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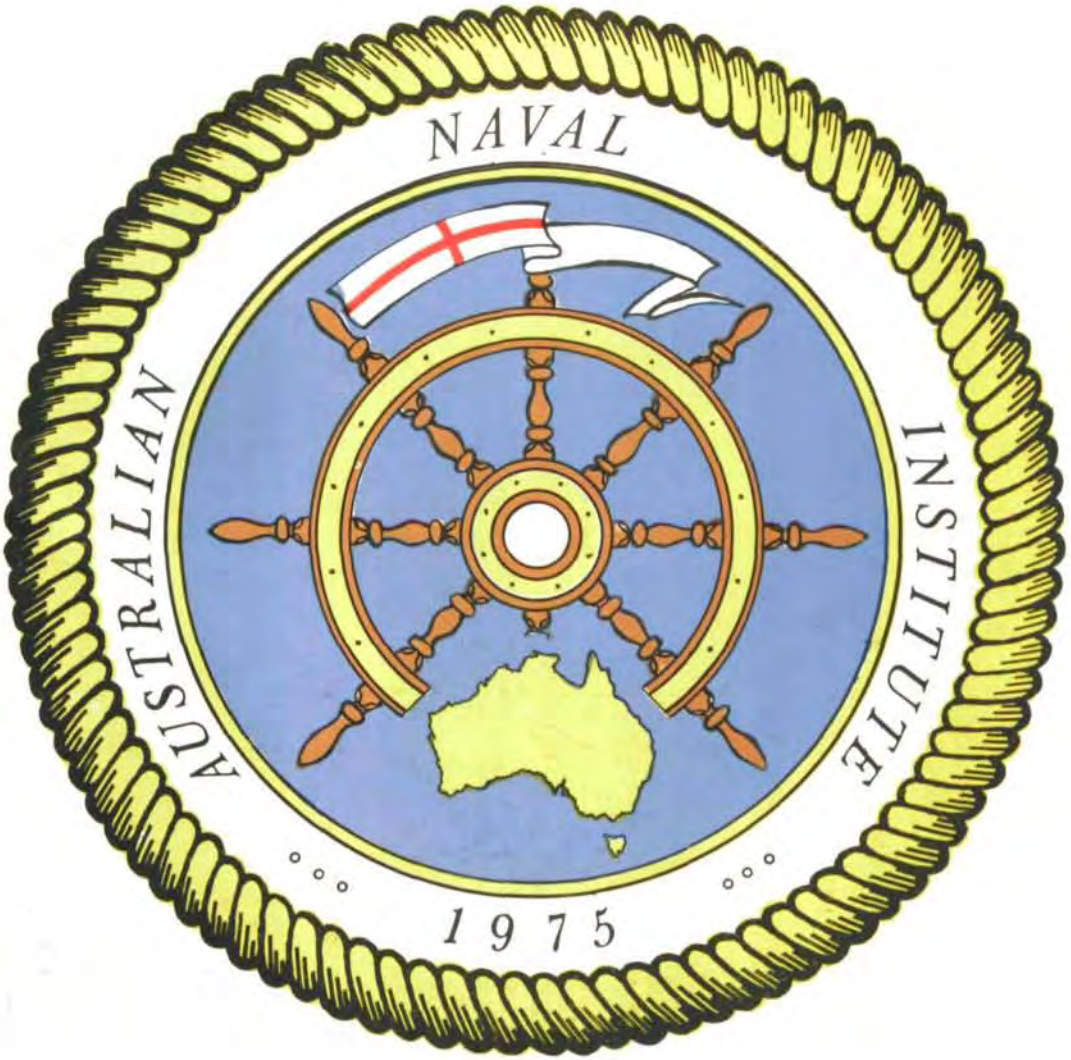
JOURNAL OF

THE AUSTRALIAN NAVAL INSTITUTE



VOLUME 3 MAY 1977 NUMBER 2

AUSTRALIAN NAVAL INSTITUTE

1. The Australian Naval Institute has been formed and 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.

   c. to publish a journal.

2. The Institute is self supporting and non-profit making. The aim is to encourage freedom of 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 Forces, 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–A person who has made a distinguished contribution to the Naval or maritime profession or who has rendered distinguished service to the Institute may be elected by the Council to Honorary Membership.

4. Joining fee for Regular and Associate Member is $5. Annual Subscription for both is $10.

5. Inquiries and application for membership should be directed to:–

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

CONTRIBUTIONS

As the Australian Naval Institute exists for the promotion and advancement of knowledge relating to the Naval and maritime profession, all members are strongly encouraged to submit articles for publication. Only in this way will our aims be achieved.

DISCLAIMER

In writing for the Institute it must be borne in mind that the views expressed are those of the author and not necessarily those of the Department of Defence, the Chief of Naval Staff or the Institute.

JOURNAL OF THE AUSTRALIAN NAVAL INSTITUTE (INC)

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OUR COVER

Our cover now features the crest of the Australian Naval Institute.

CANBERRA CHAPTER NEWS

Captain P.G.N. Kennedy, RAN and Commander O.R. Cooper, RAN co-operated in smooth fashion to provide a very stimulating address on "Automated Command and Control Systems - Current and Future" on Tuesday, 5th April, 1977.

About 40 members and guests attended the meeting at RSL National Headquarters and, needless to say that this large gathering, together with some of the concepts advanced by the speakers, provided the necessary elements for a protracted and lively question period.

The next meeting will be held at the RSL National Headquarters, Constitution Avenue, Canberra on Tuesday, 5th July, 1977. A paper titled "One Man's View of Naval Aviation - Past, Present and Future" will be delivered by Commander H.G. Julian, DSC, C.Eng, M.I. Mech. ARAES RANEM.

Correspondence

24 Vista Street
Greenwich, N.S.W. 2065

17th May, 1977

Dear Sir,

I read the article "Ship Based VTOL Aircraft" by Lieutenant Commander Jones in the February 1977 Journal with some interest.

I am a little surprised that the author refers throughout his article to VTOL especially when discussing various versions of the Hawker Siddeley Harrier. Harrier is certainly capable of performing VTOL operations but due to the significant increases in payload/radius parameters accruing when short take-off runs are used, I believe the more correct acronym is V/STOL. Further, as Harrier is normally landed in the "V" mode a more precise description could be V/STOVL.

In the interest of accuracy I would like to make the following observations:

Page 28 – The USMC did not participate in the Tri-Service assessments in U.K. or the U.S.

Page 28 & 29 – The author appears confused regarding AV-8B and AV-16. The AV-8B will be powered by the Pegasus 11 engine (21,500 lb. thrust), whereas the AV-16 was planned to use the Pegasus 15 (25,000 lb.).

Page 29 – The RN Sea Harrier will be fitted with Sidewinder on outboard wing stations only.

Page 29 – I presume "unlimited" is a typographical error in the reference to CAP time on station. From a "V"take-off sortie duration would be comparatively limited.

Page 30 – Aircraft fitted with "deflected thrust" engines, (I would prefer "vectored thrust"), can be designed for supersonic speeds. Plenum chamber burning has been successfully demonstrated in the Pegasus engine and can be equated to afterburning.

One can argue that supersonic speeds are not always essential for an air defence capability. Sea Harrier, because of its high thrust weight ratio can reach medium altitudes in much the same time as M.2 aircraft. Given good ground control interception and fitted with a modern air-to-air missile system. (e.g. Sky Flash) Sea Harrier would provide a genuine air defence capability especially against the air threat likely to be encountered at sea.

Page 30 – The old bogey of high deck temperatures apparently remains. Even with VTO's the deck area directly beneath the nozzles can be touched with the bare hand very shortly after take-off. During trials from the wooden deck of the Spanish Navy's Dedalo the only effect was some melting of the inter-plank pitch during VTO's.

In concluding I would recommend that any reader wishing to further his understanding of VSTOL in the naval scene should study John Fozard's "Sea Harrier – The First Of The New Wave". This was the title of a lecture given to the Royal Aeronautical Society on 10th November, 1976 by the Chief Designer of Harrier.

Any reader desiring a copy of the lecture could write to me at the above address.

Yours sincerely,
A.J. (Nat) Gould
Commander R.A.N. (Ret'd.)

Dear Sir, 5 April, 1977

I was interested to read 'Joseph Porter's' remarks on sea training in his letter in your February 1977 issue but I cannot agree with his enthusiasm for Junior Entry. I feel that the 'catch 'em young' theory is no longer valid in this country. The very isolation of Jervis Bay and the inevitable limitations of the educational process there tend to place 'blinkers' on those officers who join by Junior Entry. It is too easy for Junior Entry officers to possess a dangerously limited knowledge of the outside world that will limit their effectiveness as officers at all stages of their careers - to the Navy's detriment as well as their own.

It is also too easy for an officer who enters at this early stage to become disillusioned with the training system and the Navy. The retention rates over the past ten years speak for themselves; for example, the 1973 Junior Entry has already lost two-thirds of its members and the 1974 Entry has lost nearly a third. A Junior Entry who undertakes the Creswell Course has to spend nearly four and a half years at the Naval College and it is two years more before he is a qualified officer. Too often in recruiting the 'get in early' aspect is over-stated and the studies that need to be undertaken are largely passed over. The feeling often exists that Junior Entry is something of a con job to make the numbers up.

This brings me to my next point, 'Sir Joseph' stresses the beauty of being able to get in before other outside influences are able to take the cream but is this attitude fair to either the Navy or the recruit? It seems to me that this argument somehow indicates an inferiority on the Navy's part, an inability to face other organizations in open competition for fear of defeat. It is my feeling that if the Royal Australian Navy cannot attract the best men in the face of all opposition, then the R.A.N. is not worth serving. I suggest that we look to our recruiting if we are not getting what we want, the Air Force seems able to do well enough. But whatever one says about the R.A.N. it is not fair for the prospective recruit to refuse him the opportunity to select his career from the widest range, we must always remember that we are a volunteer force and that the commitment of those who serve the R.A.N. must be complete and mature. If we consider the 15 year old entry to be desirable, then why not at 13, or even the Jesuit ideal of from birth?

I would remind those who say that Junior Entry provides an excellent opportunity for those who would otherwise have been forced to leave school to attain a secondary education and their matriculation that the excellent 'Topman' scheme exists within the Junior Recruit organization and that this system shows no signs of faltering or failing.

Yours faithfully,
'Master Ned'

NOBODY ASKED ME, BUT . . .

For some time the United States Naval Institute has included in its journal a successful feature under the heading NOBODY ASKED ME, BUT . . . . In response to a request from the Australian Naval Institute, the USN has graciously given its permission to our using the idea for our own Journal. Unfortunately we cannot also follow their example by offering $50 for a contribution, but the articles will be eligible for one of the annual prizes.

Most of us are pretty good a giving voice, in the mess, at home or anywhere for that matter, to some profound statement. This may be a bright idea, a trenchant criticism, a long needed innovation or some simple truth which should be perfectly obvious to anybody with a brain in his head. Yet, in the cold light of day, it is difficult to put into words for the Captain, or one's spouse is too busy, or "they" don't have time to listen. Nobody listens any more. But a few do read. If nobody seems to care what you think about anything, then perhaps you should contribute to NOBODY ASKED ME, BUT . . . .

Perhaps what you want to say isn't worth listening to, but at least you'll feel better for getting it off your chest. If it is worth printing then you'll have your audience, your idea may stimulate further discussion in the Journal and could even lead to somebody doing something about it.

Contributions should be short, say one or two pages in the Journal. Your anonymity will be protected if you wish to write under a nom de plume.

GENERAL CONTRIBUTIONS

With the introduction of NOBODY ASKED ME, BUT . . . we now have five feature columns, the others being TECHNICAL TOPICS, I WAS THERE WHEN . . ., CLASSIC SIGNALS and SHIP-HANDLING CORNER. These columns are for your contributions and, as can be seen, a wide variety of subjects can be slotted under their titles. Unfortunately we are not receiving a steady supply of copy for these columns as you can see by their irregular appearance in the Journal.

Contributions do not have to be long therefore those of you who do not wish to, or do not have the time to write a major article have your chance here. I feel sure these are many of you with humorous stories, personal anecdotes and experiences or knowledge of incidents which would be of interest to our readers. Therefore let us hear from you.

THE NEEDS OF THE R.A.N. 1985 to 2000

At the Annual Naval Symposium held at HMAS Watson in November 1976 the following paper was presented by a syndicate of officers consisting of:

Captain E.E. JOHNSTON, AM, OBE – Commanding Officer HMAS Perth

Captain M.B. RAYMENT – Fleet Operations Officer

Commander N.J. STOKER – Officer-in-Charge, Tactical School

Commander I.D. MACDOUGAL – Officer-in-Charge, Submarine Command Team Trainer

Lieutenant Commander C.J. SKINNER – Combat Systems Engineer Officer, HMAS Perth

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The views expressed in the paper are those of the syndicate who presented it and are not to be construed as being the views of the Australian Government, the Department of Defence, the Chief of Naval Staff or the Australian Naval Institute.

The Needs of the R.A.N. 1985 to 2000

In June of 1976 a group of officers was invited to present to the Naval Symposium their ideas of the needs of the RAN for the period 1985 to 2000. The 'Young Turks' as they were dubbed (with considerable adjectival licence), decided that in the time available for their presentation it would be impracticable to address such topics as types and numbers of ships, weaponry, size of the Service and like subjects. Therefore certain broad topics were selected and it is our deliberations on these which we will lay before you.

INTRODUCTION

Our syndicate addresses the needs of the Royal Australian Navy in and for the period 1985 to 2000 that is from nine years to twenty years hence. This timescale provides time for formulation and implementation of policies to fulfil the needs. You will note we have omitted all reference to the Seaborne Air Platform–a subject already receiving much attention.

Before describing the likely roles of the RAN in the period under study, the major influences on the functions of the RAN will be discussed.

Firstly, geopolitical influences. The likelihood of direct invasion is generally accepted as low, and indeed may well be the lowest possibility of all. Nevertheless, shifts in the power balances anywhere in the area of Australia's interest have effects that are felt throughout and can include expansion affecting Australia even though not caused *by* Australia.

On the other hand major nations, especially Japan, are becoming more and more resource hungry. As the unexplored areas dwindle the competition will become more fierce. The arbitrary interference by governments *or* trade unions in the trading of raw materials will only amplify this ferocity. We have assumed that the 200 km resource zone will be adopted by all countries even if unilaterally–these influences will result in a much greater requirement for offshore surveillance than at present.

Changes in political attitudes in neighbouring countries allied with increasing activism in minority groups within Australia will lead to increasing import of subversive material and ideas. As fishing grounds become depleted the fishing fleets from other nations will range further afield and will take even more liberties with national boundaries.

Greatest of all the influences however will be the ever increasing world trade carried on or over the seas. There is every sign that the already interlocking world economy will become more interdependent. Even now the closure of the major straits through the archipelagic countries would have serious consequences for countries like Japan and Australia.

The high level of seaborne trade is itself worthy of closer study–the trends in levels on the various routes and the content of the trade goods carried thereon are just as important as knowledge of military capability.

Secondly, technological factors. Of these we must first address the submarine. We do so because of its overriding influence on seapower. Notwithstanding any other technological innovation, the foreseeable strength of Russian seapower will rest heavily on the vast radius of action and on the invulnerability of submarines. This is one technological area we do not expect to change greatly. No amount of opposing technology, whether increased capability of sonars, vast passive acoustic arrays, laser underwater sensors, nuclear depth bombs or anything else is going to remove the high vulnerability of merchant shipping to attack by submarine. Probably the best defence is to multiply the numbers of hulls (that is less eggs in each basket) – a suggestion quite contrary to present trends for bigger and bigger ships, or to make merchant ships less sinkable. We argue that whatever else may change, the offensive capability of the submarine will continue largely unchanged. However the concentration, until recently, of many of our resources into anti-submarine forces may well be misguided.

The other technological influence on roles is the increasing number of smart weapons. These arms are now increasingly being sold to countries with little or no industrial or technological basis of their own. Of more significance however is the

decreasing cost, and the increasing reliability, simplicity of operations and comparative invulnerability to countermeasures of these weapons. These are the greatest levellers of all–the tiniest nation can fit them to fishing boats and produce a credible threat at low cost, a threat whose greatest asset is *our* difficulty of identifying which are the enemy. That these forces are vulnerable to air attack is not the point – the cost of the boats and missiles is vastly less than the loss of just one bulk carrier and its cargo.

