MAY, JUNE, JULY, 1968

Registered in Australia for Transmission by Post as a Periodical

15 cents

THE Navy

THE NAVY

The magazine of the Navy League of Australia

(Registered in Australia for transmission by post as a Periodical)

Vol. 30 **MAY-JUNE-JULY, 1968** **No. 2**

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The views expressed in articles appearing in this publication are those of the authors concerned They do not necessarily represent the views of the editor, the Navy League, or official opinions or policy

Published by the Navy League of Australia, 66 Clarence Street, Sydney, N.S.W., 2000; Tel.: 29-6531
Postal Address: Box 1719, G.P.O., Sydney, N.S.W., 2001

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ADVERTISING AND PUBLICATION: PERCIVAL PUBLISHING CO. PTY. LTD.

SYDNEY	MELBOURNE	ADELAIDE	BRISBANE	PERTH	HOBART
108 Henderson Rd. Alexandria. 2015 Phone: 69-6231	17 Elizabeth St Melbourne, 3000 Phone: 62-6411	17 Currie St. Adelaide, 5000 Phone: 51-6225	546 Queen St. Brisbane, 4000 Phone: 31-2531	63 St George's Tce Perth 6000 Phone: 23-2031	152 Collins St Hobart, 7000 Phone. 23-732

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Fast CODOG Warships For Finland

The true connoisseur of warships and naval architecture is always on the lookout for the unusual. Particularly attractive is the fighting ship which is out of character with the country for which it was built, the warship which is not in keeping with a particular navy's role, or a new-construction order which appears to be in excess of a nation's defence requirements.

So faithful fans of warship lore sat up and took notice a few months ago when a perhaps over-zealous public relations agency put it out that a certain enthusiastic and enterprising British shipbuilding firm had a hand in supplying equipment for high-speed frigates of 2,000 tons for Finland!

Warships in the plural of 2,000 tons when the whole Navy was limited by Treaty to 10,000 tons. The agency stuck to its guns, but the firm subsequently admitted that the figure had been a misprint. And these fast frigates turn out to be fast gunboats of the kind which it is becoming fashionable to class as corvettes of only a fraction of that displacement which have been officially rated as "tykkiveneet" for trade protection.

Nevertheless it appears that they will be nice little ships and quite as sophisticated as many a larger warship. They are to have combined diesel or gas (CODOG) turbine propulsion machinery, and Vosper fin-stabilisation equipment designed to operate throughout the speed range, from the diesel cruise condition to the full speed with gas turbines in operation.

Rolls Royce Olympus gas turbines are being fitted, and the top speed is expected to be substantially higher than that of steam-turbine-powered vessels at present in service. The hydro-dynamic lift on the stabiliser fin will be adjusted by limiting the maximum angle of incidence of the fins as speed increases, this being done by setting a control on the bridge console.

The equipment for these ships will be the first for naval vessels to make use of the new Vosper electronic control system recently announced. The sensing elements are a roll-rate gyro with the addition of a vertical-seeking element. The fin installation is required to stabilise the ships with a wave slope of five degrees, at 18 knots.

The new ships are being built by the Wartsilayhtyma Oy Shipyard, Helsinki, to a specific (similar to NATO) Finnish Navy requirement. With a standard displacement of 600 tons, increased to about 800 tons at full load, they have a length of 228½ ft. and a beam of 26½ ft. Their armament comprise one 4-7 inch automatic dual-purpose gun forward, two single 40 mm. anti-aircraft guns aft, and anti-submarine depth-charge projectors. Rocket-flare guide-rails are provided on the sides of the 4-7 inch turret.

The ships are flush-decked with a raked bow and simple lines affording a clean superstructure. The main engines were designed for developing 22,000 h.p. Vosper Thornycroft's Hydraulic Power Division recently delivered two sets of fin stabiliser equipment. It is expected that the two ships will be completed and ready for sea trials by the time the northern Baltic is free from ice in the spring of 1968.

The Finnish Navy's TYKKIVENE

OUR COVER

H.M.A.S...**Stuart**, leads H.M.A. Ships **Derwent** and **Queenborough**. **Queenborough** is steaming under the Sydney Harbour Bridge

Periscope on Australia

by Grommet

HMAS VAMPIRE

R.A.N. SHIP WINS SHOOTING MATCH

The Daring class Destroyer VAMPIRE won the Naval gunfire support (shore bombardment) section of a naval gunnery competition against all-comers from the British, Australian and New Zealand Navies, in the Far East.

The gunnery competition is conducted in three sections — anti-aircraft, surface and naval gunfire support.

* * *

RECRUITING STATISTICS

Strength of the armed forces at the end of February, 1968, were — Navy: 16,476; Army: 42,527 (26,681 Regular and 15,846 National Servicemen); Air Force: 20, 979.

FIRST VISIT BY CANADIAN NATIONAL DEFENCE COLLEGE

A party of 35 from the Canadian National Defence College visited Australia during early March, in the course of a study tour of Asia and the Pacific.

The group, comprising faculty members, students and staff were led by the Commandant of the College, Major General F. S. Carpenter, A.F.C. Students are senior officers of the Canadian Armed Forces, Government Departments and civilian agencies.

The College which is located at Fort Frontenac, Kingston, Ontario, visits a number of countries each year.

The tours are made to obtain a better picture of the social, political and economic aspects of a countries foreign and defence policies.

* * *

R.N. Submarine returns to U.K.

After 7½ years service with the R.A.N., the submarine H.M.S. TABARD left Australian waters on 22nd March to return to the United Kingdom. She will be replaced later this year by Australia's second Oberon class submarine H.M.A.S. OTWAY.

NEW NAVY MINISTER

The recently appointed Minister for the Navy, the Honourable C. R. Kelly, made his first official visit to a ship of the R.A.N. on 8th March. He led a party of Members of Parliament and journalists aboard the G.M. destroyer H.M.A.S. HOBART.

The official R.A.N. photograph shows Mr. Kelly wearing a flying helmet, being strapped into his seat in a Navy "Tracker" aircraft before leaving for Jervis Bay where the party joined HOBART.

* * *

VISIT BY U.S. NATIONAL WAR COLLEGE

A party from the United States National War College visited Australia during late March in the course of a tour of the Far East.

Forty-five students and members of the faculty and staff were led by Ambassador E. Allan Lightner, Deputy Commandant of the College. The students are senior officers from the U.S. Department of State, Navy, Army and Air Force and other government agencies.

The College was established in 1946 and is controlled by the American Joint Chiefs of Staff.

It prepares students to exercise high level policy, command and staff functions.

* * *

BRISBANE SHOWS HER TEETH

This photograph shows the firing of an anti-submarine acoustic homing torpedo by the GM destroyer H.M.A.S. BRISBANE during her acceptance trials at the under-water tracking range in Puget Sound, Washington State. BRISBANE is working-up in U.S. waters before leaving for Australia later this year.

* * *

H.M.A.S. DIAMANTINA — OCEANOGRAPHIC SURVEY

The R.A.N.'s oceanographic research vessel, H.M.A.S. DIAMANTINA, left Bunbury, Western Australia on 20th March for a 10 day hydrographic study of the

physical and chemical properties of the waters of the Southern Ocean.

She carried a research team led by Dr. John Bye of the Horace Lamb Centre of Oceanographic Research at Flinders university.

* * *

AUSSIE TOPS SUBMARINE COURSE

Sub-Lieutenant P. D. Briggs, R.A.N. has been awarded the Admiral Max Horton prize for obtaining the highest aggregate marks in the final examination of the submarine officers training course conducted at H.M.S. DOLPHIN, the Royal Navy's submarine training school.

* * *

NEW AQUANAUT CHOSEN

Lieutenant Richard Sutton, R.A.N. (see photo below) has been selected to take part in the U.S. Navy's aquanaut programme.

He will replace Lt. Commander Michael Shotter, who was injured recently in a car accident in Key West, Florida. Lt. Cmdr. Shotter was training for Project Sea Lab III, which is to be conducted off the coast of San Clemente Island, California, later this year.

Lt. Sutton will live with other divers in an ocean habitat for 12-day periods at a depth of approx. 600 feet.

* * *

PATROL BOAT LAUNCHED

The wife of a former elected member of the Papua-New Guinea House of Assembly, Mrs Robert Tabua, launched the fourth patrol boat (H.M.A.S LADAVA) of the R.A.N.'s Papua-New Guinea Division, at Walker's yard, Maryborough, on Saturday, 11th May.

* * *

COAST WATCHER HERO

The ashes of the late Commander Eric A. Feldt, O.B.E., Commander of Australia's Coast Watchers of World War II, were scattered at sea, off the Coastwatchers' Memorial Light at Madang; from the patrol boat H.M.A.S. SAMARAI, on Monday, 20 May.

Commander Feldt who was supervising Intelligence Officer, Northeast Area, during the War, organised the group of men who became known as the Coast Watchers. They worked behind enemy lines, radioing information on Japanese movements to the Allies.

The Coast Watchers were credited with causing 5,414 enemy deaths, wounding 1,492 and capturing 74.

Twenty-seven European Coast Watchers were killed during the War; 18 were captured and only 2 survived. Twenty native helpers were killed and 40 captured.

Coast Watchers also rescued 321 shot-down airmen, 280 naval personnel from sunken ships and 190 civilians.

* * *

CHIEF OF NAVAL STAFF RETIRES

With the retirement of the Chief of Naval Staff, Vice Admiral Sir Alan McNicoll, K.B.E., C.B., G.M., on 2nd April, 1968, the R.A.N. said farewell to the man who had steered it through a period of great change.

The Minister for the Navy, the Honourable C. R. Kelly, M.P., further stated that "during Admiral McNicoll's service as Chief of Naval Staff, the R.A.N. introduced into service 3 guided missile destroyers, patrol boats, new aircraft and a destroyer tender, all of which add considerably to the strength of the Australian Fleet.

The new equipment has made the R.A.N. more independent and self-reliant and certainly a great deal more powerful.

Sir Alan encouraged the Navy to become more Australian in character. It was he who sponsored and saw to completion the introduc-

VICE ADMIRAL V. A. SMITH.

VICE ADMIRAL SIR ALAN McNICOLL

tion of the R.A.N.'s own distinctive White Ensign.

Under his leadership the R.A.N. had gone to war without the Royal Navy for the first time, by entering the Vietnamese conflict. Australian ships have a very fine reputation with the officers and sailors of the U.S. ships with which they have operated."

Vice Admiral McNicoll, who reached the compulsory retiring age of 60 years, had served for 46 years in the R.A.N.

Sir Alan was succeeded as Chief of Naval Staff by Rear Admiral V. A. T. Smith, C.B., C.B.E., D.S.C., who assumed the rank of Vice Admiral on appointment.

DEATH OF FORMER NAVY SECRETARY

Mr. George Lionel Macandie, C.B.E., who was secretary of the Australian Naval Board from 1914-46 and the first secretary of the Navy Department from 1915 until 1921 when the Department was incorporated with the Defence Department, died in Melbourne on 1st May, aged 91 years.

Born in Queensland, Mr. Macandie's first appointment was in 1895 as a clerk in the Queensland Marine Defence Office in the days of the State Navy's and Naval Brigades. He transferred to the Commonwealth Service in 1901.

Nearly 50 years later after witnessing and playing a large part in the development of the Royal Australian Navy he was to leave Navy Office Melbourne after a lifetime of service which included 2 world wars. He was awarded the C.B.E. in 1920. His service which continued beyond the normal retiring age concluded in 1946.

After his retirement he wrote, 'Genesis of the Royal Australian Navy" which placed on record the history of navies of the various States before Federation, with a glimpse of early naval history, including the Australian Naval Station when under Admiralty Command, and the various colonial conferences which paved the way for the formation of the Royal Australian Navy.

Mr. Macandie was closely associated with Vice Admiral Sir William Creswell, "Father of the Royal Australian Navy," from 1900, and himself contributed much to its successful administration.

Japanese Battleships and Battle-Cruisers

by R. G. MELLAR

With her victory over the Russians in 1905 complete, Japan had become a nation of major naval importance in the Pacific, and it was only natural when Dreadnought-type warships became fashionable in the major navies of the world that Japan should obtain one or more to hold this position.

The first Japanese vessels of this type were both completed by 1913 in Japanese yards, and they bore the names KAWACHI and SETTSU.. They were armed with 12 twelve-inch guns and of 21,420 tons (normal), which was driven through the water by four turbine engines developing 25,000 h.p.=20 knots, only one knot slower than Britain's first Dreadnought, H.M.S. DREADNOUGHT.

These two were to be the only two Japanese Dreadnoughts to be completed and not see service in World War II. the KAWACHI being destroyed by internal explosion in July 1918, and the SETTSU having to be discarded under the Washington Naval Treaty (finally she became a target ship and was beached in July '45).

The next two classes of Dreadnoughts completed 1915-18 and each of two ships were the FUSO and ISE classes.

The FUSO and YAMASHIRO of the "Fuso" class were both completed with tripod mast, but by 1924 this had developed into a pagoda type structure, and again in 1933-35 they underwent refit, the forward funnel being removed and seaplanes being shipped on C turret of FUSO and on the stern of the YAMASHIRO.

After the Battle of Midway it was planned to fit them with a flight deck aft, but the idea was finally dropped, and it was to be in a gunfire and torpedo battle at Surigao Strait where they were to be eventually lost in October 1944.

The ISE and HYUGA were improved "Fuso" class ships, and also at completion carried the tripod mast, but they also were to lose these in the early 1930's, and in 1936 the forward funnel was also to be removed. During the Second World War they were to gain an important place in naval history by being the only battleships to be equipped with a flight deck, so they could act the dual role of carrier-battleships. This was accomplished by the removal of X and

KIRISHIMA after her first conversion

Battleship FUSO in 1915

Y turrets in 1943 and the placing of a platform in their stead, which enabled twenty-two seaplanes to be carried; also one hundred and eighty five-inch rockets in six mounts were shipped. Both of these ships were to see action at Leyte Gulf, finally running foul of U.S. planes in July 1945 at Kure.

In the last two years of the First World War Japan's naval planners began to lay down plans for eight new dreadnoughts and eight battle-cruisers, the 8-8 programme which, with the dreadnoughts already in service, would give Japan something like the most powerful fleet in the world when the programme would be finished in 1928.

Abroad, especially in the United States, it was believed that Japan would have neither the money nor the facilities to complete such a programme, but from time to time, as information leaked out, the U.S. State Department was frightened into taking steps to stop this programme before it was completed; hence the Washington Naval Treaty which was to cause the cancellation of many of these ships.

The first battleships of this programme were the MUTSU and NAGATO, of 33,800 tons, mounting eight 16-inch guns, the first ships to be so armed by any nation. The NAGATO was completed in 1919 and the MUTSU in 1920, and both were refitted in 1934-36 and subsequently saw service in World War II, the MUTSU accidently being destroyed in 1943, the NAGATO surviving the war, to be destroyed by atom bomb tests in 1946.

The following two ships, KAGA and TOSA, were to be improved "Nagato" class ships, mounting ten 16-inch guns, but although they were laid down as battleships they were never to be completed as such. Because of the Treaty, the TOSA was expended as a target in 1925; the KAGA became the carrier KAGA, which was sunk at Midway in 1942.

The final class of battleships of this programme were the 41,400 ton ships of the "Kii" class — OWARI, KII No.-11, No.-12, which had to be suspended under the Treaty, the material which had been gathered for the four ships being discarded.

With the cancellation of this programme many years were to elapse before Japan again strove to obtain new Dreadnoughts and although plans were drawn up in 1934 these plans were to go through twenty-three stages before work commenced in 1937. Originally there was to be four ships in the class, but in 1942 another one was planned, named "Yamato," "Musashi," "Shinano" and No. III, they were to be the mightiest ships in the world mounting nine 18 inch guns and having a top speed of 27½ knots.

The "Yamato" and "Musashi" were completed as planned and both were to end their career's under a hail of U.S. bombs and torpedoes at Bonomisaki 1945 and Leyte Gulf 1944 respectively.

The "Shinano" was redesigned as a carrier, being sunk in November

1944 by the U.S. submarine "Archefish" while on way from one yard to another to be fitted out. Hull No. 111 was scrapped for economy reasons.

The two improved Yamato's No. 798 and 799 — 64,000 tons, 6-20 inch guns — of the 1942 programme were never ordered, being the last battleships planned for the Imperial Navy.

Japanese battlecruiser construction had actually began at Kure in 1907 with the completion of the "Ikomo" and "Tsukuba" both of 13,760 tons, mounting four-12 inch guns and the following class of two ships "Ibuki" and "Kurama" of 14,600 tons, completed 1909-10 and also mounting, 4-12 inch guns. But these ships were to be reclassified as armoured ships so the "Kongo" class of 1913-15 were to be the first Japanese battlecruisers.

The "Kongo," the first of the class, was built in a British yard but the following three were all to be completed in Japan. They carried 14 inch guns, the first in the Imperial Navy and were an improved version of the British Lion class, which resulted in them being the finest ships of their type in the world for a time.

Extensively modernised in 1930 and 1936, they lost speed and gained armour which resulted in them being reclassified as high speed battleships.

They all had tripod masts at completion and three funnels.

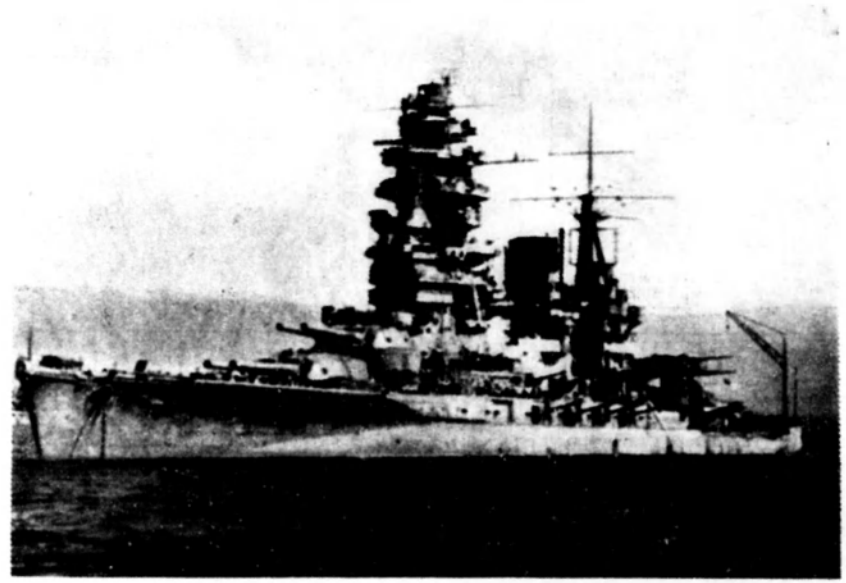
In the mid 1925's the "Kongo" had additions made to her tripod but by 1933 the tripod had developed into the pagoda type structure and one funnel had been removed. By 1938 the final modernisation had been completed and basicly consisted of more additions to the pagoda structure and the addition of 24 ft. to the stern, plus a catapult. "Haruna" and "Kirishima" did not have additions to their tripods in 1925, but from then on they were refitted basicly the same as the "Kongo."

