the Seacat guided-missile system, twin 4.5-inch guns and a Wasp helicopter, which carries homing torpedoes to deal with submarines at long range. The main propulsion machinery consists of two sets of steam turbines developing 30,000 shaft horse-power and giving speeds in excess of 30 knots. They are among the finest sea-keeping ships ever possessed by the Royal Navy and have an excellent performance in bad weather. Certain ships are being refitted to operate the Ikara anti-submarine weapon system, and others, the Exocet surface-to-surface guided-weapon system. Fifteen *Leander* class ships are in the review lines, showing the various weapon-fits above.

Type 12 Whitby Class Frigates

The six Type 12 *(Whitby* class) frigates were the first post-war design A/S frigates to join the Royal Navy. The *Rothesay* and *Leander* classes improved on the Type 12 design. The remaining *Whitby* class ships are mainly used for training and their armament and accommodation have been modified to fit the new role. HMS *Torquay,* now used for navigation training, and HMS *Eastbourne,* used for MEA apprentices training, represent this class.

Type 81 Tribal Class Frigates

The Tribal class are general-purpose frigates. New equipment includes the Seacaf missile system. The main machinery is supplemented by gas turbines to boost their speed and enable them to leave harbour at short notice. They are equipped with a Wasp helicopter. Four of this class of seven ships are at the Review. Their names, *Ashanti, Eskimo, Gurkha, Mohawk, Nubian, Tartar* and *Zulu,* perpetuate some of the famous destroyer names of World War **II.**

Type 61 Salisbury Class Frigates

These ships are primarily for the direction of carrier-borne and shore-based aircraft. For this role they are fitted with highly developed electronic equipment. They can also be used for anti-submarine warfare. HMS *Salisbury* and HMS *Lincoln* have been fitted with the Seacat missile system. HMS *Lincoln* is fitted with controllable pitch propellers. HMS *Chichester* has been modified for guard-ship duties in the Far East. HMS *Salisbury* is the only ship of this class in the Review.

FACING PAGE (top to bottom): *HMS* Zulu, a *Tribal class frigate; HMS* Sheffield, *name ship of her class of destroyers; HMS* Phoebe, *a Leander class frigate which featured as HMS* Hero *in the popular BBC TV series `Warship'; HMS* Plymouth, *a Rothesay class frigate.* **THIS PAGE** (top to bottom): *HMS* Arrow, *a Type 21 frigate; HMS* Salisbury, *name ship of her class; HMS* Dundas, *a Blackwood class frigate; a Mine Countermeasures squadron of the 'Ton' class* (from top : *HM Ships* Crofton, Shavington, Walkerton, Stubbington, Ashton *and* Leverton).

Type 41 Leopard Class Frigates

Four *Leopard* class frigates were built for the anti-aircraft protection of surface forces. Their armament is two twin 4.5 automatic radar-controlled turrets and an anti-submarine mortar. HMS *Lynx* is present at the Review.

Type 14 Blackwood Class Frigates

The *Blackwood* or Utility class frigates were small A/S frigates armed with two small guns and two three-barrelled A/S mortars. HMS *Exmouth* was converted to be the first gas-turbine-propelled major warship. Three ships of this class are still used for training at .sea and two others are retained as Harbour Training Ships. Two of the class are at the Review.

Patrol Boats

The Navy has ordered four 190-ton Bird class patrol boats, based on the Seal class long-range recovery craft. Their duties will include fishery protection. HMS *Peterel* is present at the Review, manned by men of the RNR.

A recent order has been placed for five Isle class patrol vessels for protection of oil-rigs in the North Sea. These ships will be approximately 1,250 tons and the earliest vessels have been launched.

Fast Training Boats

Three fast training boats, *Scimitar, Cutlass* and *Sabre,* provide anti-fast-patrol-craft training for ships and helicopters of the fleet. They are powered by two sets of engines, the main engines are gas turbines supplied by Rolls-Royce Limited and the auxiliary drive engines are diesels manufactured by Fodens Limited. Their top speed is in excess of 40 knots. All are at the review.