FUNCTIONS AND ROLES

Functions

We believe the common functions for the Australian armed forces are satisfactory and we consider the single Service functions are adequate with the exception that the RAN single Service function should be re-stated as follows:

> 'The conduct of operations at AND OVER the sea for the defence of Australia and Australian interests.'

This would not in our opinion degrade the function of the RAAF but would be a realistic statement of the requirement for the RAN to conduct air operations as an integral part of Naval operations. We do not believe that maritime operations can be divided into distinct air and surface segments with both RAN and RAAF holding separate responsibilities. The present functions inadequately recognise the requirements of Naval aviation and tend to re-inforce the general inefficiency and difficulties that have occurred in maritime operations for many years. We believe that the present system whereby sea surveillance is largely the prerogative of the RAAF is wrong and that the RAN is the appropriate Service to be the prime mover in this activity.

Roles

First let us consider the single Service function of the conduct of operations at and over the sea for defence of Australia and Australian interests.

We speculate that the maritime situations that could occur may be one or more of the following:

a. as a minor ally of a number of non-communist nations, probably including USA, in a struggle for survival with the USSR and Warsaw Pact countries, our commitment probably forced upon us by membership of ANZUS;

b. involvement in a regional war as a result of deliberate actions taken against Australian nationals by a foreign government. A situation where the government is forced to intervene, because public opinion demands intervention to stop the killing of Australians and the less important but nevertheless significant destruction or confiscation of Australian owned assets.

We believe that the prospects for involvement in this type of maritime action is fairly remote but could occur with devastating suddenness;

c. defence of Australian trade carried on the high seas against military sanctions imposed by a nation determined to influence our government policies. Interference with Australian maritime trade could occur at great distances from Australia and could occur separately or as an adjunct to the two maritime situations already mentioned;

d. action to prevent the plundering of national resources by industrial resource-hungry nations;

e. actions to suppress political blackmail or acts of political terrorism. The type and rationale for this activity is limitless and could occur without warning;

f. a fish war or similar, resulting from the necessity to enforce the national claim to an economic zone as established by International law but not recognised by a country which does not ratify the Law of the Sea Treaty;

g. participation in peacetime operations designed to save life and/or property;

h. participation in projects for the advancement of knowledge and the good of mankind.

To be able to meet these situations we believe the RAN requires the following roles:

a. to organise, train and equip naval forces for sustained combat operations;

b. to project sea power in order to deter the aggressor against Australian persons, property or interests at sea;

c. to react effectively to meet sudden situations where maritime intervention is desirable to support national interests;

d. to maintain tactical superiority in any areas necessary for naval operations including the defence of maritime trade;

e. to conduct maritime surveillance.;

f. to conduct oceanographic and hydrographic surveys to meet national needs and as a contribution to the advancement of knowlege;

g. to provide military sea transport to meet national requirements.

We believe the roles we have postulated would meet the Navy's needs to achieve its proper Service function.

Let us now consider the four common functions of the Australian Services. The roles we have suggested should adequately meet the requirement of the following functions:

a. to deter aggression, as far as a single nation defence posture will deter the aggressor.

b. uphold and protect Australia's National interests by military means;

c. contribute to United Nations supervisory or peacekeeping forces;

However, we are conscious that the fourth function – 'to ensure the security of Australia and its territories' – may prove to be beyond the resources of Australia in circumstances where a major aggressor with vast resources of manpower and material could overwhelm the nation. We believe that a navy could not be developed by a nation of our population and resources to meet this eventuality. We would need support from powerful friends.

TECHNOLOGY, RESEARCH AND DEVELOPMENT

The critical path in readying the RAN for 1985 will be the acquisition of hardware, due to the gestation period involved. Naturally, purchasing hardware off the shelf reduces the period but this introduces unwanted side-effects, all of which undermine Australia's strategic self-reliance.

There is a general need for Australian research, development and industrial capability to be expanded to match the pace of advance of other national objectives in order to provide that stand-alone factor in providing for national security.

Shipbuilding

In addition to the current need to revitalise the shipbuilding industry in general, there is an urgent requirement to have in Australia the capability to build, to maintain but most of all to design warships in order to provide the independent capability to expand our forces in time of need–a time when our allies may not find it convenient to replace or augment our ship forces. The proper means to achieve both viability of the shipbuilding industry and strategic independence we need is to provide long-term building programmes to the shipyards that include the construction of warships.

Smart Weapons Implications

The major implication of smart weapons we believe is that warships, as presently conceived, present too valuable and attractive a target to hazard in the face of a sampan/SSM threat. At the same time the much increased surveillance requirements demand many more hulls. For both these reasons there is a clear need for many small and powerful units–but with emphasis on the small. Involvement of the Australian shipbuilding industry at this level is an obvious place to start; even better if weaponry such as Harpoon can be built here also. The design capability must be seen as a total package design with a lead contractor coordinating a range of government and private activities.

Nuclear Technology

It is only a matter of time before we are forced into nuclear technology, firstly for ship propulsion because other energy sources will become prohibitively expensive. The size and relative cost of nuclear powerpacks will fall. The present popular reaction to nuclear powered ships resembles scenes from the beginning of the Industrial Revolution and shows clearly that the Federal Government must lead in educating the population of Australia to live with nuclear power. Further, the Defence Department must lead within government, lobbying all other areas to accept the necessity of nuclear power particularly for ship propulsion.

Secondly, the club of nuclear powers is growing steadily. No one has yet postulated a non-nuclear deterrent to nuclear arms. We would probably have to develop a nuclear deterrent on our own. The development time is long (albeit decreasing) and it is too late when a neighbouring country, with outside assistance, detonates their first warhead.

At this moment we should know precisely how many years hence we could have such weapons and this assessment should be updated continuously. Further to this, as the time approaches for their introduction, the Services should begin to practise their use. If the threat level we intend to combat includes nuclear weapons in limited numbers then it follows we should have them too. We should not rely on the USA to equalise the balance, or to provide the nuclear umbrella.

Satellites

The use of space vehicles as an alternative method of accomplishing our maritime surveillance role must be recognised as an option. Systems analysis of the whole surveillance task is needed urgently to determine the proper place of space, air and seaborne vehicles. Such analysis must also take account of the increased effectiveness of all arms of defence due to the availability of more up-to-date intelligence from satellites.

The purchase of launch-vehicles to be operated from Woomera is probably the best means of deployment. However the manufacture of the satellites themselves is surely within Australian capability in 10 years time, even if perhaps the design is not.

Control of Technology

So far we have covered a few very important but very innovative areas of technology. We hasten to correct any impression that 'only the latest is good enough ' by sounding a cautionary note. We have for many years indulged ourselves in purchasing, overseas, hardware embodying the latest

in technology. We have also acquired two undesirable attributes of this indulgence. Firstly, the maintenance of such hardware requires ever increasing levels of maintenance expertise with all the attendant costs of further training etc. However, far more disturbingly we have inherited all the logistic problems as well. What does it matter if the Mean Time Between Failures of an equipment is hundreds of hours if the replacement spare takes 18 months to obtain from the USA– a not atypical figure. We take too much notice of usage in our stocking of key spares and not enough of lead-times.

Use and Development of Existing R & D Capability

There is existing a large R & D capability in Australia. With forward-thinking policy and guidelines that are *maintained* throughout the years there is no reason to prevent Australia being at the optimum technological level in 1985. There *is* a need for greater awareness of the present R & D capability. Far too few of us know of the capabilities of WRE and ARL for example, let alone RANRL. This may be a problem more applicable to the Navy than the other Services.

Realism in R & D

A related feature of R & D is the need for greater realism in its management. We have now conducted enough projects of our own to realise that using optimistic figures in the original estimates is foolhardy. The practice of underestimating R & D costs of a project to get it approved is an overall waste of resources far beyond the direct costs involved because of the impact on other areas.

Enlightened Extension of Role of R & D

Finally we believe the whole field of R & D suffers from a traditional myopia. Broadening the field is desirable and should include such areas as:

- management information systems for command and control;
- behavioural science aspects of service motivation;
- political science studies of the credibility of a deterrent force;
- marketing aspects of maintenance of volunteer forces;
- studies of the construction of merchant shipping and offshore structures to render them less vulnerable to deliberate attack; and
- economic studies of the strategic importance of trade commodities;

to name but a few.

OPERATIONS AND TACTICS

We feel that there are changes needed to our present approach to operational and tactical matters. At the coal face we feel our maritime strategy is hidden in documents which are not readily available to the junior members of the Service. The vast majority of the officer corps look forward to service in a fleet but feel the concept of operations is vague. We believe there is a need to spell out in more detail our maritime strategy and our concepts of operation so that all personnel have a greater appreciation of what they are trying to achieve.

As a Service we exist on the fringe of both NATO and the USN, conditioned to looking to these organisations for tactical doctrine. As a result we have tended to lack some original thought in tactical matters and at present we have inadequate manpower or time devoted only to the development of tactics and their testing in realistic exercises. We believe there is a need to analyse carefully the capabilities of potential opponents and to develop viable tactics to counter them. This requires an effective tactical 'think tank' realistic tactical exercises and full and rapid analysis of these exercises.

While we rely heavily on NATO and USN tactical publications for our operations we have no access to their preparation. It has therefore become necessary to supplement NATO and USN doctrine with our own resulting in the present large number of procedures. There is a need to rationalise our publications, to reduce their number and to firmly establish what are RAN procedures and tactics and what are not. Once this has been accomplished we require an adequately staffed book writing organisation with access to Navy Office and the fleet staff, backed with adequate typing and printing facilities to meet its needs.

We shall now turn to the fleet, its organisation, and its method of operating. It is our contention that having reached a laudable level of professionalism the RAN in the post-Vietnam period has allowed its professionalism to decline to a point where our present standards in basics such a seamanship are below those taken for granted in the '50's and early '60's, because the emphasis has shifted elsewhere.

A ship lives a hand-to-mouth existence during its refit period at a time when basic procedures are being established to ensure safety and efficiency in the commission ahead. Its ship's company tries vainly to cope with a backlog of ship husbandry tasks, while simultaneously providing personnel for courses, exercise staffs, courts martial, boards of inquiry, ship riding duties; in between taking major leave.

The ship enters refit with an apparently inflexible date to be met in the future, knowing full well that any slippage in the refit programme arising from industrial disburbances or any other cause may be counterbalanced by a reduction or

general degradation of the forthcoming SQT and workup periods. The ship's company takes its ship through refit, SQT and workup, striving to achieve the teamwork essential to the management of a modern man-of-war, only to see key personnel posted out just when the light begins to shine at the end of the tunnel. These postings, of course, result from the need to honour the seashore roster.

Ships are organised into squadrons composed of same type units, squadrons which rarely if ever work together and whose commanders apparently have no other function than to act as branch post offices for type correspondence.

Finally, while some ships appear to spend a good proportion of their "commissions" undertaking foreign cruises and participating in multinational exercises, some less fortunate sisters seem banished to the Sydney-Jervis Bay racetrack from where after a trying season of contesting maiden welter events, they are occasionally released for a spell in the agistment paddocks of Newcastle or Port Kembla.

The syndicate understands the problems which confront posters and the planners, the need to retain flexibility; the need to meet routine commitments. But notwithstanding these constraints we feel that there must be a more efficient and satisfying way of running the stable which will ensure that all the entrants will be properly trained before working their way up through the maiden, novice and encourage events, eventually taking a crack at the classics and major handicaps. We acknowledge that fundamental changes will need fundamental policy reversals to support them.

We will place one idea before you without claiming it to be the panacea; an idea which has as its major purpose the stimulation of discussion. We concern ourselves solely with a core force of escorts and submarines for 1986 which corresponds to that at present in existence, namely 3 DDGs, 3 DD/FFG, 6 DEs and 6 SS.

The core force is organised into three Task Groups each comprising 1 DDG, 1 DD/FFG, 2 DEs and 2 SS and we feel that the Task Group Commander should also command the DDG. All ships would operate on a three year cycle regardless of type and all postings of officers and sailors to seagoing units would be of three years' duration. Type postings should continue throughout a sailor's career particularly for technical and weapons sailors once they have reached the rank of Leading Seaman. We realise that the foregoing constitutes one of the fundamental changes to existing posting policy foreshadowed but it is intrinsic to the success of the scheme.

Year one would see all vessels of a Task Group going into dockyard hands at their type dockyards (DDGs and DD/FFG–Garden Island; DEs – Williamstown; SS – Cockatoo Island). Key personnel from the previous commission, having prepared the defect list, would spend one month onboard with the new crew handing over in detail. Where possible new-to-type personnel would ride year 2 and year 3 units for familiarisation. PCT's for all units should be run separately and specific and detailed attention should be paid to the training of the new commanding officers. By year's end all units should have satisfactorily completed SATS, shakedowns and SQTs, with SATS carried out mainly in waters adjacent to refit ports.

At the beginning of year two all units would carry out individual workups and, once a satisfactory standard has been achieved, all units combine for squadron CTT and a squadron tactical period. We would expect that, after a further period at sea devoted to a coordinated tactical workup, a squadron ORE and a JUC, basic training would be completed and for the remainder of the year the Task Group would operate as an entity on what is at present known as the Australia Station, ending the year with a mid-cycle docking and leave period.

Year three would commence with a short squadron shakedown and workup followed by the Task Group participating in all multinational exercises and undertaking at least one lengthy foreign cruise/deployment.

In addition to the present infrastructure, or in some instances instead of it, we see the need for type cells in RANTAU, type cells in each Dockyard in the form of specialised fleet maintenance units, and type expertise and equipment available in all specialist schools. Personnel for these billets should be posted direct from completion of their three year sea cycle.

Finally we must state that, if the fleet at sea is going to be manned to ensure maximum efficiency, then for officers of Commander's rank and above there must be a formalised wet and dry list.

INFRASTRUCTURE

Regardless of how efficient individual sea and airborne units become, their optimum employment is largely dependent upon the infrastructure which supports and guides them. It is in this particular hydradic body we see the need for considerable change.

Oversimplifying, we can regard the infrastructure as a large body supporting the following:

The head political
The head managerial
The head logistic.

The Head Political

While appreciating Machiavelli's dictum that ". . . success in war is determined by the political advantages gained, not victorious battles . . .", and while sometimes echoing, silently of course, Von Moltke's wish "The politician should fall silent the moment mobilisation begins, and not resume his precedence until the strategist has informed the King, after the total defeat of the enemy, that he has completed his task". The uninformed pragmatist would do well to learn from the late Chairman Mao who said "There are some militarists who say 'We are not interested in politics but only in the profession of arms'. It is vital that the simple minded militarists be made to realise the relationship which exists between politics and military affairs. Military action is a method used to attain a political goal. While military affairs and political affairs are not identical, it is impossible to isolate one from the other".

We agree with the late Chairman Mao and see an urgent and ongoing need for the naval officer to understand the political mind and equally, if not more important, for the politician to understand the naval mind. To achieve this there must be frequent opportunities to talk freely in informal circumstances. While recognising the need for some measure of constraint, we decry the muzzle at present placed upon the tongues of uniformed officers when addressed by politicians. Under the present rules the politician, hearing the same stereotyped evasive answers to his question, must begin to wonder if the military mind is capable of any original thought at all; the naval officer, entrusted with the lives of hundreds of men and millions of dollars worth of equipment, must begin to wonder whether he will ever be trusted to act without rigid guidelines to direct him.

Politicians should be encouraged to visit ships and establishments and to talk freely with their uniformed fellow citizens. Short term (three month?) postings to ministerial staffs and other departments such as Foreign Affairs would do much to dispel any thoughts of mysticism which may dwell within the serviceman's mind.

The Head Managerial

It is to this head that all middle-ranked officers belong; and to its higher levels we all aspire. It would seem to us that our training at present is insular and largely by example and experience within the ambit of naval duties, occasionally enriched by staff courses and postings which impinge upon other spheres. But do we keep pace with modern managerial theories and practices? Are we given sufficient responsibility at an early age to fit us for higher managerial tasks? Do we have modern management aids and services to assist us in performing our duties? The syndicate's answer to all three questions is an unqualified NO.

To overcome these serious deficiencies in our daily lives, we see the need for the following to have been implemented by 1986:

- An active short term exchange system between industry, commerce and government at all levels on the one hand and the service on the other.
- Financial responsibility channelled further down the chain of command.
- Decentralisation of some directorates with cells established in areas such as Sydney and Perth and the North of Australia.
- A maritime operations room established to control the management of all surveillance operations.
- Landbased Task Group offices handling the bulk of the paperwork which at present clogs the lives of seagoing personnel.
- Stenographic facilities readily available to ships alongside in dockyard ports to handle the paperwork which must come to the ship.
- Modern management aids installed in directorates and establishments, with initial and running costs more than offset by the manhours saved.
- A vastly improved intra-Australian communications network including such items as secure person-to-person telex, conference telephone links and secure telephones, all leading to considerable savings in manhours and service costs.
- Correspondence stowage problems alleviated by computer stowage in ships and shore establishments and simple information retrieval services.