"Hiei" was modernised in 1929 similar to the "Kongo," but by 1933 when she was demilitarised under the London Naval Treaty she had lost number four turret, all her secondary battery, plus many boilers, when she was converted to a Training ship. This conversion was not to last long and by 1939 (refit started in 1936) she had been rebuilt as the most powerful of the "Kongos,"her new pagoda structure being a test bed for the one to be fitted to the "Yamato" and her new oil fired engines giving her a speed of 30¼ knots.

All four were to be active in most of the major naval engagements of the second world war, the "Kirishima" being sunk by the U.S.S. "Washington" (the first battleship to sink another by gunfire) on the night of the 15th November, 1942, off Savo Island.

Only the night before this, her sister ship "Hiei" had been damaged and then sunk by torpedo bombers off Savo the next day.

The remaining two ships were to see 1943 through but in the next two years both were to be lost, the "Kongo" to submarine torpedoes off Formosa in November 1944, and the "Haruna" at Kure in July 1945.



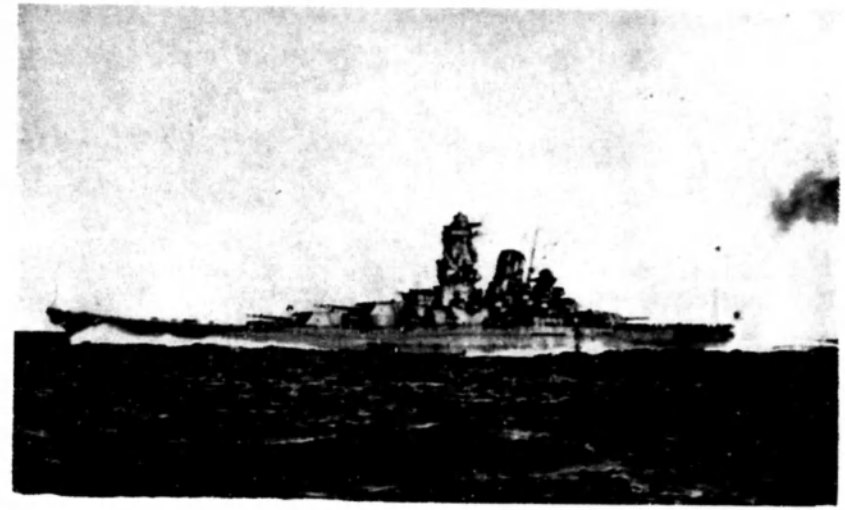
NAGATO—Note spotter biplane at stern.

The eight battlecruisers of the 8-8 programme none of which were to be completed as battlecruisers were divided into two classes.

The "Amagi" class consisted of the "Amagi," "Akagi," "Citago" and "Tako" of 40,000 tons mounting 10 16-inch guns having a speed of 30 knots. All except the "Akagi" were cancelled, the "Akagi" as the carrier "Akagi" being sunk at midway.

The 13 class Nos. 13, 14, 15, 16, were to have been very large ships mounting 8 18-inch guns on a 14,750 ton displacement but they all were to be cancelled 1921-22.

In 1942 two ships, hull 795 and 796 of the 13-65 class were cancelled, (32,000 tons 9-12.2 inch 33 knots) and with the cancellation of this class Japan never obtained any other battlecruisers other than the four "Kongo" class ships.



Battleship YAMATO at 27 knots—the year, 1941

Australian Firm Makes World's Largest Crane

The world's largest crane of its type designed and built in Australia by Favelle Mort Limited, has been shipped to its buyer in the United States.

The crane is the first of eight tower cranes to be delivered by the end of this year to the American Construction firm of Robert Koch, under a contract work $U.S.2.5 million.

The Australian company won the order for the cranes against world competition.

Favelle Mort Limited designed its STD2700 crane specially for the construction of the twin 1500 feet high towers of the World Trade Centre, being built by the Port of New York Authority.

The STD2700 can lift more weight over greater distances and at higher speeds than any crane of its type ever before assembled. It is an external, or lift-well climbing type, which hoists itself up to ten feet at a time, by means of powerful hydraulic jacks fitted to the base of its tower.

It is powered by two 340 horsepower diesel engines and is capable of lifting weights up to 50 tons at a radius of 60 feet.

The Managing Director of Favelle Mort Limited, Mr. Eric Favelle, said the Company had won the order because of the unique features of this crane. These include diesel power, which cuts the running costs up to 50 per cent compared to electric power, together with hydraulic drive for all the crane's functions, which gives unequalled delicacy of control on all motions.

The first crane passed its safety tests with 50 per cent overload.

— MISSILES AT SEA —

The British Government decision to scrap aircraft carriers in the 'Seventies leaves a gap in naval air support capability that will be hard to fill. A further complication is added by the need to deal with long-range guided weapons operated by surface ships.

The Soviet Navy is already well endowed with this type of weapon. Large cruise-type missiles are carried by KYNDA and KRESTA-class cruisers and KRUPYY-class destroyers. KILDIN-class destroyers also have surface-to-surface guided missiles.

Although included in Red Square parades, the large cruise missile NATO code-name Shaddock has been concealed within a tank-like container. The only certain features are a pointed rocket nozzle and twin boosters for ramp-launching. Shaddock must have a range of at least 50 miles: terminal guidance is probably by radar.

The whole area of naval weapon development needs revision in the light of these changing circumstances. More potent ship-launched missiles must be expected in the future.

This class of weapon has been relatively neglected in the West where heavy reliance has been on naval air power. The HSD Sea Dart is now being developed for both surface-to-air and surface-to-surface application. The combination of rocket booster and ramjet sustainer is a useful formula and one which could be developed with profit in larger forms of ship-launched weapon.

A wider application of the standard Sea Dart on smaller naval vessels is also possible to counter the threat of cruise-type missiles launched from inshore patrol boats of the Soviet KOMAR and OSA class. Missile-launching boats have already been supplied by Russia to the United Arab Republic, Cuba, Syria and Indonesia. Egypt has seven OSA- and five KOMAR-class, both equipped with Styx surface-to-surface missiles (see photographs). It does not need a major East-West confrontation to face this type of weapon, as the sinking by Egypt of the Israeli destroyer EILAT clearly demonstrated.

Two views of the Soviet naval cruise missile NATO, code name Styx, launched from Osa and Komar class patrol boats. Missiles of this type — under UAR command — sunk the Israeli destroyer EILAT last October.

On the horizon is a further complication. While Britain phases out her aircraft carriers, the Soviet Union has started a carrier building programme. New air-launched missiles clearly are in the pipeline!

Whether or not the high-performance V/STOL aircraft will fit into a naval role with the phasing out of aircraft carriers in the Royal Navy remains to be seen. Last year we saw the HS Harrier getting its "sea-legs" aboard a commando carrier and the Italian guided missile escort carrier ANDREA DORIA.

At first sight the concept of a trans-sonic close support aircraft which can land on any ship equipped with a helicopter platform has its attractions. Unlike conventional carrier-borne strike aircraft it does not have to be "navalized" although its operation could be more limited by bad weather conditions, though certainly no more than helicopters.

We already have the situation where missiles are being applied to helicopters for defence against missile-firing patrol boats and other sea and coastal targets. It was recently announced that Wasp and Wessex helicopters of the Royal Navy will be equipped with Nord AS.12 air-to-surface missiles capable of destroying enemy boats at a range of 5 to 7 miles. The new missile has been developed from the Nord SS.12 used on patrol boats against surface targets.

These are to be followed in the 1970s by SH-3D Sea King helicopters armed with HSD/Matra Martel air-to-surface missiles.

But helicopters are almost "sitting ducks" to surface-to-air guided missiles even assuming stand-off ranges of 15 to 20 miles. A V/STOL trans-sonic strike aircraft, able to operate at low-altitude with stand-off missiles, would be a far better proposition in the fast-changing climate of naval warfare.

Helicopter-destroyers for the RAN

by R. J. HALLETT

The Royal Australian Navy has recently returned to service its seven "St. Laurent" class ships after conversion from escort destroyer (DDE) status to helicopter-destroyer (DDH) status and has undertaken the construction of four new, larger, gas-turbine powered DDH's which will be among the most advanced and versatile anti-submarine weapons afloat. Each of the new ships will carry two Sea King ASW helicopters as well as VDS (Variable Depth Sonar) and a Limbo three-barrel depth charge mortar.

The DDH has several advantages over the normal anti-sub marine frigate. Its helicopters enable it to maintain surveillance over a far greater area of ocean. Besides its anti-submarine role, the helicopter may also be used for search and rescue, reconnaissance, gunfire observation, transport and ground support (gunship) operations thus permitting the DDH to be used in a much wider field of military operations than the usual ASW frigate.

The DDH is particularly suited to Australian requirements for numerous reasons.

Because of the size of the Australian continent and the dependence which Australia has on seaborne commerce, it is imperative that the Australian Fleet should patrol a large area of sea. For reasons of economy, it seems unlikely that Australia will be able to procure, equip, staff and protect a second, let alone a third or fourth carrier which would be necessary to provide adequate anti-submarine protection and at the same time give the R.A.N. a counter-offensive capability.

It may not however, be beyond economic and staffing limitations for Australia to commission several DDHs, which, if suitably equipped, would substantially add to the present anti-submarine forces and also allow a moderate counter-offensive capability.

No New Ships Needed

It may not be necessary to build new ships to carry out the vital role which would be performed by the DDHs.

The R.A.N. at present has five ships which may be suitable for conversion to DDH status. These are H.M.A. "Battle" class destroyers, TOBRUK and ANZAC, and H.M.A. "Type 15" ASW frigates, Queenborough, Quiberon and Quickmatch.

On emerging from conversion, the statistics of these ships might read as follows;—

	"BATTLE" CLASS	"TYPE 15"
Dimensions: Length	379'	358'
Beam	41'	35' 8"
Draught	13' 6"	13' 6"
Aircraft	2 ASW Helicopters	2 ASW Helicopters
A/S Weapons	1 Limbo mortar	1 Limbo mortar
Guns	2 4.5" Dual purpose 2 40mm AA	4 40mm AA
Missiles	1 Seacat launcher	1 Seacat launcher
Speed	31 knots	31 knots

It might be argued that these ships are too old to make their conversion worthwhile. The "Q" class were completed in 1942 and converted to ASW frigates in 1954-57; the "Battle" class were completed in 1950-51. As the conversion of these ships to DDH would evolve a major extended refit and up-dating, these ships should remain in service until about 1980 (a similar period required of H.M.A.S. Melbourne after her present refit).

If the present rate of development continues, it is reasonable to surpose that by the mid 70s a new generation, a new concept in warships will emerge, bringing with it, a complete re-appraisal of naval strategy. Australia will then have to think about a complete revision of Naval policy. The Oberons and theDDGs are the only warships which could remain effective for more than ten or twelve years. Until this revision is forth-coming, it is essential that Australia's security be assured and that the Navy should expand sufficiently in order to operate its ships of the next generation. The time to plan for the eighties is now!

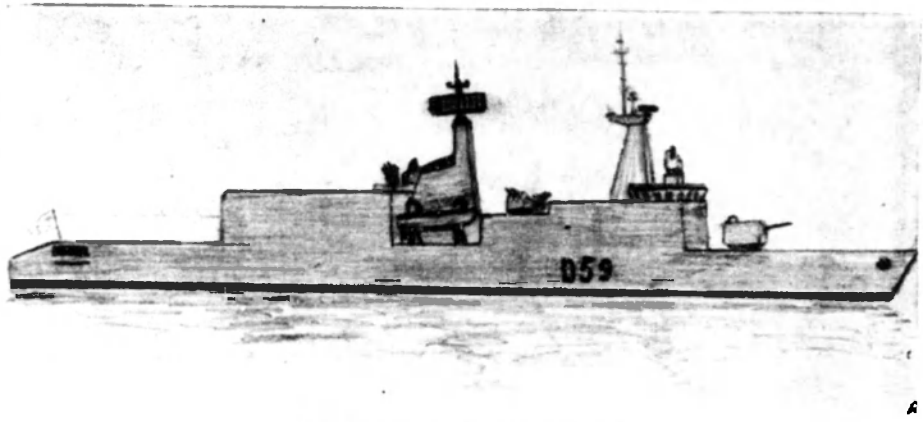
The interim DDH programme will not only substantially increase security, but will supply extensive "front-line" training facilities, as well as facilities for experimentation in various aspects of naval warfare which could play an creasingly important part with the development of more sophisticated weapons for each of the Armed Services.

This tactical experimentation role is almost equally as important as any other to establish a DDH force. It is a proven fact that the nation with the most efficient weapons is best able to maintain peace as it is not worth an aggressor's while to provoke hostilities while at a military disadvantage.

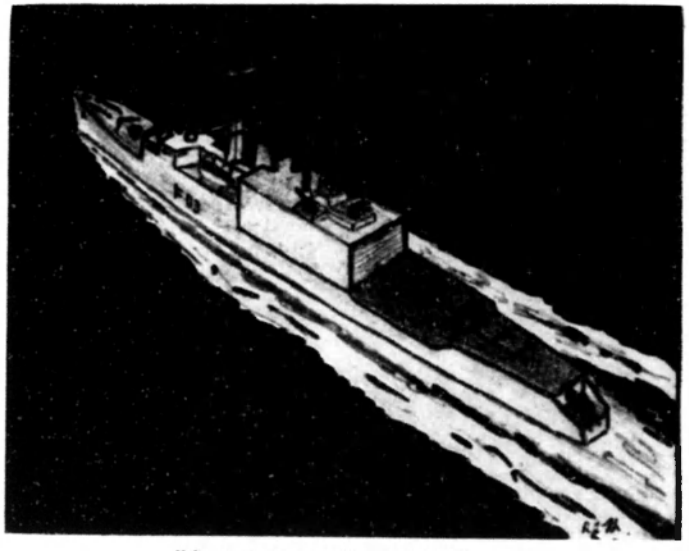
With the British withdrawal from east of Suez, Australia must, if only for her own survival, maintain peace in south-east Asia. For obvious reasons, Australia cannot take Britain's place by stationing forces throughout the area. There are, however, two means by which she can maintain peace. These are firstly by diplomacy, and secondly, by the principle of a "Force in Being." The "Force in Being" is not meant to be a threat to neighbouring nations, but a deterrent force which will facilitate diplomatic co-operation. In order that the "Force in Being" principle should work, although this force need not be numerically large, it must be of high quality, flexibility, fighting power and have a moderate strike capability.

Here again, the DDH appears as a useful concept. If equipped with ASW helicopters, it provides a

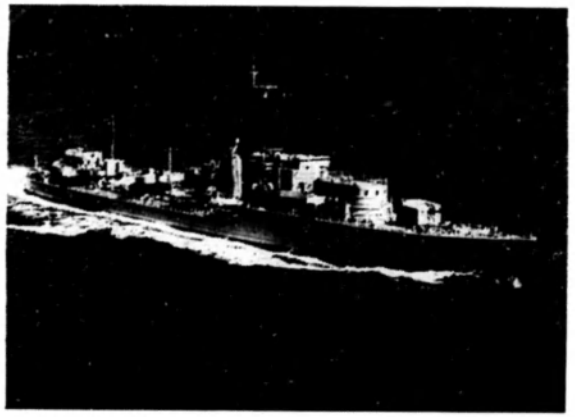
Helicopter-Destroyers for the RAN



Helicopter-Destroyer Leader (DDHL) — HMAS ANZAC



Helicopter-Destroyer (DDH) — HMAS QUIBERON



powerful deterrent to submarine attack. The DDH may, as previously mentioned, assume a counter-offensive role if equipped with VTOL (Vertical Take-Off and Landing) aircraft such as the Mach 0.98, Hawker Siddeley Kestrel, Ground Attack Fighter, or preferably, the Mach 2, Mirage III U, Strike and Reconnaissance Fighter type which, besides being able to carry nuclear weapons against an enemy ground or sea target, may also provide reasonable anti-aircraft defence. A force to be reckoned with by an aggressor!

The use of VTOL aircraft with small ships has not yet been fully developed but the proposed DDH programme would provide a splendid opportunity for Australia to develop what would appear to be a particularly useful strategic concept.

Taking an overall look at Australia's defence forces, the following facts might be noted:—

When the RAAF takes delivery of its F111 aircraft, its defence and strike capability will be second to none in this area of the world. Vietnam has demonstrated the effectiveness of the Army, and increased mobility will shortly increase this effectiveness.

The condition of the Navy is by no means as good as that of the other Services. The number of major warships in commission in 1970 will be only sixteen. (1 light carrier, 4 submarines, 3 DDG's, 2 destroyers, 6 ASW frigates). The anti-submarine capability, though considerable, is still comparatively small and inadequate in case of emergency. Apart from the Oberons and ten small fighter-bombers, strike potential is non-existent. Every unit serving with, or proposed for the R.A.N. is of the highest quality in its own field, but simply because of the size of the Australian continent and inevitable economic restrictions, the Navy is unable to carry out completely and effectively its stated aims.

