at the time, then the target has often vanished when a sortie is mounted. This is particularly important in the Queensland and Torres Strait sea areas where myriad islands and coral cays are readily available as shelter or camouflage for small ships and yachts which do not wish to be found. However, as things stand at present, there is little chance of any significant change to the level of air surveillance now being programmed; thus, Navy has no real alternative to its current participation. (The matter of whether it should participate will be discussed in the second of these articles).

Role of Coastwatch

As previously mentioned, the role of RAN patrol boats in coastal surveillance is often misconstrued or misunderstood. Their true function is to support aircraft as rapid response platforms, on hand in patrol areas to quickly investigate sightings made. In this capacity, HMA ships engaged in such tasks admirably supplement the COASTWATCH organisation. Based in Canberra, the latter is controlled and staffed mostly by ex-Servicemen who keep duties on a watchkeeping basis to maintain accurate, up-to-date surface plots of Australian coastal waters and to so build up a comprehensive picture of activities in and around our waterways. More than 6000 reports each month are received from surveillance aircraft and ships, and from a variety of other sources including members of the public living in remote areas. Most of these are routine sightings of ships or yachts legitimately engaged in their normal business, but about 10 percent of all reports require subsequent investigation. For Navy patrol boats, this might mean anything from a mercy dash, to a stricken yacht aground on a coral reef, to a routine investigation boarding of a foreign fishing vessel inside Australian waters. Because such tasks are not strictly in accord with its primary role, ie, the defence of Australia, the Defence Department and COASTWATCH engage in a rather detailed procedure whenever particular RAN assistance is required. Each request is relayed from COASTWATCH through Defence to DEFNAV Canberra to the Fleet Commander, and lastly to the appropriate operating authority in the form of a directive. In such fashion, the apprehension of an illegal Taiwanese fisherman in the Great Barrier Reef may have its origins in a request to Defence handled by more than a dozen people. Although it sounds slow and clumsy, this procedure in fact works very quickly and smoothly, through the close co-operation of all parties along the line.

Behind those surveillance exploits which hit the headlines lies much co-ordination by COASTWATCH. Headline seekers expect to be told of fishing arrests, or heroic SAR achievements, but as in most things, Navy patrol boats make their greatest contribution to national surveillance by doing everyday things which draw no publicity at all. COASTWATCH activities are aimed at helping to prevent the introduction of dangerous animal and plant diseases as well as combatting smuggling; unauthorised landings on our coastline by people from other countries have to be prevented; checks have to be made upon the health of indigenous aboriginals or



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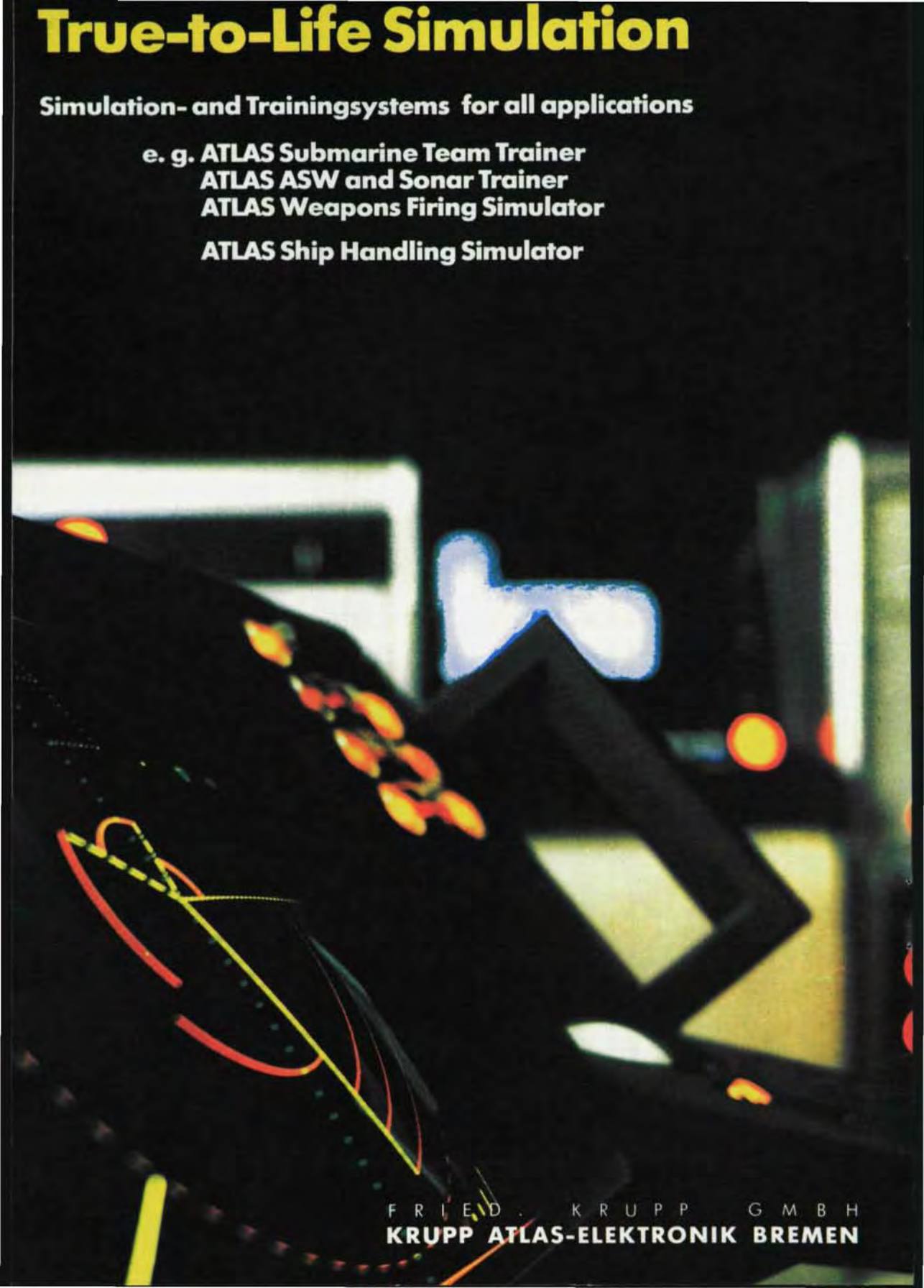

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Torres Strait Islanders in isolated places; close observation of fishing activities must be maintained; all these and more require the assistance of several government departments other than Defence. Because these needs have to be met on an almost daily basis, RAN patrol boats are tasked to conduct particular patrols in designated sea areas, often embarking an officer from a relevant government department, say Health or Immigration, and spend much of their time on seemingly mundane duties. For the Navy personnel concerned, such routine tasks help to develop or preserve just those skills which will be needed in tricky situations when a boarding is needed or an emergency develops.

Patrol Boat Activity

The importance of such surveillance work is generally unknown amongst the community. Estimates have been made that the Australian economy could suffer almost irreparable damage through agricultural or animal diseases, and these are too numerous to list. One little known strain called Newcastle disease, prevalent in the many small islands to the north of Australia, has the potenial to virtually wipe out this country's poultry industry just as it did in California a few years ago. RAN patrol boats spend many hours assisting in its prevention by ferrying appropriate field officers to and from the various islands suspected of harbouring it; although unsung, this kind of assistance from the Navy probably contributes as much to our nation's continued prosperity as any other activity we undertake.

Undoubtedly, the most widely publicised patrol boat activity concerns the apprehension of foreign vessels found illegally fishing in the AFZ. Co-operation between Navy and the Department of Primary Industry (DPI) is very close in this aspect of operations, to ensure that the maximum is achieved without wastage of patrolling time. As described previously, COASTWATCH co-ordination is essential, indeed the main thrust of effective fisheries surveillance could not be achieved without it. Scrutiny concentrates upon the operations of licensed foreign fishing vessels which allows the presence of an illegal boat to be quickly detected. (The COASTWATCH/ Defence request procedure described previously is then implemented). Under relevant Federal government legislation, RAN patrol boat commanding officers have the authority to arrest vessels suspected of engaging in illegal activities, but in most cases a DPI Fisheries officer is embarked when a particular investigation is begun. Other than to give evidence at any subsequent court proceedings, Navy is not involved once the suspect boat has been escorted to harbour, and experience has shown that things go very smoothly when a Fisheries expert is present at the apprehension. For incidents in the Bass Strait, patrol boat captains are invested with the powers of the Australian Federal Police in protection of oil rigs from terrorist activity; thus, legally, the RAN is well protected against charges of enthusiasm or overstepping authority on the high seas.

Although lacking in glamour, routine patrols are the ones which count. In order to achieve these, COASTWATCH relies upon inputs from the various government departments concerned, and seeks assistance from naval operations staffs in Fleet Headquarters and the operational bases. Using Cairns based FCPB as an example, each patrol promulgated in the Fleet Programme, is the result of close consultation at the local level between the naval base and appropriate government field officers to provide the Fleet Commander with a picture of just what surveillance activities are required to be performed. This is incorporated into his Defence requirements and the patrol boat is tasked. While on patrol, the PTF will report all sightings to COASTWATCH and to those naval authorities who need to know, so that at all times everyone concerned at the various operations centres has the fullest picture possible of what is happening around Australia's coastline.

Information is also provided from coastwatchers, merchant ships, private civil aircraft and the airlines, the owners of small boats and lighthouse keepers. The picture compiled thus shows what is happening on the fishing scene; gives details of the movements of small boats or yachts (these are particularly relevant to the Immigration and Customs departments if remote or isolated waterways are involved); provides data upon pollution at sea, in estuaries, and along the coast; and permits rapid response to be organised in SAR situations.

Navy's Commitment

Navy's commitment in terms of manpower, ships, and facilities has grown steadily over the years. Introduction of the *FREMANTLE* boats has meant a quantum jump over the capabilities of their predecessors, although it must be recognised that the *ATTACKs* rendered sterling service to the surveillance cause. FCPB are bigger, faster, and more sophisticated, with greater endurance and sea keeping qualities. Their dedication to the coastal surveillance task has significantly increased Navy's effectiveness in this role but has similarly raised the level of maintenance commitments, noting that the

FCPB is a new class of ship for the RAN. The relevance of such commitments including their effects upon manpower and patrolling availability will be discussed in a subsequent article, so it suffices here merely to say that although they are proving excellent response platforms, the FCPB are not a panacea for all of the surveillance ills, imaginary or otherwise.

As the *FREMANTLE* class building programme winds down (the last boat, *HMAS BUNBURY*, commissions in December 1984) the RAN patrol boat force structure sees 15 FCPB supplemented by *ATTACK* class boats in RANR port divisions. Most surplus *ATTACKs* have either been designated for the Defence Co-operation Programme or for disposal, but reconsideration of this is possible given recent government inclinations concerning DCP. It may even be possible to retain one or two *ATTACKs* for patrol duties but this would depend much upon estimated ship life. Surveillance is achieved through regular patrols by PTF based at Sydney, Cairns, and Darwin, with future boats to be deployed to Perth and Westernport. Although the Sydney PTF contribute to the organisation previously described, they are primarily employed in Bass Strait oil rig protection, which means that the bulk of routine patrols is conducted by northern boats based at Cairns and Darwin. Coincidentally, the northern areas of Australia are at present drawing the most interest from government departments concerned with the surveillance programme, for it is here that our country is very vulnerable to incursion by unwanted elements. As matters stand in 1983, illegal immigration is rated as perhaps the greatest problem, because although overseas fishermen still operate against the law in Australian waters, their numbers are decreasing. Smuggling is perennial, but measures taken by Customs in conjunction with the efforts of COASTWATCH and RAN patrols seem at least to keep abreast of the moves and countermoves made by drug runners and others. Nevertheless, constant and careful vigilance must continue.