The Head Logistic

Even with the politician and the Serviceman understanding each other and our management modernised in thinking and assisted by modern aids, the body hydradic will cease to function unless supported by a well oiled logistic machine, adequately primed and refuelled.

In this regard we see the centralisation of stores in the Sydney area under the control of FOCEA as the first in a series of significant steps, leading to the formation of a Support Command controlling not only stores but also military transport. As a natural extension of this concept we see increased use of military transport for leave and duty travel and the rapid movement of stores and equipment.

The stores demand and supply system, although greatly streamlined over the past decade, needs further streamlining in order to expedite the movement of articles from store to user. Here we feel that the potential available in modern computers has been barely tapped.

We see the need for the establishment of new bases, particularly in the North and North West of Australia. Floating docks should be deployed and utilised in peacetime. When assistance is needed and no base exists, Mobile Technical Units should be available to deploy rapidly for trouble shooting.

Finally we see the need for all civilians employed by the Department of Defence to be amalgamated into one Defence Support Union.

PERSONNEL

We now examine the needs of the *officers* who will man the Navy of the future.

Identity

Although a generalisation, it is true to say that naval officers adopt a low profile in the community. Continuity of civic activity is inhibited by posting turbulence, and the constraints on wearing uniform in public places breeds an attitude of anonymity. Both syndromes are less pronounced in isolated communities but do prevail in the large cities.

Peacetime incidents which involve the Navy are generally pitched in matter of fact terms devoid of human interest. By comparison, other professions enjoy large media exposure albeit often coloured by fictional plots.

We feel that there is a need for a radical overhaul of our attitudes to projecting our image to the public. As one of the first steps a budgetary allocation should be made for the professional production of a series of semi-documentary television dramas featuring the Navy's past, current and possible future services, laced with human interest.

Recruiting

If we are to compete with the other professions for our share of school leavers we need to project in forceful terms the purpose and rewards of service as an officer in the RAN. Infrequent quarter page newspaper spreads and kaleidoscopic television commercials lack sufficient substance and inducement to compete with the magnets of civilian professions.

We see a need for the acquisition of civilian expertise in the marketing and advertising fields in order to modernise our approach to projecting our product.

Education

There is an ever increasing mutual interdependence of uniformed and civilian officers in the Navy. Increases in the cost of military hardware are rapid, and this creaes a critical need for close co-operation and concerted endeavour between the research, design, production, user and analyser inputs if procurement is to be cost effective and totally suited to its intended tasks.

The Australian Defence Force Academy will not ensure that sufficient naval officers are adequately equipped academically until about the turn of the century. In the meantime essential user experience will be inserted in the equation but not necessarily collated by disciplined thought process.

We see a need to commence now a programme in which a number of selected officers in the ranks of senior Lieutenant, Lieutenant Commander, and junior Commander are allocated for full time tertiary or post graduate study in order to cover the academic gap. If this means a temporary under-bearing at the coal face, the sacrifice is warranted in the short term for the long term advantages.

One of our greatest potential forums for the debate of defence matters is the Universities, and if it can be established in those institutions, the incumbents will spread it to the Australian public at large. Currently the one place where our advertising and search for publicity is not directed is into the universities.

The spin off in this regard from the education programme I described above would enable the Navy to project:

a. the importance of strong maritime forces for Australia, and
b. the professionalism of the Navy's personnel.

We do not see ADFA in the long term as a total answer. In order to satisfy the needs of the service and the individual we envisage an educational pattern which meets the following criteria:

a. a sound basic education to the level required by the community for an important profession i.e. ADFA;
b. further studies at career break points in order to meet personal needs for advanced education unhindered by trying to conduct two jobs simultaneously;
c. training in the community to fit officers for postings in the higher echelon of the defence force;
d. manpower levels to cope with the allocation of appropriately qualified officers not only to in-service hardware orientated billets but also to research and development.

Training

Training is considered separately from education and is examined in the context of an educational process or acquisition of skills for short term benefits. The Navy tends towards a philosophy that no officer is experienced until he has gained practical experience in a wide range of billets. In point of fact a significant proportion of the tasks in each succeeding billet are repetitious.

We consider that the level and nature of professional skills necessary for an officer to per-

form the tasks required of him at each stage of his career should be clearly defined. Any training superfluous to the requirement should be deleted. Inevitably this will produce more specialised but also more professional officers.

To make our Navy one where lack of resources is counterbalanced by superior performance we must be prepared to invest a higher percentage of our manpower and money to improve training–not the administration of training but the training itself.

To this end we consider a need:

a. for a manpower level to allow personnel to be borne in the training and educational environment without detriment to operational commitments;
b. for facilities to enable meaningful training in the shore environment in order to reduce as far as possible the need for operational units to conduct basic training on board;
c. to train personnel in our national industries in what we need in terms of equipment and expose them to our problem areas.

Employment

The small specialised arms of the Navy such as Aviation, Submarines and Hydrography seem able to offer a more measured tread to officers' careers than general service. As a result an officer within these arms derives:

a. encouragement from an easily recognisable career pattern and progression;
b. motivation to master the clearly defined skills required at each stage; and
c. stability in his personal life because of the planning he can pursue with knowledge of his career patterns.

As impartial observers often assess the level of performance within the specialised arms as very professional, we consider that the reasons should be identified and adopted where practicable in general service.

Industry recongises with concern a syndrome called 'mid career crisis' in which many middle level managers in their late 30s realise that they have reached their final level of the pyramid. A significant proportion opt out for the challenge of a second career. The resultant loss of expertise to the original career is a waste. Whether we realise it or not the same situation arises in the Navy but currently it is too easily camouflaged by the supposed attractions of a commuted pension.

Flattening the pyramid's peak is no solution for either industry or the Navy but we cannot afford any unnecessarily premature loss of expertise. This syndicate does not see a need for the Navy, like industry, to pursue urgently a means of coping with the crisis.

We do however, consider that insufficient attention is given to management of officers in whom large investments in terms of finance and training are made. One means of improving this situation would be increased accessibility of DNOP staff officers to those officers not within convenient striking distance of head offices. This is now done occasionally.

Motivation

Despite the nebulous nature of preparation for a non-identifiable military threat, some of the aspects of military service which motivate are:

a. job satisfaction
b. participation
c. ambition.

Industry is able to measure productivity and, in so doing, motivate their people to achieve targets or results. The Navy's product cannot of course be easily quantified but we feel that the Service could work harder at developing methods of measuring and promulgating the results of endeavour.

In order to ensure that a suitable officer applicant, once properly educated, trained and retrained as appropriate to his career level, has sufficient motivation we see the need for:

a. accentuated measurement techniques for the promulgation of job performance hence satisfaction for the individual stemming from the knowledge that results and goals are being achieved. Conversely, protection for the system when poor performance is recognised and can be corrected;
b. greater emphasis on the satisfaction of successful group activity. Too often officers at all levels who have participated in an exercise have little or no awareness of whether the aims were achieved and what contribution their own unit made.

Officers must feel that their job is worthwhile, interesting and itself giving them status. When serving at sea they must be involved in operational tasks and not continuously training for trainings sake. This problem was addressed in the operational segment of this paper.

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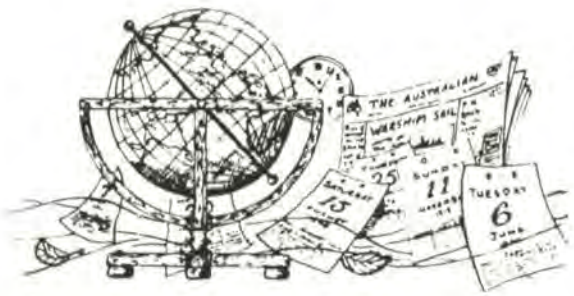

I was there when...

SECOND BATTLE OF TARANTO

What the Battle of Midway is to the US Navy, the Battle of Taranto is to the Fleet Air Arm. It was not surprising therefore that when the Fleet Air Arm's main base in the Mediterranean was due to close it was decided to hold the Wardroom De-commissioning Dinner on Taranto Night–the FAA equivalent of Trafalgar Night. It was a glittering occasion. Senior Fleet Air Arm Officers – past and present – flew in from all parts of the compass to attend the function at the RN Air Station, Hal Far in Malta. The Governor-General was the guest of honour and every other local dignitary attended – the Commander-in-Chief, Mediterranean, General Officer Commanding, Air Officer Commanding, High Commissioners, Ambassadors (including the Italian, naturally); in fact the lot! Silver trophies were sent out from England to adorn the table and the menu can only be described as a banquet. The piece-de-resistance was oysters direct from the scene of battle – Taranto. By arrangement with the Mayor, they were flown to Malta on the day of the party.

As was to be expected, the battle was refought at bar and table; the speeches were witty, apposite and nostalgic and a great time was had by all.

At the dinner table, I was seated between the Chief Officer WRNS and the Commander-in-Chief's Secretary. No lover of oysters, the Chief Officer shared her dozen between me and the Admiral's Secretary. The following day I felt a little queezy but, following the recommendation of a naval medical officer given many years before, I attacked the minor ailment with a mixture of port and brandy which quickly did the trick.

Fit and well on Monday, I repaired to the Air Station to discover chaos. Six officers were in hospital – one on the danger list. Every VIP who had attended and numerous other officers were confined to bed. Not a single pilot was fit to fly. PMO was in a state of shock.

To make matters worse, the day after the mess dinner was Malta's National Day always celebrated by a huge service at the Cathedral in Valletta attended by all local and foreign dignitaries. The Prime Minister (who had been unable to attend the Mess dinner) arrived to find himself virtually the sole occupant of the VIP pews. Almost an international incident ensued until it was explained that no insult was intended and that the absentees were at that time forced to sit on seats in more restricted surroundings.

It was discovered afterwards that the Wardroom staff had opened and washed the oysters, pre-plated them and then left them in the galley for some hours before they were served. The disastrous result was hardly surprising.

But there were many who said that the Italians had won the second Battle of Taranto.

B.W.

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A ROYAL VISIT

I was there, in January 1956, when His Royal Highness, the Prince Philip, Duke of Edinburgh, Admiral of the Fleet, kindly agreed to visit our newly acquired carrier, *HMAS Melbourne*, at Portsmouth. We had arrived in Pompey from Vickers Yard at Barrow-in-Furness to conduct flying trials in the Channel. No aircraft had yet been embarked. His Royal Highness had indicated his intention to come onboard by helicopter from Lee-on-Solent, and, on a bitterly cold winter day, he flew himself onboard in a Westland Whirlwind, an impressive beginning. After Divisions in the hangar, His Royal Highness addressed the ship's company and then inspected the ship. I cannot say for certain, but I strongly suspect he got increasingly bored by all the 'everything is beautiful' comments from people reporting compartments; they were so determined to please, and His Royal Highness's questions drew only bromide replies. We were on the last leg of the tour coming aft down 4 deck (I think) to fetch up at the Wardroom for lunch; we had been through the cafeteria and the Chief Cook had just reported the Main Galley ready for inspection. As he entered the Galley, His Royal Highness said something to the effect of 'How is your Galley? Chief'. To everyone else's shocked surprise, and, I suspect, His Royal Highness's delight, the Chief Cook replied 'Bloody awful, Sir'. His Royal Highness's face lit up, he rubbed his hands in that characteristic gesture of his, and with great warmth said 'Tell me'. 'Well,' said the Chief, 'Look here at this . . . ' They had a very animated discussion about the inefficiency of the layout, and the inadequacy of the equipment was discussed at length. The inspection of the Main Galley ran over the time allowed on the programme. I don't know, but I suspect our direct and plain spoken Chief Chef had made Prince Philip's visit all worthwhile.

J.A.R.

International Economic Relations

The Peoples Republic of China

by GIG

This is the second of three articles on the Peoples Republic of China. The first of the series "International Political Relations" appeared in the February edition of the Journal of the ANI.

China is unique among developing nations in that since the early 1950's control over all facets of international economic relations has been exclusively by the Ministry of Foreign Trade.

This all encompassing nature of control over economic sectors for the pursuance of political goals makes it a necessity to study the international economic relations of the People's Republic to enable us to view the homogenous nature of all contact with that great giant; political, military, social and economic as being welded to the needs, aspirations and demands of the Party.

The party line has been the pursuance of self reliance and independence. We can see the pursuance of state goals in the economic policies by examining the three central mechanisms of international economic relations.

FOREIGN INVESTMENT

In sharp contrast with all other underdeveloped countries China has accepted no foreign investment either direct or indirect and has not indulged in any of its own outside of Hong Kong.

FOREIGN AID

Gifts/Grants

China has received virtually no gifts or grants and although the USSR did train 10,000 Chinese specialists in 1950 China paid half the training costs. The 11,000 Soviet experts in the country in the 1950's received allowances and salaries paid by China, so these movements can only be regarded as useful exchanges rather than gifts.

Loans/Credit – Long Term

In per capita terms there has only been a minimal level in China by comparison with other countries. The only loans of this nature are those from the USSR in the 1950's which only comprised 3% of China's Gross Domestic Investment with economic aid only being 1%, the remainder being military aid.

All these loans were repaid by 1965 and since that date China has been free of long term indebtedness.

Loans/Credit – Medium Term

China had virtually no access or desire to these types of funds until the1970's when short term loans repayable within 6-8 months had extensive use for the import of grain and fertilizers. Medium term loans, repayable within 18 months to 5 years were increasingly used in the 1970's to import complete industrial plants mainly from Japan, U.S. and West Germany.

But the total short/medium term loans in the 1970's are only the equivalent of one year's export earnings and this debt burden is extremely slight in comparison with all other underdeveloped countries. So China is virtually self reliant in terms of receiving aid.

China's Aid to Other Countries

Total aid, credit plus gifts from 1950-1974 came to $US 6 billion compared to the $US 2.2 billion China herself received from the USSR in the 1950's. It is equal to about $US 400 million per year today or 1/3 of 1% of China's Gross Domestic Product.

The allocation of this aid has been mainly to capitalist Third World countries which took 50-60% of total aid up until 1970 of which over half went to Africa, and socialist Third World countries which had a strong concentration on North Viet-Nam which until 1971 took over half of this aid.

Significantly, the main proportion of aid, up to 80%, has been economic rather than military aid.

Aid/Politics Relationship

Aid and political relationship has changed over time.

Pre Cultural Revolution: the strongest association was with politically radical countries such as Tanzania, Ghana and North Viet-Nam with stronger military support towards independence movements in underdeveloped capitalist countries.

Post Cultural Revolution: There has been much less support for radical countries so as to prevent the undermining of the long term presence in these countries.

Terms of Chinese Trade

The repayment terms of Chinese aid are extremely good with all credits payable without interest and repayable in goods or kind. There is usually a period of 5-10 years before repayments start with no adjustment for inflation and the average period of repayment is 10-30 years. This contrasts favourably with Soviet Aid which has to be repaid within a maximum period of 12 years and interest accrues at 2.5% per annum.

Physical Nature of Chinese Aid

Of total aid 40% has gone towards the building of infrastructure such as roads, railways and buildings while 33% has gone towards the provision of commodities and foreign exchange with only a small proportion of total aid going towards heavy industry.

CHINA'S FOREIGN TRADE

Foreign trade grew faster than the Gross National Product overall from 1949 but exports have never exceeded 2% of the total world's exports and only 5.6% of China's GNP is in foreign trade which is small in comparison to other countries.

It has grown fast but since China started with such a small base and foreign trade has not exceeded GNP growth by much so it is still small today especially for a country with a large percentage of the world's population.

Direction of Chinese Foreign Trade

Before the Revolution the main trading partners were Japan, Hong Kong, U.S. and Britain which made up about 70% of trade while Russia only amounted to around 5%. But in the 1950's this pattern changed dramatically with a predictable reorientation of trade towards socialist countries. Of total foreign trade 29% in 1950 grew to a peak in 1955 of 74% going towards socialist countries with the USSR being vastly dominant, taking 48% of total trade in 1959.

This great drop in trade with non-socialist countries was basically caused by changes in political affinities especially with the USSR as it was found to be very useful to have trade between two controlled economic trade sectors with ministry to ministry contact vastly simplifying the trade process. The USSR was also prepared to make credit available and was a ready export market at a time when China suffered a trade embargo by many previous trading partners.

