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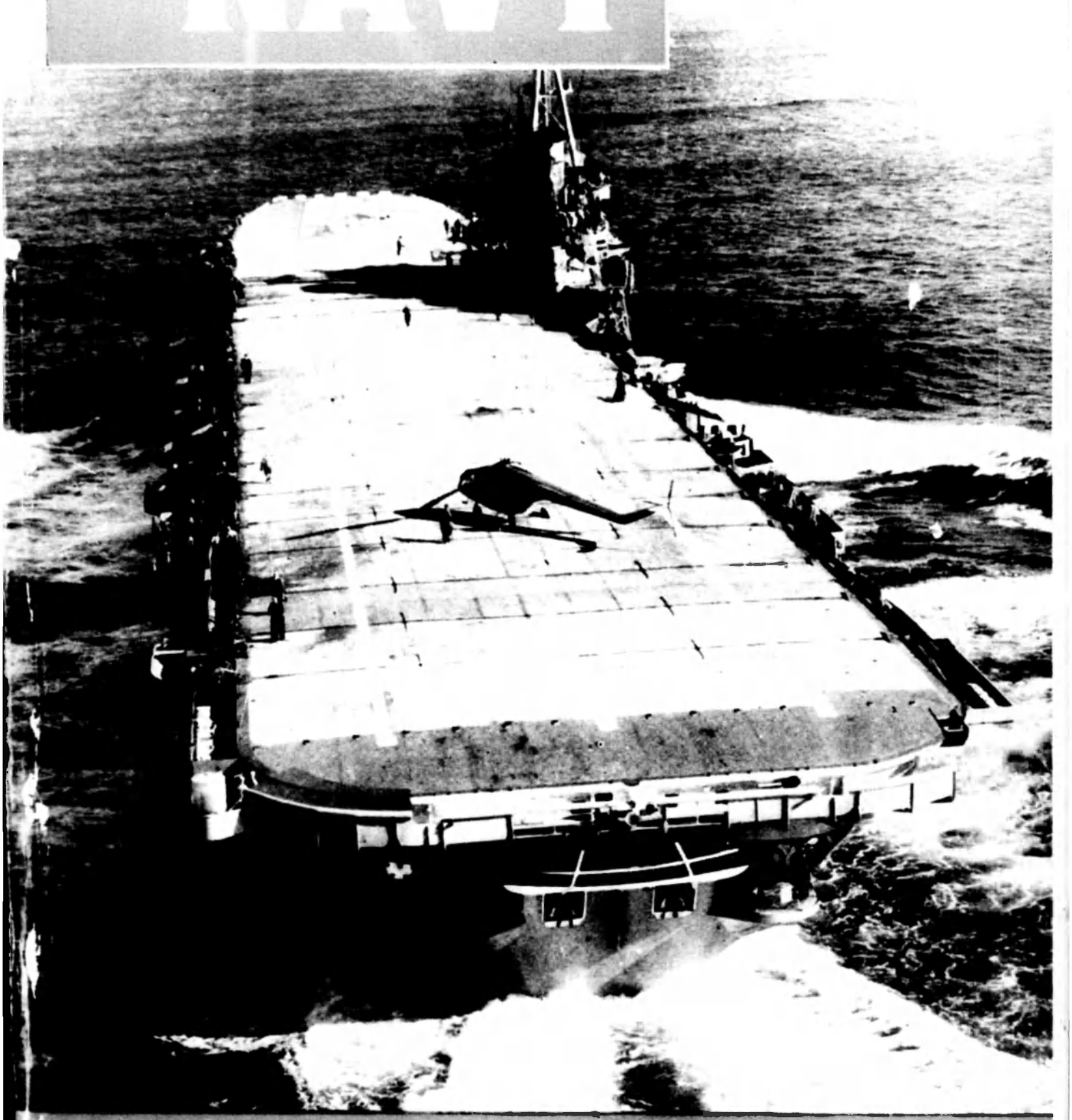

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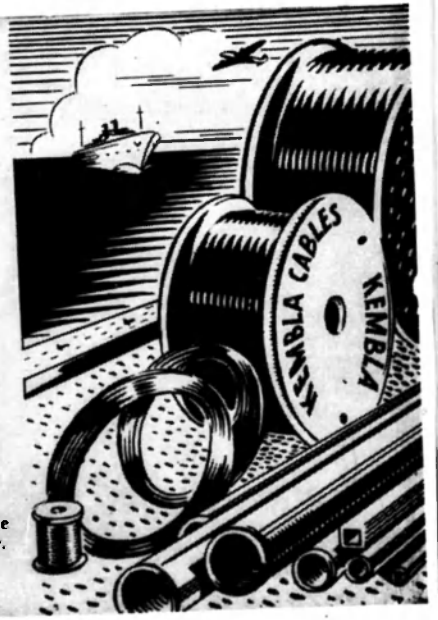

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NUCLEAR PROPULSION

By the announcement on February 18 of the creation of a new post, that of Rear Admiral Nuclear Propulsion, the Admiralty has given an encouraging expression of its belief in the vital importance, both to the Royal and Merchant Navies, of the early development of nuclear propulsion for ships.

The Rear Admiral Nuclear Propulsion, said the announcement, "will act as the focus within the Admiralty of the operational and material aspects of nuclear propulsion, and will keep in touch with developments by the Atomic Energy Authority and by industry in the application to ships of this revolutionary form of power. He will also be the link in these matters between the Admiralty and other Government Departments, Ministries and Services, and between Commonwealth Navies and Foreign Navies, as appropriate. Further, he will have general direction of the work of the Navy Section at Harwell."

As the Civil Lord stated recently in the House of Commons, careful studies are being made of the application of nuclear propulsion to surface ships, in addition to the development of a submarine power plant, on which considerable work has already been done.

"But," the Admiralty warned, "this application is by no means 'just around the corner.' No one can predict how long it will be before such application becomes either technically feasible or economically attractive."

The official designation of the new post is Deputy Engineer-in-Chief (N) and Rear Admiral Nuclear Propulsion, and its first holder is Rear Admiral G. A. M. Wilson, who took office from the date of the Admiralty announcement.

Rear Admiral Wilson joined the Royal Naval College, Dartmouth, as a Cadet in 1920. He was promoted to Commander in 1940 and from 1941-1943 served as Engineer Officer of H.M.S. *Berwick*. In 1943 he joined the Engineer-in-Chief's Department and was responsible for the design of machinery in aircraft carriers including the *Ark Royal*, and the *Eagle*.

He was promoted Rear Admiral on December 12, 1955, and joined the Engineer-in-Chief's Department, Admiralty, as Deputy Engineer-in-Chief for Fleet Maintenance and Administration, in which appointment he has served until February 18.

The establishment of the new post caused surprisingly little Press comment in London.

Most of it dealt with the lead established by America in nuclear propulsion. The "Scotsman," however, took the line that, although the United States had two atomic-powered submarines already at sea, the installations in these two vessels were hopelessly uneconomic.

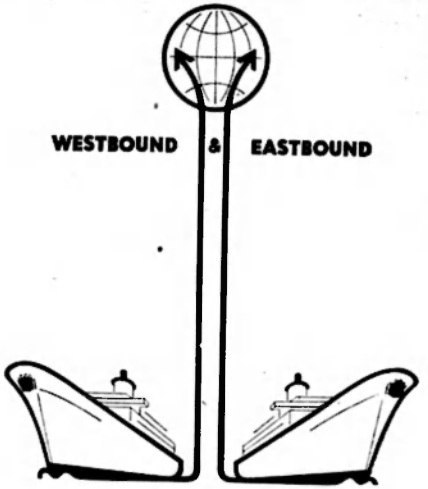
On the other hand, the experimental work going forward at Harwell held out the prospect of evolving a system sufficiently economical to be of more immediate interest. The newspaper added:

"The Navy's appointment of a Rear-Admiral, Nuclear Propulsion, has to be seen against this promising background. The Navy can afford to wait no longer. The wide powers given to Admiral Wilson suggest something like a 'crash programme' to take our fleet into the atomic age as quickly as the immense problems of reactor, engine, and hull design can be solved in pratcice. Gradually from now on we may expect the uncertainty which has hung over the Navy for the past few years to dispel as the technical possibilities crystallise into something more definite. Atomic submarines carrying nuclear warhead rockets of moderate range can definitely be expected. Surface missile carriers of cruiser size are controversial—aircraft carriers much more so. Both show up far too easily on ultra-modern radar.

"While all this is important strategically, the greatest significance of the appointment for Britain's future as a seafaring country lies in the close tie-up made between the naval and commercial uses of nuclear propulsion. Admiral Wilson becomes responsible also for its application to the Merchant Navy—a wise decision. It is better to concentrate what is essentially one job in one pair of hands. Any advance made in one form of use will benefit the other. With costs running still above what would be commercially feasible, the State had to make the first plunge. By this arrangement, money we should in any case have to spend on defence will also help our Merchant Navy to stay in the forefront—just as Calder Hall was an offshoot of the need for military plutonium. It is the most painless kind of subsidy, and something like it was badly needed."

In a letter to "The Times," Vice-Admiral B. B. Schofield, who was Chief of Staff to the head of the British Joint Services Mission in Washington from March, 1948 to November, 1950, said he doubted whether many people in Britain realised how long the U.S. lead was.

"While we are slowly and surely building a nuclear-powered submarine, in the United States the nuclear-powered submarine *Nautilus* has already steamed 50,000 miles without refuelling and work is in progress on the construction of an aircraft carrier of 85,000 tons, a cruiser of 11,000 tons, and 15 submarines, all driven by nuclear power," he said. "According to the Secretary of the Navy, by 1960 the formation of a nuclear-powered task force will have begun and by 1970 the United States will have a nuclear-powered fleet."



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Australia's Coastal Ships

By CLIVE TURNBULL

(In the "Vacuum Review")

AUSTRALIANS, like their ancestors from the British Isles, have the sea in their blood. In the pioneering days, the long voyage out was an adventure of the highest order, often hazardous in the extreme as the grim record of Bass Strait bears witness. Stout ships and expert seamanship were needed to survive the perils of uncharted waters and unmarked reefs and promontories. The hazards have been removed by modern aids to navigation and a great coastwise trade has developed with the years.

Almost all the early Australian settlements were ports, and for many years the only links between them were seaways. Though the nature and functions of Australia's shipping fleet have changed with the years, its importance, notably as a cargo carrier, remains.

The industry, which has seen many economic fluctuations and not a few periods of crisis, has proved itself to have the virility to adapt itself to altered needs.

Many of these changes have been implicit in such fundamental developments as the transition from sail to steam and from coal to oil as fuel, and in the development of alternative systems of transport—rail, road and latterly air.

Nevertheless the basic advantages of sea transport, particularly for the carriage of bulk cargoes, remain dominant. If some of the picturesqueness of other days has gone, the vital function of transport is being fulfilled with as much initiative as in the years when the shipping advertisements covered the front pages of every Australian newspaper and the whole community's interest centred upon the affairs of the port.

Seven Ships

The ups and downs of the industry are illustrated in some figures brought together by the late Dickson Gregory, a well-known historian of the sea.

In 1844 the entire steamship fleet in Australasia consisted of seven vessels, with an aggregate tonnage of 1,102. By the 'sixties and 'seventies a large number of steamers were engaged in trading between the different colonies and New Zealand, with which there have naturally always been the closest links.

Despite railway competition in the service of ports previously linked only by shipping the industry continued to grow.

In 1914, just before the outbreak of the First World War, when the population of Australia was about half what it is to-day, the numbers of passenger steamers reached its peak.

No fewer than 31 high-class steamships with gross tonnages ranging from 2,000 to nearly 10,000, with an aggregate of 151,071 tons, supplied the needs of the Commonwealth.

The requirements of maritime awards, industrial troubles and the operation of the Navigation Act, however, all had their effect upon the mercantile marine. Many steamers were dismantled, not because they were no longer useful but because alterations officially required would have been unprofitable.

Many were gradually disposed of and others, wrecked or lost during the war, were not replaced.

By 1927 the number of interstate passenger vessels had dwindled down to seven — the same number as in 1844—with an aggregate tonnage of 56,166. Such was the position when Gregory wrote in 1928, nor has that particular story ended yet.

Household Words

The names of the pioneer shipping companies are household words in Australia, intimately linked as they are with the development of the nation. Of these may be noted the Howard Smith Company, which has its origins in 1854 as a pioneer of the Melbourne-Sydney trade; the Adelaide Steamship Company (1875), formed to cater for the Adelaide-Melbourne trade; Huddart Parker Ltd., which, originating in Geelong in the 'fifties, expanded into the intercolonial trade; and the A.U.S.N. Co. of London, which operated from Brisbane.

Later comers included the Melbourne Steamship Company and McIlwraith, McEacharn. With these must be linked the Union Steam Ship Company of New Zealand. Companies associated with particular regions include Burns, Philp, in the Islands, and William Holyman in the Tasmanian trade. The Colonial Sugar Refining Company Ltd. and the Broken Hill Proprietary Company Ltd. are important shipowners in their own right. Among the later formed companies is James Patrick & Co. Pty. Ltd.

Great Ships

The names of many ships of the great days of passenger transport still linger in the memory of old-timers (and not so old-timers).

SAILORS FROM AMERICAN DESTROYERS DONATE BLOOD

When four U.S. Navy destroyers visited Sydney in April, 200 sailors donated blood to the Red Cross Transfusion Service at its mobile unit at Garden Island. The unit had more volunteers than it could cope with. Picture shows men from the U.S.S. "O'Bannan" giving blood.

Many will remember the Union Steam Ship Company's *Rotomahana*, famous for years on both the New Zealand and Tasmanian runs, for her beauty of line and her speed as well as, in more technical circles, for the fact that she was the first ocean-going steel steamship built.

The Australasian Shipping News thus saluted her in 1879:

"The *Rotomahana*, now building for the Union Steam Ship Co. of New Zealand, is intended to eclipse, if possible, all the other steamers in these colonies, in speed, accommodation for passengers and comfort. A special feature in the new boat (apparently it wasn't a sin to refer to ships as 'boats' then) will be the 'Bridal Chamber'—a large cabin on deck, fitted up for the use of those newly married couples whose purses are long enough, or whose honeymoon is recent enough, to make the additional charge that will be imposed a matter of no consequence."

Karoola and Katoomba

After a long and honoured career the *Rotomahana* was sold and broken up at Melbourne in 1927, mourned by shiplovers, who felt that an era was passing.

In her day, the magnificence of the *Rotomahana* was eclipsed by that of the *Karoola* (McIlwraith, McEacharn), whose luxurious fittings astounded her three classes of passengers before the First World War. Even the *Karoola* was outdone by the *Katoomba*, used as a troopship and the first steamship to navigate the Dardanelles after the Armistice of 1918.

Ships of the Australian merchant marine have played a gallant part in both world wars—far too extensive to describe here—and there is even a tie-up with earlier conflicts, for Howard Smith's first intercolonial trader, the *Kief*, renamed the *You Yangs*, was built for the Imperial Government for carrying water to the Crimea.

Even in modern times seafaring has not been without its share of adventure. Many people will remember the *Riverina*, one of the most popular steamers on the coast, which ran ashore in a fog on a beach one and a half miles west of Gabo Island in 1297.

The few residents of Mallacoota, the nearest settlement, it is recorded, were "surprised" when they beheld the sight of a large steamer ashore. This is putting it mildly. The present writer, who has vivid recollections of swimming a horse across the lagoon to report the incident, was equally astounded at seeing a large ship in which he had lately voyaged high and dry, and apparently unharmed but stuck fast on the sand while the passengers gazed wonderingly over the side.

Some of the fittings of the *Riverina* were afterwards to be seen in an East Gippsland hotel and maybe still are. No doubt after a fashion the passengers enjoyed the experience.

These few names of passenger ships of yesterday are taken at random from the records and may revive memories for some of times when we were not in quite such a hurry as most of us seem to be in to-day.

So rapid has been the development of Australia that it is becoming difficult to realise that many settlements were wholly dependent for years upon sea communication with their capitals, and many so remained until the rise of air transport.

Government Services

It is worth noting that there has been no conflict between these ways of communication. The Holyman family of shipowners indeed pioneered the commercial air service across Bass Strait from which there grew in time our greatest privately owned airline. Australian National Airways, in the ownership of which five steamship companies are directly interested — Adelaide Steamship, Huddart Parker, the Union Steam Ship Co., Holyman's and the Orient Company.

Since the days of pioneering—and shipping is essentially in the formative years of fleets an industry of rugged individualists—both Commonwealth and some States have entered into sea transport, in the case of the Commonwealth as a matter of national policy, in the case of such States as Western Australia to provide a service to a number of outports which because of their smartness and remoteness, it would be economically impossible for public companies to give without Government assistance. (This does not mean that there is no alternative to the Government ownership and operation of vessels; it does imply that certain trades require to be subsidised.)

To-day, the Australian Shipping Commission, the State Shipping Service of Western Australia and the 10 major private operators together account for more than 9(per cent. of the total coastal trading fleet. Of interstate vessels Australian-owned or Australian registered, the Commonwealth owns 43 (163,319 tons gross) Western Australia five (14,48(tons) and public companies 8((274,467 tons). Seven New Zealand owned ships are on the Australian register. In addition, there is one overseas vessel on charter to the Commonwealth and eight to private interests, making a total interstate trading fleet of 141 vessels (503,798 tons). To these may be added 37 intrastate vessels and 18 Australian-owned overseas trading vessels, making a total of Australian trading vessels of 196 (626,227 tons).

Constitution of the Fleet

The constitution of this merchant fleet is interesting, particularly when we look back on the heyday of the passenger ships earlier mentioned.

Passenger—Cargo	*No.*	*Tons gross*
Interstate	8	54,794
Intrastate	2	3,377
Overseas	3	19,583
	13	77,754

A Customs Department boarding inspector with opium valued at £5700 which was seized on board the "Chaldina" in Sydney. The six parcels of opium, weighing 13¼ lb. were one of the biggest hauls ever made by department officers in Sydney.

Cargo only		
Interstate	124	400,473
Intrastate	35	27,070
Overseas	15	72,399
Chartered vessels	9	48,531
Totals	183	548,473

Recent years have seen no marked change in the numbers of vessels and tonnages. The significance is rather in the type of vessels serving the coastal trade.

The decrease in passenger ships, a matter of deep regret to those who travelled, for instance, in such fine vessels as the *Manunda*, is due not so much to the development of other means of transport as to causes within the industry itself.

The growth of air transport and the rejuvenation of various mainline railways have, in fact had little effect on passenger ship book-

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ings; except in off-seasons passenger ships are heavily booked. The trend however is for passenger vessels not to be replaced as they reach retirement age (25 to 30 years) and for an increasing emphasis, in cargo vessels, on the carrying of bulk cargoes. In both cases, labour and economic factors are influential. Passenger vessels are also cargo vessels and, in today's circumstances, these categories are often incompatible.

As a passenger-carrier a vessel must move to schedule, but scheduled movement as cargo-carrier can, and does, cause severe losses whenever industrial disputes affect the vessel.

The biggest single item of ships' costs is crews' wages, overtime and leave, and the increase in the cost of this item between 1947/8 and 1953/4 was of the order of 125 per cent. And it is still rising.

Replacement Problems

Passenger-cargo vessels of the type now on the coast are thus becoming less and less attractive as an avenue of capital investment because of their enormously high operating cost. This, in addition to other factors, has caused shipowners, faced with the problem of spending about £3 million or more on replacing an old-age passenger vessel, to consider whether shareholders would be best served by such an investment.

The Committee of Inquiry into the Stevedoring Industry reported: "The level of profits in 1953/4, the year of highest profit, was too low to provide from that source the estimated replacement cost at the time of the fleets of the private operators engaged in industry."

The average profit of the main operators engaged in the interstate trade, in fact, amounted in 1953/4 to 5.4 per cent. of the original cost of their vessels and to 3.3 per cent. of their estimated replacement cost. Such averages of course include vessels of the highest profitability as well as those of the lowest. Passenger-cargo vessels are among the lowest.

Not only obsolescence but modification of quarters in existing vessels and the possibility of more in the future may persuade owners to dispose of them. Enlargements to crews' quarters usually encroach on space that would otherwise be used for cargo or passengers. This does not mean that shipowners want seamen to live in cramped quarters or lack recreation rooms and facilities — it is merely a statement of fact.

The less physical room for revenue-earning cargo (human or inanimate), the less **revenue** earned. This is the reason behind some recent notable losses to the Australian passenger fleet.

Following are the age categories of the interstate fleet:

Year built	*No. of ships*
1930 or earlier	20
1931-35	8
1936-40	21
1941-45	17
1946-50	33
1951-56	33

With regard to cargo ships we find that, although they are subject to the same trends within the industry as passenger-cargo ships, other factors also enter into the question.

Whereas the demand for the services of passenger vessels, as such, has not been a factor causing change, the demand for the services of general cargo vessels has been, and still is, a significant factor.

With the rise of road and rail transport, general cargo has inevitably drifted away from the sea, where many factors during the post-war period have increased costs directly to shipowners and indirectly to the community. The way out of this present impasse is the building of ships which are not exclusively confined to use in the general cargo trade but may be used also for bulk cargoes.

Bulk Cargoes

Thus it is important to realise that, although some 75/80 per cent. of all goods transported between the States is transported by sea, 75 per cent. of this is represented by bulk cargoes. The nature of these cargoes makes them eminently suitable for sea carriage. (The conspicuous example, on the international level, is of course oil.) Such are the advantages of sea transport, particularly in freight rates, that bulk carriage is attracting more shippers than ever before.

The main bulk cargoes on the coast to-day are coal, limestone, iron-ore and gypsum. In the future, cement and sugar will be carried in bulk instead of in bags. Shipowners are building ships for this purpose and shore installations will provide the necessary machinery for loading and unloading.

In this direction there is a heartening pattern of progress and the general re-building and expansion programme, extending over the next five years, will run into millions of pounds. The shipping companies will put no fewer than 15 new ships into service—the Adelaide Steamship Co. five, the Union Steam Ship Co. of New Zealand, five, Mellwraith, McEacharn Ltd. two, Australian Steamships Pty. Ltd. two, and Huddart Parker Ltd. one.

As the first step in the Adelaide Company's programme an order has been placed for a 7,150 ton bulk sugar carrier, the first of its design on the coast, which is expected to be trading in mid-1959; with the approval of the Australian Government, the order has been placed with the Burntisland Shipping Co. of Scotland.

A second bulk carrier will be designed later to meet the requirements of the next port to be equipped for bulk working. Orders are also going ahead for three vessels to replace others nearing the end of their useful lives — they will be designed to meet the changing conditions of sea carriage and the different types of cargo now being carried and to be carried in the future.

The Union Company's new vessels will include the 5,100 ton bulk ore carrier *Risdon*, to engage in the movement of the Electrolytic Zinc Company's cargoes between Tasmania and the mainland. Two new Mellwraith, McEacharn 3,450 ton motor cargo vessels will be used for carrying all classes of goods, including bulk gypsum. Howard Smith Ltd. is likewise pursuing the matter of the construction of highly specialised modern tonnage. The 5,500 ton bulk carrier motor vessel *Century* has been specially designed for the carriage of zinc concentrates, coal, etc. The Australian Shipping Board (now the Australian Shipping Commission) recently stated that, in addition to 10 new merchant vessels to be added to its fleet before March, 1959, two 12,500 ton bulk carriers would be built.

Turnaround

Any development which tends —as bulk handling does—to reduce time lost in turnarounds is obviously beneficial to the community. Generally the position today is that coastal ships average two-thirds of their time in port and one-third at sea.