This article has attempted to show that a vibrant, efficient organisation exists in Australia to implement coastal surveillance and that overall it achieves satisfactory results. Protection of Australia's huge coastline and offshore waters is clearly an enormous task, one which requires a great deal of time, effort, and money from many departments and dedicated people. Under present arrangements, much data is collected and analysed, but it can be argued that more is needed before Australian coastal surveillance could be regarded as fully and comprehensively meeting the requirement. This aspect of the subject will be addressed later. Aerial resources must be improved and perhaps Defence can contribute more in this area. As far as the RAN is concerned, there are few organisational 'bones' which could be pointed. The patrol boat force is active, conspicuous, and effective, a situation resulting very much from the fact that surveillance patrols are accorded high priority in RAN operations. For example, patrol boats have suffered little from the current fleet fuel consumption limitations and deployment of boats to bases around the country achieves a good balance between needs and resources. Some effects of this policy upon the RAN as a whole, and other surveillance aspects alluded to earlier, will be the subject of a future article.

The Author

Commander Alan Brecht joined the RAN in 1957 as a telegraphist and, after training, served in HMA ships *QUICKMATCH* (twice), *PARRAMATTA* and *MELBOURNE*. He attended the SD officers promotion course in UK as a Petty Officer Radio Supervisor, was promoted to Sub-Lieutenant SDEXC in January 1975 and served in the RN in *HMS DEFENDER* and *HMS MERCURY* (the RN Communications School). Since his return to the RAN in 1966 he has served in *HMAS PARRAMATTA*, the RAN Communications School, the Directorate of Naval Communications (twice), Naval Communications Station Canberra and *HMAS ALBATROSS*. He was promoted to Lieutenant SDEXC in January 1967 and transferred to the Gereral List in 1970. He attended the RN Advanced Communications Course at the Royal Military College of Science, Shrivenham, UK in 1974 and then served as Communications Officer in *HMAS MELBOURNE*. He is currently CO of *HMAS CAIRNS*.

THE WORK OF THE ROYAL AUSTRALIAN NAVY HYDROGRAPHIC SERVICE

by Lieutenant Commander J.W. Leech RAN

May 1983 was a month for bad news in the RAN Hydrographic Office. In that month, an international bulk carrier struck an unsurveyed shoal in the main shipping lane off Cape Otway, suffering extensive damage to the fore-peak and double bottoms, and a large ship struck a shoal off Lancelin, severely damageing her screws. (Both ships forwarded a hydrographic note.) The charts of the areas in which these incidents occurred contain warnings of the inadequacy of the survey information upon which they are based. It is perhaps not widely appreciated that only about 20% of Australia's continental shelf has been satisfactorily examined using echo sounder and sonar, that a further 16% has been surveyed less adequately at either open spacing or without sonar examination, and that the remaining 64% has never been surveyed since sonar and echo sounder were invented. Charting in these areas depends upon random lead line soundings. Mariners are well advised to heed the notes about the reliance to be placed on charts, which are published in the Mariners' Handbook. Figure 1 shows the areas surveyed by the RAN since 1945.

The Department of Defence (Navy) is the government department responsible for the surveying and charting of Australian waters, and hydrographer RAN is the responsible officer within the Department. This responsibility was laid down by Cabinet in 1946, and was reaffirmed as a result of the Review of Commonwealth Functions in 1981. The Navy has a duty to provide accurate charts of Australia's coasts for the benefit of all Australian and international mariners. The Navy carries this reponsibility because obtaining a full chart coverage is an expensive undertaking essential for national defence, and such wide coverage, although of value to civil interests, is not essential.

The civil task is important to Australia for the safety of commercial shipping, for reasons of marine science research, for the development of resources both in the Exclusive Economic Zone (EEZ) and on the mainland, and for the delineation of the EEZ. The importance placed on the civil task was summarised in the 1981 Senate Report on Australian Marine Science, which recommended that all possible avenues be explored to acquire a complete bathymetric and hydrographic survey of the Australian coast as rapidly as possible. An example of the value of hydrographic surveys to the commercial world was the discovery in 1981 of 'Hydrographer's Passage', a deep water channel through the Great Barrier Reef east of Mackay. The survey was carried out for defence purposes, because the lack of a channel through the reef between Capricorn Channel and Palm Passage, a distance of some 500 miles, was a severe restriction on naval operations. However, its discovery off Hay Point, a port for the bulk export of minerals, will save commercial ship operators (and indirectly Australia) many millions of dollars each year.

The availability of accurate and up-to-date navigational charts is a prerequisite for the successful conduct of maritime operations, both naval and commercial. Without charts, no navigation can be safely undertaken. The survey work required for the preparation of charts is extremely time-consuming, involving the collection and verification of large volumes of data. It is an activity comparable with the provision of infrastructure and the collection of intelligence, and is best carried out in peacetime, since it is almost impossible to collect data in the required detail in a war zone.

Hydrographic surveys provide the raw data from which navigational charts are produced. The Australian chart series, which includes Papua New Guinea, will, when complete, consist of some 650 charts. To date, 350 charts have

The Author

Lieutenant Commander Leech is a hydrographic surveying specialist who joined the Royal Australian Navy in 1977 after serving ten years in the Royal Navy. His principal postings since arriving in Australia have been Executive Officer of *HMAS MORESBY* and Officer in Charge of the RAN Hydrographic School. He is at present serving in navy Office as Staff Officer to the Hydrographer

been published. In addition to the publication of new charts, there is a continuing requirement for chart maintenance. Charts become obsolete when they are no longer accurate, and new editions must be published at intervals varying from 5 to 15 years, depending upon the rate of development of the geographical area covered. These new editions normally require a re-survey of some part of that area. As an aside, 270 charts in the current series are in need of metrication. Hydrographic surveys are also required for a number of special Defence purposes, notably for amphibious and mine warfare operations.

Surveys are progressed according to a five year plan called the Hydroscheme. This is put together by a consultative process involving the Departments of Defence and Transport, the Shipping Industry, and the State Hydrographic Departments. The majority of surveying effort in the next few years will be concentrated in the North and North West of Australia and in the Great Barrier Reef.

Hydrographer is Australia's representative in the International Hydrographic Organisation (IHO). This is the world's governing body on hydrography and nautical charting, and it lays down minimum standards for surveying, charting, and training in these disciplines, which Hydrographer administers and improves upon in the Australian context. The RAN Hydrographic School has been accepted by the IHO as operating to standards which will train Category B surveyors — hence its attraction to students from overseas hydrographic authorities.

Hydrographer maintains close contact with other Commonwealth, State and commercial authorities which engage in hydrographic surveying for their own purposes, in order to encourage sufficiently high standards in their work that the data may be used to improve the national chart series. For this reason, he is the Chairman and Convenor of the Hydrographic Sub-Committee of the Australian Association of Port and Marine Authorities. He is also one of the four federal members of the National Mapping Council and an adviser to the Commonwealth Co-ordinating Group for Mapping Charting and Surveying. He has regular contact with the Department of Transport, both when deciding what areas require to be surveyed, and also as a member of the Maritime Services Advisory Committee which is concerned with many aspects of maritime safety.

Complementary to the external liaisons maintained in surveying, Hydrographer has close links with all organisations in Australia (and many overseas) who publish charts and maps of the marine environment. Wherever practicable, the quality of these products is reviewed and, if satisfactory, they are incorporated in Australian charts.

Under a tripartite agreement with the United Kingdom and New Zealand, Australia is responsible for providing nautical chart coverage for an area stretching from the southern shores of Indonesia to the Antarctic and from west of the Cocos/Keeling Islands to east of Norfolk Island, including all PNG waters. Current cartographic resources allow fewer than 40 new charts, or major new editions of existing charts, to be prepared each year and, once again, it will not be much before 2020 that the full series will exist, some of which will still depend on inadequate data. New products are prepared to standards and in a format laid down by the IHO, and the Hydrographer RAN is a member of IHO's Chart Standardisation Committee. Several small scale charts are already published by Australia in the International Chart Series, and it is expected that, as time goes on, more of the medium scale and even large-scale charts will be published in this series.

Hydrographer is also responsible for publishing annually the Australian National Tide Tables, and officers of the Branch are members of the National Mapping Council's Permanent Committee on Tides and Mean Sea Level. The first steps have been taken towards preparing an expanded series of Sailing Directions for Australian waters, which will eventually supercede the UK volumes. Hydrographer also works with the Division of National Mapping in delineating the base lines from which the nation's off-shore boundaries and exclusive zones are calculated.

Apart from supplying charts and publications to the Fleet and other government departments, Hydrographer administers the sale of these products to commercial shipping interests, and members of the general public. This is effected through agency agreements with some 70 outlets in Australia and another dozen overseas. This involves responsibility for sales worth about $750,000 a year and for the collection of sales tax worth about $40,000 a year. This is not a small business, and is a rarity for a branch of Navy Office!

The hub of the Hydrographic organisation is the Hydrographic Office in North Sydney, arguably one of the Navy's best pieces of real estate. The work of the office includes the planning and quality control of surveys, scheming of charts, chart compilation, chart amendment, issue of notices to mariners, publication of tide tables, and chart issue and accounting. At present, the majority of this work is done manually, but computers are being introduced to provide a hydrographic data base, an automated chart compilation facility and a new stock and financial

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accounting system. The printing of charts is done by the Army Survey Regiment at Bendigo.

The Hydrographic Office embodies the Australian Oceanographic Data Centre (AODC), the repository of oceanograpic data obtained around the country not only by Fleet units but also through the close links which exist with research establishments elsewhere in the country. The AODC is closely associated with regional and world data centres and there is a regular exchange of such data, with the AODC acting as the national focus. Through the AODC, Australia is one of the principal contributors of oceanographic data to the International Oceanographic Commission.

Partly because there are aspiring naval surveyors there, but also because he is the national authority, Hydrographer is closely connected with the surveying faculty of the University of New South Wales, and is a member of the Visiting Committee. He has also been consulted by other tertiary institutions involved with hydrography, particularly during the last year by the Australian Maritime College in Launceston. This liaison, with educational establishments and with such professioal bodies as the Institution of Surveyors of Australia and the Institute of Cartographers of Australia, is considered essential to the promotion within Australia of the standards of the international bodies concerned with hydrography and nautical charting.

Every year, Hydrographer and his staff respond to a very large number of enquiries on a wide range of subjects from civil organisations and members of the public. These include questions on navigation, chart coverage, equipment, nautical history and various research subjects. In the latter cases, the unique collection of survey documents and old charts which form part of the national archive are available for scrutiny by serious students.

Hydrographer is responsible for the professional tasking of the Marine Science Force. The ships available for hydrographic surveying at present are HMA Ships *MORESBY* and *FLINDERS*. In the not-too-distant future, it is hoped that the force will be expanded to include four Surveying Motor Launches, a Laser Air Depth Sounder (LADS) unit, and perhaps other minor fleet units allocated to the surveying role. Even with these (and their replacements) it will not be until well into the next century that all parts of Australia's area of charting responsibility will be adequately surveyed. The field force is supported by the RAN Hydrographic School at *HMAS PENGUIN*, and a hydrographic adviser is on loan to the Solomon Islands Marine Department under arrangements within the Defence Co-operation Programme. The uniformed manpower of the Hydrographic service consists of 36 surveying officers and 77 survey recorders. The civilian staff is 72, and includes cartographers, draughtsmen, computing systems analysts, oceanographers and administrators.

