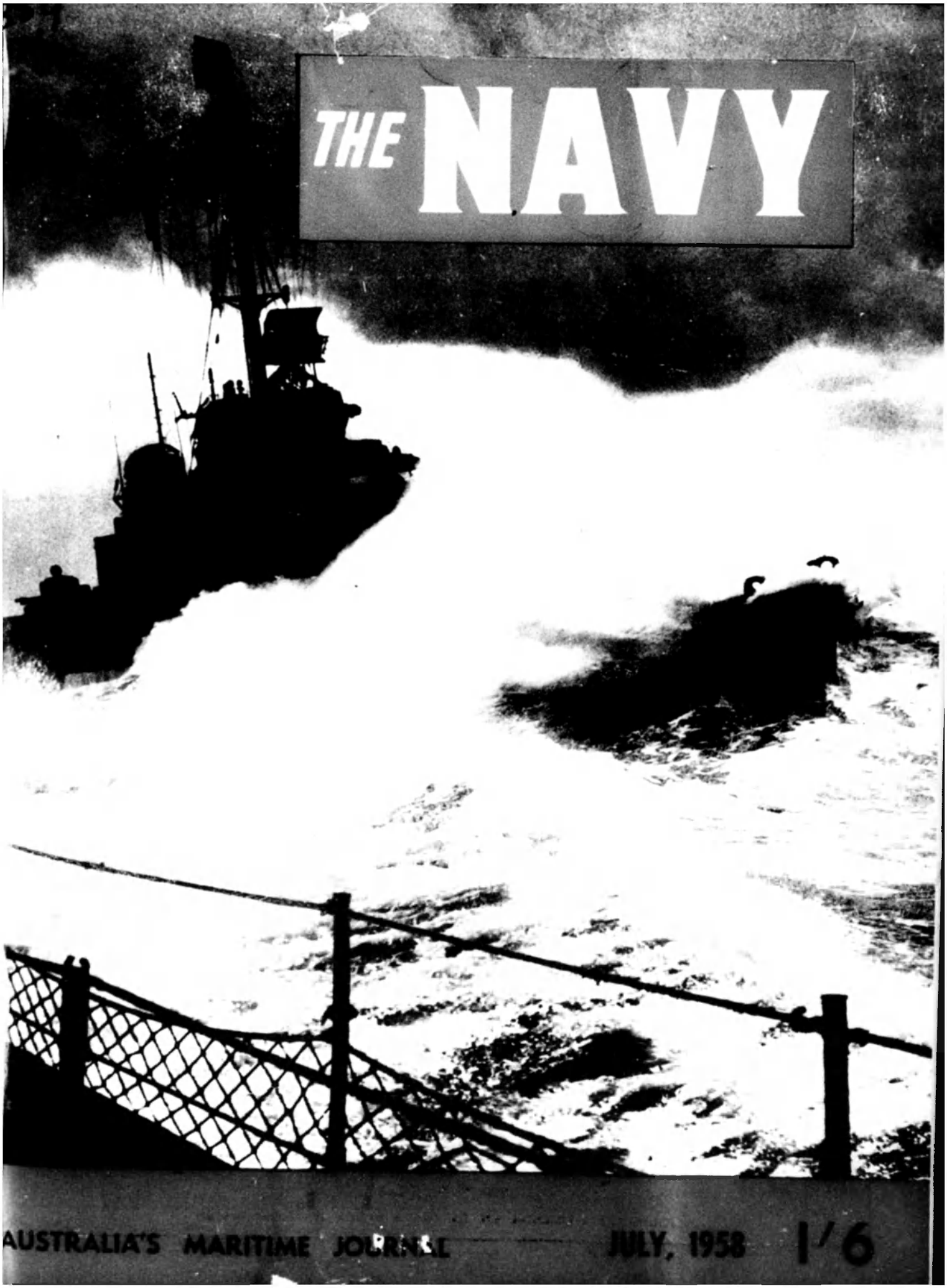
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THE SHAW SAVILL LINE

The Shaw Savill Line this year celebrates the 100th Anniversary of its foundation.

By a Special Correspondent

IN March, 1858, two young men, Robert E. Shaw and Walter Savill, set up business in London under the title "Shaw Savill & Company."

They did not have the capital to build or own ships, so they started business as brokers, chartering vessels to carry cargo and migrants to New Zealand. They adopted as their house flag the white, red and blue ensign of the Southern Cross which the English traders and Maori Chiefs of New Zealand had chosen in 1834 to safeguard their trading ships' status at sea.

It remains to this day the flag of the Shaw Savill Line.

On May 28, 1858, the new company despatched the 435-ton iron screw steamer Lord Ashley for Auckland carrying Government dispatches and mails.

It was followed soon afterwards by the 735-tons wooden sailing ship Avalanche, whose round voyage to New Zealand and back lasted nearly a year.

The following year the partners attracted considerable attention by the voyage of a Liverpool ship Spray of Ocean, which reached Auckland in the then unprecedented time of 85 days.

The sixties and seventies were the golden years of British sail and the qualities and performance of the company's ships at that time have never been surpassed.

In 1869 they purchased the Crusader, an iron clipper of 1,058 tons, one of the fastest and most beautiful sailing vessels of all time. In her day she was even more famous than the Cutty Sark, and did the passage from New Zealand to England in the almost incredible time of 69 days.

At this time Shaw Savill were carrying passengers from England to New Zealand at rates ranging from 75 guineas for a first-class cabin to £16 for open berth steerage. The firm secured a Government contract for the carriage of migrants at £12 per head.

In 1882 Shaw Savill & Co. reached an agreement to amalgamate with Hendersons Albion Line. In the same year the iron sailing ship Dunedin, under this flag, pioneered the development of the frozen meat trade when she successfully carried the first cargo of frozen mutton and lamb from New Zealand to London.

The venture almost foundered at the start. After the first 1,500 carcases had been loaded the crankshaft of the refrigerating engine broke and the cargo had to be hastily landed and sold in New Zealand. Nearly all the passengers, fearing a similar accident would send the ship to the bottom, cancelled their passages.

But after an anxious voyage of 98 days in which sparks from the funnel several times set alight to the sails and the captain narrowly escaped being frozen alive while investigating a fault in the refrigerating ventilation, the Dunedin reached London with her cargo intact.

Only one of the 4,311 carcases of mutton and lamb had to be condemned and the remainder, carried for 12,000 sea miles at a freight of 2¾d. lb., sold at Smithfield at prices which heralded a revolution in the feeding habits of the British working classes.

With cheap food for the British workman's dinner went, hand in hand, new prosperity for the virgin lands of the Empire overseas. It was the shipping companies that provided the link that made both possible.

Soon after the amalgamation, Shaw Savill & Albion Co. Ltd. commissioned the building at Dumbarton of two steel, single-screw, two-funnelled, four-masted barque-rigged steamers with clipper stems, each of more than 5,000 tons.

Capable of up to 15 knots they offered accommodation of a kind never before seen on the colonial service, with bathrooms and electric light for all three classes.

They carried 95 first class, 52 second class and 200 steerage passengers.

This venture cost the company nearly £250,000, but this was amply repaid.

The first of these, the Arawa, on her maiden voyage in 1884 reached New Zealand after calling at Hobart in 38 days' steaming, and made the homeward voyage in 32 days.

At that time these ships were routed outward from the United Kingdom via Capetown and Tasmania to New Zealand, returning by Cape Horn, Montevideo and Rio.

In 1903 the 7,755-ton cargo-passenger twin-screw steamer Gothic was built for the company. It was the largest ship until then that had ever used the Port of London or engaged in the Australasian trade. This ship in 1895 carried the first shipment of chilled beef from New Zealand.

A new development occurred in the history of the company in 1905. It obtained a share of Geo. Thompson & Coy.'s Aberdeen Line, which carried an important part of the trade between the United Kingdom and Australia.

Shaw Savill became increasingly concerned in the Australian trade, eventually acquiring the Bay steamers of the former Australian Commonwealth Line, which they incorporated in their existing services under the title of Aberdeen & Commonwealth Line.

By the time World War I broke out, the last of the company's sailing ships which had long become uneconomic had been sold.

During the 1914-18 war the company's ships, armed with 4.7 guns, played their part in maintaining England's food supplies in the face of German surface raiders and submarines.

It was the wireless operator of the Arawa who picked up from the Cocos Keeling Islands the faintly heard message that led to the destruction of the famous commerce raider Emden.

The company's losses were comparatively light in World War I, but in World War II they were far heavier. Thirteen of the line's 26 vessels were sunk, including 3 in a single day.

One episode in the line's war record stands in a category of its own.

The story of Captain Fegen and the Jervis Bay is one of the great epics of British history, rivalling the death of Sir Richard Grenville and the last fight of the Revenge.

The Jervis Bay was requisitioned in September, 1939, by the Admiralty as an auxiliary cruiser and armed with eight old and rather worn 6-inch guns. In this capacity, with her peace-time officers and crew serving under a retired Naval officer, Captain E. S. Fogarty Fegen, she was escorting a convoy from Canada to England when on the afternoon of November 5, 1940, she encountered the German 10,000-ton battleship Admiral Scheer.

Seeing no other way of saving the convoy, whose only hope of escape lay in scattering quickly into the falling dusk, Captain Fegen in the unarmoured Jervis Bay closed with the battleship and, hopelessly outranged and outgunned, succeeded in drawing her fire until by the time she was sent to the bottom by her adversary's 11-inch guns, 33 of the 37 ships of the convoy had made good their escape in the gathering darkness.

For this sacrificial action Captain Fegen, who had an arm shot off before his ship sank, was awarded a posthumous V.C.

Less spectacular but highly valuable was the war service of the Dominion Monarch, the 26,500-ton flagship of the line, which during the war carried some 90,000 British, American and Dominion troops across the oceans.

It was the very extent of the company's service in World War II that brought about in the decade that followed the virtual rebuilding of its passenger and cargo fleet to meet its obligations in the New Zealand and Australian trades.

The climax of that program of reconstruction and renewal came in 1951 when, after the company had replaced the cargo fleet, Harland and Wolff launched the 20,000-ton Southern Cross, a single class, twin-screw, oil-burning turbine passenger vessel of revolutionary design. She established for the first time the practicability of siting engines and funnel aft in an ocean-going passenger ship.

She carried no cargo and because of her freedom from loading and unloading cargo could make four round-the-world voyages a year between Australia and the United Kingdom, via Panama Canal and South Africa.

It is now a century since the original Shaw Savill Company began its history in its modest office in Billiter Street, London, but from its grander premises in Leadenhall Street the line still maintains the purpose and policy of its original founders.

HYDROGEN POWER

By PROFESSOR J. P. BAXTER, Vice-Chancellor, N.S.W. University of Technology

(In an A.B.C. "Science Commentary" broadcast)

WE are all familiar with the process of fission, in which we get energy by causing certain very heavy atoms like uranium to break up into medium sized atoms, and in this process energy is given out. We can cause fission to take place by the action of neutrons on uranium at ordinary temperatures.

We have also known for quite a long time that energy can be obtained by causing very light atoms to join together, or fuse, to give somewhat heavier atoms, and we believe that the fusion of hydrogen atoms to produce helium is the process that provides the immense energy of the sun and of many of the stars.

This process takes place spontaneously in the sun, where the internal temperature is over 20 million degrees, and the problem of making it go upon the earth appears to be mainly that of producing, in some way, conditions and temperatures comparable to those within the sun.

The fusion can be made a little easier by using heavy hydrogen instead of ordinary hydrogen. Heavy hydrogen occurs to the extent of about one part in five thousand of ordinary hydrogen, and when we remember that hydrogen makes up about one-ninth of the weight of water, and that the amount of water in the world is immense, we can see that supplies of heavy hydrogen are almost inexhaustible. Very approximately the fusion process, if it went with 100% efficiency, could provide all Australia's power requirements for a year from something less than a thousand tons of water.

Clearly we cannot heat heavy hydrogen to temperatures of, say, 50 million to 100 million degrees, even if we knew how to produce such temperatures, in any ordinary apparatus made of earthly materials. Before we reach 5 thousand degrees all materials we know of are boiled off as gases. We must therefore devise some other method.

The most promising at the moment is that in use at Harwell, where a quantity of gas is heated to a high temperature by a powerful discharge of electricity through it, and is maintained in a stationary and constricted space by electrical and magnetic forces, which prevent it from moving into, and filling, the rest of the vessel.

With this apparatus, a British group, led by Dr. Thoneman, an Australian, has produced temperatures of several million degrees for very short periods of time in a filament of heavy hydrogen gas.

It is thought that for the process to become self-sustaining, that is, to produce more energy from fusion than that which must be supplied to produce the high temperature, temperatures of about 50 million degrees must be obtained, so the work still has some distance to go.

Most scientists believe that the problem will in due course be solved by man's ingenuity and that fusion reactions will be carried out one day. There is more difference of opinion however, as to when that day will be.

Let us assume that the problem is solved, and consider its impact upon the world's power requirements, and on the development of fission power, on which so much effort is now being spent.

The accelerating progress of industrialisation suggests that about the middle of the next century coal supplies will begin to get scarce. Oil will have gone, and hydro-electric power will be fully developed. Power from fission will carry man on for some time, say, another fifty or perhaps a hundred years. And then, without a new source of power, civilisation will collapse in disorder. Fusion power, with its unlimited fuel resources, seems to be the answer to that problem.

You may find it hard to worry about the problems of the middle of the next century, though it is but a short time away really.

Let us first remember that power is a means to an end, and not an end in itself. A new source of power is only of interest if it is cheaper than the sources already available.

The cost of power is made up of three main factors. These are the cost of fuel, the capital charges on the power station, and the cost of transmitting the power from the station to the consumers.

The third cost will be much the same for any system, pro-

vided the type of power station we are considering can be placed anywhere we like. Fission and fusion power have a slight advantage over coal or hydro-electric power in this respect.

The advanced types of fission stations that we expect to build in, say, ten years' time, will have reduced their fuel costs to negligible proportions, and the overall cost should be less than that from coal practically anywhere.

Fusion stations should also have negligible fuel costs, so the question of whether fission or fusion will give the cheapest power will depend mainly upon the capital costs of each type of station.

Now, since no one at present has any real idea what a fusion station will look like, no estimate of capital costs that is worth anything can be made.

There seems no reason at present, however, to think that fusion stations are likely to have lower capital costs than fission stations. In fact, the contrary may well be true.

I do not think it likely that the comparison will be made in this way, and that fission and fusion will compete for the world's power markets. Rather, I think they will be partners, and that they will be used in a strictly complementary fashion.

The fusion process will probably produce a large number of neutrons, which are of no value in that process, and which would have to be absorbed in shielding.

These neutrons could be used to make fissionable material by absorbing them in Thorium or Uranium 238, and the Uranium 233 or Plutonium so produced could be used in fission power plants in other places. The fusion power stations will probably be large central generating plants, and the fissionable material they produce as a by-product will be used elsewhere.

These fuels would be particularly suitable for small and mobile atomic power units. The two processes should thus work admirably in harness together.

It is quite clear that the investigation and development of the fusion process is well worth while and should be pursued. It would be wrong, however, to assume that if it is accomplished fusion will replace fission, or to reduce in any way the tempo of research and development work on fission power stations.

We can, I believe, expect Uranium and Thorium to continue to be important materials, and to see fission atomic power stations play a major part in the future development of civilised man.

BLACK MAGIC IN THE FLEET

EQUIPMENT produced in recent years has revolutionised the effectiveness of modern warships and given the Navy power undreamed of in the past.

The First Sea Lord, Admiral of the Fleet, the Earl Mountbatten, said this in London recently.

He was addressing the British Institute of Radio Engineers.

He singled out for special comment the combination of type 981 radar and its comprehensive display system which is essentially the eyes, brain and central nervous system of the ships (such as H.M.S. Victorious) in which it is installed.

"Integrated with the directing intellect of the human staff, it constitutes a device of almost fabulous performance without which modern warships would be highly vulnerable to long-range attack from the air," Earl Mountbatten said.

"The uninitiated, looking at this ship or seeing pictures of her, may wonder why she carries an enormous 'searchlight' on the island superstructure. Some may wonder if this contains some new form of black light or possibly even a magic eye. It is indeed a form of magic eye which, in conjunction with its electronic 'brain' between decks, not only gives the captain phenomenal far sight but also provides him with infinitely greater powers of calculation and judgment than his own eyes and brain could produce unaided.

"The eye part of this system is a revolving stabilised structure which weighs 27 tons and incorporates many new ideas. Like the human eye it uses a radio lens instead of a reflector, and for much the same reason. If a reflector were used the various scanners would obstruct the actual radar beams. Also by using the lens, greater flexibility in aerial design is achieved.

"The radio lens is made up of hundreds of short sections of different length wave-guides stacked together like a honeycomb. It has an 'F' value of 1, which gives greater collecting power than the best camera lens. There is one way, however, in which this 'eye' copies the bat rather than the human being. It sends out its own sort of illumination in the form of a number of narrow pencil beams, all sharing the same lens.

"One of these is fixed in elevation and provides the long range warning, while the others make a co-ordinated scan of various sections of the target area as the rotating structure revolves.

"Like the human eye again, this radar antenna unit sends a hotch-potch of impulses to the 'brain,' in this case an elaborate electronic computer system in the superstructure of the ship. These impulses, though quite meaningless in themselves, contain all the information on airborne targets which is needed by the operational staff.

"To enable them to make full use of this information, there is a very complex display system which processes, stores and filters it so that it can be displayed in an easily intelligible up-to-date form. Range, height, bearing, speed and course are all provided and presented for easy use by a novel system of electronic writing.

"All the numbers and symbols required for identifying targets and for other purposes are written electronically on the display tubes themselves. This is achieved by a suitable combination of different wave-forms to produce Lissajous' characters of the required shape. Even for the most complicated characters not more than four of these wave-forms are needed.

"As if this were not enough, a section of the 'brain,' known as the intercept computer, works out for the control officer a future presentation of which and when his fighters will intercept or miss their targets if they continue on his present directions. These directions have also been computed for him.

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"Even with all this elaborate and effective aid the operational staff of a warship, trying to compete with a mass air attack at modern high speeds and great altitudes, is faced with enormous difficulties. Almost instantaneous decisions have to be made of how best to use all the rapidly changing information. This brings me to perhaps the most important and interesting aspect of these new developments, and that is the integration of man's intellect with his creation. For this system cannot, of course, be used and directed or maintained without the human intellect.

"The term 'electronic brain' has often been criticised on the grounds that these machines are not capable of original thought and have, in fact, no intellect.

This is, of course, perfectly true and the comparison between these machines and the human brain applies only to the semi-automatic part which controls the routine functions of the body as necessary to carry out the directions of the intellect.

"This is precisely the case with an elaborate electronic system such as I have described. By itself it can achieve nothing. Its sole purpose is to provide for the human element much more information than their own eyes and brains can handle unaided, and to help carry out the directions produced by the combination of man and machine.

"If equipment as complex as this radar and display system is to serve its purpose and not become a liability it must be maintained at its designed performance. Moreover, this must continue as the equipment becomes older and therefore inherently less reliable.

"The system is, therefore, fitted with a comprehensive monitoring system. This is extremely important because the mounting cannot be worked on while it is in operation and the length of time when the system can be put out of action for maintenance must be kept to the bare minimum. It is, therefore, only by continuous and careful monitoring that the system can be efficiently serviced during the short periods when it can be shut down. For the same reason the units and components of the system must possess a very high standard of reliability.

"When Type 984 Radar was first planned serious doubts were expressed whether the valves and other components would be sufficiently reliable for them all to be kept in working order at once. This equipment uses about 10,000 valves and 100,000 components, to say nothing of a quarter of a million soldered joints, with 275 slip rings to the revolving structure.

Cost of Equipment

"However, I am glad to say that this and other similar systems are now being operated and maintained at a very good standard of overall reliability, and this must reflect the greatest credit on all in the industry, from top management to the worker at the bench.

"There is, of course, a price to pay for such tremendous achievements and the financial cost is probably the greatest of these. I wonder if you realise the difference in costs between radio and electronic equipment in ships of the 1938 era and those of the present day. So staggering are these differences that I will quote a few.

"The cost to equip a frigate or destroyer in 1938 was £4,000; in 1958 it is £120,000 to £150,000.

"For a cruiser the cost in 1938 was £20,000; now it is £500,000.

"And for an aircraft carrier the cost in 1938 of £12,000 has now risen to more than £1 million.

"To this must be added, of course, the huge expenditure on research and development.

"The other price is that complicated systems call for a higher degree of skill and personal qualities in our sailors than ever before. The men concerned with equipment of this sort need the ability to think quickly, they need mental endurance and they need sound judgment both in operating the equipment and maintaining it.

"I am very glad to say that we are getting a sufficiently high standard of recruits coming into the Navy to meet this formidable but fascinating task."

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MAGNA CARTA SERVICE

A service was held in St. John's Church, Darlinghurst, Sydney, on June 15 to commemorate the sealing of Magna Carta.

Navies of the Soviet Satellite States

By J. MEISTER

WITHIN the framework of the Warsaw Pact the preponderance of the Soviet Navy is even greater than the numerical superiority of the U.S. Navy over the other N.A.T.O. fleets. Strongest of all the European "allies" of Russia is Poland, because the Polish Navy fought during the war with the Royal Navy and acquired an outstanding fighting record and reputation.

Shortly after the war the surviving ships of the pre-war Polish fleet returned from England and Sweden to Poland, although many officers preferred to stay in England. To these two destroyers, four submarines, and some auxiliaries, as well as four small minesweepers recovered from the Germans, the Russians soon added two motor torpedo boats, twelve patrol boats and nine minesweeping launches.

Later the Poles purchased four "YMS" class minesweepers, and converted some merchant ships into training ships.

