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THE NAVY

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Another Westland Helicopter Joins The Royal Navy

Sea King armed with 4 Mk.44 torpedoes and operating in the A.S.W. role.

First Operational Sea King Squadron Commissioned

Squadron Number 324, the first Royal Navy operational unit to form with Sea King helicopters was commissioned into Service in February, 1970, under the command of Lt.-Commander L. Hallett, R.N., at the Royal Naval Air Station, Culdrose, Cornwall.

The commissioning had been preceded by an intensive flying trials programme by 700S Squadron I.F.T.U. over a period of six months during which over 2,300 hours flying was completed and before that Westland Helicopters had carried out a 160hour trials programme in a tight two weeks schedule. In addition some 1500 hours development flying have also been completed by the company.

Now in quantity production at Westland's Yeovil factory the Sea King is the largest helicopter ever built in Britain and constitutes an operational platform for the most advanced A.S.W. systems operational in the world today.

With its integrated airborne search radar and tactical display, medium range sonar, fuly automatic flight control system and a variety of weapon loads, the Sea King is a completely self-contained, tactical unit capable of detecting, classifying and destroying advanced submarines in all-weather operations.

Its power plant consists of two Rolls-Royce Gnome 111400 gas turbine engines which have a 2.5 min. contingency rating of 1500 s.h.p. a one hour maximum rating of 1400 s.h.p. and is cleared for 1250 s.h.p. continuously. The engine is controlled by a specially-designed electronic system. Well proved in service, this system provides excellent control of rotor speed during steady state and transient manoeuvres.

In its primary role the Sea King carries a crew of four: two pilots a sonar operator and an A.S. control officer, or observer as he is often referred to.

Basically intended for operation on cruisers and aircraft carriers, the Sea King will have an endurance of approximately four hours and will give it a 'time-on-station' far in excess of machines currently in Service. The normal procedure on an A.S.W. mission consists of a flight out to the selected area followed by a search which calls for the sonar transducer to be lowered from the helicopter into the water, or "dunked" as it is often referred to, at a number of locations within that area for the purpose of detecting an enemy submarine in the vicinity. This operation is normally carried out while the helicopter is hovering 'into wind' at an altitude of approximately 40 ft. where spray ingestion is reduced and adequate wave clearance maintained.

An average 'dunk' lasts something like 8 to 10 minutes after which the transducer is winched out of the water and the helicopter is flown to the next position. This cycle of operation consisting of transition to hover, dunk and transition to next location constitutes the general pattern of operations.

While the primary role of the Sea King is A.S.W. the machine can be readily adapted for other roles including Search and Rescue, Troop Transport landings, Casualty Evacuation and Freight carriage.

The machine is of conventional layout with a single five-bladed main rotor system and a five-bladed tail

rotor. The engines are mounted fore and aft beside each other on top of the fuselage and drive a common gear box from which two power off-takes drive the rotor systems.

The fuselage is roomy and will carry eleven fully-equipped troops without the removal of the A.S.W. equipment or up to twenty four passengers in the empty, roomy cabin. The Sea King has a boat type hull and outrigger sponsons into which twin-wheeled oleos retract. It could, if necessary, land and take-off from the water although this is not intended as normal procedure. This ability, however, is a useful asset especially if involved in S.A.R. duties.

Fuel is carried in bag tanks situated in under-floor compartments which have a capacity for 630 gallons (5,000 lb.).

When operating in the A.S.W. role armament — normally four Mk.44 homing torpedoes— are carried externally although in some cases, for example in shallow water operations,

Right: Sea King parked in its hanger on H.M.S. *Engadine* with blades and tail folded.

Below: Sea King on H.M.S. *Engadine* ready for hanger storage.

depth charges are a more suitable armament and in this case a similar number is carried. A door, with integral steps, situated on the port side of the machine give the crew access to the cabin. For loading cargo and operations in the rescue role a sliding door on the starboard side of the fuselage moves forward to give an access opening of 5.6ft x 5ft. A 600 lb capacity rescue hoist is situated just above the door of this opening. For external freight up to 6,000 lb can be carried on a quick release sling under the fuselage.

Avionics equipment, other than that associated with the sonar is mounted on a tray in the nose of the aircraft and is easily accessible through a 'lift-up' panel.

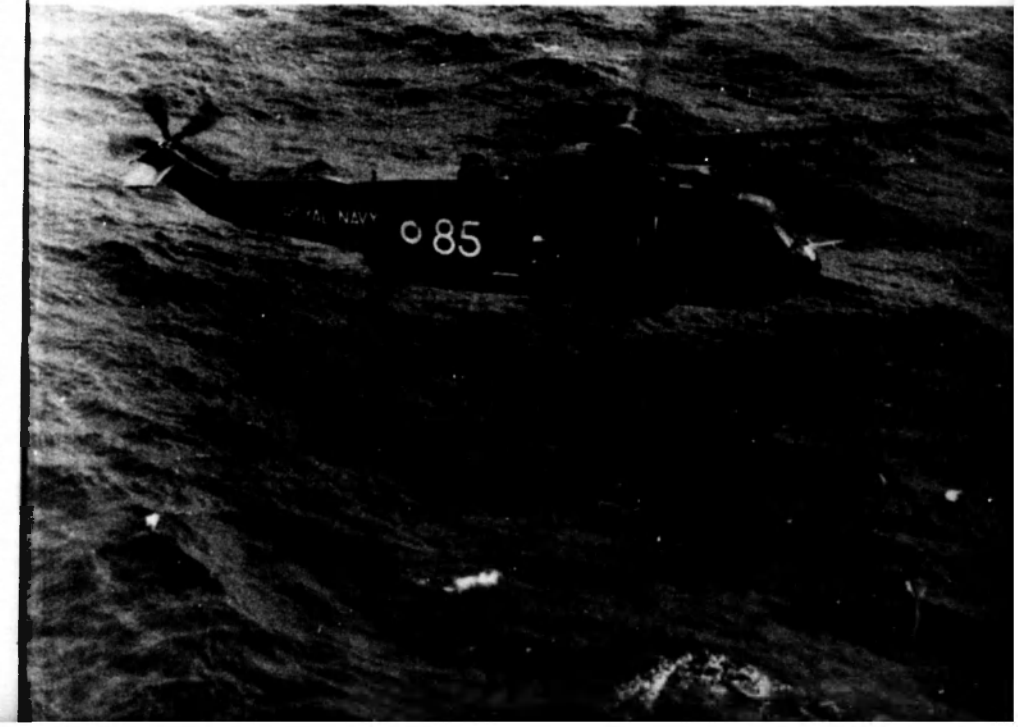
Main rotor blades are of conventional light alloy construction and built up from an extrused leading edge.

Fully articulated with coincident flap and drag hinges, the rotor hub is fitted with an automatic blade folding and spreading system which is operated from the cockpit. Actuating power is supplied from a utility hydraulic system and the necessary sequencing is accomplished electro-hydraulically, the system is fully-interlocked to prevent mishandling.

The flying control system is operated through duplicated controls in the cockpit, each channel being energised by an independent hydraulic system. Collective and cyclic pitch control is exercised by three primary servos connected to a non-rotating swash plate which transmits movements through the rotating swashplate and push-rods to the rotor head. Control demands from the pilot are fed to the primary servos via four auxiliary servos installed in the cabin. These operate respectively the pitch-control servo, the two roll-control servos (via a mixing box) and all three servos to provide collective pitch. The fourth auxiliary servo operates directly on the tail rotor collective-pitch control.

The A.S.W. systems in the Sea King includes the autopilot, Doppler navigation and search radar facilities.

The modular automatic flight control system incorporates a fixed-time programmed transition manoeuvre which eliminates variations in the flight path of the kind that, with earlier systems have given rise to aborted transitions. The hover entry gate (the combination of speeds and heights from which, the aircraft may be brought automatically into as well as out of the hover) is very wide which makes it easier to fly in the search pattern. In good visibility there is no particular problem in flying the A.S.W. manoeuvre manually except of course that it places a strenuous and constant workload on the crew. In bad weather, or at night, the problem becomes even greater, therefore, a good autopilot is essential for reliable and consistent transitions. The other requirement for a flight control system in this role is the ability to exercise delicate control of the helicopter in order to ensure the tightness of hold required during sonar hover; unless the sonar buoy is hung vertically in the water, errors can be caused by surface and sea bed effects. In the hover the input to the automatic



Winching trials being carried out by 700S Squadron Royal Navy in the English Channel.

flight control system is the cable entry angle at the aircraft, which need not be 90 degrees but can be some other angle depending on sea and wind states. This angle is set up by feeding appropriate data to an offset computer which provides the reference input to the system. The required hover height is controlled via smoothed outputs from the radio altimeter system.

Under normal search and strike operations more than one helicopter as well as surface vessels are involved and in this respect the Sea King carries a search radar. This equipment gives, in addition to the helicopter's position and underwater plots, Azimuth data on other craft in the vicinity and all this information is shown on a tactical display unit situated at the observer's station. It offers all the data required by the observer to prepare for an attack or, alternatively, to assist in co-ordinating the attack with other craft.

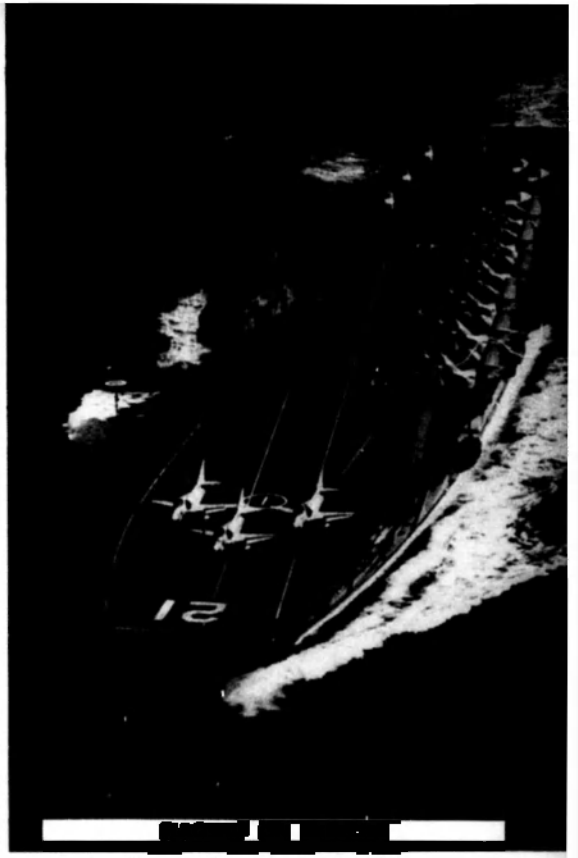
With one of the most advanced A.S.W. systems in the World, an operational performance which is extremely high, plus a proven airframe and transmission, the Sea King is one of the most advanced weapons the Royal Navy has operated to combat the threat of submarine attack.

Integrated search radar and tactical display in the Westland Sea King.

Sea King production line at the Yeovil Division of Westland Helicopters Limited.

Deck landings and take-off trials of the Sea King on H.M.S. *Engadine*.

EXERCISE SEA ROVER



The Australian aircraft carrier H.M.A.S. Melbourne with Skyhawk fighter-bombers, Tracker anti-submarine aircraft and Wessex helicopters on bar flight deck moves through the South China Sea during Exercise Sea Rover. The flagship was taking part in the multi-nation SEATO exercise which began from Manila early in April after a six-day work-up phase.