In closing this brief description of the hydrographic service, I would like to return to the theme with which I started. I have on my desk a newspaper cutting from the West Australian Daily News of 28 May 1980. Under the title 'For the Want of a Map the Battle ....' the author says that during the Soviet intervention in Afghanistan and the troubles in Iran, US maps and charts were found to be so basic as to be almost useless, and this was one of the causes of failure of the mission to rescue the hostages in Tehran. The Defence Mapping Agency (DMA) subsequently sought a staff increase of 150, and an annual budget of $350m. It is interesting to contrast this with the British experience in the Falkland Islands. The Royal Navy, using its Ice Patrol Ship, had over many years been resurveying the waters of the Falkland Islands, and as a result during the recent war, navigational safety was not a hazard with which the Naval Commander had to contend.

Fig 1: Areas Surveyed by the RAN since 1945.

(This article was published in the Journal of the Australian Marine Science Association and in Wishbone, the Hydrographers' Journal)

DEVELOPMENTS IN LASER HYDROGRAPHY IN AUSTRALIA

by Lieutenant Commander D.C. Holliday RAN

The Hydrographer RAN is the national hydrographic and charting authority. The area of Australian charting responsibility includes large tracts of the Indian and South West Pacific Oceans and the adjacent waters of Papua New Guinea and Antarctica. By modern standards, the area of the Australian continental shelf is poorly surveyed. Statistically, 20 per cent is classified as satisfactorily examined, 16 per cent less so, while the remaining 64 per cent depends on early lead-line soundings or is completely unsurveyed.

Inadequate chart coverage has major implications for defence, particularly for a maritime nation such as Australia. The collection of hydrographic and oceanographic information for use by the defence forces is a primary peacetime role of the Hydrographic Service. In fulfilling this role, support of defence requirements must be balanced against the needs of the civil maritime community and safety of navigation in general.

In 1972, the RAN initiated a study into available techniques capable of improving the efficiency of hydrographic surveying. The concept of using an airborne laser sensor was identified as having the greatest potential and the task of developing the necessary laser technology was given to the Defence Research Centre, Salisbury (DRCS). Two experimental systems, designated WRELADS 1 and WRELADS 2, were developed. Extensive field testing in South Australian and Queensland waters have demonstrated the feasibility of laser techniques. Continued development has been formalised in a Naval Project and the system redesignated as the Laser Airborne Depth Sounder (LADS). The project has entered a Project Definition study phase which will form the basis for the subsequent production phase. The current timetable provides for delivery of the first production system in 1987.

LADS is designed to operate in depths from 2 to 30m with penetration to 50m under favourable conditions. As almost half of the continental shelf lies in depths of less than 50m, LADS will have a large area of potential use.

System Configuration

The basic elements of the proposed LADS system include: (see Fig 1)

- A suitable aircraft fitted with the laser depth sounder and associated subsystems for navigation, data processing, and aircraft systems integration.
- A Ground Analysis Sub-System (GASS).
- A suitable radio navigation position fixing system.

Aircraft

The RAN intends to use a modified Fokker F27 aircraft. In the operational role, the aircraft is required to fly at an altitude of 500m at a ground speed of 135 knots (70m/sec). Endurance provides for a 4 hour survey sortie plus a transit time of 1½ hours each way from the operating airfield. Given a ferry range of 1200n miles, the F27 can be rapidly deployed to remote areas and is capable of operating from unsealed runways with a minimum length of 1200m.

Laser Sounder

LADS uses a Nd:YAG laser which generates 5n sec light pulses at 1064nm wavelength in the infra-red band. The infra-red (IR) beam is split and using frequency doubling techniques, a second green laser with a 532nm wavelength is generated. The lasers are housed in a Transmit Receive Scanner (TRS) which is mounted on a stabilized platform above a modified camera bay, cut in the fuselage of the aircraft. A high resolution colour video camera is also mounted on the TRS platform for use in navigational checks, monitoring of sea surface conditions and subsequent processing of LADS data.

In operation, the sounder transmits red and green laser pulses towards the sea surface. The red beam is held vertical to provide a height and sea surface reference while the green beam penetrates the water column and is scanned through an arc of 30° at right angles to the aircraft track to produce a swath of soundings approximately 270m wide. At the operational

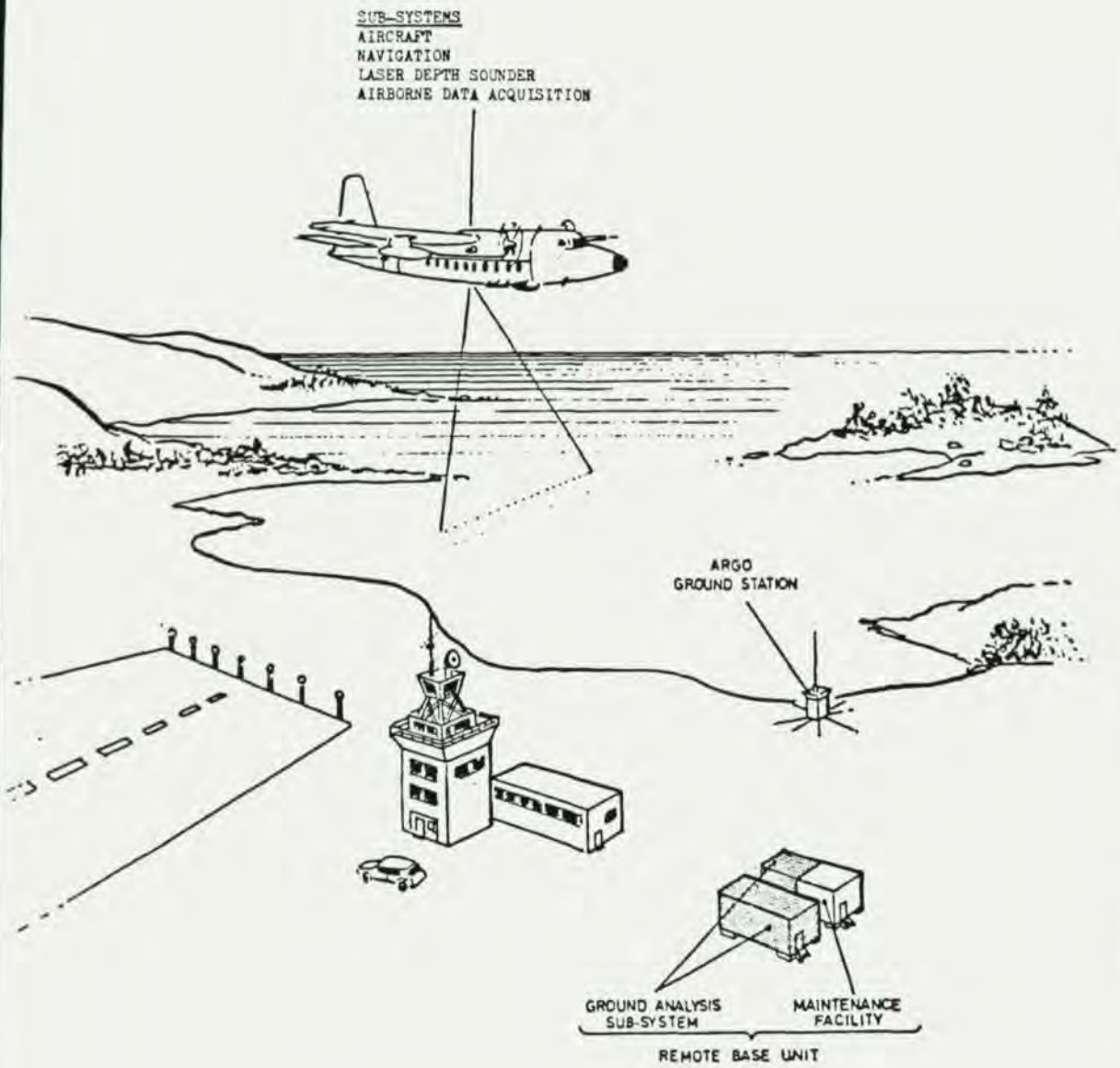


Fig 1: LADS System Configuration.

height and speed of the aircraft, LADS will generate a grid of soundings at a nominal spacing of 10m square. The depth measurement is provided by the difference between the red and green pulses. Correction for systematic and random errors provides a resolution of better than one metre.

Navigation Systems

The RAN uses the Cubic Western ARGO DM54 position fixing system to conduct hydrographic surveys. LADS will operate with ARGO in a passive hyperbolic mode which requires a minimum of three transmitting stations to be established in the survey area. The aircraft receiver provides continuous position information which is correlated with the sounding data and recorded by the onboard data processor. The aircraft's Navigation sub System provides outputs to a pilot display and to the auto-pilot giving cross-track and height corrections which are used to maintain accurate tracking of pre-programmed flight paths.

Within the limitations of the ARGO and scanning systems, LADS will provide discrete positional data for each sounding in absolute terms on the Australian Map Grid to an accuracy of better than 20m.

Ground Analysis Sub-System

The GASS is co-located with the aircraft at the operating airfield. It consists of two standard ISO containers which house the dedicated computers and displays required for processing the raw sortie data. Position and depth (x.y.z) information is corrected and output in x,y,z,c format where c is a confidence factor derived during processing. Because of the volume of data, the process is highly automated and calls for operation through a hierarchy of quality flags.

Concept of Operations

The LADS system will normally be deployed in consort with a conventional survey vessel. The ship's responsibilities include the establishment of ARGO and tidal stations, the provision of ground truth information in selected calibration areas, the investigation of critical depths and anomalous LADS data and any operations in water depths beyond LADS capablilities.

Prior to deployment, the tidal regime in the survey area will have to be defined and the appropriate co-tidal factors provided as inputs for the reduction of depth data to a common datum. Tide gauges monitored by ship's staff will provide real time base data for tidal reductions.

Index errors in the navigation and laser sub-systems are determined on a sortie basis by overflying established calibration areas. The survey sortie then involves flying a predetermined pattern of parallel flight paths at a typical 250m spacing optimised to reduce time lost in aircraft turns at the end of each swath. Given a maximum on task time of 4 hours, LADS is capable of generating in excess of two million soundings or the equivalent area coverage of 50 square nautical miles.

The LADS laser is designed to be eyesafe at 500m and conforms to Standard AS2211-1981 of the Australian Code of Practice for Laser Safety. In addition, a basic laser inhibit switch is provided at pilot and operator consoles for use when over flying vessels and populated areas.

Post sortie data processing is to be undertaken by the GASS facility. To avoid a processing backlog and enable efficient survey planning, it is essential that a 4 hour sortie be processed in less than 7 hours. A high level of automation is mandatory; however, operator interaction will be required in the validation of data. As the survey progresses, selected data is written to a master file for eventual onforwarding to the Hydrographic Office. Areas of anomalous data are identified for re-fly action or investigation by conventional means.

The RAN manning for LADS calls for two pilots, a flight engineer, six Hydrographic specialists, a systems anaiyst and a systems maintainer. Of the hydrographic specialists, one is appointed 'In Charge of Surveys'. From the remainder, four are split into teams of operators. Each team will alternate on a daily basis collecting and processing their own data. It is envisaged that 5 sorties will be flown per week with a nominal 1000 hours flown annually.

On completion of a survey, the selected data is forwarded as an input to the Hydrographic Office and used in the updating and production of charts. All original raw data tapes will be archived to allow reprocessing for any future applications.