In the 1960's there was another dramatic reorientation of trade again reflecting the political situation. There was a great decline in trade conducted with the USSR and eastern Europe. The proportion of trade going to socialist countries declined from 66% in 1960 to 20% in 1970 while the proportion to the USSR dramatically dropped from 30% in 1959 to 1% in 1970. Correspondingly trade with capitalist countries rose from 30% in 1959 to 70% in 1965 where it levelled off so that China's three main trading partners are now:

Japan

In 1959 trade with Japan comprised 0.5% of the total, reached 15% in 1966 and 24% in 1974 so Japan is now China's principal trading partner with linguistic and transport advantages as well as a general economic efficiency in costs.

Hong Kong

Has always been consistently one of China's biggest trading partners in the 1960's and 1970's and has averaged 8.9% of China's total trade. Much trade goes to Hong Kong because it is a large direct consumer of food and clothing and many goods are reexported onwards. Hong Kong provides readily available foreign exchange from a trading pattern that is virtually inter-province.

United States

Until 1971 there was no trade between these two countries but with the lifting of the trade embargo in April of that year the U.S. rapidly climbed to be one of China's most important trading partners.

Overall the relative proportion of foreign trade conducted with non-socialist developed countries is 50% of the total trade, and this figure does not include the unique intermediary of Hong Kong.

Commodity Composition

The material structure of imports and exports of China's foreign trade.

Imports

The import strategy has concentrated on a massive preponderance of producer good rather than consumer good production machines. The only qualification occurred in the early 1960's when there was a rise in agricultural imports due to the food shortage. Producer goods totalled 90% in the 1950's, 80% in the 1960's and early 1970's and the percentage looks like rising again under the current leadership. These imports are clearly being directed towards the country's development needs by the Ministry.

Exports

Foodstuffs still comprise about 30% of total exports in the 1970's. Manufactured goods have undergone a change with textiles being the most important single export earner, now stabilised at around 25%. Crude materials comprise around 20% of export earnings and the increase in China's known reserves of oil in the 1970's could make crude exports more important in foreign trade policy.

Relative to other underdeveloped countries China has been fairly successful in its expansion of manufactured goods for export but lacks the aggressive marketing required to expand demand for her watches, cameras, radios etc. at the same pace as the growth of demand for her oil, wheat and coal.

Balance of Payments

Chinese international trade has only shown a deficit in seven years since 1951, three years since 1955, which is a big contrast with other underdeveloped countries.

Examining balances of trade by regions we find an interesting situation for the professed champion of the third world since China tends to be in deficit with developed countries but makes up for this deficit and then some in its trade with underdeveloped countries.

AN OVERVIEW

Given China's major policy concern for independence and self-reliance with its associated requirement for industrialization then the state is faced with the question of whether buying advanced plants overseas encourages dependence by discouraging domestic invention and the development of expertise? And if these plants are not brought in to boost the investment goods sector then future growth may be limited because of overseas dependence caused by an inability to expand the foreign exchange market.

In the last several years China has gone ahead and purchased big industrial plants overseas while trying to minimise foreign dependence caused by purchasing foreign technology. The Chinese realise that there is a choice available where they can either buy while not stimulating domestic techniques or buy in such a way as to develop and stimulate local technology. They look at a Russia still heavily dependent on western technology and a Japan that is not and they are trying to emulate Japan with a possibility of success we can only guess at.

Given that China's international political relations have always been policies to ensure the survival of China as an independent state, shown by a principally non-revolutionary foreign policy, we can see this reflected in the aims and effects of her international economic relationships.

Whatever Marx maintained history has shown that underdeveloped countries are the most ripe for revolution and yet China's economic policies towards these countries have been largely counter revolutionary. With its emphasis on the growth of their economy rather than military support there has been a corresponding growth in access available for the advanced capitalist countries and the growth of an infrastructure reinforcing the self generation of the society.

Industrialization for these countries certainly means materialist advancement but it also makes for a state more dependent on capitalism by the development of an international market dependent on comparative advantage in the components of international trade. So China, by largely encouraging growth under capitalism has been following its foreign policy line and that same warning I gave in my last article still applies and has been reinforced.

As soon as China feels it has achieved a high level of independence and self reliance then foreign policy, both political and economic will begin to pursue a violent series of revolutionary goals which will be hard to obstruct given the demonstrated insularity of China's economy.

The normal procession of political censure and economic sanction will be of no avail to prevent the stirrings of the awakening giant heeding the calls of Marxist–Leninist–Mao Tse Tung thought. This leaves us with some rather intriguing and abnormal naval considerations when confronted with such a scenario.

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"The pathway of man's journey through the ages is littered with the wreckage of nations, which, in their hour of glory, forgot their dependence on the sea".

— Brigadier General Hittle, USMC, October 1961

The Role of the Submarine in Future Limited Conflict

This paper by Lieutenant Commander K. W. GRIERSON RAN won second prize in the Officers' Section of the 1976 Peter Mitchell Trust Essay Competition and is produced by permission of the Chief of Naval Staff. The views expressed by the author are his own and not necessarily those of the Australian Government, the Department of Defence, the Chief of Naval Staff or the Australian Naval Institute.

In many ways, the submarine takes the art of the guerrilla to sea. The same features prevail: stealth and concelament; ambush and evasion; anonymity and ambiguity; initiative and surprise. It is a made-to-order instrument for an enemy which has traditionally sought its victories at limited commitment and cost

– VADM J.S. Thach, USN to the
Royal Australian Naval College, 1963

INTRODUCTION

The development of nuclear powered submarines, sea skimming submarine launched anti ship missiles, wire guided torpedoes and long range passive sonar have combined to make the fast, highly manoeuverable attack submarine potentially the capital ship of the future. These developments far outweigh the progress that has been made in submarine detection sensors which are still limited in range and performance.

Advances that have been made in anti-submarine technology, for example the long range passive sonar, have benefitted the submarine more than ASW forces. Developments in other fields, such as navigation and communications, have also greatly enhanced the potential of the submarine.

The two main roles for both conventional diesel-electric and nuclear attack submarines will continue to be anti-ship and anti-submarine. By blockading the enemy's ports and bases, both of these functions can be attained by a fleet of submarines. The sinking of enemy submarines before reaching their own patrol areas and destroying his surface ships before they can get into action are both important objectives.

The use of "wolf pack" tactics for damaging the enemy's naval and merchant forces and the protection of one's own convoys by submarines are also viable roles.

"War is therefore an act of violence intended to compel our opponent to fulfil our will"
–C. von Clauswitz "On War" 1832

CONFLICT

Conflict is one of the basic universal laws of life. It derives from the individual's will to survive. What one form of life regards as a necessity to its continuance or well being, another may perceive as a threat to its own. On the human scale, conflict can range from a minor disagreement between two human beings to total war between two nations or groups of nations. Conflict can thus be considered a continuum of disagreement between two parties, the disagreement being caused by a clash of interests. Just how important both or either one of the parties regard these interest will determine the level of conflict that they are willing to escalate to.

With nation states, conflict is regulated by what each state sees as interests which are vital to its survival and security. These vital interests

THE AUTHOR

LCDR Kenneth William Grierson was born in Adelaide in December 1943 and, after graduating from the University of Adelaide and teaching in secondary schools in South Australia, joined the Instructor Branch of the RAN in January 1970. On completion of courses and sea time in HMAS Sydney, LCDR Grierson joined HMAS Leeuwin and instructed Navigation until posted as Staff Officer to Director Naval Recruiting in September 1972. Posted to the Joint Services College of Papua New Guinea (PNG) in January 1975, LCDR Grierson became OIC Maritime Element at the College and instructed Senior PNG Officer Cadets in Coastal and Astro Navigation. He is currently Divisional Officer for the General List/ Supplementary List Officer Candidates in HMAS Leeuwin.

vary from state to state but are related to what each state's populace perceive as necessary for the well being and continuance of that state. When interests which are perceived as important or vital by one state clash with those of another, a state of conflict occurs. The level of conflict is indicated by the overt actions of the opposing sides. This overt action can range from propaganda, political or diplomatic pressure applied through international agencies or alliances, economic pressure in the form of sanctions or blockades, the threat of the use of armed force or the use of paramilitary or guerrilla forces, to the use of armed forces which can take the form of a limited expeditionary incursion using conventional forces through to the use of thermonuclear weapons and general nuclear war.

Thus the different types of conflict can generally be categorised by the type of action taken in a given situation and the level of intensity of that action.

At the lower level of the conflict continuum we have what has been termed "cold war". This expression, invented to describe the ideological conflict between the USA and USSR, has been expanded to encompass conflicts betwen nations which have resulted from racial, ideological and nationalistic differences. In cold war situations the pressures exerted are most usually propaganda and pyschological attacks on the opponent's populace, diplomatic or political pressure exerted through international bodies such as the UN, or economic pressures such as the restriction on the supply of oil or the economic sanctions imposed against Rhodesia.

In the twilight zone on the continuum between cold war and the overt use of armed force come two other types of conflict which involve the use of armed force. The first is guerrilla or unconventional warfare which can be thought of as an internal problem of one state, but is more likely nurtured by other states. A prime recent example of this is the help given, in terms of weapons, food and sanctuary, by some African states to guerrillas operating in Rhodesia and South Africa. The super powers also nurture guerrilla warfare by supplying military equipment and guidance to various groups which are considered 'revolutionary' by the government of their state.

The second type of action open to a state short of warfare is called interposition. Interposition is the tactic of placing one's own forces between an opponent and his objective. This increases the risk and cost of the objective to the opponent and forces him to re-assess the value of his objective. Interposition depends greatly on the resolve of the two opponents and the fact that each is aware of the lengths to which the other is prepared to go. The successful use of interposition results in what has been termed 'deterred war.' Some recent examples of this are the placing of the US 7th Fleet in Formosan waters to deter CPR aggression in 1958, the use of the US Marines in Lebanon in 1956 and possibly the Cuban Blockade of 1962. The failure of interposition, however, leads to overt military action and thus escalates the situation to one of limited or total war.

Limited war is so called because of "limitations of objectives, arms, forces, geographical area, commitment or participants".[1] This is a very broad definition which includes both guerrilla warfare and interposition. Most strategic writers, however, tend to regard limited war as the clash of conventional organised armed forces as has occurred in the Arab-Israeli conflict. Furthermore, limited war is usually fought by client states of the super powers so that these nations, whilst they have an interest in the outcome of the conflict, do not have their security or survival directly threatened. To the nations involved these wars are not limited as their survival as a people, with their own culture and form of government, is at stake.

Limited wars (both internal and cross border conflicts) occur because the interests of the major powers collide in gaining or retaining political orientation, economic ties, access to resources and advanced military bases in smaller countries. The fear of escalation to general nuclear warfare indicates that wars limited in one form or another will continue to exist in the future.

In the recent past, limited conventional wars, such as the Arab-Israeli wars, have been over very quickly. The immediate political aims have been clear and the military objectives have been rapidly and decisively achieved. Examples of this swift action, besides the one mentioned above, are the US intervention in the Dominican Republic and the Soviet invasions of Hungary and Czechoslavakia. With limited unconventional warfare the move to action is slower. A decision must be made on whether the conflict is only one of internal dissent or whether outside powers are involved. Opposing guerrilla fighters with conventional troops leads to escalation by both sides to a point where the added cost in terms of manpower and material is not worth the gain. Political aims (the reasons for the conflict) tend to change and become tailored to military gains or objectives. In this situation, the power using conventional forces is committed to long term involvement with all the attendant problems and frustrations of fighting an 'invisible' enemy. It is possible that such wars could escalate to the point of general nuclear war, but more likely, due to domestic and foreign pressure, that one of the belligerents would be forced to review its war aims, eventually to the point of withdrawal from the conflict.

Generally speaking, since World War II the three main reasons for war have been:

1. Independence from colonial domination,
2. Internal warfare to determine the form of government, and
3. Border disputes between independent nations.

Of these, only the third, disputes over border territories, has involved the use of conventional armed force by both sides. The other two types have involved a mixture of conventional and unconventional forces, the conventional forces usually being used by the established authority. Since wars of independence are, with the last Portugese colonies gone and the USSR maintaining a tight grip on its satellite states, now a thing of the past, it would appear that limited conflicts in the future will take the form of internal disputes and action over disputed territory by neighboring states. It must be remembered, however, that the great powers have an interest in the outcome of wars in or between small states as "what is at stake is political orientation, economic ties, access to resources, and advanced bases from which tactical forces can exercise localised influence, strategic threat, and deterrence".[2]

The Future

By the end of the century it seems likely that there will emerge five powerful nations or groups of nations. These will be:

1. USA and Canada.
2. USSR and Warsaw Pact Countries.
3. Western Europe (NATO/EEC Countries).
4. China.
5. Japan.

It is unlikely that Canada and the nations of Western Europe will submerge their national identities; it seems that Canada will be linked to the USA and the nations of Western Europe linked together in very close economic and defence ties in much the same way as the Warsaw Pact countries are tied to the USSR even now. With the development of economic and trade ties between EEC countries and their continued cooperation in defence projects, it will be more logical to think of Western Europe as a whole rather than as individual states. Japan is the only one mentioned above that does not have a nuclear capability at present, although the Japanese certainly have the materials and the ability to produce these weapons. With the passing of the generation that knew the horror of Hiroshima and the increasing necessity to safeguard the supply of raw materials that is so important to the Japanese economy, it is highly likely that the Self Defence Force will be expanded, both in size and in the functions that it has to fulfil. Similarly, it is not inconceivable that a situation may arise in which the Japanese feel that they can no longer rely on the alliance with the US and that they need possession of their own nuclear weapons.

There seems little hope of any reconciliation between the USSR and the CPR, partly because of doctrinal differences and partly because of the Soviet occupation of what the Chinese consider their territory. It is highly likely that China and the USSR will continue also to compete with each other in the less industrially developed nations of Asia, Africa and South America.

Unless the population explosion is controlled in the less developed nations, there seems little chance of these countries progressing to a satisfactory living standard in the years to come. The gap between the "have" and the "have not" nations will not appreciably narrow as resources that could be used to promote development and raise the standard of living in these countries will be channelled into keeping the ever expanding population fed. Added frustrations and discontentment will be caused by awareness of living standards in more developed countries. The UN will continue to be regarded by these countries as valuable because of the aid and expertise that is channelled through it. However, the role of the UN as a peace keeping agency will continue its decline with the Security Council being hamstrung whenever one of the great powers opposes intervention.

The oil rich states of the Middle East and India have not yet been mentioned. The Middle East states are in a very powerful position now and will continue to be through their control of oil. These states have the money to spend on massive armament purchases and can control certain political events by manipulation of the production or the price of oil. However, most of them have a very low literacy rate and are just beginning to develop industrially. Their virtual only resource is oil and thus their industrialisation probably won't go beyond this industry. With the most sophisticated weapons in their armories, they will continue to rely on outside expertise to keep these serviceable. This state of affairs seems likely to last at least for the next 20 years until significant proportions of their populations can attain the necessary educational backgrounds.

The direction that India will follow when Mrs. Ghandi goes is hard to predict. India is already a nuclear power and has made some progress towards industrialisation. There are diverse social problems aggravated by religious customs. In some states (Kerala for one) there is strong popular support for the banned Indian Communist Party. At present the USSR turns a blind eye to what happens to this party but, with Mrs. Ghandi gone and the Indian honeymoon over, the Soviets may more forcefully support movements in India in a bid to increase their influence in the Asian region. This, no doubt, would produce a reaction from the Chinese who will still be concerned about Soviet encirclement.

It appears that in the future, the definition of limited war will be adjusted to encompass any war which does not threaten the survival or continuance of the five major power groupings. Each of these states or groups of states will inevitably have some interest in these wars which will continue to take place predominantly in the economically underdeveloped regions of the world. Wars waged on religious-political and territorial grounds will continue to occur. It is even conceivable that Japan may again be forced to go to war to guarantee her sources of raw materials.[3] Not all of these wars will necessarily be unconventional or guerrilla. In the past few years we have seen the continuance of the Arab-Israeli conflict, the Turkish invasion of Cyprus, Syrian intervention in Lebanon, Cuban forces in Angola and the Indonesian annexation of East Timor. All of these conflicts have involved the use of conventional armed forces. The Israeli habit of responding to terrorist attacks with conventional forces, as was again demonstrated in Uganda, also leaves open the possibility of other nations becoming involved in actions of this type.[4]

THE ROLE OF MARITIME FORCES

In the previous section of this essay I indicated that I would take 'limited conflict' to include all those conflict situations short of general or total war–armed conflict between the major powers in which their survival is in danger. We have thus a whole range of situations, from propaganda through to the use of conventional armed force, which can be labelled "limited conflict situations" and in which maritime forces can play a role.

