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Australia's industry and trade, the company is also exporting to other countries of the world. In fact, when you consider it, that's quite a lot to do, for just one division of an all-Australian company — Favelle Industries Pty. Ltd.
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The more comes later. Like when your engines kick over and you head out for open water. Less engine weight means greater fuel capacity. Fewer parts, less maintenance. No wasted piston strokes, more responsive power. And that's the Detroit Diesel story. Power. Pure and simple.

EXCHANGING APPOINTMENTS


MINE SWEEPERS

The mine sweepers IBIS and TEAL are now stationed at Darwin. H.M.A.S. BASS, the general purpose vessel is to return to Sydney for refit.

SECOND SUBMARINE LAUNCHED

Australia's second Oberon class submarine, OTWAY, was launched in Scotland on 29th November, 1966. The ceremony was performed by Her Royal Highness, Princess Marina, who is Honorary Commandant of the Women's Royal Australian Navy Service.

OTWAY is now being fitted out, and is expected to commission later this year.

ASIAN DUTY

The destroyers VAMPIRE and DUCHESS left Australia on Thursday, 5th January, for service with the Commonwealth Strategic Reserve (based in Singapore) in South-East Asia.

They relieved the anti-submarine frigates STUART and PARRAMATTA, which returned to Sydney on Friday, 27th January (see photographs this page).

RESCUE BRINGS AWARD

The helicopter rescue of four survivors from the sunken dredge W.D. ATLAS, off Jervis Bay on 21st November, 1966, earned a Navy award, the "Collins Trophy", for the Fleet Air Arm's No. 723 Squadron.

The award is made to the squadron which carries out its designated task with the highest degree of efficiency.

As well as assisting in the rescue of the dredge survivors, No. 723 Squadron performed most creditably in the fields of flying safety, helicopter training and search and rescue.

RESERVISTS PROMOTED

A Sydney accountant has become the first R.A.N. Reserve Officer to be promoted to the rank of captain in the Supply Branch of the Naval Reserves.

He is Captain Robert Thom Gamble, who joined the R.A.N.R. in 1941 as a rating. He was promoted paymaster sub-lieutenant in 1943.

Captain Gamble was awarded the O.B.E. in 1964 and was appointed an A.D.C. to Her Majesty the Queen in 1965.

Three Reserve Lieutenants — an Adelaide medical practitioner, a Perth bank manager and a Hobart accountant — have been promoted to the rank of commander. They are Surgeon Commanders Colin G. Alderman and Arnold K. Wertheimer.

MINISTER VISITS H.M.A.S. CERBERUS

The Minister for the Navy, the Honourable Don Chipp, paid his first visit to a Naval establishment on 23rd January when he visited H.M.A.S. CERBERUS, Victoria.

H.M.A.S. CERBERUS is the Navy's principal training establishment and has a service population of approximately 2,000 officers and sailors.

The Minister also visited the West Head gunnery range.

PAPUANS TO TRAIN AS NAVAL OFFICERS

The personnel strength of the Papua-New Guinea Division of the R.A.N. has increased in recent days with the recruiting of 54 sailors.
What does the Roseville Bridge have in common with the Gladesville Bridge? the Tarban Creek Bridge? and the Captain Cook Bridge? C.M.A. Cables were used in the construction of all four.

For all projects in construction, engineering and mining, C.M.A. Cables are the first choice.

C.M.A. Cables were used in the construction of all four.

For all projects in construction, engineering and mining, C.M.A. Cables are the first choice.

CLEARANCE DIVERS FOR VIETNAM

A team of Naval Clearance Divers (frogmen) to be sent to Vietnam will work with American and South Vietnamese units. Their tasks will include locating and rendering safe, bombs, mines, missiles and booby traps set by the Viet-cong.

JOINT SERVICES STAFF COLLEGE

Two Australian Service officers and a civilian, Lieutenant Commander D. J. Orr, Lieutenant Colonel A. W. F. Rofe and Mr. W. L. Hanks, have been selected to attend the 34th course conducted by the Joint Services Staff College in the United Kingdom, commencing May this year. The objectives of the College are to train officers for staff appointments on Joint Staffs; for higher staff appointments in their own Services; and to foster and develop mutual understanding and a common doctrine between the Services.

PILOTS' TRAINING COURSE IN U.S.

Two R.A.N. fighter pilots, Lieutenant Commander John Dascoota and Lieutenant Graham King, left Australia early last January to undertake "Skyhawk" conversion courses at the United States Naval Air Station at Lemoore, California. On return to Australia after five months, they will assist in the training of R.A.N. pilots selected to fly the "Skyhawk" (see photograph).

SUBMARINE SERVICE BADGE

A distinctive badge has been issued to officers and sailors trained for the R.A.N. submarine service.

The badge, a gilded metal brooch depicting two dolphins, nose to nose, supporting a crown, is worn on the left breast of the uniform coat or jacket.

The badges will be awarded:

To officers, on completion of 6 months' service in a seagoing submarine following the completion of the submarine training course.

To sailors, after passing a submarine sea test normally held after 16 weeks' service in a seagoing submarine, following the completion of the submarine training course.

H.M.A.S. STUART

Among the recruits are two Cadet Midshipmen, Francois Moisan and Elias Garafolo, who attended Keravat High School.

They will join two other Cadet Midshipmen selected from an earlier intake and will undergo professional and academic courses at H.M.A.S. TANGAUL on Manus Island. They will then be sent to H.M.A.S. CERBERUS for further training in professional subjects.

The objectives of the College are to train officers for staff appointments on Joint Staffs; for higher staff appointments in their own Services; and to foster and develop mutual understanding and a common doctrine between the Services.

BATTLE OF LEYTE GULF COMMEMORATION

Last October, the R.A.N. and R.A.A.F. represented the Australian Armed Services at commemorations recalling the Battle of Leyte Gulf, one of the most significant battles of the Pacific theatre in World War II.

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course.

A Douglas A-4E Skyhawk Attack Bomber

February-March-April, 1967

THE NAVY

February-March-April, 1967

THE NAVY
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The minesweepers, H.M.A. ships SNIPER and CURLEW, visited the Philippine city of Tacloban for the 22nd anniversary of the battle.
On 20th October, 1944, eight R.A.N. vessels (AUSTRALIA, SHROPSHIRE, ARUNTA, GASCOYNE, WARRAMUNGA, WARDNA, KANIMBLA and WESTRALIA) supported the American amphibious assault in Leyte Gulf. It was the first landing in the Philippines and marked a major turning point in the campaign against Japanese forces in possession of the Philippines.

STEWARDS FOR "EXPO 67"
A Chief Petty Officer and two W.R.A.N. Stewards have been chosen for 8 months duty at official luncheons and dinners in the V.I.P.'s dining room of the Australian pavilion at EXPO 67, Montreal, Canada. The successful volunteers, Chief Petty Officer Allen Guthrie, Leading Seaman Malcolm J. Baulch and Wren Susan Horrobin are currently serving in H.M.A.S. CERBERUS, and before their departure late in March, they are being given an intensive training in specialised Wardroom duties.

VICTORIAN RADIO STATION PIONEERS NEW FREQUENCY

By 3UL Manager—Colin McL. Cameron

By virtue of its climate and geographic situation, Gippsland is one of the most important dairying provinces in Australia, the rainfall in the central area being approximately 45 inches per year.

Due to this fact, the Gippsland-Latrobe Valley Area is the fastest growing and one of the most densely populated areas in Victoria (outside the metropolitan area). Six months ago 3UL established an ultra modern satellite studio in the heart of the Latrobe Valley, bringing modern radio closer to the north of the transmitting site, with the main pattern covering the required service areas in the Latrobe Valley, South and West Gippsland and the Westernport areas.

The original radiator used on 880 kcs. has had 150 feet of 6 top loading wires, whilst the new radiator also 280 feet high has been fitted with 6-150 feet of top loading "umbrella" wire.

With the change of frequency 3UL purchased two 2.5 K.W. S.T.C. Transmitters incorporating the new silicone avalanche rectifiers, and the necessary power dividing network, aerial coupling units and phase angle measuring equipment.

Five months ago 3UL established an ultra modern satellite studio in the heart of the Latrobe Valley, bringing modern radio closer to the 63,000 people within 10 miles of Morwell. The studio in Radio Arcade features a glass frontage which enables the public to actually view the studio in operation from the front of the building. It is estimated that over 8,000 people use 3UL transmitters. Bular Bular, Victoria Radio Arcade every day as it bridges the two business sections of Morwell.

OUR COVER

THE NAVAL NEXT WEEK:
3UL transmitters. Bular Bular, Victoria

February-March-April, 1967

THE NAVY

Page 7
John Helmore has been associated with the fishing industry since 1930, and looks after at least 40 fishing vessels in Eden. Commenting on the performance of GM's engines, Jack said: "The big feature of their compactness is the engine room can be shortened up to 4 feet. What was once a crowded engine room now becomes a ballroom. This often allows extra space for rope wells, and with only one basic family design for all engines, 20-1400 h.p., the customer saves O-I parts. GM's range of engines are tailored to boats' requirements, and give a combination of performance, economy and durability no other engine can equal."

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THE FRENCH NAVY
A Survey

HISTORY
France began to be interested in naval affairs when the boundaries of her Kingdom reached the European coast at the beginning of the 13th century. The first Kings had to charter fleets from Venice, Genoa or Monaco in order to pursue their crusades and expeditions against surrounding countries. Jacques Cartier, the famous French navigator, took possession of Canada for King Francois the First in 1535.