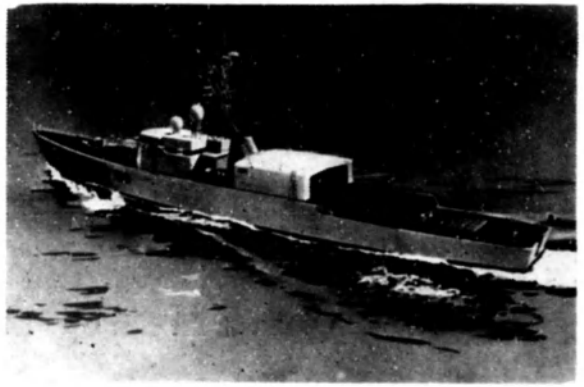
It is not supposed for one moment that the DDH programme will, like a magic wand, solve the navy's difficulties, but it would ease them by a considerable amount.

Here, then, in summary, is a brief statement of the advantages of a DDH force developed on the lines suggested above:—

1. Anti-submarine potential increased by 50%.
2. Air strike potential doubled (using VTOL aircraft).
3. Extensive "front-line" training facilities.
4. Facilities to develop tactics and associated interests.
5. Flexible patrol and reconnaissance force.
6. Maximum use of present resources; no new ships needed.
7. Facilities for expansion in preparation for the future.

I think that for the good of Australia and the Navy that this programme is worthwhile; don't you agree?

The Editor invites Readers to respond to Mr. Hallett's article. Suitable letters will be published.



A model of the proposed Canadian Destroyer Helicopter Carriers. It is understood that their construction commenced earlier in 1967. Designed as anti-submarine ships, they will be fitted as leaders, having variable-depth and conventional sonar, landing deck equipped with double hauldown and beartrap, Flume type anti-rolling tanks to stabilise the ship at low speed, pre-wetting system to counter radio-active fallout, enclosed citadel, bridge control of machinery and automatic combustion control in boilers. Provision is also being made for the fitting of a short-range anti-aircraft missile.

NATIONAL SERVICE IN THE USSR

by ANDREI GRECHKO

Under a new law approved by the Supreme Court on October 12, 1967, the period of national service in the Soviet Union has been reduced by one year. At the same time there has been a 15% increase in the defence budget voted by the Supreme Soviet for 1968. The speech summarised below, in which the new Minister of Defence announced the new law, shows that these two measures are by no means contradictory, but should be seen as an attempt to reconcile rising costs for new weapons with the Soviet Union's growing commitments.

Outlining the main provisions of the new law, which goes into force on 1st January 1968 and replaces a law adopted in September 1939, the Defence Minister explained that privates and NCOs of the Army and the Air Force would serve two years, and naval ratings and petty officers would serve three years. A one-year period of national service was being retained for persons with a higher education.

A uniform call-up age, 18, is being established instead of 18 or 19 as has been the case previously —18 being the age at which most young people finish their studies at secondary schools.

The call-up will be carried out twice a year, in May-June and November-December. Marshal Grechko explained that this procedure would create more favourable conditions for maintaining the combat preparedness of the armed forces at the proper level. Transfer to the reserve will also be made twice a year.

A system of initial military training is being introduced for all young men of call-up age and younger. This preliminary military training will be carried out at ordinary schools beginning with the ninth form, and also at specialised secondary and vocational schools. Young people who are not studying full-time at educational establishments will do their military training at special centres.

The need for this preliminary training was explained by Marshal Grechko as being due to the increased demands made on servicemen and to the reduction of the period of national service.

Full-time students of higher educational establishments will have their call-up deferred, and the category of persons eligible for deferment for family reasons will be extended. There will be no deferment for students of evening and correspondence institutes. The age limit for call-up is fixed at 27.

Marshal Grechko explained that under the new law the service age-limit for officers would be raised. "This is being done in order to cut down the number of officers who are transferred to the reserve at a comparatively young, working age," he said.

The law also makes provision for women who have medical or other special training to perform military duties. In peacetime their names will oe placed on a military register. They will take part in training sessions at military camps and will also be admitted to voluntary active military service between the ages of 19 and 40. t

Marshal Grechko said that servicemen enjoyed all the rights and had the same duties as all Soviet citizens under the Constitution of the USSR.

Servicemen on active service would have their housing reserved for them, while those transferred to the reserve must be given jobs within a month of their application for employment, duly taking into account their experience and specialities.

"The adoption of the new law on universal military service will accord with the changes that have taken place and will be in keeping with the spirit of the party's demands that the problems of the country's defence be always in the centre of our attention," he said.

"The colossal growth of socialist industry and structural changes in its development have made it possible to supply our Army and Navy with the most up-to-date military equipment — nuclear weapons, missiles for various purposes, supersonic aircraft, new tanks, nuclear submarines and other modern means of warfare."

Marshal Grechko stressed the higher technical level and combat capacity of the Soviet armed forces.

"In their technical equipment and combat possibilities the Soviet Army and Navy differ considerably today from what they were in 1939," he said. "A present-day motorised rifle division, for instance, as compared with a motorised rifle division of 1939, has 16 times as many tanks, 37 times as many armoured personnel carriers and armoured vehicles, 13 times as many automatic weapons and five times the radio communication facilities, and is incomparably superior as regards the quality of this equipment.

"The division's increased technical equipment has considerably enhanced its combat potentialities. Thus one artillery mortar salvo of a division of 1939 weighed 1,700 kilograms, whereas that of a present-day division weighs 53,000 kilograms. These figures do not take into account nuclear weapons, several hundreds of times greater in power. Thus, the power available to an army division has grown from three horsepower per capita in 1939 to 30 hp per capita today.

"This is true of each one of the arms and each one of the fight-

ing services," the Defence Minister continued. "The Air Force has taken a leap during these years from piston-engined planes to modern jets with a speed of 2,500 to 3,000 kilometres per hour (1,500 to 1,850 mph). The bombing strikes of the jets are five times more powerful than those of the military planes of 1939.

"The Air Force now has aircraft capable of inter-continental flights in any weather and of inflicting crushing blows on an enemy with missiles carrying nuclear warheads.

"Furthermore, our Navy has acquired a qualitatively new feature-nuclear submarines have become its main force.

"The powering of an up-to-date submarine is almost 100 times, the depth of its dive five times, and its speed when submerged three to four times greater than in the case of a pre-war submarine.

"The submarines, armed with ballistic missiles, are capable of destroying ships from a distance of hundreds of kilometres and of delivering blows from under water against enemy strategic targets thousands of kilometres away.

"As for the younger arms of the service — the Stategic Rocket Forces and the country's Anti-Aircraft Defence, which are equipped with the latest, first-class and most complex military equipment and weapons — as far as they are concerned, their fighting strength is colossal and their combat capacity is in general incomparable."

Marshal Grechko told the Supreme Soviet that "the Communist Party and the Soviet Government are taking all the necessary steps for the further strengthening of the country's defence potential."

He said that the Soviet people "will continue to show every concern for strengthening the defence capacity of our country and our armed forces. It is only growing military might brought to the highest level that can cool the bellicose ardour of aggressors and guarantee our country from possible eventualities."

During the discussion in the Supreme Soviet, it was announced that the legislative proposals committees of both chambers had approved the draft law on compulsory military service.

SEA CADET CORPS NEWS

SEA CADET INTERNATIONAL RIFLE SHOOTING COMPETITION 1967

The Royal Canadian Sea Cadet Corps CRESCENT of Hanna, Alberta, has been declared the winner of the Navy League's International Small Bore Rifle Shooting competition for Sea Cadets in 1967.

This Corps has won the Navy League of Canada's DUKE OF EDINBURGH SHIPS BELL TROPHY, signifying the top award, for the second consecutive year.

The Sea Cadet Corps T. S. IMPLACABLE of Southend on Sea, Essex, England, placed second and will receive The Navy League of Great Britain's trophy which was held last year by the Sea Cadet Corps T.S. STEADFAST of Christchurch, New Zealand.

The Navy League of Australia's trophy, emblematic of third place, will be sent to Sea Cadet Corps T.S. TALISMAN of Nelson, New Zealand, by last year's winner, the Sea Cadet Corps LIMHAMN of Malmo, Sweden.

The Malmo, Sweden, Corps placed Fourth in 1967.

Top individual honors were shared by A/C R. K. HOFFMAN, PO2 E. J. BUCHFINK, both of RCSCC CRECSENT, Hanna, Alberta, and L/C S. T. ROBINSON, of T.S. TALISMAN, Nelson, New Zealand, who posted perfect scores.

EFFICIENCY TROPHY TO NEW SOUTH WALES DIVISION

At Admiralty House, Kirribilli, on 20th April, the Governor- General, Lord Casey, presented the Navy League Efficiency Shield to the training ship "TOBRUK."

The unit, situated in Newcastle, was adjudged by the Naval Board to be the most efficient unit in Australia in 1967.

Presenting the shield, Lord Casey said:—

"This is a great achievement and one of which the C.O., Lt. Williams, his officers, instructors and cadets can well be proud."

The ceremony took place on the lawns at Admiralty House and the entire N.S.W. division, some 350 strong, marched from nearby Bradfield Park to Admiralty House.

The contingent, in full uniform, and including an armed guard, was led by the band from the East Australian Area.

Lord Casey, after reviewing the cadets, congratulated all upon their bearing and appearance.

Addressing them he said:—

"It is good to see so many of you young men showing an interest in the history, spirit and traditions of the sea service.

What is also so very important is that by being a member of the Sea Cadet Corps you are helping to develop your own character and at the same time learning to be good citizens in the widest sense.

I realise also the untiring efforts of the officers and instructors who voluntarily give so willingly of their time to the Sea Cadet Corps. They are to be commended for the part they play in moulding the Cadets we see before us, and I trust that you Cadets will do the same when you are older.

I believe you all know that a change from the present organisation is proposed and I refer to the re-organisation of the Sea Cadet Corps, by which it is intended to bring you fully under the administration of the Naval Board.

When that time comes I am sure the Navy League will continue to support you in every possible way and I am confident that you as Naval Reserve Cadets will, like your Army and Air Force Cadet counterparts, continue to flourish and to offer the youth of Australia the opportunity of joining a worthwhile organisation."

The Royal Salute — the official R.A.N. photographer snapped the guard provided by the winning unit T. S. Tobruk.

The Governor-General, His Excellency the Right Honourable the Lord Casey. Patron of the Navy League of Australia addresses the Cadets prior to the presentation of the Efficiency Shield. On the Governor-General's right is Rear Admiral H. A. Showers, the Federal President of the Navy League of Australia; and to his left Lieutenant Commander L. Mackay-Cruise, R.A.N.R., Senior Officer, N.S.W. Division, A.S.C.C.

The Presentation — to Lieutenant V. C. Williams, A.S.C.C. Commanding Officer of the winning unit.

A proud moment for Lieutenant Williams as he displays his Units trophy.

SEA CADET CORPS NEWS

NEW SOUTH WALES DIVISION

Report of Activities ond Training Undertaken by the New South Wales Division of the Quarter Ending March 31, 1968

Periods of continuous training were carried out in the following Naval Establishments:—

2/1/1968 to 12/1/68 (10 days) H.M.A.S NIRIMBA. 2/1/1968 to 12/1/68 (10 days) H.M.A.S. PENGUIN. 2/1/1968 to 12/1/68 (10 days) Jervis Bay Air Strip.

In future Cadets will not be permitted to undertake a training period of 10 days as in view of the increasing shortage of billets the Naval Board has recently decreed that the maximum time for any form of continuous training for Cadets will be limited to 7 days. By adopting this limitation it is hoped to provide postings for many more Cadets than has been possible in past years. There is no doubt that the Jervis Bay air strip is an ideal location for Cadet training particularly when coupled with the boat work facilities available at H.M.A.S. CRESWELL. With the addition of a few extra essential amenities this area could well provide an ideal permanent training camp for Cadets. This is the subject of a separate submission which has already gone forward.

Harbour and weekend training was conducted in the following ships and establishments:—

H.M.A.S PENGUIN 16 to 18 February.

H.M.A.S. QUEENBOROUGH 16 to 18 February.

H.M.A.S. CRESWELL 23 to 25 February.

H.M.A.S. QUEENBOROUGH 15 to 17 March.

It was regrettable that both Sydney Grammar School and Scots College found it necessary to cancel their weekend training resulting from insufficient Cadets being available due to School sporting committments.

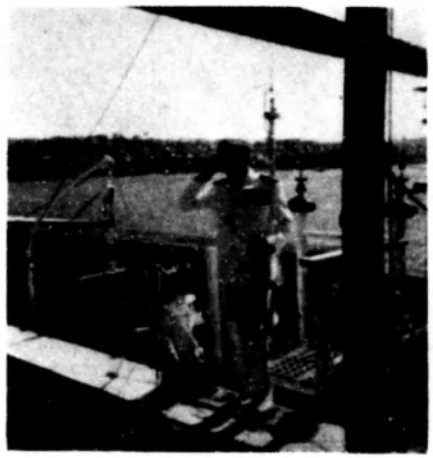
An Indoctrination Course of 7 days for Officers was organised by days for Officers was organised by this Division for personnel from A.C.T. Queensland and New South Wales. The course was conducted in H.M.A.S. PENGUIN.

The annual swimming carnival was held in H.M.A.S. PENGUIN on Saturday 17th February 1968 and it was pleasing to observe such strong contingents of Naval Reserve Cadets participating from St. Ives High School and Scots College. The trophies were presented to winning Cadets and Units by the President of the Navy League of Australia, N.S.W. Division, Rear Admiral H. A. Showers, C.B.E. (Ret'd).

The annaul inspection of T.S. CONDAMINE (Manly Unit) and T.S. SYDNEY (Refer photos) were carried out on 9th March 1968 and 23rd March 1968 respectively by the representative of the Flag Officer-in-charge, East Australia Area, Commander D. J. Beckley, D.S.O., D.S.C., R.A.N.

As a result of discussions held with the Mayor of Manly and the Council Engineer a most suitable alternative site for T.S. CONDAMINE (Manly Unit) has been determined and the Navy League has now been requested to complete and finalise the negotiations that have taken place. During the past three years a considerable amount of time and energy has been spent trying to find a suitable location to resite the Manly Unit and it is to be sincerely hoped that the matter is now resolved.

L. MACKAY-CRUISE
Lieut-Commander R.A.N.R.
Senior Officer



Commander D. J. Beckley, D.S.O., D.S.C., R.A.N., the representative of the Flag Officer-in-charge, East Australian Area, accompanied by Lt. Commander L. Mackay-Cruise, R.A.N.R., Senior Officer, A.S.C.C., N.S.W. Division, board T.S. SYDNEY (Snapper Island) for the Annual Inspection.

L. to r.: Lieutenant J. G. Hampson, A.S.C.C., Commander L. E. Forsytho, A.S.C.C. and Lieutenant W. J. Jackson, A.S.C.C. — At Ease after the Inspection.

ANNUAL CHURCH PARADE

The annual Church Parade of the New South Wales Division of the Corps was held in Her Majesty's Australian Dockyard Church, Garden Island, on Sunday, 28 April, 1968.

Approximately 300 Cadets paraded and were inspected by the Flag Officer-in-charge, East Australia Area, Rear Admiral D. C. Wells.

The service was conducted by the Base Chaplain, Archdeacon L. W. Long, R.A.N., the evangelicai message being expounded by Fleet Chaplain A. W. Rosier, R.A.N. The Division's Colours were laid up in the Sanctuary during the service. Music was provided by the band of the East Australia Area, conducted by Lt. N. G. Gullick, L.R.A.M. R.A.N.

The service concluded with the Naval hymn "Eternal Father Strong to Save" and the Naval Prayer.

The Division then, led by the E.A.A. band, "Marched Past," outside the Church, Admiral Wells taking the salute.

The Editor is always pleased to receive news and photographs concerning the activities of Divisions of the Corps.

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.

The aim of the Australian Sea Cadet Corps is to provide for the spiritual, social and educational welfare of boys and to develop in them character, a sense of patriotism, self-reliance, citizenship and discipline.

Uniforms are supplied free of charge.

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

Parades are held on Saturday 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, 2090.

QUEENSLAND: C/- Box 376E, G.P.O., Brisbane, 4001.

SOUTH AUSTRALIA: C/- 30 Pirie Street, Adelaide, 5000.

TASMANIA: C/- 11 Quorn Street, Sandy Bay, 7005.

VICTORIA: C/- Room 8, 8th Floor, 528 Collins St., Melbourne, 3000.

WESTERN AUSTRALIA: C/- 182 Coode St., Como, 6152.

AUSTRALIAN CAPITAL TERRITORY: Industry House, National Circuit, Barton, 2600.

NORTHERN TERRITORY: Box 444, P.O., Darwin, 5794.

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.....

STREET..... SUBURB.....

STATE OR TERRITORY..... POST CODE.....

PHONE No..... AGE.....

(Please print clearly)

Please address your envelope to the Senior Officer in your State or Territory—see list of addresses above

A DAY AT CHATEAU TAHBILK

— BY LADY BURRELL

Melbourne justifiably has a reputation for unpredictable weather in February. After months of century and near century readings, it should have been easy to predict a scorching temperature of 105 deg. with a North wind blowing half a gale, on Sunday 25th February when some 120 guests had bought tickets for a picnic lunch at Chateau Tahbilk plus a tour of the cellars.

With such a frightful day we were agreeably surprised when everyone turned up. It was a family day and those who had children brought them along and many swam in the river which flows through this lovely historic Vineyard.

Anyone who is a parent of course knows that, if you promise children an outing on a certain day at a certain time, you take them rain or shine — it is by far the lesser of two evils.

Everyone enjoyed themselves, and not the least attraction was seeing Top Brass ex Naval types in action. Rear Admiral Beecher looked after the bar by the river and stood up all day dispensing delicious white and red wine from the "House of Tahbilk", to the continuously thirsty guests. Vice Admiral Burrell sold raffle tickets for a case of wine and also organised groups and tickets for the cellar visits. Commodore Plunkett-Cole battled with the hot north wind to tack down table cloths and dispense food.

Victorian President, Geoff Evans, and Secretary Pat Shorrocks, with their guests, arrived looking distinctly jaded, but revived under the ministrations of Admiral Beecher.

It was all in a good cause—to defray the expenses of the Navy League Ball scheduled for 3rd October next, the proceeds of which go to the A.S.C.C. and other causes which the League supports.