Basic Depth Measurement and Accuracy

The heart of the LADS system is the laser sensor. The determination of depths depends on the speed of light through sea water and the time difference between the reception of the IR surface return and the sea-bed return. Accuracy is subject to the systematic and random errors associated with the measuring equipment and environmental factors such as sea state and turbidity.

Beam geometry assumes that the laser energy is refracted at a flat sea surface and reflected back along the reciprocal path. In reality, the presence of ripples, waves, swell and multiple scattering increases the average path length and is a major contributor to bias error in the basic measurement. The limitation on depth is given by the ability of the system to

discriminate between reflected sea-bed signals and background noise. In coastal waters, the maximum depth is a function of turbidity while in the clearer offshore water, reflected sunlight is the dominant noise source. Experimentation to date, has established an empirical relationship between turbidity, beam attenuation and extinction depth (the depth at which the sea-bed signal is lost in noise). Utilisation of this relationship enables the system to remotely sense turbidity and produce qualifying statistics on system performance.

Overall system accuracy depends on the determination of bias errors and the effects of random errors. Developments in system design coupled with suitable calibration and field techniques should allow depth discrimination to one decimetre with an absolute accuracy of better than one metre.

Future Development

Current and future development centres on the refinement of data processing and field techniques. The basic technical aspects of the LADS concept have been proven by DRCS during the WRELADS trials, but data processing requires more attention. The sheer volume of data produced by a single sortie presents a daunting processing task. The presence of ambiguous data is a limiting factor in automatic validation and selection of data. Development of software algorithms which incorporate conventional hydrographic philosophy is essential if the high levels of automation required are to be achieved.

The advent of the Global Positioning System (GPS) later this decade will permit independent LADS operations. This will give LADS significant potential as a reconnaissance platform in addition to its normal survey role. In addition, the GPS will increase the geographical area in which LADS can be used by allowing it to operate outside the present limits of land based electronic survey control systems.

Conclusion

Subject to the successful completion of the project, LADS will represent a quantum leap ahead in hydrographic surveying technology and will have a profound effect on the charting of the shallower waters of the continental shelf. Current estimates of this task put completion of basic coverage at 50 years using conventional assets. LADS has the potential to provide detailed coverage in less than 13 years.

The availabiltiy of accurate bathymetric data is of fundamental importance to navigation and Defence. It is also becoming increasingly important in terms of national development, marine research and the management of natural resources. On this basis, the advent of LADS will have a substantial impact on the future of hydrography and marine science in Australia.

Acknowledgements: 1. Penny M.F., 1982, DRCS-ERL 0229 TR

ISSUES IN AUSTRALIAN SHIPPING. Occasional Papers on Maritime Affairs: 2. Canberra, Australian Centre for Maritime Studies, 1983. 73 pp, ill, tables. $9.00

This volume of papers addresses itself to current issues in mercantile shipping with particular emphasis on Australian mercantile shipping.

The volume includes ten papers. A breakdown of the contents shows three papers discussing the validity, operation and effectiveness of the Liner Conferences, two papers on aspects of ship design, two papers discussing the Australian shipping industry and one each on the OECD outlook for the future of Western shipping, the new Law of the Sea and Australian shipping and the shipping problems associated with Tasmania as an Island State.

It is interesting to note that it is unlikely ship types will change in the near future. With ships presently in operation, the main changes are operating at lower speeds and/or limiting the amount of cargo carried on any particular ship. Some ships have been re-engined but this is subject to a strict cost analysis for each case.

It was gratifying to note that Australia is in the forefront of some of the new developments. Particularly noted was the world's first natural gas powered ship (built by Carringtons, N.S.W.). Even though the volume is dated 1983 there was only one very brief mention of the ANL order for two coal fuelled bulk carriers.

Included were a number of clear and well captioned photographs, all of ships to be seen in Australian waters. This volume is interesting, but it must be said it has very little that is of direct application to defence considerations. It is available from the Secretary, ACMS, PO Box E20, Queen Victoria Terrace, Canberra, A.C.T, 2601.

J. Wishart

(*The views expressed in this paper are the author's and do not necessarily reflect those of the Australian Department of Defence or the Minister for Defence.)

THE ROAD BEYOND MONTEGO BAY

Progress with the 1982 UN Convention on the Law of the Sea

By Captain W.S.G. Bateman RAN*

BACKGROUND

The last article in the ANI Journal on the UN Convention on the Law of the Sea appeared in 1980 and was called cryptically, 'The Road to Caracas'.[1] The author, Captain Whitten, reviewed progress with the Third UN Conference on the Law of the Sea (UNCLOS III). In doing so, he looked forward to the expected occasion in Caracas, Venezuela, when members of the United Nations would sign a new Law of the Sea Convention, finally agreed after the years of long and arduous negotiation which had commenced with the first session of UNCLOS III at UN Headquarters in New York in December 1973; Caracas was to be selected for the location of the final signing session since the initial, major negotiation session of the Conference, the second session, was held there between June and August 1974.

Unfortunately, there was to be no return to Caracas — due to concerns about provisions in the new Convention regarding substantive and procedural aspects of the delimitation of marine and submarine areas between States with opposite or adjacent coasts, Venezuela withdrew its support for the convention and voted against it at the last UNCLOS III negotiating session in New York in April 1982. Three other countries (Israel, Turkey and the United States) also voted against the Convention and there were seventeen abstentions, but otherwise a very large measure of international support was shown by 130 countries, including Australia, voting in favour of its adoption.

We should not underestimate the significance of this support for the new Convention shown in April 1982. With the exception of some final tying up of loose ends in drafting, there was then ready for the formalities of signature, a comprehensive, international treaty covering virtually every area and aspect of man's uses of the sea — from the shoreline to the most remote ocean spaces and the deepest seabed. It represented major political agreements on matters of vital national and global interest, and has been hailed as probably the most significant international agreement since the UN Charter itself. The purpose of this article is to review what has happened since April 1982 and to discuss the defence importance to Australia of the Law of the Sea Convention eventually entering into force.

UNCLOS III ended at Montego Bay in Jamaica, the location chosen instead of Caracas, on 10 December 1982 with the signature by 118 countries, including Australia, of the new Convention (another eleven had signed by August 1983). Whilst it is unusual for so many countries to sign a convention as soon as it was opened for signature, unfortunately the non-signatories included three of the world's major maritime nations, the Federal Republic of Germany, the United Kingdom and the United States (Japan did not sign the Convention at Montego Bay but has since done so). Countries, having signed a Convention, must subsequently ratify it before they have a binding commitment to it. Signature of a convention does not create legal obligations for the signing country, other than an obligation to refrain from actions which would defeat the object and purpose of the treaty. The legal obligation results from the stage of ratification which is achieved in Australia through the processes of Government and the approval of the Executive Council. An essential step is to ensure that domestic law is or will be in conformity with the treaty.

The Convention on the Law of the Sea will enter into force twelve months after it has been ratified by at least sixty countries. So far only a few countries have done so (nine as of August 1983) and the whole process of ratification and entry into force may take several years to complete.

Although Australia has signed the Convention, this does not necessarily mean that we will ratify it. The ratification decision will be made by the Government taking account of a range of political and economic factors, most particularly, the degree of acceptance of the principles of the Convention by other countries and the level of the financial contribution Australia will be required to make to support the activities of the supranational seabed mining organisation established by the Convention (this contribution could be quite large, if, as seems possible, the US and some other major Western industrial nations remain outside the Convention).

Defence Interests

During the next year or so, all Australian interest groups concerned with using the sea will need to determine whether or not their interests will best be served by Australia's ratification of the Convention.[2] Defence has an important general interest in the early international acceptance of a comprehensive and widely accepted Convention which reduces the potential for conflict between nations. Australia, as a maritime nation with diverse maritime interests (most particularly, seaborne trade, offshore territories and resources) has a significant vested interest in any development which reduces the potential for maritime disorder.

Particular aspects of the Law of the Sea, of Defence significance, which have been clarified in the new Convention include:

- freedom of navigation,
- freedom of overflight beyond areas of national sovereignty,
- a clear and agreed delineation of areas which can be brought under Australian jurisdiction (the territorial sea, the Contiguous Zone, the Exclusive Economic Zone, and the continental shelf), and
- an effective system for the peaceful settlement of maritime disputes (through the International Tribunal for the Law of the Sea to be established in Hamburg).

(This paper concentrates mainly upon the freedom of navigation, as the topic presumably of most interest to readers of the ANI Journal.)

NAVIGATION ISSUES

The provisions of the new Convention dealing with the freedom of navigation should be seen against the background of the last thirty years or so which have witnessed a process of creeping national jurisdiction seawards, placing wider controls over the areas of marine space available to shipping. Many coastal States have sought to push their territorial sea boundaries beyond the traditionally accepted three mile limit to 12, 100 and even 200 miles. Widely varying national laws have been passed with regard to fishing rights, offshore oil production, and marine environmental issues, including a proliferation of conflicting pollution laws which could have placed severe limitations on the navigation of particular types of vessels.

The first UN Conference on the Law of the Sea held in Geneva in 1958 was not able to reach agreement on the breadth of the territorial sea. The Convention on the High Seas, agreed at that Conference, established the high seas as all parts of the sea that are not included in the territorial sea (of unspecified breadth) or the internal waters of a State. The complementary Convention on the Territorial Sea and the Contiguous Zone provided for the sovereignty of the coastal State over the territorial sea and the exercise of certain controls by the State in a Contiguous Zone extending not beyond twelve miles from the baseline from which the breadth of territorial sea is measured. Whilst this suggested an effective limit to the breadth of the territorial sea, on the other hand it did not rule out that a coastal state could claim a territorial sea beyond twelve miles, but by doing so, the State could not claim additional Contiguous Zone rights.

Innocent Passage

Under the 1958 Convention on the Territorial Sea and the Contiguous Zone, ships of all States enjoy the right of innocent passage through the territorial sea. Coastal States can neither hamper innocent passage through the territorial sea nor suspend the innocent passage of foreign ships through straits which are used for international navigation between one part of the high seas and another part of the high seas or the territorial sea of a foreign State. This relatively liberal interpretation of innocent passage came to be seen by some coastal States, which have gained their independence since 1958, as an intrusion on their sovereignty and an attempt by major maritime nations to enshrine traditional, over-bearing rights under one particular interpretation of international law. Some uncertainty also began to emerge regarding what activities are innocent and what are non-innocent, not least of all because the concept of innocent passage in the 1958 convention is the historical one which evolved before the advent of submarines and aircraft.

The new Convention on the Law of the Sea has two fundamental differences on these points from the 1958 convention. First, it permits the territorial sea to extend up to twelve miles with a Contiguous Zone of up to twenty four miles from the territorial sea baselines. This provision has the effect of closing off as territorial sea 116

additional straits used for international navigation which had previously been regarded as high seas passages.[3]

Secondly, to accommodate the concerns of coastal States for pollution control measures and the protection of national security, the regime of innocent passage is much stricter under the new Convention than it was under the earlier one. A coastal State may, without discrimination among foreign ships, temporarily suspend innocent passage for the protection of its security, and specific activities are listed as being contrary to the meaning of innocent passage. These are generally directed at warships and include such issues as the prohibition of any exercise or practice with weapons of any kind and the launching, landing or taking onboard of any aircraft or military device. A warship which is merely exercising the right of innocent passage is thus inhibited from taking some fundamental measures of self-defence. Submarines are required to navigate on the surface and show their flag. The new Convention's greater clarity on these points has been described as 'a major improvement over the 1958 Convention'.[4]

The coastal State is also allowed to adopt laws and regulations relating to innocent passage through the territorial sea in respect of the safety of navigation and regulation of maritime traffic and various other specified issues. It may require ships to confine their passage to stipulated sealanes within the territorial sea with special mention being made of foreign nuclear-powered ships and ships carrying nuclear or other inherently dangerous or noxious substances. Whilst the Convention states that the coastal State shall not hamper innocent passage *except in accordance with the Convention*, it seems possible that a coastal State would have little difficulty in justifying the disruption of the flow of shipping which was merely exercising the rights of innocent passage in accordance with the Convention. Strictly, the State is not able under the Convention to impose requirements on foreign ships which have the practical effect of denying or impairing the right of innocent passage but there remains the fundamental right of the coastal State, expressly stated in the Convention, to take steps it deems essential for the protection of its security.