It was not until the end of the 17th century that the French navy became an organised Force. This was achieved under the direction of Colbert, who was a great minister under Louis XIV. Duquesne, Forbin and Tourville achieved great success at the battles of Beuzeville, Barfleur and Lagos respectively. Because of excessive costs, however, the French Navy began to decline during the Regency and the reign of Louis XV. Nevertheless Jean Bart, Duguay-Trouin and Ducasse had some success with their speedy, light ships. The result of this period of great economy was the loss of the French territories in Canada, India and Louisiana during the middle of the 18th century. Immediately afterwards there followed a period of resurrection which led to success during the American War of Independence. Orvillies, Lamotte-Picquet and De Grasse at Chesapeake contributed to the victory of the young Republic.

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personnel were formed into naval brigades and saw service on land inside the Paris fortifications. In 1881 the Colonial expedition resumes in Tunisia, in Tonnin under Francis Garnier and in Annam under Courbet. This activity was later to extend to the Congo, Madagascar and Morocco. The contributions by the Navy during this period of colonisation were very significant and success would not have been possible without its aid. Progress in technical achievement became quite marked during the same years. In 1887 the first French submarine "GYMN NOTE" was launched and in 1913 the Fleet Air Arm was created, by the end of World War I the Fleet Air Arm consisted of 2000 aircraft.

During the First World War the French Navy was divided into two Fleets; one to control Dover Strait against the German fleet and the other was used in the Adriatic Sea against the Austrian fleet. The French Navy also saw service in the Dardanelles, during the defence of Suez and on convoy escort duties.

Because of the large naval programme between the two World Wars the French Navy was in good shape in 1939 to undertake modern warfare at sea. It participated in the escort of Atlantic convoys, on sea operations in Norwegian waters and at the evacuation of Dunkirk.

After 1940 the French Navy continued the liaison between France and her Colonies. In 1942 practically the whole of the French Fleet was scuttled at Toulon to avoid falling into enemy hands. Thus in one blow the French Navy had reached another low point in its history. In a few years time, however, it had regained its strength.

ANTI-SUBMARINE (T 56) TYPE DESTROYER
LA GALISSONNIERE

Fitted with extensive sonar and anti-submarine apparatus, including variable-depth sonar and homing torpedoes, this vessel also has well-developed anti-aircraft and radar equipment. A platform for landing anti-submarine helicopters and a hangar have been fitted off.

NAVAL POLICY

French overall defence policy is based on the three aims of deterrence, intervention and defence; the naval policy fits in accordingly.

By 1972 the weight of the French deterrent forces will have moved from Mach 2 atomic bombers and surface-to-surface ballistic missiles to nuclear submarines armed with nuclear ballistic missiles. This choice has been dictated by geographical considerations and the omnipotence of this discreet weapon system. Nevertheless the Navy should be able to continue to play its classical role which ranges from peace-time flag-showing missions to conventional operations at sea. The flexibility of a navy is also of great value in exerting the exact amount of "diplomatic" pressure wished by a government. In the defensive role the Navy could provide for coastal defence (France has nearly 1850 miles of coastline), defence of the French merchant fleet (France possesses 300 ships worth S$2 billion constantly at sea) and the protection of overseas trade (which amounts to some 100 million tons of imports per annum, of which some 60 per cent consists of fuel oil and other petroleum products).

The naval defence task has many aspects including small counter-actions, minelaying, air defence, convoy escort and port defence.

THE MEANS

The means are well-matched to achieve these roles. Twenty years after the end of World War II the French Navy has attained a personnel strength of 72,000 officers and men plus 40,000 civilians and a warship tonnage of 350,000. This happy state of affairs is due to an annual budget of S$640 million (i.e. 16 per cent of the annual defence vote). Almost half of this...
VICTOR SCHOELCHER
One of the nine dual-purpose frigates of the “Commandant Reviere” class. Vessels of this class have all been completed during the last five years. Displacing 2,200 tons full load, they are 334 feet in overall length, are fitted with three 3.9 inch single automatic anti-aircraft guns and two 30 mm. anti-aircraft guns. Provision has been made to land a helicopter aft. Vessels of this class are equipped with six 21-inch ASM torpedo tubes. Anti-submarine weapons comprise one 12-inch quadruple ASM and anti-shore mortar. A commando unit of 80 can be accommodated.

amount is spent on capital expenditure. The current five year Arma-

tment Plan (1965-1970) has more than $1 billion allocated to it for the new construction programme alone.

THE FLEET
The attached appendix shows the current French naval strength and construction programme. The main characteristic is the versatility of almost all ships for different types of missions. It can be noticed that the complexity and cost of each new ship, which become greater and greater for the same mission, follow the pattern of all other Navies indulging in the construction of warships for modern warfare. It takes about nine to ten years to design, build and test a new type of warship. One should not overlook the logistics fleet which has become relatively important because of the reduction in French overseas bases and the necessity for replenishment at sea of nuclear forces. As in the time of sail, the main limiting factor in nuclear operations at sea will be the temper of the crew.

NAVAL BASES
However land bases are necessary for the maintenance of ships of the French Fleet.

Four main naval bases are located on the French mainland and these consist of:
(a) Cherbourg — Submarine and minesweeper construction and repair facilities.
(b) Brest — Large dockyard and repair facilities. Brest is the operational base for ships of the Atlantic Fleet.
(c) Toulon — Operational base for ships of the French Mediterranean Fleet.
(d) Lorient — Submarine base.

Secondary naval bases are located at Dakar, Fort de France, Diego Suarez, Papeete, Mers El-Kebir, Nouméa and Djibouti; the latter two have no facilities.

The main Fleet Air Arm bases are located at:
(a) Hyères Le Palyvestre — Mediterranean Squadrons
(b) Nimes — Maritime aircraft and schools.

February-March-April, 1967

(c) Lann Bihoué — Maritime aircraft.
(d) Landivisiau — Atlantic squadrons.

France is divided into three naval command areas as follows:
(a) First Naval Command Area at Cherbourg.
(b) Second Naval Command Area at Brest.
(c) Third Naval Command Area at Toulon.

Each is under the command of an Admiral (Prefet Maritime). Other naval command exist overseas.

ORGANISATION OF THE FORCES
Besides the small forces allocated to each territorial command the French Fleet is organised as follows:

(a) Mediterranean Escadre
One aircraft carrier
Two destroyer squadrons (eight in each)
Marine commandos

(b) Atlantic Escadre
Two aircraft carriers
Twenty destroyers and destroyer escorts

(c) Submarine Force
One submarine squadron in the Atlantic
One submarine squadron in the Mediterranean

(d) Amphibious Intervention Force at Lorient

(e) Pacific Force
Some sloops and patrol boats

Any operational force may be composed of ships from all five commands. For example the command cruiser "COLBERT" one aircraft carrier, nine destroyers, six submarines and one logistics ship operated in the Eastern Mediterranean from 15th November to 20th December, 1966. This illustrates the ever close French interest in the Mediterranean Sea.

In summary the French Navy at the present time comprises a balanced force which is entirely suited to the defence of the French coast and, indeed, of France's world-wide interests. The original design of many of its ships and equipment and the flexible organisation of its naval forces enable the French Navy to undertake the defensive roll with great effectiveness.

(c) Lann Bihoué — Maritime aircraft.
(d) Landivisiau — Atlantic squadrons.

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APPENDIX
Current Strength and New Construction

The actual strength of the French Navy exceeds 350,000 tons. Planned new construction involves another 60,000 tons.

<table>
<thead>
<tr>
<th>Type</th>
<th>No.</th>
<th>Built Year</th>
<th>Displacement in tons</th>
<th>NEW CONSTRUCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aircraft Carrier</td>
<td>1</td>
<td>1946</td>
<td>20000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1961-1963</td>
<td>32000 each</td>
<td></td>
</tr>
<tr>
<td>Helicopter Carrier</td>
<td>1</td>
<td>1964</td>
<td>12300</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1959</td>
<td>12000 each</td>
<td></td>
</tr>
<tr>
<td>Cruisers</td>
<td>4</td>
<td>1956-1962</td>
<td>3700 each</td>
<td></td>
</tr>
<tr>
<td>Destroyers</td>
<td></td>
<td></td>
<td></td>
<td>1 x 2200 tons 1967-1974</td>
</tr>
<tr>
<td>Sloops/DE</td>
<td>8</td>
<td>1962-1966</td>
<td>2200 each</td>
<td></td>
</tr>
<tr>
<td>Frigates</td>
<td>18</td>
<td>1955-1960</td>
<td>1700 each</td>
<td></td>
</tr>
<tr>
<td>Submarines Nuclear/Missile</td>
<td>1</td>
<td></td>
<td>3000</td>
<td>3 x 9000 tons 1970-1974</td>
</tr>
<tr>
<td>Conventional</td>
<td>6</td>
<td>1957-1960</td>
<td>1800 each</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>1959-1964</td>
<td>1200 each</td>
<td>2 x 1000 tons 1969</td>
</tr>
<tr>
<td>Patrol Craft</td>
<td>1</td>
<td>1958-1960</td>
<td>650 each</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>1954-1959</td>
<td>400 each</td>
<td>1 x 400 tons 1972</td>
</tr>
<tr>
<td>Minesweepers</td>
<td>99</td>
<td>1952-1956</td>
<td>22000 total</td>
<td>8 x 7000 tons 1969</td>
</tr>
<tr>
<td>Lading Ships</td>
<td>23</td>
<td></td>
<td>25000 total</td>
<td>2 x 6000 tons 1969</td>
</tr>
<tr>
<td>Logistic Ships</td>
<td>8</td>
<td>1956-1965</td>
<td>83000 total</td>
<td>31,000 tons Total</td>
</tr>
<tr>
<td>Hydrographic Ships</td>
<td>4</td>
<td>1956-1965</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