By contrast, the pre-war ratio was one-third in port and two-thirds at sea. This is significant because the only time a ship is gainfully employed is when it is plying between ports loaded with revenue-earning cargo.

Tied up in port, a ship (an average size coastal freighter, say 4,000 tons gross) costs from £500 to £600 a day and is earning nothing. One result inevitably is higher costs, which cannot all be absorbed by the industry; another is lack of confidence of shippers who, in such circumstances, tend to use alternative means of transport.

Overall, it is apparent the Australian shipping industry is in a period of crucial change. Because passenger and cargo transport today do not always mix, there is a shift of emphasis to cargo carrying and wherever possible to bulk handling and carriage of cargoes. In a sense this is, perhaps, a retreat but it is a retreat from a position which is becoming economically untenable. If our passenger fleet is dwindling relatively to our snowballing population it is for reasons which are abundantly clear, much though lovers of sea travel may regret it. Shipowners believe that their cargo ship programme abundantly demonstrates their faith in the future of Australia and of the coastal trade and their determination to play a positive part in assisting in the industrial development of the nation.

Transition

Australian shipping has shared in the two great mechanical revolutions which have transformed sea transport—the transition from sail to steam round about the mid-Nineteenth Century and the substitution of oil for coal as a fuel in our own time, whether as a direct fuel for steam raising or as the source of energy for motor ships. The Vacuum Oil Company has played a prominent part in this great change; its association with shipping indeed goes back many years to the supply of the early mineral lubricants for the fast coal-burning ships of the time.

To-day the scene is transformed. As an example, the percentage of oil-burning ships passing through the Port of Melbourne from overseas rose from 74 per cent. in 1946 to 99 per cent. in 1955. Although the percentage of oil burning vessels in the Australian coastal trade is not yet so high as this it is nevertheless extremely high and continually increasing.

Australia has always been of great importance as a bunkering

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atation; the quantity of petroleum fuels supplied to shipping rose from 120,729,000 gallons in 1946 to 242,000,000 gallons in 1955, approximtely double.

The petroleum industry is itself vitally interested in shipping and it is interesting to observe that its own pattern of bulk carriage is now being adapted over so wide a field to the needs of marine transport as a whole.

Such is the position of Australian merchant shipping to-day. Lines of vigorous development are indicated. What else the future has in store remains to be seen: the latest of reminders in the form of the Suez crisis and its aftermath of Australia's dependence on ships owned elsewhere for the vital transport of its primary exports has once again revived suggestions of ventures by Australian ships beyond Australasian waters. These are questions inextricably bound in with national policy.

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New Training Machine

An ingenious training device, designed by the Engineering and Materials Research Department of the Admiralty and known as the "Action Speed Tactical Teacher," has been installed at the Royal Naval Tactical School, Woolwich.

THE new trainer was formally set in operation on March 6 by the Vice Chief of Naval Staff, Admiral Sir Wm. Davis.

The "Teacher" is a complex apparatus which, by electric and electronic means enables the tactical operation of ships to be reproduced, and provides Naval officers with the opportunity to exercise tactical skill in meeting situations that arise in active service conditions.

The installation consists of an auditorium with which are associated a number of cubicles fitted as conrol rooms to be used to represent surface ships, submarines or aircraft as may be required. The control of the exercises is conducted by the staff from the auditorium.

In setting an exercise the officer students are placed in two opposing teams and a tactical situation and objective is set before each team by the directing staff.

The teams are allocated control rooms (cubicles) one for each of the craft engaged and each of the two team commanders formulates his plan of action based on the data and intelligence given.

In his cubicle each student controls the speed and course of his "ship" which is automatically traced on his plotting table.

Usual methods of sea communication enable him to plot the position of other craft and to transmit or receive orders.

Electronic coupling between cubicles provides him with a picture of the tactical situation within the detection range of his own radar and asdics.

In the auditorium sit the director and directing staff acting as controllers or umpires.

Before them on a wall screen twelve foot square is plotted in illuminated symbols, the positions of the forces engaged, surface, submarine and air. Electric contacts from each control room cause these light symbols to move as the "ships" or "aircraft" change course or speed.

The director and his assistants are thus enabled to watch the tactical situation as it develops. Behind the screen members of the W.R.N.S. track in coloured chinagraph pencils on a perspex back screen the courses of the various units.

FISH FROM THE OCEAN AREAS

Great untapped resources of fish may eventually become available for food as scientific studies reveal new deep sea fishing grounds and more efficient methods of catching and preserving many varieties of fish.

AT present, according to the Commercial Fisheries Service of the U.S. Department of the Interior, only five per cent. of the world's seas is being actively exploited. The Service also notes that 70 per cent. of the U.S. fish catch comes from surface waters, those up to 100 feet deep, while the remainder is taken from the shallow continental terraces out to about 1,000 feet of depth.

Many other countries are fishing an even smaller proportion of their accessible waters.

Beyond these nearby grounds, and still unexplored by fishermen, are great ocean areas, which, experts believe, would yield rich harvests to vessels equipped with modern scientifically-designed gear and adequate refrigerating or canning machinery.

On the basis of exploratory studies by the U.S. Commercial Fisheries Service, it is believed such a potential harvest is available not only in seas close to the American coasts, but in the waters of many other parts of the world.

For a number of years the service has carried on a widespread programme of research in the Atlantic and Pacific Oceans. Essentially, its main purpose is to develop more effective techniques both for locating new sources of fish and then catching them. Its findings have already provided valuable technical data for all countries interested in developing their fisheries.

Offshore waters have in the past been regarded as barren of fish useful for food, in comparison with the organically rich and more easily accessible inshore waters.

New evidence suggests, however, that there are large quantities of such fish as ocean perch, hake, sardines, rockfish and salmon far out in the ocean.

This evidence includes the fact that the more than 3.3 million fur-bearing seals from the Pribilof Islands breeding grounds, which feed on the high seas, would require 3.5 billion pounds of food a year, which is in excess of the entire fish production along the Pacific Coast of North and South America, and obviously comes from waters not yet exploited by fishermen.

Studies of the stomachs of whales captured far out in ocean waters of more than 800 fathoms depth show that their diet includes young fish of the above-mentioned varieties.

Japanese reports to the International North Pacific Fisheries Commission also note that they take millions of salmon each year with gill nets dropped hundreds of miles beyond the continental shelf.

UNDERWATER TV

Such evidence is pinpointed and confirmed to-day by U.S. ocean-going trawlers and exploratory vessels equipped with such modern devices as loran, radar, echo-sounding equipment, underwater cameras and underwater television.

Loran, an electronic navigational device, is now standard equipment on many off shore fishing vessels which find it essential for the accurate location of fishing grounds.

Radar, used for efficient and safe navigation and for locating surface gear, is another valuable research tool. Advances in echo-sounding equipment, according to a recent report by the Commercial Fisheries Service, have revolutionized some fisheries in the last decade, and are expected to play an increasingly important role in the exploration of the high seas fishery potential.

Electronic devices are helpful in offshore navigation for detecting fish and in studying the design of fishing gear.

Surface regions can be further investigated with various sizes of gill nets, seines, trolling gear and traps.

Sub-surface, or mid-water regions must be explored with high-speed large mesh mid-water trawls, sunken gill nets and long-line gear. (Experience has shown that mid-water trawls must be designed in a special way for each type of fish or fishery.) The bottom areas will be increasingly studied with deep-water commercial trawls.

All this research indicates that there is apparently no limit to trawling depths except that imposed by the physical capabilities of the vessel and its gear and the availability of deep-water species. Larger vessels with more powerful engines, bigger and better winches, efficient nets, stronger floats and improved navigating and echo-

Continued on page 18

NEWS OF THE WORLD'S NAVIES

Warning on Soviet naval strength

Russia has a known fleet of 475 submarines, believed to be increasing at the rate of 60 or 70 a year, according to a pamphlet issued by the British Navy League.

The pamphlet, "The Danger by Sea," says the Soviet Navy also has 30 cruisers of the Sverdlov class and will soon have another six.

It describes these as more heavily gunned and more modern than any British cruiser.

"This constitutes a threat vastly greater than Germany ever posed against us in the two world wars and one not less than the nuclear threat," the pamphlet adds.

It says it does not believe the present British Navy is adequate for its task.

"No start has been made on the construction of vessels to carry guidded missiles," it says.

"No postwar-designed carrier or cruiser has been laid down.

"Of destroyers, only the eight Daring class are of post-war design.

"An immediate programme of construction of ships for the Royal Navy cannot be delayed without the gravest risk to this country."

R.N. frigate programme speeds up

In Britain one more frigate was launched and two accepted into service during February, the Admiralty announced.

One of those accepted was H.M.S. *Salisbury*, the first ship of the Salisbury Class to be completed. She was launched in June, 1953.

Frigates of this class are designed primarily for the direction of carrier-borne or shore based aircraft. They will also serve as small destroyers in offensive operations. They have been prefabricated in a manner to allow for rapid building and are all-welded.

H.M.S. *Salisbury* has twin screws and is powered by Admiralty Standard Range I heavy oil engines coupled to propelling shafts through hydraulic couplings and oil operated reverse and reduction gear boxes. These engines, of the latest Admiralty design, were manufactured by Vickers Armstrongs, Barrow, who also made engines of similar design to drive the ship's electric generators. The hull was built at Devonport and machinery and other fittings were installed there.

In addition to her aircraft direction equipment, the *Salisbury* is armed with a twin 4.5 in. gun mounting, two small additional guns and an anti-submarine three-barrel mortar. Her dimensions are: length (extreme) 340 feet, length (B.P.) 330 feet, breadth (extreme) 40 feet.

Normal peace-time complement is nine officers and 198 men.

The seventh of the Blackwood class anti-submarine frigates, H.M.S. *Russell*, came into service on February 7.

The *Russell* was built by Swan Hunter and Wigham Richardson Ltd., of Wallsend-on-Tyne, and the main machinery and turbines by Messrs. The Wallsend Slipway and Engineering Co. Ltd.

She was launched at Wallsend-on-Tyne on December 10, 1954.

The Whitby Class anti-submarine frigate H.M.S. *Blackpool* was launched on February 14 at the shipyard of Harland & Wolff Ltd., Belfast.

Frigates of this class are of 370 feet in extreme length, 360 feet between perpendiculars, and have a beam of 41 feet. Having been primarily designed for the location and detection of modern submarines, they are fitted with the latest underwater detection equipment and anti-submarine weapons of post-war development.

More U.S. guided missile ships

Contracts to convert the light cruisers U.S.S. *Springfield* and U.S.S. *Oklahoma City* to guided missile light cruisers have been awarded to the Bethlehem Steel Company shipyard at Quincy, Massachusetts, and the Bethlehem Pacific Coast Steel Corporation at San Francisco, California, respectively, the U.S. Navy has announced.

The U.S.S. *Springfield*, to be converted to the CLG 66, will be equipped with the Terrier missile.

The U.S.S. *Oklahoma City*, to be converted to the CLG 91, will be equipped with the Talos missile.

The *Springfield* and *Oklahoma City* are light cruisers of the *Cleveland* class, having a length over-all of 610 feet, beam of 66 feet, and light displacement of 10,500 tons.

The *Springfield* will be the fifth cruiser converted to employ the Navy's surface-to-air Terrier missile. The first, the U.S.S. *Boston*, was commissioned in November 1955 and is now deployed with the Sixth Fleet in the Mediterranean. The second, U.S.S. *Canberra*, joined the fleet in June 1956, and two more, U.S.S. *Topeka* and U.S.S. *Providence*, will be converted at east coast naval shipyards.

Contracts for 14 nuclear subs let

Of the total of 15 nuclear-powered submarines authorised for the U.S. Navy, contracts or project orders (in the care of Naval shipyards) have been issued covering 14.

The U.S. Navy announced this recently when it revealed that the Newport News Shipbuilding and Drydock Company would build the SSN-591 nuclear-powered submarine at a contract price of 24 million dollars.

A U.S. Navy spokesman said: "The SSN-591 will be an attack submarine of the SSN-588 class, with an *Albacore*-type hull and single screw. The *Albacore* design offers the advantages of greater range, greater underwater speed, and improved manoeuvrability. A nuclear reactor plant using pressurized water as the coolant will be installed in the vessel."

Recommissioning of H.M.S. "Eagle"

H.M.S. *Eagle*, under the command of Captain M. Le Fanu, D.S.C., R.N., was recommissioned at Devonport on February 26. This will be the second General Service Commission and the fourth commission of the *Eagle* since she joined the Fleet in October, 1951.

She recently completed a maintenance and refit programme .

First Leopard class frigate in service

H.M.S. *Lynx*, the first of the Leopard Class frigates to complete, was provisionally accepted into H.M. service on March 14.

The *Lynx* was launched by Her Royal Highness The Princess Royal at Clydebank on January 12, 1955, at the yard of John Brown & Co. Ltd.

The Leopard Class frigates are designed primarily for the protection of convoys against attack by aircraft. They will also serve as a small type of destroyer in offensive operations.

The dimensions are 340 ft. extreme length (330 ft. between perpendiculars), beam of 40 ft. Armament consists of four 4.5 in. guns, with two smaller guns and a "Squid" anti-submarine mortar.

New A/S frigates for Australia

The first section of one of four new pre-fabricated fast anti-submarine frigates to be built for the Royal Australian Navy was placed in position on the slips at the Naval Dockyard, Williamstown (Vic.), in April.

The hull of the frigate, known as No. 04, was pre-fabricated in sections in the dockyard workshops. The vessel will be launched soon after the assembly and welding of the sections is completed next year.

Two of the four frigates will be built at Williamstown and two at the Cockatoo Island Dockyard, Sydney.

R.N. submarine may be world's fastest

Belief that Britain's experimental submarine, the *Explorer*, with peroxide propulsion, may be claimant for the title of the fastest submarine in the world was expressed in the House of Commons, London.

Admiralty Parliamentary Secretary, Mr. Christopher Soames, told questioners it would not be in the public interest to state the precise capabilities of this submarine, but he said she had attained an underwater speed of more than 25 knots.

"We cannot claim she holds it, but we believe that the speed she has attained makes her a strong contender for the title of the fastest submarine in the world," said Mr. Soames.

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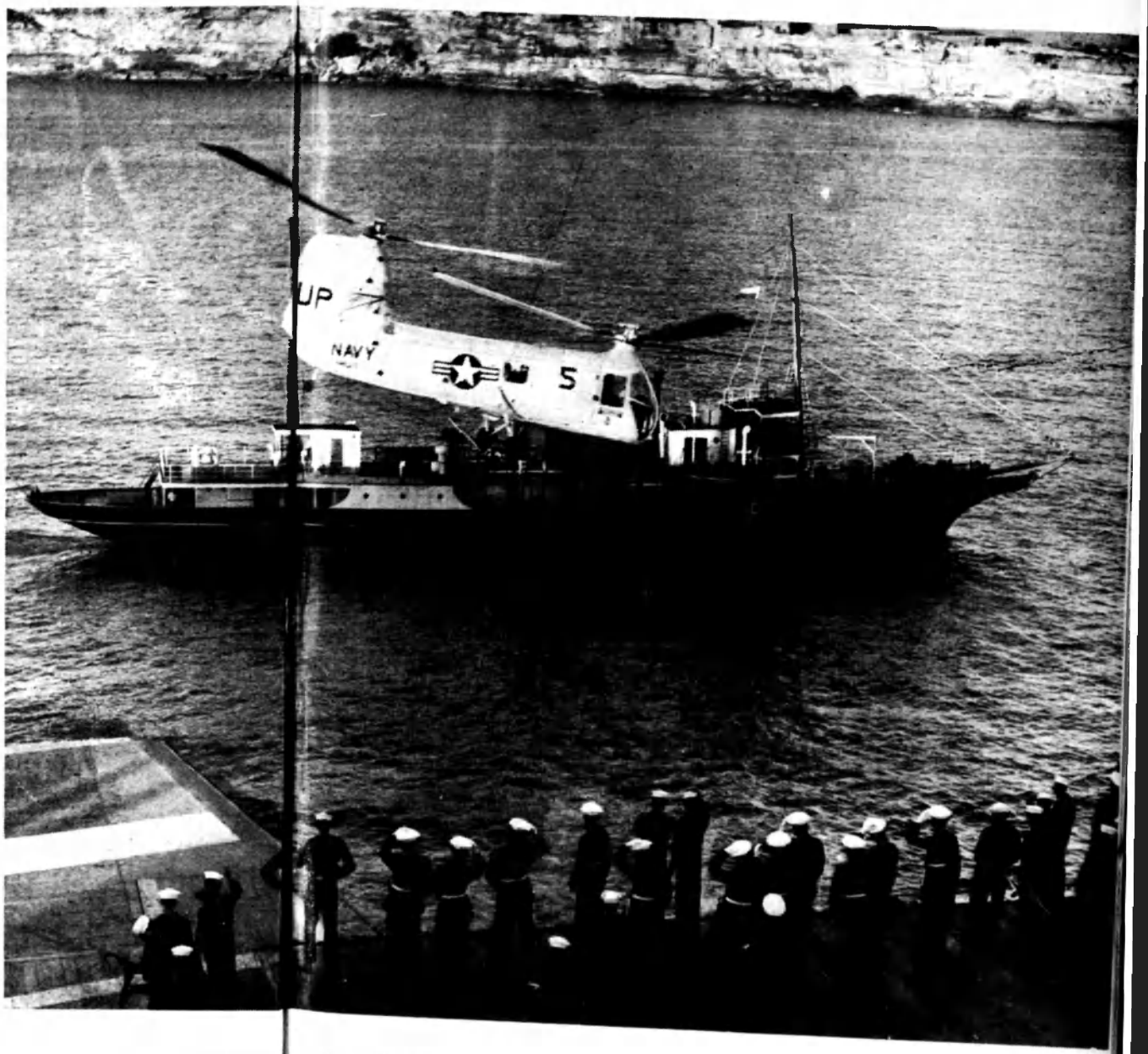
U.S. SHIPS HERE FOR CORAL SEA WEEK

A U.S. Navy helicopter (right) hovers above the pilot ship "Captain Cook" as it leads the U.S. aircraft-carrier "Bennington" to the Heads on April 30. The "Bennington" and three U.S. destroyers arrived in Sydney on a visit for the Coral Sea Week celebrations. American sailors (below) sunning themselves on the flight deck of the "Bennington" off the N.S.W. coast.



FISH FROM THE OCEAN AREAS
Continued from page 13
sound equipment that are now being developed will aid deep-water studies and are expected to make bottom fishing feasible far beyond the present depth limits.

GEAR RESEARCH

Gear research, hampered in the past by the fact that the gear could not be seen in operation, has been greatly helped by the use of underwater cameras and television.

TV units can be hung at mid-depths, set on the bottom, towed from research vessels, or propelled by their own power supply under remote control from the surface.

The U.S. Department of the Interior organizes its research work with the co-operation of institutions and organizations in various sections of the country, and has contracts for biological and other studies with universities, colleges and public institutions and with 13 commercial and independent scientific research organizations.

During the typical year of 1955 a fleet of five specially equipped vessels covered thousands of miles of Pacific waters in a study of the distribution, abundance and identity of salmon stock.

Other studies investigated bacterial diseases of fish, problems relating to Atlantic herring, yellowtail flounder, whiting, sea scallops and Gulf shrimp, and other matters concerning the culture and habits of fish.

Exploratory fishing operations the Atlantic, Pacific and the Gulf of Mexico made discoveries of long range importance to the tuna fishery, and found new fishing areas for ocean perch, shrimp and albacore.

A special fishing gear research vessel was designed and purchased.

Other undertakings included the promotion of voluntary fishery product standards; research on handling, freezing and packaging southern oysters; the development of an index for the nutritive value of fishmeal; the development of new uses for fish oil, and of methods of freezing catches of large tuna at sea.

The discovery of new fishing grounds and the development of new fishing and refrigerating techniques have already increased the supply of fish available in the United States.

As other countries benefit from these pioneering studies, fish is likely to become a much more important item in their national food supply.

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AUSTRALIAN LEAD ON NEW FISHERIES

INVESTIGATIONS which may lead to the development of valuable new fisheries are being undertaken with some of the money available from the recently established Fisheries Development Trust account, the Australian Minister for Primary Industry, Mr. William McMahon, said last month.

The Fisheries Development Trust Account was established under the Fishing Industry Act 1956 from the proceeds of the sale of the Whaling Commission's assets in Western Australia.

In reply to a question in the House of Representatives, Mr. McMahon said a considerable number of applications had been received for assistance from the Trust Account.

Careful consideration had to be given to the type of project on which the limited funds available would be expended to ensure that maximum benefit was obtained from their use for the development of fisheries in Australian waters.

"So far, £10,000 has been allocated for a survey of pilchard resources off the coast of New South Wales. A purse-seine vessel has been chartered and is at present testing the commercial prospects of this fishery," Mr. McMahon said.

"Other prospects being investigated include an examination of the results of an economic survey of the tuna industry off the south-east coast of Australia by the Fisheries Division of the Department of Primary Industry," he said.

SUEZ--AND THE TANKER FLEET

DURING the dark hours of the war years, when the enemy U-boat campaign against allied shipping was taking appalling toll despite every possible anti-sub marine precaution, oil-tankers were singled out for especially ruthless attack. The enemy knew full well that oil supplies were absolutely vital to our continued resistance — and the very shape and design of tankers made them sadly conspicuous when seen through a periscope.

More than one U-boat commander in 1942 must have reviewed the ships in some convoy being "stalked"—and passed over as too unimportant-looking a target a medium-sized merchantman with the traditional mid-ship funnel of a dry-cargo vessel.

What the U-boat captains did not know was that this funnel was a dummy—and that the seemingly ordinary merchant ship was an oil-tanker cunningly disguised.

At other times, U-boats were disconcerted to find a convoy protected by a conventional-type aircraft carrier, proudly wearing the White Ensign of the Royal Navy.

By no means all of these carriers were, however, naval vessels. Many were "MAC-ships"—Merchant Aircraft Carriers—and were in fact other oil-tankers in a new disguise.

The absence of deck hamper made a tanker an ideal ship for this temporary conversion and her complement of 'planes in no way prevented her from bringing in her usual quota of petroleum products. At least one former MAC-ship that did sterling escort duty is still serving with her oil-company's House Fleet.

Lately, oil-tankers have once more entered into headline news. The drastic re-organisation of world oil supplies following the Middle East disturbances has made necessary an equally drastic re-deployment of the world's tanker fleet.

Available tonnage has again been put under a tremendous strain in keeping up international petroleum stocks. It is doubly fortunate that in the past ten years the oil companies have been so active in enlarging their tanker fleets — and that progressively more charter tankers have been added to the fleets of independent shipping concerns.

With tankers of 80,000 deadweight tons now already launched and with vessels of 100,000 d.w.t. currently on order, the super-tanker of to-day—and even more so of to-morrow—would astonish the marine architects of earlier times.

Even as recently as 1939, a tanker of 12,000 d.w.t. was regarded as a sizeable ship for her class—and when the first of the "super" class was launched in 1945, a ship of 24,000 d.w.t., or twice the size of the bigger pre-war tankers, it was realised that a new era in tanker design and a new concept of the sea transport of petroleum had been attained.

Now, only ten years after the first of the tanker leviathans made fresh mercantile history, other tankers have been built that make the earlier leviathan seem almost a minnow.

THE cost of tanker building has soared almost as starkly as has the size of the ships themselves. An 18,000 d.w.t. ship—for which type plenty of need still exists—costs nearly £1½ million; an 84,000 d.w. tonner costs about £4 million, which in view of such an immense size, is far less than might be expected perhaps having regard to the cost of the smaller ship.