Naval and Air Forces of six SEATO member nations exercised in the South China Sea between 23 March and 9 April.

The combined maritime defence exercise, named SEA ROVER, was the 37th exercise to be conducted by SEATO member nations since the Organisation was formed in 1954.

Some 40 ships from Australia, New Zealand, the Philippines, Thailand, United Kingdom and United States assembled in Manila and Sattahip, Thailand, on 23 March. Australia's contribution to the exercise was the aircraft carrier MELBOURNE, the destroyer escorts YARRA and DERWENT, the Daring class destroyer DUCHESS and the submarine OXLEY.

Four Orion aircraft of the R.A.A.F., together with maritime aircraft from New Zealand, Thailand, U.K. and U.S.; strike aircraft from the Phillipines also participated.

After a variety of training activities, a convoy operation started from the Philippines on 1 April and ended in the Gulf of Thailand seven days later. During this phase the convoy was subject to simulated submarine attacks from the Australian, U.K. and U.S. navies and to air attacks from the Philippines Air Force fighters.

Rear-Admiral W. T. Rapp of the United States was exercise director and Rear-Admiral Supa Gajeseni (Thailand) together with Rear Admiral H. D. Stevenson (Australia) were co-deputy directors.

FACE TO FACE

Left: Rear-Admiral H. D. Stevenson, C.B.E., Flag Officer Commanding the Australian Fleet, keenly inspects Drum-Major YAI of the Papua-New Guinea Division of the R.A.N. Rear-Admiral Stevenson, who was on board the flagship H.M.A.S. *Melbourne* on the way to SEATO exercises, went ashore to make the annual inspection of the naval base at Manus Island, H.M.A.S. *Torangau*.

Right: Silhouetted by the evening sun, a team captain aboard the aircraft carrier H.M.A.S. *Melbourne* signals to a Skyhawk pilot about to leave on a mission over South-east Asian waters. The mission was one of many flown by Skyhawk and Tracker aircraft and Wessex helicopters from the carrier during the SEATO exercise Sea Rover.

U.S.N. GOES JET

(Above) The gunboat U.S.S. 'Marathon' (PG-89) one of the seventeen 'Asheville'-class gas-turbine ships. (Below) The U.S.C.G.C. 'Boutwell' (WHEC-719) one of the twelve 'Hamilton'-class ships.

By Norman Polmar, Washington Correspondent to 'Navy'

The United States Navy will (hopefully) begin operating its first large, gas-turbine warships about 1975. By that time there will be at least 125 cruisers, large frigates, destroyers, and escort ships partially or fully powered by gas turbines in 11 other navies, plus a score of ocean-going gas-turbine cutters in the U.S. Coast Guard. (See footnote.) In addition, numerous merchants ships in operation and on the building ways with gas-turbine propulsion.

This is an area of naval technology in which the United States has lagged, despite a ten-year, multi-million dollar research and development effort.

When discussing warship propulsion there can be no question of the superiority of nuclear-powered surface ships to all other propulsion for sustained high speeds and endurance. These characteristics are invaluable in a warship.

However, nuclear propulsion is limited for naval application because of the size and cost of the machinery in surface ships. Nuclear propulsion is not considered feasible for ships smaller than 6,000 to 8,000 tons, and the approximate cost of a nuclear destroyer is cited as $128m. compared to about $60m. for a conventionally powered ship.

These factors have severely inhibited the application of nuclear propulsion to surface warships. The U.S. Navy has built only four nuclear surface ships: the carrier ***Enterprise*** (83,350 tons full load), missile cruiser ***Long Beach*** (17,350 tons), missile frigate ***Bainbridge*** (8,580 tons) and missile frigate ***Truxtun*** (9,200 tons). Since the first of these nuclear ships was completed late in 1961 the U.S. Navy has completed two conventional attack carriers, 18 missile frigates, 15 missile destroyers, and 24 large escort ships (six armed with missiles). All of these non-nuclear ships have steam turbines (with super-charged boilers in 16 of the escorts).

In contrast, the soviets have some 70 ships in the light cruiser-frigate, destroyer, and ocean escort categories with all-gas-turbine or combination machinery, and the British have built eight 'County'-class missile destroyers and seven 'Tribal'-class escort ships with combined steam and gas turbine (COSAG) machinery.

The only U.S. warships which hum along on gas turbines are the small 165-foot, 245-ton coastal gunboats of the ***Asheville*** class. The first was commissioned in 1966 and a total of 17 have been built. They have combined diesel and gas turbine (CODAG)

(There are today some 100 gas-turbine 'boats' of less than 500 tons built and building, several in the U.S. Navy.)

United States Gas Turbine Ships

Type	*Units*	*Name*	*Length (oa)*	*Displacement (fl)*	*Gas Turbine*	*Maximum Speed*
Gunboat	17	*Asheville*	164½ ft.	245 tons	1 GE LM1500 13,300 h.p.	40+ knots
Hydrofoil gunboat	1	*Tucumcari*	71⅔ ft.	58 tons	1 Proteus 3,040 h.p.	40+ knots
Hydrofoil gunboat	1	*Flagstaff*	74½ ft.	57 tons	1 Rolls-Royce 3,200 h.p.	40+ knots
Hydrofoil research	1	*Plainview*	212 ft.	310 tons	2 GE LM1500 30,000 h.p.	50 knots
Hydrofoil research	1	*High Point*	115 ft.	110 tons	2 Proteus 6,200 h.p.	48 knots
Hydrofoil research	1*	*Denison*	104½ ft.	90 tons	1 GE LM1500 14,500 h.p.	62 knots
High-endurance cutters	9+3 bldg.	*Hamilton*	378 ft.	3,050 tons	2 P&W FT-4A 35,000 h.p.	29 knots
Medium-endurance cutters	5	*Reliance*	210½ ft.	1,000 tons	2 Solar 2,000 h.p.	18 knots
Cargo ship	1	*Adm. William M. Callaghan*	694½ ft.	24,000 tons	**1 P&W FT-4A 1 GE LM2500	26 knots

*The Denison is in reserve.

**The Callaghan carries a spare FT-4A for use as a replacement in the event of emergency.

machinery which can push them at more than 40 knots. The Navy also has five essentially experimental hydrofoil craft which have CODAG propulsion *(see table)*.

The Navy has been close to the U.S. Coast Guard development of CODAG machinery for two types of cutters: the 12 ***Hamilton***-class ships are 378-ft. long, displace 3,050 tons, five smaller, ***Reliance***-class cutters are 210½ft. and displace 1,000 tons

There is only one all-gas-turbine ship flying U.S. colours, the roll-on/roll-off merchantman ***Admiral William M. Callaghan***. Powered by two gas turbines, she regularly crosses the Atlantic at an average speed of some 26 knots. This 695-ft., 24,000-ton ship was built specifically for long-term charter to the Navy's Military Sea Transportation Service and is civilian operated.

OPPOSITION

During their service some of the Navy gunboats and Coast Guard cutters have experienced trouble with their transmissions and gearing. These problems have been minor and, indeed have generally been overlooked by the opponents of the Navy's adopting gas turbines for large warships. Rather, the opponents usually cite (1) the high fuel consumption of gas turbines (2) the lack of service experience with the fuels required for gas turbines (3) the wisdom of creating a third major ship-propulsion technology for surface ships (the others being fossil-fired steam and nuclear steam), and (4) the necessity of new engineer training programmes.

Now it appears that there are suitable answers to all of these points: (1) gas turbines have reached a specific fuel consumption similar to that of fossil-fired steam turbines, (2) the U.S. Navy is converting all fossil-fired steam ships from Navy Special Fuel Oil (NSFO) to a distillate fuel which is readily usable by gas turbine machinery (and will save some 2,000 ship-operating days and 10 million maintenance man-hours per year for the 500 steam-powered ships in the Navy), (3) the maturity of steam propulsion makes the achievement of major improvements more difficult and nuclear propulsion is not suitable for destroyers and smaller ships, (4) a reservoir of personnel with gas-turbine experience exists because of the smaller U.S. gas-turbine craft and the similarity between aircraft and marine gas-turbines.

ADVANTAGES

The advantages of gas turbines for surface ships, especially destroyers and escort ships, are considerable: gas turbines have a high power-to-weight/space ratio, can accelerate rapidly, are capable of cold starts, require minimal engine-room personnel, can be quickly replaced, and have no vulnerable steam lines.

These advantages caused all three shipyards competing for the Navy's ***DD-963/DX*** destroyer programme to propose gas-turbine propulsion in their designs. Bath Iron Works, the General Dynamics yard at Quincy, Massachusetts, and Litton Industries (which owns Ingalls shipyard) all offered design proposals to the Navy for this new class of 'general purpose' destroyers which will be some 500 ft. long and displace about 6,000 tons full load. The General Dynamics yard has been eliminated from the competition and as this issue went to press the Navy was expected to announce whether Litton or Bath had won the so-called 'contract definition' phase.

Upon successful negotiations, the winner will build a minimum of 30 destroyers of the ***DD-963*** class. Estimates of the total programme range from 60 to 100 ships of this general design being built during the next 10 to 15 years, some being of an enlarged, guided-missile-armed configuration. Even a programme of 60 ships would easily run to more than $3,500m.

The prime contenders for the ***DD-963***-class propulsion plant are the General Electric LM2500 gas turbine, which is derived from the jet engines of the giant C-5A cargo plane, and the

Pratt & Whitney FT-4A, which powers the F-105 fighter-bomber and Boeing 707 jet transport.

There is considerable operating experience with the FT-4, installed in the roll-on roll-off ship ***Calloghan*** and the ***Hamilton***-class Coast Guard cutters. The ***Calloghan*** has more than 5,000 hours on her FT-4 gas turbines and the Navy Boiler and Turbine Laboratory in Philadelphia has tested an FT-4 for more than 6,000 hours. One of the ***Calloghan's*** FT-4s has been replaced with a General Electric LM2500 for a 1,000-hour operating test to determine effects on fuel consumption.

AT LAST

Twice before there were plans to provide gas turbines in a U.S. destroyer-type ship. The Fiscal Year 1955 conversion programme had provided for the ***Mills***, a 360-ft., 1,850-ton escort ship, to be fitted with two British RM60 gas turbines in place of her diesel engines. The gas turbines were to have reduced plant weight by approximately 15 per cent while providing 67 per cent more power. However, the project was dropped and the ***Mills*** survives as a radar picket escort ship.

Of more import, late in 1968 the Department of Defence cancelled plans to build a 438-ft., 4,100-ton ***Knox***-class escort ship, with gas turbine propulsion. According to Secretary of Defence, Melvin Laird, the ship was dropped because it was intended as an experimental ship and would not be needed due to the decision to use gas-turbine propulsion in the ***DD-963***-class.

This decision was in some respects unfortunate because the gas turbine DE, albeit a single-screw, 27-knots-plus ship compared to the twin-screw, circa 35-knot ***DD-963*** ships, could have been operational in late 1973 whereas the first ***DD-963*** ship will not be ready until at least 1975. With the proper priority, the DE might have been completed even earlier than 1973 because 46 geared-turbine sister ships are being built; material and components could have been diverted to her.

A gas turbine ***escort ship*** available in 1973 or before could provide the Navy with valuable large-ship operating and maintenance experience before the gas-turbine destroyers became available. And, of course, the escort ship would still have the sensors and weaponry of a conventional ***Knox***-class DE. Perhaps some visitor to the ***DD-963*** in 1975 — or whenever she is completed — will chalk the Roman historian Livy's oft-quoted words 'Better late than never' on one of her gas turbines.