In 1956 the Soviets handed over another four minesweepers of "T-43" class, four submarine chasers of the "Kronstadt" class, eight motor torpedo boats and six submarines of the "M" class, while Polish yards delivered some patrol boats.

A few landing craft were also bought from West European sources. Another five Soviet warships, including a destroyer, were transferred shortly before Christmas 1957, and more warships will follow in 1958.

It is said that altogether the Polish Navy will receive 20 submarines and six destroyers or escort vessels from Russia. Although Polish seamen have still plenty of "know-how," morale seems to be poor, as was shown a few years ago when the ship's company of the surveying vessel HG11 mutinied and took her to Sweden!

The Polish naval bases at Hela, Gdynia and Gdansk have been reconstructed; and, although three of the pre-war built submarines have been discarded, the Polish Navy is today numerically stronger than in 1939.

The Rumanian Navy does not enjoy at all a good reputation, as it lacks both tradition and that ferocious fighting spirit which kept the Poles going from 1939 to 1945.

However, to be fair, one must remember that the Rumanian Navy was always considered as negligible quantity. Nevertheless, during World War II, the Rumanian Navy was the main sea power of the Axis in the Black Sea; and, although the Soviet Black Sea fleet was at least 10 times stronger, the Rumanian ships were able to do their share of valuable escort work, losing only one old torpedo boat, two motor torpedo boats, three monitors, and some auxiliaries up to the capitulation at the end of August, 1944.

The surviving ships, four destroyers, three submarines, three gunboats, two torpedo boats, some motor torpedo boats, two minelayers, four monitors, a depot ship, a yacht and a sail training ship and some other small craft and auxiliaries, were at once taken over by the Soviets.

For a few years Rumania had no navy left, but after the country had been brought completely under the rule of the local Bolshevik party, most of its former warships were returned though many of them were by now completely worn out.

Since then the Soviets have given the Rumanians, first, about a dozen patrol boats, followed by at least four former German minesweepers and some landing craft.

Later four submarines of the "Shja" class were commissioned, and in 1957 two destroyers or escort vessels, probably of the "Riga" design, were also handed over.

Finally, some rumours have it that Rumania has lately received from the Russians an elderly cruiser, handed over in 1947 by the Italians.

While the seagoing Rumanian naval forces are today numerically stronger than in 1941-44, the Rumanian Danube flotilla, which between the two world wars was the strongest fighting force on this river, has not regained its strength and seems to consist now of only a few launches and old gunboats.

Bulgaria has always had a very small navy, though it was considered to be well trained; and it also showed some fighting spirit during the Balkan wars, when one of their small torpedo boats damaged a Turkish cruiser.

During World War II, Bulgaria claimed to be neutral, but she patrolled territorial

waters against Russian submarines and opened her ports and yards to German ships. Two old torpedo boats and some launches were lost accidentally during the war, and some merchant ships fell victim to Soviet and allied submarines.

The surviving Bulgarian vessels, two small old torpedo boats, seven motor torpedo boats, ten minesweeping launches, three minelayers and some auxiliaries were seized by the Soviets in September, 1944, when Bulgaria surrendered without a fight, but they were restored soon afterwards.

Later the Russians gave the Bulgarian Navy one old destroyer of World War I vintage, at least three submarines of "M" type, numerous patrol launches and some motor torpedo boats and other auxiliaries, while the Bulgarians commissioned several of the landing craft and transports which the Germans had started to build in local shipyards.

A second, modern destroyer was transferred some time ago and the Bulgarian C.-in-C. made a trip to Albania on board this ship. There is also a small Bulgarian patrol and minesweeping force on the Danube.

Hungary's small but well-trained Danube flotilla went into exile in Germany in 1945 and was not returned after the war. Only a few ships — auxiliaries and minesweeping launches — fell into the hands of the Soviets.

After the war, the Hungarian government raised some sunken vessels of river-patrol and minesweeping type, and altogether there are about 20 small craft afloat today.

Czechoslovakia recovered after the war the only river gunboat they owned in 1939, and she may have added since some patrol and minesweeping launches.

The Navy of the so-called East German Democratic Republic consisted for many years of a number of patrol launches and an ex-Danish gunboat, scuttled in 1943 but later recovered.

After 1950, the East German yards constructed 12 minesweepers and 24 minesweeping launches, while nine more minesweepers are being built.

Lately the Soviets have handed over two escort vessels of "Riga" class, as well as some former German minesweeping launches and four submarines of "M" class, while some naval annuals even credit the East Germans with the intention of building four destroyers and a number of submarines. New motor torpedo boats have also been received from the Soviets and others are building; and there are over 70 modern patrol boats and numerous auxiliaries and surveying ships. The morale of the East German naval forces is, however, very low.

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A word must also be said, unfortunately, about Finland. This country, stoutly anti-Communist, has fought three times against the Soviets in the last 40 years.

The Finns were forced not only to accept the harsh terms of the Peace Treaty of 1947, but also to conclude with Russia an alliance which obliges the Finns to help the Soviets against any attack in the Baltic.

The pre-war navy of two modern coast defence vessels, five submarines and several minelayers, four gunboats, numerous motor torpedo boats, patrol boats and minesweeping launches was reduced by the Peace Treaty and by scrappings to a mere 14 motor gunboats, 18 patrol boats, two minelayers, 20 minesweeping launches and some auxiliaries.

Only two motor gunboats (British-built), seven patrol boats and two minesweeping launches, in addition to two icebreakers, have been added since 1945, while the surviving coast defence vessel Vainamoinen, had to be sold to Russia.

Although the Finnish Navy in 1941-43 showed plenty of fighting spirit and skill, its strength is actually so low that it is insufficient to patrol, even in peace time, the long coastline and the very numerous small islands. Finland is the only country within the Red orbit whose navy is now weaker than when the war ended.

When in 1949 China fell into the hands of the Reds, about half of the Nationalist Navy deserted and formed the basis of the "People's Navy." Among these ships were 13 former U.S. and Japanese destroyers and escorts, some 40 gunboats, patrol vessels, submarine chasers and minesweepers, and about 40 landing craft, and China's only

cruiser, the former H.M.S. Aurora.

The Russians soon transferred more warships, mostly minesweepers, motor torpedo boats, and patrol boats, and the Chinese added craft, either refloated or purchased, which enabled the "People's Navy" to seize some coastal islands from the Nationalist forces.

Although Chinese motor torpedo boats were able in 1954 to sink a Nationalist destroyer and in 1955 two motor gunboats, Mao's navy could not, however, prevent the Nationalists from seizing two Polish merchant ships and one Soviet on the high seas.

In the last few years the Russians have handed over four destroyers, more submarine chasers and minesweepers and a number of submarines, about 120 warships altogether, so that the "People's Navy" is today far stronger than the "Nationalist Navy."

Further, at least six escorts of "Riga" class, some minesweepers and numerous small craft are building in Chinese yards at Canton, Shanghai, Kiautchou and Charbin, while several of the Nationalist vessels are in bad condition and of no fighting value.

Besides being protected by U.S. warships, the Nationalist naval forces may still be better trained; but these assets could disappear, and then the Reds could launch an attack against Formosa.

The North Korean Navy, which consisted in the summer of 1950 of a few motor torpedo boats and patrol craft, was soon destroyed. Nevertheless, with the help of local fishing craft, the North Koreans were able to mine several of the harbours they possess and inflicted some losses upon the U.N.O. forces.

Since the armistice, Russia is said to have put another dozen motor torpedo boats, and a score of patrol boats, some minelayers, and possibly even two or four submarines under the flag of this satellite, while about 70 local fishing boats have also been armed for harbour duties.

The navy of South Korea is, however far stronger and better trained.

Finally there are a few patrol boats and river launches in the People's Republic of Viet-Minh.

Relations in the Mediterranean are somewhat more complicated.

Albania, the only "true" satellite, had, for about 10 years, only a few patrol boats, motor torpedo boats, minesweeping launches and other small craft, mostly of Italian origin, plus some vessels handed over by Yugoslavia before the dispute of 1948.

These laid the mines that caused the loss of two British destroyers shortly after the war. Albanian ports, however, were insufficiently developed to permit the maintenance of stronger naval forces.

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The oft-mentioned island of Sasseno was far from being the "Red Gibraltar" and no submarines, except perhaps some pocket submarines, were based there. In the last few years, however, the Soviets have been making great efforts to improve the Albanian harbours and bases.

A floating dock has been towed there, coastal batteries and airfields have been built, and a naval mission installed. Soviet naval forces have started to pay visits to Albanian ports, and some more small craft have been stationed there, some of which are Russian manned. Although the value of the Albanian bases and the strength of the naval forces there — above all the submarines — is generally grossly overestimated by Western press reports, it seems quite possible that the Russians will, in the near future, base a naval squadron on Valona and other ports.

Two more countries have purchased Soviet warships and accepted Russian naval missions and visits.

Egypt has bought two modern destroyers, four minesweepers, four submarine chasers, some motor torpedo boats and three or four submarines, while another three submarines may soon follow.

Although Egyptian ships' companies have been trained in Russia and Poland, it would be unfair to call Egypt a satellite; but the impression prevails that Egypt does not fully realize how dangerous it is to "ride a tiger."

Even more alarming is the case of Syria, with a strong leftist party in power, which has already bought some motor torpedo boats and patrol boats and intends to acquire two submarines as well.

The danger to the West in these acquisitions lies less in the strength these navies have thus gained, than in the fact that the Soviets have penetrated these countries, and in the propaganda value for the Communist cause.

Yugoslavia does not like to be considered as a satellite; but while its politics between 1948 and 1955 were perforce, if not pro-western, at least anti-Russian, things have again changed since 1956. Tito's behaviour during the Hungarian revolt, his help to all subversive causes, the fact that he no longer wishes to receive any allied war material, all show clearly that what we may expect from Yugoslavia is at best unfriendly neutrality.

It was, therefore, a mistake to strengthen the Yugoslav Navy, because if the N.A.T.O. powers between 1948 and 1955 had some reason to help Tito to build up the army which might have to fight the Russians and other satellites, there certainly existed no sound reason to transfer warships to the Yugoslavs, as a Russian attack from the sea was impossible.

The Royal Yugoslav Navy put up a very poor show in 1941. Only one submarine and two motor transport boats escaped to serve the allied cause, while the rest of the navy, with the exception of one destroyer blown up by two officers, surrendered to the Italians.

After the war Yugoslavia received from Italy three torpedo boats, some minesweepers and auxiliaries, refloated another Italian torpedo boat as well as a submarine, recovered a few small vessels of the former Royal Yugoslav Navy and acquired eight U.S.-built motor torpedo boats.

Since 1948 Yugoslav yards have delivered about 20 minesweeping launches, a dozen or more patrol launches, about 50 motor torpedo boats and a score of coastal transports and tankers while a large destroyer, building since 1939, is still under construction.

This naval force seems strong enough to deal with the few Albanian launches and with any mines Soviet aircraft may drop off Yugoslav ports.

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Nevertheless, the N.A.T.O. powers have felt that it was not enough and have transferred, since 1955, one modern coastal escort vessel and three inshore minesweepers to the Yugoslav Navy, which also purchased in 1957 two wartime-built British destroyers. Opportunist as the Yugoslav policies are, it would have been reasonable to give these ships to a more reliable ally.

While all Soviet satellites, except Finland, have stronger navies today than before World War II, their united tonnage amounts only to about 10 per cent. of the Soviet Navy.

The Russians clearly intend to allow no misunderstanding about who rules the waves of the Communist world.

It is interesting to note how the satellites have violated the terms of the Peace Treaties of 1947 which limited the strength of their naval forces in tonnage and in manpower and which forbade the possession of submarines and motor torpedo boats.

It is obvious that these violations of the Peace Treaties were committed with the full approval of the Soviet.

None of the satellite navies will be able to wage anything like an oceanic war or to make a bid for "sea power," even if it is only in the Baltic or the Black Sea.

But these coastal forces should be able to defend their own littoral and to provide inshore escort and minesweeping forces, relieving the Soviet Navy of these tasks.

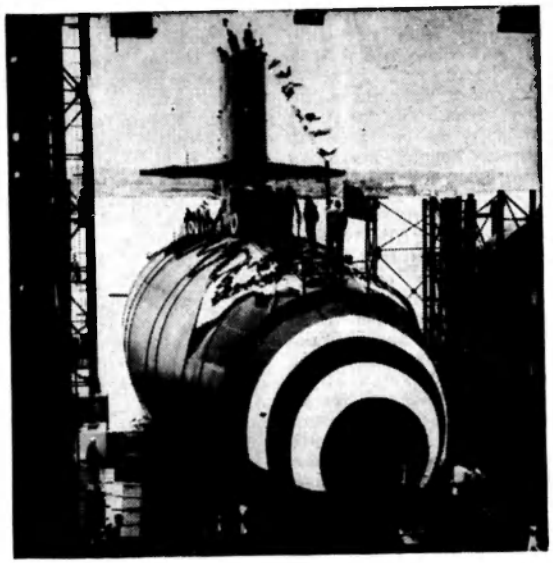
They may also clear such rivers as the Danube or the Oder of mines, and make themselves useful in many other ways to the Soviet Russian cause.

Morale and fighting spirit of the European satellites may, however, prove very weak, and they may soon become a liability to the Soviets, rather than an asset.

(From the London "Navy")

ROCKETS FROM UNDER THE SEA

By MAJOR OLIVER STEWART, M.C., A.F.C.



The U.S.S. Skipjack, first of a new class of nuclear submarines that will achieve unprecedented underwater speed and manoeuvrability, splashes into the Thames River from the shipyard of General Dynamics Corporation's Electric Boat Division, Connecticut, U.S.A.

ONE proposition will receive almost universal acceptance from both military and naval authorities. It is this: other things being equal, mobile rocket bases must be superior to static rocket bases. If appropriate launching pads for ballistic missiles can be moved from place to place and brought into action quickly on any new site they will be less vulnerable than if they were static. It is one of the oldest axioms of war that mobility is the master of everything else and it was knowledge of this axiom that led Members of Parliament and others to criticise the plan for basing American rocket missiles in Britain.

The intention, so far as it can be ascertained from the White Papers and official statements, is to set up a number of rocket stations from which missiles—at first American, later British—could be launched. Now the world's first sophisticated ballistic missile, the German V2, was mobile.

It could be put on a special road conveyor and could be set up for launching at any point. It is sometimes said of the more highly developed missiles of the present time, however, that they require a most carefully prepared base with a fixed launching pad and that they cannot be moved from place to place when they are in operational use.

On the other hand, the Americans declare that Polaris, the solid fuel rocket, is intended for launching from submarines. In other words, this rocket is highly mobile.

Nothing has been said about how much, if at all, its accuracy suffers from the elimination of a precision constructed, static launching pad. Here military secrecy, as in so many matters of modern defence, makes it difficult to reach final conclusions.

If it be accepted, however, that the Americans are justified in their claims for Polaris it must be concluded that some kinds of ballistic missiles can be operated from a mobile sea-going base. And that fact seems to me to be of the highest importance when our future defence planning is being considered.

For here is another military axiom: that the shorter the range, the greater the accuracy and the greater the force with which the enemy may be hit.

The Royal Air Force stand-off bomb is based on this contention for it is nothing other than a bomb so designed and constructed that it can be delivered from closer range than could any form of ground-to-air missile. The bombing aeroplane carries it to a point as near to the target as the defences will allow and then sends it on the rest of its journey alone.

All talk about the "ultimate" weapon has omitted to take these fundamental facts into account. For an "ultimate" weapon capable, for example, of working at a range of 5,000 kilometres, will become a more accurate and a more powerful weapon (a more "ultimate" weapon!) if it works at a range of 2,000 kilometres.

After all, the marksman hits the target harder and with greater accuracy as he shortens the range. It seems so absurdly obvious that it is the more puzzling that all consideration of the point should have been avoided or evaded when modern methods of defence were being discussed.

Probably a reason for the neglect of this basic fact of ballistics is that the thermo-nuclear war-head is now thought to be so potent, so destructive over a wide area, that it will always have all the striking power that is required no matter what the range and that accuracy is no longer necessary because of the immense area covered by a single explosion.

A logical case can be made out if this idea be accepted. If any future attack is to be entirely indiscriminate and if all thought of the relative importance of different targets is to be set aside, perhaps range no longer plays the part it has always played in the past.

Perhaps the attack would be effective if it were simply directed against a county-size target. Such a sweeping conception, however, rules out the limited war and makes nonsense of all the work that has been done to develop the smaller, more restricted kinds of atomic war-head.

Ten thousand times it has been shown that the fixed gun position is vulnerable. No matter what concrete and other protective materials are used; no matter whether the emplacement be sunk under the ground, or how it may be concealed, human ingenuity always has and always will find a way to spike the guns in a static base.

The static base is an illusion. The mobile base is the only kind that remains effective when a battle is joined. It follows that for the defences of Great Britain by means of ballistic missiles, the objective should be, not to set up enormous and expensive bases on land, but to use the mobile bases provided by ships at sea.

If ballistic missiles are, indeed, being developed without reference to their mobility, it is a major error. The statement in Parliament that a British missile is being studied which will be launched "from underground" does not inspire confidence; it does exactly the opposite.

Finally, I would like to carry the argument one stage further. By taking its weapons nearer to the target the military vehicle improves the effectiveness of those weapons; but the military vehicle's own vulnerability is increased as it moves nearer to the target. Consequently the closer it goes to the target, the greater the defensive powers it needs.

When it is decided to launch an earth satellite, different stages are used in the process of acceleration towards the orbit. Each rocket contributes its bit and is then discarded until finally the "payload"—the instrumented satellite—completes its journey to the orbiting range alone. It is not too fanciful to see a similar staging process in the employment of rocket weapons. The initial stage of the journey to the target would be by ship; the second stage would be by ship-borne aeroplane and the final stage would be alone.

Thus the aircraft - carrying ship would, in effect, start the weapon on its way and cover some of the distance; the aeroplane would take over and cover more of the distance and, finally, the weapon itself would finish the job. The ship-borne, missile-launching aircraft becomes, therefore, a mobile launching platform.

Such ideas must be partly speculative because of the limitations — already referred to — imposed by military secrecy. But at least it is known that atomic weapons can be carried by some ship-borne aircraft. And it must follow that they can be divorced from a static base. The ship and the aircraft are mobile bases capable of offering a measure of resistance to attack.

(From the London *Navy*.)

OPERATION "POP-UP"— A dummy Polaris intermediate-range ballistic missile rises from the sea near Los Angeles after being fired from a stationary cylinder beneath the surface in a test of the launcher designed for the U.S. Navy's nuclear-powered ballistic missile submarines now under construction.

The U.S. Navy has revealed that it has another new missile near the production stage. Called "Subroc", the weapon will be fired through a submarine's conventional torpedo tubes from beneath the surface at targets 25 to 50 miles away. The Subroc will also rise into the air where rocket engines will carry it to the vicinity of the target; there it will dive and become a homing torpedo seeking its prey. It is capable of carrying a nuclear warhead.

The first Dependants' Day held outside Sydney Harbour by the Royal Australian Navy took place on June 20 on board H.M.A.S. Quickmatch. Seventy people—wives, parents, friends, and children of the crew—were taken 15 miles off shore on an exercise Miss Sonya Pearson (left) and Bruce King, 14, found the 4 in. guns too noisy.

THE NAVY TO-DAY

By DONALD BARRY — in London

THE emphasis in all spheres of defence is twofold: to align our forces to the strategy of the nuclear missile age and to make an equitable contribution to the collective defence of the free world.

The combined effect of these twin purposes is to create a situation more revolutionary than military history has recorded and to leave no yardstick by which to measure our national strength. A war of the future could be just as different from the last one as that was from the Napoleonic Wars.

For several years Parliament has been hesitant about committing itself to the full implications of this new order, particularly as it affects the Navy. This year, however, the Government is more specific. In face of Russia's successful launching of artificial satellites and evidence of remarkable progress in rocketry, the Minister of Defence has declared that if Soviet forces ever launch a major attack on the West, even with conventional arms only, the free world will hit back with strategic nuclear weapons.

The West will never start a war of such fearfulness; the aim is to prevent war, with nuclear weapons a deterrent force. The Minister's statement, however, officially reinforces the accepted belief that in a global war of the future the ultimate weapon

STRENGTH OF THE R.N. FLEET
(Estimated strength during the coming year, excluding Commonwealth strength)

TYPE OF SHIP	In Commission	In Reserve, extended Refit, or undergoing modernisation or conversion	TOTAL	Under Construction in the U.K.	Ordered	REMARKS
Fast Battleships	—	1	1	—	—	
Carriers	4	5(a)	9	1(b)	—	(a) "Triumph" to be converted to repair ship.
						(b) Plus one hull—work suspended.
Cruisers	7(c)	8	15	3(d)	—	(c) Includes "Cumberland", Trials Cruiser.
						(d) "Tiger" class.
Guided Weapon Ships	1(e)	—	1	—	4(f)	(e) "Girdle Ness" for testing missiles.
						(f) G.W. destroyers ordered.
Fast Minelayers	1	2	3(g)	—	—	(g) "Apollo" class. There are also some smaller minelayers.
Net Layer	1(h)	1	2	—	—	(h) "Protector" employed in Antarctic.
Destroyers	26(j)	30	56	—	—	(j) Includes "Darings".
Despatch Vessels	2	—	2	—	—	
Frigates	51	54	105	14(k)	11(l)	(k) 2 A/A, 2 A/D, 9 A/S, 1 general purpose.
						(l) A/A, A/D, A/S and general purpose.
Submarines	39(m)	18(n)	57	5(o)	not stated (p)	(m) Includes 1 X-craft.
						(n) Includes 3 X-craft.
						(o) Excludes those not yet launched.
						(p) "Dreadnought" as already announced.
Minesweepers	52	156	208(q)	25(r)	—	(q) 42 ocean, 92 coastal, 72 inshore, 5 others.
						(r) 13 coastal, 12 inshore.
Coastal Craft	7	19	26	4	—	
Landing Vessels	8	14	22(s)	—	—	(s) Tank-landing ships, tank-landing craft. Includes 1 H.Q. ship.
Surveying Vessels	6	1	7	3	—	
Fleet Support	40	48	88(t)	2	—	(t) See note (t) below.