APPENDIX
Fleet Air Arm

<table>
<thead>
<tr>
<th>Squadrons</th>
<th>Type</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Crusader (FBE)</td>
<td>USA SW and Matra 530</td>
</tr>
<tr>
<td>3</td>
<td>Etendard F. Bomber</td>
<td>Dassault SW and Nord AS 30</td>
</tr>
<tr>
<td>1</td>
<td>Etendard Rec.</td>
<td>Dassault SW and Nord AS 30</td>
</tr>
<tr>
<td>3</td>
<td>Alize ASM</td>
<td>Breguet SA 3210 from 1967</td>
</tr>
<tr>
<td>2</td>
<td>HSS 1 ASM</td>
<td>USA</td>
</tr>
<tr>
<td>1</td>
<td>HSS 1 Assault</td>
<td>USA</td>
</tr>
<tr>
<td>5</td>
<td>Neptune P2V7</td>
<td>maritime Breguet Atlantic from 1966</td>
</tr>
<tr>
<td>12 (Flights)</td>
<td>Fouga and Alouette</td>
<td>Potez—Sud Aviation Training and Transport</td>
</tr>
</tbody>
</table>

Missiles

<table>
<thead>
<tr>
<th>Function</th>
<th>Type</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface/Air</td>
<td>Mururka</td>
<td>Tartar United States</td>
</tr>
<tr>
<td>Surface/ASM</td>
<td>Malafon</td>
<td>SS11/SS12 Latecoere</td>
</tr>
<tr>
<td>Air/Ground</td>
<td>AS30</td>
<td>Matra 530 Nord Aviation</td>
</tr>
<tr>
<td>Air/Air</td>
<td>Matra 530</td>
<td>USA</td>
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H.M.A.S. DELORaine SINKS FIRST
JAPANESE SUBMARINE

By JACK MILLAR

Twenty-five years ago the Japanese were sweeping all before them in their swift drives southwards, and playing a leading part was the Nip Navy with its vastly superior forces. Against such numerical strength at that time the Allied Navies could do no more than harass them with hit and run raids. One of the most active areas of the Jap Navy early in the war was the Southwest Pacific, ready to pounce on any unsuspecting merchantman or warship.

Included in their underwater fleet were four mine-laying submarines, I's 121 to 124, and these craft were among the hardest worked of all. Built about 1925-7, these 1140-ton submarines were considered an obsolete type of vessel by the time war commenced. Nevertheless, they carried and laid many lethal mines which sank or caused damage to many of our ships. Armed with one 15-cm. gun, they had a top speed surface speed of 141 knots and a range of 10,500 miles at an economical speed of 8 knots. Their operational time range was about 20 days. With a safety diving depth of only 195 feet, they were considerably hampered in this respect as compared with later subs, which could go down to 325 feet with safety. In an emergency many went below this depth without damage.

Carrying 12 torpedoes, I's 121 to 124 were also equipped for laying 42 mines, which was an extremely hazardous task. To the Japanese they were regarded as cranky craft to handle and manoeuvre owing to their small hydroplanes and radius of action. Throughout the service they were known as the "Dreaded Submarines".

If the least bit lighter they tended to surface, and if over-heavy would sink deeper. The 40-ton mines had to be moved one by one to the tail of the subs, while at the same time water was pumped to the fore end to prevent tail-heaviness — a really dangerous task.

When a mine was dropped the same weight of water had to be let in, otherwise the stern would break surface. If too much water, the boat would sink. Usually the mines were laid with a two-knot tide running at the entrance to bays, making it extremely difficult to keep the subs level at the prescribed depth, and at the same time lay the mines in the correct positions. This called for the utmost skill on the part of the captain, navigator and training operators to avoid any dangerous errors. Is it any wonder then that they were feared by their crews? During 1940 they were equipped with petrol tanks on the upper deck for refuelling aircraft, adding another role to their already arduous concept.

On December 1st, 1941, the four subs were at Hainan Island when orders were received to take up their assigned war positions. At the time of the treacherous attack on Pearl Harbour, I's 121 and 122 were laying mines in the Singapore shipping channel, and I's 123 and 124, which had only arrived the previous day, were laying mines in the Singapore pine waters.

In Darwin were the corvettes H.M.A.S.'s Katoomba and Lithgow, which had only arrived the previous day, escorting a convoy from Thursday Island. Another corvette, H.M.A.S. Deloraine, based on Darwin, was already at sea sweeping the entrances to allied harbours.

On receipt of the enemy submarine report from U.S.S. Edsall, the Naval Officer in Charge at Darwin, Captain Thomas, immediately ordered Deloraine, Katoom- ba and Lithgow to the attack. Deloraine was first on the scene at 10.35 p.m., where I 124 showed she was very much alive by firing a drastic evasive alteration of course, allowing the torpedo to pass harmlessly by. The pinging echo of Deloraine's sonar then made contact, and it was loud and clear, audible to all on the bridge.

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Suddenly, when dead on target, the firing bell was pressed and a moment later the depth charges were down. Behind Deloraine the whole surface of the sea jumped and quivered as the pattern exploded. A huge column of water shot high into the air, and it seemed to those on board that no sub could possibly live through such a barrage, but when it subsided the surface remained empty. Wheeling into the fray once more, Deloraine carried out a series of such attacks until at last success came her way. Oil and air bubbles were observed on the surface. Was she damaged, or had the wily Jap. commander merely shot oil to the surface to give the impression of a kill? Despite the crankiness and difficult manoeuvrability of I 124, there was to be no surrender. In true Japanese style it was determined, if need be, to die fighting for the Emperor. By 3 p.m. Deloraine had expended her outfit of twenty depth charges, and she remained on the scene until Lithgow arrived at 4.20 p.m. and Katoomba at 6 p.m. These two ships then carried out a series of attacks, and Captain Cousin, in Katoomba, who had taken over as Senior Officer, sent Deloraine racing in towards Darwin to get more depth charges from the anti-submarine patrol vessel H.M.A.S. Vigilant. Patience is a good attribute when hunting submarines. A quick kill is not always possible, and in the Atlantic it was sometimes necessary to stalk a Nazi U-boat for days before the final blow. Nor were they always successful, as the cunning sub. commanders, using all manner of ruses, occasionally managed to outwit their hunters and creep away to safety in the depths below.

As soon as Deloraine rejoined the other two ships with another 15 depth charges at 21st January, her asdic got a firm contact, and she at once attacked. At 3.56 a.m., under the directions of Katoomba, Deloraine carried out a series of concentrated attacks until all her depth charges were used. If I 124 had not already been dealt her death blow, Deloraine's attacks certainly wrote finis to her career. Following them, large quantities of fuel oil rose to the surface from the doomed submarine — so much, that she could not possibly have survived such a withering bombardment of depth charges.

At the time, it was thought in Darwin that three submarines had been destroyed — two by Deloraine and one by Katoomba, but only one, the I 124, was ever located. I 124 lies there to this day, the skeletons of her crew no doubt still entombed within her hull. In the overall assessment credit was given for her destruction to the three Australian corvettes — Deloraine, Katoomba and Lithgow — and the U.S.S. Edsall.

Very little publicity has been given to this incident in the war against the Japanese, and it is fitting, twenty-five years later, to recall the gallant deeds of an Australian warship named after the picturesque and thriving northern Tasmania township of Deloraine. Although essentially a team effort, there is little doubt that H.M.A.S. Deloraine played a major part in sinking I 124, first unit of the Japanese Navy to fall victim to the Royal Australian Navy.
Spa~t get Helicopter Carrier from the U.S.

It will be recalled that last year the Spanish Navy had every hope of acquiring from the United States a surplus carrier for use as an amphibious assault ship and helicopter transport. The ship selected was the U.S.S. "Thetis Bay", later classified as an amphibious assault ship with the designation CVE 96, and put into service as the first Assault Helicopter Aircraft Carrier (CVHA 1) and before that as the Escort Aircraft Carrier (CVE 90). On the face of it this was a sound choice, for if Spain required anything like an aircraft carrier at all (and there were those who could not see her necessity as regards this category) "Thetis Bay" was ideal in that, although she had been designed from the start as an aircraft carrier, she had subsequently been specially converted to an amphibious transport and therefore was good for almost anything that the Spanish Navy had in mind and had by large and fairly economical to run both as regards maintenance and complement.

The House Armed Services Committee of Congress considered the transfer and in August 1965 the United States officially approved the loan of "Thetis Bay" to Spain for a period of five years. Students of naval affairs looked forward with interest to see what Spain would do with such a ship, for she was the sole survivor of that numerically large class of war emergency ships of the "Anzio" class all specially designed as escort carriers and colloquially known as "Woolworths Flat-Tops" or "Jets" of which some 50 were built.

Like her sisters, "Thetis Bay" was built to fill in the gap at a time. Laid down on December 22, 1942, she was launched on March 16, 1944, and completed by Henry J. Kaiser of Vancouver, Wash., on April 21, 1944; not bad going for an aircraft carrier with a full load displacement of nearly 11,000 tons and an overall length of 512 ft. designed to carry 30 aircraft. On June 20, 1955, she began a 13-month conversion at San Francisco Naval Shipyard and emerged as an amphibious assault ship with her lift aft open to the quarter deck.