There was considerable polarisation of views at UNCLOS III between the coastal States, particularly those adjacent to major shiping 'choke points' (eg. Spain and Morocco for the Straits of Gibraltar, and Malaysia, Singapore and Indonesia for the Malacca Straits), on the one hand, and the major maritime powers (eg. US, UK, Japan, USSR) on the other. Invariably, Australia closely identified with the latter countries on navigational issues.

Transit Passage

To overcome the limitations of the innocent passage regime, the maritime powers were successful in achieving acceptance of a new regime of transit passage, *which shall not be impeded*, to be applied to straits which are used for international navigation. This right, to be allowed by coastal States, was in effect the *quid pro quo* for the acceptance of the twelve mile limit of territorial sea which had earlier been opposed by the major maritime powers because of the additional straits which could become closed as territorial sea. Whilst ships exercising the right of transit passage are required to refrain from any activities other than those incidental to their normal modes of continuous and expeditious transit, these activities are not specified in the same way as they are with the innocent passage regime. Since it is also not possible to suspend transit passage, this new regime can only be regarded as an important new contribution to the freedom of navigation. A coastal State can make laws and regulations relating to navigation and pollution, for example, but it cannot hamper or suspend transit passage.

The regimes of innocent and transit passage, as they are established in the new convention, are well illustrated by consideration of Australia's two major international waterways — the Torres and Bass Straits. Passage through the Torres Strait by the recommended route via the Prince of Wales Channel requires at present the exercise of the right of innocent passage through Australian territorial seas within the current three mile limit. After the entry into force of the new Convention, passage will be governed by the transit passage regime for straits used for international navigation.

Bass Strait is at present a high seas route since the recommended passage can be used without passing within three miles of Australian territory. However, if or when Australia declares a 12 mile territorial sea, as allowed by the new Convention, the territorial seas of islands in the Strait between Wilson's Promontory and Flinders Island will overlap and passage will only be possible using Australian territorial seas. Bass Strait will then become a 'strait used for international navigation' within the provisions of the Convention and the transit passage regime will apply.

Archipelagic States

The other major provision of the new Convention which has significant implications for the freedom of navigation of Australian shipping is its establishment of the new category of 'archipelagic States'. States which are constituted wholly of one or more groups of islands and meet

certain other criteria specified in the Convention may draw archipelagic baselines joining the outermost islands and drying reefs of the archipelago. The waters between the islands of the archipelago and within these baselines assume characteristics of the territorial sea in that the archipelagic State exercises sovereignty regardless of the depth of these waters or their distance from the coast. This sovereignty extends to the air space over the archipelagic waters, as well as to the seabed, and the resources contained therein.

This regime of archipelagic States has considerable importance to Australia in view of the number of countries in Australia's region which claim the status of 'archipelagic States'. The list of such countries comprises from west to east: Indonesia, Philippines, Papua New Guinea, Solomon Islands, Vanuatu and Fiji. New Caledonia will also be able to do so after Independence, but cannot do so at present since France, as a nation, could not qualify for archipelagic status!

The *quid pro quo* for international acceptance of archipelagic status is the regime of archipelagic sealanes passage which allows ships of all nations the right of unimpeded, continuous and expeditious passage through archipelagic waters along sea lanes which may be designated by the archipelagic State. If the State does not designate these sea lanes, then the right of archipelagic sealanes passage *may be exercised through the routes normally used for international navigation*. The archipelagic sealanes passage regime is the same in effect, and is governed by similar provisions, as the transit passage regime with the archipelagic sealanes (up to 50 miles wide) becoming virtual 'straits' through the archipelagic waters. Outside these 'straits', ships of all nations have the right of innocent passage only and must abide by the provisions of that more restrictive regime, including recognition of the power of the archipelagic State to temporarily suspend innocent passage in specified areas of its archipelagic waters for the protection of its security.

The regime of archipelagic sealanes passage should ensure the freedom of mobility of Australian naval and air forces through and over the archipelagos in our region. In the words of article 53 of the new Convention, archipelagic sealanes passage means 'the exercise in accordance with this convention of the rights of navigation and overflight *in the normal mode* solely for the purpose of continuous, expeditions and unobstructed transit' (*emphasis added*). 'Normal mode' is interpreted, at least by the major maritime nations, as meaning that submarines can transit submerged and that surface units may undertake those activities which are necessary for their security, including the launching and recovery of aircraft and streaming towed sonar arrays, for example. Subject only to restrictions on navigation, presumably this also would allow a naval task group to proceed along an archipelagic sealane, which may be up to fifty nautical miles wide, in its normal cruising formation with aircraft in support and a deployed ASW screen.

To return briefly to the regime of straits' transit passage, significantly the term, 'in the normal mode', which is not defined in the Convention, does not appear in the equivalent article which gives the meaning of transit passage (Article 38). However, the next article (Article 39, which incidentally also applies *mutatis mutandis* to archipelagic sealanes passage) states that ships and aircraft while exercising the right of transit passage, shall 'refrain from any activities othemas watson.
modes of continuous and expeditious transit unless rendered necessary by *force majeure* or by distress'. This reference to 'normal modes' is regarded as 'euphemism for submerged transit of submarines'.[5] The omission of the words 'in the normal mode' from the description of transit passage permits the view that archipelagic sealanes passage has rather more clarity, particularly with regard to the activities of surface ships, than the regime of transit passage.

DIFFERENT NATIONAL VIEWS

Before work started on the provisions of the new Convention relating to the freedom of navigation, uncertainty was beginning to appear regarding assured navigation rights for both warships and commercial vessels, with even the concept of transit fees or tolls through certain straits looming as a possibility.[6] With warhships, some nations had sought to have the right to receiving prior notification or granting prior authorisation of ship transits throught the territorial sea or other waters under some form of national jurisdiction. Australia interprets the relevant articles of the new convention as providing the same rights for warships as for commercial vessels without any need to obtain prior authorisation or to give prior notification. Unfortunately, even now, there is no certainty that these provisions will be universally accepted despite the hard bargaining during UNCLOS III and the requirement for States to accept the Convention as a 'package', ie, they must accept the good with the bad, with an aspiring archipelagic State, for example, theoretically being unable to claim the benefits of archipelagic status without at the same time granting the right of unimpeded archipelagic sealanes passage to ships of all nations.

Dissenting national views regarding this issue of prior notification of warship transits were

still being expressed at the last session of UNCLOS III in Montego Bay. The round-up press release of that session records that:

> 'A number of States which had unsuccessfully sought to amend the draft Convention in order to require prior notification or authorization for innocent passage of foreign warships through the territorial sea, repeated their support for that position in the interest of coastal State security. Benin regretted that coastal States had had to accept omission of such a clause, at the price of their security. The Democratic People's Republic of Korea, Romania and the Sudan contended that coastal States had the right to safeguard their security interests in regard to the passage of warships through their territorial waters. Malta said it went along with the compromise on this point, and reserved the right to submit a declaration. Saint Lucia regretted what it described as the vagueness of the test on this point. The United Arab Emirates disagreed with the article as it stood. Vanuatu regretted that the text permitted vessels carrying nuclear weapons and materials to pass through the territorial sea. In Yemen's view, the passage of warships through the territorial waters of a small developing country was a violation of its sovereignty.'[7]

Seabed Mining

Although the United States, as a non-signatory State, now argues that the navigation rights under the convention are available under customary international law (and is therefore in effect being selective itself in its approach to the Convention because it has rejected the seabed mining provisions of the Convention), it is clear that the American arguments will not be accepted by many States. In addition to the Montego Bay statements noted in the UN Press release quoted above, the Philippines claimed that sealanes passage would apply *only* in such passages as the archipelagic State may designate.[8] It is more that probable that these dissenting views of the Convention have been largely inspired by a desire 'to see the Americans off' and some may not have been stated if the US had continued its earlier support for the Convention.

The United States has so far refused to sign the Convention on the grounds that its seabed mining provisions do not meet US objectives. The problems with these include:[9]

- A decision-making process that would not give the US or others a role that fairly reflects and protects their interests.
- Provisions that would allow amendments to enter into force for the US without its approval.
- Stipulations relating to mandatory transfer of private seabed mining technology.
- The absence of assured access for future qualified deep seabed miners to promote the development of these resources.

Although it is not the purpose of this article to discuss the seabed mining issue and the US concerns in any detail, at least it should be noted that it is now a matter of public record in the report of the Australian delegation that the final negotiating session of UNCLOS in New York in April 1982 was nearer achieving consensus than was commonly appreciated at the time. In the early stages of the session, the United States, joined by several other large Western industrial countries, pushed for amendments to the text of the Convention which were not acceptable to many other national delegations and were also known to be 'far in excess of what the United States might have been prepared to accept'.[10] In an attempt to overcome these difficulties without disturbing fundamental elements of the seabed package negotiated during previous years, eleven smaller Western nations, including Australia, proposed their own set of amendments to bridge the gap in the opposing national positions. These included less onerous obligations on seabed miners to make technology available to the International Seabed Authority, and a clause to the effect that future amendments would not bind States that did not formally adhere to them. Unfortunately, by the time a United States 'bottom line' began to emerge with regard to these amendments, it was the final days and hours of the conference, things had moved too far and the situation could not be retrieved.[11]

Aside from the UNCLOS III activities, the US and some other major industrialised nations have pursued a Reciprocating States Agreement (RSA) to establish a general framework for reciprocal recognition of national seabed licences between countries which have the technology and general wherewithal to undertake deep seabed mining. Six nations (FRG, UK, US, Japan, USSR and France) have enacted domestic legislation on seabed mining and others are in the process of legislating.[12] Due to the general slow-down in economic activity, and falls in commodity prices, deep seabed mining now appears less attractive than it did several years ago. An Australan mining expert has assessed that 'the possibility of seabed mining taking place on a healthy commercial basis in the medium term future of 20 to 30 years is only slight'.[13]

Australian policy on seabed mining has 'generally been to steer a middle course between the aggressive demands of Western mining interest and the ideologically opposed

developing States'.[14] Although Australia's mining will be mainly land-based for the foreseeable future and there is little common ground with the US concerns regarding seabed mining, the Australian mining industry remains quite lukewarm with regard to the new Convention. Its problems lie in the Convention's seabed mining provisions which are considered to violate or threaten freedom of access to markets, as well as introducing regulatory and bureaucratic procedures, the totality of which could give seabed mining unfair advantages over land-based procedures.[15] Meanwhile, since commercial seabed mining is unlikely to be economically viable for the time being, the Australian mining industry is unlikely to argue strongly against Australia's ratification of the Convention.

It is easy to be pessimistic about the future of the Law of the Sea Convention. It is clear that US mining interests and the so-called 'ideologues', who suspect that the Convention could become a means for the less developed countries 'ripping off' the major Western industrialised nations, have been able to carry the day against those US interests which identify with the positive benefits of the Convention. Some would argue that the US is now set on a path which could destroy the Convention.[16] Other nations will assist in this outcome if they persist with interpretations of the Convention which are contrary to the process of consensus and compromise which prevailed during the nine years of negotiation at UNCLOS III.