Yet the total cost of tanker construction is such that just one oil company alone—in which British interests are represented — spent almost £80 million in this way during the years 1951-1955, while it is also expected that some £300

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million will be spent annually on tanker-building, outside the U.S.A., during the next four or five years.

It is to be hoped that a fair proportion of this huge annual expenditure will come the way of British shipyards.

As well as building new tankers, the operating companies have to maintain existing ships in good order—and this introduces another problem where ships of, say, 50,000 or more d.w.t. are concerned. That is the relatively few shipyards (naval depots excluded) with drydock facilities for vessels of such dimensions.

In Britain, these facilities exist only at the ports of Liverpool, Tilbury and Southampton—though it may well be that similar amenities will soon be provided at Milford Haven if all the developments provisionally planned for that particular port are translated into reality.

In fact there are fewer than forty ports where these drydocking facilities exist in the entire world.

Need of substantially enlarged drydocking arrangements for these outsize super-tankers has already been stressed by the U.S. National Petroleum Council's special committee on tanker requirements.

It may go without saying that provision of these facilities, together with whatever general port improvements may also be necessary to accommodate such ships, is bound to be a tremendously costly undertaking. Yet, once installed, these amenities might attract an enormous volume of work to the ports able to offer such repair services.

Since the trend in the oil-company and private charter tanker fleets is so clearly moving towards an increase in the size of individual vessels, ability to carry out overhauls and repair work should be ensured at as many U.K. shipbuilding centres as possible. Otherwise, Britain looks like missing a substantial volume of valuable future business to competitors overseas.

—From Petroleum Information Bureau.

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QUICK "FIX" FOR LOST NAVAL AIRCRAFT

THE pilot of a Naval aircraft, possibly flying at ten miles a minute, who asks for a "fix" by radio-telephone can now be given his position within five seconds.

This has been made possible by the introduction by the Fleet Air Arm of the first two automatic fixer stations for Service aircraft in Britain.

Known as the Southern and Northern Fixers, they have their central controls located at the R.N. Air Stations at Yeovilton (Somerset) and Abbotsinch, near Glasgow, respectively.

They cover the whole of the United Kingdom, the Irish Sea, English Channel and some of the North Sea.

Aircraft requesting their whereabouts obtain bearings by directional finding sets installed over a wide area at four or more other Naval airfields and instantly telemetered over G.P.O. telephone lines to be the control station, where they appear as lines of light on a ground glass screen.

From a screen with a map engraved on it a Wren operator can immediately note the intersection point of the bearing lines and give the pilot his position, if necessary, in relation to towns and airfields.

The operator can also make immediate use of transmitters and receivers at the stations where the directional finding sets are located to facilitate communications with an aircraft in any particular area.

All a pilot has to do is to select the correct channel on his V.H.F. transmitter-receiver, call up the appropriate fixer station and identify himself. The reply is almost instantaneous.

From these high speed fixes, the Southern fixer at Yeovilton makes use of D.F. bearings obtained on equipment at that airfield and also at the R.N. Air Stations at Ford (Sussex), Culdrose (Cornwall), Brawdy (Pembrokeshire) and Stretton (Cheshire).

Bearings for the Northern Fixer at Abbotsinch are supplied from the Naval Air Stations at Eglinton (Co. Londonderry), Anthorn (Cumberland), Lossiemouth (Morayshire) as well as a D.F. installation at Abbotsinch itself.

By a former method, involving the passing of bearings to a central control by telephone, it took as long as a minute to give a pilot a "fix."

REVIEWS

LOOKING BACK

My Memories of Six Reigns, by Her Highness Princess Marie Louise; published by Evans Bros. (U.K.).

There is a peculiar charm that belongs to the work of those who, never having cherished literary ambitions, are persuaded to sit down and write in complete simplicity of matters wholly within their own experience. It cannot be imitated by practised writers (unless James Boswell be the exception); and the virtue evaporates if the amateur even begins to copy the professionals.

Of this engaging quality the memoirs of the late Princess Marie Louise afford a perfect example. She writes exactly as an old lady of warm heart, perfect manners and rich experience of men and women might talk over the tea-cups to a few of her grandchildren's contemporaries, who have set themselves to draw her out on the subject of the days gone by.

With an occasional touch of diffidence she apologises lest her reminiscences may begin to bore; but the reader, who can almost hear the young people's "Oh, please go on," readily supplies the words for himself, and the kindly, humorous, conversational flow continues.

The Princess was well aware how strange to ordinary experience is the life of courts; but she neither deplores nor defends it: she describes.

She was in later life an habitual traveller in buses and an occasional straphanger; she alludes to these things with the same casual naturalness as she recalls the formal pomps of dancing a state quadrille under the eyes of Queen Victoria.

Still more archaic were the splendours of old Potsdam, where two English princesses, aged 11 and 13, were permitted to feed the imperial roedeer. "The plate was held by Field-Marshal von Molkte, handed to Thora and myself by Prince Bismarck, and the old Emperor [Wilhelm I] superintended the arrangements."

Many years later the same two princesses, standing in the crowd to watch King George V leave Buckingham Palace for Bognor, were gravely rebuked by a patriotic artisan who had heard them referring to their cousin and his Queen by their Christian names.

The book is a compendium of fascinating anecdotes, many amusing, a few pathetic, some uncanny—for Her Highness was one of those who seem to be in contact with phenomena difficult to explain in terms of the material world.

She does not deny herself the enjoyment of a little mild scandal. Between the lines may be read the unassuming record of a life mainly devoted to the good of others, maintained with little diminution of energy to the very end at the age of 84.

—D.M.M.M. in the London "Navy."

MODEL SHIPS

Shipbuilding in Miniature, by Donald McNarry; published by Percival Marshall (U.K.).

This book will serve both modellers of steamers and sailing ships, and is by probably the most skilful builder of miniature ship models at the present day.

Starting off with the tools required the author deals with materials, sources of information (with special reference to Mr. Norman Ough's drawings), and goes on to "methods" which describes the various ways in which a hull can be made with a variety of materials, painting, and case making.

His detailed making of several miniatures is described, ranging from the Carolean yachts to the big liners, and as a professional craftsman of many years standing he can draw on a vast experience.

Mr. McNarry is to be congratulated on a real guide to his subject.

—O.P., in the London "Navy."

ROYAL YEAR

Our Sovereign Lady, by L. A. Nicholls; published by Macdonald (U.K.).

The Book of Scouting and the Open Air. Edited by Eric Leyland; published by Edmund Ward (U.K.).

Adventure of the Sea, by James Fisher; published by Rathbone Books (U.K.).

Over 100 photographs illustrate this diary of the Royal Year. Her Majesty the Queen is shown during the Nigerian tour, the State visit to Sweden and in many more personal moments with her children.

Many of the photographs are of the Duke of Edinburgh, Queen Elizabeth the Queen Mother and Princess Margaret.

The diary itself is delightfully written in a very personal style and the author, officially accredited to Buckingham Palace as Court Correspondent for the past 11 years, is to be congratulated on a most delightful production.

Eric Leyland's book contains real life stories of Alpine adventures by Sir John Hunt, a flight

Sydney Water Police testing a new 35-h.p. outboard-motor flood boat on Sydney Harbour. One of its main values in floods is its ability to fight fast currents.

through the sound barrier by Neville Duke, interviews with Chris Chataway, Tommy Newbold and Freddie Mills, camping hints, and a chapter of "Things to do in the open air." It is a real sort of book for nearly every boy.

Adventure at Sea made a deep impression on this reviewer; the sort of book that fires one's imagination and delights one's eye. It is magnificently produced with coloured relief maps, diagrams, drawings and representations that leave one a bit breathless! The main chapter heads give you some idea of the scope of the book—"The Sea and its Waters," "The Sea and its Life," "The Sea Challenges Man and Man Challenges the Sea."

The book takes you from the primeval oceans through countless evolutions until we arrive at sea life as we know, or could know it, to-day.

Man adventures forth in a canoe, and through his various vicissitudes we arrive at some understanding of what lives on the ocean bottom and how to-day he has arrived at scientific navigation.

If this book was to be given to the head of the family, it would be seized by "Junior" — and vice versa.

—G.A. in the London "Navy."

Keep a Good Lookout

FOR THE NEXT ISSUE OF

The Navy

MARITIME NEWS OF THE WORLD

From our Correspondents in LONDON and NEW YORK

By AIR MAIL

Revived interest in Channel tunnel

Interest in a tunnel under the English Channel has been revived in Britain. Lord Mancroft, Parliamentary Secretary to the Ministry of Defence, described such a tunnel as "a realistic aim," and "something we shall have to look at again."

As a result of Britain's decision to join the European Free Trade Area, the British Transport Commission is stated to be interested in the tunnel idea.

It is said, also, that Britain's motor car manufacturers would benefit from the scheme because the consequent land link would improve the competitive position of British cars in Europe.

An all-party Channel Tunnel Parliamentary Committee has before it the technical details of a tunnel scheme recently drawn up by a London firm of consulting engineers.

The first channel tunnel plan was drawn up 155 years ago. There is in existence a channel tunnel company formed many years ago.

In 1880 a tunnel was actually started. A pilot section from Folkestone ran for two-and-a-half miles to a shaft in the white cliffs of Dover, where it turned for one mile out to sea.

The existence of a chalk bridge uniting England and France under the sea has always made a cross-channel tunnel a practicable proposition from an engineering standpoint.

U.K. lifeboats aid stricken ship

United Kingdom lifeboats went to the aid of 77 foreign vessels from 17 different countries in the course of 1956.

The total number of "launchings on service" during the year established a new peace-time record of 745 (the previous record was 668 in 1954).

Only in 1940, the year of the Battle of Britain, was this total surpassed. These figures have been announced by the Royal National Lifeboat Institution.

Shipwrecked pilgrims rescued from island

H.M. Frigate *Opossum* (Commander H. P. Westmacott, D.S.O., D.S.C., R.N.), during a recent visit to the island of Socotra in the Arabian Sea, embarked 91 survivors from a dhow wrecked while conveying pilgrims from Pakistan to the Holy Shrine of Mecca.

These survivors — among them many women and children — had been left, almost destitute, in a small village on the Western shore of Socotra.

They were embarked in the *Opossum* at the personal request of the Sultan of Qishn and Socotra, having regard to the limited resources of the island to support such an influx of people.

The *Opossum* disembarked the survivors at Mukalla, in the eastern Aden Protectorate, where their welfare was attended to by the local Qu'Aiti State Authorities.

The patient and stoical manner in which the survivors accepted the situation left a great impression on the ship's company.

Egypt may seek loan for Canal

Press agency reports in London early this month stated that Egypt was seeking a loan of 10 million dollars for tugs, dredges, and navigational equipment.

Egypt wants these to put the Suez Canal in full operation.

The reports said that President Nasser on April 1 conferred for an hour with Mr. John McCloy, United Nations consultant on Canal finance.

They discussed developing and expanding canal facilities to meet increased shipping.

Correspondents said one proposal was that the United Nations should finance the scheme by in-

creasing members' contributions to the technical assistance agency.

The other was for Egypt to apply to the World Bank for a loan.

In Ottawa, the Canadian External Affairs Minister, Mr. Lester Pearson, told the House of Commons that Canadian shipowners should be cautious about using the Suez Canal.

Correspondents said that British and U.S. sources in Washington believed there was only a glimmer of hope that President Nasser would relax his terms for control and operation of the canal.

President's statement on Panama Canal

The President of Panama, Mr. Ernesto de la Guardia, said in April that Panama "could not realistically think of operating and protecting the Panama Canal alone."

"I think that nationalisation of the Panama Canal is not a public issue in Panama," he added.

The President also dealt with the issue of sovereignty.

He said: "Panama granted the United States Government jurisdictional—and only jurisdictional—rights in the canal zone, for the specific purposes of 'construction, maintenance, operation, sanitation, and protection of the canal,' without relinquishing sovereignty over that territory."

Press reports state that President La Guardia's statement is regarded in Panama as the most forthright definition yet of Panama's position on the Panama Canal since President Nasser's nationalisation of the Suez Canal last year.

Japan leads world in shipbuilding

Japan continued to be the world's leading shipbuilding nation in the first quarter of this year, according to Lloyd's Register of Shipbuilding Returns.

The output of Japanese shipyards is given as 586,545 tons launched and 481,172 tons completed during the quarter.

This compares with 224,945 tons launched and 349,303 tons completed by Britain.

The loss in British production due to the shipyard strike was assessed at about 60,000 tons.

Apart from China and Russia, for which figures are not available, shipbuilding work in hand throughout the world totalled 1,598 ships of 8,381,697 tons.

Britain topped the list with 348 ships of 2,086,262 tons. Japan followed with 161 ships of 1,433,835 tons.

Big falling-off in passenger trade

Disturbed world conditions, the less atractive Cape route, and the temporarily deterrent effect of increased fares have discouraged many Australians from visiting Europe this year.

The chairman of the Orient Steam Navigation Co. Ltd., Sir Austin Anderson, said this at the annual meeting of the company's shareholders in London this month.

He added: "Many who had originally planned to come have deferred their visits and cancelled their bookings.

"We and the whole of the tourist industry in this country (England) have suffered.

"This falling off in homeward traffic may result in a reduction in our outward carryings of Australians returning home in the second half of this year.

"Operating results for the current financial year may be insufficient to provide the full statutory depreciation on our fleet."

The lower results applied especially to the older ships in the company's fleet, Sir Austin said.

"While we are getting increased rates of passage money and freight to offset the heavy extra increases in operating costs, the loss en route earnings, from Ceylon and the Mediterranean, was not taken into account when the scale of increases was calculated," he added.

No Jap ships in H-bomb area

The Japanese Government will not let "protest" ships sail from Japan to the Christmas Island nuclear test danger zone.

Announcing this in the Diet, the Prime Minister, Mr. Nobusuke Kishi, said that a "sit-down" fleet protest would endanger life and would be against commonsense.

Mr. Kishi's personal envoy, Mr. Masatoshi Matsushita, arrived in London on April 1 to appeal for suspension of the scheduled British nuclear tests at Christmas Island.

Mr. Kishi told the Diet that Japan would await the results of Mr. Matsushita's appeal before taking any further action.

The Japanese Council Against Atomic and Hydrogen Bombs recently decided to send one or two ships to cruise just outside the British-designated danger zone.

The Alliance Against Atomic and Hydrogen Bombs in Shikoku, south-western Japan, proposed the sending of a fleet of fishing boats from Shikoku into the danger zone.

Ban on liner "Queen Mary"

The liner *Queen Mary*, carrying 1,750 passengers, on April 1 ended her crossing from New York at Cherbourg, France, instead of Southampton.

Unions at Southampton imposed a boycott on the liner for "breaking" the shipyard strike at Southampton by sailing while on overhaul.

Another Cunard liner, the *Iverna*, took the *Queen Mary*'s passengers to Plymouth.

SOLDIERS WHO GO TO SEA

By PENGUIN

THE motto of the Royal Marines, *Per Mare, per Terram*, "By sea and land," broadly describes the functions of this Corps, ten thousand strong, which provides highly trained infantry soldiers to serve in Her Majesty's ships, in Commandos, in landing craft and small boats and which provides the Royal Marines Band for the fleet and shore establishments.

A Marine is basically an infantryman, but he has special skills to suit him for his special role as a "sea soldier." His training is consequently long and arduous to make him the proud member of a *corps d'elite* that he is. He starts at the age of 17½ as a recruit at the Depot at Deal. Here in fine modern surroundings he acquires some of the alertness and smartness which is the hallmark of the trained Marine, and learns something of the history and traditions of the Corps. After three months he passes out at a ceremonial parade. He may then be a member of the senior or King's Squad, whose best recruit will be awarded the King's Badge, to be worn throughout his service. There follow in succession three months at the Infantry Training Centre at Lympstone, Devon, where he learns the basic skills of an infantry man, six weeks with 42 Commando, the home-based training Commando, where he learns to climb rocks and cliffs, cross swollen rivers, cover large distances across rugged country quickly on foot and with a heavy load, land on difficult shores from light raiding craft; all the skills of a Commando are acquired, and above all he learns to take his place in the fighting team, the section. With his special position as a "sea soldier" in mind, he now goes on board ship for two weeks of seamanship training and learns sea routine, how to take his place working "part of ship" and in the boats' crews. A further two weeks of "refresher" training, mainly on the parade ground, is the end of his basic training.

He now has the choice of serving his first commission in one of Her Majesty's Ships or in the Commando Brigade — either by sea or land. According to his choice he will either do a course of Naval Gunnery or travel out to the foreign station where the Brigade happens to be stationed at the time.

Service at sea

Royal Marines detachments are borne in aircraft carriers, cruisers and some frigates, their strength varying from about 90 in the fleet carriers to 20 in the frigates. Over 1,000 marines are at present serving in Her Majesty's Ships. They form a team within a team, providing healthy competition within the ship's company whether it is in manning the ship's guns, doing ceremonial duties, running their own ship's boat or in sport and recreation. And they are always at hand to provide a landing party at any trouble spot within the range of the fleet. Since World War II, detachments from ships have landed in Hong Kong, British Honduras, South Johore, Korea, Granada and Palestine, either to help the local authorities to maintain order or to take part in active operations against terrorists.

The Third Commando Brigade consists of a headquarters with two Commandos, 40 and 45, serving overseas, and a third, 42 Commando, serving at home. Each Commando contains some 600 officers and men and the Brigade as a whole forms by far the largest concentration of fighting men in the Corps.

Since 1945 the Brigade has served overseas without a single break. It has been moved from place to place to meet threats to British security and interests as they are foreseen or arise, and in the theatre it forms the local strategic reserves. It can be moved quickly by air with its heavy equipment following up by sea; in special assault craft complete with its vehicles; or in whatever ships and auxiliaries can be made available to it. The essence of its usefulness is its mobility and its mobility is a reflection of its versatility.

Since World War II the Commando Brigade has served in Hong Kong, where it gave invaluable help in restoring the life and security of the Colony, in Palestine and Aqaba during the last difficult period of the mandate and the partition crisis and in Hong Kong for a second time, whence it was moved to Malaya for two years of hard jungle fighting against the Communist terrorists. After this the Brigade went to Malta where it remained for a brief period of reorganisation and training. It was then sent to the Suez Canal zone during the troubles in 1952, and from there back to Malta for a short time before going to Cyprus to join the fight against Eoka. It was withdrawn from Cyprus in the summer of 1956 and took part in the recent operations in Port Said. Here the Brigade created history when 45 Commando landed in the

assault area in helicopters from Her Majesty's ships *Ocean* and *Theseus*. The landing of the Commando was completed in 90 minutes in the first helicopter-borne amphibious assault ever made. One man who was wounded was flown back on board and was in the sick bay within an hour of leaving the ship.

The Brigade is the country's specialised amphibious formation; its men are trained to go ashore from the sea in assault landing craft, fast raiding craft, inflatable power-driven boats, and more recently to leap across the beaches in helicopters and so avoid a frontal assault on the enemy defences. With all these methods, success depends on co-ordinating the action of the Commandos with the supporting aircraft and guns of the fleet.

In all these Commando operations, and in the actions of 41 (Independent) Commando which was raised to fight in Korea, 29 officers and 33 other ranks have been decorated for gallantry and distinguished service in action, and a further 75 have been mentioned in despatches. Twenty-eight officers and 68 other ranks have either been killed in action or have died of wounds or are missing presumed killed.

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Landing craft

The Royal Marines man one of the major landing craft and all the minor landing craft in the Royal Navy as well as a few motor launches. Marines who specialise in landing craft are trained at the Joint Services Amphibious Warfare Centre at Poole. When fully trained in the handling of their craft, they can then serve in the Amphibious Warfare Squadron in the Mediterranean, where they will work with the 3rd Commando Brigade, in the Royal Naval Rhine or Elbe squadrons, or in a home based landing craft squadron.

The Special Boat Section is a small team of men trained to make attacks on ships in harbour, to reconnoitre beaches and clear mines and obstacles in the shallows in preparation for assault landings, to penetrate harbours and inland waterways in order to demolish key installations, and to operate against targets of all descriptions, such as radar and signal stations or listening posts on enemy coasts where small, swift, silent raids can achieve great effect at little cost.

Each man is trained as a "frogman" who can swim under water to his target under his own fin-assisted power and with the aid of a breathing apparatus. He is also a parachutist specially trained at landing in the water. He travels to the shore in a two-man canoe — each pair can if necessary operate alone — and the canoe is introduced to the operating area by fast small boat, submarine, or men and canoes may all be dropped by parachute from aircraft.

At least one special boat section will always be found operating with Commando Brigade.

Band Service

Apart from some volunteer bands, all the bands for the Naval Service are provided by the Royal Marines. A boy can enter the Royal Marines School of Music at Deal between the ages of 14 and 18. He will also have a normal syllabus of general education, military drill and disciplinary training, and physical and recreational training. At the end of his training as a Junior Musician he will become a member of one of the Royal Marine Bands, either a Commander-in-Chief's Band, one of the Royal Marine Group Bands, the Commando Brigade Band, one of the Fleet Bands or, later, a member of the Band of the Royal Yacht. Before him is a life of ceremonial parades and interesting tours and engagements in all parts of the world, massed band and orchestral concerts in well known concert halls, B.B.C. and television broadcasts and a variety of engagements, public and private, for orchestras over a hundred strong down to the four-man dance band.

For nearly three centuries the Royal Marines have provided soldiers to serve in the Royal Navy. Throughout the years emphasis has shifted now one way, now the other. With the passing of the battleship fewer marines to-day are found in the fleets and more in the Commandos and amphibious units, but the main role always remains the same. The sea soldiers, whether they be in the detachments of the fleet or the Commando Brigade, are still there to exploit the mobility of the fleet and extend its influence ashore.

—From the London "Navy."

Personalities

Admiral Harrington is New F.O. Eastern Area

CAPTAIN W. H. Harrington, D.S.O., R.A.N., until recently captain of the aircraft carrier *Sydney*, has been promoted to the rank of Rear Admiral.

In March he assumed the appointment of Flag Officer-in-Charge, East Australian Area.

Admiral Harrington, a graduate of the Royal Australian Naval College, has had a distinguished career. In the Second World War he was awarded the Distinguished Service Order for courage, enterprise and devotion to duty in operations in the Persian Gulf and was twice mentioned in despatches.

He also took part in the Battle of the Coral Sea, in the landing at Guadalcanal and in many bombardments in the New Guinea area.

At the time of the award of the D.S.O. he was captain of H.M.A.S. *Yarra*, which served in the Mediterranean, the Red Sea, the Persian Gulf and the East Indies. When the Battle of the Coral Sea was fought he was executive officer of the cruiser *Australia*.

In the latter stages of the war, Admiral Harrington was captain of the "Q" class destroyer *Quiberon*, which with the *Queenborough* and the *Quickmatch* was later converted into a fast anti-submarine frigate.

In 1948 he was appointed captain of the Tribal class destroyer *Warramunga* and captain of the 10th Destroyer Squadron.

He did the course at the Imperial Defence College, London, in 1952 and his services were then lent to the Admiralty.

He was appointed to the command of the *Sydney* on his return to Australia in 1955.

APPOINTMENT

Mr. A. E. Gregory has been appointed Manager of the N.S.W. branches of Siemens (Aust.) Pty. Ltd. He was formerly General Manager of Siemen Brothers & Co. Ltd., of India.

Matson Lines

Mr. Harry A. Johnson, Matson Lines' general manager for the South Pacific Area, has been appointed area vice-president for the company in Hawaii.

Mr. Johnson joined Matson Lines in 1932 and, after important assignments in America, was transferred to Sydney in 1952.