Under the title of 'propaganda' could come such exercises as 'showing the flag' cruises. Powerfully armed warships are an impressive sight, and besides having an effect in the ports visited, there is nowadays the rapid reporting of such events in the world press, as the USSR found to its delight with its visits to Indian Ocean littoral states in particular. The whole world is impressed with the new bluewater navy and its challenge to the USN and these visits and the Soviet presence in the Indian Ocean have sparked off much debate and discussion about the relative merits of the two navies. For the USSR it is a tremendous success, not only because of the interest shown, but also politically in the influence it may acquire for them in these littoral states. It must be remembered that many of the Indian Ocean states are ex colonies and nominal members of the third world. The US is too closely associated with their ex colonial masters and the Soviets are usually generously welcomed. By making their presence felt and demonstrating part of their naval power, they are expanding their influence, demonstrating that their technology is just as good, if not better than, that of the US, and opening the way for further co-operation. Unfortunately, submarines are not as good in this role as a surface ship because they don't visibly bristle with weapons, are relatively ugly and have other public relations drawbacks. For instance, there has been very little mention in the press about the relatively important strategic problem posed by the presence of Soviet submarines in Cuba or the reported floating submarine bases stationed in the Indian Ocean.

Blockade of a country's entreports can be an effective economic weapon in a conflict situation. Blockade can be partial, limited to say preventing strategic materials and arms entering a country, or it can be total, preventing all sea trade. The size and composition of maritime forces committed to a blockade, and the tactics adopted, depend to a large extent on the determination of the blockading power. The commitment of large numbers of ships and aircraft may place an economic strain too large for the results achieved.

Interposition is a strategy which has been used successfully in the historical as well as recent past. This involves positioning ones forces between a potential enemy and his objective. To obtain that objective means coming into armed conflict. This causes a reevaluation of the situation where the potential enemy has to consider whether the attainment of the objective is worth starting a war for and the likelihood of success in such a war.

Recent examples of the use of interposition include the positioning of Soviet ships between the US 6th Fleet and Egyptian objectives in the Arab-Israeli war of 1971 and the steaming of units of the US 7th Fleet to the Indian Ocean in the last Indo-Pakistani conflict.

The interposer must also be aware of the likely cost and be fully prepared to risk escalation to open warfare.[5] If open warfare does occur as a result of this tactic, the aims and objectives should be clearly defined and the war prosecuted until either the objectives have been attained or it is apparent that the cost of gaining the objective is prohibitive.

The successful exercising of sea power in any conflict involves denying the use of the sea to ones enemies whilst enjoying the use of it oneself. Brodie, in his adaptation of Mahan's views to modern warfare, defined seapower as "the sum total of those weapons, installations, and geographical circumstances which enable a nation to control transportation over the seas during wartime".[6] More recently, Admiral Sir Peter Gretton has enlarged on this and defined maritime strategy as "that which enables a nation to send its armies and commerce across those stretches of sea and ocean which lie between its country and the countries of its allies and those territories to

which it needs access in war, and to prevent its enemy doing the same."[7] Thus, in a limited war, the successful application of sea power would be realised by a nation's maritime forces accomplishing several types of missions. These are:

1. Protecting allied troop movements across the seas.
2. Protecting normal commerce shipping from enemy attack.
3. Denying the use of the sea to the enemy for movements of troops, supplies and commerce.
4. Blockading enemy naval and commercial ports.
5. Providing mobile gunfire and air support for land and naval operations.

To achieve this capability in war, a nation must pursue peace time strategies which will ensure:

1. superiority in ships and equipment, both in numbers and quality. This enhances the abiltiy to deny the enemy the use of the sea and adequately protect shipborne commerce.
2. secure bases so that naval operations can be supported.
3. an internationally recognised law of the sea permitting free passage in national waters and the right to stop and search neutrals on the high seas.

In wartime situations, these strategies allow the maritime power to:

1. neutralise the enemy fleet, either by complete destruction, serious damage or blockade.
2. strike at enemy maritime communications in order to damage his economy and prevent him from using the sea for military purposes.
3. transport invasion troops and prevent the enemy from using the sea to invade its homeland.
4. protect its own merchant shipping.[8]

In the present and future world situation these ideals will be impossible to attain. No one great nation will have the necessary wealth, technological superiority and manpower to enable it to completely dominate the others. I will try to show, however, that the nuclear powered fleet submarine is probably the one weapon which has the capability to bring about complete maritime domination by one power in most of these wartime strategies.

"Pitt was the greatest fool that ever existed to encourage a mode of war which they who command the sea do not want and which if successful would deprive them of it"

– Lord St. Vincent (1805)
on the development of the submarine.

THE SUBMARINE

The British attitude towards the submarine was, for a long time, derogatory. Lord Fisher described it as an "underhand" weapon, one to be used by the "weaker" side, whilst at the same time recognising its potential as a major weapon of war. During World War One, the Germans deployed 373 submarines and sank 11 million tons of allied shipping for the loss of 178 U-boats and 5,000 men. But for the primitive detection equipment, this tonnage would have been higher. The 13,000 men at sea in submarines required 140,000 men in the allied ASW forces to counter them.[9] In World War Two, the Battle of the Atlantic was over in 1943, the German U-boats being defeated by the growth of air cover over the convoy routes and the development of direction finding equipment and radar by the allies. The British submarine campaign in the Mediteranean played a decisive role in the Axis collapse in North Africa and the US submarine campaign in the Pacific virtually eliminated all the Japanese merchant ships from the sea by the last few months of the war.

In all of these campaigns it has become clear that the difficulty of detecting a submarine before it attacks is extremely expensive in terms of manpower, material and money. The Mediterranean campaign cost the British 50 submarines, but it disproportionately cost the Axis powers 4 cruisers, 17 destroyers, 21 submarines and over 280 supply ships as well as being forced to commit more escorts that could have profitably been used elsewhere.[10]

Since the end of World War Two, there have been great advances in submarine technology. These advances include:

1. Nuclear propulsion.
2. Submarine launched strategic missiles.
3. Anti ship missiles of the cruise/sea skimming type.
4. Wire guided homing torpedoes.
5. Low frequency passive sonars of improved range.

There are three distinct classes of submarine operational in the world today. The first is the ballistic missile submarine (SSBN) which is the maritime component of the US Triad of nuclear deterrence and are virtually mobile strategic missile launchers which have the advantage over land based platforms. These submarines are usually nuclear powered although the Soviets do have a class of conventionally powered ballistic missile boats. Because of its nature, the role of the SSBN in a limited war is non-existent, being brought into operation only when the war has escalated to general nuclear war. As well as their ballistic missiles they are armed with conventional torpedoes so that they may also defend themselves against attack.

The second class of submarine is the Fleet or Attack submarine (SSN) which is nuclear powered and is designed for tactical use against ships and other submarines. These boats have the advantage

of high speed (in excess of 30 knots) and unlimited submerged endurance, but are noisier than the conventional diesel-electric submarine (SS). This is the one disadvantage of the nuclear powered boat and is caused by the reactant coolant pumps in the pressurised water reactor and the reduction gearing between the steam turbine and the propeller shaft. Much research is currently being undertaken in the US to reduce the acoustic noise level of nuclear submarines. Possible solutions may be the elimination of the reduction gearing by using turbo electric propulsion and using a natural circulation reactor to eliminate the reactor coolant pumps. These modifications will probably result in a decrease in the maximum speed attainable, but the cost may be well worth the gain. An acoustically quiet submarine is very difficult to detect and enhances the effectiveness of its own passive sonar.

Modern SSN's are large craft of 3,500-4,000 tons standard displacement. Since the most successful boats of World War Two were small (under 2,000 tons displacement) and capable of operating on the high seas as well as in confined waters, the future trend will be for smaller boats powered by improved nuclear reactors, fuel cells or turbines fed by liquid hydrogen and oxygen, or primary batteries and other systems of long endurance.

The SSN's of the USN are mainly fitted with the Raytheon BQQ2 system which consists of the BQS6 active sonar with transducers mounted in a 15 foot diameter sphere in the bows, and a BQR7 passive sonar with hyrophones mounted on the sides of the forward end of the hull.[11]

The range of active sonars has not materially improved over the last 25 years, but passive sonars have improved considerably, with detections of over 100 miles not being uncommon. Whilst the bearings of such contacts can be obtained, it is difficult to obtain their range unless two sumarines are operating together to form a base line. Research is being carried out to enable ranges to be estimated within definable limits. The submarine is a better sonar platform than a surface ship as it can vary its depth to suit the temperature conditions, it is not bothered by rough seas, its own cavitation and other noises are less than those of a surface ship, it is more difficult for another submarine to torpedo and it is immune to anti ship missiles. With these advantages, the submarine itself is a valuable anti submarine weapon and a number of submarines are being built specifically for this task.

For a long time development of submarine weapons lagged far behind the development of the boats themselves. Torpedoes have remained the main armament and up till recently their range was less than 5 miles which meant that there was a high probability of detecting the submarine before it had a chance to attack. The USN has now developed, and has in quantity production the Mark 48 torpedo for use against surface ships or deep diving submarines. It has a standard 21"diameter, a length of 19 feet and a weight of 3600 lb. It travels at a speed of 50 knots for 25 nautical miles and will operate in depths up to 500 fathoms. It is wire guided up to the moment of target acqusition when the homing system takes over.[12] The RN has developed a similar weapon, the Mark 24 or Tigerfish. Because of its length (21 ft), it is too large for US torpedo tubes, but is suitable for British SSN's and Oberon class submarines. As with the Mark 48, it is wire guided, the wire being paid out from both the submarine and the torpedo so that the wire remains stationary and strain free in the water, irrespective of relative movement between the submarine and torpedo. It has its own computer which is connected to the submarine's central computer by the wire and also to the torpedo's own homing system. The performance of the Tigerfish is classified information but it is assumed to have much the same range and capabilities as the US Mark 48.

The Soviets have led the West in the development of the submarine launched anti-ship cruise missile. They are believed to have developed two types of underwater launched tactical missiles, one with a maximum range of about 25 nautical miles, and the other, a Shaddock type, with a range of 150 nm or more. Such weapons are invaluable if they can be launched well outside any active sonar screen. The problem is to obtain a sufficiently accurate position of the enemy target by purely passive sonar. Assuming that the screening vessels and helicopters are screening against torpedo attack they would be perhaps 5 miles from the main body. If the screen could detect a submarine by sonar at about 6-7 miles, it would mean that the submarine must launch its missiles at least 12 miles from the main body. Thus a missile range of 15-20 miles should be adequate to ensure the safety of the submarine. If the missile has an adequate homing system an accurate position of the target is not so essential, but if there are a large number of ships in company, it might be difficult for the missile to home on the desired target.

The Soviet Shaddock missile is designed to engage from well outside radar range up to a distance of 150 nm or more. The initial target plot is likely to be too inaccurate for the missile's terminal homing device to correct and so mid course guidance has to be used. This mid course correction is thought likely to be done by an aircraft which has the target on its radar. This method is not favoured by the USN or RN as the mid course guidance aircraft has to remain in position fairly close to the target with the risk of being shot down. They have thus concentrated

on shorter range, usually just over the horizon capability. The McDonnell Douglas Harpoon has a range of 60 nm and can be launched from the air, surface or sub-surface. With booster, the missile measures 15 ft with a diameter of 13½ inches and a weight of 1400 lb. The warhead is 500 lb HE and guidance is strap down inertial with digital computer, plus radar altimeter for the cruise phase and frequency-agile active radar homing for the terminal phase.[13] For submarine launch the missile is installed in a buoyant capsule which is fired from the submarine's torpedo tubes. As the capsule rises towards the surface, aft mounted control fins unfold to maintain the required altitude. Upon broaching the surface, the capsule ends separate automatically and the missile's solid fuel booster ignites launching the missile at a low elevation angle. After booster separation the sustainer engine starts and the missile descends to a low, sea skimming cruise altitude. Flight control is centralised through a mid course guidance unit which consists of a relatively simple altitude reference platform and digital computer.

The USN has also developed SUBROC, a missile which is launched from under the water, surfaces, takes off like a rocket until it reaches the vicinity of the target, then drops a depth charge which follows a ballistic trajectory to the water and finally sinks to a predetermined depth and explodes. The depth charge can be either high explosive or nuclear. SUBROC is launched from a normal torpedo tube and has a range of about 25 nm. This is a very useful anti-submarine weapon as the target cannot hear it approaching on its hydrophones as it can a torpedo. It presupposes however, that the attacking submarine can locate her target at ranges up to 25 miles sufficiently accurately.

To keep anti submarine helicopters at bay, Vickers have developed a short range (3000 metres) point defence air missile system for submarines caled SLAM (Submarine Launched Air Missile system) This incorporates a Short Blowpipe missile for which a special multiple launcher is provided capable of carrying six missiles. The launcher is retractable and can be raised on a telescopic mast from inside the submarine. It carries a TV camera, remotely operated via a monitor screen in the control room. The whole system is designed for use from periscope depth. On an aircraft being sighted through the periscope, the launcher is raised and automatically aligned with the periscope. The operator then elevates the TV camera until he sees the aircraft on his monitor and then tracks it. When the aircraft is within range the operator selectss one of the missiles and fires it. It is automatically gathered into the line of sight and he then directs it by radio commands with his joystick. The drawback of this weapon is its extremely short range. An armed anti submarine helicopter is more likely to have released its homing torpedo well before it gets into range.[14]

When dealing with fast targets, such as nuclear submarines or fast surface craft, attack submarines need an efficient plotting and control system. Vickers have developed a Tactical Information Organisation System (TIOS) which offers maximum reliability with minimum manpower requirements. The system uses a Ferranti FM 1600 B computer and is designed to show the overall tactical picture in both tabular and symbolic forms. The computer receives from the submarine's sensors all available data relating to a potential target. This data is then filtered and shown on a display; in addition the data is stored in a 24,000 word memory storage so that the target history is always available and can be called up on demand.

Functions of data analysis and torpedo control are carried out simultaneously. Using a light pen the operator can select from five different display formats:

1. track association display which gives up to six target contacts.
2. tactical display which gives up to six contact vectors referenced to own ship vector.
3. tactical tote giving alpha-numerical presentation of data on tactical display.
4. weapon control display giving weapon pre flight and flight information relative to target.
5. weapon control tote which gives an alpha-numerical presentation of data on the weapon control display.

When the mode of attack has been selected, the computer calculates the torpedo control data and transmits it to the selected torpedo. If a guided torpedo is being used, guidance is automatic under control of the computer, but the operator can take over and guide the torpedo manually if required.

TIOS was initially developed for installation in Oberon class submarines but will be fitted in other RN classes.[15]

The conventionally powered diesel-electric submarine (SS) can also be fitted out with many of the weapons systems described above. SLAM and TIOS were both developed for the Oberon class. Oberons can accommodate both the Tigerfish and the Mark 48 torpedoes, and it is highly probable that they could also handle the Harpoon. The great advantage that SSN's have over conventional submarines is their great underwater speed and their ability to go deeper and stay submerged virtually indefinitely. The SS has to come to periscope depth at least once a day to snort, and this increases the risk of detection. The greater acoustic noise of the SSN is its one drawback at the present. Whether this can be overcome at acceptable expense is a matter for the future.

ANTI-SUBMARINE WARFARE

The development of the high speed true submarine powered by a nuclear reactor has caused a revolution in the approach to anti-submarine warfare (ASW). During World War Two, the majority of torpedo attacks occurred with the submarine on the surface. Torpedoes had a very limited range so the submarine had to approach within 10,000 yards of her target to have a chance of a kill. The submarine thus had to manoeuvre through the escort screen to get at her target. This, coupled with the German tactic of using one U-boat to follow a convoy and issue information to others in the area led to a great deal of radio traffic between U-boats and their subsequent detection by escorting vessels equipped with high frequency direction finding (HFDF) equipment. The Germans were unaware of the development of small highly accurate HFDF sets and continued to give their positions away, many to be caught on the surface by an escort steaming towards them at high speed.[16] The situation today is extremely different and is changing very rapidly.

Undersea launched missiles with ranges from 10 to 150 plus miles, allow the submarine to attack from well outside the range of the normal protective screen. The difficulties encountered with mid course guidance will probably deter the use of long range missiles in the near future and the emphasis will be on missiles with ranges up to 30 nm, the submarine locating its target by sonar and EW equipment. There is the possibility that, in the distant future, satellites will be able to take over the mid-course correction of the long range missile. This will occur after many communications problems are solved.