OUR COVER

THE DARING CLASS DESTROYER, H.M.A.S. VAMPIRE

(R.A.N. OFFICIAL PHOTOGRAPH)

"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".

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THE NAVY LEAGUE OF AUSTRALIA

Application for Membership

To: The Secretary,
The Navy League of Australia,

(.....Division)

Sir,

I am desirous of becoming a Member 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.

Periscope on Australia

by Grommet

NAVY BAND AT EXPO 70

The Royal Australian Navy band which performed at Expo 70, in Osaka, Japan, is shown in the photograph below, during a full dress-rehearsal in Sydney. Watching are the Flag Officer in Charge, East Australia Area, Rear Admiral G. J. B. Crabb, and the producer of Australia's musical programme at Expo, Mr Stefan Haag.

VISIT BY SOUTH VIETNAMESE NATIONAL DEFENCE COLLEGE

A group of 14 students and staff from the National Defence College of South Vietnam visited South Australia from 10 to 15 February, 1970. The team was led by the commandant of the College, Lieutenant General Vinh Loc. This was the first occasion that representatives of the College had visited Australia.

The South Vietnamese College trains senior Service and civilian officers for positions of higher command and responsibility. The purpose of the visit to Australia was to provide an opportunity to study developments in the political, economic and military fields and the visitors also inspected industrial establishments and development projects.

H.M.A.S. *HOBART* — VIETNAM DUTY

The guided missile destroyer *Hobart* sailed from Sydney on Monday, 16 March, for her third tour of duty in the Vietnam war theatre.

Hobart, commanded by Captain R. C. Swan, is serving for six months as a unit of the U.S. Seventh Fleet.

EXERCISE BERSATU PADU

Ten ships of the R.A.N. and units of the Fleet Air Arm grouped on 25 May, 1970, for training prior to the commencement of a five-nation defence exercise in west Malaysia.

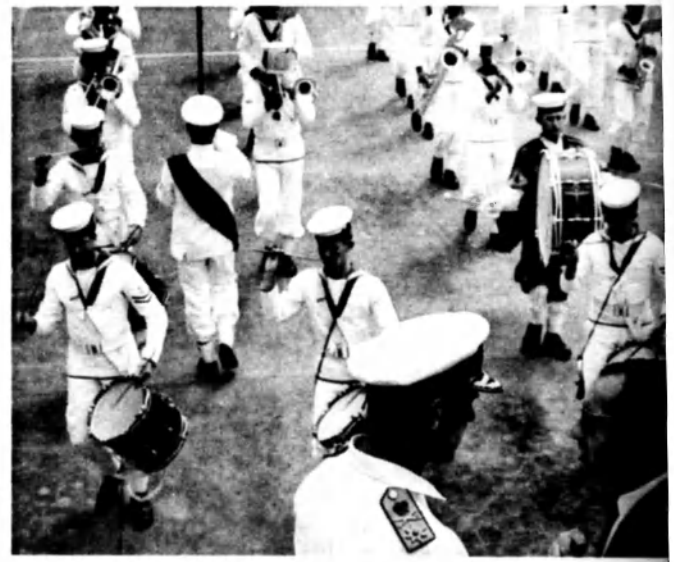
Exercise Bersatu Padu (complete unity) involved British, Australian, New Zealand, Malaysian and Singaporian forces. Australian vessels that participated included H.M.A. Ships *Teal, Ibis, Curlew, Parramatta, Supply, Stalwart, Stuart, Melbourne, Derwent* and *Oxley*.

Each of the five nations had an individual objective. Australia's was to train and exercise its Navy, Army and Air Force in the Malaysian-Singapore area to co-operate with the four other participants.

SOVIET SURVEY SHIPS

During mid-April the Soviet tanker *Dunaj* and Zulu class submarine *Vega* were approximately 300 miles south of Australia in the centre of the Great Australian Bight and proceeding slowly on an easterly course.

It is believed that the vessels were engaged in oceanographic research, however, they were kept under strict surveillance at all times.



Relatives and friends of the ship's company, farewell H.M.A.S. *Hobart*.

CANADIAN FORCES REVIEW 1969

Looking back, what's happened this year in Canada's Armed Forces?

The government's defence review came to fruition with a mandate for a more compact, flexible force suited to current national and international commitments.

In his major policy statement of 3 April, Prime Minister Trudeau called for highly-mobile armed forces and emphasised protection of sovereignty, multi-purpose maritime coastal shield, defence of North American air space, plus collective security and peacekeeping commitments overseas; at the same time he spoke of a reduction of Canada's NATO forces in Europe based on the "... magnificent recovery of the economic strength of Western Europe."

Defence Minister Leo Cadieux sketched in the first details of a restructured force in late June, and on 19 September, presented a detailed report on the reconfiguration of the armed forces scheduled to take shape over the next three years.

Mobile Command will be concentrated into three combat groups — at Calgary, Alta, Petawawa, Ont., and Valcartier, P.Q. — plus an airborne regiment with headquarters in Edmonton.

Artillery and armoured regiments in these combat groups are being re-equipped with airportable artillery and airportable armoured vehicles. Approximately 2,500 new 1¼-ton trucks will beef up the vehicle fleet over the next few years, and 50 Bell Utility Tactical Transport Helicopters on order will add a new dimension in mobility.

Regrettably, three well-known infantry regiments — The Canadian Guards, the Queen's Own Rifles of Canada and The Black Watch, Royal Highland Regiment of Canada — will disappear from the regular force, as will the Fort Garry Horse and the 4th Royal Canadian Horse Artillery. The 2nd Guards battalion will be re-designated 3rd Royal Canadian Regiment and the 1st Queen's Own Rifles re-designated the 3rd Princess Patricia's Light Infantry. Personnel of the other regiments will be absorbed into existing units.

A northern headquarters will be established, initially at CFB Gagetown, to co-ordinate increased military activity in the Arctic. The headquarters subsequently will be moved to a northern base; two small sub-headquarters' staffs will be established at Yellowknife and Whitehorse in January, 1970.

The NATO commitment in Europe will be reduced by nearly half to 5,000 men divided between an interim mechanised land force and three squadrons of CF-104 fighters. After 1972, these forces will adopt a light airmobile role with fighter or reconnaissance aircraft support and without nuclear delivery capability.

An air-transportable brigade group from Canada will still be available, as needed, to reinforce the NATO northern flank in an emergency. The similar commitment to NATO's southern flank will be discontinued in 1970.

The aircraft carrier *Bonaventure*, the only carrier ever owned outright by Canada, and the 25-year-old maintenance ship *Cape Scott* will be taken out of commission in 1970. A new operational support ship, the *Protecteur*, joined the fleet this year, and a sister ship, the *Preserver*, will be commissioned in 1970, giving the fleet greater range and endurance. Four helicopter-destroyers are being constructed for 1971 and 1972.

Closures of three bases and four depots touched home for a number of smaller communities across Canada. Bases at Camp Picton and Clinton, Ont., and depots at Ville La Salle (Montreal), Cobourg, Ont., London, Ont., and McGivney, N.B., were closed or are in the process of closing; one base in Germany, Zweibrucken, has been phased out; and Canadian Forces Base, St. Hubert, will be substantially reduced. The closings are an economy measure to help the department work within its budget — fixed at $1,815 billion annually for the next three years. The Department has been working with government at all levels to promote other uses for those bases being closed.

Although their organisation was in flux, servicemen in a montage of blue, black, brown, khaki, and new green uniforms, carried out all the regular and essential tasks of an armed force in peacetime. Maritime aircraft carried out surveillance patrols in the north and off Canada's coasts while forces continued to carry out duties in Europe with the North Atlantic Treaty Organisation, in North American Air Defence Command, and in distant countries with the United Nations.

North American Air Defence Command underwent two reorganisations this year: the first, in September, simplified the regional organisation, and the second, in November, replaced the former divisional structure by an eight region command. The overall Canadian

commitment, however, remained virtually unchanged.

Search and rescue teams from four rescue centres across Canada had the heaviest year of their history as private aircraft crashed, boats overturned, children wandered away.

At the CNE, PNE and Quebec Exhibition, armed forces displays let more than 40,000 people listen to some of those air-sea rescues actually unfolding.

In the first eight months of 1969, rescue co-ordination centres handled a record 1,807 incidents, involving 4,169 hours of search flying and the rescue of 340 persons.

About 500 men, 14 fixed wing aircraft and seven helicopters have the permanent task of search and rescue, while additional resources are provided by the forces as required. The forces' workload is increasing year by year as private aircraft and boat traffic becomes heavier, and more people become aware of the armed forces' facilities.

Several colorful activities during the year caught special public notice.

The hydrofoil *Bras d'Or* set a world's speed record for warships, racing 62 knots (72 miles per hour) across the mouth of Halifax harbour. The *Bras d'Or*, still undergoing trials, is the first ocean-going hydrofoil designed as an anti-submarine warfare vessel.

In Germany, Canadian pilots and photo interpreters swept the annual NATO photo reconnaissance competition. Not only were the Canadian squadrons the two best in six nations, but Toronto pilot Scot Clements placed first among 108 NATO flyers.

An unusual sight in Montreal — troops of the Royal 22e Regiment guarded city hall, city and provincial police headquarters, and TV transmission towers for six days following the civil disorders of October 7. The troops were made available at the request of civil authorities.

At CFB Shilo, near Brandon, Manitoba, in September, and November, a joint team of Canadian, German, and British scientists evaluated the production models of a tactical reconnaissance rocket — the CI-48 Drone. Developed by the three countries for short-range intelligence gathering, the unmanned jet surveillance vehicle travels near the speed of sound photographing enemy positions.

The vessel *Quest*, possibly the quietest ship in existence, was commissioned for the Defence Research Board in August on the west coast. The new underwater research vessel is operating out of the Defence Research Establishment Atlantic in Dartmouth, N.S. The ship's activities will assist Canadian research in the whole field of oceanography.

And somewhere among the icy precipices of Glacier and Banff National Parks, unknown to most Canadians, a 105-mm gun crew and an 81-mm mortar crew spent the winter shooting down avalanches before they could endanger travellers or tourists in the national playgrounds.

Outside Canada, the tight schedule of the mechanised brigade in Germany called for two large NATO battle exercises in the fall. Almost 400 militiamen flown from Canada supplemented the brigade in August and September, and another 66 trained with brigade units in May and June.

The Air Division in Germany sorted itself into a more consolidated position on two instead of three bases. With the base at Zweibrucken closed, the four strike and two reconnaissance CF-104 squadrons are operating from Baden Soellingen and Lahr. Within the next two or three years, both Canada's land and air commitment to NATO will be co-located on these bases.

As a world peacekeeper, Canada kept her military contingent in Cyprus (sixth year), plus United Nations observers in India-Pakistan (20th year), and Palestine (15th year). A 31-man military delegation was provided to the International Commission of Supervision and Control in Vietnam/Laos/Cambodia for the 15th year, and two military observers were sent to Nigeria this year at the request of the Nigerian government.

In Ghana and Tanzania, training teams of 17 and 51 worked with local forces, while the Canadian Forces gave training in Canada to some servicemen from Malaysia, Jamaica, Zambia, Kenya, Uganda, Singapore, and Korea.

From the Artic ice to the Libyan desert, Canadian soldiers shivered and sweated through a wide range of training missions.