Mr. T. E. Rowe, who recently visited Australia on the maiden voyage of s.s. Monterey, will succeed Mr. Johnson in the Sydney office. Mr. Rowe, who joined Matson in 1949, has been vice-president in charge of marine operations.

R.N. appointments, etc.

The Admiralty has announced the following appointments:

Admiral Sir Guy Grantham, G.C.B., C.B.E., D.S.O., to be Commander-in-Chief, Portsmouth, in succession to Admiral of the Fleet Sir George E. Creasy, G.C.B., C.B.E., D.S.O., M.V.O., (May).

A simultaneous announcement was made by the Secretary General, North Atlantic Treaty Organisation, of Admiral Grantham's appointment to the N.A.T.O. post of Allied Commander-in-Chief, Channel.

Rear-Admiral H. P. Koclic to be promoted Vice Admiral in Her Majesty's Fleet and appointed Director-General Supply and Secretariat Branch, in succession to Vice Admiral Sir Maurice H. Elliott, K.C.B., C.B.E., (August).

The following change in the Flag List is announced:

Rear-Admiral R. A. Currie, C.B., D.S.C., and Bar to be placed on the Retired List.

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THE GREAT SHIPS

By B. J. HURREN

MORE than a million is the figure given for visitors to Britain last year. Perforce they came by sea or by air. And whilst even we, the natives relish the enticing advertisements to come here, there seems to me to be no attention paid as to how to leave. Surely, the last moment ought to be the abiding one? And from that, at this Christmastide season of wishing, it is an easy step to wonder as to what is the best point of departure.

Personally, I loathe trains: things that move in "predestinate grooves," or, more ably expressed by an American wit as "mobile storage." So, no night train to Paris for me.

The air travel: apart from very occasional exceedingly interesting moments, air travel is dull. I remember flying from Montreal by BOAC several years ago, and we made the journey to London direct in a shade over 10 hours. Said a fellow bored traveller as we landed: "To think a piece of tin could stay in the sky that long!" So, no humdrum departure by air for me.

Now, of all the possible sea ports I would choose, Plymouth wins by far. As the ship turns her bows to the mighty heave of the Channel, anyone with red blood must feel a sense of romance. This was the route, one can say, that Drake took against the Spaniards in 1588—outward bound on the great adventure that was to be one of the decisive battles of recorded history—the defeat of the Great Armada, 1588.

Long before then Drake had established his fame as a seaman. It was in 1577 that he sailed from Devon and returned to England three years later having circumnavigated the globe. A fine and splendid thing, but a personal triumph rather than the national victory against the Spanish in which he played a leading part.

We can leave to the Hoe the legend of the game of bowls, and turn to reflection on the changes in the warships since Drake's days at Plymouth.

Well, the sea has not changed at all: "There's never a wave of all her waves, But marks our English dead," wrote Kipling, and the character and courage of the men who sail to-day across the Sound differs little from yesterday's story. Indeed, that yesteryear is not so far away: if 70 years be taken as the span of life, then only five such lifetimes ago did Drake sail from Plymouth.

One of the ships which sailed to beat the Spaniards was the *Ark Royal*. It happens that the modern *Ark Royal* is a Plymouth ship, so it might be illuminating to make a comparison.

The Bowls Legend

In 1588, the British Fleet was dispersed along the Channel, but the main body was at Plymouth. There, for many months, all manner of rumours had been current as the summer came on. (These may explain the bowls legend: fed up with constant alarums and excursions, Drake probably decided to take a chance—just as we, of the same breed, so often finished a game of darts when the air raid sirens sounded.)

The Great Ship of the British Fleet was the *Triumph*, of 1,100 tons—about half the displacement of a modern destroyer. The flagship was the *Ark Royal*, of 800 tons. Just to keep the matter in perspective from the start, that anti-Armada flagship was 1/57th of the listed full load tonnage of the modern aircraft carrier *Ark Royal*. The qualifying adjective "listed" is used because the official figure of 46,000 tons would seem to even amateur observers to be a typically British understatement.

The crew of the 1588 *Ark Royal* numbered 430. Of these, only 270 were sailors: there were 34 gunners and 126 soldiers. At war maximum, the modern *Ark Royal* has a complement (and she might carry more) of approximately 2,350 inclusive of the air squadrons which embark or disembark as convenient.

Thus, the modern *Ark Royal* has a war complement approximately five times as great as her famous forerunner.

If you were on board the modern *Ark Royal* going out of Plymouth you might like to reflect that the original *Ark Royal* was built in 1587 at a cost of £5,000. Just to make things easy we will ignore the change in the value of the £ sterling, and anyway all sorts of figures have been quoted for the modern ship which may have cost around £20,000,000. At that figure, the modern ship is thus 4,000 times as costly as the first *Ark Royal*.

But, of course, every accountant will assure you that longevity comes into the reckoning. Now, the original *Ark* lasted only 49 years, being broken up in 1636, but Hawkins' *Victory* (which was more representative of the period in the shape of long service) was built in 1561 and lasted well in the line of battle until burnt out

Continued on page 30

For Sea Cadets

ENGLAND'S PATRON SAINT

By JOHN K. LAVETT

President of the Sydney Branch of The Royal Society of St. George

ST. GEORGE slaying the dragon with his magic sword Ascalon represents the principles of truth and justice gaining mastery over lust and fury. It is fitting, therefore, that St. George should be the patron saint of England. And it is equally apt that the Emblem of St. George—the fiery red cross on the white banner, which is so dominantly featured in the British National Flag, the Union Jack and most flags of the Commonwealth nations—should be everywhere accepted as the symbol of liberty, justice and altruism.

Until the time of the Reformation, the name and symbol of St. George were intimately interwoven with the history of the English nation, having been specially honoured by three famous Kings —Alfred the Great, the "Father" of the British Navy, Edward III, and Henry V.

If you remember your Shakespeare, you will need little reminding of the inspiring oration made by Henry, to his men—before Harfleur, commencing with:

Once more unto the breach, dear friends, once more;
Or close the wall up with our English dead!" . . .

and concluding with—

. . . The game's afoot;
Follow your spirit, and upon this charge
Cry "God for Harry! England and Saint George!"

It was Edward the Third, however, who had previously raised the St. George cult to a great height of popularity and adopted his name as a war-cry, the cross of St. George becoming the English flag.

At the beginning of the seventeenth century, the crowns of England and Scotland were united, the diagonal white cross on a blue ground of the Patron Saint of Scotland — St. Andrew — being then added to the cross of St. George as the first Union Flag of Great Britain.

At the commencement of last century, Ireland was united to England and Scotland and the diagonal red cross on a white ground of St. Patrick was added giving us the Union Jack of today, a flag that stands for British power and freedom all over the world.

Its very name is interesting, for the word "Union" commemorates the union of the three Parliaments of England and Ireland in 1801, and the word Jack is a reminder of the times when crusading warriors wore the Cross on their coats or jacques.

In 1386, in the reign of Richard II, during the invasion of Scotland, the King ordained that every man should "bear a sign of the armies of St. George, large, both before and behind." The red cross was worked on a white cassock which was worn over the armour, and as a writer of the time said, it became "a seemly and magnificent thing to see the armies of the English so sparkle like the rising sun."

St. George is the patron of nine military orders and is the protector of sailors and soldiers. He was not altogether an imaginary figure, as many people seem to think, although his mythical encounter with the dragon has developed into a legend that now carries a spiritual interpretation.

St. George was born at Lydda near Joppa in Palestine, about the year 270 A.D. His birthplace was near the Plain of Sharon — the native home of the rose, this supplying one reason why the rose afterwards became (and still remains) the floral emblem of St. George and the English people.

St. George entered the Roman Army and in the course of his military service was sent to Albion (since, of course, called England), where he became the friend of Constantine Chlorus—one of the four leaders of the Roman world. The son of Chlorus and Helena—his British Christian wife—afterwards became Constantine the Great, the first Christian Emperor of Rome.

Very little historical data is available concerning the life of St. George, but it seems quite certain that he was martyred at Lydda. The actual year of his death varies, but it is generally accepted that the day was Good Friday, April 23, 303 A.D., this coinciding with the great persecution of the Christians by the then Roman Emperor Diocletian, whose reign marked by many successes was marred by this cruel attempt at oppression.

St. George openly defied Diocletian, whom he was then serving, and publicly proclaimed himself to be a Christian, whereupon he was thrown into a prison, tortured again and again and, finally, beheaded—a martyr to his faith.

St. George was given a shrine at Lydda where—and this is probably where we get the dragon story—Perseus (in Greek legend) is supposed to have saved Andromeda from the sea monster when

on his way back from securing the head of Medusa — the sight of which turned all beholders into stone.

St. George's connection with a dragon is mentioned in the Golden Legend — the English title of a collection of lives of the Saints compiled by the Archbishop of Genoa in the latter part of the Thirteenth Century.

In this collection, it is claimed that St. George, having slain the dragon, put off his knightly habit, gave all he had to the poor and went forth to preach Christianity until his death.

When Constantine became sole Emperor, he canonised St. George, making him the patron saint of ancient Albion.

It may well have seemed, on that fateful day in April 303 that Christianity was doomed and that the sacrifice of the martyrs—of whom tradition has recognized St. George as the leader—was a splendid but futile protest. But the history of the world, particularly that surrounding the British, has proved the contrary to be the case.

To-day St. George—the patron saint of England—personifies the Christian spiritual force fighting the dragon or powers of sin, darkness and temptation. To many, his story symbolises the power of God.

St. George's Day will be commemorated on April 23 and nearby dates. Let us not only honour his spirit at that time, but let us keep his tradition and purpose always before us. The spirit of St. George and the Divine response which it calls forth are more vitally needed these days than ever before.

With the great Elizabethan poet, Edmund Spenser, let us constantly keep before us, and in our hearts, the stirring call and challenge—

St. George of Merrie England
The Sign of Victory!

THE GREAT SHIPS
Continued from page 28

in 1666 in the Dutch war, being then 105 years old.

Another interesting comparison concerns fire or attack power. The first *Ark Royal* mounted an almost heraldic array of weapons. She had four 60-pounders ("cannon") and four 30-pounders ("demi-cannon"). The secondary armament was 12 18-pounders ("culverin"); 12 9-pounders ("demi-culverin"); and six 6-pounders ("sakers"). The total amounts to 680 lb. which, as everyone will know, is no more than a small bomb in the last war.

It is soon apparent that the comparison to be made is not between the one ship of to-day and of yesterday, but of the one modern ship against entire Fleets of 1588. In size alone, the largest of the British and Spanish warships was *La Regazona* of 1,249 tons. It carried only 30 light guns.

In all the six Armadas which comprised the Great Armada, only seven ships exceeded 1,000 tons and these headed 14 ships of 800 tons or more. Total Spanish tonnage was 57,868 tons, and of this the main ships totalled 46,478 tons. The Spanish grand total applied to 130 ships of war, but there were 45 store and communication ships of 11,300 tons. In broad terms, then, the modern *Ark Royal* exceeds in tonnage the entire warships of the Great Armada.

There were 197 English ships under Lord Howard of Effingham, and the majority of these were small, coasting ships. Only two British ships exceeded 1,000 tons: there was one of 900, two of 800, five of 500 tons, and the remainder were of 400 tons or less. The entire British Fleet was roughly one-sixth the size of the modern ship.

Perhaps the comparison is no more acute than in the search or reconnaisance characteristics. A month before the main battles, and even longer since the Great Armada had put to sea, the British defence forces did not know the enemy's whereabouts—except for scare stories from merchantmen who had run for Land's End and reported with evident inaccuracy.

In the event, 40 Spanish ships lost contact with the main force shortly after sailing. Driving rain was the cause, and it was this stray force which was sighted and led to so many rumours in Plymouth. No such uncertainty exists to-day: even in thick fog the ship's radar would sweep 200 square miles of the sea on constant watch, whilst its aircraft in less than an hour would cover at least 40,000 square miles on square search.

Nevertheless, the British Fleet was then sufficient for its task—even if the meaning of Sea Power was not fully understood, and waited on the coming of Nelson to demonstrate and Mahon to write about this great fact. But can we not imagine the pride of the commander of the flagship *Ark Royal* in his 800-ton warship? It could not have escaped his mind that Drake's *Pelican* (later *The Golden Hind*) was of only 120 tons . . . and if such a tiddler could master the oceans of the world what could not his great ship do?

Eight hundred tons? Why, since a Gannet aircraft burns about two tons of fuel on a four-hour patrol, the aircraft of the modern *Ark Royal* would consume 800 tons in no time. Furthermore, the cost of one modern aircraft fully equipped exceeds the cost of the entire main units of the British Fleet of 1588.

Blood is not the only price of Admiralty.

—From the London "Navy."

For Sea Cadets

SEA CADET TRAINING REVIEWED

ALL N.S.W. Sea Cadet units have maintained a steady strength of cadets the Divisional Administrative officer, S/C Lieut.-Commander D. J. Mort, states in a review of Sea Cadet activities for the last half of 1956.

This year's work ended with a seven days continuous training course in H.M.A.S. *Penguin*.

The programme included seamanship, signals, and recreational training. Swimming, tennis, cricket and deck hockey were arranged.

The Commanding Officer T.S. *Condamine*, Lieutenant H. Madge, was in charge of the course.

Other training courses in H.M.A. ships and establishments were held during the half-year.

Lieut.-Commander Mort states that it is hoped that in the not far distant future sea cadets of suitable standards may, like the U.K. cadets, go to sea for training courses.

The annual athletic carnival was held in September at the Sydney Athletic Field and competition was keen. T.S. *Albatross* (Wollongong) and T.S. *Tobruk* (Newcastle) sent teams to compete.

The "Stamina" Cup for the aggregate point score was shared by *Australia* and *Shropshire* with 101½ points each. Each unit will hold the cup for six months.

The Division's annual swimming carnival was held on February 23, 1957, at the Balmoral Naval Depot baths.

Trophies and prizes were presented to the winners by Rear-Admiral H. J. Buchanan, then Flag Officer in Charge, East Australian Area.

Among those present at the carnival were Rear-Admiral H. A. Showers and Mrs. Showers, Rear-Admiral Moore, Captain Darling (Senior Officer, N.S.W. Division), Commander and Mrs. Schoffield, and Lieutenant-Commander Whyte (National Service Training Officer).

The Navy League aggregate point score cup was won by T.S. *Tobruk*, with 25 points. The *Australia* was second with 21 points.

T.S. *Australia* won the Sirius relay cup.

Appointments

The following appointments have been confirmed:

Captain Stanley Darling, R.A.N.R., D.S.C. (2 Bars), as Divisional Senior Officer, N.S.W. Division, A.S.C.C., vice S/C Commander Leonard Edgar Forsythe, S.S.D.

S/C Commander Leonard Edgar Forsythe, S.S.D., as Commanding Officer S.T.D. Snapper Island and T.S. *Sydney*.

Commander Ronald Denovan, R.A.N.V.R., as Deputy Senior Officer, N.S.W. Division, A.S.C.C.

S/C Lieutenant - Commander David John Mort, as Divisional Administrative Officer, N.S.W. Division, A.S.C.C.

S/C Lieutenant N. A. McPherson, as Divisional Supply Officer, N.S.W. Division, A.S.C.C.

William Adey Buckley, as Sea Cadet Sub-Lieutenant and as First Lieutenant T.S. *Shropshire*.

Joseph Edward Blight, as S/C Sub-Lieutenant and First Lieutenant T.S. *Tobruk*, to date November 9, 1956.

Advancements

To Cadet Petty Officer: 1215 Robin Warren Castles (T.S. *Sirius*).

To Cadet Acting Petty Officer: Ian McMath (*Sirius*), Raymond Arthur Booth (*Albatross*).

To Cadet Leading Seaman: 1465 Frederick Lewis Clarke (*Sydney*), 1300 Alan Coombes (*Tobruk*), Albert John Hinchey (*Australia*), 1330 Brian George Hockey (*Condamine*), 1391 Brian William Hughes (*Shropshire*), 1251 Ian Mears (*Warrego*), 1270 Roland Douglas Ogden (*Australia*), 1389 Robert John Palmer (*Tobruk*), 1240 Ian Grant Pirie (*Warrego*), 1257 Brian Robert Stobbie (*Warrego*), 1287 Alan Frederick Wasson (*Albatross*).

To Acting Cadet Leading Seaman: 1318 Trevor J. Fairbairn (*Australia*), 1023 Kenneth Allan McMath (*Sirius*), all to date January 1, 1957.

Entries

T.S. *Sydney*: 1594 G. R. Gray, 1617 B. K. Nicol, 1608 P. A. Millar, 1611 R. O. Arthur, 1633 R. T. Woods, 1634 B. Wormesly, 1635 G. R. Wilcox, 1637 P .N. Taylor.

T.S. *Australia*: 1601 N. Birchall, 1602 J. McKenzie, 1603 K. J. Martin, 1604 R. B. Reynolds, 1612 P. E. Harvey, 1631 K. H. Dorrey, 1632 E. Bowman.

T.S. *Condamine*: 1575 D. Pallett, 1577 G. Parker, 1586 D. F. Dray, 1587 W. Hanson, 1588 M. J. Ryan, 1590 D. Partridge, 1591 R. Gough, 1593 J. A. Hatton, 1605 J. Nihill, 1614 S. Bennett, 1621 E. J. Balkin.

T.S. *Sirius*: 1599 W. A. Barry, 1600 S. J. Simpson.

T.S. *Albatross*: 1598 P. C. Adams, 1597 E. R. Truscott, 1598 T. Sloan, 1609 W. S. Armstrong, 1615 P. C. Nott, 1616 R. J. H. Sitter, 1617 B. Vennard,

1618 N. Carpenter, 1619 B. E. Russell, 1622 M. J. Sharman, 1624 F. T. Jeffries, 1626 R. P. Barker, 1627 B. J. Reilly, 1628 P. Van Stockeven, 1630 B. Hadley.

T.S. *Tobruk*: 1578 B. W. Tarrant, 1579 B. Casey, 1580 J. Woodfrey, 1581 R. Balks, 1582 S. McPherson, 1583 C. Shoesmith, 1584 D. Brazel, 1610 C. Sinclair.

T.S. *Shropshire*: 1576 J. S. Graham, 1596 W. Beetham, 1613 R. Holland, 1620 P. H. Douglas, 1623 D. Pickering, 1629 C. Cochrane, 1636 R. J. Crawford.

Transfers

S/C Sub-Lieutenant Alfred William Brooker, Petty Officer Instructor William George Stanford, Petty Officer Instructor H. G. Charlwood, all T.S. *Shropshire* to T.S. *Sirius*.

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SEALS—AND SEALERS

By ROY KINOHORN

(In an A.B.C. Talk)

WHEN I think of the hundreds of thousands of seals killed during the year 1887 and the skins sold on the London market (there were 226,000 killed that year) and the thousands killed every year since, it is a wonder that there are any left to-day.

There certainly would not have been, had not the United States government outlawed what was known as pelagic sealing more than fifty years ago.

Pelagic sealing was more or less buccaneering, because seals were met at sea on their way south, after breeding in the Aleutian islands, or off Alaska and Newfoundland, and set upon by the too eager sealers, who not only took males and females, but the young.

You can imagine how they were being ruthlessly slain, in fact they were being rapidly wiped out.

Actually, it is mainly the young unattached males that are taken, they never having indulged in fights that would tear their skins about and make them useless for trade purposes.

That reminds me that, when the seals gather on the islands where they breed, the older and more powerful males gather great harems of females, and guard them against all comers.

The males are called bulls, and the females cows, and the unmated males bachelors. But even though there are bulls and cows, strange to say, the young are called pups; so what a mix-up it is.

Under international agreement controlling sealing, about 40,000 are now taken yearly, and that should allow for the continuation of the species.

If you care for figures, here is a big one, it has been estimated that during the past 140 years, more than 40 million seals have been taken by hunters, and that is a lot of seals.

An adult fur seal, particularly the hooded and the harp seal, may measure up to eight feet from tip of snout to tail, and weigh up to four hundred pounds.

Whilst sealing is carried out mainly in the north, particularly in or near Hudson Bay, Canada, the position at present round the Australian coast is that all are totally protected now. I am reminded that some sixty years ago a well known sealing area was on Kangaroo Island off the coast of South Australia.

Here again in the sealing industry we find some peculiar names. Male hair seals were known as bulls but male fur seals were called wigs, and all females, both fur and hair seals, were known by the extraordinary name of klapmatch.

Seals are extremely fast in the water, as you may have noticed if you had seen them in ponds at zoos, but they are clumsy on land. Even so they can cover a stretch of beach at a pace that would astonish you.

There are some well-known seal rookeries, or should I say sealeries, on islands off the Victorian coast, and in Bass Strait, where rookeries of up to 5,000 have been counted.

That may seem a lot, but seals will have to be in their hundreds of thousands before sealing will be allowed again in this part of the world, or they would be exterminated in a few years.

THE NAVY

NAVY'S BILL FOR SUEZ IS £2 MILLION

The cost of the Navy's part in the Suez operations has been set at £2 million.

This is shown in two White Papers concerning Navy finances, published in London in February.

They were a Supplementary Estimate for the year 1956-57 and the Navy Estimates 1957-58, the latter in the form of a "Vote on Account" as the full Estimates will not be presented to Parliament until later in the session, probably after the new financial year has opened.

The Supplementary Estimate, published by H.M. Stationery Office on February 13, asked Parliament to vote an additional £11,000,000 for the Navy.

The request for the additional money is mainly due to increased wages, prices and freight rates, plus £2,000,000 arising from the Suez emergency. On the other hand, certain additional liabilities have been partly offset by the imposition of further economies and the disposal of surplus stores, etc.

With the original net estimate for the financial year 1956-57 contained in last year's Navy Estimates of February 9, 1956, as amended by the revised estimate published in Command Paper 311 of June 27, 1956, the total net expenditure on the Navy for 1956-57 amounts to £348,840,000.

The original net estimate was £346,000,000. The revised estimate reduced this to £337,840,000 by means of effecting a number of savings in accordance with Government policy; and to this must now be added the supplementary requirement of £11,000,000.

MEMORIAL UNVEILED

The Singapore War Memorial was unveiled at Kranji War Cemetary, Singapore, by the Governor and Commander-in-Chief, Sir Robert Black, on March 2.

Inscriptions in English, Hindi, Urdu, Gurmukhi, Chinese and Malay commemorate the 24,000 men and women of the Commonwealth Armed Services who died during operations in southern and eastern Asia.

NEW RESERVE SECTION

The formation of a new section of the Royal Naval Volunteer Reserve and of the Woman's Royal Naval Volunteer Reserve was announced in the House of Commons on February 13.

Its purpose is to provide a reserve of trained men and women living near Naval headquarters who will be immediately available in war to assist in manning the headquarters.

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THE NAVY

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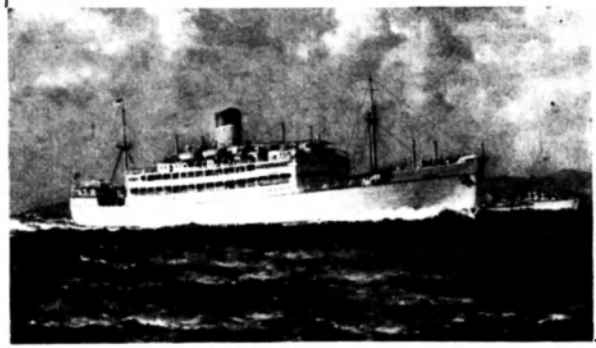

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AUSTRALIA EXPORTS OIL

In the past two years Australia has become an exporter of oil products. This has arisen from the establishment of oil refining here.