An Italian, visiting England for the first time, was talking at a cocktail party given in his honour. "Yes," he said, "I'm very happily married, except we have no children. My wife is unable to have babies. She is what you say in England — impregnable." z

This caused a burst of laughter which confused him. Hurriedly he added, "What I meant was — she is inconceivable."

This only added to the merriment and further puzzled him. However, the house was down by his final attempt "She is unbearable!"

Nautical Notes from all Compass Points

By SONAR

CANADA

Another 'Tribal' Class

Information has been received from Canadian Forces Headquarters that the Minister of Defence for Canada has approved the following names for the DDH 280-class destroyers scheduled for construction in the near future:

Name	Hull Number
H.M.C.S. IROQUOIS	280
H.M.C.S. HURON	281
H.M.C.S. ATHABASKAN	282
H.M.C.S. ALGONQUIN	283

Three of these names were, of course, identified with the previous Canadian 'Tribal' class, namely ATHABASKAN, HURON and IROQUOIS, but the fourth, ALGONQUIN, although also a previous Canadian DDE name, was borne by the former British destroyer VALENTINE transferred from the United Kingdom on completion in 1944 and fully converted into a fast anti-submarine escort.

The projected new ALGONQUIN, DDH 283, however, has found her right niche in warship class nomenclature, for the Algonquins were the most prominent of the three aboriginal races (the other two being the Hurons and the Iroquois) which occupied the great basin of the St. Lawrence at the beginning of the 17th century.

* * *

NEW CANADIAN COAST GUARD SUPPLY SHIPS

Maine Industries Ltd., of Sorel, Que., has been awarded a Federal $8,402,303 contract for the construction of two 189 ft. inshore supply vessels for the Canadian Coast Guard.

The welded-steel ships, which will carry 37-man crews, are to be completed in 1969.

They will be used on the East Coast to replace two other vessels.

The twin-screw ships will be powered by diesel engines and will be used for buoy tending, lighthouse supply and search and rescue duty.

They will have an 11-knot cruising speed and a range of 3300 nautical miles.

* * *

PEOPLE'S REPUBLIC OF CHINA

Red China May Be Building SSBMS

Communist China's two largest submarines, one now in commission and the other nearing completion at Dairen, have been equipped with three tubes for launching ballistic missiles, according to U.S. Navy sources. Solid evidence is adduced in Washington that these tubes are compatible with missiles with a range of 380 miles — the range attributed to the nuclear missile which China claimed to have tested successfully on 27th October, 1966.

The two Chinese submarines are modelled on the Soviet G-2 class. Conventionally powered, they are no match for nuclear submarines in speed or range.

* * *

FRANCE

New Minesweepers

The French Navy is to build a fleet of eight ultra-modern wood and plastic minesweepers equipped with a top-secret mine-destroying system.

* * *

JAPAN

Research Submersible

The keel of the first underwater survey vessel of its kind to be built in Japan was laid recently at the Kobe yard of Kawasaki Dockyard Company. Japan's Maritime Safety Agency ordered the craft, which is being built under an appropriation from the Science and Technology Agency. All governmental agencies concerned will share the vessel, according to their needs.

The underwater boat will be about 50 feet long, with a beam of about 18 feet and a submerged displacement of about 85 tons. It will operate at depths up to some 2,000 feet, manoeuvring at a speed of about 3.5 knots. The vessel will carry a crew of four, including two researchers, and will be equipped to perform a variety of underwater research and survey projects.

Kawasaki was the first Japanese shipyard to build a submarine. Pre-war construction totalled 61 submarines, and the survey vessel is the yard's fifth postwar submersible. It is scheduled for completion late 1968, with delivery set for March 1969.

* * *

WEST GERMANY

Cuts In New Construction

Bundesmarine Inspector Gert Jeschonnek, outlining the future of the Navy to the Bundestag Defence Committee in January, stated that, owing to reduction in defence expenditure, the originally planned ten AA corvettes, armed with the Tartar missile, would not now be built. In their place four 'Fregatten 70' AA frigates would be laid down.

These vessels are of some 3,000 tons and will have the U.S. SM-1A missile (improved Tartar) and a 76-mm. rapid-fire gun for anti-aircraft and ship targets.

* * *

LIBYA

Another Order For F.P.B's

Recently Vosper - Thornycroft launched the second of their 96 ft. fast patrol boats and also received a further order for four more 100 ft. F.P.B.'s. The latter are to be steel-hulled and powered by diesels.

* * *

NATO

Operations off the Dutch Coast

A preliminary underwater-obstacle survey was carried out in February off the Dutch Coast in

preparation for a major mine-countermeasures operation to be carried out in May by Belgian, British, French, Netherlands and Norwegian forces.

The object of the operation is to create safer and better routes for merchant shipping.

• • •

SWEDEN

Laser Rangefinder

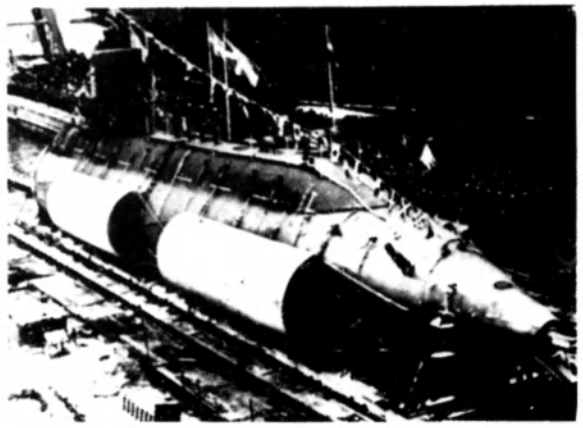
This laser rangefinder (see photo below), developed for the Swedish Navy by the L. M. Ericsson Telephone Company of Sweden, has a range of 12 miles with an accuracy of +— 5 metres. It contains a ruby crystal laser with a rotating prism, emitting high intensity pulses of ultra-short duration. Range is determined by an electronic counter, with values being transferred to a direct-reading presentation.

• • •

Ship-to-Ship Missile

After the recent furore caused by the Egyptians sinking the Israel destroyer ELATH with a Russian ship-to-ship missile, comes the news that SAAB of Sweden have developed a similar weapon.

The Swedish missile is apparently fitted in two destroyers and in



mobile defence batteries for use on the coast.

The missile is some 19 feet and is launched by a rocket booster, which separates, and the missile is then propelled by turbojets. No speed is given, except that it is subsonic and the range is stated to be several times that of conventional guns'. No details as to its guidance are given beyond that it is 'radio-controlled', which might mean anything from: beam riding to radar homing.

The First Five

The submarine SJOORMEN (see photo above), is the first of five being built in Sweden for their Navy. The SJOORMEN is conventionally powered, displaces 1,100 tons, and has a length of just under 175 feet. A highly streamlined shape and a large, slowly rotating propeller makes the craft fast and silent when submerged. She will be armed with a new type of guided torpedo and mines; advanced electronic systems have reduced manning to 23 crewmen.

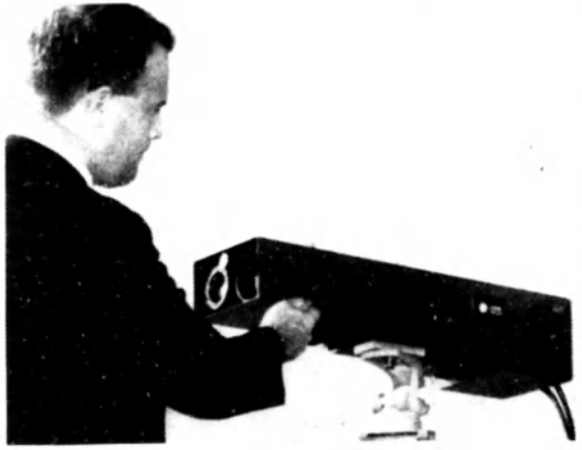
• • •

UNITED KINGDOM

Vosper Patrol Boat

Vospers are reported to be developing a new high-speed patrol boat mounting a French (Nord Aviation) surface-to-surface missile. The vessel will be capable of 50 knots and will carry eight SS12 wire-guided missiles which have a range of 3.7 miles.

This type of boat should be ideal for small navies, as its missiles will give it the equivalent firepower of much larger conventional ships, though the range is nothing like as good as the Styx missile fitted in the Russian KOMAR class which is reputed to carry as far as 12 to 15 miles.



Glass Fibre In British Submarines

The Royal Navy has, for a period of several years, been evaluating the use of Cellobond polyester resin and glass fibre in a prototype G.R.P. ship section and in the construction of the foredeck, fin and outer structures of submarines.

Trials, and subsequent use have established that British Resin Products' Cellobond polyester resins meet the tough requirements of submarines, and the majority of "Oberon"-class submarines now incorporates many tons of this resin and glass fibre in their outer structures.

Others within this class will change construction to plastics as they are due for refit. The moulding of the structures is carried out by dockyard personnel.

Royal Naval Constructors and personnel of the Admiralty Materials Departments have found that the polyester resin and glass fibre offers a structural material which facilitates construction of the outer unpressurised sections of the submarine, and is resistant to corrosion.

It also has the added advantage of weighing only one-seventh of the equivalent amount of steel. The life expectation for the metals previously used, prior to a major overhaul, was around the three-year mark, but this period is now "considerably extended" by the new material.

• • •

Hovercraft For R.A.N.

British Hovercraft BH-7, the 45-ton vehicle which has a speed of 75 kt., and — in civil version — will have a capacity for 140 passengers or 70 passengers plus eight vehicles, is to be ordered by the UK Government for use as a naval patrol vessel, according to a reported statement by Technology Minister John Stonehouse on 4th April. Stonehouse also said that the Government intended to increase its civil vote for hovercraft research and development at Cowes by BHC on a Ministry of Technology grant for evaluation by the Inter-Services Hovercraft Unit and the Royal Navy.

Sea Dart Production

First production order for the HSD Sea Dart has been placed by the Ministry of Defence for the Royal Navy. The weapon will arm the Type 82 Destroyer, now under construction. It will also be fitted to a new class of cruiser providing command and control for future naval forces and to a new class of destroyer, scaled down from the Type 82.

Effective both in surface-to-air and surface-to-surface roles, Sea Dart will defend against air attack at all levels and can be used in support of coastal operations at long range. It could also deal most effectively with missile firing ships and homing missiles of the type that sank the Israeli destroyer ELATH last October. Continuous propulsion is provided by a Bristol Siddeley Odin ramjet which ensures excellent manoeuverability under all flight conditions.

Other leading contractors working with Hawker Siddeley Dynamics are Sperry Gyroscope, EMI, AEI, GEC, Ferranti and Vickers.

• • •

U.S.A.

All-Purpose Boat For Naval Air Stations

The Navy has recently accepted the first of ten new 40-foot aircraft personnel and rescue boats from the Grafton Boat Company. The heavy-duty all-purpose craft (refer photo below) is a refinement of the 40-foot utility boat now used by the Navy and Coast Guard. Diesel-powered, she has a speed of over 23 knots. The hull is steel and the superstructure is aluminium.

• • •

Sea Based Anti-Missile

A sea-based anti-ballistic missile intercept system (SABMIS) is being studied by Hughes Aircraft Company under a six month $700,000 US Navy contract. Designed to intercept missiles during the ascent phase of the trajectory, the primary effort is being directed toward the application of anti-ballistic missiles aboard surface ships. If approved, the system would take five years to develop. State Department interest is reported on the grounds that SABMIS might also protect other nations of the Western Alliance.

• • •

Hazardous Oceanography

U.S. Navy divers and civilian scientists recently carried out a most hazardous oceanographic environment study of the Long Tau shipping channel from Phu An, north of Saigon, to Can Gio where the Long Tau enters the South China Sea. It was a survey of some 35 miles of deep-draft chan-

nel, conducted under combat conditions with the men in constant danger from Viet Cong sniper-fire and mines.

During the survey, the team tested the water for temperature, salinity, conductivity, currents and sound velocity at some 65 different observation points. At each point, the divers obtained bottom core samples of the river bed and made other underwater measurements, such as visibility and bottom hardness.

* * *

Defence Budget

Included in the 1968-69 U.S. Defence budget, totalling $US77,000,000,000, sent to Congress by President Johnson on 29 January is $500,000,000 for converting Polaris submarines for the latest Poseidon missiles. Provision is also made for further "hardening" of Minuteman ICBM sites to make their destruction more difficult, a decision which postpones the building of a new generation of ICBM's beyond Minuteman 3, which slips from 1969 to 1970. Missile provisioning in general, however, rises from $2,600,000,000 in 1967-68 to $3,600,000,000 in 1968-69, a trend reputedly due to U.S. decision that aircraft-launched missiles hold greater promise for precision targeting in limited war. Aircraft procurement ($8,700,000,000 for fiscal 1969) is based on the Defence Department assumption that Vietnam needs are flattening out, after peaking at $9,700,000,000 in 1966-67, with $8,500,000,000 provided in 1967-68. Peak year for missiles was 1962-63 when nearly $4,000,000,000 was budgeted for various types.

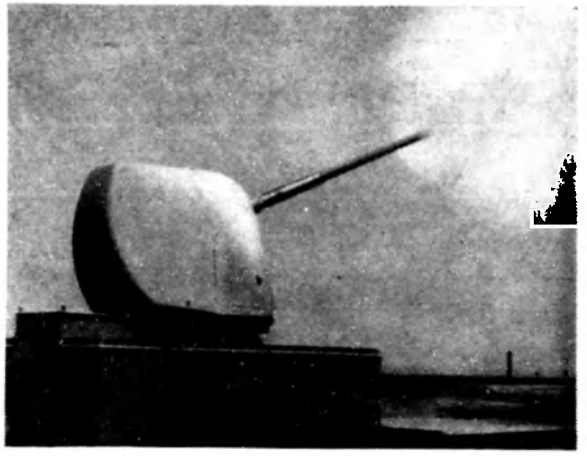
* * *

The VSX Programme

The U.S. Navy has obtained approval for the development of a new anti-submarine aircraft, to be called the VSX. Now comes the news that five ASW carriers are envisaged.

Each carrier would probably be capable of carrying up to 20 aircraft and, with spares, etc., the total number of VSX's expected to be ordered is in the region of 140, with a value of between $2,000m. and $3,000m.

U.S. naval officers, whilst delighted that the controversy of land-based versus carrier-based ASW aircraft has been settled in their favour, feel that the number of carriers ordered is insufficient for anti-submarine groups to be deployed in the Pacific, Atlantic and Mediterranean. A figure of nine, they say, would have been more realistic and with five probably only the Pacific could be recovered, the remaining areas having to rely on the Orion shore-based ASW aircraft.



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New 5-incher

The Navy's new 5-inch 54-calibre gun is test fired (see photo above) at the U.S. Naval Weapons Laboratory. The lightweight, fully automatic gun, can fire projectiles of more than 50 pounds for over 20,000 yards.

* * *

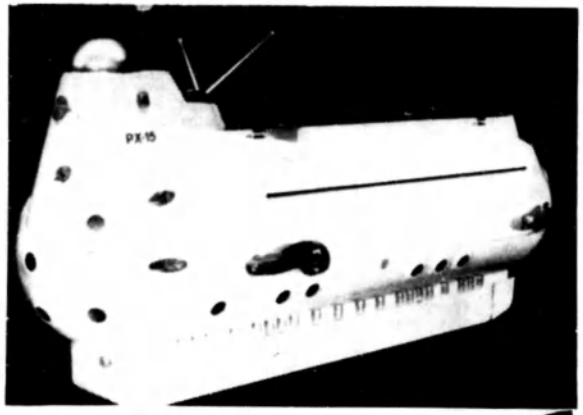
Phoenix Missile

U.S.N. is developing the Hughes-built Phoenix missile — designed initially for F-111B use against high-flying, missile-carrying supersonic bombers — for defence of ships against cruise missiles (such as the Soviet-supplied Styx missile which Egypt used to sink the Israeli destroyer ELATH last October). Senate Armed Services Committee was told recently by Navy Secretary Paul R. Ignatius that analysis of recent tests suggest that the Phoenix missile system will be effective both against air-to-surface and surface-to-air missiles. He expects basic performance characteristics of the Phoenix to be satisfactorily demonstrated by mid-1968, and the R & D programme is scheduled for completion in January, 1969. U.S. intelligence has reported locating what appear to be two Styx sites in North Vietnam.

* * *

Grumman/Piccard Craft

The PX-15 research submarine (see photo of model over page) is scheduled to make a six-week submerged survey of the Gulf Stream about June, manned by Jacques Piccard and five others. The craft, now under construction, will have 29 viewports, television, flood lights and photographic equipment for conducting acoustical and environment experiments. The 130 ton vehicle has a pressure hull 48 feet long with a 10-foot diameter. Operating depth is 2,000 feet below the surface.



Navy Develops ASR Rescue Ships

The U.S. Navy's new class of submarine rescue ships (ASR) will he unique in capabilities and design. These ships will serve as:

(1) Surface support ships for the Navy's new rescue submersibles.

(2) Submarine rescue ships employing the existing McCann Diving Chamber.

(3) The Fleet's major deep-sea diving support ships.

(4) Operational control ships for salvage operations.

These new ships have twin, catamaran hulls. This design will provide a large, deck area, to facilitate the raising and lowering of submersibles and underwater equipment, and to give the ship improved stability when operating equipment at depth.

Each hull of the ASR will be 251 feet long and have a beam of 26 feet. The well between the hulls will be 34 feet, giving the ASR a maximum beam of 86 feet. The ship's draft will be 19 feet with a full load displacement of 3,411 tons. Propulsion for the ASR will be provided by four diesel engines, producing a maximum of 6,000 s.h.p. to two propeller shafts. The ship will have a sustained speed of 15 knots with an endurance of 10,000 miles at 13 knots.

Space and weight are being reserved in the ASR for future installation of a ducted thruster in the bow of each hull to enable the ship to maintain position while stopped or at slow speed. For self-defence, the ship will be armed with two 3-inch 50-calibre dual-purpose guns and four 50-calibre machine guns.

Accommodations will be provided for a ship's complement of 6 officers and 109 enlisted men, a unit commander staff of 4 officers and 10 enlisted men to operate the submersibles of a Salvage Operational Control Centre.