But with the completion of new amphibious assault ships specially designed as such from the start, the "Thetis Bay" became surplus to naval requirements and she was stricken from the Navy List on 1st March, 1964. That she was capable of handling further service was proved by the fact that 1 was planned to transfer her to Spain 18 months later. Her brief details and history are given here because it is still a matter of speculation what Spain wanted to do with the United States Navy's first experiment to produce an amphibious transport. The "Thetis Bay" was designed for a Marine Corps battalion of 1,000 men and had accommodation for 1,600 troops (her official complement was 40 officers and 500 men of the ship's company plus 350 troops). She could carry 15 to 20 helicopters, was armed with 16 40 mm. anti-aircraft guns and 60 20 mm. AA guns, and was powered by two General Electric geared turbines giving a speed of 191 knots.

Now, more than a year after the loan of "Thetis Bay" was approved, it has been announced that the transfer is not to be. However, if the original intention, if not the original ship, remains. Another former aircraft carrier, the U.S.S. "Cabot", has been chosen in her stead, and again the question is being asked why Spain needs a ship of this category, since "Cabot" is even bigger than "Thetis Bay" and more than a year older.

"Cabot" (ex-Wilmington) was laid down as a large light-cruiser of the "Cleveland" class, but was completed as an aircraft carrier. With a full load displacement of 15,800 tons, she has an overall length of 623 ft., a maximum beam of 109 ft. and an extreme width of 41 ft. Four Babcock & Wilcox boilers and General Electric geared turbines aggregating 160,000 shaft horsepower and turning four screws, give her a speed of 32 knots. She originally carried over 40 aircraft. Built by the New York Shipbuilding Corporation she was laid down on August 16, 1942, launched on April 4, 1943 and completed on July 24, 1943; also not going for an aircraft carrier of the size and complexity, even under the impetus of war urgency. "Cabot" was converted to A.S.W., i.e. modified to specialise in anti-submarine warfare, and classed as a "Hunter-Killer Carrier" with strengthened flight and hangar decks, large port-side catapult, revised magazine arrangements, new electronic gear, corrected stability to counter added top weight, and a maximum of 24 aircraft. She was practically modernised to a new type. Since conversion she has had only two or her original four funnels. She was originally designed to include four 5-inch guns in her armament but eventually carried 40 mm. anti-aircraft guns and forty 20 mm. AA guns, reduced still further subsequently. Her original scheme of complement was also reduced considerably on conversion, from the designed 1,109 to 1,183 in peacetime and 1,400 for wartime. (Photograph next page.)

On May 15, 1959, "Cabot" was reclassified from an aircraft carrier (CVL 28) to an auxiliary aircraft transport (AVT 3) and for some years recently she has been decommissioned. But now approval for her transfer to Spain has been given by Congress and she is being re-activated and modernised at Philadelphia Naval Shipyard for employment as a helicopter carrier. Her completion as such is scheduled for not later than May 1967.

Which still leaves several questions. Why was the transfer of "Thetis Bay" rescinded? Why was an even bigger ship acquired? How will she be employed? Where will she be used? Can she be modernised? And otherwise the rest of the fleet comprises vessels of destroyers and destroyers.
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NEW ENSIGN FOR R.A.N.

From 1st March, 1967, the new Ensign for the Royal Australian Navy was flown in all H.M.A. Ships and Establishments.

The new ensign conforms to two important principles — it is a recognisably Australian flag which fits neatly into the general group of Australian flags, such as the National Flag and the Australian Red Ensign.

It is an ensign which embodies the main features of the traditional British White Ensign — the Union Flag in the upper corner and the white background.

In place of the Red St. George’s Cross, which was added to distinguish the Royal Navy’s Ensign as an English Flag, the Australian Ensign carries the Australian stars to distinguish it as an Australian Flag.

HISTORICAL BACKGROUND ON THE WHITE ENSIGN

In 1625 it was considered necessary to distinguish for tactical reasons the centre, van and rear squadrons of English battle fleets. Accordingly, the ships serving in each squadron flew an ensign either red white or blue. The ensigns were all similar in basic design, having a plain field with a small red St. George’s Cross in the top corner. In 1702 it was found that the white ensign of the three was apt to be confused with the French National Colours, which at that time also had a white field, and with the Flag of Dunkirk, which in fact was identical with the White Ensign. Accordingly, a large red St. George’s Cross was added to the White Ensign to remove the source of confusion. As the other countries of the British Isles came into union with England, so their crosses were added to the small St. George’s Cross until the Union Flag in its present form evolved. These modifications were incorporated in the Navy’s ensigns and so these flags now bear the Union Flag in the upper corner.

As with squadrons, so with Admirals, who were appointed Rear Admiral, Vice Admiral or Admiral of the Red, or of the White, or of the Blue. The individual ships of the Admiral’s Squadron or division wore a coloured ensign of the same colour as the Admiral. Ships on independent service wore the red, which was the senior ensign.

In the course of time the need to distinguish the different squadrons for tactical reasons disappeared and the complication of the various units in one fleet wearing different ensigns itself became a hindrance. Moreover the French Revolution brought about a change in that country’s flag — the tricolour — and this was now sometimes confused in the smoke of battle with both the red and blue ensigns. It therefore became the practice for the Commander to order only one ensign to be worn, and the white was normally selected. Thus, at the Battle of the Nile in 1798 the British ships wore White Ensigns, although Sir Horatio Nelson was in fact Rear Admiral of the Blue. At the Battle of Trafalgar Lord Nelson was Vice Admiral of the White and all ships wore the White Ensign even though those in Lord Collingwood’s Squadron would normally have worn the Blue Ensign.

In 1864, just over a century ago, it was decided that three ensigns were unnecessary and the white was selected for the exclusive use of the Royal Navy. The Blue Ensign was allocated for use by Merchant ships commanded by officers of the Naval Reserve, and the Red Ensign for use by other British Merchant ships.

When the Royal Australian Navy was founded in 1909 the question of the selection of the ensign to be flown by Australian ships was raised during the Imperial Defence Conference. The Admiralty view was that Dominion warships should fly the White Ensign, because this “would foster and maintain a feeling of union between the Dominion naval forces and the Royal Navy, and would show that it is desired to offer the new Dominion ships a full share in the heritage of the British Navy”. Australian Ministers considered that Australian ships should fly either the White Ensign defaced with a seven-pointed blue star or the Australian F.I.g. After some months of discussion it was finally agreed that Australian ships would fly the White Ensign at the stern at all times, with the Australian F.I.g. hoisted on the bow in harbour. The new Australian White Ensign preserves two features of the British White Ensign — the Union Flag in the upper corner and the white and the blue background. In place of the St. George’s Cross, which was added in 1770 to distinguish it as an English Flag, the blue Australian stars denote an Australian ensign.
**BOOK REVIEWS**

"WEATHER AND CLIMATE"

**AUTHOR:** R. C. Sutcliffe, C.B., O.B.E., F.R.S.
**PUBLISHER:** Weidenfeld and Nicolson. 193 pages. Price $5.90.
**REVIEW BY:** M.E.T.

This timely publication, in the "Advancement of Science" Series, coming as it does, at a time when an appreciation of the various factors affecting our weather are more widely known than heretofore, due in part of course, to the contributions made by the weather satellites, adds considerably to the knowledge of both expert and tiro. Written in a most interesting manner, and completely intelligible to the average reader, the more-not-so-readily understood aspects of factors involved, i.e. Vertical Convection, Radiation and Energy exchanges etc. are here presented in a readily understandable manner.

A special mention should be made of the chapter on synoptic meteorology which shows the enormous amount of attention currently obtaining in this field with some interesting suggestions for future expansion of this vital work. The charts accompanying this chapter add a good deal to the explanatory text.

In his chapter on the control of weather and climate Professor Sutcliffe effectually deals with the unfounded suspicion directed at the interference with weather by nuclear explosions and the like-while at the same time removing any grounds for complacency. Altogether a worthwhile contribution to our knowledge of a most contentious and little understood subject.

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"Matthew Flinders 1774-1814"

**AUTHOR:** James D. Mack.

As small schoolchildren we acquire, towards famous people, attitudes that it is hard to abandon. At primary school, I was taught about Flinders, Bass and the Tom Thumb, Aborigines being shaved and this trivial episode somehow leading to the circumnavigation of Australia. I felt then that it was part of the hotch-potch of Australian history, all deadly dull compared with English history.

Years later, when I saw the Admiralty manuals on hydrographic surveying and on navigation, I read that Flinders, in sailing round the Australian coast, had carried out the greatest single operation in the history of hydrographic surveying. Then I discovered that Flinders was not only part of dull Australian history but was one of the great men in the history of the Royal Navy. Australian history of course, should not really be so dull. In the end many of us learn this about Australian history; but it often takes long to learn, and, while we are learning, many of the great men who have been here fall into obscurity.

Mr. J. D. Mack, an American librarian has, in this book, produced a vivid account of Matthew Flinders as one of the great men of history. He presents the historical evidence so carefully that the story seems to tell itself. He does, however, indicate the importance of Flinders in history. As he gives a useful bibliography and stresses less obvious facts, this book is a very useful companion to Flinders's own writings. After reading Mr. Mack's account, we can remember Flinders's problems and hardships, the wife whom he left behind, the brother who was not a good officer, or the death of the cat who was taken prisoner with him at Mauritius.

Finally, we can be led to read further.
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"DOWN TO THE SEA"
A Century of Oceanography
AUTHOR: J. R. Dean.
PUBLISHER: Brown, Son and Ferguson, Ltd., Glasgow. 1966
REVIEW BY: William Charles Colvin, D.Sc.

"They that go down to the sea in ships, that do business in great
wastes; These see the works of the
Lord, and his wonders in the deep."
PSALM 107, verses 23 and 24.