It is a significant development from the viewpoints of trade—including shipping—and defence.

It is of particular importance to New Zealand. In 1953-54 Australia did not export any motor spirit or heavy oils to New Zealand. But in 1954-55 she was able to send New Zealand nearly 13 million gallons of petrol and nearly 11 million gallons of heavy oils; and in 1955-56 37 million gallons of petrol and 27 million gallons of heavy oils.

By 1955-56 Australia—in just two years—had developed her oil products market to the extent where she was supplying 17 per cent. of New Zealand's petrol needs.

Australian exports of petrol have been limited only by the capacity of her refineries—which have not by any means reached their maximum output.

In the field of heavy oils the Australian export picture has been even more surprising. In 1955-56, in addition to supplying New Zealand with 27 million gallons—25 per cent. of her requirements—Australia sent 49 million gallons to Singapore. Exports to all countries for that period totalled 107 million gallons.

As the refineries progressively increase their output Australia could well become the main source of oil products for a big part of the Pacific and South-East Asia.

For its size New Zealand has a relatively large market for petrol products. Much of this arises from the fact that New Zealand has more cars in relation to population than any country outside North America. In the past 10 years the number of vehicles in the Dominion increased from 200,000 to 410,000. In September last year there were 664,525 motor vehicles on the road which is about 19 cars for every 100 of population.

Australia now has large modern refineries at Kwinana, Western Australia, Geelong, near Melbourne, Altona, near Melbourne, and Kurnell, on Botany Bay, N.S.W. Australia's total refining capacity is 9,150,000 tons of crude a year.

If oil is ever found in payable quantities here, Australia's significance as an oil supplier will be a mighty factor in trade and defence planning.

Meanwhile, shipping authorities are heavily occupied with plans for tanker fleets—which include ships of huge tonnage.

The National Petroleum Council of U.S.A. recently announced that 24 tankers each of at least 100,000 tons d.w. are expected to be in service by 1965.

The Council undertook a study of long-range tanker building programmes at the request of U.S. President Eisenhower.

The president said he wanted a clear picture of the free world's tanker strength before discussing plans for the possible construction of an American emergency oil fleet.

The council reported that in addition to the 24 super-tankers, there will be another 39 tankers of between 60,000 and 100,000 tons. However, the most fashionable size for new oil ships is between 30,000 and 40,000 tons, and 320 such vessels are either on order or are planned.

These ships will constitute part of the total tanker tonnage of 38 million which is expected to be added to the world fleet in the next eight years.

Allowing for scrapping and losses the additional tonnage will increase the capacity of the world's commercial tanker fleet by 80 per cent.

The council's survey showed that at the beginning of this year, the world's commercial tanker fleet—excluding ships of Russia and her satellites—comprised 2,353 vessels of at least 6,000 tons. In addition, 902 vessels were on order or under construction and additional ships totalling 11 million tons were to be ordered soon.

SUBMARINE THREAT

The British Vice-Chief of Naval Staff, Admiral Davis, at a recent launching ceremony, reflected the concern felt by the West at Russia's submarine strength. He said:

"It is a sombre thought but we are faced to-day with a formidable threat of over 475 Russian submarines—greater than the peak threat at the height of the German submarine campaign in the last war. We are a very important part of NATO and it is one of the charges on NATO to see that this island is supplied. If we don't keep the sea lanes open or show that we have the ability to do so in the event of war, we will either starve or increase the possibility of a global war.

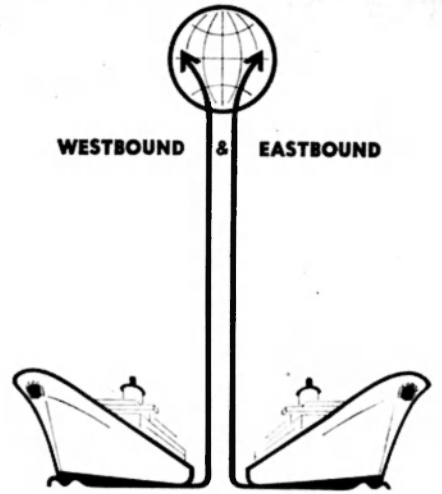
"All the inventions in the world cannot get around the inescapable fact that we are more and more dependent on seaborne supplies for our existence as time goes by, and we perish if these fail.

"I forget who it was who said in the past that 'it is only numbers which annihilate,' but in anti-submarine warfare that is abundantly true to-day.

"We must have adequate numbers of A/S vessels, A/S aircraft and other devices if we are to match up to the submarine threat.

"The importance of the naval threat is fully appreciated by those who rival us.

"Marshal Zhukov, the Russian Minister of Defence, said at the 20th Communist Party Congress: 'In a future war the struggle at sea will be of immeasurably greater importance than it was in the last war'."



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The Navy's Role In The G.M. Age

By "LIAISON" — in London

AT the handing over ceremony recently of the *Bonaventure* — a 15,700 ton "Hercules" class carrier, laid up half-finished for several years after the war, but now reconstructed, modernised and completed for the Royal Canadian Navy — Lord Hailsham made a speech which was both a warning and an encouragement for the Royal Navy.

He said it will perhaps be no longer than seven years from now when the land-based fighter will be displaced by the ground-to-air guided missile and the land-based bomber will begin to be displaced by the ballistic missile.

If the ground-to-air guided missile is to be the only effective defence of our homeland against the supersonic bomber it surely follows, that surface-to-air guided missiles are urgently required for the protection of our fleet. Is there any hope within the next seven years of converting our existing ships — or building new ships — to fire these missiles?

The development of guided and other self-propelled missiles is still carried on in this country behind a curtain of secrecy, ostensibly for security reasons but more probably because little real progress has been made. We are asked to be patient and meanwhile to be content with the knowledge that an air-to-air guided missile has been issued to the R.A.F. for operational training and a surface-to-air missile is now under test for the use of the Fleet.

It is not, therefore, surprising that the British people are unaware of the potentialities of the self-propelled missile in its various forms or of the remarkable progress that has already been made in the United States.

In particular the American anti-aircraft guided missile has reached such a stage of reliability and effectiveness that various types are in quantity production and have been issued to all three of the United States Fighting Services. The American defence chiefs are indeed convinced that these missiles provide a sound defence against the bomber and that the need is urgent for another kind of explosive carrier to supplement, if not entirely to replace, the bombing aircraft. They have for several years been investigating two tyes of alternative long-distance explosive carrier — a winged missile propelled by a ram-jet or other air-driven engine, on the lines of the German V-1 flying bomb; and a ballistic rocket, with a trajectory beyond the atmosphere, a development of the V-2.

500 Mile Range

Considerable progress has already been made with the winged missile and two varieties of it, with a range of 500 miles, are now in use as an auxiliary to the main armaments of the U.S. Navy and Air Force — the "Regulus" in the Navy and the "Matador" in the Air Force. Until comparatively recently efforts had been largely concentrated on increasing the range of these missiles and there are two types with an inter-continental (5,000 miles) range under development which show great promise as a weapon of the reasonably near future.

All these winged missiles, however, though they can be guided throughout their trajectory, are air-driven and must thus remain within the atmosphere — below 100,000 feet. Moreover, with engines dependent on air, their speed is relatively slow — certainly insufficient to render them immune from anti-aircraft measures.

On the other hand, there are immense difficulties in producing a very long-range ballistic rocket in view of the inability of the materials at present available to withstand the heat friction developed when the missile is re-entering the atmosphere at speeds of something like four miles a second. The "Atlas"— a rocket of this kind with a range of 5,000 miles now under investigation in the United States — is still, in fact, very much a weapon of the remote future.

Latterly, however, two new developments have caused a marked revival of interest in the ballistic rocket and concurrently in the importance of sea power — developments which the former First Lord seems to have had in mind when he referred to the ballistic missile.

Tests have shown that both nuclear and even thermo-nuclear explosives can now be used in a warhead of reasonable size, which makes accuracy of far less importance.

There has also been very great progress in methods of combustion and propulsion and the American authorities now seem satisfied that the design of a relatively short-range rocket is, in essence, suitable for missiles of up to 1,500 miles range.

The Chrysler Corporation has, in fact, been given the contract for prototypes of the ballistic rocket "Jupiter" which has a range very much greater than the "Redstone," a one-stage rocket of the same design with a range of 250 miles, which is already in production. The "Jupiter" is to be tried out at sea in two large merchant ships now being converted for the purpose.

Practical Considerations

In brief, priority is being given to producing what is at present practicable, leaving the inter-continental ballistic missile to be developed in due course as a weapon of the future. Rockets of up to 1,500 miles range, to reach vital targets, must be launched from positions off an enemy's coast and because of their size, require large ships to carry a worthwhile number.

This means little change in the function of the United States Navy which has under construction a fleet of six supercarriers — each of 60,000 tons and costing £70,000,000 — for launching A3D bombers at targets 1,000 miles inland.

The Americans have always in mind the fear that their land-based bombers may be partially or even totally destroyed by a sudden, unexpected attack and these naval bombers provide an alternative strategic bombing force.

But what of the Royal Navy? Will its primary task in the missile era remain, as hitherto, to guard the sea communications? Or will the intermediate range ballistic rocket of the early future give a new impetus to the principle of hitting the enemy where it hurts him most?

The answer must clearly depend on whether we have, or can build up, a home defence sufficiently effective to enable us to protect ourselves against or at least to endure the effects of hydrogen bomb or other thermo-nuclear missile attacks. But other considerations are also invoked.

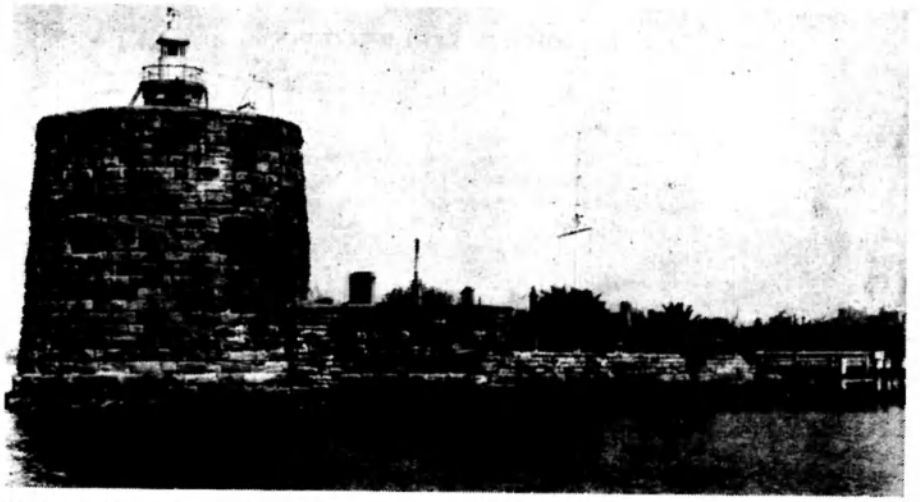
The Prime Minister in his broadcast, when taking office, emphasised that Britain has been, is, and, provided we pull together, will remain great. But with all due respect, is this possible unless we are also a great military Power?

There are no more deserving or go-ahead nations than Switzerland, Sweden or Holland. But have they any influence on the course of events except by their vote in the United Nations?

Again, is there not a lesson to be learned from Suez? To stop a general conflagration in the Middle East and to produce a United Nations Emergency Force are results which need cause us no shame. But we were none the less prevented by the United Nations from finishing the job and it is obvious that we shall have the greatest possible difficulty in the future in taking action to safe-

Continued on page 32

FORT DENISON IS 100 YEARS OLD



Last month — on May 15 — was the centenary of Fort Denison. Built on the rocky island in Sydney Harbour known as Pinchgut, Fort Denison has never fired a shot in anger. It was intended as a defence against possible Russian attack in the mid 1850's.

WHAT CAUSES "ICE CYCLES"?

By PROFESSOR E. W. TITTERTON

In an A.B.C. broadcast

ALL glaciers move, even though very slowly, and to-day, most are retreating steadily. However, in the Pacific northwest some are holding their own, while a few have even begun to advance.

An interesting problem of current study is to search for a possible correlation between glacial history and long range weather patterns.

A glacier is a body of ice, at least 150 feet thick, originating from an area where the annual accumulation of snow exceeds the melting rate.

The snow becomes compacted into ice which, under pressure, becomes plastic and flows down hill, carving out a U-shaped valley as it goes.

Some glaciers terminate in oceans and huge chunks break off to form icebergs.

The terminus of a valley glacier is located at the point where the prevailing temperature is sufficient to melt the ice and counterbalance the forward motion.

At the end and along the sides of the glaciers there are moraines —that is masses of mud, gravel, rock, debris, and so on deposited by the glacier.

Glaciers, because they leave permanent or semi-permanent records on the landscape of their existence and their extent, serve as excellent long-term indicators of temperature. Thus geologists have found evidence of several ice ages in higher latitudes, and at present we are in the middle of one which has been characterised by four major advances.

The most recent of these, the Wisconsin ice sheet, reached its greatest extent about 10,000 years ago. Since then there have been two minor advances, one in Europe about 6,000 B.C., and the other in North America about 1,500 years later.

After that, Continental glaciers retreated rapidly and disappeared, except for the ice caps of Greenland and Antarctica, but even these diminished in thickness by several hundred feet.

However, beginning about 1600 A.D., there has been a re-advance of glaciation, which is responsible for most of the existing mountain glaciers in the higher latitudes, and since 1900 we have been emerging from a "little ice age" into a period of gradually warmer temperatures.

What causes the rhythmical glacial tides that we know have swept over the higher latitudes? A number of factors from wind currents to cosmic dust might play a part, but most scientists now think that the variation in solar radiation is the critical factor.

Curiously enough, ice ages are associated with greater solar radiation. As temperatures rise, more water is evaporated from the earth's surface and there is more cloudiness and precipitation.

LOWER summer temperatures, caused by the cloudiness, accelerate melting of the increased snow that has fallen during the winter.

Associated with these variations in solar radiation are complex changes in the circulation of the upper atmosphere, which causes more cold polar air to be carried down into the middle latitudes than in the usual case.

Particles of dust in the earth's atmosphere interfere with the absorption of solar radiation, and it is possible that variations in amounts of cosmic or volcanic dust or carbon dioxide in the air may affect major weather patterns significantly.

Some people believe that the gradual warming of the last 50 years has been caused by an increase in atmospheric carbon dioxide.

Recent glacial activity has brought about some predictions of colder winters and wetter summers, and in any case there is a good deal of conjecture about what is happening to our weather.

But this is one aspect of a much larger and more intriguing problem, namely, why does the earth's climate, normally warm and tropical with ice-free polar seas, turn colder periodically, and develop continental ice sheets that envelope the higher latitudes?

The lack of long-term precise knowledge about weather and climatic change prevents an answer to these questions.

Answers may be found when scientists learn to simulate weather phenomena on a small scale in the laboratory.

"PEROXIDE" SUBMARINE PERFORMS WELL

The first of two Royal Navy experimental high-speed submarines, H.M.S. "Explorer," visited London recently. She is well streamlined. Her manoeuvrability at high speed is good and she is readily controllable at all speeds.

THE *Explorer's* main propelling machinery consists of turbines supplied with steam and carbo dioxide produced by burning diesel oil in an atmosphere of steam and oxygen formed by the decomposition of high test peroxide.

She is thus able to develop full power when completely submerged, independent of atmospheric oxygen.

Conventional means of propulsion at lower speeds is possible by diesel for surface passages, and on main motors supplied by batteries when submerged.

Most of her superstructure fittings are retractable.

Apart from the indications of instruments and a tremor on the depth gauge there is nothing to suggest high speed to the crew when submerged.

The dimensions are 225ft. 6½in. length overall and breadth of 15ft. 8in.

This submarine will provide experience in the operation of this new propulsive combination and will serve as a fast underwater target to train surface forces in the tactics which would be required to destroy submarines with high underwater speeds.

She is unarmed, and has a complement of seven officers and 42 ratings.

The following technical description of the vessel was issued by the Admiralty during March:

"H. M. S. *Explorer* has two shafts normally driven by conventional submarine motors but to each a turbine, deriving power from diesel fuel burnt in decomposed H.T.P., may be clutched to provide high speeds underwater.

"Each turbine installation operates on a 'direct cycle,' so called because heat transfer takes place between hot gas and water which passes a mixture of steam and carbon dioxide to the turbine.

"The major items of the turbine plant are: triple pump, proportioning device, control or 'three cam' valve, catalyst chambers, combustion chamber, turbine, condenser, compressor, clutch and gearbox.

From a Special Correspondent in London

"Briefly the triple pump supplies high test peroxide, special oil fuel and feed water through a proportioning device to a control valve known as the 'three cam' valve. The first movement of the 'three cam' valve allows H.T.P. to be fed through a regulating or 'load' valve to the catalyst chamber, where violent decomposition of the H.T.P. occurs and steam-oxygen mixture passes to the combustion chamber.

"The second and third movements of the 'three cam' valve pass water and then fuel to the combustion chamber and reduces the gas outlet temperature to that required at the turbine inlet.

"From the combustion chamber the steam-oxygen mixture passes to the turbine through a change-over valve. During starting, this valve discharges the products of the combustion chamber overboard to avoid a build up of neat oxygen in the condenser and also serves to separate combustion chamber and turbine controls.

"The condenser design is such that the steam is condensed and the carbon dioxide separated, the former being returned to a feed

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tank and the gas discharged overboard by a Lysholm compressor.

"The triple pump passes the three working fluids: H.T.P., special diesel fuel and water, which feed to the combustion chamber. The pump is driven by a 150 h.p. motor.

"Coupled to the motor shaft is a gearwheel which engages around its periphery three pinions turning at approximately 20,000 r.p.m. Each pinion drives an impeller. The triple pump is fitted with its own lubricating oil pump, cooler and filter.

"The proportioning device consists of four meters coupled to pass and control the correct proportions of H.T.P. water and fuel at any load controlled by the load valve sited in the H.T.P. line to the catalyst chamber.

"Three of the meters pass H.T.P., water and fuel. The fourth meter passes water from the sea into the submarine to allow automatically for alteration in weight due to expenditure of H.T.P. and fuel.

"After the installation has been prepared for running, and the circulating water, lubricating oil, condensate and triple pumps are running, the plant is started by operating the three cam valve. During the standby period this valve is in the 'off' position and H.T.P. fuel and water pass back to the triple suction through a bypass in the three cam valve.

"Two catalyst chambers per plant decompose the H.T.P. to steam and oxygen, which is passed to the combustion chamber. In the combustion chamber an igniter is energised by a switch operating a handle. This also admits primary oil to the igniter sprays.

"The igniter is switched on after the first movement of the three cam valve. Once ignition has been established the three cam valve is moved through its final two positions and the productions of the combustion chamber are then available for admission to the turbine by operating the changeover valve.

"An impulse cycle was chosen for the turbine because of the large clearances necessary in order to meet the operational requirement for quick starting. At admission the turbine has a velocity compounded impulse stage, followed by five pressure compounded stages.

"The high pressure nozzle box is separate from the turbine casing and is formed into an admission ring supported at three points, and connected by branch to the steam inlet by piston rings in order to prevent high pressures and temperatures at the main casing. The loose nozzle ring was adopted to allow for the quick starting requirement. A horizontal joint has been omitted to avoid distortion due to uneven heating of a bolted flange casing joint.

"The gases leaving the combustion chamber contain 14 per cent. by weight of CO_2, the remainder being steam.

"A satisfactory carbon ring gland seal has been developed which prevents steam and carbon dioxide filling the turbine room. Steam and carbon dioxide pass from the turbine to a low pressure condenser.

"The turbine drives on to the main propeller shaft through double reduction gears and is connected, while the propeller shaft is rotating, by a clutch which is engaged when the turbine has been run up to synchronous speed with the propeller shaft.

"A Lysholm compressor was chosen for the discharge of the exhaust gases overboard because it gives the best characteristics over the range of speed and throughput required. The rotors and rotor casings are uncooled. The compressors are driven from the aft end of the turbine through the compressor gearbox.

"In any of its three positions the three cam valve will trip when any one of the following conditions occur: (1) turbine overspeeds; (2) lubricating oil pressure fails; (3) maximum depth is exceeded."

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"A DELICIOUS SPREAD"

The Free-Piston Gas Turbine

By PROFESSOR A. H. WILLIS

Head of the School of Mechanical Engineering, N.S.W. University of Technology

From an A.B.C. Broadcast

In the familiar internal-combustion engine, compression of air or air-plus-petrol-vapour is necessary before the fuel can be burnt. When the burning takes place, there is an expansion of the gas and mechanical energy is produced. This cycle of compression and expansion takes place in both piston engines and gas turbines.

IN a diesel engine, say, compression takes place on the up-stroke and expansion on the down-stroke; and to convert this up-and-down motion into a rotary motion, the familiar arrangement of crank-shaft and connecting rod is necessary.

A complete gas turbine, on the other hand is a wholly rotary machine. The compression is brought about by a rotary action, fuel is burnt in a combustion chamber, and the hot gases expand by rotating a power turbine.

In the free-piston gas turbine the two functions of compression and expansion are separated. A piston arrangement is used to produce a flow of hot compressed gas to a turbine from which the useful work comes. With such a scheme, it is found that the crankshaft and connecting rod can be dispensed with; hence the term "free," in the sense that the piston is not constrained to make exactly the same stroke as it does on an ordinary engine.

This is the basic idea.

There are two identical pistons in a free-piston compressor, and they work in the same cylinder.

They are "opposed" pistons; that is to say, they move towards each other in compression and away from each other in expansion, the fuel injection valve being exactly in the centre.

But the pistons are not of the usual kind; these are "stepped" pistons. There is a small diameter part which works in the engine cylinder, and a rather larger part which works in a larger cylinder, called the compressor cylinder.

Each compressor cylinder draws its air from the atmosphere and pumps it out to a collecting box. This compressed air has a job to do, as we shall see.

So, there we have an arrangement of two stepped or T-shaped pistons, the stems of the Ts facing each other in an engine cylinder, and the wider parts running in compressor cylinders one at each end.

"Bounce" Cylinder

Note that there is no connecting-rod. Therefore, you will ask, how do the pistons move inwards again after they have been blown apart?

This return action is provided by the compressor cylinders which have no valves on the outer side. When the engine fires, the pistons are blown apart with great force, and all the energy of this action is absorbed by the air on the outside of the compressor cylinders which is compressed to an extreme pressure.

This part of the compressor cylinder is called the "bounce" cylinder.

On the way out, the other side of the compressor piston has sucked in air from the atmosphere. But when the "bounce" cylinders do their work, they hurl the pistons toward the centre with just as great force as the pistons came.

This returned energy does two things: it pushes some compressed air out of the valve; and, secondly, it compresses the air between the two engine pistons so that the whole cycle can take place over and over again.

So you see that this is a novel way of using the diesel principle to produce compressed air, all in the one unit. The orthodox way would be to use two units — a diesel engine and an air compressor. Many hundreds of free-piston compressors have been built, by the way, and they operate quite successfully.

But a compressor isn't enough. We want to make an engine out of this basic idea; so the process must be taken a step further.

The compressed air, which incidentally is very hot, is stored in a jacket around the engine cylinders. When the pistons separate during the working stroke, they uncover a series of holes, or ports, one on each side of centre.

One piston uncovers the exhaust ports which connect to a gas collecting chamber. Very soon afterwards, the other piston uncovers the ports connecting with the compressed air, so that a fierce rush of clean air blows through the engine cylinder into the gas collecting chamber.

The rest is easy. There is the hot compressed mixture of gases in a chamber, ready to be admitted through nozzles into the gas tur-

bine which drives something or other; perhaps a ship's propeller, perhaps the wheels of a car.