The Canadian Airborne Regiment which must be prepared to operate in any environment, followed two weeks of Arctic training in October with two weeks of tough tropical training in Jamaica in November. Artillery detachments gained experience with British troops in Libya. Air Transport Command lifted a Mobile Command battalion to Jamaica in February for a hot week of tropical training; in September the big Hercules and Yukons loaded the 1,000-man Canadian standby battalion group and ferried them 5,000 miles to Denmark for a four-day exercise with NATO's ACE Mobile Force.

In addition, Transport Command aircraft flew approximately 35 million passenger/miles and 69 million ton/miles during the year on 4,465 scheduled and 4,324 special flights.

Maritime Command's major NATO exercises this year were in the Caribbean and the eastern Atlantic. Almost the entire maritime force is assigned to NATO in the event of an emergency, otherwise their primary task is protection and anti-submarine surveillance of the Canadian coastline.

The naval reserve was of valuable assistance to the fleet on these exercises; about 130 reserve sailors served on the first exercise, and 45 on the second.

This kind of direct support illustrates the philosophy behind the forces' 2,700 primary air, land, and sea reservists, who are trained to step into specific slots at short notice. The Air Reserve's 100 pilots, for instance, can provide light transport or reconnaissance support for Mobile Command, as well as other duties.

In the land reserve, 7,000 militiamen earned higher trade or rank qualifications in the last year, and thousands of others trained alongside soldiers of Mobile Command in Canada or the Mechanised Brigade in Germany.

At another level, the armed forces encouraged and equipped the 100,000 youths and instructors of the national cadet movement, and conducted numerous summer camps and training programs for navy, army and air cadets.

Within the force, a new concept was introduced for the career serviceman, placing an enlisted man on the same career footing as an officer. After an initial five years, if the armed forces and individual agree, the enlisted man can re-enlist for an indefinite length of time, rather than for specified five or ten year periods.

The Canadian Forces Technical Training School opened in April at St. Jean, Quebec — step one in a programme of technical training in French, with French textbooks. The programme follows the theory that a man is most successfully instructed in the language he best understands, and thus gives servicemen of either tongue equal training opportunities.

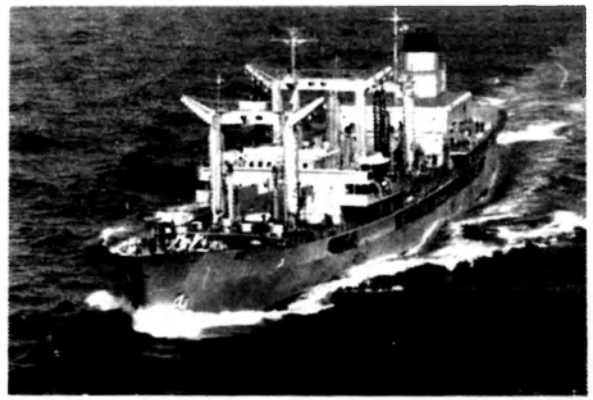
Green uniforms blossomed in earnest — more than 8,000 so far. The first general issue of the new uniform began in August, when officers and men of CFB Cornwallis and CFB St. Jean were outfitted. They were followed by CFBs Petawawa and Foymount with Valcartier slated for completion by the end of this year. The general issue will work from base to base across Canada and in Germany.

As 1969 ends, one decade of flux for the Canadian Armed Forces — integration, unification, defence review — draws to a close and introduces new changes for the '70s.

"There are culturai, sociological and technological changes taking place in Canada," said General F. R. Sharp, who succeeded General J. V. Allard as Chief of Defence Staff in September, "and faster than ever before. We must face change, look at it positively, accept it, and change with it. But this makes it much more difficult to predict the future, so we must have that built-in flexibility, not only in the art of war, but in our relationship to the nation.

"The big thing is to establish that link between national aims and the military contribution to them."

BONAVENTURE, the only carrier in the Royal Canadian Navy. She is fitted with a steam catapult and angled deck. She carries Grumman tracker aircraft and Sea King helicopters.



The Helicopter Carrier and Supply ship PROVIDER was completed in 1963. She is equipped with a modern eight berth hospital and can carry six Sikorsky helicopters. Her decks are fitted with 23 electro-hydraulic winches to facilitate the ship-to-ship and ship-to-shore movement of cargo and supplies.

CONTRIBUTIONS INVITED

The editor invites persons to submit articles, photographs and drawings (black ink) 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. 2000 Australia.

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

Vosper Thornycroft – TO B D WORLD'S LARGEST PLASTICS SHIP

A complete mine-hunter, built of glass-reinforced plastics, has been ordered by the Ministry of Defence (Navy), from Vosper Thornycroft. The total cost of the project including equipment being supplied by the Ministry of Defence (Navy) is in the order of 1½-2 million Pounds Sterling. She is to be 153 feet long, and as far as is known this will make her the largest glass-reinforced plastics vessel anywhere in the world.

Glass-reinforced plastics, although at present more costly than steel for ships of this size, have great advantages in their resistance to corrosion and, in comparison with wood, to marine organisms. For mine countermeasures ships it is primarily the non-magnetic nature of the material which favours its choice.

Vosper Thornycroft have been working on the problem of glass-reinforced plastics ships, in collaboration with the Ministry of Defence, for several years. In December 1966 details were announced of a type of cellular sandwich construction being applied to an experimental section of a ship's hull, made for structural testing. This section was moulded at the Woolston, Southampton, shipyard of the Vosper Thornycroft Group, the necessary technology being developed in association with Bristol Aeroplane Plastics Ltd. Later a second section, of solid laminate rather than sandwich construction, was moulded at Woolston, and tested in comparison with an experimental section in laminated wood manufactured at the Vosper Thornycroft Portchester yard.

All these test sections underwent extensive structural testing at the Naval Construction Research Establishment, at Dunfermline in Scotland, including shock loading, representative of the effects on a ship's hull of underwater explosions. The outcome of all these tests has been that for the new complete ship the solid glass-reinforced laminate type of construction has been chosen.

The moulding of the new ship's hull will be done in a specially built shop at Woolston, adjacent to the shop where the earlier plastics test sections were made. This new larger shop has special provisions to meet the most stringent requirements for large-scale plastics moulding, both from the point of view of quality control and to avoid health hazards for the operatives. The whole shop will be temperature controlled, and provided with special ventilation for fume extraction, to remove the styrene vapour given off by the resin. Stringent fire-protection measures will also be incorporated. The shop is costing ½-million Pounds Sterling, and is a joint project by Vosper Thornycroft and the Ministry of Defence (Navy). Provision has been made in its design for still further extension so that larger plastics ships could be built later. It is also foreseen that the new building facility could be used as a completely covered berth for the construction of ships in conventional materials.

Apart from the shop itself a special amenity block is being built nearby to make possible the high standards of hygiene which are essential to prevent people working with resin and glass fibre from suffering skin troubles. About fifty men will be employed on the actual work of moulding, some being shipwrights, and others semi-skilled laminators. In addition there will be lofting and other traditional shipyard skills at work, including fitting out once the hull is complete. Special training courses are under way to ensure that the finished laminate is to the quality standards demanded, which are higher than for any other known glass-reinforced plastics ship construction in the world. Special quality control procedures are under development.

The actual laminating work will be done on a semi-automated and mechanised basis, and not entirely by hand as is usual with small craft built of the material. The laminate will consist basically of polyester resin reinforced with glass fibre woven rovings. This ensures good strength/weight ratio, and good fire resistance. The basic structure consists of single-skin hull shell with transverse framing and a deep keel member, and some limited longitudinal framing. Frames, keel, deck beams and bulkhead stiffeners will all be of 'top hat' section, moulded over a plastics foam core. Bolted fastenings will be used to increase the strength of the bond of the frame flanges to the hull.

Decks, bulkheads, and other relatively flat components will be moulded in a separate shop alongside and subsequently bonded into the hull structure. There is also a separate cuttings, bay, with special dust extraction plant, for trimming these panels. The hull itself will be laid up in a steel female mould, constructed of bolted sections. These will be removed when the hull is complete, and the ship will be launched down ways in the normal manner.

This has been provided for in the design of the enclosed shop.

The new plastics mine-hunter will be similar to the familiar coastal minesweepers of the *-ton* class, and will be fitted out with suitably reconditioned machinery and equipment removed from H.M.S. *Darriton*. The design of the new plastics hull was carried out by the Group under separate contract from the Ministry of Defence (Navy). Concurrently with construction, development work will be carried out on a number of technical problems associated with the use of the new material in larger vessels than before, including machinery alignment, attachments to the hull, and electrical continuity and earthing.

The completion of the new ship, which is to be in 1972, will mark an important stage in the long-term programme which the Ministry of Defence (Navy) has undertaken to develop ships in glass-reinforced plastics. The effort is aimed at providing the really efficient hull for a future generation of mine countermeasures ships.

Below: A test section of a plastics ship (built by Vospe. Thornycroft at Southampton). This is the type of construction selected for the new G.R.P. mine-hunter.

Nautical Notes from all Compass Points

By "Sonar"

INDIA

SUBMARINE TENDER

The **Amba** is one of India's newest additions to her fleet. This submarine tender, of the Soviet Navy's Ugra-class is 145 feet long and has a 6,700-ton displacement. She has four 3,500-h.p diesel engines, giving her a speed of 20 knots. The **Amba** has a crew of 31 officers, 88 petty officers, and 211 enlisted men. She has a helicopter flight deck, several workshops, and quarters for the crews of eight submarines.

ISRAEL

NEW LIGHT SYSTEM

The Israeli Air Force has adopted the Rotor-Or Formation Light System, which enables helicopters to carry out night tactical operations in formation. Introduced by Israel Aircraft tactical operations in formation. Introduced by Israel Aircraft Industries, the system uses self-powered light sources visible under half-moon conditions over distances of more than 300 ft., and provides the pilot with light circles which serve as an artificial horizon. The pilot can also note any change in rotor disc attitude of another helicopter before the helicopter itself changes altitude, but the light cannot be seen from the ground. The four illumination devices of the system can be mounted or removed in 45 min. under field conditions, with an installed total weight increase of about 3 lb. It needs no maintenance, and has an estimated life of 10 years.

SWEDEN

NAVY COMPLETES UNDERGROUND SHIPYARD

The Royal Swedish Navy has commissioned a new underground shipyard at Muskoe, an island about 40 miles south of Stockholm. By the end of August, 1969, the base, carved out of solid granite, was scheduled to be in full operation. The Muskoe yard, under construction since 1957, has cost the Swedish Defence Ministry about $70 million, including $60 million for actual construction work and $5 million each for underground docks, access roads, and tunnels.

Some 35 million cubic feet of rock were removed from the base which consists of about five miles of tunnels, most of which are about 100 feet underground. Navy spokesmen claim the base can withstand anything but a direct nuclear hit.

Two docks, approximately 985 feet long, are large enough for ships up to 3,000 dw. tons. Smaller drydocks can handle ships up to 400 dw. tons. Underground facilities include workshops, hospitals, emergency, base exchanges, ordnance shops, and also a reserve power station.

UNITED KINGDOM

SMALL-BOAT SEACAT

A new lightweight variant of the Short Seacat close-range sea-to-air missile-launcher has been produced by the makers and recently shot off its first live rounds.

This new system, carrying three rounds, weighs half as much as the standard four-round system now in service and this will allow small craft such as F.P.B.s and Inshore Minesweepers to carry powerful defence against air and surface attack.

Seacat is already used by some 15 navies, and with an operational life estimated to last into the mid-Eighties, this new lighter model should encourage even wider sales abroad.