Note (t).—"Fleet Support" covers ferry carriers, destroyer and submarine depot ships, H.Q. ships, repair ships, submarine rescue ships, controlled minelayers, boom defence and degaussing vessels. It does NOT include Royal Fleet Auxiliary tankers, supply ships, tugs, motor launches, trawlers and many harbour craft.

would be the nuclear-armed ballistic missile, with conventional weapons having only a limited place in the scheme of things.

It is now evident that the Navy will have an important role within this new strategy. In view of the potential of the nuclear-propelled missile-firing submarine the striking power of the Navy in future is likely to be equal, if not superior, to that of the other Services.

The development of the Polaris ballistic missile by the United States has had a salutary effect on political thought. This weapon, with a megaton war-head, will be effective when launched from a submerged submarine and it appears likely to defeat any defensive measures so far visualised.

The recent voyage of the U.S. nuclear - powered submarine "Nautilus" beneath the polar ice-cap has also had far-reaching effects, proving the possibility of operating in such latitudes and of firing missiles through crevices in the ice. The strategic value of submarines armed with Polaris would be incalculable, particularly as they would be able to carry more than 20 such missiles.

From the British point of view, in particular, it would be logical to have a sea-based deterrent; one which could be moved about to broad oceans, difficult to locate and attack. This would have obvious advantages over land-based rocket launching sites, relatively easy to identify, fix and attack, and situated comparatively close to populated areas.

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It is against this background that the Navy must now be considered. Parliament, in its wisdom, does not, however, concede that its role calls for a numerically stronger Service. Indeed, the opposite is the case. The hitting power of new weapons, it is argued, will be so much greater than conventional weapons—it has been estimated that one submarine, in one sortie, could cause more damage and casualties than occurred during the last war—that fewer ships will be necessary and fewer men to man them.

By the very nature of the threat, mobility and dispersion become imperative; immediate readiness to meet an assault essential; integration within an international command necessary. No nation of the West will ever again stand alone in global war. They will become more dependent upon one another and less upon their own self-contained forces.

Thus, in line with this policy, the size of the Navy continues to be reduced and as an Opposition speaker who took the trouble to re-read many former speeches on the role of the Navy by Parliamentary Secretaries of the Admiralty said in the House of Commons: "While there has been emphasis this way and the other, there has been one constant factor. At the end of the day we have had a smaller Navy than we had before."

The 1958-59 financial year only too faithfully follows this pattern and in addition to ships and men, dockyards, air stations and barracks have to go, and the run-down is unlikely to end until the five-year programme announced by the Minister of Defence last year is completed.

For the ardent advocates of a strong Navy by accepted standards the Defence and Navy White Papers and the debate on the Navy Estimates make dismal reading. The emphasis is on the future—still a largely unpredictable future of missiles and nuclear propulsion. Conventional forces are of secondary importance.

The emphasis is so pronounced that it appears that Parliament is becoming obsessed by the threat of one weapon: a weapon which, if used, might mortally wound civilisation. It should never be forgotten that the most dreaded weapon of the last war—poison gas—was never used.

The Government recognises, however, that the Navy has responsibilities apart from global war and the deterrent: that it must be prepared for limited war with conventional arms. In such an eventuality the Navy's tasks would be to protect sea communications, escort troops and supply and support ground forces in action. The Government also acknowledges the Navy's traditional peacetime responsibilities to the Colonies and protected territories, the defence of shipping and its contribution to the maintenance of peace and stability throughout the world.

It is with these three main tasks in mind: the contribution to the deterrent and global war, the more conventional requirement of limited war, and the peace-time task of stabilising the world, that the fighting strength of the Royal Navy must be considered.

AIRCRAFT carriers are, as yet, the unchallenged core of the Navy, and striking power is measured by the efficiency of carrier strike aircraft.

The NA.39, now being developed, will be a formidable long-range machine which will give the Navy the striking power it requires. The machine will be equipped to carry nuclear weapons and a devastating array of conventional arms. It is somewhat paradoxical, however, that this may be the last strike aircraft if the missile-firing submarine achieves all that is expected of it in an operational role.

Before the NA.39, the Scimitar single - seat day interceptor fighter, which can also be used in a strike capacity, will take its place in the Fleet. This aircraft will also carry both nuclear and conventional weapons. The first front-line Squadron will be in service in a few months and is expected to embark in H.M.S. "Victorious" in September. The Scimitar, the Navy's first swept-wing aircraft, will replace the Sea Hawk.

After the Scimitar will come the all-weather Sea Vixen fighter. This will be the principal factor in the long-range air defence of the Fleet. It will be armed with rocket batteries and air-to-air guided weapons, including the Firestreak. It will replace the Sea Venom.

These aircraft and the carriers from which they operate will be the teeth of the Fleet in the near future and the carrier's importance will not diminish until the ultimate striking power is wielded by submarines. Even then it may have special anti-submarine and troop support roles. It was in recent years predicted that there would be another generation of aircraft carriers. This may still be proved to be a correct assessment, although, at present, there is a growing belief that H.M.S. "Hermes", now being built, will be the last ship of this type.

The most modern aircraft carrier is H.M.S. "Victorious", which recently emerged, after more than seven years in dockyard hands at Portsmouth, with a fully angled deck, steam catapults, and the most up-to-date landing control system. H.M.S. "Victorious" and H.M.S. "Centaur", now being modernised, are to replace H.M.S. "Ark Royal" and H.M.S. "Bulwark" in the active Fleet and on operational service with them will be the "Eagle" and "Albion". In reserve will be the "triumph", "Warrior" and "Magnificent"—the latter recently returned to the Royal Navy by the R.C.N. — in addition to "Ark Royal" and "Bulwark".

Carrier strength is thus to be nine ships, four in the operational Fleet and five in reserve, with one building — the "Hermes". There is also one hull in existence, but work on this vessel, a small type, has been suspended for many years.

A decision to dispose of other carriers, somewhat casually admitted by the Parliamentary Secretary to the Admiralty in reply to questions in the House of Commons, is a startling surprise in view of the importance of carriers — particularly the smaller type — for trade protection, anti-submarine duties and the role of troop-lifting. The decision is, nevertheless, in line with Admiralty policy of reducing the size of the Reserve Fleet and only retaining important ships in high state of readiness. The ships affected are: "Unicorn", "Perseus", "Glory", "Ocean" and "Theseus".

Readiness for action, mobility and the lessening of dependence on fixed bases are being constantly pursued. It is notable, however, that the intention to have several Task Groups has been dropped. Instead there are to be two main groupings of the Fleet.

DID YOU KNOW . . .

By SCIO

Though rockets had been known at least since 1232 A.D., the first serious scientific work with them did not begin until 1909, when U.S. physicist Robert H. Goddard began experiments to explore extreme altitudes.

A loud shout or a clap of thunder may be sufficient to upset the delicate balance in which millions of tons of snow are held on a mountain. Swiss guides often forbid climbers to utter a word near danger spots.

Bristlecone pine trees growing in California have been scientifically proved to be the world's oldest living things. Called "Methuselahs," one is 4,600 years old.

Responsibilities in the Atlantic and Mediterranean have been combined under one heading and in these areas two carriers are to be maintained with two cruisers, destroyers, frigates, submarines and supporting units. This will not necessarily be a fully balanced all-purpose Fleet, but one competent, with maritime aircraft of the Royal Air Force, of making an effective contribution to the combined forces of the Atlantic Alliance. The carriers will be predominantly equipped with anti-submarine aircraft and helicopters, but with fewer fighter and strike aircraft than is customary.

East of Suez, to enable Britain to discharge her obligations to S.E.A.T.O. and the Baghdad Pact Alliance and to fulfil her own military commitments in the area, more important units than at present deployed will be merged into a balanced all-purpose Fleet. This will include one aircraft carrier with a balanced complement of strike, fighter and anti-submarine, aircraft, a cruiser, destroyers, frigates, and smaller vessels, with support units.

This fleet will also ultimately include a Commando carrier, a ship converted to accommodate a Royal Marine Commando force with sufficient stores and fuel to support the Commando in operations ashore and with helicopters to land men and their vehicles and re-embark them speedily if necessary. The "Bulwark" will be the first Commando carrier and she is to be fitted out for the task of returning from a tour of duty in the Far East. The Commando carrier will enable the Royal Marine Corps to act as a "fire brigade", alert and ready at very short notice to smother hostile incidents in remote parts of the world: incidents which might otherwise blaze into full-scale warfare. This will be a task in the modern style, ideally suited to the traditionally adaptable Corps of "sea-soldiers".

Further carriers similarly employed when necessary could be a most valuable adjunct to Britain's strategic reserve and this poses the question: are we wise to dispense with five carriers suitable for transporting British troops to troubled areas?

Grouped round the aircraft carriers when they perform their newly assigned duties will be ships carrying the latest weapons for dealing with the air threat and with surface and underwater attacks, most of them capable of operating on detached service should the need arise.

These will include the new aircraft direction frigates which, with the air early warning Gannet aircraft, will give the aircraft carriers a far wider "horizon", warning of approaching attack before the ship's own detection devices pick up the enemy. Aircraft direction frigates, such as H.M.S. "Salisbury", will be of considerable importance.

Apart from fighter aircraft, the main defensive punch of the Fleet will come from guided missile ships, four of which have been ordered. They will be armed with the ship-to-air guided missile Seaslug, but in view of a statement that Seaslug may be capable of development as a ship-to-ship weapon these ships may also have a very significant offensive role. The "London", "Hampshire", "Devonshire" and "Kent" — as the four ships have been named— have been discussed in Parliament for three years and have been ordered for some time, but there is still no news of the laying of any of their keels.

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The three conventionally armed "Tiger" class cruisers will be in service long before the guided missile ships. These ships, the "Blake", "Lion" and "Tiger", are now nearing completion and the first one is expected to be finished by the end of this year. They will be fine ships with the most modern quick-firing guns. But the cruiser situation is disturbing. There is news of the intended scrapping of five more ships and a recent admission that the eventual cruiser strength will consist only of the three "Tiger" class ships. The present operational strength has been whittled down to six, and only eight are to be kept in reserve. The 'Cumberland" will be retained as a trials cruiser.

It is to the frigate programme that one must look for the most satisfactory building progress. As Russia's submarine force continues to be a formidable world-wide threat, the Government has decided that the efforts of the Royal Navy shall be concentrated to an increasing extent on the anti-submarine role. The chief requirement of N.A.T.O. forces is more and more anti-submarine frigates.

The programme of converting destroyers into anti-submarine frigates has now been completed and has added 32 speedy ships to the Navy's anti-submarine Fleet. In the current programme of new construction there are 11 frigates, 17 of which have now been completed, and five more are expected to join the Navy during the next 12 months.

In this class the Navy now has 30 ships in operational service, 21 engaged in trials or training and 54 in reserve or dockyard hands—a total of 105.

These ships, with helicopters employing the dipping asdic method of detection, and maritime anti-submarine aircraft, would be the back-bone of N.A.T.O. anti-submarine forces in the event of war.

But while the number of frigates is increasing the total of destroyers, partly because of the conversion of some ships into frigates, is diminishing and none is being built. There are 24 in the operational Fleet, including four of the "Daring" class ships now classified as destroyers, 13 "Battle" class, one "Weapon" class and six "C" class. In reserve or dockyard hands are 30 ships, and two are engaged on training or trials duties. It is surprising that this class of ship, which played such an important part in many actions of the last war, is receiving little attention.

For the reasons explained in the earlier paragraphs of this article, the submarine will undoubtedly be the most important class of ship in the future.

It is to the submarine that Britain intends to apply nuclear propulsion in the first instance, but we are a long way behind the U.S. Navy, which already has three nuclear-propelled submarines in service and many others planned or building. The Royal Navy is not in the race and the Russians are believed to be a few years behind the Americans.

At the time Admiral Rickover, U.S.N., designer of the "Nautilus", visited London recently there were rumours that the "Dreadnought" project was to be abandoned, but this has since been officially denied. A considerable amount of experimental work has been done in association with the Atomic Energy Authority, and a zero energy reactor, known as Neptune, is operating.

From the behaviour of this reactor scientists are working out the basic problems connected with a high pressure water-cooled reactor. At Dounreay, in Scotland, buildings are being erected to house a shore prototype plant and elsewhere the "Dreadnought" is being designed.

With the relaxation of Ameri-

can laws affecting nuclear projects, there has been an exchange of information between the United States and Britain on nuclear sumbarines. This is expected to speed the "Dreadnought" project, but the application of nuclear propulsion to merchant ships will be studied simultaneously, and it cannot be expected that a British nuclear-propelled vessel will be afloat until well into the 1960's.

As the nuclear submarine is being developed work is proceeding in shipyards on submarines of conventional type. Three of the long-range fast battery driven "Porpoise" class vessels are expected to be in service by he end of the year. They will be the first submarines to join the operational Fleet for 10 years.

That the submarine programme is of the greatest importance is not only underlined by the development of Polaris, but also by the following statement of the Parliamentary Secretary of the Admiralty:—

"Great battles for sea supremacy have for centuries been fought on the sea. For a period they have been fought over the sea. It may be that in future the battle will be fought under the sea."

THE past year has produced many new ideas and theories; it has not produced any outstanding tangible developments, and no major warships have now been laid down for many years.

There is, however, a growing realisation, stimulated by the possibilities of nuclear propulsion and Polaris, that the historic maritime strategy of Britain is as effective in modern conditions as ever it was: that the Navy, operating in oceans which cover 70 per cent. of the earth's surface, can be both a deterrent and an offensive force of the greatest significance: that the Royal Marine Corps, with its reputation of being "first in and last out", may prove to be a basis upon which to develop combined operations in the broadest sense.

There are signs that the Parliamentary attitude to the Navy is changing, though as yet this is expressed only in lip service, while the Navy visibly becomes weaker.

"Only last year", Mr. J. P. W. Mallalieu said in the debate on the Navy Estimates, "we deleted from the preamble of the Naval Discipline Act the quotation that it is upon the Navy under the good providence of God that the safety and welfare of the realm do depend. It might be a good plan this year if we put that back".

Perhaps we may more hopefully look to the future.

(From the London "Navy")

NAVY NEWS FROM ABROAD

THE "Scimitar," single-seat day interceptor fighter and strike aircraft, which is expected to be in front-line service in H.M.S. "Victorious" later this year, was recently seen by the Press at the Royal Naval Air Station, Ford, in Sussex, where a Trials Flight of seven aircraft of this type is now based.

This is one of the most important aircraft to be acquired by the Fleet Air Arm, and will immeasurably increase the Navy's efficiency in the air. In its strike role the "Scimitar" will be the first Naval aircraft to be specially fitted to carry nuclear weapons in addition to a wide range of powerful new conventional weapons.

The Trials Flight includes officers who represent a cross-section of age, seniority and experience and, in all, numbers some 16 officers, 46 Chief Petty Officers and Petty Officers, and 72 junior ratings.

The duties of the Flight are to prove the aircraft in its various roles and to evaluate its maintenance requirements, thus ensuring that it begins front-line service ready in every respect for its many duties.

FRENCH TRIALS

The submarine "Argonaute" and the patrol craft, "L'Adroit," underwent their trials last month.

Six minesweepers of the "Mercure" type are to be built in France for the German Navy. The "Mercure," the eighth of the name since 1678, was launched, completed, in February; and for reasons connected with the tides, she was launched at night. She is the first of a new class, a development of the "Europe" boats but entirely non-magnetic even to her engines and built of niamogon wood from the Ivory Coast.

In February, the Fleet Escort, "La Bourdonnais" and the fast Escort "L'Agenais" returned from a month's cold weather trials in Newfoundland and Canadian waters, designed to test the behaviour of ships of these two classes in cold weather. The results were very satisfactory, temperatures down to minus 22 degrees Centigrade being experienced with continual heavy seas. After her return from this cruise, "La Bourdonnais" was accepted into service.

OBSOLESCENT WARSHIPS

The phenomenal rate at which modern developments are making warships obsolete—a continual concern of the Royal Navy—is also a factor which is exercising the attention of other Navies of the world.

More than half of America's Navy will be obsolescent this year, Admiral Burke, the U.S. Chief of Naval Operations, is reported to have told the House of Representatives Appropriations Sub-Committee.

In 1958 more than 450 ships of World War II origin, out of a force of 850 will be obsolete.

The Appropriations Sub-Committee had information showing that America's Reserve Fleet consists of 1,303 ships, costing some £30 million a year to maintain, and of this total 64 were awaiting final disposal, including five battleships, 11 cruisers and 18 escort carriers. Next year it is expected that between 80 and 120 more ships will come into this category.

All American battleships are now in reserve, leaving the Navy without a ship of this class in operational service for the first time since 1895.

Admiral Burke considers that the American Navy has not gone below danger level but could do so if reduced further. His eye is, however, firmly fixed on the future.

He is also reported to have told the Appropriations Sub-Committee that the Navy expects in future to include about 150 ships with nuclear power, surface to air missiles in about 200 ships, and anti-submarine missiles or anti-submarine aircraft on board nearly all combatant ships.

"MAIDSTONE'S" RECORD

When H.M.S. "Maidstone," one of the oldest ships in the Navy, returned to Portsmouth after taking part in the Home Fleet cruise to the West Indies, she paid off after being in continuous service for 20 years.

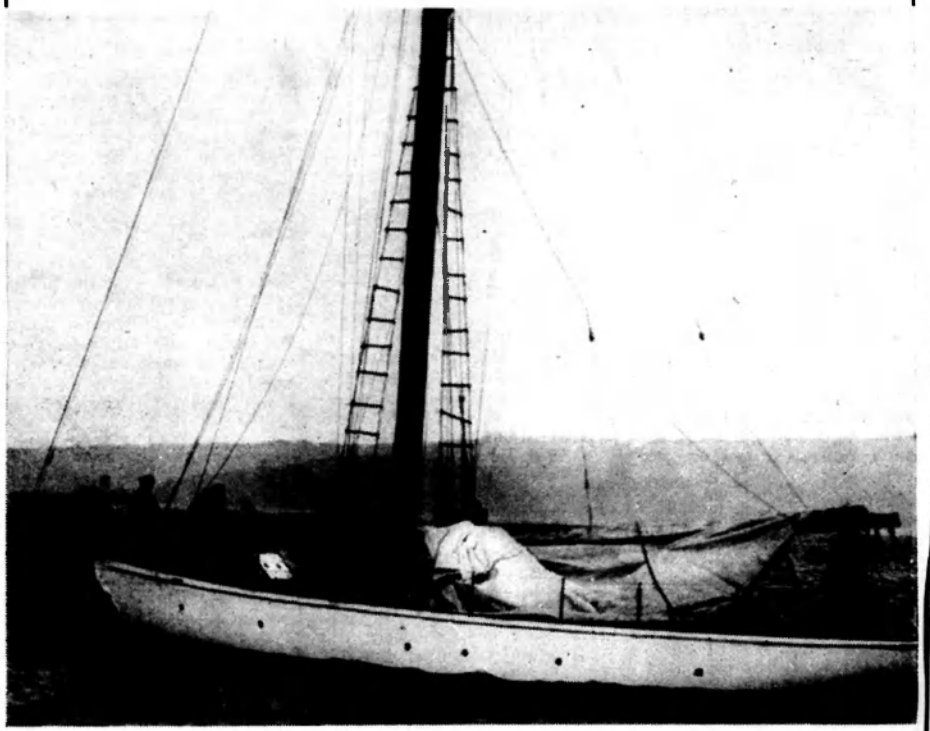
Few ships have had such an extended or eventful period of service.

The commission, beginning shortly before World War II, included historical service in the Mediterranean, where the "Maidstone" was the depot ship for famous submarines which harassed enemy lines of communications and sank nearly 400,000 tons of shipping.

One of the most famous of the submarines mothered by her was the "Seraph" which put General Mark Clark ashore near Algiers to contact French authorities before the North African landings.

The "Maidstone" was visited by Sir Winston Churchill, in 1944, and shortly afterwards she left for the East Indies and the Pacific to take part in the War in the Far East.

DEATH, DAMAGE IN STORMS



STORMS and heavy seas last month brought tragedy and damage to Sydney yachtsmen.

On June 30 one of Australia's best-known yachtsmen, Mr. Ronald Robertson, 55, was lost overboard from the yacht Kurrewa IV in mountainous seas three miles o.. Sydney's North Head.

Mr. Robertson was sailing master of the yacht, which he was bringing back to Sydney after taking part in the Cruising Yacht Club's annual race around Bird Island.

The picture above shows Kurrewa IV limping into Watson's Bay, Sydney Harbour, to land two members of the crew who were injured about the same time that Mr. Robertson was swept overboard by a wave which engulfed the yacht.

The seas were so great that the pilot steamer, Captain Cook, which put to sea to reach Kurrewa IV, had to give up the attempt just outside the heads.

The crew of the yacht had spent an hour searching the area for Mr. Robertson, but with their sails in shreds and the heavy seas breaking over the yacht they had to seek shelter.

The 57-ft. cutter Solo was forced out of the Sydney-Noumea yacht race last month when a 50 m.p.h. squall snapped the boom and almost capsized her. The photo. shows the broken boom after the cutter returned to Sydney under power. "The boat laid over more than 45 degrees," said her owner-skipper, Mr. Vic. Meyer.