Just a quick "re-cap," because the ideas may be a little difficult to understand at first. The "bounce" cylinders, one at each end, blow the pistons together to compress the air and make it hot enough to fire the oil fuel at the right time. In doing so, they also produce some hot compressed air, ready to clean out the cylinders and pass on to the gas turbine. When the engine fires, the pistons fly apart and are gradually stopped by the bounce cylinders, but not before they have uncovered the scavenge and exhaust ports that are cut into the cylinder walls. On this working stroke, too, the compressor cylinders have automatically taken in their fresh supply of air.

Synchronising Gear

Free pistons? Not quite. There has to be a mechanical arrangement linking the two pistons to make sure that they do move outwards and inwards in exact correspondence.

This is called the synchronising gear, and compared with a heavy connecting rod, it is quite a light affair.

Probably you have been asking yourself, what's the point of all this complication? Why not one engine or the other, a complete diesel or a complete gas turbine?

These are fair questions, and in many fields, particularly aircraft propulsion, the free-piston gas turbine will have very little interest for designers.

But the combination has some advantages, particularly for power generation and ship's propulsion, where it is already doing quite successfully.

Firstly, there's the matter of efficiency. You probably know that internal combustion engines improve in efficiency as the compression is raised. That is why oil engines have the highest efficiency, petrol engines a lower efficiency, and gas turbines a lower efficiency still.

And yet the gas turbine is an enormously powerful engine for its weight. It also has a useful characteristic in that it is more effective than a piston engine in turning a shaft when starting up. Fitted to a motor-car, the gas turbine would give better acceleration, and would need only a two-speed gearbox.

So the free-piston engine is an attempt to gain the best of both worlds: the high efficiency of the diesel engine with the good power-to-weight and other virtues of the gas turbine.

Tests have shown that the free-piston efficiency is only slightly lower than that of an orthodox diesel, and that its power-to-weight ratio, while being better than the diesel, is not so good as for the complete gas turbine.

I haven't mentioned any disadvantages so far. There are, in fact, some difficult technical problems to solve, one of them being the difficulty of providing a large speed variation between full revs. and idling.

The actual speed variation is brought about by changing the amount of fuel injected every stroke, and the greater the feed the longer the stroke. And yet if too little is injected, the pistons will not separate sufficiently to uncover the exhaust ports, in which case the engine will simply stop.

As a matter of fact, the disadvantages are generally worse when the free-piston engine is applied to road transport, where the speed of the vehicle is constantly changing and the vehicle is frequently stopped and started.

My own view is that there will be many years of development of the engine for power-generation and ship propulsion before it will become a competitor of the ordinary motor car engine. After all, sixty years of development have gone into the present-day engine.

Nevertheless, it is good to see the big motor-car companies spending large sums of money on new ideas such as this that may "come good" after a sufficient period of research and development.

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THE "STAND-OFF" BOMB

Britain's "V" bombers are to be equipped with a new type of guided weapon — an air-to-ground nuclear and thermo-nuclear missile described as a "stand off" bomb.

A SPOKESMAN for A. V. Roe and Co. Ltd. announced this in Sydney.

The company has been associated with the development of the missile.

"The 'stand-off' bomb will be fitted to the Vulcan and Victor bombers," the spokesman said.

"It is the size of a small fighter and can be released a long way from the target.

"After release, the missile will climb away from the bomber at a high speed and will fly at a great height to the target area, from where it will go into a steep dive to deliver its atomic warhead.

"It will be able to carry either atomic or hydrogen warheads."

A British Air Ministry statement also released in Sydney said that the two "V" bombers would be progressively developed and improved types would be introduced to carry the guided "stand off" bombs.

Armstrong Whitworth Aircraft Ltd.'s ship-to-air missile has been officially named the "Seaslug."

Four of Britain's new-design fleet escorts will be the first to be armed with the "Seaslug" for operations with the Royal Navy.

Commander J. Hardstaff plots a course on the bridge of H.M.A.S. "Warrego," which left Sydney on May 22 for a four-months' survey of North Queensland waters.

TRAINS RAN OVER OLD BOMBS

For the past twelve years, trains on the Italian side of the Brenner Pass have been running over several hundredweight of high explosive.

Six large American bombs have been discovered on the railway line near Ala, midway between Verona and Trento.

OIL SEARCHERS DRILL 51,000 MILES

THE total depth of the 67,360 new bores drilled in the non-Communist world by oil seekers last year was approximately 51,000 miles — or nearly one-quarter the distance between earth and the moon, says the Petroleum Information Bureau.

The United States was the most active drilling country, drilling new bores — 86 per cent. of the world total.

Canada, which in recent years has become one of the "Big Ten" oil producing countries, was the second most active oil drilling nation with a total of 3,791 new bores.

In the entire history of oil search in Australia, only about 375 bores have been drilled.

At present only seven exploration sites are being worked in the mainland and New Guinea.

By the end of this year, it seems probable that there will be more than 600,000 producing oil wells in the world.

Although a total for 1956 has not yet been released, the 1955 figure was 580,356, of which 537,682 were in the U.S.A. Canada had 8,759, South America 19,951, Middle East 625, Africa 296, Western Europe 4,737, and Far East 6,748.

NEWS OF THE WORLD'S NAVIES

Attack more likely from sea than air

Attack on the United States from the sea is probably more likely than attack from the air, the Chief of U.S. Naval Operations, Admiral Arleigh Burke, said recently.

The danger, he said, was the submarine.

"We have to be able to identify enemy submarines at long ranges and kill them at long ranges," Admiral Burke said.

"Most of the ships the U.S. Navy has or is developing are designed to play some part in anti-submarine warfare."

Washington reports state that Navy chiefs see the development of enemy submarines as platforms for long-range missiles as the main danger.

A submarine may surface hundreds of miles off the coast and bombard the mainland.

The Russians are stated to have test-fired rockets at ranges up to 800 miles.

The U.S. Navy has been launching missiles from submarines for some time and it presumes that Russia can do the same.

U.S. Navy sources put the number of Russian submarines in the Pacific and Far East at about 100, of which about 60 are long-range.

Good progress reported on Britain's atom-sub.

Vickers Nuclear Engineering Ltd. has announced in London that "good progress" has been made on a nuclear propulsion unit for a submarine.

The company was established in February last year. It comprises Vickers-Armstrongs Ltd., Rolls-Royce Ltd., and Foster Wheeler Ltd.

The announcement said the company was developing a propulsion unit based on a pressurised water reactor—a similar type to that installed in the U.S. atomic-powered submarine *Nautilus*.

Rolls-Royce Limited are responsible for the design of the reactor and associated equipment, Foster Wheeler Limited the steam generators and associated equipment, and Vickers-Armstrongs Limited the turbines, condensers and other auxiliaries.

The announcement added: "The prototype machinery will be installed in a land based hull structure. There the machinery will be proved, and a series of tests and trials carried out. It will also be used for training personnel.

"The machinery is designed to give a submarine high speed with very great range and will enable it to remain submerged for long periods, as there will be no need to recharge batteries every twenty-four hours as in conventional submarines."

The Royal Navy's first atom-powered submarine will be named the *Dreadnought*.

R.N. frogman believed prisoner in Russia

Newspaper reports in London last month stated that the British Government believed that Commander Lionel Crabb was a prisoner in Russia.

Commander Crabb, a prominent "frogman" of the Royal Navy, disappeared in Portsmouth Harbour on April 19 last year after diving near the visiting Russian cruiser *Ordzhonikidze*.

Reports quote a senior British Government official as saying: "We are satisfied that Commander Crabb did not die when he went into the water near the Russian warships.

"We have good reason to believe he was taken aboard one of the ships and is now held in Russia."

New composition of Board of Admiralty

It has been officially announced in London that in future the holder of the combined post of Fifth Sea Lord and D.C.N.S. will be responsible both for the general direction and co-ordination of policy on Naval Air matters and also for all questions of tactics, technical policy and fighting efficiency, including proposals for the staff requirements of new ships and the development and use of weapons in relation to naval warfare.

The first holder of the post, who will be known as the Deputy Chief of Naval Staff and Fifth Sea Lord, will be the present Fifth Sea Lord, Vice Admiral A. N. C. Bingley, C.B., O.B.E.

In consequence of the merger, the Board of Admiralty in the future will comprise: First Sea Lord, Earl of Selkirk, O.B.E., A.F.C.; First Sea Lord and Chief of Naval Staff, Admiral of the Fleet The Earl Mountbatten of Burma, K.G., etc.; Second Sea Lord and Chief of Naval Personney, Admiral Sir Charles Lambe, K.C.B., C.V.O.; Third Sea Lord and Controller of the Navy, Vice Admiral Sir Peter Reid, K.C.B., C.V.O.; Fourth Sea Lord and Chief of Supplies and Transport, Rear Admiral R. D. Watson, C.B., C.B.E.; Deputy Chief of Naval Staff and Fifth Sea Lord, Vice Admiral A. N. C. Bingley, C.B., O.B.E.; Vice Chief of Naval Staff, Admiral Sir William Davis, K.C.B., D.S.O. and Bar; Parliamentary and Financial Secretary, Mr. Christopher Soames, M.P.; Civil Lord, Mr. T. G. D. Galbraith, M.P.; Permanent Secretary, Sir John Lang, G.C.B.

Nuclear weapons for Royal Navy

Britain's Navy of the future is likely to consist of aircraft carrier task forces with nuclear weapons.

Mr. C. Soames, Parliamentary Secretary to the Admiralty, said this in the House of Commons last month.

He said each task force would have a carrier, with a cruiser, destroyers, and frigates to give protection.

These forces would be stationed around the world, but would also be able to concentrate quickly at any given point.

He asked the Commons for £316 million to cover the cost of the Navy until April next year.

Mr. Soames said Russia had the biggest submarine fleet the world had ever known, and the construction programme was still in full swing.

He believed that by 1960 Russia would be able to deploy continuously about 150 submarines in the Atlantic alone.

It already had 500 submarines in commission, considerably more than half of them being long-range vessels.

More than two-thirds of them had been built since the war.

U.S. Admiral wants airships revived

U.S. Admiral Charles Rosendal last month advocated the revival of the airship.

He was the commander of the New Jersey base, where the airship Hindenburg fell in flames 20 years ago after crossing the Atlantic. Thirty-six people died in the disaster.

Admiral Rosendal has told the U.S. Navy that the airship can be "a wonderful thing."

He added: "In it could be incorporated all the many advances made since the early 30s in the field of general aeronautical knowledge, materials, instruments, weather knowledge, power plants, fuel, and new factors in design and construction."

He said that America controls the supply of non-burning helium —which could take the place of the inflammable hydrogen used in the Hindenburg.

"The airship has never had a fair chance," he added.

"It would be disgraceful not at least to make a thorough study of their modern potentialities."

Britain's status and the H-bomb

Newspaper correspondents in America last month claimed that Britain's H-bomb had restored her status as a leading world power.

Britain exploded her H-bomb over Christmas Island on May 15.

All Japanese vessels operating near the danger zone have been reported safe.

Britain's Prime Minister, Mr. McMillan, on May 16 curtly rejected a Labour M.P's demand to halt the H-bomb test programme.

Utility helicopter for U.S. Navy

Kaman Aircraft Corporation, Bloomfield, Connecticut, U.S.A., has received a research and development contract for a new utility helicopter, the U.S. Navy has announced.

The contract is a result of Kaman's winning entry in a Navy design competition in which leading companies in the helicopter industry participated.

Kaman entered both twin-rotor and single-rotor designs in the competition. The Navy chose the single-rotor design, which will be known as the HU2K-1.

It will be powered by a General Electric T-58 gas turbine engine.

Keep a Good Lookout

FOR THE NEXT ISSUE OF

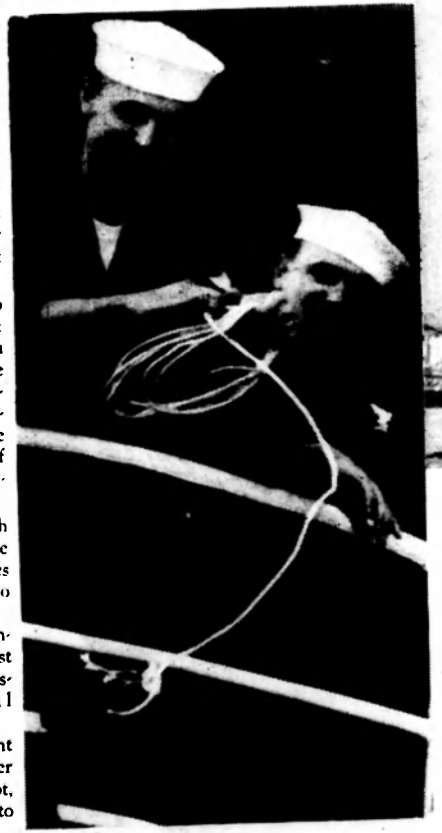
The Navy

AMERICAN SHIPS HERE FOR CORAL SEA WEEK

The Commander-in-Chief of the U.S. Pacific Fleet Admiral Felix B. Stump, said in Sydney during the Coral Sea Week last month that he would like to see the Australian armed forces at 10 times their present strength.

"I CAN assure you the more Australians, New Zealanders and Britishers we can see in the armed forces, the better it is for us all," he said.

Admiral Stump, the official U.S. visitor for the Coral Sea Week celebrations, was speaking at a luncheon at the Trocadero.



Admiral Stump said: "There is a necessity for ANZUS apart from SEATO.

"We have many things we need to discuss and plan together which do not concern Asia."

Referring to the Suez he said: "There was a serious difference of opinion between our Government and the Government of the United Kingdom.

"The British officers and the United States officers had no differences.

"They continued to trust each other despite political differences.

"In the event of war, whether we like it or not, we are going to be on the same side and we are going to like being on the same side.

"History only will tell what was the best thing to do in Suez.

"At present we are stronger in the free world than is Russia. If we keep stronger we continue to have peace."

Earlier, Admiral Stump laid a wreath on the Cenotaph in a ceremony watched by 5,000 people.

"We must dedicate ourselves to making the sacrifice necessary to keep Australia and other nations of the British Commonwealth and the United States so strong no enemy will ever dare to attack us again," he said.

At a civic reception, the Lord Mayor, Alderman H. F. Jensen, congratulated Admiral Stump on the good conduct of the visiting American sailors.

The U.S. aircraft carrier *Bennington*, which was in Sydney for Coral Sea Week, left with a papier-mache alligator, sent by students from Sydney University.

About 4,000 people gave the *Bennington* a noisy send-off.

The alligator was said to be a peace-offering. Early in the morning of the carrier's departure students, celebrating Commemoration Day, boarded the ship and sounded the chemical warfare alarm.

Garden Island officials said it received the best send-off of any overseas warship since World War II.

As the *Bennington* left the wharf, a call went over its loudspeakers: "Three cheers for Sydney."

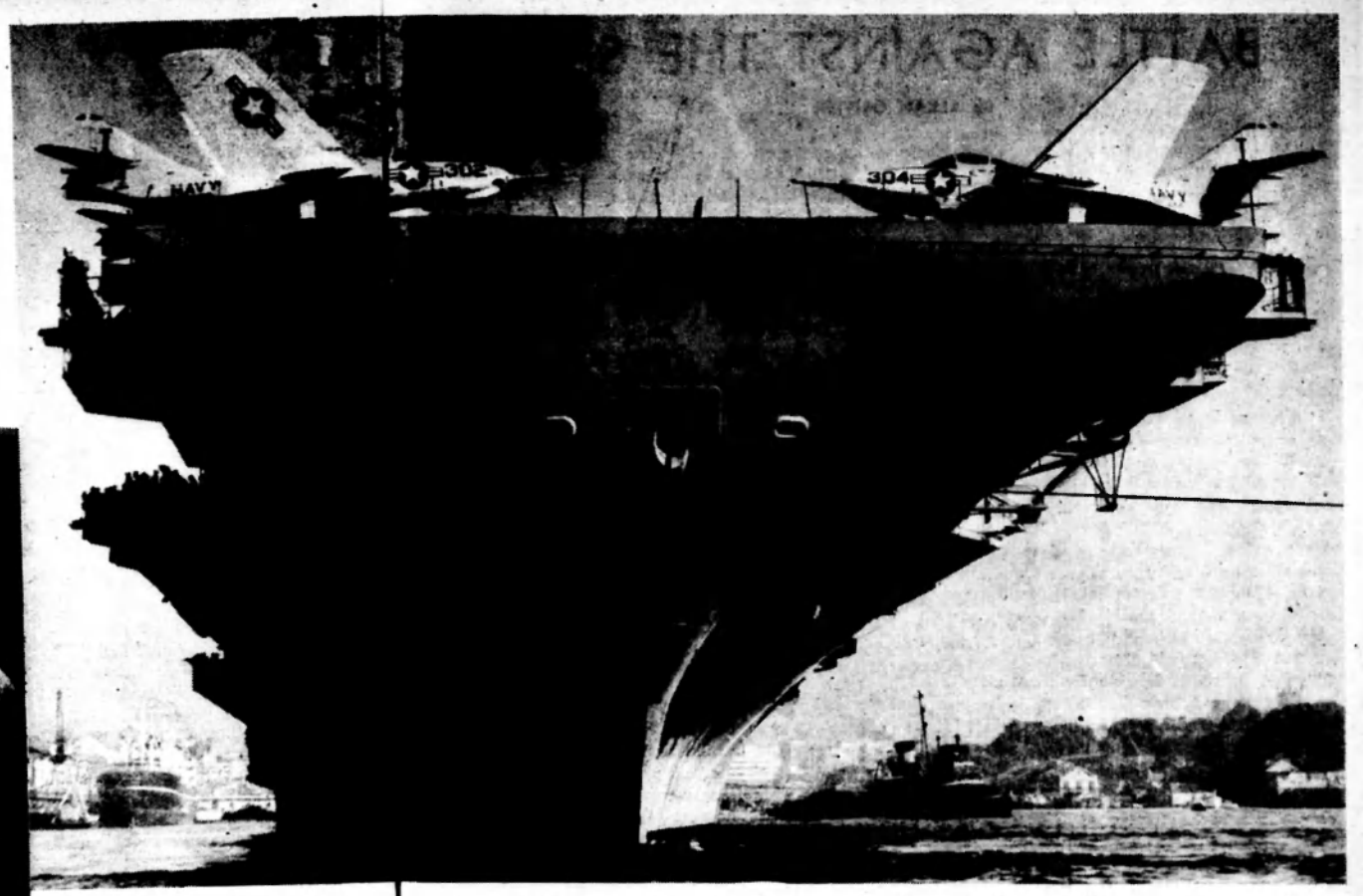
The crew cheered, and threw hundreds of sailors' caps to friends on the wharf.

One sailor nearly missed the ship. The *Bennington* was 300 yards out from the wharf when a Water Police launch brought him alongside and he climbed aboard.

Before the *Bennington* sailed, Admiral Lee said the friendliness and hospitality of the Australians could not be equalled anywhere in the world.

"Particularly for the officers and

Continued on page 32



An impressive picture of the U.S. Carrier "Bennington" as she moved from Garden Island, Sydney, after a week's stay during the Coral Sea Week celebrations. BELOW: Two American sailors haul up parting gifts from friends on the wharf. About 4000 people gave the carrier one of the best send-offs any overseas ship has received since World War II.

BATTLE AGAINST THE SEA

By ALLAN OLIVIER

PERHAPS only a Dutchman can sense how bitter an enemy water can be. The full realization was brought home to me one Sunday morning in February, 1953, when I stood amid a group of the men and women who'd just lost another battle against the sea after high gales had swept the North Sea overnight through 67 gaps in the dikes and dunes of south-west Holland.

In a few hours the roaring giant had brought death and destruction. The sea water from the west and the swollen rivers from the north and east had drowned nearly 2,000 people, 40,000 cattle, damaged 50,000 houses and completely washed away another 10,000. Over 300 miles of dikes were torn open, and nearly 600 square miles of Holland's best farmland flooded with damaging salt water. It was a heavy price to pay for the sea's latest dramatic move in the centuries-old war between Dutchmen and water.

From every part of Holland, from all over the world, volunteers came to the rescue, and hands reached out to help. In those tragic hours when the nation once more mourned, a brave people's grim determination reached a climax. "Never more!" they'd said before. This time few words were said, and even fewer minutes wasted. Exactly nine months and five days after the disaster, late in the afternoon of November 6, the last of the 67 gaps was closed.

The following day a new battle began. Holland now launched an offensive designed to bring the enemy to total defeat.

There's not nation in the world so closely linked with the water, so lastingly married to her worst assailant.

The Netherlands, or Low Countries, as Holland is often called, are to a large extent a real and constant part of the sea. During the past three centuries more than half of the present Dutch territory has been reclaimed from the North Sea.

This land lies between 3 and 30 feet below normal water level, behind a 12,000-mile-long system of dikes and dunes.

The territory also is crossed by a number of large rivers: the Scheldt, the Maas, the Rhine, and the Ijssel. The total surface of Holland's inland water amounts to some 15,000 square miles, or 10 per cent. of the entire territory.

Water became the Dutchman's natural enemy when, as far back as the 13th century, people in the province of Friesland built dikes to keep a constant hold over some land that during the dry summer season was abandoned by the sea.

In the Golden Age, prosperous Amsterdam merchants invested their money in schemes to make polders — farmland — by draining inland lakes and marshes.

Some of these lakes were large enough to have the violent character of a sea. Most of them covered fertile land. The future polders were surrounded by dikes, and windmills were built to pump out the water into canals and rivers.

The example of their forefathers inspired the Dutch early in this century to a plan which astonished the world. The plan was to reclaim the whole Zuiderzee, an arm of the North Sea reaching 85 miles deep into Holland. First the Zuiderzee was to be cut off by a 24-mile dike. Most of the lake thus created was then to be drained to get yet more first-class farmland.

The project caused a cabinet crisis, a rare event in Holland's political history. More than half the population considered the idea to be too ridiculous for further serious thought. But the promoters of the plan did not give in. The sea furnished them a fresh argument when in 1916 floods brough disaster to dozens of the small villages on the Zuiderzee coast. In 1918 Parliament approved the plan.

In 1932 the cut-off dike was finished and the people along the Zuiderzee's 200 miles of coastline no longer had to fear the enemy. But instead of being pleased about this victory, they raised the most arden opporsition against the project.

They had come to realize that their main industry, sea fishing, would slowly come to an end as the salt water was sweetened by the river water running into the now-enclosed lake.

Originally, the project had three purposes: first, to secure permanent safety; second, to sweeten the water so that it could be used for irrigation purposes to improve considerable stretches of already existing farmland; and finally (but with a great many questions still unanswered) to gain a vast stretch of good new farmland, then some 12 feet under water.

PLANS called for reclaiming the land in several sections, each covering part of the bed of the former sea — now known as the Ijsselmeer. The first section, the 50-square-mile Wieringermeer Polder in the north-west corner, was part of the enclosing dam onstruction.

When the final gap in the dike was closed in 1932 and Queen Wilhelmina blew a whistle for the last ton of sand to be dropped, she was cheered by the biggest crowd that had ever gathered anywhere in Holland.

The greatest problems still remaining were how to get the water out of the projected larger polders, how to be sure to strike fertile clay and not stand, and how to get rid of the saltiness in the soil which for ages had been soaked by the sea.

The old-fashioned windmill system was inadequate. Two electric pumping plants were built. They did the job in the Wieringermeer completely in less than six and a half months.