This useful book fulfills an urgent need for reference works written in the English language, on the early development of oceanography and traces its rise to a great all-embracing science of the sea.

Throughout this work, Mr. Dean stresses the affinity between the two sciences of meteorology and oceanography, the interaction of the atmosphere and the hydrosphere, and the advantages to be gained by following a similar course of study in the two disciplines — suitably demonstrated by the knowledge that in the ocean we may look for a pattern of travelling disturbances rather like that which is found in the atmosphere.

To any reader the book is most enlightening and covers the beginnings of marine sciences; the great work of Prince Albert I of Monaco — his voyages, equipment, findings and subsequent applications and developments, many of which were not equaled for over fifty years, marine institutions; world maps and charts; the use of aircraft in oceanography; the deep submersibles — Bathyscaphe and Mesoscaph; and the various resources of the sea as regards oceanography and the population explosion, fertilizers, offshore oil exploration and production, atomic energy and underwater medicine.

The book contains some excellent photographic plates and also includes a comprehensive Bibliography on the Bathyscaphe and other submersibles.

"Down to the Sea" — a book readily absorbed by the professional and enjoyed with interest by the amateur, is seldom boring. I should have no hesitation in recommending this book.

Contributions Invited
The editor invites persons to submit articles and photographs for inclusion in the magazine, but regrets that no payment can be made for contributions submitted. Contributions should be addressed: The Editor, "The Navy", Box C178, Clarence Street Post Office, Sydney, N.S.W., Australia.

The editor does not hold himself responsible for manuscripts, though every effort will be made to return those with which a stamped and addressed envelope is enclosed.

Season's greetings to all Navy Personnel from ...
February-March-April, 1967

Nautical Notes from All Compass Points

BY SONAR

CANADA
ONE UNIFORM FOR ALL SERVICES

Canada's much-discussed unified uniform for the new Armed Forces is ready to be presented to the Defence Council for final approval. However, it is not yet expected the uniform will be revealed to the public until after the unification bill has passed Parliament and become law.

The sight of the new uniform, it is thought, would just bolster the opposition of the military traditionists to unification.

When it finally is revealed, Canadians will see an identical uniform for officers and men. The only way to tell a man's rank will be by his badges. The colour, although still not officially agreed on, is almost certainly going to be a "rich" dark green.

"This is a deliberate effort on our part to emphasise the new sort of military establishment," a National Defence official in Ottawa said.

"In a highly technical force it is ridiculous to maintain a class distinction in the quality of uniform between officers and the rank and file."

"We are sure this will be popular with the men, and the officers will gain in prestige.

Instead of buying their uniforms through military tailors at considerable expense, officers will be able to buy from military stores at perhaps $45 to $50.

Material will be crease-resistant, the buttons do not need polishing. Heavyweight and lightweight uniforms will look identical.

It means a man working in a hot office can wear his lightweight uniform in winter, and the man working outside in unseasonably cold summer weather can wear his heavy uniform without breaking regulations, as is the case now.

Only the hat band will reveal the branch of the Service in which a man is working. Dark blue, light blue and khaki will now be worn by naval, air or ground units, with other colours designating specialised forces such as the medical units.

Badges of rank will be Army stripes for non-commissioned officers and Navy-Air Force sleeve rings for the officers, although the titles will be Army. The rank badges will be gold or perhaps a rust-brown.

All Forces will wear red maple leaf shoulder flashes and some form of command badge over their right breast pockets.

Plans call for producing 400 of the new Canadian uniforms for user-trials this year. If the bill passes Parliament relatively quickly they could be seen in public by March or April.

When the final specifications have been drawn up, Department of Defence Production will call for tenders from textile companies, button and patch and hat-makers and clothing manufacturers to produce 200,000 or so uniforms over a four-year period.

ORDER FOR DUTCH PROPELLERS

Lips N.V. of Drunen (Holland) has received an order from the United Aircraft Co. of Canada Ltd. for 200,000 Dutch propellers. The screws will form part of complete propelling machinery installations to be delivered to the Royal Canadian Navy by the United Aircraft Company.

ST. LAURENT-CLASS CONVERSION

The seventh and last of the ST. LAURENT class has just completed conversion from a Destroyer Escort to a Helicopter Destroyer (Anti-Submarine Vessel). The conversion consisted of fitting the ships with a hangar and landing platform for heavy all-weather operations, installation of Variable-Depth Sonar and other improvements in the ships' anti-submarine capability.

PEOPLE'S REPUBLIC OF CHINA
A NAVY BUILD-UP IN RED CHINA

Communist China wants a first-rate navy. Modern destroyers, destroyer escorts, submarines and other craft are being built in Shanghai and Canton shipyards to replace the junks and superannuated Soviet vessels that now patrol Chinese shores. "A fleet will reflect China's real strength," one Western expert explains. "It would have been impressive, for example, if China could have sent a couple of destroyers with a transport ship to rescue Chinese being persecuted during the recent anti-Communist take-over in Indonesia."
DENMARK
NEW FAST CODING FRIGATE

It is not only the major naval powers who are producing warships with novel weapons or propelling machinery. The new Danish fast frigate PEDER SKRAM (see photograph on page 11) is now being fitted out with her final equipment. With a standard displacement of about 2,200 tons and a conventional armament of four 5.1-inch guns and four 40mm. anti-aircraft guns, she looks very much like a normal destroyer.

Her novel feature is that she has a combined diesel and gas turbine main propulsion plant. She has two diesels of 4,800 brake horsepower and two gas turbines aggregating 37,000 horsepower, giving a speed of 28 knots. The only other combined diesel and gas turbine ships in the world are the four fast frigates of the Kole class in the Federal German Navy and the HAMILTON, launched for the United States Coast Guard last December and now being completed.

PEDER SKRAM has a sister ship, HERLUF TROLLE, being completed. They were originally to have been designated destroyer escorts (DE) but are now known as fast frigates (FF). They are the largest and most powerful ships in the Danish Navy.

ITALY
OCEANGOING SUBMARINE SQUADRON

Italy has just launched two United States fleet submarines of the BALAO class. They are the BESUGO, renamed FRANCESCO MOROSINI and CAPTAINA, renamed ALFREDO CAPUTLINI. Of 2,425 tons submerged displacement, with an armament of ten 21-inch torpedo tubes and a speed of 20 knots on the surface and ten knots submerged, they will make a homogeneous squadron with EVANGELISTA TORRICELLI, formerly LIZARDFISH, acquired from the United States in 1960, and also of the BALAO class, and LEONARDO DA VINCI, ex-U.S.S. DACE, and ENRICO TAZZOLI (ex-U.S.S. BARB), both very similar ships of the GATO class transferred from the United States Navy in 1934 and 1935.

Hitherto Italy has had to gain operational experience partly with former U.S. submarines and partly with much smaller boats resurfaced from Italy’s wartime flotillas, but now the latter are gradually being withdrawn from service. GIADA was removed from the effective list in 1965 and VORCITE is due to be stricken from the strength this year, so it is only a matter of time before the remaining Italian-built boat, PIETRO CALVI, is taken out of active service.

Italy is building four small submarines of the hunter-killer type, but they have been a long time in the pipe-line, their design having been recapitulated several times.

JAPAN
CONTAINER CARRIER

The Government Atomic Energy Commission has announced its intention to build a 30-foot container carrier, to be Japan’s second nuclear powered ship.

BOEING VERTOL HELICOPTER

The Kawasaki-built Boeing Vertol 107 helicopter is currently being considered under Japan’s 3rd Defence Programme for supply to all three services, the variant for each service differing in equipment and fuel tankage. In JASDF service the KV-107 will be employed for the air-sea rescue task, and will have an endurance of seven hours; in JMSDF service it will fulfil the minesweeping role with an endurance of four hours, and in JODSF service it will be employed in the transport of cargo transport role and will have an endurance of three hours.

NATO
ANTI-SUBMARINE EXERCISE

Londonderry was the scene for a NATO exercise at the end of September and beginning of October 1966. Ships and aircraft from Canada, France, Germany, the Netherlands, Norway, Portugal and the United Kingdom assembled there on the 19th September for a week’s schooling and weapon training.

The actual exercise took place between 1st and 7th October, and was conducted by the Joint Anti-Submarine School. Among the British forces taking part were the frigates TIGER, the frigates NAIAD, RUSSELL and MURRAY, the helicopter support ship, LOFOTEN, fast patrol boats, supply ships and the submarines FINWHALE, THERMOPYLAE and WALRUS.

Aircraft taking part included R.A.F. Shackletons of No. 203 Squadron from Ballykelly and R.N. Buccaneers, Sea Vixens, Gannets and helicopters.

NETHERLANDS
NUCLEAR DEFENCE

The Netherlands has been elected a member of the group for nuclear weapons planning of the recently instituted NATO committee for nuclear defence affairs. The term of election is from January, 1967, until June 30, 1968.

DESIGN FOR EXPORT

It is both a tribute to British workmanship and to the success of the class in service that the Royal Netherlands Navy is building
ing a class of six frigates of the LEANDER type. Known as the VAN SPEIJK class, they have been given the names EVERTSEN, VAN AMSTEL, VAN DER HEIDE, VAN GALEN, VAN NES and VAN SPEIJK.

The name ship was laid down on October 1, 1943, launched on March 5, 1945, and has just been completed.

The ships are being built as replacements for the six frigates (destroyer escorts) of the VAN AMSTEL class acquired from the United States in 1950-51 under the Mutual Defence Assistance Program and which have been completed in 1943-44, are now about 23 years old. They will be returned to the U.S.A., successively as the new ships come into service.