Aboard the submarine rescue ship, the DSRV's will be carried in cradles on the ship's main deck. They will be lowered into the water on a two-section elevator through an opening in the main deck between the two hulls. The DSRV is lowered into the water and the forward and after elevator sections swing up and away, allowing the submersible to operate freely.

To receive the DSRV, the submarine rescue ship maintains a heading at zero speed and lowers two "capturing cables". The submersible locates these cables with its television cameras and sonar, moves between the cables, and engages them with small "capturing arms". The DRSV, with a slight negative buoyancy, then uses its ducted thrusters to move up toward the submarine rescue ship, being guided by the capturing cables. When about eight feet below the ASR, the DSRV will be engaged by "positioning arms" from the ASR which will raise the submersible to the surface. There the elevators will swing down and engage the DSRV.

The DSRV is then lifted to the ASR's main deck where the elevator cradle is disengaged from the elevator and the DSRV is transferred to a wheeled dolly. The dolly, which runs on athwartships tracks in the main deck, can then move the cradle with the RSDV to a position over decompression chambers built into the ship (if the rescued submariners require decompression) or to a storage area on the deck. This DSRV handling system is designed to launch and recover the rescue submersible in seas up to Sea State 3 and without the ship being moored.

As a secondary mode of recovery, there will also be provision for the ASR to recover a DSRV on the surface during calm sea conditions. In this operation the DSRV will approach from the stern, between the two hulls, and engage the capturing cables, held in position by twin booms. The DSRV is then towed between the hulls, engaged by the positioning arms, and raised by the elevator.

Additionally, the submarine rescue ship will carry the McCann rescue chamber. This device, developed in the 1930's, is a two-chambered diving bell which can be lowered by a cable attached to the disabled submarine. The McCann chamber can only be used to a depth of approximately 850 feet and the ASR must be moored precisely over the stricken submarine. In contrast, the DSRV is a free operating submersible which can operate to 3,500 feet (and eventually greater depths). The McCann chamber can carry 6 passengers per trip compared to 24 for the DSRV. Further, the DSRV can operate under ice and without concern for surface sea states or weather when supported by a "mother" submarine.

The submarine rescue ship's rescue control centre (RCC) will be the command post during a rescue operation. This compartment will have displays for a three-dimensional sonar tracking system which will show the position of the DSRV's in relation to the ASR

during the rescue. The RCC will also have displays for the ship's detection and tracking sonar; underwater telephones for communication with the disabled submarine, DSRV's, and "mother" submarines (if being used); and radios for communication with other ships, aircraft, and shore activities. The ship's radar and other equipment normally found in a Combat Information Centre will also be located in the RCC.

During deep-sea salvage operation, the new submarine rescue ship will serve as the primary diver support ship and operational command ship. For the former role, each ASR will have a Mark II Deep Diving System. This consists of two Deck Decompression Chambers, one in each hull, and two Personnel Transfer Capsules with related equipment such as the handling gear, winches, gases, cables, and control equipment required to operate the PTC's and DDC's.

• • •

P-3 Patrol Plane May Get Mortars

Feasibility of installing a cluster of 81-mm. mortars in the belly of a Lockheed P-3 patrol aircraft specially outfitted for night attack missions in Vietnam is being studied by Lockheed-California Company under the Navy's Trim Programme

The mortar cluster would be aimed downward from the aircraft. Lockheed has been conducting extensive studies and tests of Trim concepts for the Navy.

Navy's Omega Navigation Approved

Four stations for the Navy-developed Omega navigation system have been approved for operational use to facilitate operational evaluation.

The stations, located in Bratland, Norway; Port of Spain, Trinidad; Haiku, Hawaii; and Forestport, N.Y., will provide navigation coverage to an area of more than one-fourth of the world.

Omega, which has been under development by the Navy for some time, is an all-weather, general purpose navigational aid. The system provides navigation for aircraft, ships, and submerged submarines. The system continuously provides a position to a navigator in any weather. The operation of the receiver is quick, simple, and reliable. The transmitting stations transmit signals on 10.2, 11.3, and 13.5 kilohertzes (kilocycles). The lowest frequency and the one most generally used in Omega is 10.2 kilohertzes.

Omega has a potential of providing continuous world-wide position information, accurate to one mile during the daytime and two miles at night, and will be evaluated together with other existing navigation systems as well as those in an advanced state of development in connection with the formulation of a National Navigation Plan. The responsibility for the development of this plans was assigned to the Department of Transportation by Vice President Hubert Humphrey at the 13 July meeting of the National Council for Marine Resources and Engineering Development. The Department of Defence will participate in the development of the plan.

• • •

U.S.S.R. New Missile T-5-30

At the last Red Square Parade commemorating the 50th Anniversary of the Bolshevik Revolution in November, was a new missile (see photo below), solid-fuelled, about 45 ft. long, and bore the designation T-5-30. This has been variously described as a "submarine ballistic rocket" and a Fleet missile for coastal bombardment. Much larger than U.S. Polaris-type missiles, the range would obviously exceed 2,000 miles with a hefty nuclear punch. An indication that the missile is two-staged is given by the external conduit which runs almost the full length of the constant-diameter body with a break almost two-thirds up from the base. The warhead re-entry body, if this represents definitive hardware, is curiously bull-nosed.

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Helicopter Carriers

Further information has now come to light regarding the Russian assault-helicopter carriers. Two carriers have so far been built and one of them is reputed to be carrying out trials in the Black Sea.

The ships have been named MOSCOW and LENINGRAD and

Above: The new Soviet Fleet ballistic missile employing solid-propellant. It bore the serial number T-5-30.

are about 25,000 tons displacement. They carry 30 to 35 helicopters each, but cannot operate fixed-wing aircraft. Construction of a third similar ship is believed to be about to start.

* * *

Russian Strength in the Mediterranean

The latest figures on the number of Russian ships in the Mediterranean are: one 20,000-ton cruiser, five guided-weapon destroyers, four fast gunboats, six submarines (some probably nuclear), three armoured landing craft. There are also a number of supply ships.

The landing craft are reputed to have Marine Commandos on board whose role would appear to be very similar to Royal Marine Commandos.

The Americans assert that the Russian fleet would be no match for their Sixth Fleet, because the latter have got carriers and the Russians have not.

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THE BISMARCK CHASE

By David Paton, formerly Instructor Lieutenant-Commander, Royal Navy, and Plotting Officer in H.M.S. Suffolk.

Aboard H.M.S. SUFFOLK the dawn of 23rd May, 1941, gave no hint that the day was destined for making history. The 10,000 ton cruiser was once again on patrol in the Denmark Strait, between the north-west tip of Iceland and Greenland. The Strait is about 200 miles wide but, because of the ice which borders the coast of Greenland, the width of water in winter is roughly 100 miles. In summer, southerly movement of the ice may narrow the gap to as little as 50 miles.

For months we had been sailing this strip of water, reporting continuously on the state and position of the ice edge. At times wide splits would stretch across the bows as the great ship nosed her way along. At others the surface of the freezing water was covered with a jelly-like film of ice, which had the strange effect of eliminating all bow and stern waves.

By this time the crew had become accustomed to working under conditions of unbelievable hardship. Heavy seas, piercing winds, blinding sleet, and freezing spray all made a nightmare of long hours on watch. Yet inside the ship life proceeded much as usual. Four hours on duty and four hours off did not allow much time for relaxation.

In the plotting office there was always work to be done. Besides keeping a moment-to-moment record of the ship's position, a steady flow of naval messages would be received. These ranged from the emergency to the trivial, and it was not always possible to tell at a glance the importance of each, and what action, if any, should be taken. Reports would come in too from the recently fitted radar set. Radar was then in its infancy, and the SUFFOLK was one of the first ships to test the new equipment. It was largely due to this device that contact with the BISMARCK was maintained for so long.

Suddenly, at 7.22 in the evening, one of the lookouts sighted the BISMARCK and the cruiser PRINZ EUGEN emerging from a snow squall between the SUFFOLK and the ice. There could be no mistaking the vastness of the battleship at the point blank range of seven miles, though the somewhat inappropriate remark of a midshipman — "HOOD and PRINCE OF WALES, I suppose" — subsequently became legendary. The enemy ships were moving fast in a south-westerly direction roughly parallel to our own.

Action Stations.

This was the culminating moment of all those weary months of training and waiting. "Action stations" was immediately piped, full speed rung down to the engine-room, and a sharp alteration of course made away into the enveloping mist. Every second was vital. In a flash the first of a long stream of sighting reports was sent out; that stream which set in motion the elaborate chase that followed.

Meanwhile the SUFFOLK had increased speed and located the enemy ships with her radar. We could tell by the tremendous vibration that she was putting all her reserves into the chase. I had never seen the needle touch 30 knots before, and it was difficult to use the ruler on the plotting table. Every moment we expected the BISMARCK to open fire. At this stage, however, it was more important that we should maintain contact than force an action and be annihilated.

About an hour later H.M.S. NORFOLK, which had been due to relieve us on patrol, joined us and began to shadow too. So the pursuit continued at high speed throughout the night, moving roughly parallel to the coast of Greenland. I remember losing all sense of time, especially as in that latitude there is no true night but merely a kind of pallid twilight. Bully beef and hot cocoa were brought round from the galley. I have memories of the hot syrupy liquid spilling and sloshing over the deck. Perhaps that is the reason I can no longer stomach it. Throughout the time we were sending out a succession of messages, reporting the enemy's position, course, and speed.

The German battleship BISMARCK.

At home, the intelligence services had already anticipated the enemy intentions, and as a result H.M.S. HOOD and H.M.S. PRINCE OF WALES had hastily put to sea shortly after midnight on 21st/22nd May. On Friday 23rd they were south of Iceland. In the evening they received our sighting report and had set course to intercept the enemy on the morning of the 24th.

Meanwhile the visibility had become patchy and the weather was deteriorating. Just after midnight the SUFFOLK lost the enemy for a time, and it was feared they might have doubled back to return the way they had come. But contact was regained at 2.47 in the morning; we all knew that action was imminent and was only a question of time and place.

Early Disaster.

With the pale light of morning, the HOOD and PRINCE OF WALES intercepted the enemy and the British ships opened fire at about six o'clock. The orange flashes on the horizon showed that the enemy had replied. Almost at once the HOOD was hit, and a great column of flame shot into the air, followed by an immense pall of black smoke. The shells must have penetrated her magazine. In an instant the stately ship and all but three of her gallant crew of over 1,400 had perished. Apart from the magnitude of the disaster, a dazed feeling of incredulity seemed to engulf us all.

The PRINCE OF WALES, too, had sustained damage. One of her turrents was out of action, and on the bridge all except the captain had been killed or wounded. She had only recently been commissioned and, owing to defects, was still carrying civilian workmen. But the enemy had not escaped entirely, and her speed had been reduced. She also left tell-tale patches of oil on the sea. So the chase continued, with the enemy ships heading for the safety of the ocean ahead, followed closely by the PRINCE OF WALES and the British cruisers.

After mid-day the enemy altered course to south. At the same time the weather got still worse, and patches of mist and rain got thicker and more frequent. We decided to close the range so as to maintain contact. As each successive storm hid the German ships, it became crucially important to proceed warily. At about half past six in the evening the enemy entered a particularly thick squall. An uncanny sense must have warned our captain to beware of an ambush. Suddenly the great battleship loomed through the mist about ten miles off. Immediately we altered course and at the same time opened fire with the main armament. The noise was deafening. The Bismarck, too, was firing, and after what appeared to be an interminable wait the great fountains of water rose into the air nearby. From the comparative safety of the plotting office exploding shells sounded like extra loud machine gun fire. We made violent alterations, of course, and also laid smoke in order to escape the enemy's fire. The PRINCE OF WALES had come to our assistance but the enemy once again turned to the south and tried to elude the British ships at high speed.

By this time the ship's company had been at action stations for 24 hours, and tiredness was inevitable. We tried to snatch an hour's rest in turn if opportunity allowed. Outside, the sea was rising and the visibility getting worse. We were no longer in the Arctic circle, and darkness was now adding to other difficulties.

From the reports coming into the plotting office it became apparent that H.M.S. KING GEORGE V and H.M.S. VICTORIOUS would soon be in the vicinity Late in the evening a great cheer went up when we heard that torpedo-carrying aircraft from the VICTORIOUS had made an attack and secured one hit. These attacks had been carried out with great gallantry from a carrier newly commissioned and not properly operational.

Conditions became worse than ever, and in blinding rain and mist we lost contact at about 3.6 a.m. on May 25. The enemy ships must have made a sudden turn, and for the time being had eluded their pursuers. (We did not know at the time that the PRINZ EUGEN had been detached about nine hours previously.) This was a serious setback to the operation. We continued to search with the NORFOLK to the south-west, but only after another 24 hours, when the BISMARCK had been located heading for the safety of Brest, was any relaxation possible. By this time all I wanted was sleep. Men were sleeping on their feet and carrying out duties as if in a dream.

The BISMARCK in action against HMS HOOD and HMS PRINCE OF WALES. This photograph was taken from the PRINZ EUGEN.

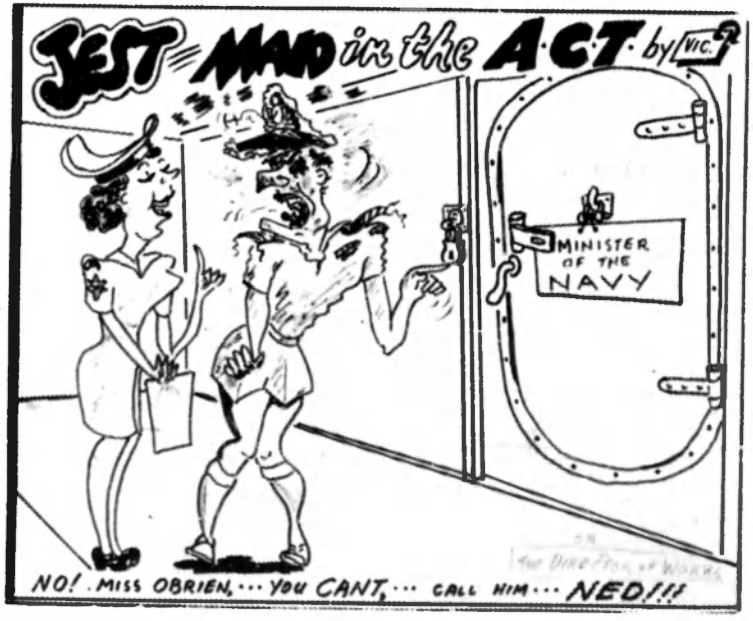
EPILOGUE

The subsequent events are now well known. The BISMARCK was located by a Catalina aircraft at 10.30 a.m. on the 26th, apparently making for Brest. At this time the Commander-in-Chief in H.M.S. KING GEORGE V was steaming in the same direction, but about 130 miles behind. He could not hope to force an action unless the enemy's speed was reduced. In the evening of that day the BIS-

HMS HOOD blows up.

MARCK was attacked by Swordfish from the carrier ARK ROYAL, and a hit was obtained which damaged her rudder and propeller. From then on she was doomed. After being harried all night by destroyers under the command of Captain Vian, she was at last brought to action at about 8.45 a.m. on May 27. She was silenced by gunfire from the KING GEORGE V and RODNEY, but she had been so skilfully designed that in spite of a terrifying pounding she refused to sink. With colours still flying she was finally sent to the bottom by a torpedo from H.M.S. DORSETSHIRE. So ended her first and last voyage and, though unknown at the time, so ended the enemy's final attempt to cut the Atlantic shipping lines with surface ships.

Of the memories I recall, the most vivid is the tragic end of H.M.S. HOOD and the desolate feeling which followed. But there are others in more cheerful vein. The splendid sight of the first lieutenant — a veteran of the Battle of Jutland — who calmly knitted socks during lulls in the action. The chaplain, who had a roving commission on these occasions, and who always brought a word of cheer to his parish'. And, finally, the iron-nerved captain, whose magnificent skill and judgment brought new battle honours to the ship, whose motto was "Nous maintiendrons".



IVAN BUILDS A CARRIER

The story of Russian seaborne air

By NORMAN POLMAR

Washington Correspondent to "Navy"

The U.S. Government has revealed that the Soviet Navy is building one and possibly two aircraft carriers to operate helicopters. Reportedly, the first carrier underwent initial sea trials in the Black Sea this past fall and the second ship is on the building ways at Odessa.

The estimated length of these new carriers is 650 ft. over all, full-load displacement 23,000-25,000 tons. They are reported to have rather large island structure forward, including A.A. guns, bridge and anti-submarine weapons.

Thus, the Soviet Union joins all other major sea powers of this century in building (or, in the case of Italy, converting) aircraft carriers. U.S. sources have not revealed whether intelligence indicates the Soviet carriers will have anti-submarine helicopters or operate as commando ships with troop-carrying helicopters embarked. The former role appears more likely at this time because of Soviet concern for U.S. and British nuclear-powered submarines, especially those armed with Polaris ballistic missiles. Although the Soviets have a large shore-based naval air arm, they are not believed to have a large number of A/S patrol aircraft similar to the British Shaekleton or the American P-3 Orion. Helicopter carriers would enable the Soviets to extend the combat radius of A/S helicopters. The most likely candidicandidate for the flattops is the Kamov Ka-20 (NATO code name 'Harp'), a turbine-powered, tandemrotor helicopter. Of course, the ships easily could be converted to the commando ship role should Soviet Naval requirements call for such a capability.

Looking further into the future, the Soviet Union is developing fixed-wing vertical take-off and landing (VTOL) combat and transport aircraft. Such planes could operate from helicopter carriers.

Could this be the beginning of a large carrier-building programme? John Slinkman, the editor of the Navy Times newspaper, has observed: "That the Soviets are building a smaller carrier does not mean they think the big attack carrier is outmoded. Starting from scratch they can get the smaller ones much faster than they can develop and build the U.S. type of attack carrier."

Periodically there have been imaginative and intelligent Soviet naval planners. Indications are that the current Soviet naval leadership is of a high calibre.

Several times in the past the Soviets have attempted to build aircraft carriers; indeed, one aircraft carrier has even flown the hammer-and-sickle ensign.