SATELLITE IN ORBIT

An A.B.C. talk by B. S. THORNTON

A SUITABLE orbit for a satellite is a nominal circle some hundreds of miles above the earth. Unavoidably, errors in the velocity and angle of firing from the launching rocket result in the orbit becoming elliptical; and the position of nearest approach to the earth could be about 200 miles, while the greatest distance could be about 1,500 miles.

Even at these great heights the resistance caused by sparsely distributed air molecules is sufficient to affect the satellite; very gradually, it spirals into the atmosphere — its lifetime of circling coming to a fiery end.

A satellite in a 300-mile orbit circles the earth approximately every 90 minutes and has a lifetime of perhaps some years.

If the orbital height were only 200 miles instead of 300, the air resistance would cause the satellite's lifetime to be only 15 days.

At a height of 100 miles it would not complete even one circuit of the earth. This is because of the air density.

At a height of 300 miles each cubic inch of space through which the satellite passes contains only one-millionth of one-millionth of the amount of air in each cubic inch of air at sea level.

The satellite circles the earth every 90 minutes, which means that the satellite collides with three ten-thousandths of an ounce of air in every circuit.

It would, perhaps, seem natural to think that the air resistance involved, although very small, will cause a very gradual but, nevertheless, finite slowing down of the satellite. But you will probably be surprised to hear that it effectively causes the satellite to speed up, not slow down, and yet Newton's Laws of Motion are not violated!

The apparent anomaly is explained by the related mathematical fact that the speed in a circular orbit is inversely proportional to the square root of the radius of the orbit.

This simply means that if we reduce the radius of the orbit the speed will increase at the lower height.

On meeting air resistance the satellite loses altitude and as it spirals down its speed increases until it comes into denser layers of air, where it burns up like a meteorite in a very short time.

The Americans have made their launchings in Florida, inclining their satellite orbits to the earth's equator at about 40 degrees, so that the satellite is observable over those regions of the earth where the density of scientific population and observing equipment is greatest. This inclination of the orbit to the earth's equator remains constant as the earth itself rotates.

The Florida site chosen enables reasonable advantage to be taken of the earth's own rotational velocity, which, at Cape Canaveral, is 1,340 feet per second. This provides the launching rocket with a small but helpful initial velocity. Also, launching over the sea from this base provides an important safety feature.

If a rocket is fired vertically it climbs to a certain altitude and then falls back to earth, landing quite close to its launching site.

To make a rocket reach a distant target after a vertical take-off it must be tilted in flight after it reaches a certain height above the ground. Using this means a rocket which could reach a speed of 17,460 m.p.h. could be made to coast half way around the globe after the power cut off before it strikes the earth.

By increasing the final speed before power cut-off by only 40 m.p.h., its coasting path would match the curvature of the earth and the rocket would still be falling, but falling around the earth.

If its height is great enough for the air resistance to be extremely small the rocket will continue unaffected in its path for a long period. This is because the gravitational force acting on it in its circular path is acting inwards towards the centre of the earth while at the same time a centrifugal force is acting outwards, due to the rocket's curved path. These two forces balance when the rocket's speed is 17,500 m.p.h.

The desired path of ascent into this orbit is called the "curve of synogy" or "curve of combined action", which simply means the optimum path of combined action both in a vertical direction to achieve the required height and in a horizontal direction so that the satellite will commence its orbit parallel or nearly parallel to the earth's surface.

It can be appreciated that to achieve an orbit very precise arrangement and timing must be made in the launching system both on the ground and in the ascending rocket containing the satellite.

To obtain the required speed of nearly 18,000 m.p.h. parallel to the earth's surface at a height of 300 miles, it is necessary to use a rocket of at least three stages.

Information for guidance of the rocket is obtained from sensitive apparatus somewhat similar to, but much more elaborate than, an aircraft automatic pilot contained in the rocket.

It consists of three gyroscopes giving the direction of the three main axes, and uses a small electronic "brain" to perform calculations on in-flight information regarding speed and position, and sends the results to appropriate controls in the rocket to keep the pre-determined course necessary for a successful satellite launching to within a fraction of a degree.

Once in orbit a satellite makes possible observations of an astronomical and physical nature which are ordinarily denied us by our atmosphere.

It enables studies to be made of the atmosphere itself and of radiations from the outer reaches of space. It is desirable to put the satellite into an orbit so that an unobstructed view of space is obtained, and from it we can study radiations from the sun and stars in their full range; we can study cosmic rays before they are absorbed and modified by the earth's atmosphere; and we can study the magnetic field of the earth at great heights, with emphasis on any modification by currents in the conducting ionosphere above the earth.

Some other studies will be on the density of atoms and ions in inter-planetary space and the density of dust and meteors in space.

To enable most of these studies to be conducted the satellite should be in an orbit as high above the earth as possible.

From the various types of measurements which can be made will come new and better information on the true shape of the earth, new and more accurate information on the relative positions of islands and continents, all of which will greatly assist in map making and navigation.

These geodetic measurements, as they are called, are of such great importance that the orbit of the American satellite was planned so that their measurement will be favoured.

Together with other information obtained, the satellites provide us with much useful information concerning the world in which we live.

BULK OIL SUPPLIES FOR NORFOLK IS.

Wearing an aqualung, a descendant of one of the Bounty mutineers will dive into 40 ft. of water off Norfolk Island one day this month, to connect a pipeline linking a tanker with the island's first bulk fuel depot.

Until now, the islanders have had to buy all their fuel in 44-gallon drums, carried in lifeboats from ships anchored beyond the breakers.

The new depot, capable of holding 60,000 gallons of motor spirit and diesoleum, has been completed by B.P. Australia, which has also installed the island's first petrol pumps.

The first shipment of bulk fuel will make the 930-mile trip from Sydney to Norfolk Island in the Norfolk Whaling Company's tiny tanker "Forso".

When the "Forso" reaches the island, the aqualung diver will connect a 100 ft. length of specially designed rubber hose to a 600 ft. galvanised iron pipeline leading along the sea bed to the storage tanks.

NEW MOTOR VESSEL FOR SHAW SAVILL

Harland and Wolff Limited have completed at their Govan Shipyard the m.v. "Alaric", a single-screw motor-driven cargo vessel for Shaw Savill & Albion Company Limited. The vessel was handed over to her owners on the completion of her sea trials.

The new vessel has the following principal dimensions: Length between perpendiculars, 440 ft.; breadth moulded, 64 ft.; depth moulded to shelter deck, 39 ft.; deadweight (approximate), 9,300 tons; service speed, 17 knots.

It has a forecastle, raked stem and cruiser stern and is of the open shelter deck type with tonnage opening aft.

REVIEWS

FIGHTING SAILOR

"Bless Our Ship". By Captain Eric Bush, D.S.O.**, D.S.C., R.N. (Geo. Allen and Unwin, 21/-.)

Captain Bush's delightful and well-illustrated book kept me enthralled. Written with kindliness, humour and generous understanding, it is one of the most agreeable volumes of naval reminiscence I have read. I do not wonder it has a "Book Society Recommendation."

It is by no means the usual detailed naval biography; but what may be called an episodic record of the highlights of the author's 36 years in the Navy, from 1912 to 1918. And what a career he had!

He earned his D.S.C. as a midshipman of 15 for services at Gallipoli, and was the youngest officer to be so honoured.

He was in the battleship "Revenge" at Jutland, and between the wars saw service in the Baltic and the East Indies with two commissions in China, the last in command of the "Ladybird" up the Yangtse.

After promotion to Commander in 1933, he was executive officer of the "Devonshire" in the Mediterranean during the Spanish civil war. All this varied peace-time service is vividly described.

The outbreak of war in 1939 saw him Captain of the Auxiliary Patrol at Dover, where he took part in the evacuation from Dunkirk, and was awarded the D.S.O., though he omits to mention it. In June, 1941, he commissioned the new cruiser "Euryalus" at Chatham, and this started what was undoubtedly the most eventful period of his career, in Admiral Vian's 15th Cruiser Squadron in the Mediterranean.

Captain Bush was later one of the Naval Assault Commanders for the landings in Normandy, and afterwards commanded the "Malaya" while bombarding in the same area. He ended war service Chief of Staff to the Flag Officer Force "W" engaged against the Japanese on the Arakan coast of Burma.

His last appointment before retiring in 1948 was in command of the "Ganges", the Boys' Training Establishment at Shottley.

In all, during the war, Eric Bush was awarded the D.S.O. and two bars. Since a bar to the D.S.O. indicating a second award was established in 1916, two bars have been granted to no more than 132 officers of the Fighting Services: and three bars to 17.

This record of a gallant seaman is pleasantly and modestly written, and above all shows his intense pride in his chosen service, and his concern, respect and affection for those with whom he served, officers and men.

"Bless Our Ship" is greatly to be commended.—Taffrail.

COMMERCE RAIDER

"Lonely Command". By A. A. Hoehling. (Cassell, 15/-.)

The exploits of the German cruiser "Emden" during the first World War are largely forgotten now, and Mr. Hoehling has done us all a service in recalling her adventures to our mind. That her brief career was spent in the somewhat unheroic and unedifying occupation of commerce raiding is no reason for failing to recognise the immense amount of trouble which she caused before she was finally brought to book.

Mr. Hoehling has written this book with much zest and verve, and has extracted the last ounce of excitement out of the story.

Some of his descriptive writing has rather less of a nautical flavour than one might expect in a book of this description, and one suspects that the author has little knowledge of warships and the life aboard them. Yet he has managed to write a lively and interesting story, and his description of the "Emden's" last fight with the "Sydney" off the Cocos-Keeling Islands is a vivid one.

Although the book, looked upon in the light of a contribution to the naval history of the first World War, must be considered a lightweight, it is yet a very readable account of a remarkably successful ship. —R.T.

A GERMAN HANDBOOK

"Weyers Flottentaschenbuch. 1958". (J. F. Lehmanns Verlag, Munich, 32 DM.)

This highly condensed and well illustrated 350-page record of the world's warships, which first appeared in 1900, is now in its 40th edition—and if Korv-Kapitän Bruno Weyer could now see how splendidly his original "Taschenbuch" has developed he would, indeed, be satisfied.

Its outstanding feature is, of course, the wonderful all-to-scale silhouettes which are the principal means of ship identification—there are also a wide range of photographs of pocket-book size, but these are more or less of an adjunct to the stippled-line portraits which are absolutely correct down to scuttles.

The text is a triumph of columnised condensation whose compilations must be a nightmare to both editor and typesetter, and the pages of class pendant numbers with their names—the U.S.A. section runs to 11 closely set four-column pages—render recognition easy when the ship's number can be seen.

For those who would turn to a reasonably priced naval handbook this little manual will be welcome. The German text should not prove much of a drawback, and the metric system is covered by the conversion lists at the end.

It is compiled by Alexander Bredt with silhouettes by Erich Groner, whose names guarantee accurate and painstaking work. —O.P.

SURVEYING THE WORLD

"'Challenger', the Life of a Survey Ship". By Captain G. S. Ritchie, D.S.O., R.N. (Hollis and Carter, 30/-.)

The story of the Surveying Service, that branch of the Royal Navy which is responsible for charting the seas all over the world, could never be dull; and in the hands of Captain G. S. Ritchie it becomes an adventure story of real life.

An ocean chart has a fascination of its own, but the means used to obtain the data on which it is based and the hardships endured by the men who compile it are little known.

In these pages we are shown how the Survey Ship "Challenger" undertook her extremely useful task in every sort of climate, from the snowy half-light of Labrador to the coasts of Africa, from the great depths of the Tonga Trench—no less than 5,675 fathoms—to the defences of the Icelandic fjords.

In the course of her travels the crew of "Challenger" came across people of all kinds. Commander Baker had to deal with a certain Renatus, an Eskimo who was defying the forces of law and order.

"Do you know of God?" asked Baker. Renatus replied that he did. "Do you know of King George?" Renatus answered that he had seen his picture and knew of his power.

"Well", said Baker, "I come next after him".

Renatus was much impressed and, turning from his reprehensible ways, became very useful as a builder of snow houses.

In the West Indies an officer was being hampered by a crowd of women, anxious to be photographed, who were peering into the object end of the theodolite telescope. When told them that he saw them all upside down there was immediate consternation, except on the part of one large "mammie" who loudly exclaimed, "I don't mind; I'm not like you common women — I wear drawers".

"I am so glad", says Vice-Admiral Sir Guy Wyatt in the preface, "that Captain Ritchie has written this book", a sentiment which many others will echo —H.B.

POTTED HISTORY

"The History of the British Navy". By Michael Lewis. (Pelican Books, 3/6.)

To compress the history of the Royal Navy within 274 pages of a Pelican Book is a tremendous achievement by any standard. To do so with the comprehensiveness with which Professor Lewis gives to the story is all the more remarkable.

The straight history of the Royal Navy, its world-wide operations, its victories, its defeats, is a much-told tale. But far more than that is needed if the story is to take its place in history.

It is not so much the "what" of naval history that matters as the "why", and it is the political and diplomatic background of the time that alone can bring the naval story into true perspective. And at this, Professor Lewis is a past-master. He has the knack of words, of those deft, illustrative touches which can crystallise the "why" in a vivid little picture.

There are a few small errors of fact, but none so important that it blurs the clarity of his story. Indeed, for the hurried reader who has not the time to spend upon such historians as Corbett, Richmond, and Mahan, the great triumvirate of naval historians in the grand manner, Lewis's little book is the answer. Inevitably in compression such as this there is over-simplification, but none the less the picture which emerges is satisfyingly complete.—A.J.T.

For Sea Cadets

THE UNLUCKY FRIGATE

By KEN LOMAX — in London

STRADDLING his legs on the cockpit grating of the pitching lifeboat, Coxswain William Gammon peered ahead through the blackness of the October evening. The south-west gale was strong on his back, flattening his dripping oilskins across his shoulders and hurling sheets of stinging spray over him and his crew.

Every few minutes squalls of hail bombarded them with icy missiles, clattering on the decks and rolling about in confused patterns before the next sea swept them over the side.

As the boat barged into the waves she shook herself and seemed to draw back to take another breath before thrusting her bow forwards once more. The heavy, breaking seas were confused and angry, reaching out as though to engulf the lifeboat and the men who manned her, then falling back as she rode high to each wave crest, sullen, resentful, preparing to strike again at this small craft which so contemptuously dared the boiling waters.

The men stared into the night, shaking the spray out of their salt-rimmed eyes, searching for the unlucky ship which had called for help; and she had been most unfortunate, they knew.

It was the Cheboque they were seeking — a Canadian frigate. Eleven hundred miles from the British coast, out in the Atlantic, she had been torpedoed; one of her crew of forty-three had been lost and she had suffered serious damage to her stern.

Fortunately she had not sunk — they were tough, these frigates in spite of their slender lines and thin plating — and she had been towed by another vessel to an anchorage in Swansea Bay.

It seemed as though her long peril had been ended, the other ship passed on her way over the war-torn oceans; but the gale had blown up suddenly and the Cheboque began to drag her anchors. The wind howled out of the south-west, playing with the helpless frigate like a cat with a mouse, and she sent out a call for help.

Gammon thought of the men on the frigate. What rotten luck they'd had. He could imagine their feelings, that long tow on board the damaged ship, in waters where every wave might hide an enemy submarine; it must have been like sitting on top of a powder barrel watching a lighted train creeping ever closer. And then, when they should have been able to relax in safety, the old enemy — the sea — had taken a hand.

He collected his wandering thoughts when he heard a shout from Thomas Ace, the bowman. "Something over there, Will, on the Port Talbot bar. Can't make it out properly ———"

AWARDS TO A.S.C.C. OFFICERS

Cadet Forces medals have been awarded to Sea Cadet Commander L. E. Forsythe and Sea Cadet Lieutenant D. J. Mort.

The coxswain gazed in the direction of the man's pointing hand. Was that something out there in the darkness — a slightly blacker patch in the darkness of the night? He gave the wheel a couple of spokes and brought the lifeboat closer in to the sand.

It was the Cheboque, all right, so smothered in the seas that it was almost impossible to see her. She was lying close to the bar and the coxswain could see that her stern was already aground. He switched on the searchlight and played it over the wreck.

The frigate seemed to be crouched down on the sand and the spray flickered silver in the light as the seas broke on her sides and sent shimmering droplets of water sailing over her superstructure. The hail, lashing down more frequently now, blotted her out for minutes at a time as it hissed into the water. As Gammon brought the lifeboat in, he could see figures clustered on the frigate's bridge, and he heard the hiss-ss as an officer switched on the loud-hailer and blew into the microphone to see if it were alive.

"Boat ahoy. Captain here. Can you take all my crew off?"

"How many are there?"

"Forty-two; repeat, four two. What do you say, Cox'n, can you take them all?"

Gammon thought quickly. It would make the boat badly overcrowded; at the same time it was probably the only chance the men would have of being rescued. If the frigate broke up during the night ———

He shouted back, bawling through the deafening noise of the wind and sea. "Yes, I can take them if they keep their heads."

But he was far from feeling the confidence his words implied; he knew that it would be a tough job. It was obvious that he could not anchor to windward and drop down to the frigate on the cable as he would have fouled the frigate's two anchor chains; it was equally useless to fire a line across and rig a breeches buoy as they could never have hauled the shipwrecked crew to safety through that surf. As Gammon gazed at the wreck he realised that there was only one way — he would have to take the boat in.

He spun the wheel in his hands and brought the boat stern to the wind and headed for the surf. He saw the startled looks on the faces of his men as they realised what he was doing, but he only grinned at them through the darkness.

As they slid past the frigate they could look down at her streaming decks as they rode on a wave; the next minute they were level with her waterline as the lifeboat slammed down into a trough. Then they were past and heading dangerously for the shore. The coxswain gauged the distance, and as the boat lay between two crests he hauled the helm over and spun her round on her heels, heading up into the gale and coming alongside the wreck. A continuous stream of engine orders fell from his lips as he eased the boat close enough for the men to jump.

The bows of the frigate were swinging in the wind and Gammon found that he could not keep the lifeboat alongside for more than a few moments at a time — only long enough for two or three men to jump. He was forced to circle and bring the boat in no fewer than twelve times before all the men were on board. One officer missed the lifeboat and fell between the two vessels, but Gammon left the wheel and hurled himself at the man, catching hold of him and heaving him on board.

It took them one and a half hours to complete the rescue, and when they had time to look about they discovered that the lifeboat's chafing rubber — a two inch thickness of tough Canadian rock elm — was crushed, splintered or torn away from the side which had been alongside the frigate; her bows and rubber were also damaged.

They had to return to The Mumbles against the full force of the gale, and Gammon had to nurse the boat all the way so that none of the men would be washed out of her in the heavy seas.

Even when the men were landed the work of the boat crew was not finished for they found it impossible to haul her on to her slipway, and as there was no shelter where she could lie they were forced to make for Swansea.

Their reward was a message sent by the flag officer-in-charge at Cardiff: "Please convey to the coxswain and crew an expression of my appreciation of what must have been a most exceptionally fine and difficult piece of work."

—From "The Sea Cadet" (London).

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BIG SHIP TONNAGE ON ORDER IN U.K.

British shipbuilders have on their books orders worth more than £900,000,000 sterling.

The orders are for 765 ships totalling over six and a quarter million tons.

GERMANY GETS FIRST WARSHIP

The first naval vessel to be built for the Federal Navy in Germany since the end of World War II has been put into commission, and the "Jaguar" has arrived at Flensburg-Murwik as the first unit of the three PT-boat squadron to be stationed there.

She is quite the most powerful motor-gunboat afloat being 138 feet long and displacing 140 tons—about 10 tons more than our "Bold" boats—and carrying a 40-mm. gun fore and aft in a roomy gunhouse with four 21-inch torpedo tubes. Powered by four Daimler-Benz diesels of 3,000 h.p. each she can make her 42 knots.

SEAS BUFFET AMERICAN LINER

HUGE seas, caused by a cyclone centred about 400 miles east of Sydney, caused injury to five passengers on the U.S. liner "Monterey" after she entered Sydney Harbour on July 1.

In less than ten minutes, damage was done to cabins, tables and chairs in the lounges, and galley and dining room crockery. Food was tossed on to the floor and walls.

Stabilisers, which had proved themselves during the rough Tasman voyage, had to be retracted because of the reduced speed at which the liner was travelling in the harbour.

"The stabilisers had carried the 'Monterey' safely and smoothly through two cyclones a few days earlier," the liner's commander, Captain M. C. Stone, said.

"All the passengers were happy until we got through the Heads and made the turn to come down the harbour."

"We were going too slowly to use the stabilisers—they don't operate efficiently at reduced speed.

"We took the precaution of warning everybody, but I guess that after travelling like a floating hotel the passengers just did not expect anything quite like it."

The seas were so rough that the pilot ship, Captain Cook, could not get out to meet the liner, and the pilot was taken on board from a Customs launch well past Middle Head.

The "Monterey's" photographer, Mr. Nick Allen, said he and a crew member were about the only people on deck as the "Monterey" turned broadside to the seas after passing the Heads.

"Because of the stormy crossing passengers had been forbidden to go on deck," he said.

"A row of deck chairs started heading for the side," he said.

"I let go a rail to save them, but instead ended up on the deck."

BIG R.A.N. SURVEY JOB NOW IN PROGRESS

ONE of the most extensive hydrographic surveys ever undertaken by the R.A.N. is now in progress between Darwin and Timor.

The area covers 9,600 square miles, in which are included the dangerous Sahul Bank and a vast number of shoals.

Ships engaged on the survey are the frigates Swan and Warrego and the minesweepers Fremantle and Cootamundra.

Acting-Commander J. H. S. Osborn, captain of the Warrego, is in charge.

The R.A.N. expects the survey to be finished in mid-August.

The survey is part of the Navy's long-term surveying program. For many areas around the Australian coast the only detailed charts available are those prepared by Captain Matthew Flinders and other early surveyors.