SUBMARINE LAUNCHED AIR MISSILE SYSTEM

Firing trials with the SLAM (Submarine Launched Air Missile System) prototype are being planned to take place during the third quarter of this year. SLAM is designed to use the Blowpipe missile — now being developed by Short Bros. as a hand-held anti-aircraft or anti-tank weapon for the British Army — in a marine role, primarily intended for submarine use but also with potential as a weapon for mounting on small surface vessels.

The Indian Submarine Tender, AMBA.

A Seacat missile leaves the new design of lightweight launcher, which is especially suitable for lightcraft.

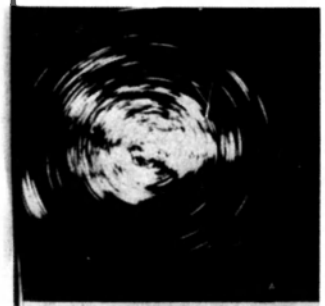
The submarine SLAM launcher, carrying six missiles, can be extended above the surface from a submerged submarine when a target comes within range, with remote TV target tracking, missile firing and control.

REDUCTION OF RADAR CLUTTER

Work has been in progress since early in 1968 at the Admiralty Surface Weapons Establishment on the development of a Digital M.T.I. Canceller to replace the quartz line cancellers in use in commercial radar sets. The first model was completed in 1969 and has now been working successfully with two separate radars at A.S.W.E., the first of its type in the United Kingdom. Our pictures show two radar displays, one with land clutter and moving targets, and the other with moving targets only.

Moving Target Indication (M.T.I.) is a technique applied to pulse radar systems, in which the doppler frequency shift, associated with moving targets, enables discrimination between fixed and moving targets to be made.

In practice, an M.T.I. system measures the radio-frequency carrier-phase-angle of received echoes and keeps a running comparison with former echoes. Up to the present, an ultrasonic quartz delay-line forms the memory to record the phase of the first echo, and a simple electronic subtractor is required to give an output for moving-target echoes, which change in phase from pulse to pulse. The combination of memory and subtractor is known as an 'M.T.I. Canceller'. The Digital canceller brings all the advantages of semiconductor integration, small size, high reliability and low power-consumption, together with far more effective filtering of clutter.



SIXTH NUCLEAR SUBMARINE LAUNCHED

Courageous, the sixth nuclear-powered fleet submarine for the R.N., was launched on Saturday, 7 March, 1970.

By the end of this year, the R.N. should have four nuclear-powered fleet submarines in service. The fifth, ***Conqueror***, was launched last August.

The seventh and eighth are still under construction and an order for a ninth is expected to be placed soon.

Primary role of ***Courageous*** will be as a submarine hunter-killer and she will be equipped with the latest underwater detection equipment and weapons.

She will carry an inertial navigation system and a means of measuring her depth below ice.

SHIPBUILDING NEWS

Cammell Laird (Shiprepairers) report that the contract to refit two destroyers of the Venezuelan Navy has been followed by the receipt of a further contract for the refit of H.M.S. ***Diana*** and ***Decoy***, which the government of Peru agreed to purchase from the British Ministry of Defence. These ships were both built by Yarrow and were first commissioned in 1953-54. The cost of the refit contract is expected to be of the order of 2.5 million Pounds Sterling for each ship.

U.S.A.

SUBMARINE TENDER

The U.S.S. ***L. Y. Spear*** (AS-36), the first of a new class of submarine tenders, moves out of the Quincy shipyard for her builder's sea trials. The 644-foot ship will be delivered to the Navy this year.

ADVANCED SKYHAWK

Initial flight test of a new, uprated and developed version of the Skyhawk attack bomber, designated A-4M and produced for the U.S. Marine Corps by McDonnell Douglas, is scheduled for April this year. The A-4M will be powered by an advanced P&W J-52 with substantially added thrust to increase the aircraft's rate of climb, acceleration and combat manoeuvrability as compared with the A-4F. It will also feature a bigger canopy and windscreen; a self-contained engine starter and a drag chute for short field landings.

NAVY APPLIES NEW RIGID FOAM FOR ADDITIONAL FLOTATION

A new foaming system, called Autofroth I, is capable of filling below

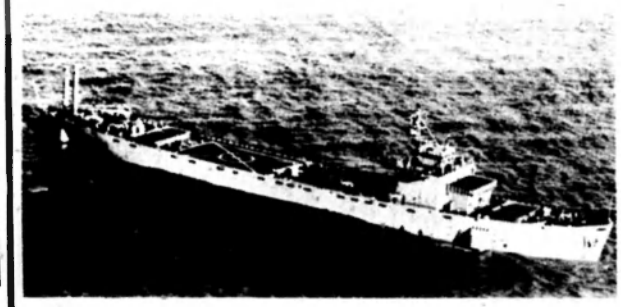
deck spaces of large ships with urethane plastic foam. In a current application, the foam is being used to make a U.S. Navy special minesweeper, the MSS-1, which is being converted from a World War II freighter, practically unsinkable. The flotation material — only one-thirtieth the weight of water — will be placed below the ship's decks by means of the foaming system.

The rigid foam is a layer several feet thick extending almost the entire length of the vessel and just below the second deck. The foam was placed above a wire rope platform covered by a plastic film. The platform is suspended from the overhead.

Under the Autofroth I system, two large pressure cylinders containing the foam-making chemical remain above the deck, long double hoses from the cylinders are connected to foam guns below decks. When the triggers on the foam guns are pulled by the operators, the two chemicals combine into urethane foam that can be directed into every nook and cranny and visually inspected to eliminate voids.

Within a few minutes the foam cures into a rigid and permanent flotation material.

This 15,000-ton converted Liberty ship, the MSS-1, was conceived to sweep missed or unswept mines. She is 441 feet long, with a 57-foot beam, has five inboard-outboard engines, and has a maintenance crew of one officer and eight enlisted men. The bridge and all machinery are shock-mounted, and all machinery is remotely-controlled from the bridge. The hull is filled with a special flotation foam material.



NAVY DEVELOPS SONAR SYSTEM TO HELP LOCATE SUNKEN SHIPS

Navy scientists have developed a new tool for quickly finding and photographing sunken ships, such as the nuclear submarine ***Thresher***, and for studying the "lay of the land" beneath ocean waters.

An oceanographer, F. M. Daugherty, said the device, called Teleprobe, "may become a welcome addition to existing search and identification capabilities, especially those being developed for use in marine tragedies."

"For example," he continued, "ocean scientists searching for the ***Thresher*** knew exactly where the ill-fated nuclear submarine lay but had trouble manoeuvring the surface ship carrying cameras to photograph the wreck over the exact spot."

Daugherty and an ocean survey team from the U.S. Naval Oceanographic Office in Suitland, Maryland, developed the towed search and identification instrument primarily as a means of underwater survey. Its wreck identification ability was a bonus.

Daugherty said his camera and sonar instrument had proved itself during a trial in which it was used to locate a destroyer escort ship purposely sunk earlier in 2 500 feet of water about 20 miles off San Clemente, California, in another Navy programme.

The Teleprobe looks like an overweight guppy on sleigh-like runners.

The secret of Teleprobe's increased efficiency in finding wrecks is its sonar system.

Sonar devices send out pulses of sound, which bounce off objects under the ocean surface. These reflected sound waves are recorded and processed through special equipment to produce an outline of the object that reflected them.

Teleprobe's sonar picture of the sunken destroyer escort showed up as a fuzzy white outline on a grey background that represented the surrounding ocean floor.

The instrument, mounted on a sled-like frame 18 feet long and weighing lbs., uses its camera after the sonar has found the subject to be photographed.

GLASS-HULLED SUBMERSIBLE

Known as the Swimmer Delivery Vehicle, this fibre glass-hulled submersible, developed for the Navy, can carry four SCUBA-equipped crewmen on shallow-water operations. When diving, the hull of the submersible is filled with water. The craft is equipped with a three-blade propeller, and is powered by a 400 r.p.m. direct-drive electric power plant (see photo).

U.S.S.R.

LARGEST RESEARCH BUOY ARRAY TO BE SET OUT BY SOVIETS

The largest array of research buoys ever to be moored in the ocean were set out in February in the North Atlantic by Soviet oceanographers.

Seventeen buoys were set in an "L" shape 1,000 miles north of the Equator near the Canary Islands. They are equipped with instruments to measure oceanic currents at 11 levels, from 33 feet to 9,840 feet below the surface, and will stay in place for six months.

The project was announced by Professor Andrei S. Monin, director of the Institute of Oceanology of the Soviet Academy of Sciences, at a scientific meeting in Dublin. The meeting was organised by the International Council for the Exploration of the Sea. It was co-sponsored by the Intergovernmental Oceanographic Commission, an organisation founded by UNESCO.

SOVIET PACIFIC FLEET ROLE TO INCREASE AFTER VIETNAM

The Pacific Fleet of the Soviet Union, which has been built up in recent years, is expected to play an increased role in the years after the Vietnam war, according to American and Asian analysts.

The analysts foresee a build-up of nuclear submarines as part of the Soviet deterrent against the United States, as well as wider-ranging submarine patrols along the sea lanes between North America and Asia and between Japan and Southeast Asia.

A greater Soviet naval presence is also expected in Asian waters as the United States withdraws some of its power from the region. The Soviet presence is likely to be used in support of efforts to form the collective security arrangement that Moscow leaders have urged several times.

Dr Robert A. Kilmarx, research director of the Centre for Strategic and International Studies at Georgetown University, said that:

"The Soviet Union uses its naval power as a political instrument much more precisely than the United States."

The Soviet Union's Pacific Fleet is based in three ports — Vladivostok and Sovetskaya Gavan on the Sea of Japan, and Petropavlovsk in Kamchatka.

The Soviet Navy has about 400 submarines compared with fewer than 200 submarines on active duty in the U.S. Navy. The Soviet Pacific Fleet is believed to have 110 to 125, including 30 armed with missiles. The others are mostly attack submarines designed for operations against shipping and for mine-laying.

Much of the information on Soviet naval movements is obtained by U.S. planes based at Wakkanai, in Hokkaido, Japan's northernmost island, and on Okinawa.

Over the years, the Soviet Navy has been increasingly active in the Sea of Japan. In 1967, a Soviet destroyer scrambled through a U.S.-South Korean naval exercise and sideswiped the American destroyer ***Walker***. In 1968, the Russians moved a large force to the coast of North Korea to counter an American task force that had been ordered into those waters after the North Koreans seized the intelligence ship ***Pueblo***.

The Russians turned out a search force to look for survivors of the EC-121 reconnaissance plane shot down by the North Koreans in 1969. Soviet naval aircraft, numbering about 400, are also in evidence and occasionally cause Tokyo to protest to Moscow about intrusions of Japanese air space.

The Japanese government sees a potential Soviet threat to Japan's shipping lanes off East Asia. This has led to a gradual increase in the Japanese naval force and plans for a further build-up in the five-year defence plan that begins in 1972.

The Soviet naval expansion has been co-ordinated with penetration of the shipping business in Asia. Soviet freighters sailing to Haiphong, in North Vietnam, tried in 1968 with modest success to get into the wool trade from Australia so that they would not have to sail back to European waters empty.

VIETNAM

VIETNAMESE NAVY USING CEMENT BOATS

The Republic of Vietnam Navy (VNN) has introduced its new model of the famed yabuta junk — a 60-foot, $17,000 patrol craft with a cement hull.

The idea of using ferro-cement for naval construction was first introduced to the Vietnamese Navy in May, 1969. The actual construction of the new yabuta junk took only three months.