The problem today remains the detection of the submarine before it can attack. The problem is compounded by several factors; the high submerged speed of the modern SSN (as fast or faster than the traditional anti-submarine frigate), the range of its weapons, its ability to go deep or hide between thermal layers. Many of these factors are shared by the diesel-electric submarine which has a fairly high underwater speed (15-20 knots) and enjoys the advantage of being extremely quiet. (The SSN is even noisier at high speeds).

The problem of the high speed submarine is a double edged one for ASW practitioners. A ship at high speed cannot use its own sonar because of interference caused by cavitation effects. Thus, helicopters are used to 'dunk' sonars and report contacts to shipborne control.

To date, all successful methods of detecting submarines have relied on the transmission of acoustic energy. The speed of sound in water is only 5000 ft per second. This means that if a target is 10 miles away, the echo of a sound impulse will not return for something like 25 seconds. This assumes that a contact can be made at that range. Active sonars have not appreciably developed in range in the last 25 years. At present, in good conditions, contacts may be detected up to 10 miles away, but the average is probably closer to 5 miles.

Active sonars can be either 'searchlight' or 'all round'. The 'searchlight' obtains longer detection ranges because all the energy emitted is concentrated into one long beam. The operator trains his beam, transmits, waits for an echo to return (if there is one), trains his beam a few more degrees and repeats the process until he has covered his arc of search, which may be from 70 degrees on one bow to 70 degrees on the other. The process is a long one and, with submarines capable of higher speeds than the detecting ship, a dangerous one, since a submarine may approach from outside the arc or even from inside it whilst the sonar beam is trained in another direction.

The 'all round' or 'floodlight' sonars overcome this problem by transmitting energy the whole 360 degrees around the ship and echoes are picked up by an all-round receiver. Ranges obtained this way are very much shorter as the acoustic energy is dissipated over 360 degrees instead of concentrated in a narrow beam.

Ship sonars suffer from the noise made by the ship moving through the water and in rough weather they are badly affected by the ship pitching. Thus a hull mounted sonar cannot be used effectively at high speeds or in rough weather if the ship is steaming into the sea.

The USN has experimented with bouncing a beam off the bottom to obtain greater ranges. This requires enormous power and low frequencies and the whole system becomes large and cumbersome. It is also very dependent on the nature of the bottom; mud absorbs the sonar wave whilst a rocky undulating bottom causes odd reflections. Another problem with long range detection is that the beam widens the further it goes and towards maximum range covers quite a large segment of the ocean. Thus, not only is bearing accuracy not good, but other objects such as whales and shoals of fish may produce false echo.

Variable depth sonar (VDS) is simply a sonar transducer towed astern of the ship. By varying the length of the tow the depth of the transducer can be varied. VDS is an attempt to get the sonar transducer below a thermal layer and so catch the submarine unawares. This sonar also has the ability to increase the range of detection by bouncing the beam off adjacent layers. The system, however, is cumbersome and awkward to tow and slows the speed of the ship.

Helicopters are often used instead of a ship on an anti-submarine screen. Helicopters have the

advantage of speed and the fact that the submarine cannot hear it coming. Because of the size and weight of the helicopter transducer, it can only be carried in larger helicopters which are normally too large to operate from a frigate and require helicopter or aircraft carriers to operate from.

Sonobuoys are carried by most maritime reconnaissance aircraft and are composed of a small sonar set and radio transmitter. Sonobuoys can be either active or passive. Until the development of Barra [17] is complete, passive sonobuoys will continue to be unable to detect range or direction of a contact but passive buoys, dropped in patterns, have the advantage of not being detectable by the submarine.

Fixed sonars are moored or laid on the sea floor in positions submarines are likely to transit. This system offers the only possible means of accurately detecting the SSN providing the sensors can be laid in sufficient numbers in all the areas through which these craft are likely to pass. This is extremely expensive and presents great technical difficulties. The US is known to have two of these systems. The Ceasar/Sosus consists of a number of passive sea bed sonars with a cable connecting them to the shore. The Suspended Array System is still under development. It is to be in the form of a tripod, six miles to a side, in 18,000 feet of water and supporting a hydrophone array in the duct beneath it. The potential range of such systems as these is in the order of hundreds of miles.

Magnetic Anomaly Detection (MAD) equipment measures minute changes in the Earth's magnetic field. The large metal mass of a submarine will cause some slight change in the Earth's field and MAD can detect this, but again, the range is at present small.

Overall, the majority of sonars in use today area restricted in range. The problem of detecting the fast SSN armed with anti ship missiles at a range which will enable its neutralisation before it attacks has not been satisfactorily solved, nor is it likely to be so in the near future.

> *"Overall anti submarine capability is losing ground to submarine capability because, on balance, the latter is benefitting to a greater degree from a variety of expanding technologies. Among these, specifically, are navigation, long range communications, satellite and undersea surveillance techniques, underwater propulsion systems, life support systems and homing weapons. Perhaps the cruellest blow to more traditional forms of naval power is the consistent ability of the submarine to benefit on balance from sensor developments, even when these are ostensibly anti-submarine in motivation. Any sensor which can detect a submarine can more easily detect a surface ship."* [18]

It appears that the best sensor platform to detect a submarine is still another submarine, and this state of affairs will last well into the future. Until some efficient long range method of detecting objects under the sea, possibly with infra red detection of water temperature differences or more likely as a spin off from advanced laser technology, the submarine will continue to hold the advantage.

"The only thing that ever really frightened me during the war was the U-boat peril"
– Winston S. Churchill

As previously mentioned, submarines are of limited use in "showing the flag" or in peacefully underscoring diplomatic initiatives short of war. Submarines can only support operations ashore to a very limited extent although they can convey clandestine groups and arms to enemy held coastline. Surface naval and air power is still an indispensable element in balanced naval forces necessary for mastery of the sea but the role of the submarine in maritime warfare is becoming increasingly important. The speed of nuclear attack submarines coupled with long range weapons and better communciations make the SSN suitable for several offensive and defensive roles in the future.

Surface naval forces are also necessary for interposition although submarines should support that force. In the event of the interposition strategy not working, submarines would supply valuable anti submarine cover for the force and be the first line of defence that the enemy would encounter, attacking his capital units with missiles and torpedoes.

Gretton's principles of maritime power apply to the ideal case where one nation has complete domination of the oceans to the detriment of its opponents. In a more realistic situation, in a limited war situation, the opposing parties are more likely to be able to fulfil only some of the objectives in the maritime sphere. Thus, the essence of sea power is to be able to dominate a particular and comparatively small area of sea so as to permit the free passage of one's own merchant and naval shipping and to deny it to one's opponents. [19] The nuclear powered attack submarine is a vital element in a nation's armoury which will allow this condition to be fulfilled. It can clear the surface and sub surface of the enemy's major units and act as escort to merchant or naval convoys. Its superior passive sonar enables it to detect the presence of other submarines long before surface units can and its long range anti ship missiles and anti submarine torpedoes give it a decided advantage.

In World War Two the 'wolf pack' tactics of German U-boats very nearly caused the downfall of Britain. One of the major reasons for the U-boat failure was the inability to stay submerged for long periods. The snorkel was not developed

until near the end of the war when the Battle of the Atlantic was well and truly over. This inability to stay submerged coupled with technological improvements in HFDF and radar, and the extended surveillance from the air brought about the failure of this campaign. The wolf pack tactics, however, are still valid and, with SSN's and SS boats that have a high submerged endurance, even more viable. The procedure was as follows:

(i) The convoy was detected and its presence reported to the U-boat operational command.
(ii) The U-boats involved were informed of the situation and given their orders from Doenitz's headquarters.
(iii) Each U-boat involved determined the position of the convoy relative to its own position. This information was frequently updated.
(iv) The U-boat needed a position and/or speed advantage to enable it to close the convoy within the time allotted.
(v) U-boat high command and the U-boats involved maintained a 'tactical picture' as the pack assembled and the attack began.

"Broadly, the development of the wolf pack attack required detection of the target (convoy), designation of the target and the U-boats to attack it, target vector information, and physical closure".[20]

With modern technology, the general form of the tactic can still be employed. Instead of a submarine or aircraft initially detecting the convoy, this will be done by surveillance satellites which transmit the information to a shore based command post. This command post evaluates the information and transmits it and any relevant orders to submarines by VLF radio which a submarine can receive whilst it is still submerged at periscope depth. The shadowing U-boat used to constantly transmit to the shore based command and other U-boats. In the modern situation there is no need for the submarine to transmit at all as the target information is constantly updated by the surveillance satellite and retransmitted to the submarines by the shore command. To achieve their attack positions, U-boats almost invariably had to make use of their superior surface speed. This is not the case with modern SSN's. There is no necessity for the submarine to risk exposure in any way before the attack begins. The operational command has a clear picture of what the situation should be from the information received from the surveillance satellite and the orders and information that has been passed to the submarines. Armed with sea skimming anti ship missiles with a range of 20-30 nautical miles, the submarine needs only one brief radar transmission to gain an accurate range and bearing before beginning the attack. With a computerised fire control system the missile could be launched within a matter of seconds of this transmission being made.

During World War Two the British committed just over 100 submarines to the Mediterranean in order to keep 20-30 operating in the area. With nuclear submarines and the use of two or three crews for the same boat this situation does not occur to the same extent. There is no refuelling problem on return from patrol so the turnaround time for the submarine is dictated by the time necessary to embark the relief crew, refurnish provisions and stores, and remedy minor defects. The passage to and from the patrol area could be accomplished at high speed, increasing the risk of detection but decreasing the percentage of the cruise spent on this transit.

Blockade is one tactic that the submarine has a great potential for.

"As the years go on, the likelihood strengthens that, in spite of the most strenuous anti submarine efforts carried on with the most exotic of available equipment, a submarine fleet of a relatively moderate size–perhaps several hundred vessels–can destroy or drive into port any present day surface navy and merchant fleet.'[21]

By blockading ports and destroying naval and merchant ships on the high seas, nations who do not possess a SSN fleet able to counter that of an enemy, can be held to economic blackmail or forced to economic ruin.

If a situation did occur in which one of the great powers wanted a free hand in some area of the world and blockaded that area, sinking the merchant ships of another great power, the blockading power has the advantage. If its own merchant ships do not have to traverse the ocean to this area, they do not have to run through a counter blockade. The great power that has lost some shipping has to decide whether the cost of escalating the conflict by taking retaliatory measures is worth the objective. Escalation or threat of general nuclear war is pointless because no one great power can be certain of surviving a general nuclear war.

The submarine itself is the most effective anti submarine weapon. Thus it will be a major component of any escort group, be the main body naval or merchant ships, as it has the ability to detect enemy submarines at longer ranges and 'hiding' from hull mounted sonars beneath thermal layers. Equipped with weapons such as wire guided homing torpedoes (which can be heard by the enemy on his hydrophones) or developments of missiles similar to subroc, it can destroy an enemy submarine before the convoy comes into the range of the most effective anti-ship submarine launched weapons.

CONCLUSION

Submarines, both attack and patrol classes, are highly economical and effective weapons. The trend in the future will be towards smaller boats which can operate effectively in coastal waters and on the high seas. Their propulsion systems need not be nuclear but it is highly likely that this form of power will continue well into the future.

To date, there has been no real advance in the development of submarine detecting sensors. Sonar has a limited range which is far short of the range of modern submarine weapons. The most effective sensor is passive sonar, which gives bearing but not range, mounted in another submarine. When the technical problems associated with nuclear reactor coolant systems and turbine reduction gearing are overcome, detection of attack submarines will become even more difficult. Conventional submarines are extremely quiet and their main risk of detection is during the forty-five minute snort period that they must do each day. Snorting is usually done at night after using a passive search receiver to give warning of any radar fitted aircraft in the area. They can stay submerged for weeks and (using the Oberon as an example) are large enough to take a large weapon load.

In a limited war situation, the role of the submarine will be twofold. It will have the task of destroying the enemy's shipping, both on the high seas and as it leaves his ports and bases. Secondly, it will be a major componenet of any escort force in order to give the most effective protection to the convoy from the submarines deployed by the enemy.

". . . the large surface vessel–the mainstay of conventional naval and merchant power–has become vulnerable beyond salvage to a variety of weapons of which the submarine, armed with air flight missiles, is king."[22]

In order to protect sea borne trade from enemy submarine attack, his submarine bases and transit routes should be blockaded to prevent his submarines reaching the target area. The blockade would be composed of the attack submarine in its anti-submarine role.

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ON HISTORY AND ITS APPLICATION

In the final analysis, few lessons to be learned from the plethora of historical strategic advice are clean-cut. The mission is to understand what transpired before and to appreciate the content, so that inference can be applied to the future with perspicacity. As Santeyana said, "Those who cannot remember the rest are condemned to repeat it."

John M. Collins
"Grand Strategy"

HMAS Penguin – A Short History

by LCDR W. N. SWAN RAN (RTD)

In an article in the February 1977 issue of the Journal I made reference to The Queen's visit to HMAS *Penguin* (then commanded by Captain Claude Brooks OBE, ADC, RAN) in February 1954. I now follow this with a short history of the name *Penguin* for the benefit of Members.

The principal RAN Barracks for New South Wales, HMAS *Penguin* occupies a commanding position in picturesque Sydney Harbour on the northern side of Middle Head. It overlooks the seaside resort of Balmoral and commands a fine view of Clontarf, Manly and the Spit Bridge. Up to 1939 there was little requirement for a large naval barracks (other than the Training Depot at Flinders) in Australia, as the total strength of the RAN between the World Wars had never exceeded 6,000. By 1941 the RAN had grown to unprecedented strength that the need for a barracks at the main base was very real.

So in 1941 work started on the construction of a Naval Depot on the present site, and *Penguin* was commissioned on 18th July, 1942, under the command of Captain E.C. ("Dusty") Rhodes, ADC, RAN. Previously, the main Establishment for Officers and ratings serving in or passing through the Sydney area had been situated on Garden Island and Potts Point. This function was now taken over by HMAS *Penguin*

The complement of *Penguin* varies; but has been as high as 45 Officers and 500 ratings in peacetime (many more in wartime). Activities within the Depot have also varied with governments and the naval vote. In addition to barrack and detention facilities, there are (or were) a Defence (NBCD) School modelled on the HMS Phoenix at Portsmouth where I did the 6 weeks Defence Officer's Course in 1949, an Instructional Technique Centre, a National Service Training Centre (when "Nashos" were in vogue) and a base for the 4th Submarine Squadron. A very important aspect of Penguin has been the RAN Hospital, which has shared the burden of naval ailments with Flinders Naval Hospital. This fine facility, equipped for all surgical and medical needs, including the special requirements of the Depot Diving School, can make your days on the sick list very comfortable (except one morning when an absent-minded attendant gave me a fork with which to eat two lightly boiled eggs).

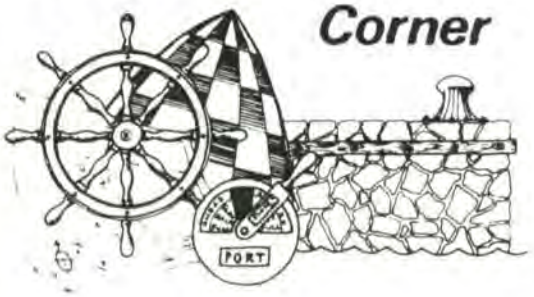
The name *Penguin* is connected with the genesis of the British Navy in Australia. HMS *Penguin* was launched at Glasgow in 1876, and was the seventh ship of this name to have served in the Royal Navy. She was one of 14 ships of the *Wild Swan* Class, her sister ships being *Cormorant, Dragon, Doterel, Gannet, Wild Swan, Kingfisher, Miranda, Osprey, Pegasus, Pelican, Phoenix, Mutine & Espidole.* All were built between 1876 and 1878. Classified as Survey Ships, they were single screw, composite sloops with iron frames, sheathed with wood and copper. *Penguin* was 170 feet long, 36 feet beam, had a draught of 16 feet and displaced 1,130 tons. Her maximum speed was 11 knots and her armament comprised 2-20 cwt M.L's., 2-5 inch 30 cwt B.L's, 3-64 Pdr M.L's and 4 machine guns.

The original *Penguin* cost £52,111 to build; much of her early service was spent as a combat ship, and the middle 80's saw her helping to suppress the slave trade on the Africa Sation. In 1888 she took part in the blockade of Zanzibar, and captured several dhows.