Czarist Russia developed a large naval air arm prior to World War I. Russian naval aviators flew a variety of aircraft in the War, including the wold's first four-engine bombers; others — among them air-power intellect Alexander P. de Seversky — test-fired rockets and an 82-millimetre cannon from aircraft; and Russian Navy fighters were equipped with 37-millimetre cannon in adition to the lighter machine-guns common to other aircraft of the War.

The War, Revolutions, Civil Wars, and Allied intervention in Russia destroyed this naval air arm. However, its rebirth was rapid and by 1925 Soviet naval air strength reached some 300 to 400 seaplanes in addition to a few landplanes. New land-based aircraft became available to the Red Navy and by the outbreak of the Germano-Soviet War in June 1941 the Soviet naval air arm is believed to have had as many as 1,000 aircraft, most of them land-based fighters and bombers; by war's end Soviet naval aviation numbered some 2,500 aircraft.

Despite this development of naval aviation under both the Czars and Commissars, there was no serious effort at aircraft-carrier development by the Russians. From the Revolution of 1917 until 1927 the insecure Soviet leadership could not afford the time or money to undertake warship construction. The situation was explained by Naval Commissar V. Zof at the Soviet Naval War College in 1925 when he declared: "You speak of aircraft carriers and of the construction of new types of ships . . . at the same time completely ignoring the economic situation of our country and the corresponding condition of our technical means, completely ignoring the fact that perhaps tomorrow or the day after we will be called to fight. And with what ships shall we fight? We will fight with those ships and personnel that we have already."

The first post-revolution naval construction in Russia was begun in 1927, just as the German parliament began public discussion on the proposed construction of armoured ships (popularly known as POCKET BATTLESHIPS). The first Soviet-built naval vessels were submarines, part of a new Soviet maritime strategy of 'offensive defensive' whereby submarines and light surface warships, working with aircraft, would be capable of undisputed control of Soviet coastal waters. Thus, destroyers, torpedo boats, submarines, and naval aircraft became the principal weapons of the Red Navy.

But this concept was not compatible with external influences: other nations, even within treaty limitations, were operating and building large warships: Japan, a major naval power, was pushing against Soviet interests in the Far East. Although the Soviet leadership hoped to concentrate on light naval forces, they were forced to defend their own right to build major warships.

In 1934 the Soviets began the construction of 2,900-ton (light) destroyer leaders and a year later the Soviets began their new cruisers, 8,500-ton ships armed with 7.1 inch guns. (Those completed were slightly heavier and were armed with nine main guns.) By 1937 the Soviets were asking the United States for battleship plans and were inquiring into the possibilities of such ships being constructed in U.S. shipyards.

Premier Joseph Stalin told the Supreme Soviet in January of 1938: "The powerful Soviet State must have a sea-going and ocean-going fleet consistent with its interests, worthy of our great task." (But that same year a Stalinist purge executed the older naval commanders who had big-ship experience).

The construction of aircraft carriers was inevitable under such a programme and in 1939 the keel was laid down for a 12,000-ton aircraft carrier as were the keels for two 35,000-ton battleships. The carrier was purported by some sources to be named STALIN and by others to be christened KRASNOYE ZNAMYA. Francis E. McMurtrie, warship authority and editor of **Jane's Fighting Ships** during the period, reported that the 12,000-ton carrier KRASNOYE ZNAMYA was laid down at Leningrad in 1939; a second ship of the same type, to be named VOROSHILOV, was later reported to have been laid down that same year. Each carrier was to operate 40 aircraft.

Mr. McMurtrie did list another aircraft carrier to be named STALIN, describing her as a 9,000-ton ship laid down as a cruiser in 1914. Originally named ADMIRAL KORNILOV, her construction was said to have been suspended until 1929 when she was re-designated as an aircraft carrier. This STALIN was credited with a 22-plane capacity and was expected to be finished in 1939. Regardless of the facts, none of these aircraft carriers survived the war; not even their bones remained as the Soviets scourged all available metals for their war industries during World War II.

Technically an aircraft carrier did fly the hammer-and-sickle ensign. The scuttled German carrier GRAF ZEPPELIN was captured by the Soviets at the end of World War II and, after being refloated and loaded with booty, she was taken in tow across the Baltic Sea. In rough water — and possibly a storm — her heavy load caused her to sink. Popular accounts to the contrary, she was not salvaged, but lies in the Baltic depths as mute testimony of the Soviet's lack of knowledge about aircraft carriers construction and centres of gravity.

Soviet naval policy for the post-war years was announced on 28th July, 1945, when Stalin declared: "The Soviet people wish to see their fleet grow still stronger and more powerful. Our people are constructing new battleships and bases for the fleet . . ."

But there was no evidence of warships larger than cruisers being laid down during the Stalin era. Late in the 1940s the Soviets began laying the keels for a large number of light cruisers, comparable in size with earlier heavies (15,450-tons light, armed with 12 5.9-inch guns). Seventeen of these ships were launched and 14 were completed, some having subsequently rearmed with guided missiles. Periodically there have been rumours that the finished ships were delayed to allow their reconstruction as aircraft carriers, but there has been no evidence of such action. When one of these SVERDLOV-class cruisers was transferred to Indonesia in 1962 it was even reported that one of the unfinished ships in the class was being completed as a carrier for Indonesia!

Stalin's successor Nikita Khruschev opposed the development of conventional surface ships, dismissed the head of the Navy claiming he was trying to fight the next war with weapons of the last, and declared that cruisers were only good for carrying political leaders on visits and firing their guns on salutes. Still, in the mid-1950s, under the Khruschev regime, the Red Navy began another major warship programme, this based on large destroyers. The first ships were armed with guns, but more recent units have advanced anti-aircraft and anti-shipping missiles. Later ships also have gas-turbine power plants and elaborate electronic equipment.

This belated increase in surface warship construction was coupled with an increase in naval air strength, reaching a peak of some 4,000 planes about 1957. With this new Red Fleet came an increase in world-wide naval and merchant operations.

Although Soviet leaders periodically ridiculed U.S. and British carrier operations in this period, their concern for the flattops was evidenced by the use of surface warships, submarines, electronic-laden trawlers, and reconnaissance aircraft to keep tabs on the ships. A high-level Soviet attitude towards carriers was revealed by Marshal of the Soviet Union Vasiliy, D. Sokolovsky in 1962, when he wrote that the role of the Red Navy in future wars "Will be to defeat the enemy naval forces, primarily the defeat of carrier based shock units and the annihilation of rocket-carrying nuclear submarines, and also the disrupting of enemy naval communications." Marshal Sokolovsky's credentials include having served as First Deputy Minister of Defence of the U.S.S.R., and Chief of Staff of the Soviet Army and Navy from 1949 until 1960.

The current growth of the Soviet Navy includes the recent development of a number of advanced classes of destroyer-type warships and amphibious assault ships.* This is again coupled with a surge of Soviet naval and merchant operations, the reinforcement of the Soviet squadron in the Mediterranean and the arms pipeline to Eygpt and North Vietnam being the most evident examples. The Soviet acquisition of aircraft carriers — albeit helicopter ships at this time — is a further manifestation of Soviet Union's "super power" status.

* See "Naval Baffins Do It Again", The Navy, February-April, 1968, Page 39.

ANNUAL REPORT OF THE VICTORIAN DIVISION OF THE NAVY LEAGUE OF AUSTRALIA, FOR THE YEAR 1967

This is my first report to you since I became President of the Victorian Division of the League in September last, and so relieved Mr. R. H. Collins who had served three consecutive annual terms in a difficult period when a number of changes were being made to the Federal Organisation of the League.

With regard to the office of President, the League is now fully operative as an "Incorporated Organisation with a structure similar to that of a Public Company. The members (shareholders) elect the Executive (or Board of Directors) and the Executive in turn elects the President, or Chairman of the Board. I mention this because some people wondered why the President was not elected at the last Annual Meeting by the members as in the past. I should add that "incorporation" involves a number of legal advantages which I do not propose to go into now.

THE EXECUTIVE

At the Annual Meeting the following members were elected: Cdr. G. Ashley-Brown; Mr. W. Bell; Mr. R. H. Collins; Lt. Cdr. F. G. Evans; Captain C. I. Flaherty; Captain G. J. Fowle; Cdr. R. A. Nettlefold; Captain I. H. McDonald; Lt. Cdr. W. Speakman.

Since then the Executive has been increased to include: Captain Sam Benson, M.H.R.; Mr. J. H. Paterson; Sir Kenneth Luke

THE NAVY LEAGUE BALL

Under the imaginative leadership of Lady Burrell the Ladies Committee organised a very successful Dinner-Ball on 3rd October last. The change from the usual Oaks Eve date was made to bring the Ball into "Navy Week" which is celebrated in early October each year, and is considered a more appropriate period for our function than Race Week. I have used the term "successful" as it was socially most enjoyable and from the financial point of view, the Executive subsequently received a cheque for $1900.

The 1968 Dinner-Ball will be held on 3rd October; the Ladies' Committee is extremely energetic and apart from the Ball has arranged a picnic-visit to the Chateau Tahbilk on Sunday, 25th FeLruary, 1968. It is up to us all to support the Ladies' Committee, and in anticipation of this support, a "Notice" has already been forwarded to you concerning the Chateau Tahbilk visit.

FINANCE

You may wonder why the League requires a fairly substantial income, and I remind members that we are still responsible for the provision of accommodation and administration of the Australian Sea Cadet Corps. (The Navy provides uniform, training equipment, etc.). We estimate that in the financial year 1968, some $2,500 will be required to maintain the existing seven "Open" Units, without any provision for additional Units.

As many additional Units are required throughout Australia, steps have been taken to relieve the League of at least part of it's financial burden, but this is in the future, and in any case the League will always have an obligation to the Sea Cadets, an organisation which it raised and has maintained for very many years.

OBJECTS OF THE LEAGUE, & VISIT BY THE MINISTER FOR THE NAVY

We have several "objects' apart from supporting the Sea Cadets, not the least being to ensure the provision of adequate Naval defence for the Commonwealth and support of the Naval Service generally.

So that members of the Executive can become better informed of Naval "thinking", and be in a position to exercise an independent and objective sense of judgement, we have decided to invite to our meetings from time to time, persons holding high office in the community.

To further this policy, the Minister for the Navy, the Honourable Don Chipp, M.P., willingly agreed to be our first "guest," and attended the December Meeting of the Executives.

The discussions with the Minister were extremely interesting, and it is hoped that other persons from whom we can learn, and also, to whom WE can express our own views, will attend some of our future meetings.

SEA CADETS

The Geelong Unit, T.S. BARWON, was nominated as the top Unit in Victoria following the 1968 Annual Inspection, and received custody of the Sea Cadet Colour at a ceremony held in Geelong in November last. Councillor Sir Roy Fidge, Mayor of Geelong and a former Reserve Officer, effected the Transfer.

Yours Sincerely,

F. G. Evans,
PRESIDENT.

Our cameraman at the Investiture, Government House, Melbourne, 1968, photographed three of the Service personnel recently honoured by Her Majesty the Queen. Left to right: Lt.-Col. Allen; Squadron Leader Hibben, A.F.C.; and Lt. Commander F. G. Evans, M.B.E., V.R.D., RANR, President, Victorian Division, The Navy League of Australia and Senior Officer ASCC.

"The Civilian Arm of the Navy"

The principal objective of the Navy League of Australia is to stress the vital importance of Sea Power to the Commonwealth of Nations and the important role played by the Royal Australian Navy.

The League, in conjunction with the Commonwealth Naval Board, administers the Australian Sea Cadet Corps, by providing finance and technical sea training for boys who intend to serve in the Naval or Merchant Services, also to those sea-minded boys, who do not intend to follow a sea career, but who given this knowledge will form a valuable reserve for the Naval Service.

We invite you to swell our ranks and so keep up to date with Maritime Affairs to help to build an ever-increasing weight of informed public opinion. The Navy League will then become widely known and exercise an important influence in the life of the Australian Nation.

The League consists of Fellows and Associates. All British subjects who support the objectives of the League are eligible for membership. Members receive copies of the League's magazine "The Navy".

DIVISIONS

New South Wales — Box 1719, G.P.O., Sydney, 2001.
Victoria — Room 8, 8th Floor, 528 Collins Street, Melbourne, 3000.
Queensland — Box 376E, G.P.O., Brisbane, 4001.
Tasmania — 11 Quorn Street, Sandy Bay, 7005.
South Australia — 30 Pirie Street, Adelaide, 5000.
Western Australia — 182 Coode Street, Como, 6152.
Australian Capital Territory — 60 Limestone Avenue, Ainslie, 2602.
Northern Territory — C/- H.M.A.S. Melville, Darwin, 5790.

THE NAVY LEAGUE OF AUSTRALIA

Application for Membership

To: The Secretary,
The Navy League of Australia,

(.....Division).

Sir,

I am desirous of becoming a Fellow of the Navy League of Australia with whose objects I am in sympathy.

Name (Mr.) (Mrs.) (Miss) (Rank) .....

Please Print Clearly.

Street ..... Suburb .....

State ..... Post Code .....

Signature ..... Date .....

Enclosed is a remittance for $4.20 being my first annual subscription.

AFTER COMPLETION, THIS FORM SHOULD BE DISPATCHED TO YOUR DIVISIONAL SECRETARY — NOTE LIST OF ADDRESSES ABOVE.

- H.M.A.S. MANOORA -

By BARRY JONES

With the outbreak of the Second World War, the Royal Australian Navy, which lacked the number of ships considered necessary for large scale war operations, requisitioned several ships on the Australian Coastal Trade.

One of these ships was the coastal passenger vessel MANOORA, owned by The Adelaide steamship Co. Ltd. Taken oven on October 14, 1939, for service as an Armed Merchant Cruiser (A.M.C.), as such she mounted seven six inch guns and two three inch anti-aircraft guns.

MANOORA, commissioned into the R.A.N. on December 12, 1939, at Sydney, under the command of A. H. Spurgeon, R.A.N., however, conversed to an A.M.C. was not completed until February 5, 1940. In March she sailed for Darwin, arriving on the 29th and thence to Macassar near Borneo, where she maintained a patrol until relieved by H.M.A.S. WESTRALIA in April.

In the same month Germany invaded Denmark and Norway and as a result the British Admiralty sent a signal to the Australian Naval Board saying that all Danish and Norwegian ships in the area were to be taken under British protection: As part of this operation, MANOORA intercepted the Norwegian tanker, HAVBOR, and escorted her, with another Norwegian tanker, THORDIS, to Darwin, leaving that port on April 15, and proceeding to Brisbane via Thursday Island. May found MANOORA in New Guinea, and she remained in those waters until the 22nd when she arrived at Townsville.

On May 31, the ship was at Hervey Bay, Queensland, when she was instructed to shadow the Italian merchant vessel ROMOLO, then at Brisbane. On June 5, the ROMOLO sailed, with MANOORA at a respectable distance. This continued until the 9th when, with no sign of Italy entering the war, the Australian ship discontinued the operation, but the chase was resumed later that day, the quarry being sighted on the 12th, however the distance between the two ships was thus that MANOORA could not reach the ROMOLO in time to prevent the ship being scuttled. The 129 people on board the ROMOLO were picked up by MANOORA, which later took on board the crew of the vessel ADMIRAL WILEY, this ship having run ashore on a reef at Kitava Island. MANOORA arrived at Townsville on June 17, 1940. The rest of June and the remainder of the year was spent on the Australian station

In January, 1941, MANOORA commenced patrols in the Ocean Island area, returning to Sydney on April 3, but maintained the Ocean Island patrol in May. MANOORA remained active throughout the following months, reaching Singapore on December 6, 1941, where two days later the ship experienced her first Japanese air raid. However, no damage was suffered and she continued her operations as an Armed Merchant Cruiser until September, 1942, when she arrived at Sydney to be converted to a Landing Ship Infantry (L.S.I.).

The job of converting MANOORA into L.S.I. was no simple task. It involved much re-working of her initial accommodation to provide for the troops which the ship would later carry. One innovation that would make things a lot easier was the installation of a fresh water distilling plant. New boat davits which would carry the landing barges were fitted to the deck and the armament increased.

Her first operation was to transport Australian troops to Milne Bay (New Guinea). This she did in company with another Australian L.S.I. WESTRALIA. Both of the ships were escorted by the destroyer U.S.S. DRAYTON. The group arrived at Milne Bay on August 4, 1943. MANOORA, continued to carry troops to the New Guinea area until February, 1944, when she commenced overseas service. A change in command occurred in January when A. P. Cousin assumed command.

The largest operations in which MANOORA participated were the two Phillipines landings. The first was at Leyte (Panaon) on October 20, 1944, three R.A.N. landing ships were present: KANIMBLA, WESTRALIA and MANOORA. Approximately 540 allied ships took part. The second landing at Lingayen was on January 9, 1945, and 955 ships were present.

These operations were followed by landings at Brunei, Tarakan and Balikpapan in Borneo.

With the ending of hostilities, MANOORA commenced repatriating troops to Australia. In this role she visited the New Britain-New Guinea-Morotai and Borneo areas. The ship also made several trips to Japan.

On December 6, 1947, MANOORA was paid off, ending her naval service after steaming 339,710 miles, and was converted to her original state as a passenger vessel, returned to her owners, The Adelaide Steamship Co. Ltd., in which service she remained until sold to the Indonesian Government on August 15, 1961, and renamed AMBULOMBO.

I met the young husband in the street and asked him what sort of a cook his wife was.

"Mind you, I'm not saying she isn't a god cook," the husband replied.

"But now I know why her her family prays before every meal."

* * *

"Our Canberra correspondent reports that a foreign delegate to the United Nations was motoring along a country road and stated that he had been shocked by the "open display of sex-mindedness in that part of the Country."

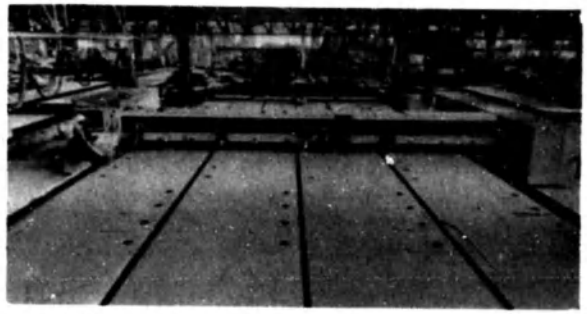
When asked what he meant specifically, he said "Well, as I drove along the highway it confronted me again and again. First it was 'soft shoulders', then 'dangerous curves', six gals for $2', try 'Ethyl' and finally 'Watch out for children'."