When World War II broke out Wieringermeer was filling some 40 per cent. of Holland's need for wheat. By the end of the war, a second much larger section, the North-east Polder (300 square miles) was completed and ready for cultivation. But when early in 1945 the Allies marched into Holland and Western Germany, the Nazis savagely blew up the dike surrounding the Wieringermeer. (Only a few months earlier they had first made use of this demoralizing weapon when they had bombed the dikes of the island of Walcheren.)

Wieringermeer offered a hopeless sight. Not one house or barn was left undamaged, the growing crops were destroyed, and there were no means available to start repairs. But during the summer of 1945 the two giant pumping plants were re-equipped with stronger turbines, and before winter came the polder was dry again. Since the water had not contained a large percentage of salt, Wieringermeer produced a modest harvest even in 1946.

As the North-east Polder was opened up, work began on the third polder, East Flevoland (325 square miles). East Flevoland was completed late last summer. This year the first houses, schools and churches will stand there on the former sea bottom.

Two polders remain to be constructed: Markerwaard (325 square miles), and South Flevoland (300 square miles). They may well be ready before the deadline, the summer of 1980. There's a willpower and a determination to put a new Holland on the map that is stronger than even the spirit of enterprise shown in the nation's Golden Age.

That isn't all. It's ironic that it took the lesson of the 1953 floods to gain acceptance for an even vaster project that had existed, really, since long before the war. This scheme is nothing less than to build dikes almost entirely around the group of islands lying off the south-west coast of Holland.

For years, Dutch experts had been studying a plan to strengthen the defence against the North Sea by closing three sea-arms in the island district. But up to the 1953 disaster, the idea that an entire province of Holland stood in grave danger would have been dismissed as complete rubbish by most people.

Not for a century and a half had there been any serious flooding in the region — from natural causes, that is.

Then in 1953 there came a combination of natural circumstances which occurs perhaps once in 200 years.

The resulting disaster brought proof that half the country, and the lives and livelihood of half its population, depended on sea defences that were inadequate.

The lesson was taken to heart, and the so called Delta Plan — then expected to cost in the neighborhood of $300 million — was adopted.

The plan provides for building three main dikes right across the three large channels, strengthening existing dikes and dunes, and constructing a further series of pumping plants and lock systems throughout the province of Zeeland.

Careful preparations for putting the Delta Plan into effect are now under way, and already the original cost estimate has been doubled. But cost what it may, the project will probably be finished around 1985, and with its completion Holland expects her most implacable enemy to go down in final defeat.

The triumph of man over nature will no doubt be announced with that old Dutch cry of victory: "*De dijk is dicht!*" — "the dike is closed!"

—From the "World Veteran"

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AIR STRATEGY

Planning For Two Kinds of War

By JOHN W. R. TAYLOR—in London

WORLD War II was fought for the most part with weapons that were under development before it started. In the air, the Hurricane, Spitfire and Me.109 fighters that met in the Battle of Britain and the great Lancaster, Halifax and Fortress bombers with which the Allied air forces hammered Germany in the later round-the-clock counter-offensive were all conceived in the mid-1930's.

Even the Superfortress, which laid waste so much of Japan in 1944-45, began life in 1940, long before America entered the war.

There were two important exceptions — the jet aircraft and the atomic bomb — and their sudden brief intervention as the fighting reached its climax changed overnight the whole pattern of aircraft design and overall military strategy.

At first, ideas were confused by the quick ending of the Pacific war, the wholesale cancelling of production contracts, the belief that many years of peace lay ahead, and a realisation of the awful, overwhelming power of the new bomb that could burn the heart out of a city in one searing flash.

More confusion was added when Allied technical teams examined captured enemy documents that revealed the full extent of German research and progress with piloted aeroplane and missiles.

In many cases, these projects were in an early stage of development, but they were pointers to the future.

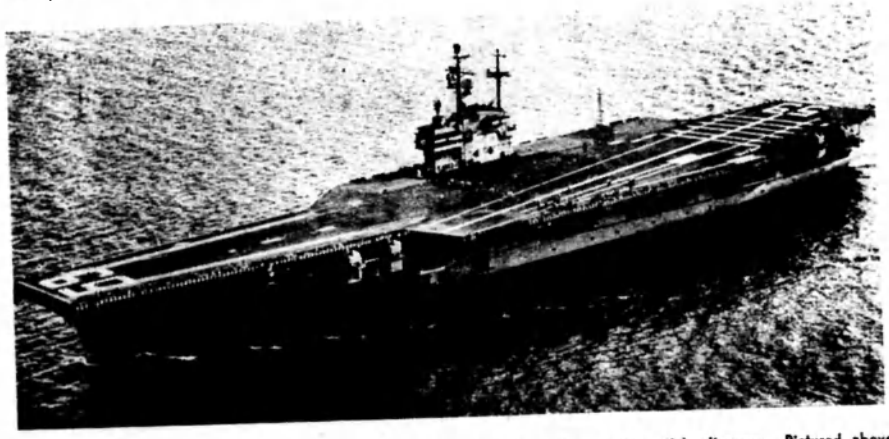
FIRST, however, it was necessary to build up strong defences, for the fear of sudden attack was genuine on both sides of the Iron Curtain. And here designers of every country had a common enemy, which the newspapers called the "sound barrier."

To technicians it was "compressibility"; to pilots a vicious shock-wave that formed when the airflow over their aircraft approached the speed of sound (760 m.p.h. at sea level, dropping to 660 m.p.h. in the rarefied air above 36,000 ft.) and which caused buffeting so severe that it led to loss of control and sometimes break-up of the aircraft in flight.

Costly research programmes were started in all the major aircraft producing countries to find a way of getting interceptor fighters pas the sound barrier. That this was possible had been proved on 14th October, 1947, when Captain (now Colonel) Charles Yeager of the U.S.A.F. had become the first man to fly faster-than-sound in the Bell X-1 research aircraft.

Unfortunately, the X-1 was no fighter. But it had at least shown

Continued on page 22



Carriers are essential both in "local" wars and in global wars, which the author of this article discusses. Pictured above is H.M.A.S. "Melbourne."

NAVAL HISTORY

The War at Sea, Volume III, by Captain S. W. Roskill, D.S.O., R.N.; published by H.M. Stationery Office (London).

The second instalment of Captain Roskill's monumental history of the Navy during the Second World War has now made its somewhat ponderous bow to the reading public. It consists of 444 pages of text, 15 appendices, 42 maps and 38 tables, a formidable mass of information to be absorbed within the covers of a single volume.

Yet the discerning reader would not have it shorter, for it is packed with facts, all of them vital for any comprehensive understanding of the Navy's work in a world-wide war. Captain Roskill marshals these facts with the deft touch of a true historian and from them paints the picture of naval operations during the pregnant years covered in this second volume.

His first volume ended on a sad, dismal note, with the fortunes of the Royal Navy at their lowest ebb. The Mediterranean Fleet had suffered heavy losses both in the battle off Crete and in enemy attacks at sea and in harbour; off Malaya the *Prince of Wales* and *Repulse* had been sunk; in the Atlantic the U-boats were building up their strength much faster than it could be destroyed.

In this second volume, as the story unfolds, one sees the dawn of renewed hope and the mounting evidence that the balance at sea is tipping more and more toward the Allied powers.

As the volume ends the Mediterranean seaway has been re-opened, and the U-boats in the Atlantic are slipping down into irrevocable defeat.

The first few months of 1942 saw serious losses of ships in the Far East, the Indian Ocean, the Mediterranean, the Atlantic, and the Arctic, yet somehow the Navy recovered its poise and struck back with blows of increasing force that in the end turned the scale. It is in this overall view of British sea power, of a Navy in adversity applying its age-old and well-learned lessons to achieve in the end a supremacy over its foes, that the true majesty of the story appears.

One can discern this in Captain Roskill's book, but to some extent the overall picture is lost in the detail of the naval operations which he describes. This must inevitably be so from the very plan of the book, which is constructed in a series of more or less water-tight compartments.

It could hardly be otherwise, for the reader is switched from campaign to campaign in an arbitrary limit of dates, so that some of the natural sequence is lost.

As a direct result of this, some of the overall picture is lost. This is not Captain Roskill's fault, it is the fault of the tremendous scope of the book in which so much is covered in so much detail.

Captain Roskill's plan of writing is completely logical for the particular task he has been set, indeed he could have achieved it in no other way.

For the naval reader, already aware of the profound effect which sea power exercises on the conduct of the war, this new volume makes wonderful reading.

The general reader, to whom this effect may not be quite so apparent, may miss some of this essential and central theme in the complexities of the operations described.

Captain Roskill is a fearless writer, as should any true historian be. He has seen all the evidence, has weighed it in the balance of his own judgment, and passes sentence without fear or favour.

His description of the disaster in the Barents Sea when convoy P.Q.17 lost so many of its ships is a case in point. There is no attempt here to gloss over the mistakes which were made on that unhappy occasion, and he apportions the blame with obvious impartiality. And yet one tiny facet of that grim picture is missing.

The decision to scatter the convoy, for which the First Sea Lord was responsible, was taken by a man who was already very sick and in considerable pain. The constant battle which, even at this date, Admiral Pound was waging against the disease which eventually laid him low may well have clouded his judgment on that occasion. Such a thing has happened many times before in the history of the Navy.

This fine book, by any standard a brilliant piece of work, whets the appetite for Volume III, which will bring the story to a close. In this first volume, Captain Roskill made a fine start to a work that promises to stand out as a monument in the writing of naval history. This second volume consolidates that promise in the mastery of his intricate subject with which Captain Roskill writes. — N.O. *(in the London "Navy.")*

PLANNING FOR TWO KINDS OF WAR

Continued from page 20

that the sound barrier was a myth, and that there was no barrier for a properly designed aircraft.

IN the case of the X-1, "properly designed" meant a tremendously strong structure and sheer brute force, and Yeager had a rough ride as he battered his way to supersonic speed.

In a fighter, some of the heavy structural weight and the fuel-thirsty power of the rocket had to be replaced by better aerodynamic design to reduce the effects of compressibility.

One of the German documents captured in the Aeronautical Research Institute at Brunswick gave a valuable clue, by recording the results of wind tunnel experiments that showed how drag at high speeds could be reduced by sweeping back the wings of an aircraft.

As soon as the document was discovered, designers in America and Russia got to work furiously on swept-wing fighter projects, resulting in the Sabre and MiG-15, both of which flew in 1947.

They represented a great advance over previous fighter designs and the Sabre even proved itself capable of supersonic speed in a dive, with the result that the mysterious "supersonic boom" was heard for the first time when it shed its shock-waves at the bottom of a dive and they continued down to produce a thunder-clap at ground level.

In Britain, Hawker and Supermarine produced new jet-fighters, both straight and swept-wing; but the Air Ministry, gambling on peace, decided that its Meteors, Vampires and later Venoms would be good enough for a few years until even more advanced aircraft were possible.

Up to that time, air forces had been so mesmerised by the atomic bomb that they planned for little but an all-out nuclear war, which it was reckoned would last about a fortnight, after which the least-atomised nation might be regarded as the victor.

The Berlin air lift of 1948-49 showed that the uneasy peace might be better maintained at times by fleets of transport aircraft and bombers.

But it was the Korean Campaign, starting in 1950, that gave conclusive proof of the necessity of planning for two kinds of war.

Nobody stood to gain much from an all-out slogging match with nuclear weapons. A small-scale "local" war of the old-fashioned kind was a different matter.

History had shown over and over again that a comparatively small, determined army, fighting guerilla-fashion in conditions and country of its own choosing, could play havoc with even the best-equipped enemy fighting in unfamiliar circumstances that denied the full use of his weapons.

SO it was in Korea and later in Indo-China. And so it will be again if preparations are not made to meet the threat of local wars as well as the full-scale variety.

Korea persuaded the R.A.F. to order large-scale production of its first genuine swept-wing dive-supersonic fighters, the Supermarine Swift and Hawker Hunter, and it accelerated the development of newer, faster fighters in America, Russia, France and Sweden; but designs began once more to diverge after a period in which they seemed to follow the same straightforward swept-wing fashion.

In the physical sense, the biggest impact had come probably from the advent of the delta-wing, pioneered by Convair in America and A. V. Roe in England.

Aerodynamically, it combined the advantages of swept wings with better structural stiffness and less tendency to "dig in" dangerously during a steep bank. And its great chord (width from leading to trailing edge) made it possible to use a relatively thin wing-section and yet provide plenty of room inside the wing for the undercarriage, fuel and equipment.

Simultaneously, other companies discovered that the characteristics of swept wing could be improved by giving it compound sweep (the crescent wing) or extending forward the leading edge of the outer wings only, giving the now-familiar "saw-tooth" effect.

Strategically and tactically, the types of fighter and bomber produced in Britain and America began to differ more and more, with Russia inclining more to the British ideas on fighters and the American ideas on bombers. France and Sweden also conformed to a large extent with the British fighter concept, and did not attempt to set up a force of long-range atmo-bombers costing, perhaps, £1 million each.

The reasons for the divergence are obvious.

The United States, with Canada, is an immense land mass and it has, in consequence, been able to base its fighter and anti-aircraft defences on the early warning of enemy approach given by three great radar chains, extending up into the Artic circle and down both sides of the North American continent. Inside this radar ring, it has been able to lay down long concrete runways in strategic positions from which its fighters can operate.

Availability of the radar information, allied to a highly-organised ground control system, has made it possible for U.S. all-weather interceptors to be made virtually automatic in operation. After take-off, the pilot of an air-

Continued on page 29

MARITIME NEWS OF THE WORLD

From our Correspondents in LONDON and NEW YORK By AIR MAIL

Japanese pearlers to operate off N. Aust.

Japanese pearlers will operate off the northern coast of Australia during the forthcoming 1957 season under an arrangement made by the Commonwealth Government, the Australian Minister for Primary Industry, Mr. W. McMahon, has announced.

But to conserve pearl shell resources limits are being placed on their activities in certain areas, he added.

Mr. McMahon said the Japanese pearlers would operate again this year under the Provisional Regime set up by the Governments of Australia and Japan.

It was a temporary arrangement concluded in 1954 to operate pending a decision by the International Court of Justice on Japan's challenge to the validity in International Law of the Australian Pearl Fisheries Act 1952-53.

"Arrangements for the 1957 season are substantially similar to those which operated in 1956," Mr. McMahon said. "The number of pearling vessels approved is the same and the greater part of the Japanese operations will again take place off the Northern Territory.

"However, in the interests of conserving pearl shell resources two areas are being closed to all pearling and an upper limit is being placed on the quantities of shell the Japanese will be permitted to take in two other areas north of Arnhem Land," he said.

Permission was again being given to the Japanese to operate in two areas off the north-west coast of Western Australia, and they would also be permitted to take a limited quantity of shell from an area south-west of Broome.

The areas to the west of Torres Strait, which were made available last year, would be slightly enlarged this year.

The prohibition against the Japanese operating within 10 miles of the Australian mainland or of an inhabited island would continue to apply. The Japanese would be required to comply with all requirements of Australian legislation, including the taking out of licences and furnishing of returns. Their activities would be closely supervised.

Marking of whales in the Pacific

Japanese whale marking started in 1949 and has since then continued annually.

Marking has been carried out in coastal and pelagic whaling areas.

Whale marks used at present are made of chromium plated steel tubes 220 m.m. long, weighing about 100gr. Besides the usual penicillin oiled marks, streamer marks with coloured nylon threads are also used.

On fourteen marking cruises 1949 to 1955 a total of 2,521 whales were marked in the North Pacific of which only 57 were recaptured.

The percentage of recapture was low.

Twenty-five marked whales were taken in the year they were marked, 15 within 10 days, and 10 within 100 days of marking.

One whale (a female sperm whale) was killed 2,165 days after marking. It is estimated that the whale grew from 22ft. to 36ft. between August 4 1949 and July 8 1955.

Generally the analysis suggests that growth in sperm whales is slow.

Egyptian "victory" seen in U.K. canal decision

Britain's decision to resume using the Suez Canal is seen in Cairo as putting the final stamp on Egypt's victory.

In America, the New York Times said:

"If permitted to stand, this arrangement would in effect make Western Europe economically and militarily the hostage of Egyptian President Nasser, and through him of the Soviets . . .

"It is ironic that this stultifying

result has been achieved under the leadership and pressure of both the United Nations and the United States, which adopted a completely one-sided approach to the Suez crisis and reneged on their own principles and pledges."

The British Prime Minister, Mr. McMillan, announced in the House of Commons on May 13 that British ships would go through the Canal.

He said the Government had agreed to this because of the decision of a majority of members of the Suez Canal Users' Association.

This decision was to let Governments make their own choice on the unofficial boycott of the Canal.

Pipe-line proposed to by-pass Suez

Executives of eight international oil companies met in London last month to discuss a new £300 million sterling oil pipeline for the Middle East.

The pipeline would carry oil from the Persian Gulf oilfields through pro-Western Iraq and Turkey to the Mediterranean.

It would avoid the troubled areas of Syria, Jordan, and Palestine—through which present pipelines pass.

It would also carry enough oil to keep West European countries going if the Suez Canal were again closed.

But the companies are also considering that Western countries' demand for crude oil will increase by 70 million tons a year in the next five or six years.

Planners have suggested that to provide for this amount of extra oil a new trunk pipe line system with a capacity equivalent to a double 38-40 inch line should be built in stages.

They estimate it would take from three to five years to build.

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14 new ships for Australian line

The Australian National Shipping Line has announced a building programme which will add 14 ships to the line's fleet by 1961.

Most of the ships will be built at the B.H.P. shipyards at Whyalla (South Australia).

The line now has 48 ships on the register.

A spokesman for the line said additional tonnage was needed to meet increasing coal and iron ore traffic.

The programme includes ten bulk ore carriers, mainly of 10,000 tons, and four ships of 16,000 tons each.

The line also announced that a new £2 million passenger-vehicular ferry for Bass Strait would be built at Newcastle (N.S.W.).

A FAMOUS SHIP NAME

Special Correspondent

THE name *Dreadnought*, earmarked for the Royal Navy's first nuclear submarine (see page ??), was made famous by the battleship of this name built at Portsmouth in 1906.

This ship was of 17,900 tons and of a design which revolutionised battleship construction at that time. She was superior in both firepower and speed to any other ship then afloat, and was described by Lord Fisher as the "hard-boiled egg — because she cannot be beaten."

Her main armament consisted of ten 12-in. guns, eight of which could be fired on either beam and six ahead and astern.

The armament of battleships immediately before the completion of the *Dreadnought* was normally of about four 12-in. guns supported by a miscellaneous battery of nine, eight, six and four-inch guns.

Many ships of *Dreadnought* design subsequently built materially helped to maintain and strengthen Britain's position as the premier Naval power in the pre-World War I period.

Before the *Dreadnought* of 1906, seven other ships had borne this name. The first, a 450-ton 41-gun ship built at Deptford in 1587, was one of the British fleet which engaged the Spanish Armada. Subsequently she took part in the expedition commanded by Sir Francis Drake which resulted in the capture of Corunna.

The second *Dreadnought* was a Cromwellian frigate built at Blackwall in 1653. She took part in the four days' fight against the Dutch between Dunkirk and the Downs, and also in the battle of Solebay.

The fifth *Dreadnought* was present at the battle of Trafalgar and later became a Seamen's Hospital at Greenwich.

CRUISERS FOR ROYAL NAVY

By OSCAR PARKES, Ass.I.N.A.

JUST over 10 years ago work ceased on three out of a group of six cruisers of a modified "Fiji" design which had been laid down in 1941-42. Of these six the *Swiftsure*, *Superb* and *Ontario* (ex-*Minotaur*) R.C.N. were in commission when hostilities ceased, but the *Blake*, *Defence* and *Tiger*, although in an advanced state afloat, were suspended and laid up pending some future decision as to their employment. Two more, the *Hawke* laid down at Portsmouth and the *Bellerophon* (ex-*Tiger*) ordered from Vickers were cancelled, and the framing of the *Hawke* was broken up on the stocks.

Incidentally, there was some confusion in the allotment of names, as the *Blake* was also ex-*Tiger* and the *Tiger* had originally been named *Bellerophon*. One concludes that the naming committee at the Admiralty recalling that both the early destroyer *Tiger*, and the battlecruiser of that name, had been built by John Brown & Co., consequently changed the name from *Bellerophon* to continue the Clydebank sequence.

And so the *Blake*, laid up at Greenock, *Tiger* at Dalmuir, and *Defence* at Gareloch, were kept in maintenance awaiting decision as to future employment until October 1954, when the news was released that they were to be armed with four of a new type of fully automatic dual-purpose 6in. and 13in. guns.

As sisters to the *Swiftsure* their particulars will be familiar—8,000 tons designed displacement, 75,000 s.h.p. for 31 knots, and intended for nine 6in., 10 4in. A.A., 16 2-pdr. pompoms, and 13 40mm. with six torpedo tubes. As rearmed they will carry a twin 6in. turret fore and aft, the after one being raised to fo'c'sle level, and three twin 3in., one pair superfiring forward and two abreast the second funnel.

No smaller guns are shown in the official sketch plan; but when their new armament was made known it included some of the improved Bofors for short-range defence, directed by a new fire-control system. This, if its promise was maintained last summer in the *Cumberland*, should prove 10 times as effective as any used in the last war, and will be as accurate by night as by day.

The new 6in. is capable of firing three times as fast as the ordinary 6in., which was listed at nine rounds p.m., so that the new broadside will be 108 rounds p.m., compared with 81. This, of course, entails a larger ammunition supply, and the weight saved in armament can be devoted to additional magazine capacity and doubtless increased protection over the crowns.

The Commander-in-Chief of the U.S. Pacific Fleet, Admiral Felix B. Stump (right), is farewelled by the Flag Officer in Charge East Australia Area, Rear-Admiral W. H. Harrington, when he left Sydney Airport last month after visiting Sydney for Coral Sea Week.

THE directors can be seen on the superstructures and amidships—the lower one forward for the 6in. and the upper for the 3in., amidships for the 3in. and aft for the 6in.

Absence of the built-up screening for the 4in. in the *Swiftsure*, accentuates the three-deck superstructure aft, and takes away from the otherwise sleek appearance of the earlier vessels.

As all the cruisers in due course are to be armed with guided weapons, the *Tigers* are likely to be re-armed again when some of the older ships have been converted, and once the type of weapon and its launcher have been settled that should not be a lengthy job. The next step in evolution will be the true guided weapon cruiser of which anticipatory drawings now appear in Admiralty recruiting advertisements.

Two guided weapon destroyers have been ordered under the 1955 programme but are not yet laid down, and two under last year's Estimates have still to be ordered.

Thes are what were previously referred to as "fleet escort ships" which were to be improved "Darings" or "super-destroyers" to quote the official publication from which the drawing was compiled.

The displacement would appear to be about 3,000 tons, but as they are still only in the design stage and changing frequently, the present conception cannot be regarded as much more than a general indication of their ultimate appearance.

There are two twin gun positions forward of uncertain calibre — probably 4.5 in.— with two 3 in. abaft of amidships on each beam. The guided weapon installation is aft with limbos on the centreline; no torpedo tubes are carried, but what is apparently a battery of rocket discharge tubes appears abaft the fore funnel. All surfaces have been kept smooth and unbroken to facilitate decontamination from atomic radiation, and short stout masts replace the customary pylons — although the

It is to be hoped that an end will soon be made to the modifications-to-design stage, and that "ordered" will give way to "laid down." —From the London "Navy."

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For Sea Cadets

YOUTHFUL MUSICIANS

By DOROTHY HELMRICH

President of the N.S.W. Division of the Arts Council of Australia

A NATIONAL Youth Orchestra has been formed and recently gave its first concert in the Sydney Town Hall under the auspices of the A.B.C.