From 1890 to 1906 *Penguin* was actively employed on Pacific and Australian coastal hydrography, including surveys of the Barrier Reef. In 1907 she reached Sydney and ended her seagoing career in March of that year. The following year the Admiralty approved the sum of £650 to convert *Penguin* into a depot ship, and in 1909 she became the first such vessel in Australia. When the RAN was formed in 1913 the Admiralty relinquished all control of *Penguin* and sold her to Australia for £2,000. In 1923 this veteran ship ended her naval career, being sold to a private firm. Her figurehead now stands proudly in the Establishment that bears her name. The figure of a woman, it adorned *Penguin's* bow for 46 years.

It is a remarkable fact that this veteran ship was still afloat in Sydney Harbour in the 1950's, in her 80th year of life, and in use as a heavy lift ship. A survey at that time showed her timbers to be still in very good condition. She should not, of course, be confused with the *HMAS Penguin* of 3,455 tons (ex-*Platypus*) which, then commanded by Captain George Scott DSC, RN., lay alongside Garden Island in 1936 when I passed her in a boat on my way to join *Waterhen* as a Midshipman in July of that year. This ship was then Depot Ship for Sydney.

Shiphandling Corner



The Second World War was over and we were gliding gently back to civilisation over the placid waters of the Pacific. It seemed a good idea to 'keep clear of the putty' by fixes from the lighthouse on Frederick Reef. But suddenly we had an uneasy feeling that all was not well . . .

Every year throughout the world hundreds of ships go aground; or in the polite naval way of phrasing it, 'touch the bottom'. In every case there is subsequent heartburn and investigation, and often legal action, be it a Naval court martial or a civil damages claim, and eventually some sort of a reason for the grounding is arrived at to the satisfaction of the majority of those concerned.

The story I am about to tell is not one of a grounding. Consequently it never became public, and only three or four of the participants know the details, such as they were. In the art of navigation there are dozens of well tried principles. Additional lessons are always being learnt by navigators, but it is normally safe to generalise to the extent of saying that every situation begins with known facts. The only trouble is that sometimes the fact is wrong. So it was in this case. I tell this story because I think it holds a lesson which may be new to some seamen.

Necessary risks only

The middle watch is always a lengthy period in a ship by herself in the middle of an ocean. The middle watch of my story was no exception. In our destroyer, at the end of 1945, we were gratefully steaming away from the Pacific battleground after the completion of a successful war. In the preceding few years we had many times taken navigational risks in badly charted waters and got away with it. Our Captain was an able and reliable seaman, who, whilst taking these necessary risks, had always stuck by the rather sensible maxim of keeping as far away from the putty, as he put it, as he possibly could. This even gave rise to the invention of one or two nicknames for him which I shan't record.

When the dust of Hiroshima had settled (which, incidentally, we had seen in the distance from the ship), there followed the peace and the occupation. In Tokyo we had wandered, with interest, through the desolated bombed ruins and had taken part in a victory parade at the British Embassy (miraculously still standing and still kept immaculately clean by the same caretaker who had looked after it for twenty years before the war). Now, with all this behind us, we were hurrying south through the Coral Sea with high hopes of being in port for Christmas. The Coral Sea, as every seaman who has been in that part of the world will confirm, is a dangerous place. Mostly the depth of the water is in the region of one or two thousand fathoms, but every now and again there suddenly rises from the sea bottom a towering mountain, atop which a coronet of coral has thrust itself to the surface, giving rise to the well-known lagoons and atolls of this area. The average atoll (I won't say typical because no one case is the same as another) is therefore rather like the top of a submerged volcano. The rim either breaks the surface, forming little islets which may even have vegetation growing precariously in their sandy crevices, or lurks menacingly below the surface at a depth, one would think, designed especially to trap the unwary mariner. In places a deep channel may exist between the sunken reefs or the visible islets. Inside the rim the lagoons usually have sufficient depth of water for a ship to navigate, provided she dodges the Nigger Heads and knows the way in and the way out.

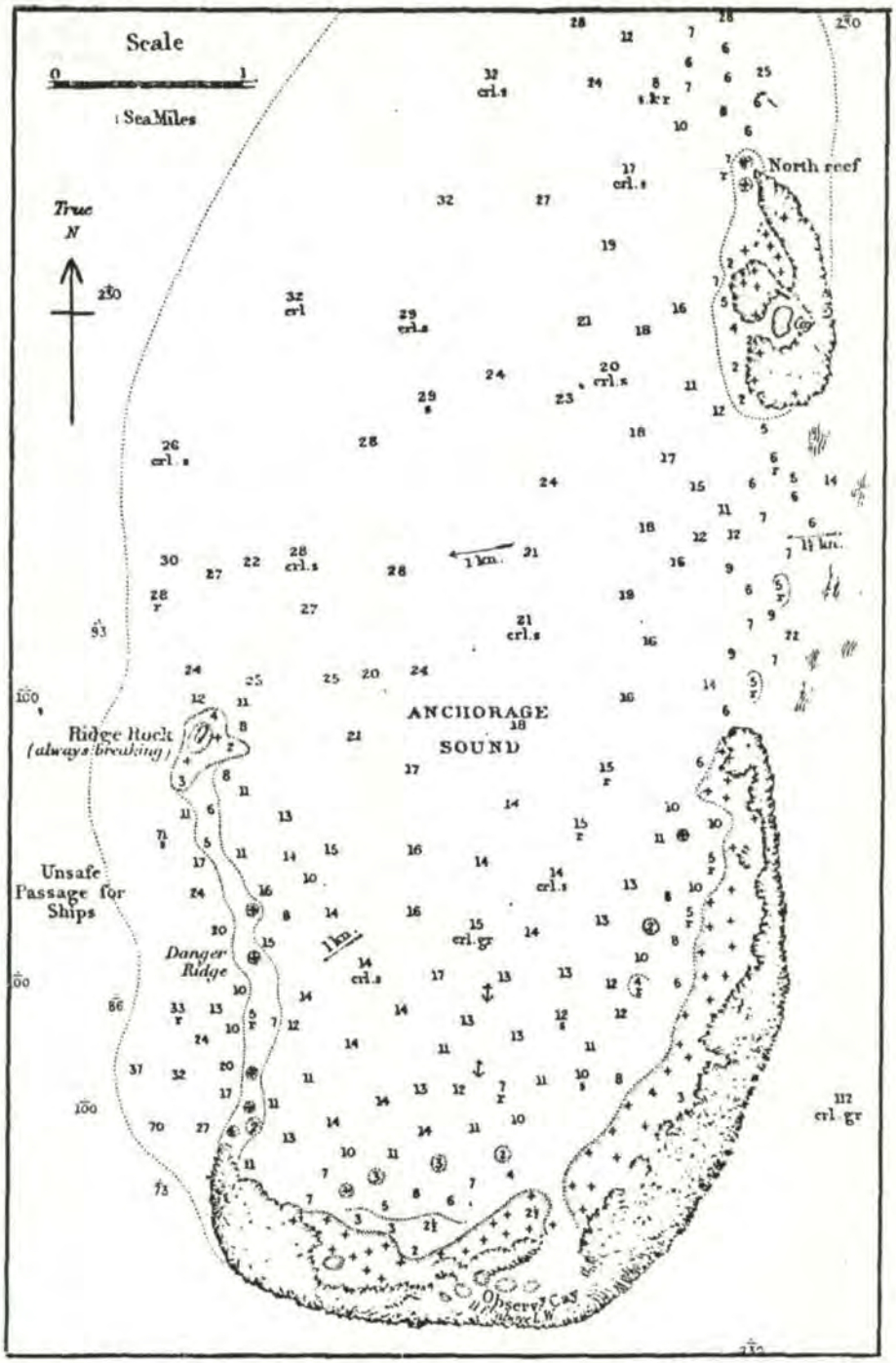
Turtle and sea-fowl eggs

Quite good charts exist of the majority of the Coral Sea reefs, many of which reveal safe havens and anchorages. These plans, as one of the Admiralty charts explains, will, 'with the help of a masthead lookout, enable a ship to round-to under the lee of the reefs where she may caulk topsides, set up rigging, and obtain turtle, fish and sea-fowl eggs. On some of the salient reefs, beacons have been erected and, for the sake of castaways, coconuts, shrubs, grasses and every description of seed likely to grow have been sown in the sparse soil to promote the superstructure; and it is most desirable that these refuge spots should be held sacred for universal benefit and not ruthlessly destroyed.'

In lattitue 21° 01' 46" South, longitude 154° 23' 29" East, there exists just such a coral atoll.

This is Frederick Reef.

Oval in shape with the longer axis lying north and south, Frederick Reef is as near to being a typical coral atoll as one could wish. Right across the sothern end, and halfway up the eastern side, the reef is just above the water. In the centre of the southern part, in fact, there is a small islet called Observatory Cay, which rises



Frederick Reef, latitude 21° 01′ 46″ South, longitude 154° 23′ 29″ East, from a portion of the Admiralty chart

eleven feet above low water. The south-western part of the reef is called Danger Ridge, and here the reef varies in depth from five fathoms to nothing, with one or two rocks that just break the surface. Needless to say this area is labelled on the chart as an unsafe passage for ships. At the northern end of Danger Ridge, which is halfway up the western side of the atoll, lies Ridge Rock, over which the sea is always breaking, and northward of this the water deepens and is safe for ships. Halfway up the eastern side another safe entrance exists, but north of this, on the norht-eastern corner of the atoll, the reef again rises to the surface and sand cays and rocks are just visible. At the northern part of the atoll, or the 'top of the egg', and in the whole of the lagoon inside, measuring about six miles by three, there is clear water with a depth of between ten and thirty fathoms. All round Frederick Reef the sea-bottom drops sharply away, down the steep-to sides of the sunken mountain, to depths of many hundreds and even thousands of fathoms.

We planned to keep clear

As we approached this lonely speck in the Coral Sea that middle watch, we had few worries and certainly no premonitions, for on the south-western corner there existed an unwatched lighthouse which we knew we would see at least ten miles away. Our course was set to pass four miles to the west of this light, steering due south. Sure enough, the light was raised on time, and although we found as we approached that we would pass rather closer to the light than the planned four miles, the water was clear to the west of it and we were not worried. Being a dutiful officer of the watch I informed the Captain and the Navigator and the latter came up to the bridge. There we shared a cup of cocoa together as we watched the light draw nearer over the moonlit sea. By running fixes and later by a small radar contact, it soon became apparent that we would pass two miles to the west of the atoll.

At about this stage the Asdic Operator, whom we still had closed-up in case there were any Japanese submarines who had not heard that the war had ended, reported indications of a deep reef ahead. This interested me, but gave no cause for alarm even when he later reported that the reef was fairly shallow. Knowing that we were in deep water. I successfully persuaded myself, with the Navigator's concurrence, that what was being picked up was a tidal eddy sweeping round the southern end of the reef across our path. Sure enough, as the light drew aft towards the beam we passed over the alleged sunken reef and were then certain that it was, in fact, tidal effect.

The night, as I have said earlier, was a brilliant moonlit one, and as the lighthouse came abeam to port we could even see the rocks and strips of sand on which it was constructed. One of the officers on the bridge commented at this stage that he thought the sea had become very calm. Admittedly there had only been a gentle swell and a light breeze previously, but the Navigator and I had to admit that even the swell seemed now to have departed. As the light drew abaft the beam, we knew that we were well clear of all dangers, because the light was situated on the extreme south-western corner of the southerly reef.

Imagine my surprise, therefore, when the Starboard Lookout awoke from his reverie to report, in a rather startled voice, his sighting of a small island broad on the starboard bow. Sure enough, at first glance it did appear to be a small island or rock, but knowing there was no rock there we persuaded ourselves successfully that it was a whale spouting on the surface. I should point out, perhaps, that the visibility to westward was not as good as in other quarters, and our supposition about this object can therefore perhaps be forgiven.

An odd effect

We have all read in meteorological books of that 'uneasy feeling that all is not well' that often attends the approach of a tropical revolving storm. This feeling, as many seamen know, also appears at other times. Perhaps it was a slight attack of this feeling that caused me to sweep the horizon a little more carefully through my binoculars at this stage (though, of course, I knew I would see nothing). The calm sea was producing many lines of light from the reflected moon, and right across the horizon directly ahead of us was one of these. As it drew nearer, however, I could not help likening it, as perhaps explorers in the Sahara have often done with mirages for which that desert is famous, to something more materialistic: in this case it looked for all the world like a reef!

We discussed this odd effect for a few minutes during which we were also busy in preparing our second cup of cocoa. When I again looked ahead through the binoculars, the uneasy feeling suddenly turned into one of early fright. Leaping into action I (a) called the Captain and told him there seemed to be a reef ahead, (b) ordered an operator to close up in the echo sounder (just, of course, to confirm that we were in deep water), and (c) suggested to the Navigator that it looked as if we were on the point of discovering a hitherto unknown reef. As the Captain appeared on the bridge, the mysterious broken water was by now only a few cable-lengths ahead, and there even seemed to me to be in the air around us that roar of breaking water that one always hears when close to a real reef in the open sea.

Hard a'starboard

The Captain, I think, felt much the same as I was beginning to do, and let loose in his best stentorian voice.

'Hard a'starboard'.

'Hard a'starboard, sir'. The Navigator repeated the order almost gratefully down the voice pipe.

'What's the depth?'

'Echo sounder just closing up, sir. No report yet'.

'Show me the chart, pilot'.

'Steer 240'.

'240, sir'.

'Bridge. This is echo sounder'.

'This is bridge'.

'No bottom at two thousand fathoms, sir'.

At this moment I was leaning over the port side of the bridge watching with horror the broken edge of a very realistic reef sweeping down along our port side at a range of about ten yards. Still no bottom with the echo sounder, so the Captain, after a quick examination of the chart with the Navigator, ordered the ship to resume her southerly course, and stumped off the bridge with a remark to the Navigator as he left. 'Looks like you've found a new reef, pilot. See me in the morning about making a signal reporting it'.

Still slightly unnerved and troubled in our minds, the pilot and I discussed the odd pheomenon as some length, and eventually were equally divided in our minds on two possible answers. Firstly, that it was a new reef (but we could not quite believe that somebody had not seen it before); secondly, that our tidal eddies which had caused us some concern earlier in the watch, had grown to even bigger proportions under the influence of, perhaps, some subterranean volcanic disburbance. Anyway, all was well and the pilot trudged off to bed, leaving me to the loneliness of the Coral Sea.

Ten minutes later a white-faced apparition appeared silently at my elbow and motioned me to come to the chart table with him. Even in the moonlight I had to admit to myself that I had never seen the pilot look quite so ashen-faced or worried, even in the face of kamikaze suicide bombers or typhoons off the Japanese coast. Within half a minute I think my own face had probably assumed the same hue and for the rest of that night, even after I had left the bridge on being relieved at four o'clock, I found my imagination playing over a vast array of frightening possibilities.

On the mat

At 8.30 sharp the following morning the pilot presented himself nervously at the Captain's door.

'Yes, pilot. Come in. I suppose we'd better get that signal away about the reef. Is that what you came to see me about?'

'Well . . . er . . . Yes, sir.'

'Right. Let's see what you propose.'

'Well . . . er . . . Sir, you see . . . it's like this.'

'Well? Come on, come on.'

'Well, sir, I don't think we ought to make a signal.'

'Good God, why not? That was definitely a reef and we don't want some other poor blighter to go up on it!'

'No, sir. But . . . well . . . you see . . . I found a notice to mariners last night after you turned in . . . '

'Well, what was it?'

'It's one I seem to have missed, sir. It appears they've moved the light on Frederick Reef from the south-western corner to the north-eastern corner. We must have gone right down the centre of the lagoon and, as far as I can see, we went out over Danger Ridge in between that rock there, and this rock here, with about a yard to spare each side, and a foot or two underneath.'

There was silence for a few moments, although no doubt the pilot felt that the knocking of his knees was readily audible.

'Hmmm. Well . . . All right, pilot, it looks as if we were lucky, but now perhaps you realise why I never like going too close to the putty!'

D.H.D.S.

The Impact of Technology Upon the Royal Navy 1860 –1914

Part 1: The Battleship

by MASTER NED

An Introduction

Naval warfare has undergone three major periods of change since the beginning of the Renaissance. The first was the introduction of the broadside armed full-rigged sailing vessel in the years 1500-1600, the second was the period when the industrial revolution made its impact upon the world's navies and the third was the introduction of electronic warfare which began when radar was first taken to sea in 1938.