So far as is known the Sahul Bank, which has not previously been surveyed, extends from 160 miles north-west of Darwin to 50 miles south-east of Timor.

It is believed to consist of shoals, banks of sand, and coral outcrops covered by water varying in depth from 30 to 96 feet with a general depth of between 210 and 360 feet.

The shoals and banks rise abruptly near the 100-fathom line, which runs approximately parallel to the southern coast of Timor at an average distance of 80 miles.

A depth of only 30 feet was reported in 1915 in a position about 118 miles south-east of the south-western extremity of Timor, and four years later a coral shoal at a probable depth of less than 30 feet was reported about 15 miles north-east of that position.

Because the Sahul Bank has not been surveyed, "The Australian Pilot," issued by the Hydrographic Department of the Admiralty, warns all vessels navigating in its neighbourhood to proceed with caution.

The survey of this area has become necessary because of the increasing volume of shipping traffic that now passes between Australia and South-east Asia.

\+ \+

CANADIAN ESCORT

The destroyer-escort "Huron" has undergone a major refit and re commissioned. Ships formerly classified "frigates" have been reclassified as "frigate-escorts."

The anti-submarine frigate "Beacon Hill" has been modernised after paying-off in January, 1951, and recommissioned. The "New Waterford" has also recommissioned after modernisation by Yarrows at Esquimalt, being the last of the 21 frigate escorts to be rebuilt and rearmed.

A De Havilland Sea Venom makes its final approach over the round-down of an aircraft carrier. The Sea Venom is a two-seat, all-weather, day and night jet fighter now in service with the navies of Australia and Great Britain.

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Fitted with the most up-to-date radar and electronic equipment, De Havilland Sea Venoms form a large part of the fighting power of H.M.A.S. Melbourne, Australia's newest carrier and the largest ship of the Australian fleet.

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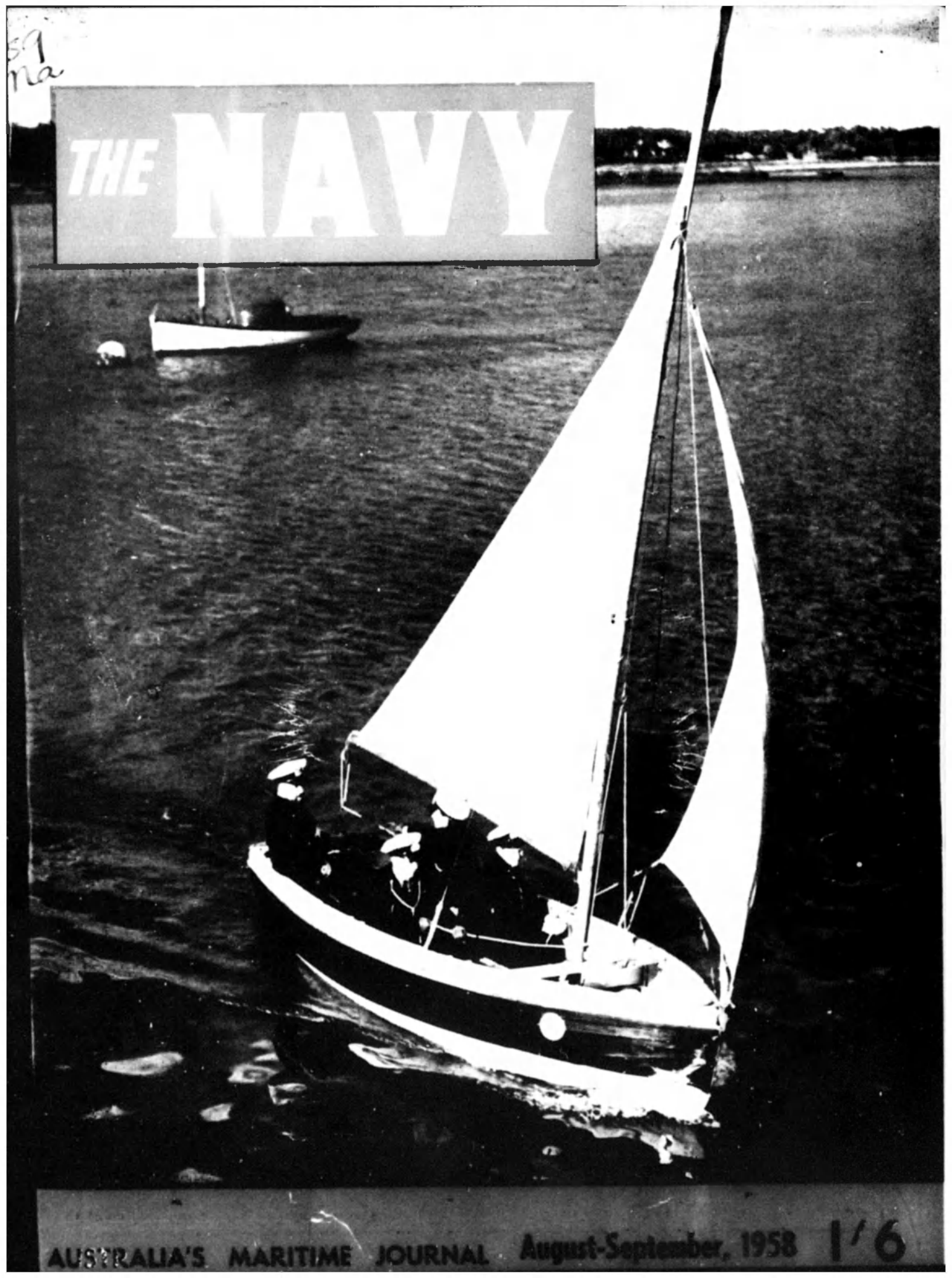
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THE NAVY
Australia's Maritime Journal

An Historic Voyage

THE extraordinary feat of the U.S. atomic-powered submarine Nautilus in navigating under the Polar ice cap will go down as one of the great voyages of history.

In this age of astonishing technical and scientific achievement it rivals—and, according to some opinion, eclipses the Soviet and U.S. successes in putting artificial satellites into orbit around the earth.

Of more immediate significance is the emphasis which the voyage of the Nautilus has placed on naval power.

Those who only a few years ago wanted navies scrapped as being obsolescent in view of the vast progress made with aircraft and the emergence of atomic weapons must now realise that sea-power is far from a spent force.

Just as ships moved from sail to steam they are now moving into the phase of atomic propulsion.

Large, fast submarines with almost unlimited under-water endurance are now seen as the fleet of the future.

Similarly in weapons, the big guns of the battle fleet have given place to guided missiles, fired from surface ships or from submarines deep below the surface.

The navy of the future will thus retain the mobility, flexibility and fire-power which have been its traditional qualities.

The move to under-water atomic-powered vessels is also becoming evident in merchant ship planning.

News from England tells of a proposed 80,000-ton under-water tanker.

The English Mitchell Engineering Group, according to its managing director, has given the "go ahead" to Saunders Roe Ltd. to begin work on the second phase of preparations for the building of this giant submarine.

AIRBORNE RADAR FIRE CONTROL

● A new fire control system incorporating airborne radar which directs a fighter pilot on to his target has been developed in Britain for installation in the English Electric P1B all-weather fighter. The radar is contained in a cone-shaped unit mounted in the principal air-intake or nose of the aircraft, thus offering no extra wind-resistance. It is seen here being mounted in a Dakota aircraft during tests made by the makers, Ferranti Ltd. In a typical interception, ground radar will put a pilot on to the general direction of the target.

● Airpass (Airborne Interception Radar and Pilots' Attack Sight System) will then take over and guide the pilot right up to the target, giving him the figures for the best approach course. He may thus fire at and "kill" an aircraft which he may never see.

BASCULE OF NEW SPIT BRIDGE WAITS TURN

The bascule of the new Spit Bridge (opposite) towers in the background as the old bridge opens to allow the Merilyn, from Adelaide, through. Work on the new bridge is progressing rapidly and it is expected to be completed by the end of the year. The bascule weighs 700 tons, though it will be slightly more when finished, and is 129 ft. long.

FLAGS OF CONVENIENCE

By ROBERT D. ROPNER

President of the Chamber of Shipping of the United Kingdom

IT is most gratifying to day to be able to recotd that there is a growing public appreciation ol the seriousness of the subject ol flags ol convenience. For some time leaders ol the shipping industry had the impression that when they raised the matter they might just as well have been crying in the wilderness.

In both Houses of Parliament (U.K.), in the Press, and in broadcast and television programmes the existence ol flags ol convenience lleets and their significance to a traditional maritime nation such as ours have been analysed and discussed.

We, that is, the shipping industry, now know that there are many men and women in the country who are not indifferent to the threat posed by these tax-free lleets to the prosperity of our own great Mercham Navy.

We know, too, because we have lost no opportunity ol telling them so, that the Government are aware of the facts ol the case.

Let me briefly review just what the facts are.

Filty years ago we owned half the shipping in the world. Today we own only about one-fifth. Other countries have developed their fleets at a much quicker rate than we have—one ol the consequences of the war —and some have started mercantile marines of their own without regard to economic considerations or to the shipping services already available.

But even after two World Wars the British Merchant Navy remained fairly constant in size once it had re-established itself alter appalling losses. The total tonnage may have varied from year to year, but it must be remembered that new ships are invariably an improvement on those they replace, so that either because of larger size or greater speed their cargo carrying capacity is often increased.

Since the Second World War, in particular, British shipping has had to lace the competition not only of the "traditional" maritime nations — which, of course, is fairly and squarely accepted—but also Irom foreign rivals who have registered their ships in countries which have no geographical or traditional claims to be maritime nations. These operators derive great advantages Irom flying the flags of Panhonlib countries, because ol their virtual freedom from taxation and over the past 10 years there has been an enormous amount of new tonnage which can be and is fairly described as "mushroom fleets".

Taxation in these countries is only nominal and one of the consequential advantages of this is that ship-owners find it much easier to obtain finance for building new ships than does the British ship-owner, subject to heavy taxation and uncertainty from year to year as to what the level of that taxation is to be. These Panhonlib countries have no control over the ships registered under their flags—indeed, some ol the vessels may never visit the country whose flag they fly. There is no body of maritime law, nor courts, able to enforce such law as is the case in the old-established seafaring nations and these flag-of-convenience countries contribute nothing to the maintenance of order on the high seas. In other words, they obtain all the advant ges of the lreedom ol the seas without having to shoulder any of the responsibilities.

Let me give some figures which show the gravity of this phenomenon. In 12 years the lleets of Panama, Liberia, Costa Rica and Honduras (the "Panhonlih" tonnage) have grown from 1¼ per cent. of world tonnage to 15 per cent.—half the total world increase for the same period. In 10 years Liberia, from the barest connection with the tanker market, has developed the second largest tanker fleet in the world.

That is the position the the British Merchant Navy has to face. That is the measure ol the competition which, if it can neither be checked nor fought on equal terms, may well prove disastrous to the greatest merchant fleet at sea in the world to-day. I do not exaggerate. We are not an industry merely trying to obtain tax concessions by complaining ol loreign competition. What we are trying to do is to establish some means of fighting this competition on an equal looting. You cannot say of "Panhonlib" lleets and of the British Merchant Navy that "you are all in this togelher". It would be like matching two

boxers of equal weight, but putting one of them in the ring with a hand tied behind his back. We cannot shut our eyes to what the "Manchester Guardian" described the other day as "the real danger that the Red Ensign will be swept off the seas within a decade or so".

Now as to the question of what we can do about the situation. We are faced with rivals who pay virtually no taxation—and can, therefore, more easily afford replacement and expansion—and whose freedom from the tax burden makes it easier for them than for us to obtain finance.

It would be easy to say, "Let us have no taxation on British shipping", but we must be statesmanlike in this matter. What might have much the same effect on our competitive power would be, for example, some arrangement by which all funds set aside for replacement and expansion would only be taxed if used for other purposes.

Again, if it is thought that to fight a battle—in this case an economic battle—the best way is to meet on the same ground. There are parts of the Commonwealth (Bermuda is one) where the virtual tax-free benefits of registration in Liberia could be made available to British owners.

At present there are many terms, conditions, qualifications and difficulties in the way of British shipping concerns establishing companies in Commonwealth countries. There are many dusty cobwebs of regulations to be swept away. And even if they were, we, in the shipping industry, would find it hard to believe that our Government would really prefer that we should be forced to move away from Britain, rather than that they should make the adjustments which would enable us to carry on our fight at home.

—By courtesy "The Navy", (London).

Giants of the Deep Water

ONE of the most striking developments in merchant shipping since the war has been the phenomenal growth in the size of oil tankers. Pre-war a tanker of 16,000 deadweight tons (dw.t.) was considered a monster. By 1950, the majority of tankers were about this size and there were eight others ranging from 28,000 tons to 30,000 tons. We began calling the latter super-tankers.

Now there are over a hundred such tankers in service and, either alloat or on order, are some 90 others even bigger, ranging in size up to over 100,000 tons.

Last November the 85,000 dw.t. Universe Leader entered service as the first of several sister ships. Shortly thereafter, Greek owners placed orders for three ships of 100,000 tons with shipbuilding yards in the U.S.A. and Japan. Then early this year, a further contract was announced for a tanker of 106,500 tons to be built by Bethlehem Steel in America. It is known that this particular yard is already actively engaged in preparing designs for vessels in the 120,000-ton range. A German yard is reported to have received an inquiry from Greek interests for several tankers in the 130,000-ton to 150,000-ton range.

What are the reasons for this rapid growth in the size of oil tankers? The main ones are the great increase in world demand for oil and the change in the pattern of world oil trade which has resulted from the post-war policy of locating new oil refineries in consuming countries rather than near oilfields.

We can see the manifestations of this policy very plainly here in Australia where oil refining capacity increased from less than 1,000,000 tons in 1951 to more than 9,000,000 tons by 1956.

On a world scale this spreading of refinery capacity has caused a change in the pattern of oil distribution by sea. Now, most of the long-distance hauls consist of crude oil in large consignments, whereas before the war, most of this sea traffic was refined products in much smaller consignments.

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Although, of course, costly, a super-tanker is a good economic proposition. An 85,000-tonner will cost about 2¼ times as much to build as an 18,000-tonner but it will carry 4 times as much oil. And not only does the rule apply that the larger the vessel the lower its construction cost per ton of capacity, its operating cost also per ton-mile of cargo carried is lower. Up to a point the requirements of construction material, propulsive power and crew do not increase in direct proportion to the size and carrying capacity of a vessel, but at an appreciably lower rate. This is particularly true of crude oil carriers. Owing to the uniformity of their cargo, they are simpler in design than tankers which are built to carry a number of different petroleum products as regular cargo.

The effects of size alone on the unit costs of tanker construction may be gauged from the fact that, at current prices obtaining in European shipyards, the basic price of a 32,000-ton crude oil tanker works out at £70 (Sterling) a ton and that of a 60,000-ton equivalent just under £60 a ton.

Almost all the super-tankers in service today were launched less than four years ago and the larger ones are still forced to operate for some of the time at less than their full capacities. They are unable to negotiate fully laden many of the world's sea ways, channels and, in particular, canals. Fully loaded they are routed through deeper waters and their cargoes transshipped to smaller tankers for terminal deliveries. Generally, only after a portion of the cargo has been dispensed is a super-tanker able to unload at its regular terminal.

The Suez Canal, which is the obvious tanker route for shipments of Middle East oil, can accommodate ships with a maximum draught of up to 36 feet, equivalent approximately to a tanker size of 42,000 tons fully loaded.

Oil shipments from the Persian Gulf area to the Western Powers are bound to continue to increase. It is estimated that 60 per cent. of the world's proven reserves lie in this area and the enormous increase in production over the past few years is a forecast of an established pattern of potential expansion.

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Up to the time of the Suez crisis most of this oil came through the Canal. Super tankers of 60,000 tons to 65,000 tons can, in partially loaded condition, traverse the waterway. In fact, a lessening of their load by about a quarter of their capacity, to say about 50,000 tons, would be sufficient to reduce the draught to the permissible maximum for safe passage.

In this way a partly loaded 60,000 to 65,000-tonner would be able to carry between 8,000 and 13,000 tons more of oil

through the Canal than a fully loaded 42,000-ton tanker. Furthermore, the tanker could then be sent to an Eastern Mediterranean pipeline terminal for topping up to its full capacity for the remainder of the voyage.

On the other hand, a 65,000-ton tanker can take the longer Cape of Good Hope route and deliver a full load as cheaply as by going through the Canal partially loaded. An 80,000-ton tanker on the same route will realise an appreciable saving in everything except time.

* * *

With the seizure of the Suez Canal, control of the most direct water route for oil shipments to Europe and the NATO nations is now in Egyptian hands. This, coupled with Arab control of overland pipelines, rights-of-way to the Mediterranean could constitute a serious threat to the whole of Western Europe's and the United Kingdom's industrial activity, which is now estimated as being up to 85 per cent. dependent on the expanding oil production of Kuwait, Saudi Arabia, Iran and Irak.

An economically feasible alternative means of keeping up the movement of vitally needed oil supplies is therefore a matter of first importance. The large number of super-tankers under construction and on order will provide Western nations with such a means.

Thus Colonel Nasser's activities and the general unrest in the Middle East have in no small measure contributed towards a secure place in the world's future oil fleets for the super-tanker.

The latest analysis of world tanker fleets compiled by the London shipbroker firm of John I. Jacobs, shows that at the end of 1956, the total world tanker fleet comprised 2,862 vessels totalling nearly 44.4 million tons. Of these, super-tankers in service aggregated 9,640,206 tons and on order 23,569,200 tons. Of the very large total of 960 tankers under construction, more than 620, representing nearly 80 per cent. of the total tonnage, are in the super-tanker class. Comparatively few are larger than 50,000 tons and although it might now be desirable to change many of the orders to larger sizes, available building berths for such vessels are far short of potential requirements.

All the world's major shipyards are solidly booked up to the early 1960's, so it will still be several years before ships of the 60,000-ton to 65,000-ton size enter service in substantial numbers. And it is crude-oil carriers in this range which are favoured because, as mentioned previously, they have the special merit of being equally useful on a cost per ton-mile basis both for the Suez and the round the Cape routes.

However, cost per ton-mile is not the only factor involved in assessing the comparative advantages of different sized super-tankers. Formidable problems are presented in the handling of such mammoth ships both at sea and in port and in the provision of adequate facilities for berthing or otherwise unloading them.

* * *

In Australia, for example, the maximum depth at discharging terminals at Melbourne is 34 feet and at Sydney 36 feet. These correspond approximately to the draughts of a 35,000-ton and 40,000-ton tanker respectively. The Kwinana jetty can take tankers up to a present maximum of 32,000 tons.

Nowhere do we have a dry-dock big enough to accommodate a 40,000-ton tanker.

This means we will not, in the ordinary course of events, be seeing any tankers in the 60,000-ton and above range here for some considerable time.

However, for the purpose of keeping up adequate deliveries of crude oil from our present areas of supply in the Middle and Far East, tankers of a size we can comfortably handle with existing facilities are perfectly suitable. This could only change radically if Australia became a major theatre of war.

Apart from such a contingency, we can assume that consumption of petroleum products in Australia and therefore the requisite deliveries of crude oil from which to refine them, will continue to grow as the nation grows.

* * *

The National Petroleum Council in America recently made a study of the subject of port availability for giant tankers. Their findings show that there are only three loading terminals in the Eastern Mediterranean, two in the Persian Gulf and one in Indonesia at present capable of accommodating 60,000-ton tankers. By the end of 1958 there will be two more in Venezuela and by the end of 1959 another in Indonesia.

As for discharging terminals, the only ones currently available for this size of tanker are San Francisco and El Segundo on the U.S. west coast and Halifax, Nova Scotia.

However, extensive improvements are planned for a number of ports in other parts of the world, including Le Havre, Sete, Fauley and Milford Haven in Europe and the U.K.; at Shimizu and Wakayama in Japan, at Batangas in the Philippines; at Rio de Janeiro; and at Puget Sound, Huntingdon Beach and Delaware Bay in the U.S.A.

Very few of the ports mentioned could handle 80,000-ton to 100,000-ton tankers and the conclusion reached in the N.P.C. study is that a great deal of work is required in the development of ports. In particular, this includes dry-dock and repair facilities adequate for such giants which will become necessary if they are to be operated efficiently.

Reducing the draught of super super-tankers by pumping a portion of their load into lighters prior to entering port is not a generally suitable practice in north-western Europe or any other locality subject to big tides, frequent bad weather or both.

Unloading and loading at sea through submarine pipelines is, however, a development of considerable promise and much valuable work is being done to improve the techniques involved in this alternative method of handling super-tankers.

Whatever the problems involved in the advent of the large super-tanker no effort will be spared to solve them. A measure of the importance of assuring by every possible means safe and efficient transportation of oil from the prolific producing areas to the world's refineries, can be gauged from the fact that on any average day some 12 million tons of oil valued at roughly £110 million are at sea. Oil is far and away the world's most valuable seaborne cargo.

— From "Petroleum Gazette"

250-TON DRAGLINE FOR HARBOUR PROJECT

This 250-ton walking dragline, which was tested at Port Kembla recently, will be used on the new inner harbour project there to dredge rock from the harbour bed. The dragline was made in the United States and assembled on the job. It has a bucket weighing six tons, capable of carrying a seven-ton load.

"Work Study" in Royal Navy

THE Royal Navy's young but expanding "work study" organisation at Portsmouth aims at having twelve teams at work in ships and shore establishments by the end of this year. This will eventually mean: For the taxpayer — the most effective spending of public money by improving the output/input ratio; for the Service—increased operational and administrative efficiency, and for officers and ratings — gradual elimination of unnecessary "chores," with essential routine tasks carried out quickly and smoothly by fewer men.