WHAT'S NEW?

Compile by "Periscope"

NEW RADARS FROM RAYTHEON

Two completely new series of 10 cm. and 3 cm. high-power transistorised radars are announced by Raytheon-Copenhagen. Increased transmitter power, new high-gain antennae, and high data rates are features of the sets in this series. Together they provide a wide choice to embrace high-definition requirements and long-range requirements. Our picture shows a 16 in. display with an aluminised brilliant picture tube.



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SHIPS BY THE NUMBERS

Hitachi Zosen of Osaka, Japan, one of the world's largest shipbuilders, has developed a system for automatically cutting a number of complicated ships' plates from heavy steel (photo) by means of numerical value controls punched on tape. The system, called HIZAC (Hitachi Zosen Auto-Cording) utilizes points, straight lines and parabolas as basic elements to automatically produce, by means of a computer, cutting instructions for any given design. The computer tapes information regarding the cutting sequence and other essential data. As this is fed into a diagraming machine to cut the steel, it simultaneously produces the design for the plate so that this can be checked back against the original blueprint. Hitachi Zosen says its method makes unskilled workers capable of high productivity with only ten day's training.

* * *

STICKLERS

To meet the problems of handling heavy equipment on slippery and slanting surfaces (e.g., the decks of rolling ships), the Avon Rubber Co. Ltd., of Melksham, England, has developed a new "cling" solid tire, made of a specially compounded rubber. The tires were developed specifically for the British Navy Department which specified that they must not slip on wet wood or steel surfaces with an angle of up to 25 degrees. Accepted by the British Navy, the solid "cling" tires now are being made available in limited quantity for commercial users whose trucks work under wet and slippery conditions.

* * *

PLASTICISED DECK-CAULKING

A new plastic material for caulking decks is claimed by its British manufacturers to possess much more residue elasticity and greater adhesion than more orthodox jointing materials, and to have the added advantage of being quicker to lay.

It is said to make both marine glue and oakum obsolete.

The material is based on polyurethane involving a mixture of polyol and di-isocyanate. Because of its special properties, it is suited to differing climatic conditions as well as generally conforming to the changing profile of the joint. It adheres to all timbers providing the seams are clean and dry, and can be used on old decking which needs re-caulking. No priming is required even with teak decks.

The material, called Dexena, can be planed and sanded only a few hours after the seam is filled. It is completely waterproof and weatherproof. The firm can also supply a special compressed air driven mixing and dispensing machine.

SHORT CUT

A promising new method for direct conversion of heat into electrical energy (eliminating conversion of heat into steam and steam into mechanical energy) has been announced by Japan's Agency of Industrial Science and Technology. In experiments at the Hitachi Research Laboratory, electricity was produced through the interaction of a magnetic field and fast-moving, high-temperature gases or plasma. The process, known as magneto-hydrodynamics, produced 1.9 kilowatts of electricity during 110 hours of continuous operation. Plasma temperature was about 2,700 degrees K (Kelvin Scale, based on thermodynamics with starting point of zero) at the generating duct inlet; speed of the plasma across the magnetic field was approximately 2,300 feet per second. AI&T anticipates completion of a large pilot plant by 1972.

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SHIPS TV AND SRE SYSTEMS

Picture (below) shows a television studio, designed and installed by Peto Scott Ltd. in each of five Country-class destroyers. And from Redifon Ltd. details have been released of the Company's new SRE system and Communal Aerial amplifier. This is a low cost system providing for the operation of up to 100 personal broadcast receivers from a single aerial, without restriction on the individual selection of programmes.

• • •

REFERENCE BOOK FOR SEA-GOERS

A unique reference book giving detailed information about wave conditions on most of the world's main shipping routes has just been published in Britain.

Oil companies and other fleet operators interested in optimum routes for the purpose of logistics planning are among those expected to make use of the new publication's comprehensive information.

The book, entitled "Ocean Wave Statistics", contains more than 3000 tables covering the height, period and direction of waves in 50 sea areas. These are derived from some million observations made by the officers of 500 British vessels between 1953 and 1961.

The project was initiated by the British National Physical Laboratory's Ship Division at Feltham, near London, so that it would be in a better position to advise shipowners on wave conditions to help research on the sea-going quality of ships.

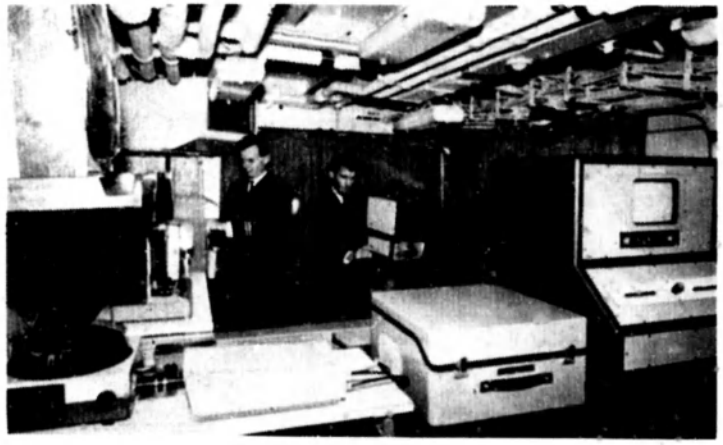
Designs benefits which may result from the wider and more reliable knowledge of wave conditions derived from the book include weight saving, better hull design and the prevention of bulk shifting in cargo vessels plying specified routes.

Keen interest is being shown in the book in Britain and other countries by ship designers, builders and operators. It is expected to interest those engaged in civil engineering, oceanography, meteorology and fisheries research.

• • •

ACOUSTIC CLADDINGS

A method of acoustically cladding high-performance diesel engines has been developed by members of the Royal Naval Scientific Service at the Admiralty Engineering Laboratory and progressed under contract by Messrs. Napier & Son Ltd. The basic principle is that of covering the engine completely with a blanket of resilient polyurethane open-celled foam supporting a heavy external skin. The mass-spring relationship of heavy coating and soft foam results in a low natural resonance frequency, giving an attenuation of vibration between engine surface and the external skin of the cladding. The inner skin is of reinforced resin and fits the general contour of the engine, but is not attached to the engine surface. The two-inch-thick polyurethane foam is bonded to this inner skin and to an outer skin which is itself a sandwich consisting of a



thin lead sheet between two layers of glass-reinforced resin.

Very useful reductions in noise have been measured under test conditions, making speech possible and ear-defenders unnecessary. No rise in temperature of the water-cooled engine was experienced and, as the cladding is designed to be removable in panels, maintenance is unaffected.

• • •

SUPPER ZIPPER

A pressure-tight fastener, operating on the zipper principle, but guaranteed 100 per cent leakproof against liquids, air, gases and light, is being made available to industry by the New Zipper Co. Ltd., of Slough, England, which developed the unique fastener for military applications. The BDM Sealed Slide Fastener has interlocking teeth, similar to those of a conventional zipper, and is opened and closed with an easy-working slide pull. But its teeth serve to pull tightly together and to hold firmly interlocking rubber gaskets both inside and outside the fastener. The result is an absolutely tight but flexible linear seal that can be made in any length. It has been applied to high-altitude, pressurized flying suits, to inflated submarine escape and immersion suits (refer photo) and sealed hospital isolation and anti-contamination tents. The manufacturer also anticipates numerous civilian applications. Price: 85 cents to $2.75 per linear foot (depending on size of zipper), plus $1.40 to $5.20 per fastener for slider and end-seals.

Aluminaut is made for deep-ocean diving

Interested in spotting old shipwrecks lying in water some 3000 ft. deep off the Southern Coast of the United States? Or in how it looks or feels to inch along the oceans' floor at depths ranging to 9000 ft.?

Ocean researchers now can get a "cut-rate" first-hand look at the mysteries of the ocean floor in the Aluminaut, the world's deepest diving submarine, according to Arthur L. Markel, Vice-President and General Manager of Reynolds Submarine Services Coroporation, which operates the Aluminaut.

Each dive will be scheduled for a particular field of interest, such as general oceanography, marine biology or geology.

Other dives will be offered to gain information on undersea structures, sunken ships, search and salvage operations and pipeline and cable inspections.

Under the plan, three to four research-passengers will be taken on each dive. The cost per person using this method, will be substantially lower than if a single individual were to charter the vessel for a project. Cost for the dives will range from $1250 to $4,500 per person per day of diving, depending on the depth of descent.

The Aluminaut will provide all basic instrumentation required, and special instruments can be accommodated in many cases. Samples from the ocean bottom can be obtained with the Aluminauts' grappling arms.

The Aluminaut is a 51 ft. aluminium-hull submarine owned by Reynolds International, Inc., a subsidiary of Reynolds. It has worked under contact for the Department of Defence in the search for the missing H-bomb off spain, for the Navy in tests of equipment and special missions, and for marine cable inspection for American Telephone & Telegraph.

Ih has made for than 150 dives and holds the present world record submarine dive to 6250 ft.

Detailed information on the cruises is available from Reynolds Submarine Services Corporation, 1,901 North Fort Meyer Drive, Arlington, Virginia, 22209.

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.

Can you help your Editor?

I have received many requests from readers, asking me to include more articles in "The Navy" concerning —

1. The foundation, history and early personalities of the Royal Australian Navy, and
2. Warship advancement 1900 - to date (all navies)

Naturally, I will be delighted to research these subjects, however, my handicap is lack of reference material. I would therefore be appreciative if any readers possessing any works of reference (books, photographs, magazines, etc.) and who would be willing to donate same, kindly forward this material to:

The Editor,
"The Navy" Magazine,
Box C178, Clarence Street Post Office,
SYDNEY, N.S.W. 2000. AUSTRALIA

Persons interested in writing for the magazine (in an honorary capacity) on the above subjects are invited to forward manuscripts for consideration.

All material received will be acknowledged in future editions of "The Navy".

— EDITOR

I hove received reference material from Rear Admiral H. A. Showers, C.B.E. and Mr. Vic Burley; also advice from Mr. Jack Millar and Mr. John Mortimer, and I am extremely grateful for their co-operation.

DENNIS TRICKETT,
Editor.

Breaking a Ship on Purpose

By DAVID WILSON

If somebody planned to build a ship wholly of plastics, how could you tell that it would be safe to sail in a storm. How could you tell that the reactor on board a nuclear-powered ship would remain safe even after the worst possible collision of ships?

Naval architects and the ship designers, aided by computers, can make calculations, but in the face of entirely new materials or radically new designs, work in the office or laboratory can hardly answer these questions. What you need is really large parts of the new designs and materials, or large models and test them to breaking point. Then you can be satisfied that the theory and the practice are in good agreement and you can have a real idea of the final strengths involved.

This is what is done at the Naval Construction Research Establishment at Rosyth on the banks of the Forth in Scotland. With some of the largest facilities for scientific tests in Britain, the staff there can find the final strength of whole sections of the hulls of ships, they can test large pieces of shipboard equipment for the strains of prolonged vibration, they can simulate the effect of one large ship ramming another broadside-on, they can test structures for effectiveness against underwater impacts either in the sea or in the laboratory and by means of water-pressure-tanks they can investigate new structures for the hulls of submarines.

For example, new proposals for ship construction are now being developed in Britain — they are for laminated wood and plastic ships. Of course, laminated wood and resin-coated glass fibre have already been used for many years in the construction of pleasure craft such as sailing dinghies and even luxury motor-yachts. This is a field in which British boat-builders are pioneers. But the new proposals are rather different. The idea now is to build ships 100-200 feet in length of laminated wood or glass-fibre-plastic. Such ships might be minesweepers, coastguard cutters, coastal trading vessels or small oil-tankers. The basic philosophy behind the new ideas is to apply to ship-building not only new materials, but the skills and methods of aircraft design. New companies, formed jointly by the aircraft industry and shipbuilding firms have been set up to develop the ideas. Full sections of the hulls of the new ships have been built of both laminated wood and glass-fibre.

These hull-sections, around thirty feet long and about the same dimensions from keel to deck, have been taken to the Rosyth establishment. The most impressive piece of equipment there is already testing the first two prototype hulls—the wooden one first. It is an enormous structure which can easily contain these hull sections. It is a colossal box of steel girders—from its four vertical sides and from its roof hydraulic jacks can press against the sections of hull to produce loads of many tons in many directions.

Underneath the keel and the bilges of the experimental ship section there are huge bags which are filled with water at differing pressures so that the whole test structure can be made to undergo the stresses and strains, the twisting and pressures that it might meet with at sea.

But the programme is not a simple affair of crushing specimens until they break and even saying that the maximum strength has been reached. At all sorts of critical points within the experimental hull there are strain-gauges; continuous readings from these are fed out by cable to recording machines. Careful analysis of the results may well show which are the weak spots in the new designs. By fairly simple re-designing and strengthening of the crucial members much stronger hulls may be obtainable. There is a careful building up of a body of design knowledge and information that may eventually change the construction of small ships which provide the largest of all shipping markets in the world at the moment, with so many countries anxious to build up their fleets of trawlers and offshore fishing vessels, light coastal craft and transport ships.

Reactors in nuclear merchant ships pose different problems. Could the reactor be protected in a collision? The Naval Construction Research Establishment tackled this with large scale model structures. They have other large equipment rather like an enormous hydraulic press, standing some thirty feet high. Across the base of this they mounted a model of the hull-design for the nuclear ship and down onto it they drove, with enormous force, a model of the steel bows of a hypothetical "ramming" ship. The exact results of this experiment have not been revealed but they keep the crumpled metal as an exhibit for visitors.

The Establishment is, of course, primarily a naval one, staffed by members of the Royal Naval Scientific Service. Much of their work is concerned with defence matters. This involves trying to measure the effect of weapons and explosions upon ship structures. Sometimes experiments can be dramatic to watch, as cranes lower some piece of steelwork into the water, and underwater explosions hurl columns of the grey waters of the Forth Estuary into the air. In the course of this sort of work the Establishment has produced a mounting which may be useful in the civilian field. Basically it con-

sists of a number of metal "spring leaves" like concentric ellipses, flattened top and bottom, with a damping material between the leaves. It can be made in various sizes to take different weights, and it was originally designed to provide safe supports for vital pieces of machinery inside a ship even when it was impacted by the force of explosions. A commercial firm is taking this up.

Although the most spectacular aspects of the NCRE's work are at the edge of the water beside the famous Rosyth Dockyard, the headquarters is in a converted mansion near Dunfermline. Here activity is on a more usual laboratory scale and is largely concerned with materials for ship-construction. There is much metallurgical work, mostly on the new high-strength steels, and on the problems of welding, but also on some of the so-called "exotic" materials.

In defence work, the actual cost of a material is not of prime importance, and, within reason, it is the performance of a new material that is most important. If the NCRE can show that some of the new materials they are examining are worth using for warship building, then production may be increased and the cost of the material brought down, possibly far enough to make it attractive to the manufacturer of consumer goods. So it may enter our ordinary lives.

WHEN WOMEN TAUGHT SAILORS TO COOK

By A. CECIL HAMPSHIRE

"An army," Napoleon is reputed to have remarked on one occasion, "marches on its stomach." This dictum is also true of the Navy and Air Force. It follows, therefore, that to win wars the men of the fighting services must have plenty of good food and competent cooks to prepare it.

Buried in the Admiralty's archives is the story of how at one stage of World War II. shortage of the latter nearly put a vitally important arm of the Royal Navy out of action. The crisis was only narrowly averted by recourse to an unconventional measure which in peace time would probably have horrified their Lordships.

The story began in the early months of 1940 when the Director of Anti-Submarine Warfare despatched an urgent minute to the Second Sea Lord, Admiralty Board member in charge of personnel. Briefly, the Director represented in no uncertain terms that unless steps were immediately taken to provide competent cooks for our anti-submarine patrol trawlers, their crews would be unable through sheer starvation to continue the vital fight against Hitler's U-boats.

Some idea of the importance of the work of the Navy's anti-submarine and minesweeping trawlers may be gained from the fact that at the outset of the war they numbered a mere 400 vessels crewed by some 3000 officers and ratings, all fishermen. By 1944 the personnel of the Royal Naval Patrol, of which they had formed the nucleus, had grown to 70,000, manning 7000 vessels. By the time the war ended nearly 3000 officers and men of the Patrol Service had won decorations ranging from the Victoria Cross to Mentions in Despatches.

From the earliest times in our history Britain's fishermen have provided one of her most important naval reserves, and in 1910 the Trawler Section of the Royal Naval Reserve officially came into being. During World War I the work of these little ships was principally minesweeping, a task for which both ships and men were particularly suited. With the introduction of the asdic device for submarine detection a proportion of officers and men of the Royal Naval Reserve Patrol Services, the post-war title of the old Trawler Section, were trained in anti-submarine techniques. By 1939 some 200 of the best fishing trawlers in the industry had been earmarked for the anti-submarine defence of our coastal convoys in the war. From the outbreak of hostilities onwards these numbers were considerably increased.

But one important point in the manning of both anti-submarine and minesweeping vessels had been overlooked by the planners. In peacetime the majority of trawler cooks in the fishing industry are men aged between fifty and sixty. They are experts at their job and paid accordingly. Thus in addition to the standard wage of a deckhand they also receive a substantial bonus on the catch.

When the trawlers due for requisitioning from the fishing industry were taken up by the Admiralty on the outbreak of war, most of the trawler cooks serving in them were, of course, over the age for call-up. Moreover, the rate of pay laid down for the Patrol Service cook was too low to attract those individuals, most of them married men with families, who might otherwise have volunteered to serve. In consequence the vacancies for cooks had to be filled by young conscripts who either volunteered to serve as trawler cooks or were drafted willy-nilly to sea as such. Not only had most of these lads very little knowledge of cooking at all, but in anything of a seaway in their wildly gyrating vessels they became completely flaked out and useless from seasickness.

This was a very serious state of affairs, for if a trawler cook cannot do his job the crew cannot eat. Thus it was when the Director of Anti-Submarine Warfare addressed his urgent minute to the Second Sea Lord.