Ferro-cement's advantages over conventional materials used for nautical construction are many. First used in mid-19th century Europe and developed throughout the world, ferro-cement has gained much popularity in recent years.

The VNN's new junk is much stronger than old models, and one-third as expensive. She will be easier to repair if damaged. Handling has been improved and engine vibration reduced.

The cement junk has a much longer life expectancy than her earlier Sau wood counterpart that was subject to warping, rotting and insect deterioration. Ferro-cement is impervious to these elements.

Cement "yabuta junk"

Construction of the ferro-cement craft was simple. Vietnamese Navy shipfitters poured a mixture of Portland cement, pozzolan, sand, and water through a mesh of interwoven chicken-wire anchored to a water-pipe framework. The cement was smoothed over the inside and outside of the hull and "damp cured" for three weeks. Then the hull was worked and finished with two applications of epoxy resin. After interior outfitting, the entire craft was painted and readied for duty.

Seven feet were added to her length and one foot to her beam. Overall savings amounted to $5,000, with savings of $1,850 on the ferro-cement hull alone. A reduction of 4,631 man-hours was realised in construction time over the old yabuta junk.

Besides the new junk, a ferro-cement swift boat (PCF) is being built at the VNN shipyard, the largest shipyard in Southeast Asia and the largest industrial complex in South Vietnam.

Naval Cadet Force News

AMALGAMATION OF NAVAL CADET ORGANISATIONS

The two Australian naval sea cadet organisations are to be combined and brought under the full control of the Australian Naval Board.

The organisations, the Australian Sea Cadet Corps and the Royal Australian Naval Reserve School Cadets, will operate under the new name of Naval Reserve Cadets.

At present the Australian Sea Cadet Corps are under the joint control of the Navy League of Australia and the Naval Board. The League administers the Corps on behalf of the Naval Board, which controls all aspects of training.

With the agreement of the Navy League, the Naval Board will shortly assume complete responsibility for the conduct, administration and financing of the Corps.

The Naval Reserve Cadets will not form part of the Naval forces. But, naturally the Navy as the parent service, will take a very great interest in their welfare, training and development.

The changes will place the Naval Cadets on a similar basis to the Army's School Cadet Corps and the R.A.A.F.'s Air Training Corps. Cadets, who are aged between 14 and 18 years, carry out weekly training in their own headquarters as well as week-end and annual continuous training in Naval ships and establishments.

The aim of Naval Reserve Cadet training is to give boys a foundation of naval knowledge and discipline, to develop qualities of leadership and self-reliance, and to foster an interest in the role of the Navy and the Merchant Service.

Cadets will wear the uniform of the Citizens Naval Forces except that 'Australia'' flashes will be replaced by others bearing the words "Naval Reserve Cadets".

Implementation of the necessary changes following amalgamation such as the passing of regulations, is in hand and will be dealt with as quickly as possible.

The Honorable D. J. Killen, M.P., Minister for the Navy, has expressed his deep appreciation to the Navy League for their past co-operation and support in sponsoring the Australian Sea Cadet Corps which had risen from 11 units in New South Wales and Victoria in 1947, to 39 units in all States and Territories, totalling over 2,200 officer instructors and cadets.

CANADA

SEA CADET PROGRAMME IN 1970

Canadian Forces Headquarters has advised that Sea Cadet Summer Training will be conducted on approximately the same scale and in the same locations as for 1969. This programme includes the instructional course for Cadet Instructor List Officers at Canadian Forces Bases, (CFB), Greenwood, Esquimalt, London and Valcartier, and "trades courses" for Sea Cadets at CFBs Halifax, Cornwallis, Esquimalt, and at H.M.C.S. ***Quadra***.

The programme for exchange of Canadian and United States Sea Cadet groups will be continued this year with Canada receiving groups of two officers and fifty cadets each on the East and West coasts. Equivalent Canadian groups will undertake training in the United States. An addition this year has been the institution of a Canada-United Kingdom Sea Cadet exchange visit, the group from each country comprising one officer and ten cadets.

On cruises this Spring the Canadian Forces have been able to accept limited numbers of Sea Cadets on both Exercise 'Maple Spring' and on the Far East cruise. It is anticipated however, there will be a shortage of billets for Sea Cadets on cruises in the Summer due to other training commitments.

NEW SOUTH WALES

QUARTERLY REPORT OF PROCEEDINGS

This report covers training and other activities carried out by the Cadet Force in New South Wales during the period 1 January 1970 to 31 March 1970.

Weekend training postings were to the following H.M.A. Ships:—

SHIP	DATES
Stalwart	6.3.70 to 8.3.70
Stuart	6.3.70 to 8.3.70
Stuart	13.3.70 to 15.3.70
Perth	13.3.70 to 15.3.70
Sydney	13.3.70 to 15.3.70
Stalwart	20.3.70 to 22.3.70

The Representative of the Flag Officer-in-Charge East Australia Area carried out the annual inspection of T.S. ***Tobruk*** (Newcastle Unit) on Saturday, 14 March and T.S. ***Hawkesbury*** on Saturday 21 March.

On Monday, 26 Janary, 30 Naval Reserve Cadets joined their Army and Air Force counterparts to form a combined Cadet Force Guard of Honour in the Domain, Sydney, for Australia Day celebrations.

The first official meeting of Senior Officers from each State was convened in Canberra by the Naval Board to discuss matters of Cadet policy. This took place on Friday 6 March and Saturday 7 March.

The St. John Ambulance Brigade requested the services of Lieutenant Causer, the Commanding Officer of T.S. ***Shropshire*** (Canterbury) to assist them with the organisation of their Commonwealth Camp at Thornleigh in January. This was approved and the Brigade were most appreciative of the help they received through Lieutenant Causer's active participation.

(sgd.) L. MACKAY-CRUISE
Commander, R.A.N.R.,
Senior Officer

News from . . . BRITAIN

(The Editor is indebted to the officers of the Information Service of the British High Commission in Australia for their ready assistance in the compilation of this article.)

SEA TRIALS FOR FAST NEW RESCUE BOAT

A new type of fast shore-based lifeboat with a speed of 20 knots over a 400 mile range has been specially designed for Britain's Royal National Lifeboat Institution.

A prototype of the 20-ton craft, designed by the Scottish firm of G. L. Watson, is to be built at the Littlehampton, Sussex, yard of William Osborne and Company for sea trials.

The Watson lifeboat is designed to be built in glass-reinforced plastics but the prototype will be given a triple mahogany skinned hull. Instead of the traditional double-ended hull of a lifeboat, the craft has the transom, or flat stern, of a normal boat.

But it is 17 feet wide, compared with the 13 foot six inch beam of a typical British lifeboat.

Improved Stability

The topdeck structure is filled with polystyrene to give the life boat a self-righting ability, while an internal ballast tank instead of an iron keel gives it even more stability.

Another feature of the new design is the fitting of 26 wooden strips along the hull. Tests on a smaller craft showed that these not only cushioned the boat when it was driven into heavy seas but also helped to improve directional stability.

The Watson boat has cabin seating for 30 men and is designed for a five-man crew instead of the normal seven. Power is provided by twin diesels, each developing 375 horsepower.

The Royal National Life-Boat Institution currently operates a fleet of 170 lifeboats and last year they were called out some 2,000 times to save more than 1,000 people.

ZINC SILICATE COATING FOR WEATHERDECK

The weatherdecks of a frigate being built for the Royal New Zealand Navy by Yarrow Shipbuilders Ltd., of Glasgow, Scotland, are being treated with a special zinc silicate coating which will withstand salt water contamination, abrasion and petroleum products.

The coating is being applied by Loyne Ltd., a firm specialising in coating techniques. They are also treating the superstructures and internal parts of the frigate with a pure zinc matellised coating.

The spray-gun applied coating for the weather deck is an organic zinc which cures by extracting moisture from the air to leave a tough, zinc film. If the surface becomes damaged there is no resultant rust creep.

Although the process is more expensive than conventional paint protection methods, its benefits have attracted the attention of navies throughout the world, including the Royal Navy.

Recently the firm received inquiries to treat the weatherdecks of Chilean and Argentinian warships with the silicate zinc as well as superstructures and internal structures with pure zinc metallised coatings.

NON-SLIP DECK COVERING FOR SMALL CRAFT

A new non-slip deck covering for small craft has been developed by a British firm as an aid to safety at sea.

The lightweight material, called Treadmaster M, is manufactured in moulded sheets which have a raised diamond pattern. It can be fixed with epoxy resin adhesive to the decks of both existing and new craft.

Resilient, hard-wearing and resistant to sea water, oil and petrol, it is made up of basic constituents which have intrinsic non-stick properties and these are maintained even under extremely wet conditions. The pattern design allows water to drain off quickly.

It is supplied in sheets 48 inches by 36 inches by one-eight-of-an-inch thick. The standard colour is grey but it is also available in blue, green and natural (brown).

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: Staff Office Cadets, H.M.A.S. Watson, Watsons Bay, N.S.W., 2030.

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

SOUTH AUSTRALIA: C/- Box 1529M, G.P.O., Adelaide, 5001.

VICTORIA: C/- Room 6, 2nd Floor, 528 Collins St., Melbourne, 3000.

WESTERN AUSTRALIA: C/- 162 Coode St., Como, C152.

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.....

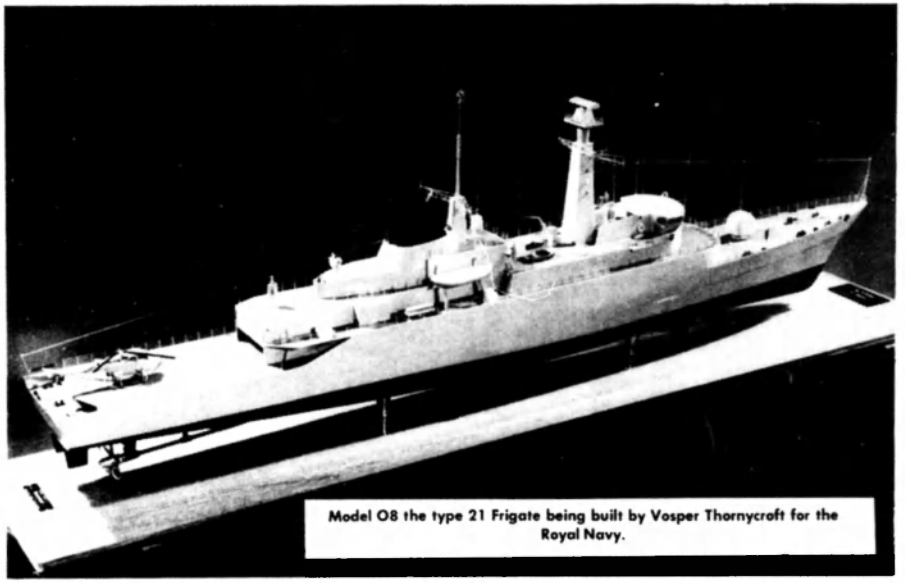
STREET..... SUBURB.....

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



Model 08 the type 21 Frigate being built by Vosper Thornycroft for the Royal Navy.

The Royal Navy's . . .

TYPE 21 FRIGATE

The Ministry of Defence (Navy) has released details of the Type 21 frigate being built by Vosper Thornycroft for the Royal Navy. The ship, which was designed by Vosper Thornycroft in collaboration with Yarrow, will have a sophisticated Ferranti weapon control system, and her Rolls-Royce gas turbines will give her a speed of 34 knots. Provision is included for carrying the new naval helicopter, the WG13, and the guided missile Seawolf, which is under development and will be fitted in later ships of the class.