On the credit side, the 1983 sessions of the Preparatory Commission for the main institutions to be established under the Convention — the International Sea Bed Authority and the International Tribunal for the Law of the Sea — have been relatively successful. This could well provide a vehicle for achieving an accommodation that would enable additional States to adhere to the Convention. It is now possible that any general perception of the success of the Preparatory Commission will produce a sufficient number of ratifications to ensure the entry into force of the Convention.

CONCLUSION

With the new Convention, nations have been compelled to take the widest possible view of their uses of the sea. They have not been able to view their interest in combatting marine pollution, for example, in isolation from their interests in other major maritime matters such as the freedom of navigation, seabed mining, maritime boundaries or marine scientific research. This has been the problem with international Conventions in the past which have attempted to come to grips with important maritime issues. Now, however, all nations have to take a 'big picture' view of their uses of the sea and reach a decision to ratify the Convention by weighing the benefits they receive from it against the possible costs.

The aura of uncertainty which at present surrounds particular uses of the sea by man will only be resolved by a widely accepted Convention on the Law of the Sea. The non-entry into force of the 1982 Convention could have serious implications for the risk of maritime conflict, including within our region, and for the freedom of mobility required for our warships and military aircraft. However whilst ratification of the Convention by Australia would best serve our defence and maritime interests, the road beyond Montego Bay is not without its pot-holes and corrugations.

NOTES

1. Whitten, R.J., 'The Road to Caracas', *Journal of the ANI*, Vol 6, No 3 August 1983, pp 47-50
2. For a full description of the background to, and Australian concerns with the UN Convention on the Law of the Sea see shearer, I.A., 'International Legal Aspects of Australia's Maritime Environment' in Australian Centre for Maritime studies, 'Australia's Maritime Horizons in the 1980's, *Occasional Papers in Maritime Affairs: 1*, Canberra 1982.
3. 63 of these straits affected by the Convention's 12 mile territorial sea limit lie in the Western Pacific Region in the SW Pacific, SE and East Asia. Neutze, D.R., 'Whose Law of the Sea?', *United States Naval Institute Proceedings*, Vol 109, No 1, January 1983, p.47.
4. Richardson, Elliot L., 'Law of the Sea: Navigation and Other Traditional National Security Considerations'. *San Diego Law Review*, Vol 19, No 3, April 1983, p.506.
5. Grunawalt, R.J. 'US Navy Contingency Operations under the Law of the Sea Convention', *Proceedings of Eighth RAN Legal Conference*, HMAS WATSON, 19-20 January, 1983, p.37.
6. Oxman, B.H., 'The New Law of the Sea', *American Bar Association Journal*, Vol 69, February 1982, p.158.
7. UN Press Release SEA/514 dated 10 December 1982, Dept of Public Information, United Nations, New York.
8. UNCLOS III, Provisional verbatim Record of the 189th Meeting held at Montego Bay, Jamaica, December 1982. A/CONF. 62/pv.189, 23-25.
9. US President's Statement on the Law of the Sea dated 9 July 1982.
10. Dept of Foreign Affairs, *UNCLOS III Eleventh Session — Report of the Australian Delegation*, (Canberra, AGPS, 1982), p.14.
11. *ibid*,p.15.
12. Cohen, L.I., 'International Co-operation on Seabed Mining', Prepared for the Center for Oceans Law and Policy 7th Annual Seminar, Montego Bay, Jamaica, 6-9 January, 1983, mimeo, p.1.
13. Reynolds, J.O., 'Deep Sea Mining and the Regime of the New Convention', Address to a Seminar on the Law of the Sea, Australian branch of the International Law Association, Sydney, 19 June 1982, mimeo, p.15.
14. Bergin, A., 'Australia and Deep Seabed Mining', *Australian Outlook*, Vol. 36, No 2, August 1982, p.47.
15. A review of the Australian mining industry's position with regard to seabed mining may be found in Reynolds, *op. cit.*
16. The proclamation by President Reagan of an exclusive economic zone within 200 nautical miles of America's coasts has been seen to seriously undermine the future of the Law of the Sea Convention. Whilst the creation of the zone is in accordance with the Convention, the provisions of the proclamation ignores the obligations for countries to share fishing with landlocked or developing nations, to preserve the environment and to allow freedom of research. *The Australian*, 14 March 1983.

(This article has been extracted from the August 1983 edition of the Dept of Transport Reporting Manual)

COASTWATCH

Background

In 1978, the Commonwealth Government decided to upgrade Australia's civil coastal surveillance program. The principal objectives of the revised program were to maximise protection of national quarantine interests and deter breaches of customs, immigration, fisheries and other relevant Commonwealth laws. The Government did not commit capital resources as such to the scheme, but identified additional expenditure for the charter of civil aircraft and directed greater use be made of Defence Force resources. Arrangements were to remain flexible to meet changing circumstances and to facilitate continuous review.

The Government also called for a reassessment of requirements to be undertaken within two years; this period was later extended to October 1981 and the review was competed by December 1981. Administrative aspects of the revised arrangements which were introduced in 1978 and are relevant today include:

- the Minister for Transport acting as the Government spokesman on the nature and adequacy of civil coastal surveillance
- responsibility for law enforcement vested in individual departments in accordance with administrative arrangements
- civil coastal surveillance policy to be implemented by the Standing Inter-Departmental Committee on Civil Coastal Surveillance (SIDC)
- administrative support to the SIDC and its subsidiary Operations and Programs Committee (OPC) to be provided by the Department of Transport
- The Australian Coastal Surveillance Centre (ACSC — short title: COASTWATCH Centre) located in Canberra, to manage the program and provide day to day co-ordination of operations.

The civil coastal surveillance effort has been largely (but by no means exclusively) concentrated on the northern half of Australia.

Current Program Arrangements

The COASTWATCH program, co-ordinated by the Department of Transport, combines civilian and Defence air and surface resources in routine and response civil coastal surveillance operations. The main elements of the COASTWATCH program include:

- aerial patrols of the 200 nautical mile Australian Fishing Zone by RAAF P3 Orion long range maritime patrol aircraft
- RAN patrol boats for surveillance and enforcement supplemented by chartered civilian vessels when necessary
- daily visual air searches of northern littoral areas by chartered aircraft, primarily for quarantine purposes
- radar and visual aerial patrols of the Great Barrier Reef by chartered aircraft in daily stages
- an extensive public awareness program focussed in northern areas.

Program Management

The SIDC on Civil Coastal Surveillance implements policy and maintains an oversight role. It reviews achievements against objectives and introduces any necessary variation or modification to improve effectiveness within approved policy guidelines. The SIDC reports to the Minister for Transport. Its membership includes Departments with a direct interest in surveillance and, responsibilities in the following areas.

Australian Federal Police (AFP) are recipients of surveillance information in respect of suspected illegal drug trafficking. If requested, AFP provide protection for fisheries inspectors when civil chartered vessels are used for the apprehension of foreign fishing vessels.

Defence provides long range maritime patrol aircraft of the RAAF for surveillance of the AFZ, and RAN patrol boats for surface surveillance and enforcement purposes.

Health is concerned with the detection of quarantine breaches which may endanger Australia's agricultural and pastoral industries. Daily surveillance in northern littoral areas is primarily aimed at meeting this requirement. This task is undertaken by chartered civil aircraft, operating under the direction of the ACSC, with crews specially trained in surveillance techniques and requirements by ACSC field officers. The quarantine effect is supplemented by periodic surface patrols using RAN patrol boats, Transport's navigation aid servicing vessels, or civil chartered vessels.

Home Affairs and Environment has a broad responsibility for the preservation of the natural environment. Through its oversight of the Great Barrier Reef Marine Park Authority, it has a

particular interest in surveillance of the Great Barrier Reef (GBR), particularly in monitoring pollution threats, human activities likely to cause damage and compliance with access restrictions. A dedicated chartered Nomad aircraft fitted with radar is used for GBR surveillance.

Immigration and Ethnic Affairs is responsible for preventing illegal immigration into Australia. Littoral search crews, patrolling primarily for quarantine purposes, are also briefed to report any activities of immigration significance, such as unexpected vessel or aircraft movements.

Industry and Commerce (Australian Customs Service) is responsible for the prevention of smuggling of both legal and illegal goods. Any information on such activities derived from surveillance patrols is passed by ACSC to Customs. Customs operates its own vessels and chartered Nomad aircraft for Customs enforcement activities.

Primary Industry (fisheries) is responsible for managing the AFZ and is principally interested in monitoring the activities of foreign fishing vessels. RAAF long range maritime patrol aircraft are used for this purpose and RAN patrol boats or chartered civil vessels are employed for enforcement purposes.

Transport, in addition to its program management and co-ordination role, acts on surveillance reports concerning marine pollution, marine navigation aids, infringements of oil platform safety zones and restricted areas and wrecks or salvage operations.

Recent Initiatives

Following the 1981 Review, a number of improvements were made in operational and management systems. These have been progressively implemented and include:

- the introduction of an annual program budget process in which program costs are shared among major user departments
- an increase in Transport's staff of field officers from two to six, to improve regional liaison in northern areas, provide supervision and training assistance to contractors and to promote public involvement in surveillance reporting
- the attachment of a Defence Force officer to the ACSC to provide direct liaison with Defence operational command
- the upgrading of COASTWATCH charter aircraft by the fitting of weather radar with surface mapping mode; VLF/Omega navigation systems, cabin air conditioning and radio communications covering the full range of HF/VHF/UHF frequencies in use with transmission modes covering both aviation and marine requirements, thereby improving surveillance effectiveness and operational safety margins
- the identification of COASTWATCH aircraft by a green and gold colour scheme; wearing of uniforms by crews; the upgrading of surveillance training and formalisation of observer qualifications.

Regular surveillance of the ocean approaches to Darwin for refugee boats was suspended on 31 March 1983 following a comprehensive review of the refugee situation and the cost-effectiveness of the operation; however, a capacity to re-introduce these patrols, if the need arises, has been maintained.

Review of Civil Coastal Surveillance

The Government on assuming office in March 1983 announced a further review of civil coastal surveillance arrangements. The purpose of the review is to propose a system of national coastal surveillance most appropriate to national requirements and the management, legislative and resource arrangements necessary to fulfil the requirements.

The review is being conducted by the Hon Kim Beazley, Minister for Aviation, in his capacity as Minister assisting the Minister for Defence, at the joint request of the Hon Gordon Scholes, Minister for Defence and the Hon Peter Morris, Minister for Transport.

WRECK OF THE BARQUE ZANONI

by Commander R.J. Pennock RAN

Until recent years, the loss of a sailing vessel or primitive steam-ship was not considered an unusual occurrence. In fact shipwreck, drowning and starvation were occupational hazards of the seafarer. Vessels were lost through a variety of reasons, many being overwhelmed by wind and sea. If a vessel foundered near land, it was flotsam or worse that alerted the local populace to the fact that yet another victim had been claimed by the unforgiving sea. At times, innocent passengers and supernumeraries were amongst the victims.

In his most recent book on the subject, *An Atlas History of Australian Shipwrecks*, maritime historian Jack Loney lists a total of 45 vessels lost in South Australian waters. Unfortunately, he has overlooked what could be the most significant wreck discovered off the Australian coast. This is the wreck of the barque *ZANONI*, lost in 1867 in the waters of St. Vincent's Gulf. Reported as having sunk on Monday 11 February 1867, *ZANONI* was the subject of a search that lasted 116 years. What has made this search so different to many others is that this vessel sank in the shallow headwaters of the Gulf, in about 10 fathoms, within 10 miles of land (in both directions) and only 30 miles from the busy centre of Port Adelaide.