The VAN SPEIJK class are practically homogeneous with the BRITISH LEANDER class, but they have minor modifications in accordance with the specific requirements of the Royal Netherlands Navy. As far as possible, equipment of Netherlands manufacture is being included. The plans for the ships, which have already been completed in some cases, are now being updated on the notice board so that it will be possible to tell when the ships will be ready for delivery.

NEW ZEALAND

BATTLE FLAG

The battle flag of the German pocket battleship Admiral Graf Spee, which is known as THE NAVY in Wellington until earlier this month.

NOYAR

FRIGATE DELIVERED

Marinesenes Hoovers, Hertogenbosch, the former Royal Norwegian Naval Dockyard, has delivered K.N.M. OSLO, first of five single-screw general-purpose frigates based on the U.S.Navy's DEALEY class. These are of 1450 tons displacement, 157 ft. in length and 36 ft. 8 in. beam, and carry four 3-in. guns in twin mountings and the Norwegian-designed Terne anti-submarine rocket. The machinery consists of a Stal-Laval PN20 (Navy type) set of two-casing turbo generators of 6,000 shp, and for service in arctic waters, with a complement of 76 men, was launched in 1939.

SWEDE

NORWAY

OF THE RIVER PLATE.

The battleflag of the German pocket battleship Admiral Graf Spee has been given the names EVERTSEN, VAN SPEIJK, etc., and are now part of the Royal Netherlands Navy. As far as possible, equipment of Netherlands manufacture is being included in the construction, but it was not handed over to the Navy Office in Wellington until earlier this month.

SEATO

NAVAL CONTROL OF SHIPPING EXERCISE

Key officers and men from six member nations of the South-East Asian Treaty Organisation began a major two-week shipping control exercise on Monday, 13th February, 1967.

The exercise, nicknamed "Sea Rose", involved over 2000 simulated ships and 99 naval command communications, in shipping control centres in Thailand, the Philippines, New Zealand, Australia, United Kingdom and the United States.

A combined directing staff of Navy officers from the U.K. and the U.S. co-sponsoring nations, executed the detailed plans from the Pearl Harbour headquarters of the Pacific Fleet, U.S. Navy, and Admiral John L. Chew.

Command decisions influencing the movement of shipping under naval control were tested under realistic conditions. However, actual ship movements were not affected.

New Surveying Ships

An order for four new surveying ships for the Royal Navy has been placed with Brooke Marine Ltd. of Lowestoft. These new coastal survey vessels, which have been designed for use in a number of Navies, will be powered by two BS Gnome 1400 gas turbines, and equipped with an "All-weather Carrier Landing System" of the Sikorsky design. The helicopter is scheduled to enter service with the R.N. in early 1969.

United Kingdom Torpedo

Britain is on the brink of an important breakthrough in submarine warfare, according to the defence correspondent of the "Daily Sketch".

This follows a series of trials of a torpedo controlled by a radio link and fired from a submarine. The new device, which has been developed by the Royal Navy, will be able to overcome the main boaters and for service in harbours. Stal-Laval has also supplied the auxiliary turbines for the generators.

Export Order for "TIGERCAT" MISSILE

Short Bros. and Harwood have won their first export order for a surface-to-air T.GERCAT missile -- an order worth almost £1 million. This good news for the War Air Division has been announced as part of a multiple-million pound defence deal between the United Kingdom and Iran. Short Bros. and Harwood have already produced very similar equipment with their SEACAT sea-to-air missile, which is in use in a number of Navies.

Preserving Guns

The last two British 15-in. naval guns in existence, from the R.N battleships RAMILES and RESOLUTION, both 29,150 tons, are to be preserved Southward in front of the Imperial War Museum.

New Surveying Ships

An order for four new surveying ships for the Royal Navy has been placed with Brooke Marine Ltd. of Lowestoft. These new coastal survey vessels, which have been designed for use in a number of Navies, will be powered by two BS Gnome 1400 gas turbines, and equipped with an "All-weather Carrier Landing System" of the Sikorsky design. The helicopter is scheduled to enter service with the R.N. in early 1969.

According to Westland this version "with its heavy load-carrying capabilities, will have the 'potentiality for a wide variety of naval tactical tasks, including, if necessary, the transport of 20 fully equipped troops'. Westland managing director, Lord Winterbottom, added, "in particular, we are keen to design a submarine hunter-killer helicopter in the world with a considerable future export potential to boost the British aircraft industry."

United States of America

All-Weather Carrier Landing System

A series of "hands-off" carrier jet landings, using the new All-Weather Carrier Landing System (ACLS), were made on the USN carrier AMERICA in late November.

THE NAVY

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plant to drive her at 27 knots. Six additional ships of this type are
now under construction, all being built by the Tacoma Boat-building
Company at Tacoma, Washington.

SWITCHING OF FUNDS
U.S. Defence Secretary McNamara has been asked to explain the
switching of a reported $US 40,000,000 funds voted for the
U.S.N. Poseidon (Polaris replacement) missile programme to the
purchase of about 15 C-130's for Navy use. The House Armed Ser-
vices Committee wants to know if this will affect adversely the plan
to equip (or re-equip) 13 submarines with the advanced Poseidon, com-
pared with 28 FBM submarines armed with the Polaris A-3 missile. —Poseidon having been proposed as a possible answer to reports that
the U.S.S.R. was establishing an anti-missile-missile system.

U.S.S.R.
SOVIET RED SEA BASE
ALLEGATION

The Soviet Union was building
a naval base with United Arab
Republic help at the Yemini Red
Sea port of Mocha, said Lieut.
Udaii, a Yemini official seeking
political asylum in the British Pro-
tectorate of Aden. He said the
Russians wanted to turn Yemen
into an Eastern military base.

TO SWEET MINES
The West German Navy during
March will begin its most hazardous
assignment since its formation in
1955.

More than 50 minesweepers will
launch Clean Sweep, a seek-and-
destroy operation to clear Ger-
many's North Sea coastal waters
of World War II mines.

Said a naval spokesman: "There
are about 3,000 wrecks in the North
Sea, but nobody knows how many
mines. "All minefields, as such, have
been swept, but mines that have
strayed from their original positions
and others that were dropped from
aircraft are still a menace to ship-
ping in this area."

The West German Navy has been
called in because the mine-free
North Sea shipping routes now in
use are becoming crowded.

The minesweepers will also set
up passages on which there will be
little risk of collisions. These will
lead from the River Elbe, in Ger-
many, to the Humber estuary, in
Britain.

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berra.
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Melville, Darwin.

February-March-April, 1967
THE NAVY
February-March-April, 1967
THE NAVY
The Royal Norwegian Navy

A brief survey specially prepared for "The Navy" by the Information Service of the Norwegian Defence Department

The traditions of the Royal Norwegian Navy date back to the Early Middle Ages with the "LEIDANGEN", which was a system obliging each settlement to mobilise longships, or viking-ships, manned by the local population.

Later we find the strong naval forces of the United Kingdom of Denmark and Norway in the 17th and 18th centuries. This navy was to a large extent manned by Norwegian officers and men.

The separation from Denmark and the establishment of the Union with Sweden in 1814 marks the founding of the Royal Norwegian Navy of today. By 1905, at the dissolution of the Union between Sweden and Norway, the Norwegian Navy had become a significant factor influencing the negotiations between the two countries. Furthermore, it played an active part in keeping Norway neutral during the First World War.

When Norway was attacked by Germany in 1940, coastal batteries, naval ships and aircraft were immediately engaged in resisting the invasion. Most important was the sinking of the German heavy cruiser "BLUCHER" by the Coast Artillery at Oscarsborg in Oslo-fjord. After the fighting in Norway, only a few minor naval vessels managed to escape to the British Isles. However small, this force was nevertheless to become a vital nucleus from which the wartime navy was developed with ships and weapons lent by Great Britain and the United States. Norwegian Naval Forces served with distinction and will be remembered for their participation in campaigns and operations as the Battle of the Atlantic, the Invasion of Normandy, the sinking of the German battleship "SCHRANHORST" and from numerous successful actions on the Norwegian coast.

A NEW NAVY
Since 1945, the Navy has composed destroyers, frigates, submarines, motor torpedo boats, minelayers and minesweepers. A new-construction programme approved by the Norwegian Parliament in 1960 provides for an extension of renewal of the navy and includes the building of:

- 5 frigates
- 2 patrol craft
- 15 submarines
- 20 motor gunboats
- 20 motor torpedo boats.

The programme will be completed in 1968.

In addition, the following ships will remain on the active list:

- 9 minelayers
- 4 minelayers
- and several auxiliary vessels of different types.

The Coast Artillery plays an important part in the defences. Modern coastal batteries are concentrated at the entrances to the main harbours. Most of the ships and forts are continuously manned. The service has a high degree of readiness and plays an important role in the defence of the country.

The main war task is defence against invasion. Of great importance is also the defence of shipping, in particular coastal shipping, which is a vital part of the Norwegian transportation system.

The Navy's predominant task in peace is patrol duties and surveillance of coastal waters. The Navy also protects the fishery border and renders assistance to Norwegian fishing boats overseas.

ORGANISATION
The Commander-in-Chief Royal Norwegian Navy has his Headquarters in Oslo. Under his direct command are the naval district commanders, naval logistic commander, commander training coastal fleet and the naval schools.
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RESEARCH SUBMARINES
Details have been received of two new STAR research submarines built and already launched by General Dynamics.

"Star III", the larger of the two, is 25 feet long and can operate at depths of 2,000 feet. Powered by a 7.5 h.p. motor, it has complete manoeuvrability in all directions.