The staff requirement which has governed the design of the Type 21 frigate called for a ship displacing some 2,500 tons, capable of contributing effectively to the defence of a convoy, or other force, against attack by surface ships or submarines, and fully able to defend itself against aircraft, missiles or fast patrol craft. The ship must match comparable contemporary warships in fighting power and in performance, while being able to maintain all-weather patrol in any part of the world.

The Type 21 frigate was designed by Vosper Thornycroft in association with Yarrow (Shipbuilders) Ltd. This was the first occasion in recent years when a fighting ship had been designed commercially. She is due to be completed in summer of 1972 and will therefore be at sea before the larger Type 42, which will have a similar main propulsion system. The cost has been quoted as over 8 million Pounds sterling.

The new ship's armament consists of one Vickers 4.5-inch Mark 8 automatic gun and mounting, quadruple launcher for Short Seacat anti-aircraft missiles.

Westland WG13 helicopter armed with air-to-surface guided missiles and torpedoes, two 20-mm Oerlikon guns, two sets of triple torpedo tubes, and two 2-inch rocket flare launchers. There is also of course an outfit of small arms. Later ships of the class will carry the new Seawolf missile system with its associated radar and trackers.

Above-water surveillance, in the earlier ships of the class, will be by Type 992Q long-range air-warning radar, as well as Type 978 navigational radar with a true-motion display on the bridge. Anti-submarine search will be by sonars of the latest British design for surface warships.

Action information and weapon control functions are carried out by equipment specially developed for the Type 21 by the Digital Systems Department of Ferranti Ltd. This consists of two interconnected systems, each incorporating a Ferranti FM1600B micro-circuit digital computer. Together these systems, which are housed in the operations room, provide for the correlation and evaluation of tactical information, for target indication and for the control of all weapons, including the helicopter. There are six separate but switchable horizontal displays for the Commanding Officer and operations room staff.

The system which carries out the action information and anti-submarine warfare functions, is essentially similar to CAAIS (computer-assisted action information system), as ordered from Ferranti by the Ministry of Defence in 1968, and, like CAAIS, uses Decca display consoles. The Type 21 system does, however, provide some functions over and above those of the R.N.'s other CAAIS installations, notably the control of the ship-launched anti-submarine homing torpedoes.

The second system provides fire control for the 4.5-inch gun and Seacat missiles. Selenia Orion radars track the target and the system provides control for anti-aircraft, surface or shore bombardment engagements, aiming being by radar, by television, or visual sight.

Both systems incorporate many features designed to simplify procedures and reduce reaction times, so imposing smaller manning requirements than any comparable system so far used by the R.N. Ferranti's Digital Systems Department have acted as weapon systems engineers for the Type 21, specifying operational systems, including radars and displays. They will continue to co-ordinate the installation and commissioning of the systems, and their presentation for the official acceptance trials.

The ship also carries modern IFF and electronic warfare equipment. The communications equipment includes full ship-to-shore, ship-to-ship and ship-to-air radio systems, with teleprinter and teletype facilities. Some systems are provided with remote control from the bridge and operations room. Visual signalling equipment is of new design. The ship is degaussed and the design embodies noise-reduction measures.

The Type 21's hull design has undergone extensive hydrodynamic development to provide the best combination of speed and sea-keeping ability. Computer analysis at the Admiralty Experiment Works, Haslar, of the hull form's response to both regular and irregular seas has made possible comparison with the behaviour of the Type 12 (Leander class) frigates. The results indicate some improvement, especially at the higher Beaufort scale numbers, even over the sea-keeping qualities, acknowledged as excellent, of the older ships.

The superstructure houses an enclosed bridge, with open wings at the same level, giving the fullest possible all-round view from the central pelorus, which contains a gyro-compass repeater. The bridge will house the steering control and engine telegraphs; automatic steering is to be fitted. Navigational equipment includes master and secondary gyro compasses, magnetic compass, electromagnetic log, echo sounder, automatic radio direction finder, Decca Navigator and Loran. The helicopter hangar forms the after part of the superstructure.

The operations room, incorporating the sonar control room, is immediately below the bridge, with the main communications office and electronic warfare office adjoining.

Accommodation is provided for a ship's company of 192, but the normal complement will not exceed 170, the difference providing a margin to accommodate training classes or other additional parties. In accordance with the latest standards the ship is fully air-conditioned and provided with heating for the coldest conditions. The whole ship's company sleeps in bunks in accommodation to a higher standard than in any previous surface warship. The victualling complex, including canteen, galley, scullery, separate dining halls for senior and junior ratings, and all necessary stores, with cool room, deep freeze and cold store, and controlled temperature store for vegetables, are grouped together and served by a vertical hoist. Special provision is also made for cool stowage of beer.

Other accommodation spaces provide for training, offices, laundry, sick-bay and recreational facilities including television, library, sound reproduction equipment, and cinema.

The Type 21 will be one of the first ships for the Royal Navy to be designed from the outset for all gas-turbine machinery in a twin-screw COGOG arrangement. The main engines are two Rolls-Royce Olympus TM3 gas turbines giving the ship a top speed of about 34 knots. The Rolls-Royce Tyne RB 209 engines for cruising enable the ship to cruise at 18 knots for 4,500 nautical miles. The power plants drive Stone Manganese Marine controllable pitch propellers through SSS clutches and David Brown reduction gearboxes.

To provide the electrical power requirements of the Type 21 and her advanced weapon systems four diesel generator sets are installed. Power is distributed from the main switchboard to five load centres, which control local areas throughout the ship. Emergency arrangements make it possible for a propulsion machinery to continue operating for a limited period in the event of a total failure in the electrical supply.

The machinery arrangement has been designed so that main and auxiliary machinery units can be removed and replaced, complete or in sub-assemblies, with a minimum of dislocation. The compact modular design possible with gas turbine propulsion machinery lends itself to this, and is one of the major advantages of the gas turbine for warship propulsion.

Main and auxiliary machinery, electrical generators and power distribution, are all remotely controlled from a Ship Control Centre.

which also houses a secondary steering position and the damage control headquarters.

The ship is designed to carry food stores for 60 days and naval stores for 45 days, though monthly storing would be regarded as usual. Departmental workshops and maintenance spaces have been provided for in the design. Spares for equipment, machinery and weapons, sufficient for about four months are carried. Special consideration in the design has been given to the needs of replenishment of fuel, water and dry stores, at sea and in harbour, with particular attention to routes between reception points and store rooms and magazines.

To ensure compliance with the staff requirements, in terms of endurance and reliability, a special pilot study was undertaken, consisting of a statistical analysis of the "mean time between failures" of various items of equipment, so that provision could be made for the necessary maintenance and replacement facilities. As detail design proceeds at the building yard a more detailed and comprehensive study of reliability and mtainability is to be made. Such studies make it possible to state with some confidence the statistical probability of the ship's reliability in operation under various conditions of service, and to make a reasonably accurate assessment of the maintenance effort needed.

In accordance with current Government policy of encouraging export sales of warships, a factor which influenced the Type 21 design from the start, the Ministry of Defence (Navy) has given Vosper Thornycroft and Yarrow (Shipbuilders) the sole right to sell ships of this design overseas, in collaboration with the Ministry's Naval Sales Division. Although the ship at present on order is to the specific requirements of the Royal Navy it is fully capable of adaption to the different armament and equipment needs of other navies, within the overall weight and space limits set by the design. Already a number of overseas navies have shown interest in the design.

New Type Military School

(Extracts from Peking Review)

There is a new type of 'college' for training torpedo boat commanders at a south China naval base. It is run on the basis of the revolutionary traditions of the Anti-Japanese Military and Political College in Yenan 30 years ago.

This college lacks adequate teaching facilities and training grounds, and full-time instructors with 'profound learning'. It does not even have regular school buildings. The students themselves cut grass and bamboo to build houses which they use as both dormitories and classrooms. Their wooden bunks serve as desks on which they draw their sea charts. The instructors are cadres and fighters from torpedo boat units who have rich practical experience. The stormy sea provides the best training ground.

This Thatched-hut college is Unit 4411's corps for training torpedo boat commanders, which is an advanced collective of the navy in the creative study and application of Mao Tse-tung's thought.

Group after group of navymen with practical experience have been chosen and sent here since 1963 to study for a few months and then return to their units to become torpedo boat commanders.

Struggle between the two lines

This college was established as a result of the victory of Chairman Mao's proletarian military line and educational line over the bourgeois reactionary military line and educational line.

The need for torpedo boat commanders grow with the development of the people's navy. Men trained in regular academies fell short of what was needed, both in number and quality. How was this to be solved? Could Unit 4411, relying on its own efforts, train such personnel?

One opinion was that torpedo boat commanders need to master highly complicated techniques which could not be acquired without being trained at 'regular' academies, and that the unit itself could not train them.

The Party committee of Unit 4411 saw it differently. It pointed out: Chairman Mao taught us long ago that our chief method is to learn warfare through warfare'. As far back as the period of the Second Revolutionary Civil War over 30 years ago, Chairman Mao personally founded a corps to train commanders and gave instructions for continuing to organise such corps in future. Although operating a torpedo boat involves complicated techniques, we have a great number of cadets and fighters with rich practical experience. We have many favourable conditions to link teaching with practice. So long as we hold high the great red banner of Mao Tse-tung's thought, follow the principle of linking theory with principle as taught by Chairman Mao, and resolutely carry out the policy of teaching fewer courses but concentrating on what is most essential, the policy put forward by Vice-Chairman Lin Piao, we are fully able to train torpedo boat commanders.

Purchased from the USSR., the Chinese now have 7 "Osa" Class (photographed) and 3 "Komar" Class guided missile patrol boats to support the existing force of 200 motor torpedo boats and 300 motor gunboats.

In point of fact, Unit 4411 had once run two successful classes for training torpedo boat captains from among outstanding fighters. In addition, the various flotillas had trained their own captains by the method of veterans helping those with less experience. Both measures had good results. But owing to the interference and sabotage by the bourgeois reactionary military line, these were later dropped.

Yang Han-wen is one of the outstanding torpedo boat captains trained by the unit itself. Not long after he had been appointed torpedo boat captain, his boat was returning to base one pitch-black night after a mission. Stormy weather came up suddenly and the rudder got out of control. The boat careered wildly on its narrow, reef-strewn course and the danger of striking hidden rocks was great. Yang Han-wen remained cool in this emergency. He kept the speed and direction under control by using the two engines on either side of the boat and eventually steered it safely back to base.

Yang Han-wen was one of those trained in the class run by Unit 4411. He has never systematically and comprehensively studied the techniques and theory of operating a torpedo boat, but he is armed with the invincible thought of Mao Tse-tung, is boundlessly loyal to Chairman Mao and has rich practical experience. This has enabled him to master modern military techniques.

These eloquent facts demolish the fallacy that the unit could not, on its own efforts, train modern military-technical cadres. The bourgeois theory that such techniques are 'mysterious' and beyond reach became bankrupt. A new type of college for training torpedo boat commanders was thus born in the sharp struggle between the two lines and between the two ideologies.

Whom to select and train

When the training corps was set up, the question of whom to select as students arose. This is an important question concerning what kind of people should grasp modern military techniques and what kind of successors the unit should train. Another struggle developed over this question . . .