Apart from the sheer speed of technological development that characterises all three eras, there is another factor common to all. This is that knowledge of basic strategy and tactics becomes hazy and indefinite until the new weapons have been extensively used, tested and analysed. The Armada of 1588 showed that the British really did not know how to fully utilise their ships. Almost right up to the First World War the various navies were under the impression that 5,000 yards was an effective fighting range and, more recently, the sinking of the Israeli destroyer *Eilath* by a Styx missile in 1967 caused a panic in the West over the lack of an adequate defence against surface-to-surface missiles.

The purpose of these two articles is to study the revolution that occurred between 1860, the year the iron hulled battleship *Warrior* commissioned, and 1914, the first year of the Great War, because there are several distinct similarities between the way that the necessary developments were undertaken then and the technological events of the last three decades. This first article will seek to outline the unnecessary round-abouts that battleship development took up to 1983 and to pose the question as to whether there may be similarities with post war surface ship developments in the intellectual and technological confusion over both issues. The second article will examine the torpedo and seek to discuss whether this weapon was adequately developed and intelligently used up to 1914.

It may be that readers will say that I am oversimplifying the issues. However I am not attempting to write a comprehensive naval history of the period. What I am trying to do is outline similarities with the present day and stimulate discussion as to whether we do really know which way naval developments are taking us and the question of whether 'progress' is really progress at all as umpteen hideously expensive different lines of research and experiment are proceeded with. The real question is: 'Where are we going?'

The Development of the Iron Mastless Battleship

The completion of the battleships *Warrior* and *Black Prince* signalled the end of an era for the entire world. What the introduction of an iron hulled steamship to the battle lines meant was that industrial might was now the basis of sea power. Even a small and relatively undeveloped country could build a reasonably large wooden sailing ship with a good turn of speed and adequate weapons carrying capacity. Even the requisite number of guns needed only a small foundry to do the casting if they were not to be purchased, but to build an iron hull was an entirely different matter. For the next forty years no major ship was to be built outside industrialized Europe or the United States. The Southerners in the American Civil War discovered this fact when they were forced to armour their ships with discarded railway rails; even the famous *Virginia* was only the wooden hulled frigate *Merrimac* stripped down and given an iron covering.

Time and time again when an embryonic navy desired a warship of any size it had to go overseas, and most usually to England, to get it. The names of Armstrong & Co., Granville, Cramp and Ansaldo litter the Navy lists of South American and other minor navies.

Yet the direct connection between a nation's technological capacity and its ability to wage war was not seen until at least 1890. Other links were drawn, that of territory or population or trade, but industry, science and intellectual capacity were never mentioned and rarely considered.

The events which best demonstrate this were the lines of development that capital ships took until 1893. The delays caused by enforced economies aside, progress on actual design was limited in this time, so limited that the battleship *Devastation* of 1873, only altered by the addition of new guns, was still in effective operation with the Mediterranean fleet nearly thirty years later. And the advance of science and technology during this time had been nothing if not meteoric.

The step from the wooden battleship to the *Warrior* had been supremely logical and successful and for the next few years the broadside battleship principle was experimented with, both from the view of expanding the design resulting in the successful Minotaur class, and the attempt at diminution, which resulted in the appalling Prince Albert class. This, however, was only a natural and reasonable attempt to economise which resulted in failure; it was not a wooly minded effort to test out some pet theory at vast expense with no previous support.

The change to breastwork turret ships was the next move, it had been demonstrated by the Americans that turrets were a most useful and versatile method of mounting guns and it had been adequately shown by the *Captain* disaster of 1871 that full flown rig and operational turrets did not mix. E.J. Reid, the Chief Naval constructor, had conceived the *Devastation's* design and, in face of great opposition, managed to have the plans accepted. The trials were completely successful and proved the clear superiority of turret ships to broadside ships in every regard but one–freeboard. Yet was the design developed? No, three months after the *Devastation* completed her trials the central battery *Alexandra* was laid down and completed as a full rigged ship. This incredible policy of reverting to a vastly less efficient and more expensive concept was continued for over ten years until a turret ship of any consequence was commissioned. This was the *Inflexible* of 1884, the largest and most expensive battleship completed up to that time. Yet, on commissioning, she was still full rigged and her turrets were mounted amidships in such a way that there were arcs of over 90 degrees over both bow and stern through which the guns could not fire because of the raised fore and after castles.

It must be admitted that the broadside line of battle was the accepted theory of tactics throughout the bulk of the time in question, yet the simple mathematics of 'A' arcs were apparently never considered. Nor was any serious criticism of the anachronistic, expensive and often downright dangerous sailing rigs put forward. For nearly twenty years after it had become unnecessary, full rig continued to be fitted to first rate battleships mainly for the reasons that it was good for training and good for economy.

Not until 1887 would any development of the *Devastation* and her two sisters appear and this was the *Collingwood*. For a time it seemed that sanity would prevail as she was followed into the fleet by her near sisters *Anson, Howe, Rodney* and *Camperdown*, appearing as slight expansions with enlarged guns. To all intents and purposes, though they were steel built, and had barbettes and six-inch quick firers as a secondary armament, they were the same ship as the 1873 *Monitor*. They still suffered from low freeboard but they were efficient, effective and logical. They formed the first homogeneous squadron that Britain had had in over twenty years.

Yet, again, there was an expensive side track. The Admiralty and the constructors were carried away with the cult of the monster gun and the diameter jumped from 13.5 inches to 16.25 in one leap.

> *. . . they were slow in action, managing one round every five minutes. They had a life of only 75 rounds at a very slow rate of fire, proved costly to repair and reline and were described as a 'highly respectable blunder.'*[1]

Benbow, Sanspariel and *Victoria*, the ill fated, were all products of this fad and each proved to be a costly mistake in every way. The latter two typified the confusion in thought at the time. They carried eight different sizes of guns and, as well as its other faults, the main armament could not bear over 90 degrees through the stern. They were unweatherly, unwieldy, bad steamers and proved to be very expensive.

In 1890 the designers returned to square one and produced the turret ships *Nile* and *Trafalgar*. They were simply expansions of the *Devastation* and differed from *Collingwood* principally in that they again mounted turrets because controversy existed as to the superiority of either system.

In the same year that these vessels commissioned, the Royal Sovereign class were laid down. The supreme difference in between these ships and their predecessors was their increased freeboard and, as barbettes were much lighter than turrets, they were again mounted. To settle the barbette-turret controversy a similar ship, the *Hood*, with turrets and the consequent lower freeboard, was built and the clear advantages of higher freeboard were completely and definitely demonstrated. From this time on until 1906, when the all big gun *Dreadnought* commissioned, the Royal Sovereign design was improved and expanded year by year, class by class until it

became obvious that the principle had reached its apex of development. By the time that the move was made it had become as logical as the transition from broadside ships had been in 1873 and, in its own turn, the development of the Dreadnought principle was proceeded with at a steady and logical pace.

But why did it take some twenty years to move from one small step to the next? False economy does constitute some part of the answer but the apparent eagerness of the Royal Navy, and others, to retain less efficient and less battle worthy designs, while at the same time endeavouring to spend a great deal of money on new construction, needs explaining.

The first reason for this delay seems to have been a lack of appreciation for technology in the Royal Navy. This is not to say that the officers were any less intelligent than they are now or have been at any other time but the 'too much Nelson' syndrome was very real. That most officers were extremely literate and well read is obvious from the logs, memoirs and diaries that remain to us and that they were superb seamen was demonstrated again and again by the feats of drill, sailing and salvage that are recorded in nineteenth century European history. But they knew little of the capacities and construction of their ships and weapons and those who did have some technical talent tended to overrate their abilities, as the tragic fate of Captain Cowper Coles and his brain-child, *Captain*, demonstrates.

The problem lay also in that no methodical system for evaluating new weapons, tactics and designs existed. It is difficult to conceive in this day and age of the bitter feuds over aspects of Naval policy and the extreme public interest in the supposed deficiencies, or otherwise, of the fleet, yet the enormous energy expended in debate was never concentrated and used in a methodical way. There was no system by which a body of doctrine could be collected to support or refute the pet theories of a hundred 'authorities' on Naval matters. The most extreme example of this situation was the extent to which Kaiser Wilhelm II was allowed to affect the constructional direction of the German fleet after 1889.

This was primarily the fault of the education system at all levels. Engineers, right up to the introduction of Admiral Fisher's 'Selbourne Scheme' in 1902, were a class apart, the ones who were told ' . . . my Ma would never invite your Ma to tea . . .'[2]. Engineers could not attain flag rank and had little or no influence on construction and design. Seaman Admirals were making the decisions about machinery and other matters and their lack of technical knowledge led to some terrible engineering mistakes. There was, for example, a brief dalliance with 'forced draught', a method by which the speed of ships could be artificially raised by a couple of knots. The method was introduced as a much vaunted principle to be applied to all new construction, yet it was not until the engineers at sea had been forced to use the system for several years that those in charge realised that forced draught drastically shortened engine life and reliability.

The incredible length of time that the authorities took to realise the need for an advance from the *Devastation* can thus only be laid at the door of confusion of thought. To quote from H.W. Wilson's admirable work of 1896, *Ironclads in Action:*

> *We had to learn that, admirable though our mastless turret monitors of the* Devastation *type were, as fighting machines, a ship has to do other things besides fighting. She must be fairly comfortable, if her crew are to retain their health . . . high freeboard ships, in which the crews need not be battened down in a moderate sea become essential, when it is desired to maintain in good physical condition the men who have to fight and work the ships.*[3]

This from the Navy that had blockaded France for over twenty years! The doctrine of close blockade was hardly questioned until 1910, yet the obvious conclusion that fighting ships needed to be both effective in the line and good sea-keepers to maintain a permanent blockade was not drawn until 1890.

What then are the similarities with the naval revolution of today? There are several broad strands that run through both eras and the problems of 1890 are very much like the problems of today, for if the seaborne aircraft platform and its accompanying escorts may be said to fulfill the same function as the battleship did in the last centruy then the decision makers of today can learn much from the faults of the decision makers of ninety years ago.

We must ask ourseleves whether the pace of developments of the ship-borne VTOL aircraft has a similarity to the development of the Devastation principle. We must ask, and this especially applies to Australia and the few other countries with a single aircraft carrier, just what we intend to use our carriers for. It is extremely significant that the rationalization of the battle fleets of England and a dozen other nations only occurred after the production of A.T. Mahan's work *The Influence of Sea Power upon History 1660-1783* in 1890. The real connnection that we have with the nineteenth century is that we are not only unsure of the capabilities of our so-called major weapons but that we are unsure as to their intended use even within the enunciated strategic doctrines. The question must stand: Do we need

a 'Guru' like Mahan to point the way or do we have an adequate concept of the future to control development?

FOOTNOTES–

1. John Leather in World Warships In Review 1860/1906. MacDonald & Jane's 1976.

2. The Life of Lord Fisher of Kilverstone. R.H. Bacon. Hodder & Stoughton. London 1929.

3. H.W. Wilson, Ironclads In Action. Naval Warfare 1855-1895. Sampson, Marston, Low. London 1896.

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NOTE: *The second part of Master Ned's article will be published in the next edition of the Journal –Editor.*

BOOK REVIEW

'THE INFLUENCE OF LAW ON SEA POWER'
Manchester University Press, 1975

by D.P. O'Connell

War, in the Clausewitzian sense of unrestrained conflict in pursuit of purely national aims, must now be seen as a remote prospect. However, since 1945 there have been more than one hundred instances of resort to coercive sea power, involving about fifty navies with the use of limited force on many occasions and a tendency to progress to higher modes of weaponry, including the use of surface to surface missiles.

In an era of local conflict at sea and naval diplomacy rather than full-scale war at sea, a premium is put on politically mature and sensitive naval officers steeped in the law and politics of the sea, governmental policy and international relations. International law is thus having an ever increasing effect on those who use the world's oceans, and yet our awareness of the potential influence of international law on sea power is generally lacking. The "Influence of Law on Sea Power" is a great aid in understanding this potential and its inherent problems.

D.P. O'Connell, Chichele Professor of Public International Law at the University of Oxford, as a historian, international lawyer and Commander RNR, is uniquely qualified to clarify the complex ramifications of law in the exercise of sea power. Using an historical perspective he cites examples from World War I, the Spanish Civil War, World War II and almost every instance of hostilities at sea since 1945 to show how international law affected, and in many instances even decided, tactical operations and strategies of nations. His analysis deals with the law and the theory of graduated force, the relationship between self-defence and weapon capability, legal restraints on weapon systems, the rules of engagement and the different aspects of self-defence operations on: the high seas, the territorial sea, the seabed and the rights of neutrals.

One wonders how much our naval equipment procurement policy is influenced by considerations of international law, yet Professor O'Connell devotes one chapter to discussing the suitability of different naval units and weapon systems for law-based sea power.

As a seaman officer I found the book easy to read, interesting and a most valuable background for my profession.

Because of the implications and of the currently rapidly changing international maritime legal situation which is being brought about by negotiations in the Third United Nations Conference on the Law of the Sea and by unilateral actions of States claiming jurisdiction over extended maritime zones I hope that Professor O'Connell will direct his attention to that area in a future work of the calibre of the book under review.

"The Influence of Law on Sea Power" is a fascinating and lucid analysis which is highly recommended reading for defence planners, naval officers (in particular naval staffs), lawyers and historians.

Capt. I.W. Knox, RAN

NOTE: This review will appear in the next edition of the Defence Force Journal.

– Editor

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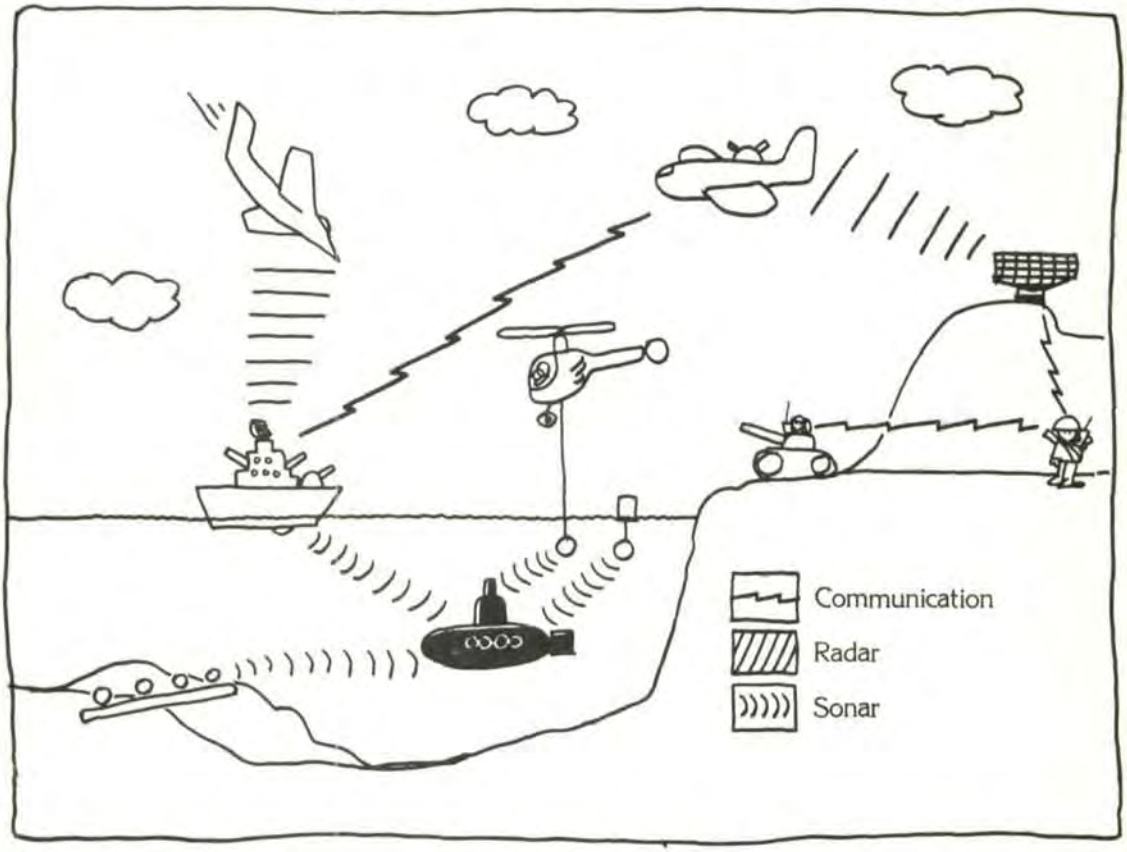

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