The "Star III" equipment includes a mechanical arm which can pick up round or irregularly shaped objects up to 150 lbs. in weight. This arm can be fitted with various attachments, such as a cable-cutter and a power nut-driver.

Blast-proof flying jackets are used to protect the pilot from blast damage. The jacket is made of a mixture of Terylene and nylon, and is claimed to withstand blasts on ejection from an aircraft flying at more than 700 m.p.h.

The Ministry of Aviation has recently concluded tests on the jacket, and these are understood to have been satisfactory.

The Frankenstein Group's new blast-proof flying jacket is made of a mixture of Terylene and nylon, and is claimed to withstand blasts on ejection from an aircraft flying at more than 700 m.p.h. The Ministry of Aviation has recently concluded tests on the jacket, and these are understood to have been satisfactory.

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WHAT'S NEW?

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The hazard of fire aboard oil tankers can be sharply reduced by a new British "Inerting" system which literally chokes off the supply of oxygen necessary for combustion. The Airfilco Gas Inerting System, developed by Airfilco, Ltd., of London, utilises boiler-waste gases which are cleaned and then forced under pressure into the tanker's cargo tanks. Since these waste gases, drawn from the vessel's main flue, are mainly carbon dioxide, nitrogen and water vapour with 3 to 5 per cent oxygen only (12 per cent oxygen is necessary to support combustion), the danger of explosion and fire is eliminated. Empty tanks are kept filled with the same inert gas to keep residual fumes from becoming a possible fire hazard. Cost of a fully automatic system: Approximately $30,000.

PLASTIC ADHESIVE

A new range of plastics, that retain much of their strength up to 650 degrees F, and that, reinforced with glass cloth to form pressed sheets or laminates, are said to be stronger than aluminium, stainless steel and titanium alloys, have been developed by Westinghouse Research Laboratories. Westinghouse reports that these plastics, used as an adhesive, will bond together sheets of titanium and stainless steel with hot strengths of more than 1000 lb.-sq. in., and with good insulating properties.

BLOW UP THE BOAT

A motorboat that can be packed into the trunk of a car, then inflated at the beach or sea, which will accept an outboard motor of up to 3 h.p., has been introduced by A.S. Cameron & Son Ltd. of Cambridge, England.

WHAT'S NEW?

World's First Laser Gyro

Conventional gyro's are affected by problems of friction-caused drift, which in turn affects the accuracy of fire-control and search radar systems. Scientists at Honeywell Controls Ltd. have now developed a laser gyro, capable of sensing motion in all three axes (roll, pitch and yaw), and this is undergoing tests with the U.S. Navy.

Each LASER (Light Amplification by Stimulated Emission of Radiation) ring uses two contra-rotating beams of coherent light to sense angular movement about its axis. Motion in each axis changes the apparent distance each beam must travel, causing a difference in the frequency at which each beam oscillates. This difference is detected by photocells and is counted electronically.

ESCAPE SYSTEM

An underwater escape system for Fairey Gannet pilots has been developed by Westland Aircraft's Surface/Sea Fairey Aviation Division under the MoA contract, and has been successfully live-tested at depths of 100 ft., with the fuselage in a variety of positions, including up-side down. It consists of two self-contained pneumatic circuits, one separating the canopy from the aircraft, and the other freeing the pilot from aircraft equipment and ejecting him at five fps. With a compressed air sensing head, operating under pressure equivalents of 15 ft. of water, ejection is automatic, but the system can also be operated manually with the hood jettison handle.

FOLD-UP BOAT

A collapsible boat of marine plywood that can be assembled in 30 seconds has been announced by Novotechnics, Ltd., of Letchworth, England. Called a Pac-A-Port, the shallow-draft craft is made of solid panels, bonded together with waterproof neoprene hinges. Folded, it forms a rectangle (5 feet long, 3 feet wide and 2 feet 9 inches thick). It becomes a rigid structure when two thwarts have been fitted. The boat has room enough to seat three adults comfortably, and a reinforced upright transom will accommodate a 6 h.p. outboard motor. Price: $275.

WAVE TO ME

A lighthouse that generates its own electric power from the sea and requires little or no servicing has been developed by Japan's Maritime Safety Agency. Unlike other ocean-power sources, the Japanese generator derives its power from air pressure within a 25-foot-long, 8-inch pipe that runs from shore to the sea. Waves, 3 feet high, at an interval of eight seconds, are sufficient to spin an air turbine at the upper end of the pipe. The turbine-run generator provides enough electricity to keep a 100-watt lamp burning constantly.
New Dimensions of Sea Power

By DR. JOHN CRAVEN
Chief Scientist, Special Projects Office, U.S. Department of the Navy

Man is on the threshold of expanding his use of the earth to include the sea bottom and its resources — a domain three times as large as that of all continents of the world.

Responsible for this expansion are the internationalization of the scientific and intellectual communities, the development of a technologically sophisticated society, and the ability to translate scientific development into engineering practice.

The greater focus today on technology of the sea and on hydrodynamics, the basic science of the sea, goes back to the recognition of sea power as the prime determinant in the two world wars.

First the submarine, and then aircraft challenged the free use of the seas. They put the navies of the world on the defensive for the first time.

The submarine threat in World War I was so great that a group of treaties calling for its elimination was proposed. In World War II the immediate impact of air power at Pearl Harbour and the sinking, again by air power, of H.M.S. Renown and H.M.S. Prince of Wales three days later made many despair.

RESEARCH SUBMARINE—This two-man submarine, operated by the Woods Hole Oceanographic Institution for the U.S. Office of Naval Research, is 22 feet (6.6 meters) long, weighs 11 tons, has a molded fiberglass hull, is capable of a continuous speed of four knots and a maximum range of 25 miles (40 kilometers). The sphere that can be released in an emergency and will float to the surface.
over the future use of the sea. Consequently, the major technological effort on the part of the allied navies was directed towards anti-submarine warfare and air defence.

But slowly a balance was achieved so that it was possible to mount the greatest of all sea invasions on Normandy Beach and to support it until victory was achieved in Europe. In the other hemisphere, zpower at Nagasaki and Hiroshima sealed a victory that had already been assured at sea.

The marriage of science and engineering played a vital role in the two major developments in World War II — the nuclear weapon and modern aircraft.

After the war, nuclear power and hydrodynamics opened the way for a revolutionary seacraft — the nuclear submarine. It brought the first of the new dimensions of sea power — time below the surface of the sea, limited only by man's endurance.

The ballistic missile opened the second of the new dimensions of sea power — distance for the projection of power from the sea.

Still another dimension awaits development. This is depth and the capability to operate at or near the bottom of the major oceans of the world.

Developments in materials, control of structure, habitability, power sources and the application of knowledge to new design assure that this capability is only a short distance away.

Pre-eminent among the technical problems involved in deep-ocean capability are those relating to hull structure and hull materials. In the past, hull structure was limited by the manufacturing techniques, and by man's ability to determine stress and buckling patterns. The rib-stiffened cylinder with spherical end caps and the sphere were the predominant shapes.

Recently, in the manufacture of missile motor cases, the U.S. aerospace industry demonstrated the capability of precisely machining large structures of almost arbitrary contour and thickness. Structural
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The nuclear submarine and the ballistic missiles have opened a dimension for sea power that will remain until some new threat to freedom of the seas develops. Scientists have yet to envision what form this threat will take. However, the control or ownership of ocean bottoms is one direction for possible change that will not be neglected.

Surely, the historical, cultural and scientific confluence which has been institutional in evolving man from a river society to an inland sea society; from an inland sea society to an oceanic society; and from an oceanic society to a world society again will appear as man expands his boundaries to space and the undersea — the full utilization of the world around him and beneath him.

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SERVICE IN LINER COMMEMORATES LOSS OF AUSTRALIAN CRUISER IN 1942

The loss of the Australian cruiser H.M.A.S. CANBERRA at Savo Island was commemorated at a
brief service held at sea on board the P & O liner "CANBERRA" early on Saturday, October 30,
1966, as the ship was passing the position where the cruiser was lost during World War II.
In bright sunlight soon after dawn, the 45,000 ton liner reduced speed two miles off Savo Island
while the service took place. It was attended by many hundreds of passengers and crew.

Five wreaths in memory of those lost in the sinking of H.M.A.S.
CANBERRA and three U.S. Navy cruisers — the U.S.S. "VINCEN-
NES", "QUINCY" and "AS-
TORIA" — were cast into the sea.
In one of the darkest episodes of World War II, the four cruisers
were sunk on the nights of August R, 1942 with the loss of over 1,000
men, including 85 from H.M.A.S.
CANBERRA.
The first wreath, from the
H.M.A.S. CANBERRA Survivors
Association, was cast by the Asso-
ciation's President, Mr. H. J. Alford.
Other wreaths from the Australian
Commonwealth Naval Board, the United States Navy, the city of
Canberra (A.C.T.) and P & O were also cast on the sea.
In a brief address at the service, the Captain of "CANBERRA",
Captain G. H. Riddelsdell, R.D.
R.N.R. (Rtd.), said, "We are here to
commemorate the combined Aus-
tralian and United States' action
which took place near this spot 24
years ago. We remember before
God the men of that task group
who were lost and especially those
from our namesake ship H.M.A.S.
CANBERRA."
At the end of the service, the
liner resumed passage, bound for
Far East ports as part of a 28-day
cruise from Australia.

Captain E. G. H. Riddelsdell, R.D., R.N.R. (Rtd.),
captain of the P & O liner "Canberra", casts the United States Navy wreath at the H.M.A.S. CANBERRA
remembrance service held off Savo Island.