Mine Countermeasures Vessels

The Navy has 38 coastal minehunters or minesweepers remaining of the 'Ton' class which once numbered over 100 ships. Between them, they can deal with all types of mine. Five ships have been converted to patrol craft and are fitted with an extra 40-mm Bofors gun. HMS *Wilton,* built of glass-reinforced plastic on existing lines, is the largest GRP ship in service. A new class of larger GRP MCM vessels has been ordered following extensive trials with *Wilton.* Twenty `Ton' class vessels are present at the Review.

The 'Ham' class of inshore minesweepers also once numbered over 100 vessels. Nine ships of this class are present here –either as the training ship of university RNR units or as RNXS ships. The RNXS ships can be seen patrolling the anchorage.

Survey Ships

One of the most important peacetime tasks of the Royal Navy is hydrographic and oceanographic surveying. Information from surveys is needed for Admiralty charts which have a world-wide sale and are used by ships of many nations. The surveys are the responsibility of the Navy's Surveying Service which has been operating throughout the world since the formation of the Hydrographic Department in 1795. It has ocean-going ships, coastal vessels and inshore craft, each carrying survey motor boats. Some ships also carry helicopters. Three ocean survey ships (one flying the flag of the Hydrographer of the Navy), four coastal survey ships and five inshore survey craft are present.

LEFT: *Naval fixed wing aircraft taking part in the Fly Past* (from top to bottom): Phantom. *A twin-engined, all-weather fighter and ground attack aircraft operated from HMS* Ark Royal. *Crew : pilot and observer. Maximum speed greater than Mach 2.*

Buccaneer. *A twin-engined, low-level strike aircraft operated from HMS* Ark Royal *Crew : pilot and observer. Maximum speech of approx. 700 mph.*

Gannet. *A turbo-prop aircraft operatee from HMS* Ark Royal. *Its main role airborne early warning, i.e. the detection of enemy air and surface forces at great distances from the carrier. Crew : pilot two observers. Maximum speed 310 mph.*

Canberra *and* Hunter (not illustrated) *These aircraft are based at RNAS Yeovilton and are operated by the Fleet, Requirements and Air Direction Unit (FRADU). Their duties include target-towing, direction training and weapon: alignment.*

Helicopter Support Ship

RFA *Engadine,* helicopter support ship, was specially designed to meet training requirements for the flying, handling and maintenance of helicopters. She does not carry her own flight, hut the hangar can house four Wessex and two Wasp or two Sea King helicopters.

The Royal Fleet Auxiliary

The Royal Fleet Auxiliary (RFA), the Merchant Navy manned fleet which replenishes warships at sea with fuel and stores, comprises some 40 ships, ranging from a 1,000-grt coastal carrier to a 42, 500- grt mobile reserve tanker. Some are fitted to operate helicopters. Five *Rover* class tankers are in service. The Royal Fleet Auxiliary is also responsible for the *Sir Lancelot* class logistic ships used in amphibious landings.

Naval Hovercraft Trials Unit

The Naval Hovercraft Trials Unit carries out trials and associated training in support of the possible development of hovercraft in the mine countermeasures role. Two hovercraft are moored in the lines of the Review, and have been used during the previous week to ferry mail, passengers and urgently needed stores to the anchored Fleet.

Other Units

In addition to the classes already described, the Royal Navy and its sea-going supporters, the Royal Fleet Auxiliary, Royal Maritime Auxiliary Service and Royal Naval Auxiliary Service, operate many other vessels. These include the Antarctic patrol ship HMS *Endurance,* small oilers, waterboats, ammunition and store carriers, harbour tugs, torpedo-recovery vessels and small cross-harbour passenger craft.