Arrangements were thereupon made for batches of raw young Patrol Service cooks to be sent to the general naval depots for training under the experienced Chief Cooks in the big modern galleys at those establishments. But this measure was soon found to be of little use. The barracks staff were far too busy coping with their own greatly increased routine work to spare the time to teach green youngsters anything more advanced in the culinary arts than how to peel potatoes. Furthermore, cookery classes conducted in the spacious, well-equipped electric galleys in the depots could not hope to transform ham-fisted amateurs into expert small-ship chefs capable of producing varied and appetising meals on a two-foot by four coal-fired range in the tiny galley of the average trawler whose unpredictable motions at sea necessitate the most skilful juggling of pots and pans.

It was at this psychological moment that, like a good fairy, Miss Grace Musson appeared on the scene. Peacetime head of Lowestoft's Technical College, this grey-haired, twinkling eyed expert suggested an ideal — if unorthodox — solution to the problem.

Lowestoft, it should be explained, had by 1940 become the headquarters, or depot, of the Royal Naval Patrol Service. A local pleasure park with its concert hall and other associated buildings had been taken over as an assembly base; hotels and schools had been requisitioned for accommodation and training, and numerous boarding houses and peacetime bed-and-breakfast establishments were roped in to provide billets for men awaiting their ships. The whole place was given the ship name H.M.S. EUROPA, with the official title of Patrol Service Central Depot, and over all reigned a Commodore whose office was a seafront hotel.

It was to this harassed officer that Miss Musson suggested the establishment of a cookery school for his men. He jumped at the idea and, without waiting to obtain higher approval, authorised her to go ahead. The good results were quickly apparent, and subsequently, with Admiralty blessing, a Lowestoft infants' school whose usual occupants had long since been sent away to a safer part of the country, was officially requisitioned to become the new cookery school.

As Instructresses, Miss Musson gathered about her eleven domestic science teachers, aged from 25 to 47, who, due to the evacuation of their usual pupils, were also out of a job. A number of coal-fired ranges of the kind to be found in the average fishing trawler were installed in the school classrooms. Each stove was sited in a small compartment no larger than the galley of a trawler, and upon it the trainees were required to prepare and cook a complete daily set of meals under conditions which almost exactly simulated those at sea, with the exception, of course, of the motion of the vessel in a seaway.

Courses lasting five weeks were instituted, the embryo cooks being accommodated in the school while under instruction, and being required to eat what they cooked! Miss Musson and her enthusiastic band of ladies worked miracles with their unpromising material. They ran their establishment with the smooth efficiency of an assembly line in a factory. At one end of the "factory" there entered young men to the number of 160 at a time, most of whom had never in their lives even boiled an egg. At the other there emerged trained cooks whose culinary creations could almost bear comparison with the products of a highly trained hotel chef.

Nor did instruction end there. One of the teachers, Mrs. Gwendoline Dempster, sat down each evening after her day's work was finished and compiled a special cookery book for the little ships of the Patrol Service. Written in everyday language that seamen could understand, it outlined the rudiment of small-ship catering, how to make the best use of whatever raw materials were available, the planning of varied daily menus, and included a number of recipes for dishes well within the scope of her readers, with detailed instructions on preparation and cooking. The book was plentifully illustrated with explanatory line drawings, one of which, captioned "A Place for Everything in its Place" stressed the not unimportant virtue of tidiness in a small galley. So successful was it that other Services clamoured for copies.

As the war went on, men from every part of the Commonwealth, including Australia, Canada, New Zealand, South Africa and Newfoundland, found themselves serving in the small craft of the Royal Naval Patrol Service. For the little ships were present in every theatre of war, from the Arctic to the Pacific. During the Normandy invasion in 1944 the Patrol Service was called upon to man in addition to their trawlers, fuel and water-carriers, fast motor boats, aircraft safety launches, tugs for towing parts of Mulberry harbour, cargo lighters, harbour launches, air lighters, aircraft tenders, balloon servicing craft and wreck dispersal vessels.

That all the crews were as well fed as their comrades in the larger ships of the fleet was due in no small measure to the devoted little band of women at Lowestoft who braved the 20,000 bombs harled upon the town to teach the men of that wartime Navy within the Navy how to cook.

THE PHILOSOPHY OF THE MODERH FRIGATE

BY D. PHILLIPS-BIRT A.M.R.I.N.A.

The frigates being built in British yards for export have the quality of compactness in common with the new corvettes. They are relatively small ships which as a result of receiving the benefit of the latest technical developments are able to offer more in terms of speed and armament per ton of displacement than other vessels of their class.

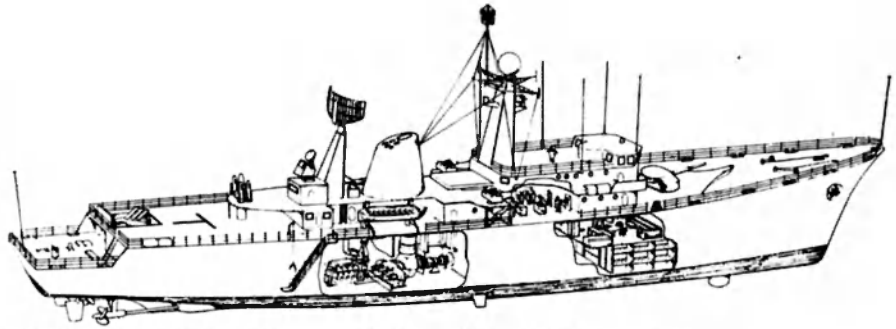
The Clydeside firm of Yarrow, for example, describe their version of a frigate as "a new long-range ocean going warship" and say that "displacement, capital cost and complement of the vessel have been kept down to about 60 per cent of equivalent figures for existing first-rate frigates without serious reduction in fire power or performance". An order for one of these ships has been placed by the Royal Malaysian Navy.

Vosper with some help from Vickers have produced a design for a frigate (Mark 5)) not widely different in size from the Yarrow conception but lighter, it seems, in displacement, with a distinctly different hull form, and powered for higher speeds — for which, it is understood, the Yarrow design may later also be developed. The Vosper ships are able to carry a total armament weight of 100 tons, described as "a much higher proportion of the ship's displacement than is commonly found", at the very high maximum speed of 40 knots — an appreciably higher relative speed for their length of 310 ft. than the longer destroyers. Four of these vessels being built at present for the Imperial Iranian Government by the Vosper-Thornycroft Group and the Shipbuilding Group of Vickers are officially called "fast destroyers".

The Yarrow frigate with, it appears, a load displacement appreciably heavier than that of the Vos-

CONTRAST OVER EIGHTY YEARS

Class	Lenth	Displacement	Power	Speed	Power-displacement ratio
Grasshopper	200	525	2700	19	5.1
Havock	185	300	3000	26	10
Kromantse	177	450	3340	20	7.4



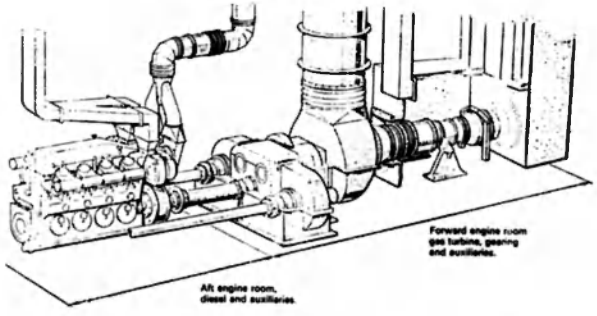
The general arrangement of one of the series of the Yarrow frigate which also shows in the cut-outs the control room directly below the mast, a portion of the accommodation and the main engines.

per ships, is stated to be able to carry an armament weight of 150 tons; but with half the latter's power installed her maximum speed is 27 knots, using a single gas turbine capable of developing almost 20,600 h.p.

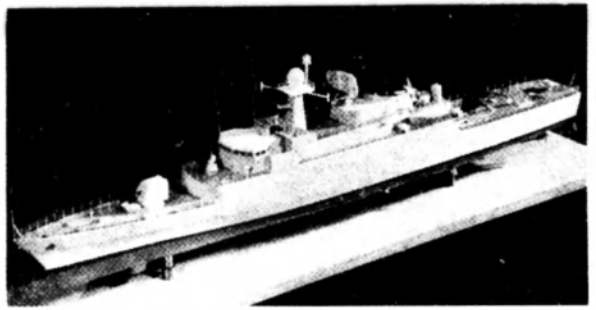
A seamark in the Yarrow story of constructing fast warships occurred in 1893, when the HAVOCK was commissioned and brought to a close a most unhappy period of technical experiments by the Navy with what were misappropriately named "torpedo-catchers". These were not intended to catch torpedoes, but the ships were also not fast enough to catch the torpedo-boats that launched them. The RATTLESNAKE of 1886 was a disappointment, having a speed of 18.5 knots, which was several knots lower than that of the French torpedo-boats. She was followed by the GRASSHOPPER class in which, using the same power, weights were reduced and speed raised to 19¼ knots. This too was disappointing. The SHARPSHOOTER class of 1889-90 were 30 ft. longer than the GRASSHOPPERS, making them 230 ft. overall, and carried 1,000 more horsepower (3,700 instead of 2,700) but a maximum speed of 20 knots was still only just reached, while in 1892 the DRYAD class appeared with speeds back at 19 knots. The matter appeared to the Admiralty as a riddle in naval architecture; which indeed it was at the then state of knowledge of the subject. And that old story is still running on today, its plot less of a mystery than it was, but still involving the same struggle for high power and low weight

For the answer to the riddle of the unhappy torpedo-catchers lay in the ratio of the powers installed in the various ships to their displacements. The RATTLESNAKE, for example, carried about 4.9 h.p. per ton of displacement. This was raised to 5.1 in the GRASSHOPPER but remained the same in the more powerful and larger SHARPSHOOTER class, while it dropped to less than 3.5 in yet more unsuccessful DRYADS. The breakthrough which came with the Yarrow HAVOCK was the result of the ship having a power-displacement ratio of about 10. The table showing the power-displacement figures for the GRASSHOPPER, the HAVOCK and for the new Vosper corvette KROMANTSE which was described last month, reveals the logic behind this aspect of design and performance during the last 80 years; and suggests too the present problem when high speeds of 40 knots are required from ships such as the Vosper frigates. In the continuing power-weight struggle, at present only the gas turbine is able to provide the package of power in a form light enough for ships of this size, requiring for their speed some 35 h.p. per ton.

Vosper have described these frigates as "about the same size as the British "Hunt" class which did such admirable service during the last war, and clearly demonstrated the capacity of a well-designed ship of this size for world-wide service". The Vosper ships are 30 ft. longer (310 ft.) than the HUNTS, and in practice there may not be much to choose between them in displacement, but rather more than double the power of the HUNTS (classified as frigates) has to be installed to achieve 40 instead of



A sketch showing the main Propulsion Machinery Arrangement



A model of the Vosper Frigate. The armament shown is that of the standard ship, not of the Iranian version.

the latter's 25.5 knots. The Vosper ships have much the same power installed as the TRIBAL destroyers of 1936-39, while being some 600 tons lighter in displacement, an engineering achievement impossible using the steam turbine.

In the contemporary phase of marine engineering, in order to combine the lightest and most compact source of maximum power for full speed with an adequate range at cruising speed, when no more than 10-20 per cent of the full power will be used, a duel engine system becomes necessary; for the big specific consumption of the gas turbine destroys the virtue of its high power-weight if it is run for long periods at partial power. The balance is achieved by means of diesel machinery which, thanks to the hydrodynamic facts of ship resistance, may be able to give a cruising speed of more than half the rarely used maximum speed for less than one-fifth the power. In the Vosper frigates the maximum speed of 18 knots under the twin diesel engines may be maintained with 10 per cent of the power needed under the twin gas turbines for 40 knots.

The Yarrow and Vosper ships have the same combination of diesel and gas turbine machinery, but twins of each engine in the latter give double the power of the Yarrow frigate, which is designed for 27 knots maximum. The layout of the engine rooms in the latter ships is illustrated. The after compartments contains the diesel, with its power take-off leading forward into the gear train between the two engines, which gives the diesel a 2 : 1 reduction. Running at 3,900 h.p. the diesel gives a speed of 16 knots, and a range of about 5,200 miles may be obtained. The turbine, in its separate compartment, drives aft into the same train of gears and at almost 20,600 h.p. gives 27 knots. Developments are being studied to produce speeds of up to 36 knots by installing two gas turbines each driving one shaft, as in the Vosper ships.

The duel engine system has some disadvantages, which show most clearly in the range of speeds above the maximum for diesel propulsion and below the high-rating turbine speeds. Considering the Vosper frigates: maximum cruising speeds under the 16-cylinder Paxman diesels is 18 knots, and up to this speed an excellent cruising range is obtainable, but for cruising between, say, 18 and 28 knots the range drops severely owing to the high specific consumption of the gas turbine, and in this bracket of speeds the steam turbine ships—the LEANDERS, for example — show to advantage. The critical speed bracket is not, of course, so wide in the Yarrow frigates with their lower maximum speed and single turbine. In the Vosper ships tankage is provided for an additional 100 tons of fuel to cater for an adequate range at the bracket speeds, at a small price in maximum speed owing to the increased displacement.

It was the object of the Vosper frigates to produce vessels of about half the cost and displacement of contemporary Royal Navy frigates such as the LEANDERS, yet large enough to carry powerful anti-submarine, anti-surface and anti-aircraft armament of the latest type, and to have an excellent degree of seaworthiness. The last is a crucial matter. In very general terms, effective seakeeping qualities, which entail amongst much else the ability to maintain a useful speed in an ocean seaway, tend to be a function of size. The improved seaworthiness of small ships is due to a concentration on this aspect of design during recent years, to a broad general study of ocean seaways and ship reactions to them, undertaken on behalf of all sizes and types of ocean-going vessels.

A series of model tests was undertaken in the Vickers tank, making a direct comparison under head sea conditions between the Mark 5 frigates and the larger LEANDER class. A wide range of speeds was examined, in both regular and irregular seas. A statistical analysis of the results is reported to have shown a remarkably good comparison between the smaller and larger ship. The ability of the former to stand up well in pitching conditions may without doubt be attributed in considerable part to the knuckle in the forebody sections extending from the boldly overhanging stem aft to the vicinity of the bridge, a feature adopted in the Vosper corvettes also. The merits of this feature in combination with an outreaching, modified clipper stem, have become so well recognised today in all types and sizes of ship, that its absence — as in the LEANDERS — cannot appear other than surprising. It is the obvious way to embody adequate reserve buoyancy above the necessarily fine lines, demanded by high speed, in the sections in the vicinity of the waterline. And it is important as a means of counteracting the excessive lifting power of the broad, flat stern, which is unavoidably necessary again for high speed performance.

The drawings and photographs of the Vosper corvettes published last month and the frigates illustrated here show the clearest family resemblance between the ships despite the disparity in size. The same balance and unity in the composition of the profile is evident throughout the series — Mark 1 and Mark 2 corvettes, Mark 5 frigates — improved if anything in the bigger ships, as usually may be achieved owing to the proportionately less height that becomes practicable with greater length. Today, when the jagged profiles of so many warships sug-sugests a number of unrelated parts joined together in desperation, these ships have an aesthetic quality indicating technical assurance and the influence of a single controlling mind of good taste. Whatever the operational value of such distinction may be, it must surely delight the eye of a seaman.

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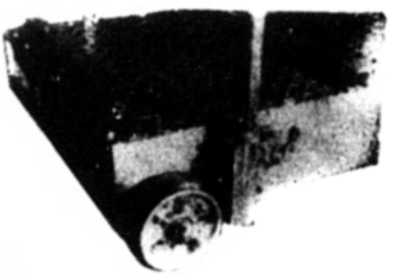

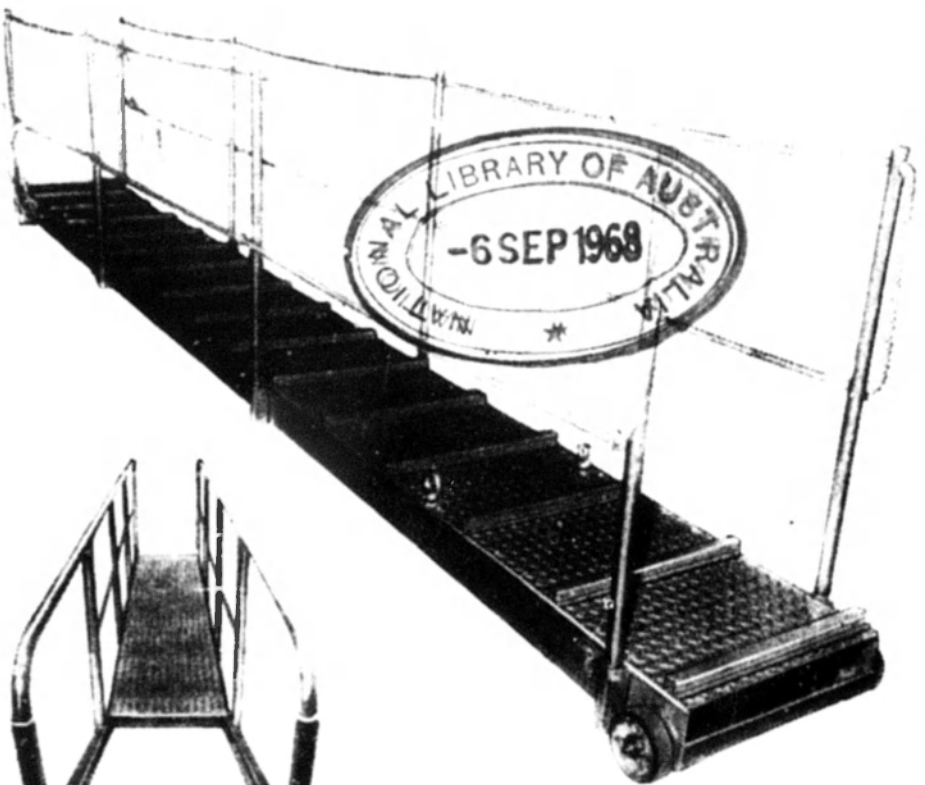

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