These fighters are most loyal to Chairman Mao and are in close contact with the masses. They have intimate knowledge of the torpedo boats' technical equipment and life at sea. Once they grasp Mao Tse-tung's thought, they can closely combine theory with practice and quickly master modern military science and technology, and sum up their practical experience and put forth valid theories.

Some people, influenced by the bourgeois reactionary military line, over-emphasised educational qualifications in selecting students. This view was sharply criticised by the unit's Party committee. It pointed out that while operating a torpedo boat did require certain learning, what was more essential was a high degree of proletarian consciousness. However highly educated, a man who was not good politically and ideologically would not serve the proletariat with the technique he has mastered, and would turn tail in battle. The Party committee made the decision: in selecting the students, the training corps should make good political-ideological qualifications the primary consideration. At the same time, the mass line must be followed. The masses of commanders and fighters should be mobilised to take part in discussing whom to enrol . . .

Class struggle is the main subject

What should be the main subject in the training corps' short courses for training torpedo boat commanders? One opinion was that military technique should be the main subject since such commanders must learn to operate the boat and launch torpedoes.

But the Party committee, following our great leader Chairman Mao's teaching that ***class struggle is the main subject young people must learn***, pointed out unequivocally that the main subject should be the creative study and application of Mao Tse-tung's thought to heighten the students' proletarian consciousness and awareness of the struggle between the two lines.

When the second class had nearly completed its specialised studies, a vigorous socialist education movement started in the villages near where the training corps was stationed. The Party committee saw this as an excellent chance for the students to be tempered in the storm of class struggle, and held that they should be sent to the villages to take part in the movement for a time before they could be considered graduated.

However, it was at this time that Unit 4411, together with a fraternal unit, won a naval battle with distinction. This caused some cadres to suggest that, since men were urgently needed in the work of preparedness against war, the students should be allowed to graduate. The Party committee again disagreed. To convince these cadres that fighting a war depends mainly on one's political consciousness and not technique, it decided to mobilise the students and the cadres and fighters in the training corps to sum up the experience gained in this latest victory.

The battle was an outstanding example of how victory can be won by applying the military thinking of our great supreme commander Chairman Mao and by relying on proletarian politics. Captains trained by the unit had commanded the torpedo boats in this battle. Concerting their action with a fraternal warship in launching a night attack, they faced the rigorous test of whether they dared to advance against heavy fire from the enemy vessel. Boundlessly loyal to Chairman Mao, the commanders and fighters showed no hesitation whatsoever. They were filled with the courage to vanquish all enemies. Using the night as cover to break through the enemy barrage at lightning speed, they accurately fired torpedoes at very close quarters in co-ordination with heavy fire from the fraternal warship, and blasted and sank the enemy ship.

Summing up this experience, the comrades realised that Vice-Chairman Lin Piao's teaching "the greatest fighting power is men armed with Mao Tse-tung's thought" is a great invincible truth. The main characteristic of a torpedo boat combat mission was its role as a "demolition unit at sea". Victory or defeat was decided by whether the crew dared to bring into full play the PLA's fine tradition of engaging the enemy at close range, fighting night battles and launching torpedoes quickly and accurately in the face of concentrated enemy fire. While it was important for a torpedo boat

commander to know how to operate the boat and fire torpedoes, what was more important was that he should be brave and unafraid of death

Having arrived at this common understanding the training corps actively organised the students to temper themselves in the storm of class struggle and take part in the socialist education movement in the countryside. When, in the great proletarian cultural revolution movement, our great leader Chairman Mao issued the great call for the PLA to help the Left, help industry and agriculture, exercise military control, and give military and political training, they immediately responded

In reviewing the road they have taken in the past few years of training torpedo boat commanders from among fighters with practical experience, the comrades of the Party committee of Unit 4411 and its training corps have deeply realised the greatness and correctness of Chairman Mao's instruction. They are determined, under the guidance of this new instruction, to thoroughly criticise and repudiate the bourgeois reactionary military line and educational line, make further reforms in training, and really turn this "thatched-hut college" into a great school of Mao Tse-tung's thought and make still greater contributions to the building up of the people s navy.

SUBSCRIPTION FORM

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I enclose $2.00 being *subscription to "The Navy" magazine for 1½ years (refer notes below).

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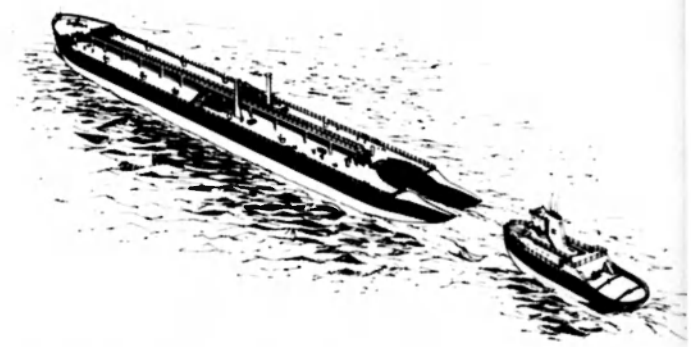
Subscriptions for shorter periods than 12 months cannot be accepted.
Overseas subscription rates (by air/sea mail) supplied on request.

BRITISH DIESEL ENGINES TO POWER AMERICAN TUG DESIGNED FOR NEW OCEAN-GOING TRANSPORT CONCEPT

Tug to be the most powerful ever built in U.S.



An artist's impression of the U.S. tug/barge concept for ocean-going transportation. The tug fits into a special 'slot' at the barge's stern to form a single unit having the same capacity and operational speed as a standard cargo ship.

British diesel engines to power American tug designed for new ocean-going transport concept tug to be the most powerful ever built in U.S.

Diesel propulsion engines have been ordered for an American 'pusher' tug being built to propel giant ocean-going barges — a new concept in deep-sea transportation which could be used instead of conventional cargo ships. The engine order, worth over 300,000 Pounds Sterling, has been won by Lister Blackstone Mirrlees Marine, of Dursley (Glos.), a subsidiary within Hawker Siddeley Diesels Ltd., who will supply two 5,564 b.h.p. Mirrlees KVMR12 Major diesels.

Under this new system, the tug fits into a 'slot' at the stern of a specially-designed barge to form a single unit having the same capacity and operational speed as a standard cargo vessel. On arrival in port the tug can be uncoupled from the barge and immediately take out another similar barge. The relatively expensive propulsion unit is therefore kept fully employed and operating costs are lowered substantially.

The engine order, which represents a breakthrough into the American marine market for the company is a package deal which also includes the supply of gearboxes, propellers and shafting, together with a complete engine control system and telegraphs.

The 11,000 h.p. tug, the most powerful ever built in the United States, is 140 ft long with a 46 ft. beam and 26.5 ft. draught. It will be constructed by the Southern Shipbuilding Corporation, of Slidell, Louisiana, for the Ingram Corporation, of New Orleans, who, together with Breit Engineering Inc., have pioneered a method of joining tug and barge to form a unit which can operate in all weather conditions. The tug will initially operate with a 532 ft. long oil tanker barge which is being constructed by Alabama Dry Dock & Shipbuilding Company at Mobile, Alabama. The barge will be 87 ft. wide and has been designed to carry about 280,000 barrels of petroleum products. Similar tug/barge combinations are planned to carry bulk cargo containers and refrigerated cargo.

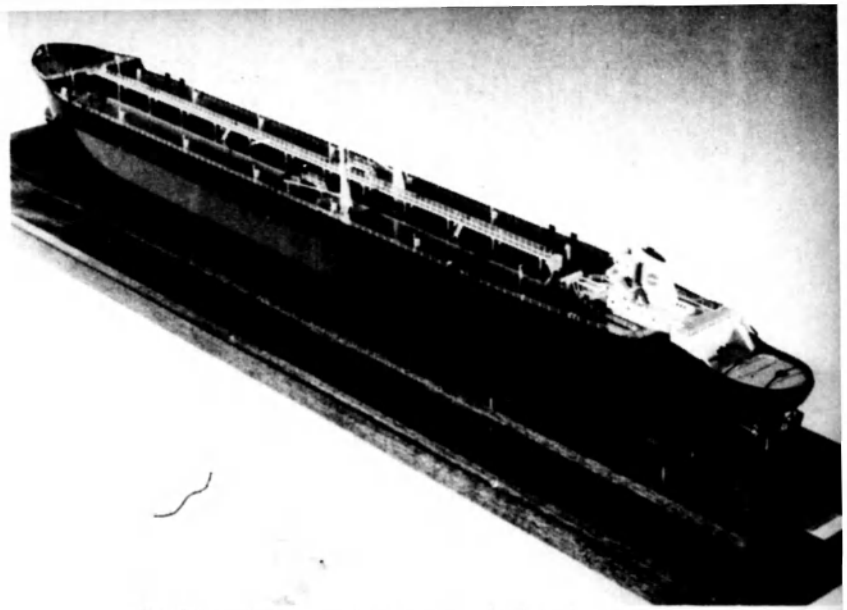
When operating together the tug-barge combination will be more than 600 ft long. The two vessels can be separated in a minimum of time and used as conventional tug and barge.

Technical Details

Each of the Mirrlees KVMR12 Major propulsion engines will have a maximum continuous service rating of 5,564 b.h.p. at 525 rev./min., giving a shaft horse power of 5,452 at a propeller speed of 135 rev./min. The engines will drive KaMeWa controllable-pitch propellers through M.W.D. type 'R', size 12, reduction gears. Flexible couplings will be fitted between the engine flywheels and the gearbox input shafts.

Mirrlees pioneered the use of heavy fuel with medium speed diesels and the engines will operate on heavy fuel (600 seconds Redwood No. 1) with the standard Mirrlees heavy fuel system. Cooling will be by tubular type heat exchangers and lubricating oil coolers.

Control consoles for the main engines will be situated in the engine room and in the pilot house, the control position being chosen from the engine room.



The photograph shows a model of the proposed U.S. tug/barge combination, with the tug positioned inside the special 'slot' at the barge's stern.

$3.2 million Contract to Magnavox for Geodetic Positioning Systems

Magnavox Research Laboratories, Torrance, California, was awarded a contract by the Naval Air Systems Command for 3.2 million dollars for production of 33 AN/PRR-14 Geoceivers plus sparing and support. They will be used for various U.S. military and other government applications.

The Geoceiver is a portable satellite tracking system which is utilised for obtaining very accurate position fixes on land or sea. The equipment consists of three major assemblies: Antenna-Preamp, Main Receiver, and Data Recorder. The contract was awarded on 6 February, 1970, equipment deliveries will start early in 1971.

The Geoceiver is one of several precise position-finding and navigation systems produced by Magnavox Research Laboratories, is capable of accuracies well in excess of systems previously used for these purposes. M.R.L. commercial systems now in production provide accuracy on land within 30 ft., accuracy underway at sea within 150 ft.

Data is recorded on punched paper tape and will provide, when reduced by an appropriately programmed computer, the precise geodetic co-ordinates of the Geoceiver's antenna location. Because the Geoceiver consists of readily transportable components, it can be delivered rapidly and economically to any area. And because the Geoceiver can automatically search for and obtain data from the appropriate Geodetic or Navy satellites, the unit can be left in place for completely unattended operation for extended periods of time.

The Geoceiver is built and qualified to military specifications. Rugged construction techniques provide for reliable operation of the system over a wide range of environmental extremes.

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JULY 19: 'ORCADES' to Rabaul, Honiara, Suva – 13 days. From $246 One Class.

JULY 29: 'ORONSAY' to Noumea, Lautoka, Suva, Nuku alofa – 12 days. Fares from $304 First Class; $214 Tourist.

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