While experts in this field avoid claiming that their principal aim is to achieve economies — their function, they assert, is to secure maximum efficiency and the best value for money — the Fleet Work Study organisation set up at the Admiralty last autumn under Captain N. C. Willmott, D.S.O., D.S.C., R.N., is, however, able to report a number of initial "gains."

An early success achieved as a result of motion study work by a small combined Naval and scientific team was to increase by 88 per cent. the number of rounds a minute fired by a twin 4-inch anti-aircraft gun, while reducing the gun crew by 23 per cent.

One of the four existing teams (others are in training), each usually consisting of two Lieutenant-Commanders with a Chief Petty Officer as a recorder - analyst, investigated the problem of the time taken by a shallow water diver to dress, a matter of considerable operational importance. By their efforts, they succeeded in considerably reducing the time factor. They devised a method whereby diving suits are prepared in advance in much the same way as a man's socks are rolled ready for dressing.

The reorganisation of two mail offices at large Naval establishments as a result of the work of a Fleet Work Study unit is illustrative of the savings in manpower that it is possible to bring about by their efforts. By introducing new sorting routines with specially designed equipment at negligible cost, a reduction in the number of staff from twelve to three has been possible at one of these offices and from eleven to four at the other. As a direct result, there has been a financial saving of £10,000 a year in the combined cost of running the two offices.

Work study has also brought about a revised procedure for "joining ship," a business which in the past has, in certain large establishments, taken a rating anything from 15 to 25 hours to complete and involved miles of walking.

The old routine meant that a rating joining one important training establishment was obliged to make a round of 19 offices for various administrative purposes. At these offices he was required to fill in forms, be booked-in and card-indexed by the staff, with inevitable delays from queuing.

From a concentrated study of the routine and the paper work involved, a system has been devised whereby new arrivals are dealt with in groups of three in an average of seven minutes, the calls reduced from nineteen to four and the walking distance from 3¼ miles to 400 yards. The new method has been brought about by including much of the needed information in the advance draft chit, which precedes the rating and allows the paperwork to be undertaken in advance.

P.&O. GETS AWARD FOR REPORT

The P. & O. Steam Navigation Company has been awarded one of two annual trophies presented by the English weekly magazine "The Accountant" for the Company's annual report for the year ended September 30, 1957.

"The Accountant" has made these awards since 1934 for the most informative set of accounts issued each year, one for large companies, the other for smaller ones requiring less complex reports, but both of equal rank.

The P. & O. Company has been awarded the 1958 trophy in the first category.

"The Accountant" awards are made by a panel of judges, mainly qualified accountants, who attach particular importance to the adequacy of the information given and to the way in which it is presented.

Aim of the P. & O. report was to provide information on the Group's activities in an attractively illustrated layout, which gives clarity to the many details included.

It is of 40 quarto pages, printed in two colours, with a number of graphs, tables and halftone illustrations.

Sir John Braithwaite, chairman of the council of the London Stock Exchange, presented the award at the Grocers' Hall, Princes Street, London, to Sir William Currie, C.B.E., Chairman of the P. & O. Company.

The award takes the form of a pair of hand-made silver wall sconces inscribed with the name of the winning company and specially designed with ancient and modern symbolism depicting commerce and accountancy.

Whaling Now Big Industry

THE Minister for Primary Industry, Mr. William McMahon, said recently that the 1958 Australian whaling season, which opened in June, was off to a good start and that results to date indicated another good season was likely.

Mr. McMahon said: "The shore-based whaling industry in Australia has now entered its tenth year of operation. In that period it has contributed substantially to the economy of our country. The whaling stations provide seasonal employment for a considerable number of skilled and unskilled workers on the Australian east and west coasts and at Norfolk Island. They produce whale oil mainly for export and meal and solubles for use as stock feed in Australia and for export. The assets of the industry are valued at approximately £2¼ million and the annual value of the products of the industry exceeds £2 million, of which over £1,800,000 represents earnings from whale oil exports."

The Minister said that in the interests of the long-term conservation of whale stocks each Australian station is allotted a maximum annual quota of humpback whales. The 1958 quotas are:

Nor West Whaling Co. Ltd., Carnarvon, W.A., 1,000; Cheynes Beach Whaling Co., Albany, W.A., 120; Whale Products Pty. Ltd., Tangalooma, Qld., 600; North Coast Whaling Pty. Ltd., Byron Bay, 120; Norfolk Is. Whaling Co. Pty. Ltd., Norfolk Is., 120. Total, 1,960.

Mr. McMahon said that the four Australian mainland stations commenced operations at different times in the month of June. By July the number of humpback whales taken at the various stations was: Tangalooma, 176; Byron Bay, 16; Carnarvon, 29; and Albany, 28.

Mr. McMahon added that a decision of considerable bearing on the future welfare of the industry was taken at the International Whaling Conference at The Hague in Holland recently. A move by some interested countries to permit greater exploitation of humpback whales in the Antarctic by the international whaling fleets was strongly resisted by Australia and was defeated, he said. The Minister explained that the humpback whales which travel the east and west coasts of Australia in season come from the Antarctic and any wholesale depletion of the Antarctic stocks by the large and well-equipped international pelagic operators would seriously menace the future of the Australian industry in a short time.

NUCLEAR PUNCH FOR NAVY

ON April 30, the Blackburn NA.39 two-seater, all-weather twin-jet strike aircraft made its first flight at Bedford airfield, England, piloted by 33-years-old Derek Whitehead, an ex-R.N. pilot, accompanied by his flight observer, 42-years-old Bernard Watson, head of Blackburn's flight-test department. At a time when guided missiles are threatening to render piloted aircraft (at least piloted combat aircraft) obsolete, the NA.39's first flight may not appear to be a particularly thrilling item of news. But there is good reason for the Silent Service to be, if not thrilled, at any rate quietly elated at the prospect of operating in two or three years' time the first squadron of NA.39 strike aircraft. And the good reason is this: the NA.39 packs a nuclear punch and is the Royal Navy's first supersonic bomber. It can carry a variety of nuclear weapons inside its bomb bay, and in place of these can certainly carry, either in the bomb bay or from pylons under the wings, a wide variety of rocket projectiles and bombs. Perhaps it can carry torpedoes of the latest type which home on to their targets; perhaps it may eventually carry air-to-surface missiles.

But at present, as is only to be expected of such a new and formidable aircraft, practically everything about the Blackburn NA.39 is secret. It has not even got a name: the number by which it is known is actually that of the Admiralty specification to which it was designed. But "Buccaneer" might well be a good name for the NA.39, for its task is to strike quickly, doing the maximum amount of damage to its target, and escape without detection. Dropping an atom bomb on an enemy task force or harbour may seem very unromantic when compared to Sir Francis Drake's famous sea raid on Cadiz in 1587, in which a large quantity of stores and ships for the Spanish Armada were destroyed, "singeing the King of Spain's beard," as this exploit was called. Yet raiding an enemy harbour would be just the sort of task that a Blackburn NA.39 squadron might be called on to undertake, and it is rather interesting to think that the cost of defeating the Spanish Armada (quoted by Sir Winston Churchill in **A History of the English-Speaking Peoples**) is reckoned to have been about £160,000, and that a single Blackburn NA.39 would cost perhaps as much as three times this sum! This does not mean that the NA.39 is more expensive than it ought to be, but that any modern military aircraft — especially a supersonic one — costs a lot of money.

* * *

There are several reasons why an aircraft like the NA.39 is not cheap. For one thing, it has to be immensely strong to be able to withstand the hard usage imposed on it by landing and taking off from an aircraft carrier and — more especially — to manoeuvre at supersonic speed. To launch its atom bomb the NA.39 will almost certainly employ what the Americans call the "toss bombing" technique. In this method the aircraft approaches its target at high speed and at a very low altitude to avoid radar detection. At the critical moment the pilot pulls up into a half-loop, releasing his atomic weapon in the middle of the half-loop, in effect "tossing" it on to his target, since the speed imparted to the weapon by the aircraft's own speed would be considerable. The pilot completes his half-loop and does a roll off the top, heading back in the direction from which he came, thus avoiding being "bounced" by enemy fighters and escaping the effects of an atomic explosion. Some of the R.A.F.'s Canberra bombers have been equipped to make use of this technique, and the NA.39's considerable range and high speed should make it very suitable for toss bombing.

The NA.39 is propelled to supersonic speed by a pair of de Havilland Gyron Junior jet engines; the exact thrust of these units is at the moment secret but each is believed to develop about 8,000 lb. static thrust each. To put it another way, at its maximum speed the NA.39's engines would develop a thrust which, expressed in terms of horsepower, would nearly equal the horsepower of a destroyer's engines at its top speed! The engines are mounted on each side of the fuselage, and one advantage of positioning them close to the fuselage centre-line is that the aircraft will not tend to swing violently to one side if an engine fails.

FIRST OF NEW PILOT VESSELS LAUNCHED

The Goondooloo (opposite), the first of three new fast pilot vessels to be constructed at the Maritime Services Board (N.S.W.) shipyard at Goat Island, was lifted from the wharf by the floating crane Titan into the water at the shipyard recently. Mrs. H. H. Edwards, wife of the president of the board, named the vessel. The Goondooloo will replace the pilot steamer Captain Cook on Sydney Harbour.

The main undercarriage units retract inwards into the underside of each engine fairing, and the nosewheel retracts backwards. Undercarriage design on Naval aircraft raises some very tricky problems for the designer; not only has the landing gear to be strong enough to stand up to the demands of Naval operation, but there is also the problem of making enough space to stow it when retracted. In the NA.39's case retraction into the wings was not desirable because this is where fuel tanks are housed, and so a cut-out has been made in each engine fairing for the main undercarriage units; this cut-out had to be large enough to house the undercarriage leg and wheel without making a drag-producing bulge, and yet small enough to leave room for the Gyron Junior jet pipe.

Above the end of each jet pipe there is a rather ungainly bulge on the fuselage which, to quote the manufacturers, has "some unusual curves and these are the very latest aerodynamic refinements to ensure smooth, fast flight." In other words the NA.39 makes use of what is known as the Area Rule principle; in non-technical language this means that the fuselage is so shaped that it has a "waist" in the middle, like the human body. The reason for this "waist" is to enable the transition from subsonic to supersonic speed to be made smoothly, avoiding the control difficulties that can occur when crossing the sound barrier.

Another interesting feature of the NA.39's fuselage is that it ends in a long, pointed fairing which opens out, clamshell-fashion, into two halves which act as dive brakes which can be used in a toss bombing attack or when coming in to land. Another feature which helps the pilot in landing (and one that is already incorporated in the Supermarine Scimitar fighter) is the "blown flap" system. This means that air from the jet engines is blown over the upper surfaces of the flaps when these are lowered to increase the lift given by the wing by accelerating the airflow locally. Swept-wing aircraft like the NA.39 have high landing speeds, but "blown flaps" enable the landing speed to be reduced and landing runs to be shortened. The crew of two are seated one behind the other, and each has a Martin-Baker ejector seat for baling out.

The Blackburn company has been making aircraft for the Navy for more than 40 years, and the NA.39 is certainly a formidable addition to the Royal Navy's striking power.

— From "The Sea Cadet"

FIFTY YEARS A BOATMAN

James Hazlett pressed himself further back into the shelter of the wall, his old body shivering from his sodden clothes and the lash of the nor'nor'easter. This was one of the worst gales he could remember in all his seventy-eight years, blowing directly on to the shore, sending the seas thudding on to the beaches.

By
KEN LOMAX
Courtesy "The Sea Cadet", London.

HE watched the men in the boat as they hoisted a rag of sail, saw her begin to draw away, scudding swiftly into the sea-fog and driving spray. It had been a difficult launch, too, he reflected, and having been assistant coxswain for fifty years —ever since 1851—he knew as much about the boat as any man on the coast.

It had been eleven o'clock on that bleak, bellowing December night when the Cockle Lightship sent up the signal which meant that a ship had met with disaster. The wild flurry on the Barber Sands, which the light guarded, had claimed another victim. The signal was picked up by the Caister lifeboat station and the No. 2 boat—the **Beauchamp**—was immediately made ready for launching. At the top of her slipway, the shore helpers clustered around to watch her take the water, the crew ready in their places, she rested poised, quivering and swaying slightly in the gale. There was a shout of command, the shackle was knocked clear, and the boat slid down towards her proper element.

But the heavy seas were roaring round the bottom of the slip, menacing, eager to snatch yet another victim; and as the boat slid into the water a heavy sea caught her under the bows, bore her up, and threw her off the slip and on to the shore.

To the men of Caister such accidents were all in the day's work. The night was black as pitch, piercingly cold; but the boat was needed and, therefore, the boat had to go. The crew and the men from the shore—tackled the capsized craft and ran it on to the beach in readiness for another attempt. With skids, warps and tackles the men mast-handled the heavy boat back on to the launching ways, and after three hours of nightmare labour she slid into the heaving seas.

"She'm all right, be the old boat", decided the watchers. They were drenched to the skin, frozen, their bodies aching with cold and fatigue. "We'll get home for a change o' clothes—we'll be back afore she returns".

But old James Hazlett stayed, watching and waiting. As he had been in the forefront of the battle to get the boat launched he was wetter than most—and just as cold; but his years of battling against the seas had fitted him better for his vigil on such a night — besides, there were men of his family out there, a son, two grandsons and a son-in-law.

He saw the boat make away on the port tack, heeled gunwale under to the fury of the gale, beating her way towards the sandbank where the flare of an occasional distress signal pierced the gloom of the night.

As she neared the wreck the coxswain brought her up to the wind to adjust the mizzen, which had not been set up to now; then, satisfied that all was as it should be, he brought her round to the starboard tack and stood towards the shore. Then again round to the other tack to make another leg towards the wreck. Hazlett watched these manoeuvres with approval in his sea-wise eyes. He saw the boat not making much headway on the new course, stand once more towards the shore, running down to come round again. But this time as he watched he saw her miss stays. The heavy breakers bouncing off the beach must have caught her awkwardly, preventing her from coming round. He saw the coxswain lay his mizzen aback and put the helm up so that she would pay off and gather more headway for another attempt; but again she missed stays and it was obvious now that the coxswain could not avoid being driven ashore.

As soon as the coxswain realised what had happened he ran down the sails and put up the helm so that the boat would run bow on to the beach; but just as they were running true for safety a breaker caught the lifeboat under the bow and slewed her broadside on to the waves. In an instant she capsized, rolling over at the edge of the sands, out of sight of the watching Hazlett.

James Hazlett turned as footsteps scraped on the stones and he saw the figure of his youngest grandson staggering towards him from the cottages, his freshly changed clothing already wet from the spray. "Better go and get a warm and change, hadn't you?"

Hazlett shook his head. "Time for that when the boat gets back. They'll be having a fair tussle out there and they'll be wanting help to bring her in".

"Mebbe so; but I still reckon you ought to go. There'll be time enough before . . . Listen! Did you hear that?"

Straining their ears they could hear faint sounds borne on the

wind—like the mewing of sea birds. "Sounds like someone shouting—down by the water's edge. C'mon, Grandad, sounds like someone's needing help".

Instantly—and well knowing the risks he took—James Hazlett dashed down to the tide mark and in to the raging surf. He saw a figure washing about in the water near the boat. The man's legs seemed to be caught under the gunwale, but, seizing an arm with a vice-like grip, and helped by the struggles of the victim, Hazlett managed to free the man—Charles Knight, his son-in-law. Hauling the man more or less upright, Old James struggled towards the beach, lugging the half - drowned Knight through the breakers. When he made safety he turned and saw his grandson, inspired by the older man's example, dash into the surf, and after some wild scrabbling about haul another of the boatmen—John Hubbard—to safety.

For a man nearly eighty years old this had been a noble effort, and no one could have blamed him if he had decided that the task had taxed his ancient strength to the full. But James Hazlett was not a man so easily beaten. Pausing only long enough to regain his wind, he once more dashed into the sea, dived under the boat and grabbed at the body of his grandson —Walter. With great difficulty, battered by the incoming breakers, staggering on the shifting shingle, he hauled his burden to the beach, above the tide-line and out of reach of the hungry waves.

By now the storm had risen to new heights of fury; it was not only suicide but completely impossible to make another attempt. But although nine men had died at their duty that terrible night the score would have been greater had it not been for a young man—and another who had served the boat for half a century.

REVOLUTION COMING IN SEA TRANSPORT

THERE is every indication that a revolution in sea transport is on the way. Many factors need intensive study by the British shipbuilding industry, but the disturbing thing is that while there is perhaps adequate research on most of the more immediate technical problems, there seems to be a serious lack of fundamental long-term research, both technical and operational.

Ships have been basically the same for donkey's years. The most daring innovation has been to place the machinery at the stern, leaving the forward part of the ship for passengers, but even this move has been sternly resisted by many companies.

Nuclear propulsion will offer opportunities for rethinking the whole approach to marine transport. For instance, it might be very useful to separate the nuclear-power unit from the cargo or passenger container — in other words — to have a very powerful nuclear tug, which would tow ocean-going barges from port to port.

A nuclear-powered tug could afford to be extremely large — perhaps surrounded by big buoyancy tanks to make it virtually unsinkable. It could arrive at a port, dump its barges, and be off an hour later with a new lot in tow. It would need to refuel only every few months.

Again, there is growing interest in hydrofoil vessels. These have underwater "wings" fixed on to the hull by struts. Above a certain speed, the body of the craft rises out of the water, leaving only the foils immersed. The immediate applications are military — for very high-speed N.T.B.'s, for instance. But there are other possibilities. There are now a few hydrofoil pleasure-boats on some Swiss lakes. The Shell group is studying a hydrofoil vessel for ferrying workers rapidly to oil-drilling platforms on Lake Maracaibo in Venezuela. A hydrofoil cross-Channel ferry, which could go from the Hook to Harwich at sixty knots, and even 1,000-ton hydrofoil cargo vessels for very high-speed marine transport, have been seriously suggested.

— From "Petroleum Gazette"

LEARNING TO SWIM AT SEA

IN six voyages from England to Australia and back ex-marine commando Brian Roberts (32) has taught 85 children to swim.

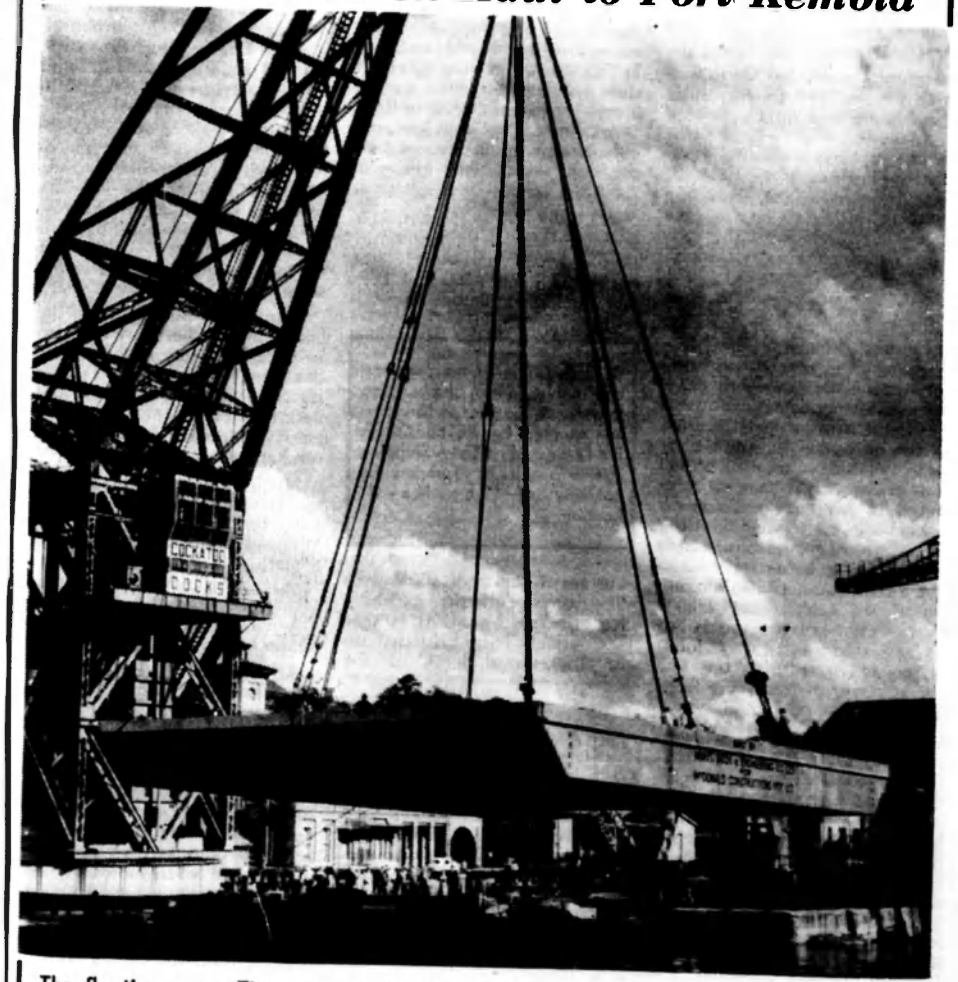
Brian Roberts is the swimming pool attendant on the P. & O. liner "Strathmore".

Two of the children not only learned to swim from scratch—they could not swim a stroke when they started the voyage—but in 10 days swam 200 lengths of the "Strathmore" pool, 1,800 yards.

They were Patricia O'Donnell (10), from Northern Ireland, who left the ship when she arrived at Fremantle from England, and the daughter of an Indian Princess, the Maharani of Morvi, who travelled on a previous voyage.

"These two were exceptional", says Roberts, "but I have quite a lot of youngsters swimming in 10 days or less". He estimates that during his period as pool attendant 500 children have used the pool.