Built by Potter and Co. of Liverpool in November 1865 for Royden and Company, *ZANONI* was a 3 masted composite built barque of 338 tons gross. Not a large vessel, her dimensions were 139ft x 23ft x 14ft 6in, but according to a report in the *South Australian Advertiser* of 13 February 1867 she was 'a very fine barque with many good qualities'.

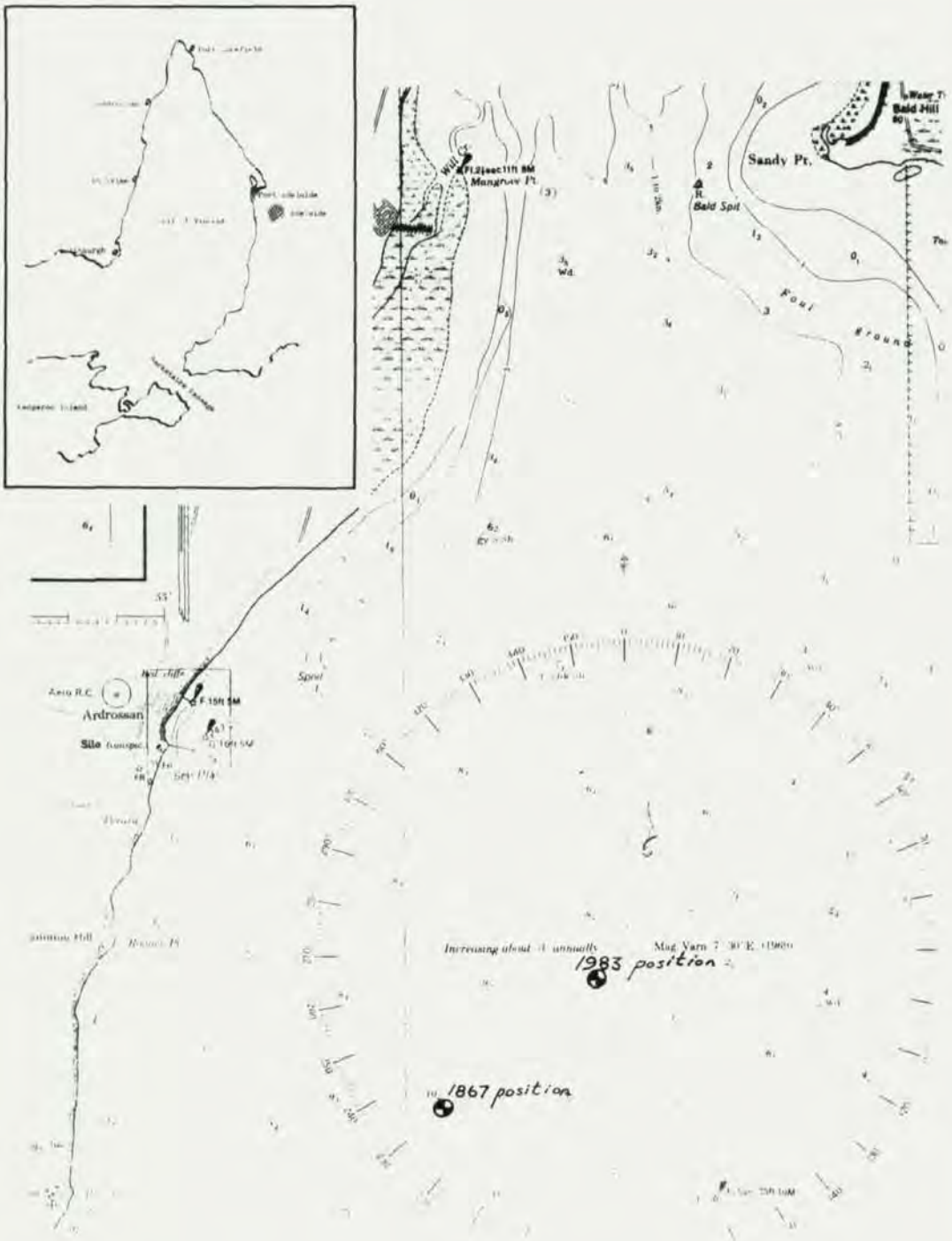
Still on her maiden voyage, *ZANONI* had loaded sugar at Port Louis (Mauritius) for Port Adelaide, arriving in late 1866 after a fast 30 day passage. Her cargo was quickly unloaded and her alleged fine sailing qualities enabled a wheat charter to the United Kingdom to be quickly finalised. Mr. J. Darwent, the charterer, required 25 tons of wheat to be loaded in Port Adelaide with the remainder being embarked at the northern gulf port of Port Wakefield. *ZANONI* left Port Adelaide on 2 January 1867 for her short trip north.

Loading of cargo completed on 10 January 1867. With 15 tons of bark and 4025 bags of wheat securely stowed she sailed for the Port Adelaide lightship at 7 a.m. on Monday 11th January. The weather was fine with a light easterly breeze. By 1.30 p.m. the wind had gone around to the west, and freshened with threatening squalls. Ever vigilant, Captain Summers had shortened sail but a squall, described by a contemporary report as a cyclone, struck *ZANONI* whilst she was shortened down to two topsails, foresail and jib. Before sheets could be let fly, the barque was overwhelmed by the wind, thrown on her beam-ends and capsized. Captain Summers (Master), Mr. Thomas Lancaster (Mate), the ten crew members and two Port Adelaide stevedores managed to scramble to the sides of *ZANONI* and after much effort succeeded in reaching the lifeboat which had broken free and drifted clear. The elapsed time between the squall striking and the sinking of the barque was between 5 and 10 minutes. Fortune had smiled to some extent as no lives were lost.

The cyclone had by this time settled into a westerly gale and against these odds the survivors managed to right the lifeboat, bale it out and make for the Long Spit Buoy some five miles distant. They reached the buoy by 11 p.m. that evening and immediately came in contact with the barques *FIVE BROTHERS* and *FOWLES*. Taken on board by the latter, all the survivors were landed at Port Adelaide by 6.30 p.m. on Tuesday 12 January 1867.

Captain Summers immediately reported the loss of his vessel to his agents Messrs. J. Newmann and Son, giving the last position as 5 miles WNW of Long Spit Buoy and about 25 miles from Port Wakefield. As soon as the weather abated, the Harbour Master set sail in the *BLANCHE* in an endeavour to locate and buoy the wreck. Although his search lasted 5 days it was unsuccessful.

A Marine Board enquiry was convened to enquire into the circumstances of the loss of *ZANONI*, commencing its sitting on 19 February. Evidence taken at the time revealed a contentious point regarding the ballasting of the barque. One of the stevedores, Mr. Henry Daulby, stated that he had advised Captain Summers to retain his stone ballast onboard. The other stevedore, Mr. J. Stone, when questioned on that point



Position of ZANONI off Ardrossan S.A. (part of Chart AUS 781)

admitted that the advice to keep the ballast onboard was purely to save the trouble of removing it. In his evidence, the Mate stated that in his opinion *ZANONI* was properly stowed, but a little tender. The Board of Enquiry completed its work on 26 February and was reported in the *South Australian Advertiser* in the following terms:

> 'The Board did not consider any further investigation necessary, the evidence not showing cause of the vessel's loss'.

A further search of the northern gulf was carried out by a steam paddle-tug *YOUNG AUSTRALIA*. Apart from sighting a quarter-gig that had broken adrift from the wreck, this search was also unsuccessful. In an attempt to establish a position, a reward notice was published in the *S.A. Advertiser* on 22 March 1867:

> '£100 Reward — the above will be paid to any person first pointing and within ten days from the date, March 18, to the undersigned, or whoever he may appoint, the wreck of the barque Zanoni foundered in St. Vincent's Gulf.
>
> H. Simpson
> Queens Wharf'

Naturally the reward was not claimed and that should have been the end of the story.

However, the Society for Underwater Historical Research Inc., was founded in 1974 in South Australia by experienced divers and others having a particular interest in underwater archaeology. Working in close co-operation with the Heritage Conservation Branch of the Department of Environment and Planning they have been and are engaged in a number and variety of projects concerned with local shipwrecks, construction and destruction of local jetties, etc.

In 1981, the wreck of *ZANONI* was declared under the Historic Shipwrecks Act, but as the wreck had not been located, no protective zone could be published to prevent the accidental (or otherwise) damage to the remains. About the same time, a $2000 reward was offered for discovery of the wreck.

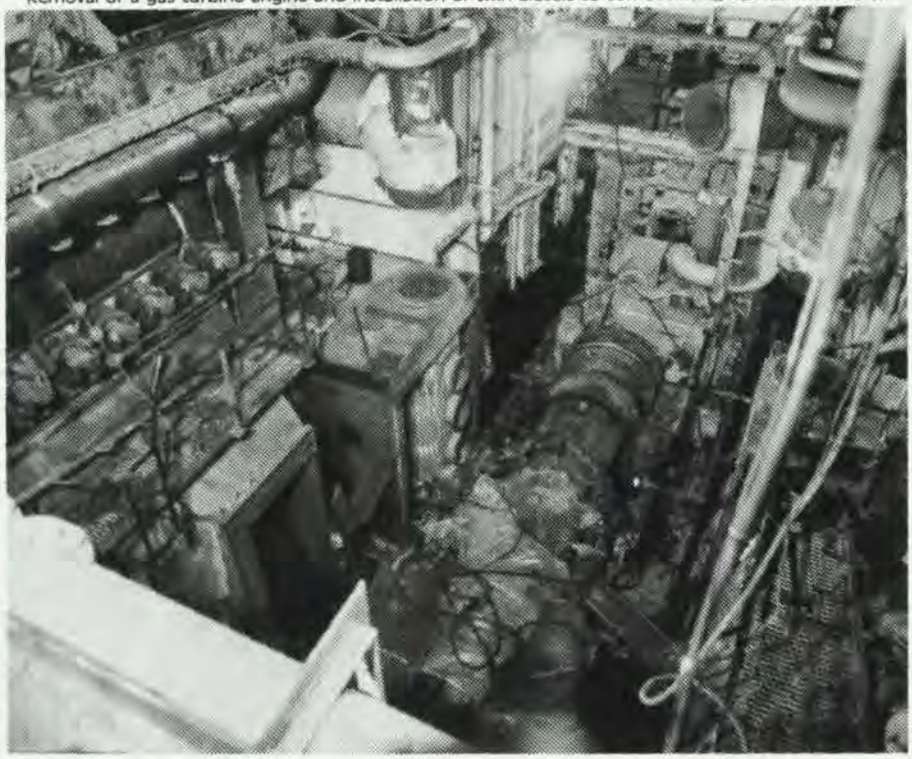
On 17 April 1983 two divers, guided by a local fisherman, located a wreck near Ardrossan which has since been identified as *ZANONI*. Lying on her port side at an angle of 45°, she is in 18 metres of water. The bow and stern complete with rudder are, according to latest reports, clearly defined and in sufficiently good condition to be recovered. The midship section, although partially collapsed on the wheat and bark cargo, appear to be in reasonable condition. A marine archaeologist from Environment and Planning regards the *ZANONI* wreck as one of the best preserved on the Australian coast. Her composite construction (timber planks on iron frames) makes this wrecked vessel even more significant for preservation.