The conductor was Professor John Bishop of Adelaide, who is also the founder.

This orchestra is made up of instrumentalists under 25 years of age.

The performance was excellent.

Another musical activity is the Muic Camp Association held in Victoria and N.S.W.— to which any boy or girl can go to benefit from lectures and training by leading musicians. The first one in N.S.W. was held at Frencham this year and was a great success.

Another youth activity is the formation, within the schools, of a Junior Arts Council.

Still another activity, shortly to be inaugurated in Australia, is the International Musical Youth Association. This will provide a centre from which can stem many musical activities in which young people can take part.

All of this shows that the young people of Australia are beginning to play their part in the cultural development of the country.

Israeli pipeline to by-pass Suez

Israel will build a 32-inch pipeline from the Gulf of Akaba to the Mediterranean port of Haifa, the Israeli Finance Minister, Mr. Levi Ashkol, announced this month.

The pipeline would make Israel almost independent of the Suez Canal for its oil supply, he said.

For Sea Cadets

Television Under the Sea

By DERMOT CANNING

A FEW minutes after midday on June 4, 1951, Lieut.-Commander John Bathurst, captain of H.M.S. *Reclaim*, was sitting in his cabin intently watching a television screen. Then suddenly on the viewing screen appeared the name *Affray*—and a new chapter in the story of nautical development had been opened up.

For the first time television had shown what an important role it will play in the future of shipping. After eight solid weeks of search to solve the mysterious disappearance of the submarine *Affray*, under-water television had at last located her lying at the bottom of the English Channel by means of a newly-devised camera suspended 260 feet below H.M.S. *Reclaim*.

Without the magic, all-revealing eye of television this submarine might never have been discovered, and the sea would have kept the secret of the most baffling naval disaster since the war.

Since the location of the *Affray* great improvements have been made to underwater television. Already it is capable of being used at depths in excess of one thousand feet, and naval authorities predict that in the near future it will be able to descend to almost any depth.

Moreover, whereas the camera in the *Reclaim* was enclosed in a cumbersome container weighing over a ton, the models installed on the Royal Research Ship *Discovery II*, the salvage vessel *Sea Salvos* and the frigate H.M.S. *Wrangler* are only about seven hundredweight and consequently much more manœuvrable.

The latest underwater camera is rectangular in shape and closely resembles a B.B.C. studio camera, but because it has to operate in very poor light, it is fitted with an ultra-sensitive image orthicon tube which can see in almost pitch darkness. To assist further it has a powerful mercury vapour lamp, providing illuminative power equal to about two hundred ordinary electric bulbs.

To withstand the terrific underwater pressure—there is a pressure of approximately 1,200 pounds per square inch at a depth of 1,000 feet—the camera is housed inside a casing made of three-quarter-inch thick steel plate, with an eight-inch diameter window of armoured, highly-tempered glass.

The camera is connected to the control panel by a multi-core cable, containing a number of leads which enables the operator on board a ship to carry out manœuvres by remote control.

THE uses of this modern marvel are limitless. For instance, television has recently been adapted for use in fishing vessels and one has been installed in the *Red Rose*, a new 600-ton Fleetwood vessel. Now the trawler with a television screen can actually stalk its prey. Consequently, there is now no need to trust to chance locations of fish, and days and even weeks of unproductive fishing are thus saved.

Scientists are likewise using television as a means of studying the actual habits of fish in their natural surroundings — a study previously impossible. The fact that the camera can work for long periods underwater without undue fatigue—about two hours and a half—allows research to be carried on for really worthwhile periods.

Moreover, the cinema film taken of the television pictures provides a permanent record for inspection at the scientists' leisure. In this way the research and experiment now going on is certain to have important and beneficial effect on the fishing industry of Britain.

Likewise, dock and harbour authorities are using underwater television apparatus to examine ships' hulls, harbours, lock gates and other underwater installations wherever damage is suspected. A few minutes of camera inspection can save countless hours of work on the part of divers.

But there is no doubt that tele-

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vision's primary contribution to the shipping world will be in salvage work. Indeed, many experts believe that it will completely revolutionize present deep-sea salvage operations, eventually making them an entirely mechanical operation.

AS soon as an underwater camera has located the wreck of a ship with a speed and accuracy previously unknown, mechanically-operated lifting gear will be brought in.

Directed and remotely-controlled by an operator standing in front of a television screen on board the salvage ship, underwater cranes and grappling irons will raise bulk cargo to the surface.

Experiments are also being carried out on an electronically-controlled robot which could be lowered, and by remote control and through the eye of an underwater television camera, made to attach airlines for men trapped in sunken submarines at depths far beyond the reach of human divers.

As its range increases, underwater television may well prove to be a new weapon of sea detection, and if there is a future war, television will play an important role as the all-seeing eye of remote controlled rockets, aeroplanes and other similar weapons which can be "shot" from aboard ships.

It will also bring new safety factors into submarine operation by giving eyes to the submarine itself when it is moving submerged, and television used in conjunction with infra-red transmission will enable ships to see moorings even through as much as ten-tenths gloom.

All these recent applications of television serve to show how it is fast becoming one of the shipping world's most useful employees.

It is a sort of super-eye that, equipped with powerful lamps, can be lowered far under the surface of the sea where it can observe the ocean floor, the plants and animals, and the wrecks of sunken ships.

No job seems too difficult for underwater television and yet only a minute fraction of its vast potentialities have been explored. Its possibilities in the future are, indeed, without limit and the introduction of stereoscopic vision will certainly add to its versatility.

—From the "Sea Cadet" (London)

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BYNG'S EXECUTION IS REMEMBERED

Special Correspondent

DESCENDANTS of Admiral Byng laid a wreath by his portrait in the National Maritime Museum on March 14 — the 200th anniversary of his execution.

Admiral Byng was shot on the quarter deck of H.M.S. *Monarch* on March 14, 1757, by sentence of a court martial which found him guilty of failing to exert himself to the utmost against the French off Cape Mola in the defence of Minorca.

Until his appointment to command a squadron with the special duty of relieving Minorca in 1756, Byng's naval career had not been particularly noteworthy.

The son of Lord Torrington, an Admiral of the Fleet and former First Lord of the Admiralty, he had passed through the usual stages of promotion and reached the rank of Vice-Admiral after 29 years of service.

The failure to relieve Minorca, coming at a time when British forces were suffering setbacks in other theatres of war, was attributed by the Government to Byng's lack of determination and negligence.

Byng claimed he was the victim of political intrigue.

Pamphlets which both sides produced gave the issue a publicity which was increased by subsequent Parliamentary efforts to obtain the recommendation to mercy made by the court martial.

Byng's death was legally justified by the disciplinary code of the day, but the catch phrases of the pamphleteers made it the cause for partionship and argument which it has remained until the present day.

PLANNING FOR TWO KINDS OF WAR

Continued from page 22

craft like the Convair F-102 has only to fly it on the course he receives over his radio until it is in the general vicinity of the target. Then he sits backs while the aircraft's fire-control system locates and "locks on" to the enemy, flies the F-102 to within range through the autopilot, works out the correct "angle-off" of the guns or missiles and then fires them; after which the pilot has only to take over for the return to base.

BRITAIN could not rely on such aircraft. To start with, it is not able to throw a radar ring round its coasts at a distance of several hundred miles to give early warning. Nor, because of its vulnerable geographic position, are long runways or a complex ground control system practical.

So British fighter aircraft have to be able to take off from short runways, which necessitates a bigger wing area. This inevitably cuts down the maximum speed, but gives in return an aircraft that is manoeuvrable and easy to control, especially at height.

Furthermore, the fact that British fighters like the Hunter and Gloster Javelin are able to fly from short runways, independently of sophisticated ground control, means that they can be switched to fight in almost any other part of the world without great difficulty.

Russia, although an immense land mass like America, is also short of radar and believes that fighters should be versatile. As a result, her MiG series are lightly-loaded, manoeuvrable, simple machines that can operate almost anywhere.

Turning now to bombers, America is able to count on the use of bases in Britain, North Africa and the Middle East within easy striking distance of Soviet targets. As a result, the U.S.A.F. Strategic Air Command has brought into service more than 1,500 six-jet Boeing B-47 Stratojet bombers, which have a normal range of about 4,000 miles at 600 m.p.h.

To guard against the possible loss of overseas bases, they can be refuelled in flight by tanker aircraft and this has become an everyday practice throughout the U.S.A.F. and U.S. Navy, giving both bombers and fighters a range that is limited only by the ability of their crews to remain awake and alert.

The Stratojets are now being joined by squadrons of eight-jet B-52 Stratofortresses, with true intercontinental range, and the capabilities of these huge bombers were shown when three of them encircled the world non-stop, with the help of flight refuelling tankers, in January, 1957.

America's B-25 bombers are big because they have to carry a great deal of fuel to give them sufficient range to reach Russia from bases in the United States. For a similar reason, Russia is building comparable aircraft — the giant four-jet bomber known in the west under the code-name of "Bison" and the no-less-impressive turboprop "Bear." Presumably they also use flight refuelling, for otherwise the most important targets in the continental United States would be beyond their range.

Britain, on the other hand, has developed an entirely different class of nuclear bomber. With potential targets much nearer, great range is not essential, and the Vickers Valiant, Avro Vulcan and Handley Page Victor "V-bombers" are therefore much smaller than a B-52, while carrying a no-less powerful nuclear warload.

A combination of small size, low wing loading and the high power of four great turbojets gives the later Vulcan and Victor in particular a speed so near to the speed of sound and at such a great height, that they would be virtually impossible to intercept at night with any fighter aircraft in service. As a result, they need no defensive armament, which again saves weight and improves performance.

SO much for the all-out nuclear war. How would these first-line aircraft of the great powers fare in a local war?

The Suez action in November, 1956, gave an indication, because the R.A.F.'s Valiants, Canberras, and Hunters, had no difficulty in eliminating the opposing air force and other military objectives, although this involved operating from strange airfields hundreds of miles from home bases without the use of their most powerful offensive weapons and in a type of operation for which the crews were not primarily trained.

Other aspects of the operation were even more significant. For example, Hawker Sea Hawk and de Havilland Sea Venom fighters and Westland Wyvern strike aircraft from carriers of the Royal Navy contributed a very great proportion of the air component used at Suez.

This re-emphasises the lesson of Korea that there is a very real need for aircraft carriers to provide close support for land forces in local wars, when there are few, if any, land bases available.

It can be argued that the carriers would have had a difficult task to defend themselves against determined submarine and air attack in either campaign; but this ignores the proven ability of such ships to defend themselves.

In fact, only eight of the 58 carriers used by the Royal Navy in World War II were sunk, only one of them by aircraft, and there

has certainly never been a case of a carrier base being captured and used by the enemy!

Nor are carriers essential only for local wars, because escort carriers are needed for the job of keeping open vital sea supply routes against the menace of the submarine and long-range bomber. And the U.S. Navy is even building a series of huge 60,000-ton carriers as mobile bases for high-speed atom-bombers.

These vessels, of which the *Forrestal* and *Saratoga* are already in service, are able to move over two-thirds of the earth's surface at more than 30 knots, which surely makes them less vulnerable than a great sprawling concrete and steel land base.

It is easy to forget that naval aircraft are no longer the lumbering bi-planes and slow monoplanes of World War II, covered with so much external equipment that they resembled Christmas trees. The Hawker Sea Hawk of to-day can outfight many swept-wing fighters above 30,000 ft. The later Supermarine N.113 day fighter-bomber and de Havilland 110 all-weather fighter are among the most formidable aircraft of their type in the world, and the N.113 will carry atomic-bombs into the bargain.

The U.S. Navy has a range of high-speed atom-bombers, from the long-range twin-jet Skywarrior to the 700 m.p.h. Skyhawk, which is so small that its delta wings do not need to be folded when it is carried by lift to the below-deck hangars. And there are supersonic carrier-based strike aircraft like the newly announced Blackburn N.A.39 to come.

JUST as there is still a place for aircraft carriers, so there is a continuing and even increasing need for military air transport.

Helicopters have already been used to carry troops to otherwise inaccessible front-line positions in Korea, where they also evacuated over 20,000 casualties, reducing the death rate for wounded men to the lowest percentage in military history.

At Suez, the Royal Navy pioneered the new technique of beach assault by helicopters from carriers.

Certainly we shall see much wider use of turboprop and "jet-rotor" helicopters and "convertiplanes" like the new 40-50 seat Fairey Rotodyne in future military operations, and it is only a matter of time before they replace completely the present fixed-wing air observation post "spotter" 'planes, liaison aircraft, light transports and even jeeps and lorries in forward areas.

Other planned applications include remote-control pilotless battlefield reconnaissance with both cameras and television equipment, but this job may be performed more efficiently by small, pilotless fixed-wing missiles.

Missiles — what is their place now and in the future?

Apparently, fighters are to give way to missiles because of the difficulty in defending the British Isles with piloted aircraft; but this overlooks the R.A.F.'s overseas commitments and assumes that accurate treliable missiles will soon accurate reliable missiles will soon

Yet in America and Russia, where progress in missiles is not lagging, there is no sign of a waning interest in fighter aircraft, and machines like the Starfighter and MiG-21 are in full production.

The Starfighter is an interesting concept, with a speed of around 1,400 m.p.h. and the punch of the new Vulcan gun which fires at the rate of 9,000 20 mm. shells per minute through revolving barrels. But there are reports that its stubby straight wings give it a rough time at transonic speeds and, although it is a first-class fighter for defending an industrialised land-mass such as the United States, something a little less demanding in the way of piloting skill, runways and ground control might be needed by most other air forces.

That speed can be achieved in other ways is shown by the Fairey Delta 2 research aircraft, holder of the world air Speed record of 1,132 m.p.h., which is powered by a Rolls-Royce Avon giving no more than 12,000 lb. thrust with reheat and flies through the transonic region so cleanly that the only indication in the cockpit is a flicker of the instruments as the shock-wave passes over the pitot tube that feeds them.

Similarly, the twin-Avon English Electric P.1B will reach 1,500 m.p.h. eventually, probably with rocket boost as mixed jet-and-rocket power is an unrivalled way of combining high combat and combat and climb performance with economical cruising.

AMERICA has flown the first supersonic bomber—the Convair B-58 Hustler delta — but here again there seems a possibility that such aircraft will be overtaken by the intercontinental ballistic missiles, designed for ranges up to 5,000 miles, at a peak speed of 16,000 m.p.h., carrying a thermo-nuclear warhead.

Such weapons are well under way and may be perfected within five years. Nearer still are 1,500-mile intermediate range bombardment missiles; and the first air-to-air, ground-to-air tactical bombardment, air-to-ground and air-to-underwater guided missiles are already in service.

The question confronting all air staffs now is to decide when all these missiles will be in a sufficiently advanced state to take over from piloted aircraft.

In Britain that decision, so far as fighters are concerned, has been

Continued on page 32

For Sea Cadets

LITTLE SHIP'S EXCITING LIFE

By JACK DUSTY — in London

One of the little ships that did so much to win the last war and in so doing crammed more excitement into her short life than falls to the lot of most was the "Master Standfast." Her career included running the blockade to Sweden during the darkest days of the war, capture by the Germans after a brisk fight, and finally recapture by the Royal Navy on May 5, 1945.

IN 1941 various Swedish products, more especially ball-bearings, were urgently required to speed up the production of war material in England, and it was decided to build a fleet of special high-powered diesel-engined craft to follow the example of two Norwegian merchant ships which early in the year had successfully run the German blockade from Sweden with a valuable and urgently needed cargo.

To penetrate minefields these craft were of shallow draught, while their high speed gave them a reasonable chance of escape if detected.

Fore and aft holds permitted some 40 tons of cargo to be carried, and the crew of 18 included two wireless operators.

For defence the ships were armed with twin Oerlikon guns forward and aft, in addition to twin Vickers machine-guns on either side of the bridge and a quadruple machine-gun abaft the bridge.

The five ships — the *Consuch, Hopewell, Gay Viking, Gay Corsair* and the *Master Standfast*— which formed the little fleet were all manned by Merchant Navy officers and men and were operated by Messrs. Ellerman and Wilson of Hull.

The crossings from Sweden to Hull took 36 hours and were confined to the winter months, moonless nights with heavy low cloud being preferred as these conditions reduced chances of detection to a minimum. Conditions of life on board were arduous, due to the bad weather which was frequently experienced and the uncomfortable motion of the ships owing to their high speed and stiffness when laden with cargo.

It was under such conditions that the *Master Standfast* spent the first year of her life.

Detected

In the early hours of the morning of November 2, 1943, in position 58° 33′ North, 10° 40′ East, the German patrol boat V.1606 of the 16th Patrol Vessel Flotilla was keeping listening watch, and at 0420 her directional hydrophones picked up the noise of engines. "Action Stations" was sounded off and the patrol boat proceeded at full speed in the direction indicated.

After 20 minutes nothing further could be heard on the hydrophones and the German Captain assumed that whatever he had picked up had stopped. A close look-out was, therefore, kept and at 0500 a darkened vessel was seen.

At first the German Captain believed that the shadow was his neighbouring patrol vessel but soon realised that it was too small. Accordingly he brought his armament to bear and challenged the vessel.

The *Master Standfast*, realising almost at the same time that she had been seen, made a fake reply to the German's recognition signal and asked by light in plain language for a Pilot, hoping thereby to gain a few minutes' grace while she increased her speed and made off westwards.

The German patrol vessel immediately opened fire and at once scored hits on the bridge and wireless office, injuring all the bridge personnel, who were thus unable to direct the defence or fire the scuttling charges. The crew manned the guns but the *Master Standfast* was being hit incessantly and soon stopped.

With her Captain, First and Second Mates and both Radio Officers wounded, and after being boarded by the larger and more heavily armed German, further resistance was useless and the *Master Standfast* surrendered — "after some hesitation" according to the German official report of the action. She was towed into Frederikshavn, where her gallant Master — Captain C. R. W. Holdsworth—died in the Naval Hospital.

The crew were interrogated by the German Naval authorities but gave nothing away, and made a great impression with their captors.

The German Naval Commander-in-Chief reported to the Operations Division of the Naval Staff that ". . . the crew made an excellent impression and had been selected very carefully: the priso-

ners stated they were not allowed to make any statements . . . no prisoner would give any information about the purpose of the trip."

From Frederikshavn the *Master Standfast* was towed to Kiel, where she was repaired and refitted by the Germans, who intended to employ her as a decoy ship and for landing secret agents on the English coast.

However, the end of the war came before she could be so used and on May 5, 1945, she was recaptured by the Royal Navy.

Later she was purchased from the Admiralty by Yacht Holidays Limited and was completely re-engined and refitted. From then on, until she was recently scrapped, she once more proudly flew the Red Ensign on her many trips through the inland waterways of Holland.

—From the London "Navy"

AMERICAN SHIPS HERE FOR CORAL SEA WEEK

Continued from page 17

men who had not previously known the friendship of your people, the visit has been an outstanding experience," he said.

"It has strengthened the bonds which bind us in the defence of freedom throughout the world.

"I speak for all of the officers and men of the *Bennington*, the frigate *McCain* and destroyers *Mullany*, *Stoddard* and *Isherwood* when I say our stay 'Down Under' has been far too short, and that we look forward with pleasure to visiting your country again."

The *McCain*, *Mullany*, *Stoddard* and *Isherwood* sailed earlier.

GERMAN WARSHIP

The first warship to be built in West Germany since World War II—a 370-ton coastal minesweeper—was launched on April 1.

NAVY'S ROLE IN G.-M. AGE

Continued from page 7

guard our vital interests overseas except by permission and on behalf of the United Nations. How then can we best make our influence felt in the councils of the world as a great military Power?

At the present time we are spending nearly £1,000,000 on each V-bomber and an equal amount on each hydrogen bomb. How many of them we intend to have for prestige purposes is anybody's guess. But such relatively small numbers as we can afford to produce will have no effect whatever on Soviet policy which is influenced solely by the massive United States Strategic Air Force and the large stockpile of thermo-nuclear missiles which it has available.

The ballistic rocket era now gives this country a new opportunity. We must build ships of 20,000 tons capable of carrying a worthwhile number of ballistic rockets with a range of up to 1,000 miles.

The vessels need not be larger, for rockets have no recoil. The Royal Navy will then become no less important that the United States Navy in its deterrent value and in the part it would play in a global war.

Some of these ships would also carry guns, others fighters and anti-submarine aircraft, depending on the types of vessels an enemy has available and the degree of support expected from the navies of the other NATO Powers.

They will be expensive, these ships and rockets, but no more expensive and of much greater value than the force of V-bombers and stockpile of thermo-nuclear bombs we are now producing to supplement an already adequate deterrent.

—From the London "Navy."

PLANNING FOR TWO KINDS OF WAR

Continued from page 30

speeded by the need for economy in military expenditure.

Other countries are being more cautious, because there is no certainty that the defence (both on the ground and in bombers) will not find a method of confusing the guidance systems of missiles so that they become mis-guided.

A missile is terribly complex, with a maze of equipment to go wrong, and it cannot reason.

If it finds itself heading for a friendly aircraft, it will not call off the chase. Some of the techniques on which it relies, such as infra-red "homing," lose their efficiency in cloud or bad weather. And there can never be a substitute for piloted close-support and transport aircraft in local wars.

Nor should we forget that new developments might give piloted aircraft the performance and invulnerability of a missile at lower cost and with a better guarantee of accuracy.

The French claim that their Leduc 0.22 fighter, powered by a ramjet engine of mighty power, may soon prove itself capable of 2,400 m.p.h. North American are designing a research aircraft to fly at 4,000 m.p.h. at 250,000 ft. and the research aircraft of today is the fighter or bomber of tomorrow.

Even more fantastic developments, resulting perhaps from current "anti-gravity" research, may change the whole picture overnight in favour of piloted aircraft. Following experiments by Avro Aircraft in Canada, we may even see genuine flying saucers

JOIN THE NAVY LEAGUE

The object of the Navy League in Australia, like its older counterpart, the Navy League in Britain, is to insist by all means at its disposal upon the vital importance of Sea Power to the British Commonwealth of Nations. The League sponsors the Australian Sea Cadet Corps by giving technical sea training to and instilling naval training in boys who intend to serve in Naval or Merchant services and 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.

The League consists of Fellows (Annual or Life) and Associates.

All British subjects who signify approval to the objects of the League are eligible.

MAY WE ASK YOU TO JOIN and swell our members so that the Navy League in Australia may be widely known and exercise an important influence in the life of the Australian Nation?

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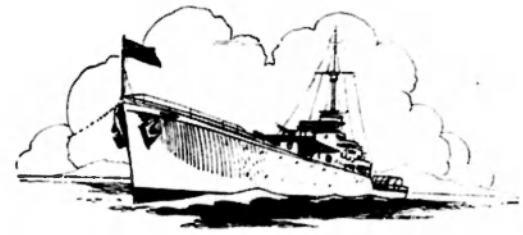

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It will be an American contribution to the astonishing scientific programme of the International Geophysical Year.

The satellite—a gleaming sphere 20 inches in diameter and weighing 21½ pounds — will be carried to the threshold of space by a three-stage rocket. Its orbital speed will be 18,000 miles-per-hour, and it will circle this planet every 90 minutes.

Instruments inside the satellite will radio back to Earth information about air density, temperature and pressure, the shape of the planet, the intensity of solar and cosmic radiation, and the incidence of meteors.

SHELL UMF, a new aviation fuel, is being used in development of the first-stage rocket that will carry the tiny fact-finding space-probing ball aloft.

Woomera, South Australia, may become the base for subsequent satellite launchings.

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