Floating Crane Starts 150-ton Pontoon on Haul to Port Kembla



The floating crane Titan recently lifted a 150-ton pontoon into the water at Mort's Dock, Sydney. The pontoon, 90 feet long, 60 feet wide and 7 feet deep, was towed recently to Port Kembla, where it will be used to clear rock from the inner harbour, Tom Thumb Lagoon. The pontoon carried a 250-ton scoop for the £1,100,000 project.

SHIPBUILDING IN BRITAIN

THE world-wide shipping slump, which has led to well over five million tons gross of ships being laid up for lack of employment, and to a doubling of last year's rate of ship-breaking, is beginning to have its effect on the ship-building industry, although it will take some time for most of the shipyards to work their way through their existing order books, provided too many cancellations do not take place.

Figures issued by the Shipbuilding Conference for the first quarter of the year show that during this period new contracts for the British shipyards numbered only 39, in respect of vessels making a total of 41,000 tons gross. In the same quarter contracts were cancelled in respect of 14 vessels, totalling 183,000 tons gross, six of them (109,500 tons) being for export. These 14 cancellations comprised six tankers of 129,000 tons, seven cargo vessels of 53,500 tons and one small vessel; in contrast to the low average size of vessels ordered during the same period.

If adverse trading conditions continue, there is no doubt that further contracts will be cancelled and intended orders postponed; but cancellations so far have been far more numerous in some other ship-building countries, particularly those like Germany and Japan,, which are engaged almost exclusively in export contracts for dry-cargo ships and tankers.

In Britain not only is the shipbuilding order book much more diversified, including almost every type of ship imaginable; but it also contains a substantial backlog of unfulfilled orders, amounting on 31st March last to 765 ships, totalling 6,331,000 tons gross, and valued at not much less than £1,000 million. Work was actually in progress on that date on 312 vessels, having an estimated total of 2,263,851 tons.

Much of this work is concentrated in the major ship-building districts, particularly the Clyde, the Tyne, Wear and Tees, and Belfast, although there is substantial tonnage building in the Liverpool district, in which the principal ship-yard is that of Cammell Laird, situated on the Birkenhead bank of the Mersey.

● THIS article on the problems confronting the shipbuilding industry in the United Kingdom was written by PETER DUFF, Editor of "The Shipping World", and is reprinted by courtesy of "The Navy", London.

Just over one-quarter of the total production comes from the Clyde, where the world's largest ships, the **Queen Mary** and **Queen Elizabeth**, were built at the well-known Clydebank yard of John Brown & Co. Ltd. No large passenger liners, strangely enough, are under construction on the Clyde at present, and the Cunard Line has had to defer the start of work on the Cunarder which had been ordered as a replacement for the **Britannic**.

The Clyde order book consists mainly of cargo liners, tankers and ore carriers, although there is also a great variety of specialised work, and much research and experimental work is going on in respect of hull design and machinery development.

The Lithgow group, which includes the Fairfield Shipbuilding & Engineering Co. Ltd., Wm. Hamilton & Co. Ltd., and other engineering establishments, is now engaged in the construction of a vessel to be propelled by gas turbine machinery with free-piston gasifiers. Much Admiralty work is going on at the same time, and Yarrow & Co. Ltd. is collaborating with the Admiralty in important engine research and development work.

Many of the ship-yards on the Clyde, as elsewhere, are engaged in long-term improvement and development schemes, costing many millions of pounds, and designed to make use of the latest techniques and increased mechanisation.

Much progress has been made at Alexander Stephen & Sons Ltd., for example; and on the Wear at Sunderland the amalgamation of two shipyards into what is now known as Austin & Pickersgill Ltd., has greatly improved the combined output of the two original yards.

As a result of the introduction of new techniques, assisted by the co-operation of the workpeople, Bartram & Sons Ltd., also on the Wear, created something of a record for a British shipyard by completing the 10,000 tons deadweight cargo vessel **North Devon** from the laying of the keel to delivery in less than seven months.

Unfortunately in all too many British shipyards the proper use of new machines and methods is being hindered by the failure of the trade unions to co-operate fully. With the introduction of new methods and new materials, work is continually being held up by disputes between different trade unions as to whose members should carry out certain types of work.

Part of the trouble arises from the fact that there are so many different trade unions which take part in the assembly of a ship. There must be nearly 40 different unions in the Confederation of Shipbuilding and Engineering Unions, and many of their members can, of course, get alternative work in other industries. Inter-union jealousies, and failure to progress towards the elimination of restrictive practices, are undeniably limiting the productive potential of many British yards, whose competitors overseas are more favourably placed.

On the Continent it is unusual to find more than two or three trade unions represented in the ship-yards, and the interchangeability and flexibility of labour exists to a degree unknown in these islands.

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As on the Clyde, the order books of North-East Coast shipyards are highly diversified, and include tramps, cargo liners, ore carriers and tankers. A passenger liner of 20,000 tons gross is being built for Portugal by Swan, Hunter & Wigham Richardson Ltd., at Walker-on-Tyne, and progress is being made on the construction of large dry docks to accommodate the larger types of tanker now being built, several tankers of 65,000 tons deadweight now being on order. On the Tees the Furness Shipbuilding Co. Ltd. and Smith's Dock Co. Ltd., between them, account for a high annual tonnage, consisting mainly of the larger sizes of tankers and ore carriers.

Vickers-Armstrongs at their Tyne ship-yard have on order a passenger liner of 27,000 tons gross for Canadian Pacific Steamships, and at their Barrow shipyard have a number of large tankers, as well as the 40,000 tons gross passenger liner **Oriana**, which is due to be launched early next year.

At Cammell Laird is the 38,000 tons gross Union-Castle passenger liner **Windsor Castle**, and this company contemplates the expenditure of some £17 million over the next few years on the extension and modernisation of the yard and engine works, and the provision of a large dry dock capable of taking the large new tankers.

One of the largest single establishments is that of Harland & Wolff Ltd., at Belfast. Unfortunately, work here was seriously hampered earlier in the year by a strike, which resulted in all work being stopped for nine weeks, except the fitting out of the liner **Pendennis Castle**. This concern also has a smaller ship-yard at Govan, on the Clyde, and major ship-repairing establishments at Liverpool, London and Southampton.

Southampton is not a major ship-building district, but some interesting naval craft and smaller merchant ships are produced at such South Coast yards as John I. Thornycroft & Co. Ltd., J. Samuel White & Co. Ltd., and Vosper Ltd. Fishing vessels are the main task of the yards in the Humber area, such as Cook, Welton & Gemmell Ltd., at Beverley, and Cochrane & Sons Ltd., Selby. Much the same can be said of the Aberdeen ship-yards. There are also smaller ship-yards at Bristol, Leith and other places scattered round the coast, such as Lowestoft and Appledore.

Many of these smaller yards contribute to a great extent to the industry's export element, although it is to be regretted that the percentage of ships building for export has been declining rapidly in the face of growing competition from overseas yards. On the contrary, there is a growing tendency for British ship-owners to place orders with overseas ship-yards from which, in addition to reasonable quality, they can expect reasonable prices and prompter delivery. If the present shipping slump continues for any length of time, competition for the few orders that will be available will be extremely keen.

HISTORIC CABLE SHIP LAYS VITAL NEW LINK

LAID by Britain's Post Office Cable Ship Iris, a new 120-circuit submarine telephone cable between the United Kingdom and Belgium is coping with the extra traffic occasioned by the Brussels Universal and International Exhibition. Prior to the opening of the Exhibition, the daily average traffic on the route was 1,700 calls, on which a ten per cent. increase is now expected each year.

The underwater section of the cable runs from Dumpton Gap, near Ramsgate, on England's south-east coast, to Middlekerke on the Belgium coast. An underground cable connects Dumpton Gap with the repeater station at Canterbury, England, while on the Belgian side a similar type cable links Middlekerke with the Belgian repeater station at Ostend. The submarine cable between Dumpton Gap and Middlekerke is 55.1 nautical miles (102 kilometres) in length.

The submarine cable — made at the new factory at Southampton, England, of Standard Telephones and Cables Ltd., where special facilities exist for the manufacture and testing of such products — consists of a polythene insulated coaxial cable comprising an inner copper conductor made up of a strand of seven wires insulated from the outer conductor by a solid dielectric of polythene. Spliced into the cable are three two-way submerged repeaters of the rigid type. Features of the cable are included in a range of important exhibits which Standard Telephones and Cables Ltd. is showing in the British Industry Pavilion at the Brussels Exhibition.

Iris is one of the smaller cable ships in Britain's Post Office fleet of four. She is approximately 1500 gross tonnage and is mainly employed in cable laying and repairs in home waters. As she is easily manoeuvrable she can work in restricted waters and approach close inshore. She has an operational radius of some 4,000 miles (6,437.4 kilometres) and can carry out repairs and renewals in depths up to 1,500 fathoms.

During the war, Iris repaired a strategic cable in 1943, only 27 miles (43.452 kilometres) off Cherbourg and, besides maintaining cables under the worst conditions, helped to lay experimental Hais cable for the famous PLUTO (pipe-line under the ocean) operation. On D-Day, Iris and her sister Post Olhce cable ship Alert laid a cable to a mobile repeater station on the Normandy beach-head.

NATURAL RUBBER IN UNIQUE POSITION

By JAMES BUSH

Broadcast over Station 2BL, August 1, 1958

IN February, 1958, there took place in Kuala Lumpur, Malaya, an event directed at giving long-range stretch to Natural Rubber's current status as one of the few world commodities that is selling just about all it can produce.

The Rubber Producers' Council of Malaya voted to increase their research and development funds by 50 per cent. These funds are collected on every pound of Malayan-grown rubber exported from Malaya. At current rate of export these collections will provide about 3.5 million Malayan dollars per year.

It is expected that this amount will increase considerably, as tens of thousands of new Malayan acres are opened to rubber production, and the high-yielding stocks now being planted bring in more and more rubber per acre. The figure in itself is not so important as the long-range sales planning it represents.

To-day, Natural Rubber is in the unique position of having had for the past several years practically a saturation market. In 1956, its production of 1.88 million tons fell only some 5,000 tons short of the actual Natural Rubber requirements.

In 1957, Natural Production of 1.93 million tons provided only a 30,000 tons surplus over consumption. The surplus for 1958, even with the effects of the recession, looks as though it will be only 45,000 tons.

It must be remembered, too, that during 1956 and 1957, these figures were established, while Natural Rubber in the United States was selling at a premium over synthetic, that for two years averaged as much as 9½d. Australian per pound.

So far this year, natural is ranging within one or two pence of the price of synthetic in the United States, and, elsewhere, it is actually competitive in price. If such pricing continues, it could well increase the percentage of natural sold abroad, vis-a-vis synthetic.

The point is, though, that even with a premium for natural, it has been selling practically its entire crop.

Industrial specialists agree that in the growing market for rubber (that all forecast), natural will continue to maintain this sales advantage lor several years, and possibly longer.

At that point, it is conceivable that the polyisoprenes and other so-called "synthetic naturals" so much in the news these days—but decidedly not in current, competitive production—can have reached competitive status in some areas of quality, coupled with production levels that might make possible an approach to natural in price. Also, synthetic, by then, will be established in a number of overseas plants, putting it into production on a world-wide scale.

It is at this point of competition with a full-blown synthetic, that the Natural Rubber industry is to-day aiming its research planning.

It is directing its efforts at maintaining at that time natural's currently enviable sales position. The increased funds are an important step at this point in the industry's thinking.

These funds will be used to set up a streamlined research structure that will place heavy emphasis on producing a natural that in price and quality will be hard to match. At the same time, natural's scientists will be working at broadening the range of their product's applications, so as to keep it up to date — and a bit ahead—of the demand of the market place.

With these goals as objectives, Natural Rubber research has two focal points—the tree and the rubber it produces.

The tree is natural's factory. In one sense, costs here are similar to that of production costs anywhere. Get more output per producing unit, and costs go down. The one major way of assuring that rubber will always be price-competitive is to produce more and more rubber per planting. This is where Natural Rubber has a great advantage.

It must be remembered, too, that Natural Rubber production is a regenerative process, and not a destructive process, such as the production of synthetic from coal and oil chemicals.

The Rubber Research Institute of Malaya has already done some remarkable things towards making each tree produce even greater quantities of latex.

The rubber trees planted today can be counted on for three or four times the yields of those planted only a few years back. Translated into tonnage, this gives natural a built-in-price advantage. The average yield in Malaya now is about 500 lb. per acre per year.

To day's plantings will produce from 1,500 to 2,000 lb. per acre per year. And Rubber

Research Institute experiments are going on right now that could well raise even this figure.

On the consumer side, Natural Rubber laboratories in England have been experimenting with mixtures that produce a natural similar to plastic in application possibilities.

This material lends itself to use for cups and saucers, electric outlets, and similar products. Also, there has been developed a new form of cyclised rubber that provides exceptionally long wear for soling and for other leather substitutes.

In the field of clothing, natural's research has produced a non-woven fabric that instead of weaving uses latex to bind the strands into cloth. And in France to-day the Paris subway is being converted to rubber tyres.

Within the framework of the new world-wide programme now being organised by the Natural Rubber industry, research activities of this type will be intensified.

Out of the work to come, the industry hopes to develop advances — far-reaching advances — on latex foam and rubber tyres for agricultural vehicles that to-day are becoming standard.

Another basic objective of natural's burgeoning research is to relate its efforts specifically to the needs of its customers. To accomplish this, a technical service of engineers will visit manufacturers all over the world to provide information on latest developments in the Natural Rubber laboratories, and to discuss means by which natural can be improved to better fit manufacturing requirements.

At the same time, Natural Rubber Industry researchers will keep an eye on the consumer market, working towards expanding the uses of Natural Rubber to meet the varying demands of an ever-changing consumer habit.

Speeding the Flow of the World's Oil

TO deleat the enemy "time", ship-builders have installed huge engines capable of driving mammoth tankers through the water at speeds up to 18 knots, have incorporated batteries of pumps that can discharge cargoes of viscous crude petroleum in a matter of hours, and have in every way striven to achieve technical perfection of design.

But if such tankers meet with unnecessary delays in port, il loading or unloading times are unduly long, much of the money spent in designing fast ships and ellicient loading systems is wasted.

So to-day new and different tanker loading and unloading systems are being adopted in oil ports all over the world, and they are bringing in a new concept in tanker turnaround activities. Time and motion study engineers are analysing every phase of activity on the wharf and the deck of the tankers to ensure that the huge capital cost of the tanker is put to its most economical use.

At the moment shippers feel they have reached the ultimate in the rate of discharge with standard equipment and procedures. Supertankers carrying cargoes of nine million gallons of crude petroleum can discharge into refinery storage tanks in about ten hours. But with more speed in making that vital linkage between ship and shore, there is a good possibility that even these times can be reduced.

To-day there are between 60 and 70 tankers fully engaged in the business of transporting crude petroleum and petroleum products to Australia. These tankers brought a total of 2,607 million gallons of petroleum products and crude petroleum for the Australian market last year, and the buoyant demand for petroleum and its products indicates big increases in these figures in the future.

But to know something of the problems confronting tanker operators, we must know something of the techniques of unloading in Australia and of those in use or under consideration in other parts of the world.

● EFFICIENCY in Tanker Fleet operations depends in large measure on seeing to it that vessels spend a maximum of time at sea in the rapid transport of cargoes and a minimum time in port.

Until the advent of the supertankers and their greatly increased capacity to discharge cargoes quickly, the actual work of unloading was done by gangs of men with cranes or ships' winches, who dragged a rubber hose aboard, connected it to the tanker's discharge cocks and stood by to repair any hose bursts.

Now the necessity for high volume discharge calls for hoses too cumbersome for efficient manual manoeuvring and oil company dock engineers are studying the possibilities of mechanised dock facilities incorporating the use of either flexible or jointed steel pipe or newly developed rubber hose.

One of the first steps in the mechanisation process was the introduction of the huge articulated steel arms of the Chiksan Company's hydraulically-powered marine and barge hoses which are now in use at Long Beach, California.

These loading arms obviate the need for the flexible hoses and their gangs of men. The arms, in batteries of five, are operated by one man at a control panel. With the aid of two fitters on the tanker's deck they can be connected to the discharge cocks in under five minutes.

Basically the design comprises two lengths of pipe coupled by swivel joints and counter-balanced. A boom and cam arrangement enables the operator to place the flanged end adjacent to the discharge cock on a tanker's deck within one minute. Once the connection is made, the operating mechanism is placed in the "free wheel" position and the counter-balanced arm allows for a 40-foot rise and fall of the ship and a 20-foot lateral drift during unloading operations.

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Each of the five arms of the Long Beach installation can be operated independently from one set of controls. They incorporate swivel joints tested to withstand pressures of 300 lb. per square inch and temperatures up to 22.5 deg. Fahrenheit.

Adaptations of this system are now making their appearance and the rubber industry has answered the challenge with new tanker hoses that can be adapted to the mechanised "arm" system and accommodate hoses from 2 inches to 12 inches in diameter.

A probability for the near future is the introduction of 16 inch diameter pipes with three times the discharge capacity at the same fluid velocity as the 8 inch hoses now in use.

Advantages of the new systems, in addition to the quick and easy connection of the ships to the discharge system and a high rate of flow, are a great reduction in the danger of bursting or thrashing hose and reduced fire insurance rates.

But there are other problems arising as Australia's capacity to refine its own needs of petroleum products increases. Already our needs, our export potential and our distance from the producing oil-fields of the world justify the use of supertankers on the Australian run.

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Broadly speaking, the advantage of supertankers lies in their ability to carry approximately four times as much oil as a normal tanker, but they cost only about twice as much to operate. In Australia, only Hobart, Fremantle, Sydney and Port Kembla have harbours which could take supertankers of 80,000 tons or more, and it is doubtful whether there are any wharf facilities within those harbours to enable such supertankers to berth.

However, the announcement in March of a decision to erect a refinery at St. Vincent's Gulf, 20 miles south of Adelaide, between Hallett's Cove and Pt. Noarlunga, could make it unnecessary for expensive harbour facilities to be provided for supertankers. What is envisaged here is the laying of a 24-inch or 30-inch pipeline from the refinery reaching underwater for a mile into St. Vincent's Gulf. At this point there is a natural depth of water of 60 feet and so crude oil could be discharged into the pipeline from a supertanker standing in the roadstead.

This pipeline will be constructed in sections. When the first section is completed it will be towed to sea, and on completion of the second section this will be welded to the end of the first section and the whole will be towed a little farther from shore. This process will continue until the entire pipeline, contoured to the seabed, is afloat over its final resting place in the sea.

The pipeline will be slowly sunk by letting in water and will be guided to its predetermined position, where it will be anchored with bags of cement and sand. The offshore end of the submarine pipeline will have two flexible hoses attached and the discharging tanker, after anchoring and tying up to strategically-placed buoys, will fish these hoses up from the seabed. It is expected a discharge rate of 5,000 tons an hour will be achieved by this method.

However, the submarine pipeline has its disadvantages. It is almost impossible to bring a big tanker to a stop right on the desired spot in the open sea, so a tanker captain usually allows for prevailing conditions before dropping his bow anchors and drifting into position by paying out anchor cable.

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While this is going on a tender must scurry from buoy to buoy to hook up the tanker's mooring hawsers and in the short time at the tender's disposal a miss could be costly.

Against the drawback of difficult berthing is an advantage which, in view of the prevailing trend in tanker design, must be given full consideration. It is the fact that the submarine pipeline can be placed at moderate cost, in a position where even the largest tanker can anchor in a safe depth of water.

While the submarine pipeline has been tested and found satisfactory in certain areas, other experiments, indicative of the industry's desire for greater efficiency, have been carried out in the United States with a "floating turret" terminal which pro-

mises to make off-shore loading and unloading techniques easy, safe and efficient.

Similar in concept is a loading and discharging platform which has been erected three miles off-shore in the Adriatic Sea. It eliminates a great deal of the jockeying for position necessary when a tanker is using the conventional submarine pipeline. This turret, firmly anchored to the seabed and round in shape, incorporates a battery of hoses all of which will swivel the full 360 degrees while performing their function of either loading or drawing off cargo.

These "floating turrets" allow the tanker to attach itself by hawsers at one point and swing free with the prevailing currents while still discharging, and gives them almost complete freedom of movement.

Speeding the tankers is designed to one end; to keep the cost of the ultimate products of crude petroleum within the reach of the consumer. The £4 million tanker bringing crude from Iran or Indonesia is generally a "one-way" ship. It has the specific job of transporting crude and, therefore, has no chance of any substantial back-loading. So the moment the job of delivering oil is done, it must put to sea again to repeat the process.

In the case of the Persian Gulf run, speedier turnarounds impose a rigid regime on crews whose approximate 18-day voyages back and forth are interspersed with only occasional glimpses of other tankers and oil ports as seen from the decks of their vessels.

This is one reason why tanker crews have the best quarters and best conditions of men afloat. And it is also the reason why most tanker companies follow the practice of allowing three months' leave every year to the men who speed across the world's oceans with the fuels for industry and progress.

—From "Petroleum Gazette".

Visiting SEATO Secretary-General Mr. Pote Sarasin (centre) inspected naval activities at Garden Island recently. With the Flag Officer-in-Charge of the Eastern Australia Area, Rear-Admiral D. H. Harries (left), and the Garden Island general manager, Captain Roger Parker, he watched Neil Docherty (extreme left) and Gordon Copping at work on a rope fender.

No Picnic in Space

By H. J. BROWN

Broadcast over Station 2BL, August 1, 1958

LET us look at our nearest neighbours in the Solar System. First there is the Moon, 240,000 miles away, a satellite of the Earth. It has no atmosphere, no water, no vegetation, and appears to be a barren stony sphere covered completely with several inches of dust. On the sunny areas the temperature is that of boiling water, or 212 degrees F., and on the shady areas that of liquid air. A barren inhospitable place to visit, indeed!