With an accurate position established, a 550 metre protective zone has been declared, making it one of only six such zones in Australia. Fines for entering such zones are heavy ($1000 or imprisonment for one year, or both) and penalties for interfering with or damaging a wreck are even heavier ($5000 or imprisonment for five years, or both).

But what of the future of *ZANONI*? It is planned to survey the site thoroughly, which on present finances could take up to five years, before any of the relics are recovered. Other long range plans include recovery of the bow and stern sections for display in a proposed South Australian Marine Park.

Whatever the outcome, time must be running out for *ZANONI*. The lack of significant currents around her present position have helped keep her in such a good state of preservation. Will man himself be so considerate? An injection of funds from Commonwealth, State and private sources could reduce the time taken to survey the wreck and start the recovery process. This Victorian time capsule could well be ready for public display in the significant years of 1986 and 1988 if action were taken now.

Removal of a gas turbine engine and installation of twin diesels to combat rising operational costs.



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WASHINGTON NOTES

by Tom Friedmann

The major naval defeat recently suffered by Australia and the West in the loss of *HMAS MELBOURNE* at the hands of those most tenacious of enemies, the naval budget cutters, has been met with dismay in the United States. At a time when our carrier fleet is being stretched to the limit, the only carrier operated by an American ally in the Pacific has been eradicated. We stand alone.

It is not an exaggeration to say the *MELBOURNE's* demise is a greater disaster to Australia and her allies than the losses of *SYDNEY, PERTH, and CANBERRA* — names that shine as beacons of heroism throughout the pages of history — because money was no object in securing the replacement of these vessels in wartime. What is needed is an equal commitment in peacetime to provide the weapons necessary to keep war away from Australia and to protect her and her allies if it does not.

The rationale of the Australian Government in eradicating its carrier force is hard to understand. At a time when the Soviet Union is building ever larger and more capable carriers, and Italy enters the foray for the first time, the Royal Australian Navy is being forced to break up a naval air service with over one-third of a century of splendid achievement to its credit.

The *MELBOURNE's* loss and the not yet irreversible dispersion of the Fleet Air Arm should be studied as carefully as any defeat at sea. Anaylsis of the 'Battle of Canberra' must be as vigorous as that of the changed defense circumstances the RAN and Australia face.

First and foremost, now is the time to encourage a national debate on Australia's defense requirements. Although this course is not favoured by the Australian Defense Minister, no politician ever wants his department investigated. A massive change has taken place in the strategic composition of Australia's forces, and her people deserve to hear all sides of the debate now, before the Fleet Air Arm totally disappears.

Since serving officers in a democracy cannot — and should not — partake in partisan political fights, the RAN must rely on retired naval personnel and concerned citizens for representation. The Australian Naval Institute should be in the forefront of this fight even if it becomes necessary to have a civilian president for the duration.

However, what the Navy can do is present its position as often as it is requested to do so by civic groups and encourage better public relations with the media. Although Bruce Davis, writing in the *Pacific Defense Reporter*, notes that Australia's major media groups tend to ignore defense issues, there is nothing to stop the Navy from giving more press briefings on its positions on all matters and to insure that the press has *full and honest* access to all but top secret information. The press should be welcome on naval bases and vessels at all times and there should be no major deployment of Her Majesty's Australian ships without a full press complement aboard.

Second, the Navy must stop fighting the Royal Australian Air Force. Similar battles, fought on a regular basis in many nations since the 1920s, are always debilitiating and are frequently unsuccessful. A member of the Congressional defense committee staff here once told me the reason for this could be partially discerned from listening to the difference in styles in the testimonies of the Services on the Hill.

The Army and Navy, he said, approach their sessions before the Armed Services committees secure in the knowledge that their survival as a separate fighting force is not threatened by the other. However, since the Army and Navy both contain air services and the Navy also has a

strategic missile capability, the Air Force generals feel it necessary to justify their Service's existence every time they testify. Furthermore, he continued, many people have flown on airliners, are familiar with aircraft and, therefore, can relate to the Air Force and flying. Most people cannot relate to the concept of sea power. Air bases are strung throughout the country while the Navy is, naturally, tied to harbours and a handful of states.

'To put it simply,' he said, 'it is hard to raise much support for a five billion dollar aircraft carrier which will never be able to anchor off Oklahoma City while the Tinker Air Force Base is one of the largest employers in the States.'

But in Australia, as in the United States, the purposes of the Services are actually different and the RAN should seek the conciliatory position that the Fleet Air Arm is a complement to and not a competitor of the RAAF. The Fleet Air Arm must serve to protect the Fleet and merchant shipping far from Australia's shores as well as provide air cover for Australian forces when they are landed under combat conditions until the RAAF can take over. The RAAF, on the other hand, is designed specifically for defending the continent, its immediate sea lanes, and Australian forces overseas, but only after adequate bases have been established. The overlap in missions is, indeed, minimal and truly ends at the furthest point a land-based aircraft can fly from Australia without refueling.

Third, the Naval Staff must recognize that money for governmental expenditures, in view of the shaky world economy, is extremely tight and an investment of over 1.5 billion dollars in one ship and her equipment might not be best either for the nation or for the RAN in view of a multitude of problems coming up on the horizon.

Although the Royal Australian Navy has never been a major naval power, it has always been a first class naval power, as its ships and weapons systems have always been at least equal to the best weapons then current in the world's inventory. However, it is an inescapable fact that most of the major surface units of the RAN are rapidly aging. No ships are fitted with close-in anti-missile defense systems at this time and only the three FFGs carry surface-to-surface missiles. Mine warfare potential, both offensive and defensive, is virtually non-existent. Faced with these and other problems, one must be sympathetic to the Treasury as it tries to expand the total defense dollar in light of other requirements of the Government.

From the view point of the naval planner, is it not more important to properly arm and equip vessels now on hand, rather than acquire more underarmed vessels that may not be able to defend themselves should the need arise? How will elderly destroyers and frigates be replaced if vast sums are expended on one ship? These are only two of many important questions that Australian (as well as American) planners must face on a more reasonable basis in the future than they have in the past.

There *are* options open to the RAN in replacing its carrier force other than the acquisition of a foreign built aircraft carrier. The United Kingdom has already acquired the ARAPAHO concept from the United States and certainly the plans for it could be acquired by Australia. Australia could and should investigate the possibility of converting a fast merchant ship to a carrier, or for the construction of an aircraft carrier in Australia, based on merchant ship lines or the lines of the new RAN supply ship. This concept, when initially introduced in the United States during the Second World War, was avidly opposed by then Chief of Naval Operations, Fleet Admiral Ernest J. King. However, Admiral King later conceded the importance of these 'Woolworth' carriers. It has been over four decades since a merchant type carrier has been constructed or converted and Australia could set a trend. Even recent proposals to launch Harriers through the use of high speed cranes should be investigated.

Undoubtedly, the alternative may not be as good as a specially constructed carrier. But the RAN must be flexible enough to accept a less capable vessel constructed or converted at home to aid in developing local defense industries, in keeping defense dollars at home, and, most importantly, in keeping the Fleet Air Arm alive.

Ministers, naval officers, and defense specialists throughout the world are watching the Australian Naval Staff to see how it handles the tremendous challenges it now faces, for they are far from unique. They are also watching for recognition, by all political parties in Australia, of the importance of sea power and naval air forces to the defense of the Commonwealth and the effective execution of Australia's treaty commitments. How Australian responds may determine the world future status not merely of the RAN, but of the nation itself.

BOOK REVIEWS

INTERNATIONAL LAW OF THE SEA Volume I. By D.P. O'Connell (Edited by I.A. Shearer). Oxford, Clarendon Press, 1982. $141.00.

Volume I of this two volume series (Volume II to be issued in late 1983) which has been published posthumously and edited by Captain I.A. Shearer, RANR, Professor of International Law at the University of NSW is a tribute to the profound erudition of the late Professor D.P. O'Connell in all matters pertaining to the Law of the Sea. Both the author and editor of this volume have had long associations with the Australian Navy in their capacity as Reserve officers. Professor O'Connell served as a commander in the RANR during his appointment as Professor of International Law at Adelaide University and regularly gave lectures on the Law of the Sea at the Royal Australian Naval College and at RAN Legal Conferences in the late 1960s and early 1970s. Professor O'Connell maintained his association with the Royal Navy on taking up his appointment as Chichele professor of Public International Law at All Souls College Oxford in 1972 until his death in 1979. Professor Shearer is the Navy's principal Reserve adviser on international law and regularly lectures on the Law of the Sea and the Laws of Naval Warfare at the Tactical School at *HMAS WATSON*

This new volume reveals once again Professor O'Connell's ability to analyse the implications in international law of actual naval events. Extensive reference is made to naval incidents in the text to illustrate international law principles.

Volume I deals with the various divisions of maritime space and the customary and conventional international law regimes applying within these areas. A historical exposition is given of the development of international law concepts such as the high seas, the territorial sea, straits used for international navigation, the continental shelf and archipelagic waters.

The present and future impact of the Third United Nations Conference on the Law of the Sea on customary international law principles relating to the use of maritime space is fully explored with considerable emphasis being placed on the content of passage rights for naval and commercial vessels. At the conclusion of each chapter, Professor O'Connell evaluates the status of new developments in the Law of the Sea such as the comprehensive navigational regimes which apply to straits used for international navigation and archipelagic waters in the 1982 Convention on the Law of the Sea.

This volume is a particularly useful reference work to supplement basic materials such as the Manual of the Law of the Sea, for naval officers concerned with the navigation of HMA ships. Since the operations of naval vessels have always played a significant role in the maintenance of passage rights on vital maritime routes, a thorough knowledge of the current state of the Law of the Sea is essential for those in command of HMA ships. Professor O'Connell's volume, together with his earlier book 'The Influence of Law Upon Seapower' are important adjuncts in gaining this knowledge. The preview at the beginning of Volume I of the subject matter contained in Volume II of O'Connell's work indicates that it will concentrate on aspects of international law such as the Law of Belligerency at Sea which are equally relevant to naval officers.

R Grant

SEA JARGON, A Dictionary of the Unwritten Language of the Sea. By Lew Lind. Sydney, Kangaroo Press, 1983. 160 pp. $14.95.

Language is never static. Words acquire new meanings over time (gay, sophisticated); new words are often coined (tri-polarity, infanticipate); different words are used to describe the same object or operation (lift and elevator, discussion and dialogue); and, words are coined which are peculiar to a particular trade, industry or occupation, (jargon).

Nowhere is this jargon more conspicuous and colourful than among those who go down to the sea in ships. From the mariners, and those associated with the sea, comes a language all of its own.

Lew Lind's *Sea Jargon* is a dictionary of nautical terms and phrases, many of which have long since lost their bond with the mariners, and have become accepted into 'normal' English. As Lind says in his Introduction: 'Sea Jargon is colloquial . . . Its meanings are flexible and derivations in most cases were lost soon after the word or expression was coined.'

Entries are arranged alphabetically and provide brief definitions — often illustrated with photographs or sketches and with verse or ditties if appropriate — and their origin categorized as aboriginal (Tingira), Fleet Air Arm (Goofers), Merchant Service (Kamels), Naval (Captain's mast) or Waterfront (Shanghai Brown). Care has obviously been taken to use Australian anecdotes or references where possible.

Those wishing to find the meaning of some of the more quaint words and phrases to be found in the Fleet Air Arm Song Book may be disappointed with this 'dictionary'; but, for the rest of us, it would provide a most useful and informative addition to our bookshelves. Particularly recommended to those who have responsibility for acquisition of books for ship or naval establishment libraries.

D.J.Woodward

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