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ANALYSIS NEWS

NEW SOUTH WALES DIVISION
Report of Activities and Training Undertaken by the New South Wales Division for the Quarter Ending 31st December, 1966.

No periods of continuous training were carried out afloat or on shore establishments during the quarter under review, but Harbour and Weekend training took place in the following ships and establishments:

H.M.A.S. MELBOURNE — 4th Nov.-4th Nov.

A Brisbane Sea Cadet Unit has been judged the most efficient of the 37 units in Australia.

A letter, paying high tribute to the training ship "Tobruk" was recently published in the "Newcastle Herald" newspaper. Knowing of readers’ interest in the Corps, the letter is reproduced below:

"VIEW FROM THE BRIDGE"

The remembrances of the ports of the world, their hospitality and friendliness, are the chief postime at sea and are of interest in the Corps. The letter is reproduced below:

"Fishing Angel Missions, under its chaplain, Rev. A. Dalling, it has been a pleasure to observe, yet not surprising, for Australia leads the world in the ecumenical field, the most important of all our human endeavours in these dangerous times.

As a former Royal Naval Reserve Officer, I am often asked to give talks to local Sea Cadet Corps units throughout our Commonwealth, and I can definitely state that your T.S. "Tobruk" is the smartest unit I have visited—and, to use a naval expression, I am not flailing. I can congratulate the Commanding Officer and his officers.

One gets so irritated to read the meaning letters of some of our British immigrants in the newspapers, but Australians are intelligent enough to realise that these lesser breeds would raise a stink even in Utopia, and on balance they are much in the minority.

I shall soon be retiring, but if ever I hear of a Novocastrian passing through our little town of Bideford, in North Devon, I shall be most disappointed if he has not rung me at Bideford 3804. There is always a cask of Devon cider under the stairs.—(Captain) S. GORRELL, m.v. Sugar Exporter, Port of Newcastle.

TROPHY NEWS

BRISBANE SEA CADETS WIN TROPHY

A Brisbane Sea Cadet Unit has been judged the most efficient of the 37 units in Australia.

The Training Ship "PALUMA"—with headquarters at Stafford, Brisbane, will be awarded a trophy presented annually by the Navy League of Australia. The Naval Board has signalled its congratulations to the unit, which is under the command of Acting Sea Cadet Lieutenant Commander F. T. G. Dixon.

Award of the annual efficiency trophy is made after an inspection of the majority of Cadets, which was most gratifying.

L. MACKAY-CRUZE, Lieut-Commander R.A.N.R.
Senior Officer.
JOIN THE AUSTRALIAN SEA CADET CORPS

If you are between the ages of 13 and 18 years

The Australian Sea Cadet Corps is a voluntary organisation administered by the Commonwealth Naval Board and The Navy League of Australia.

Cadets are not required to undergo any medical examination and are fully insured against accident while on duty.

Parades are held on Saturdays afternoons and certain Units hold an additional parade one night a week.

The interesting syllabus of training covers a wide sphere and includes seamanship, handling of boats under sail and power, navigation, physical training, rifle shooting, signalling, splicing of wire and ropes, general sporting activities and other varied subjects.

Instructional camps are arranged for Sea Cadets in Naval Establishments, and they are also given opportunities, whenever possible, to undertake training at sea in ships of the Royal Australian Navy. Cadets, if considering a sea career, are given every assistance to join the Royal Australian Navy, the Mercantile Marine or the Royal Australian Naval Reserve, but there is no compulsion to join these Services.

For further information please contact the Divisional Senior Officer in your State, using the Form provided below.

Senior Officers, Australian Sea Cadet Corps

NEW SOUTH WALES: "El Abrigo", 4 Rangers Ave Cremorne. QUEENSLAND: C/- Box 376E, G.P.O., Brisbane. SOUTH AUSTRALIA: C/- 30 Pirie Street, Adelaide. TASMANIA: C/- 11 Queen Street, Sandy Bay, Hobart. VICTORIA: C/- Room 8, 8th floor, 528 Collins St., Melbourne. WESTERN AUSTRALIA: C/- 106 Coode St., Como. AUSTRALIAN CAPITAL TERRITORY: Industry House, National Circuit, Barton. NORTHERN TERRITORY: Box 444, P.O., Darwin.

TO: The Senior Officer, Australian Sea Cadet Corps

I am interested in joining the Australian Sea Cadet Corps and would be pleased to receive further information.

NAME

ADDRESS

STATE OR TERRITORY

PHONE NO.

AGE

(Please print clearly)

Please address your envelope to the Senior Officer in your State or Territory—see list of addresses above.
U.S. Coast Guard Icebreaker Visits Sydney

The United States Coast Guard Icebreaker (WAGB) of the "Wind class", EASTWIND, under the command of Captain William M. Benkert, U.S.C.G., visited Sydney from 1st-5th November, 1966. The purpose of her visit was for rest and recreation prior to departure for Antarctica for the Scientific Research Programme OPERATION DEEPFREEZE, 1967.

Officers, enlisted personnel and civilian scientists were warmly welcomed and entertained by the people of New South Wales.

EASTWIND (see photograph) was launched on 6th February, 1945. Displacing 3,500 tons standard displacement and 6,515 tons full load, she is 296 feet in overall length, and is powered by six diesel-electrics, turning two shafts and providing her with a maximum speed of 16 knots.

She is armed with two 3-inch guns mounted forward and carries two helicopters, either the H-19 or H-52 type.

The double hull is of entirely welded construction and the plating is exceptionally heavy, being designed to crush ice 9 feet thick.

Pieces of Eight!

Skin divers in search of sunken treasure now have available what is claimed to be the first popular-priced, underwater metal detector to aid their quests. Developed by Radiac Co., of Center Moriches N.Y., the pancake-shaped device is called the NEMO. It is electronically operated, pressurised for underwater use and registers the presence of any metal (base or fine) on an easily read dial. In addition to its underwater use, the NEMO is effective on land and, because of its compact size, is practical for investigating tight places such as shafts, tunnels, crevices and crawl places.

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Those commencing subscriptions to "The Navy" magazine in the quarter commencing APRIL, should remit $1.80, JULY, $1.20 and OCTOBER, 60c.
A luxury Bertram cruiser is a joy to any sailor, particularly if he is from the Royal Australian Navy. It takes him farther away from the age when he had to polish endless brasswork and scrub down decks.

All a man has to do to keep a fibre-glass Bertram clean is give it a wipe over.

The Navy has acquired a new 36-foot Bertram for around $70,000. The freighter, City of Rickenhead, landed the Bertram in Sydney last November as deck cargo from Savannah, Georgia.

A twin-screw cruiser with a top speed in excess of 30 knots, she has two 280 hp V8 GM diesel engines and sleeping quarters for six.

When the Navy fits her out the cruiser will be put through exhaustive sea tests for rescue work with helicopters off Jervis Bay.

The Bertram has good sea-keeping abilities and a low stern over which it would be relatively easy to lift a “downed” pilot from the sea.
The Defence Estimates 1966-67 contains the following table showing the current warship strength of the Royal Navy.

Absent from the listing are almost 40 survey and fleet support ships (depot, maintenance, repair, replenishment store ships, and tankers) now in service. Also absent are the recently scrapped headquarters ship, two tank landing ships, and one tank landing craft which helped form the Royal Navy’s Amphibious Warfare Squadron, long based in the Middle East. They are being replaced by the two new assault ships, HMS “Fearless” and HMS “Intrepid” (LSD/LPD-type ships). Reportedly the latter has been delayed.

In addition to the ships shown in the table, four frigates and one fleet submarine are on order but have not yet been laid down.

Three of the fleet submarines listed in the table (one of which is operational) and all four Polaris missile submarines are nuclear powered.

### POWER FROM THE TIDES

Many attempts have been made in the past to promote schemes for using the energy of the tides but all of them have failed because the power produced cost too much. Now, interest is quickening again. In Britain, new ideas are showing that economical power from the tides may be possible.

Earlier schemes put forward in Britain include the Severn Barrage, first proposed in 1925. More recent studies have been made on the Bristol Channel site. The latest proposal is for a much more ambitious scheme than the old Severn Barrage. The site now proposed is between Cardiff and Weston-super-Mare through the island of Flat Holm. This barrage would impound an area of nearly 200 square miles, would provide a new road link between S.W. England and Wales, and would improve navigation into three important ports — Cardiff, Newport and Avonmouth — and would generate about 13,000 million units of electricity annually. Present total annual consumption in the United Kingdom is about 170,000 million units.

Recent British work on tidal energy has been directed to exploiting new advances in hydroelectric machinery and new civil engineering techniques, in the construction of estuary barrages. British manufacturers have recently completed the installation of the first high head reversible pump turbines at the Cruachan scheme in Scotland, opened by the Queen last October. The same machine operates in the double role of motor pump using supplied off-peak electricity to pump water to an elevated reservoir, and turbo-generator, generating electricity from this same water falling to its former lower level. In this way “cheep” off-peak electricity is converted to valuable peak electricity.

The French have built the first operational tidal power station on the estuary of the Rance, on the Brittany coast. This is an imaginative and technically advanced scheme and power from the station will begin to flow this year. The Russians are presently constructing the world’s second barrage scheme, and the Canadians are drilling the sea bed of Minas Bay in the Bay of Fundy. Britain has two or three of the best tidal power sites in the world, a natural resource which could make a big contribution to power generation.

<table>
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<th>Type</th>
<th>Operational</th>
<th>Preparing for Service</th>
<th>Trials and Under Training</th>
<th>Undergoing Conversion</th>
<th>Reserve or Undergoing Long Refit</th>
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