Our next nearest neighbours are Mars and Venus, about the same size as the Earth, and rotating about the Sun in the same way as our planet. At their closest points to us, Venus is about 30 million miles away, and Mars about 50 million miles.

Little is known about Venus, since it's continuously and completely covered by cloud, so we've never seen its surface. It certainly has an atmosphere, but it appears to be mostly carbon dioxide with practically no oxygen. It must certainly be hot on its surface since it's much closer to the Sun than the Earth is.

Mars, on the other hand, doesn't seem so inhospitable. It's further from the Sun than the Earth and, therefore, much colder. At its equator the temperature doesn't exceed 77 degrees F.

Mars has an atmosphere, though only a thin one. The pressure at the surface is about $\frac{1}{10}$ of that on the Earth—it's the equivalent of travelling in an aeroplane at a height of 50,000 ft. There appears to be vegetation on Mars, since the dark areas vary with the seasons, and there are polar ice caps, though only a few inches thick instead of many hundreds of thousands of feet thick as at our poles.

Water seems to be very short, as there are no seas, very limited ice caps, and little or no water vapour in the atmosphere. There appears to be no justification for supposing any intelligent beings live on Mars, and the so-called canals which were once thought to be artificial are now known to be less regular and less likely to be artificial than was previously thought.

Beyond these two neighbours, there's Mercury, so close to the Sun that it's intensely hot and has no atmosphere. Going away from the Sun beyond Mars we find Jupiter, Saturn, Neptune, Uranus, and Pluto, in that order. All are intensely cold, because of their great distance from the Sun and are covered with miles of ice.

Where they have atmosphere they're composed of methane and ammonia. To reach them the space traveller would have to travel hundreds of millions of miles. Jupiter and Saturn appear to be in a fluid state with no hard rock mantle.

Outside our Solar System, the nearest star, a ball of fire like our Sun, is four light years away, that is, light travelling from it at 186,000 miles per second takes four years to reach us. It has no planets.

No doubt within the 100,000 million stars in the Galactic System, to which our Sun belongs, there are stars with planets revolving about them like ours, and one of the planets is quite possibly at the right distance to give just that range of temperature in which living cells, as we know them, thrive.

But to travel from one side of the Galaxy to the other would take 100,000 light years. So it looks as if we must be content to admire the beauty of the Milky Way and confine our space travel to our Solar System, and even there, only to our immediate two or three closest neighbours, the Moon, Venus and Mars. Of these, only Mars appeals to me for a holiday, and even then I'm quite prepared to give up my place to some more enthusiastic scientific explorer.

No, space travel will really be no picnic

SOUTHWARD HO!

By Yvonne Ribeyrol

THE exploration of the Antarctic continent made great progress this Winter. The entire world followed with great excitement the "Conquest of the South Pole" undertaken by the English Dr. Vivian Fuchs and the New Zealander Sir Edmund Hillary, the latter of whom was already famous for having climbed Mount Everest. In order to arouse the interest of the general public, an attempt was even made to set these two men against each other in a kind of "contest", though the truth is that Sir Edmund had merely carried out the orders of the head of his expedition by establishing bases for him. The fact that the New Zealander had done his job and then continued on his way to the Pole, and got there, was of no importance. The two men were not engaged in a match, but were part of an expedition that had a definite scientific job to do.

Sir Edmund and his four fellow New Zealanders reached the Pole on January 3, 1958. Their British associates, led by Dr. Vivian Fuchs, reached 90 deg. south latitude on January 19. Together they constituted the third expedition ever to arrive there by land, for Hillary and Fuchs merely continued a long line of Antarctic explorers of whom the famous James Cook, whose expedition took place from 1773-1775, was the first.

This history of the "conquest of the Antarctic" is, therefore, almost two centuries long. It provides splendid examples of the spirit of initiative and courage.

Cook, the first of the pioneers, crossed the southern polar circle and even went beyond 71 deg. south latitude. When one thinks of the sail-boats that he had to use, one can appreciate his courage. Antarctica appeared to his crew as a universe of horror. His log-book contains the first description ever given of these regions: "Ninety-seven ice-hills were distinctly seen within the field, besides those on the outside; many of them very large and looking like a ridge of mountains, rising one above another till they were lost in the clouds. . . . Such mountains of ice as these, were, I believe, never seen in the Greenland seas. . . . I will not say that it was impossible anywhere to get further to the south; but the attempting it would have been a dangerous and rash enterprise; and what, I believe, no man in my situation would have thought of". (Voyages of Captain Cook.)

Cook even notes in his diary that in his opinion no one would ever venture south again, that no ship would again plough the southern polar seas! Nevertheless, this voyage, incomplete though it was, had given a more precise idea than ever before of the size of the hypothetical Antarctic continent.

It was not until the beginning of the nineteenth century that sailors again ventured forth on the southern seas. But it was no longer out of disinterested research. Most often they were motivated by the lure of game. The whale and seal hunters thought that the existence of southern lands might mean that there were new and intact hunting grounds. Pushing farther and farther south, they found fabulous flocks of game on the beaches of an archipelago that they baptised the South Shetlands. Little by little they extended their field of action and their ravages to the neighbouring islands and to Graham Island, probably without realising that they were on a peninsula of the Antarctic continent. During the same period, the Russian Bellinghausen circumnavigated the southern polar ice-cap for the first time (1819-1821). The English Captain Weddell sailed as far as the 75th parallel. In 1810, the Frenchman Dumont d'Urville touched upon a coast which he named after his wife Adelie. He was the first to set foot in Antarctica. The American Wilkes also contributed to our knowledge of the southern continent. Finally the Englishman Ross sailed along the hundreds of miles long wall of ice that constitutes the Great Barrier. This expedition had had a great surprise on entering the Antarctic. It had found the only active volcano in these regions. Blazing away in the midst of the ice, the volcano, which had been baptised Erebus, gave a veritable impression of an inferno.

After Ross, a long time went by before there was further exploration of the southern seas. It was not until the last years of the century that the great voyages were resumed. Expeditions then followed each other in quick succession. In 1898, the first Antarctic winter quarters were installed by the crew and experts, headed by the Belgian Adrien de Gerlache, of the ice-bound "Belgica". The 2nd Lieutenant was a Norwegian named Roald Amundsen. . . .

In 1899, Borchgrevink headed an English crew that wintered for the first time on land. In 1902-1903, Nordenskjöld and a Swedish crew spent a dramatic period at the outermost extremity of Graham Island. In 1904, and then in 1909-1910, Charcot, following in the footsteps of Dumont d'Urville, led a French crew to the Great South.

The Pole itself had not yet been stormed. It was first necessary to reconnoitre the approaches to the continent. Finally the preliminaries seemed to be drawing to a close.

In 1902, the Englishman Scott ventured from Ross Island (where "Erebus" stands) on the barrier of the same name, to Victoria Land, more than 180 miles from the coast, and also to the 80th parallel, on the ice-bank that covers Ross Sea, of which the barrier is only the shore. Another Englishman, Shackleton, fought the first battle against the Pole itself.

After wintering on Ross Island, he and three companions headed due south along the Ross ice-bank. The sleds, which were drawn by Manchurian ponies, were piled high with a three-months' food supply. On January 9, 1909, Shackleton had to stop about 115 miles short of his goal. If he continued, he would have been unable to return to

his base, for his provisions would have been exhausted.

The English had got under way on October 24. From the very beginning they were in trouble. A few days after setting out, the motors of the the vehicles broke down. The ponies, more sensitive to cold than dogs, died before they reached the mountain.

Twelve men began to climb the fearful Beardmore Glacier, which had been used by Shackleton in 1909 as a way of access to the central plateau: they themselves pulled the three heavily laden sleds. Scott reduced the final team by sending seven of his men to Ross Island.

He remained behind with four others and a sled loaded with food and equipment for four persons. They, too, watched the horizon. They were afraid of seeing the Norwegians. After a sixty-nine day march, they arrived exhausted at the Pole only to find that Amundsen had already been there. Bitter disappointment was added to their fatigue.

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They made their way back, in a state of complete exhaustion. Winter was coming on, and the weather grew increasingly worse. They were beset by one misfortune after the other. Evans, one of the explorers, died of exhaustion during the descent of the Beardmore Glacier after having delayed his companions for some days.

A month later, Oates, likewise at the end of his tether, walked out into the blizzard on the Ross ice-bank: in that way he would no longer be a burden to the others. The three survivors, imprisoned in their tent by the storm, ten miles from any depot, soon exhausted their meagre provision of food and fuel. Scott saw his two friends die.

Before succumbing, he left a final message, written probably on March 29, in the diary of the expedition:

"We took risks; we knew we took them; things have come out against us, and, therefore, we have no cause for complaint but bow to the will of Providence, determined still to do our best to the last. But, if we have been willing to give our lives to this enterprise, which is for the honour of our country, I appeal to our countrymen to see that all those who depend on us are properly cared for. Had we lived I should have had a tale to tell of the hardihood, endurance and courage of my companions which would have stirred the heart of every Englishman.

"These rough notes and our bodies must tell the tale".

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This tragedy did not stop the pioneers. Shackleton returned in 1914-1915 to attempt the first crossing of the Antarctic from the Weddell Sea to the Ross Sea. His boat was crushed by icebergs before sighting the polar ice-cap.

The Australian, Mawson, was the first to utilise modern techniques in the Antarctic. In 1913, he made use of radio; for the first time, the seventh continent was no longer isolated from the rest of the world.

The other great innovation was the airplane, which the Englishman Wilkins used on Graham Island in 1928. Thanks to this new means of transportation, in 1935 the American, Ellsworth, crossed the continent from Graham Island to the Ross Sea.

After him, the Americans used planes on a wide scale in the four expeditions that they launched from Little America, off Whale Bay, exactly where Amundsen had built his base. Under the leadership of Admiral Byrd, they employed a wealth of means hitherto unknown in the Antarctic.

In 1946-1947, "Operation High-jump" used thirteen boats and four thousand men, plus, of course, the planes. As early as 1929, however, Byrd had flown over the South Pole.

At the present time, the International Geophysical Year is making great progress in developing knowledge of that part of the world and in improving the conditions of exploration. The forty-eight stations, which are equipped by eleven countries, have, for the most part, every possible comfort: heating, running water, cinema, electricity, radio, phonograph, etc. The life of the explorers is thus made as comfortable as possible.

When we consider the fact that an American admiral and a dozen generals made a special trip to the South Pole (by plane) in the company of Hillary to welcome Dr. Fuchs, arriving on his "snowcats", we realise the change that has taken place in Antarctic exploration since the time Scott arrived there on foot, having pulled his single sled himself.

Space—The New Horizon

By George Teubeneck

As broadcast over 2BL on July 25

SPACE flight won't be continuous — like an airplane trip from Sydney to Perth. Rather, it will be done in leapfrog fashion. You'll transfer from one craft to another along the way.

From earth, first you'll rocket to a manned satellite which already will be travelling around the world at an altitude of 1,000 miles.

Next you'll take off from the satellite, and rocketship to a point near Mars or wherever. A winged landing craft then would be detached from your orbiting ship and land, say, on Mars.

Thereupon you'd look around for a while in your air-conditioned space suit, ask to "see their leader," and take notes. In due time you'd reboard your landing craft (which converts to a self-launching rocket through quick-attaching turbojet pods and tail fairings) for flight back to Earth. Aerodynamic braking after a spiralling orbit lands you safely.

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Initial take-off weight of this outer space ship would be 600 tons, with a final payload of some three tons after propellant sections were dropped.

In addition to a crew of three men, a space ship might carry on round-trip missions:

- Adequate supplies for two to six months of travel.
- Four or five passengers.
- Approximately 1,000 pounds of recording and directing instruments.

Space ship power by means of chemical reactions (such as zoop present missiles) is deemed relatively uneconomical. Three other methods are "in process."

- Gas is generated by direct conversion of heat energy from nuclear reactors, from electric arcs, or from the sun — and thrust out, as in a jet plane or chemical-type rocket.
- Nuclear or solar power is converted directly to ions, which are accelerated by electrical fields — then pushed out of an electronic nozzle.
- Photons are emitted (also as in a jet plane) to provide space travel at or near the speed of light!

In the first two types of space ship motors, a weight penalty is paid as compared with chemical propulsion. This can be compensated by higher exhaust velocities. Such exhaust velocities will be achieved by electrical acceleration. You see, much more energy can be imparted to a given mass electrically than chemically.

ALSO, in this method, exhaust particles could be so directed that they wouldn't beat a tattoo on the engine chamber walls. Hence the heating problem would be less severe.

Photon power is the real exciter. A "motor" of this sort would emit a undirectional beam of photons, which would produce momentum equal to E/C (the energy divided by the velocity of light).

These photons would be created by converting a metal into radiation energy, in accordance with the famous Einstein equation.

A space ship propelled solely by ionic photons would be limited to travel in outer space itself. Reason: its thrust would be so small (relatively) that it couldn't lift a vehicle from the surface of a planet against gravity forces.

An alkaline metal, such as rubidium or cesium, can be ionized easily and has a high power yield. Atoms of these metals are ionized with almost 100% efficiency when they strike a hot surface of platinum foil.

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A temperature of about 200 degrees centigrade is enough to produce sufficient vapour pressure from cesium to power a space ship. After the cesium "boils" in its ionization chamber, which contains hot platinum grids, its power is fabulous. From there ions are extracted by an electric field. This field accelerates ions in the thrust chamber to a velocity of about 50 miles per second. They leave the "motor" in a steady flow of electric current.

When our space ship approaches the orbit of Mars (or wherever) a few manoeuvres will bring it into a spiral around the planet. Otherwise, it either would crash on the surface or pass that planet in a hyperbolic trajectory.

After it reaches the gravitational field of a planet, it must spiral around several times to get closer, gradually, without coming a cropper.

Navigation of an outer space ship should be a relatively

simple problem, we are told. Pilot would, of course, keep a constant watch on heavenly bodies. Direction of the ship, with respect to one or more of the fixed stars, continually would be measured and recorded on automatic star trackers.

Interesting comparisons can be drawn between contemplated space flight and earlier earth exploratory voyages of the 15th and 16th centuries. For example, by the time the first space ship leaves for Mars, its trip will be much better planned in every respect and detail than was Columbus' expedition when he started in 1492.

Safe return of these first space travellers will be much more probable than was that of Columbus' venturous seamen, furthermore.

You will also recall that Columbus' navigation capabilities were so poor that he thought he had reached Asia when he landed on a Caribbean island in the New World.

Magellan started out on his around-the-world trip with three ships, but only one completed the voyage. Magellan himself, plus many crew members, died en route.

Of Columbus' three ships, the Santa Maria had a gross weight of 100 tons and carried 52 persons. The Pinta and Nina had, respectively, gross weights of 50 tons each and carried 18 persons.

The Mayflower had a gross tonnage of 180 tons and carried 102 passengers, in addition to a crew of approximately 30 persons.

For interstellar space travel we are preparing for 150 tons payload, with possibly 10 persons per ship.

You can see that, relatively speaking, living conditions on one of these space ships would be rather plush, compared, that is, to the crowding aboard the underled and foul-smelling Santa Maria and Mayflower.

Pilots of an interplanetary ship obviously should be carefully selected on basis of health, emotional stability and scientific interest.

Dedicated men of this nature will not mind spending quiet months or years travelling on board a space ship. They simply would pack their briefcases with a backlog of unfinished scientific work and enjoy an excellent opportunity to pursue it without interruptions by telephone calls, or by nosy investigators.

This promise alone would entice many a modern scientist to sign up for such a trip.

Now that interplanetary travel is within our technological grasp, it is interesting to speculate on possibilities of interstellar travel (from our Milky Way to similar galaxies) far, far out.

* * *

Here's a genuine brain stopper:

An almost unbelievable result of Einstein's theory of relativity is this: In a photon-pushed space ship moving with a velocity approaching that of light (186,000 miles per second) time stands still. Clocks stop, so do calendars.

Thus, a journey to remote galaxies conceivably could be made within a few years (as observed by the travellers).

Of course, this journey would be equivalent to a period of maybe several thousand years, as measured by people on earth.

Noticeable changes might have taken place, in the meantime, when our space travellers returned to the good ol' Earth.

Imagine: You'd depart for the Constellation Vega in the year 1998, and return — still alive — to earth in the year 7998! Staggers one's imagination, doesn't it?

THEY FOUGHT ALONE. By Maurice Buckmaster. (Odhams Press, U.K.)

War makes strange bedfellows —and many an odd character emerges in Colonel Buckmaster's book on the secret agents he organised in France under the banner of the resistance movement. This book ought to have been of the highest excitement, packed with the sort of thrillers that have appeared so frequently (and with never-failing attraction) on the cinema. Perhaps it is the rather colourless writing, perhaps the deliberate emasculation of detail, and perhaps the sameness of the anecdotes and case histories, that make it flat —not only small beer but rather stale, too.

Disclaiming that his organisation was a Fifth Column scheme, Maurice Buckmaster defines it as a "unified tactical and strategic operation" and as being of a military nature. Of his agents he says: "All were heroes" and "Courage was their common badge". At the other end of the scale he admits that some war writers have regarded the organisation as a glorified concert party. After reading his account an impression is given that these heroes, men and women, would never have fitted into the major channels of war operations and they were thus doing their best as individualists — one might almost go so far as saying quixotic, except that they did knock down a few German-held windmills.

For the student of the cloak-and-dagger method several interesting points slip out. One agent was self-exposed by having short-cut hair; many were instantly recognised by the native French who kept their secret in their common hatred of the Huns. What is also interesting is the absolute refusal of the Free French General de Gaulle to co-operate; he who "never lost his dislike of the fact that our agents were working in France". The professional's distrust of the amateur?

—B.J.H. in "The Navy", London.

OPERATION SEA LION. By Ronald Wheatley. (Oxford University Press, U.K.)

There has always been considerable diversity of opinion on the question of the invasion of Britain in the last war. Could it have been successfully carried out immediately after Dunkirk, as some German military authorities such as Field Marshal von Manstein think? Did the victory of the Royal Air Force in the Battle of Britain save us from invasion or did Germany's lack of command of the sea present insuperable difficulties? Did Hitler really want to land in Britain or was the whole invasion plan merely part of his war of nerves?

All these questions are fully investigated in "Operation Sea Lion", whose author Ronald Wheatley had unrestricted access to the official German archives captured in 1945. In his excellent book he makes it clear that owing to the immense difficulties, invasion could only hope to succeed as the last act of a series of successes starting with the destruction of the Royal Air Force and leading to the virtual collapse in Britain of the will to resist. Hitler himself was well aware of the difficulties, but he decided "to prepare, and if necessary to carry out, a landing operation against England". He himself was to be in supreme command of the operation. His generals were confident of success. Goering was certain of victory in the air battle. Only Admiral Raeder had a clear appreciation of the hazards of an attempted sea crossing with Britain superior at sea. At the end of July, 1940, Hitler decided that the air attack would begin and that Operation Sea Lion must be prepared for oper-

ation on the 15th September. But success in the air war did not come and the executive order for invasion was postponed. By the end of September the chance of carrying out invasion was remote and on 12th October Hitler renounced the operation.

The author's conclusion is that air power, the new factor in warfare, greatly influenced the method, but did not revolutionise the art of invasion. The primary problem for the invading power remained the protection of his transports during the initial crossing and guarding their lines of communication. Had Britain not been an island, she would have been over-run as surely as were Poland and France.

—A.D.N. in "The Navy", London.

CAPE OF STORMS. By Hugh Popham. (Rupert Hart-Davis, U.K.)

Here we have a vivid account of what is to the men of the trawlers a routine journey towards the White Sea, but Hugh Popham, who went as a passenger in the **Brucella**, gives us such a fresh and lively narrative that we almost envy him the experience—I say "almost", because he seems to care not at all for the discomforts and even the dangers. As it was the British trawlermen who discovered and pioneered the distant - water grounds, only to find themselves being gradually legislated out of them by countries who came late into the game, but whose shores are closest, it is not surprising that they refer to the Scandinavians generically as "Square-headed bastards" or other non-complimentary terms. But when the British vessels put into Icelandic or Norwegian ports on occasion for food and fuel, for repairs and medical aid the agents come aboard and the crews go ashore and amity prevails.

JAPAN AND HER DESTINY. By Mamoru Shigemitsu. (Hutchinson, U.K.)

The author of this informative and interesting book—Mr. Mamoru Shigemitsu — is a scholar and a statesman who served a term of imprisonment as a war criminal. He deals with the course of events during what is called the Showa era, which began in 1926, when the Emperor Hirohito ascended the throne, and his aim is to explain, for the benefit of his countrymen, the reasons for Japan's actions in the various incidents leading up to, and during the war. Throughout most of this long period Mr. Shigemitsu held important diplomatic and Government posts, including the appointment of Foreign Minister for two years after Japan's entry into the war.

Even so, he tells us, he himself was ignorant of many incidents that had occurred until he heard the evidence for the Prosecution and Defence at the War Crimes Tribunal in Tokyo. This convinced him that if his countrymen were to rebuild Japan it was essential that they should understand all that had happened, and why, during the most turbulent epoch of her history.

He writes objectively and on the whole impartially. But he is, perhaps, inclined to be too strongly biased in favour of the statesmen and to over-emphasise their complete lack of power *vis-à-vis* the military. As he points out, the storms from first to last were mainly in connection with the problem of China; and if the politicians had shown firmness and decision at the outset—in the early days of the occupation of Manchuria — Japan might well have avoided the disaster of a major war.

Mr. Shigemitsu's book will be thoroughly enjoyed by all who are interested in Japan of the twentieth century.

—G.P.T. in "The Navy", London.

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