New Classes of Ships Under Construction

To meet the changing role of the Royal Navy, new classes of ships are being built. Some of the largest ship-types include :

a. The anti-submarine or 'through-deck' cruiser –~~a~~ class planned to consist of three ships capable of operating the Sea Harrier V/STOL aircraft and Sea King helicopters. The planned complement is approximately 1,000 officers and ratings. The ships will be propelled by gas-turbine engines. HMS *Invincible,* the name-ship of the class, was ordered from Vickers of Barrow on 17 April 1973. The second ship, to be named *Illustrious,* was ordered from Swan Hunter in 1976.

b. The Type 22 frigates are the first all-metric ships designed for the Royal Navy. They will displace 3,500 tons, be gas-turbine propelled, armed with the Sea Wolf missile system, and will operate a Lynx helicopter. HMS *Broadsword,* the lead-ship, was launched on 12 May 1976 by Yarrow. Her sisters, HMS *Battleaxe,* and one unnamed (at time of writing) have been ordered.

c. Fort class Royal Fleet Auxiliaries two under construction. These 605foot-long diesel-engined afloat support ships, will he capable of operating a helicopter. The first vessel, named *Fort Grange,* was launched on 9 December 1976.

RIGHT: *Naval helicopters participating in the Fly Past* (from top to bottom):

Sea King. HAS *1. A two-engined anti-submarine helicopter which can be used on other duties where its long endurance and all weather capability are of advantage. Crew : two pilots, observer, sonar operator.* Wessex. HAS 3, HU 5 and HAR 1. *All three versions are in service with the FAA and are used on anti-submarine, troop-carrying and search and rescue duties. Marks 1 and 3 have a single gas turbine; Mark 5 has two. Max. speed 120 mph.* Lynx. HAS 2. *This new twin-engined helicopter which will replace the Wasp will enter service shortly and operate from frigates and destroyers. Crew : pilot and observer. Max. speed over 150 mph.* Wasp. *A single-engined helicopter operated from frigates, destroyers and survey ships. Its main roles are anti-submarine and anti-fast patrol boat. Crew : pilot and missile aimer. Max. speed 120 mph.*

Gazelle. *Light single-engined helicopter used for training. Normally shore based but it is also used by the Royal Marines on sea-borne operations. Crew : pilot. Max. speed 190 mph.*

Fleet Reviews of the Past

Fleets have gathered at Spithead for more than 2,000 years. This is because of Spithead's unique situation—a large sheltered anchorage with access to the sea at both ends, near Europe and yet reasonably close to the ancient and modern capitals of England, Winchester and London. Roman ships from Portchester and Chichester would gather at Spithead before departing in company for France (Gaul) and a few centuries later Alfred the Great's war vessels met here before leaving to fight the Danes.

More than 1,000 ships gathered in the anchorage in June 1346 before King Edward III sailed to fight in France in July, but it was not until 1415 that Henry V made the first Royal Review of ships before sailing in the expedition which resulted in the victory at Agincourt.

Queen Elizabeth I reviewed a squadron at Spithead in 1582 and records indicate that this was the first time yards were manned and salutes fired. King Charles II inspected a fleet at Portsmouth in May 1662, bringing his royal watermen down from the Thames to row him out. William **III** reviewed the fleet on 16 February 1693, shortly after Vice-Admiral Rooke's victory at La Hogue.

Mock naval battles were to become popular at reviews and possibly the first one in British waters marked the visit of Peter the Great, Czar of Muscovy, to Portsmouth in March 1700. 'The representation of a sea engagement was excellently performed and continued a considerable time, each ship having 12 lb. of powder allowed, but all the bullets were locked up in the hold for fear the sailors should mistake.'

In June 1773, King George III travelled from Kew to visit his fleet at Spithead. On arrival at Portsmouth, His Majesty was saluted by a 'triple discharge of cannon' and, attended by Lord Spencer, First Lord of the Admiralty, proceeded to the dockyard landing place where the admirals and captains of the fleet were assembled each with his barge to escort the King's and Admiralty barges to Spithead. On 22 June, the fleet at Spithead consisted of 20 ships of the line, led by the *Barfleur* (90 guns), two frigates and three sloops, most of them being ships which had fought the French and Spanish navies in the Seven Years' War and were soon to fight again across the Atlantic Ocean in the War of American Independence.

The King was rowed out to the *Barfieur,* and after inspecting the officers' quarters, retired aft to the admiral's cabin, where at 3.30 p.m. he 'sat down to a table of thirty covers'. Later, His Majesty was rowed round the lines of ships with his escort of captains' barges, being saluted with 21 guns from each ship, and finally boarded the royal yacht *Augusta* and sailed up harbour. For four days this programme was repeated until on the final day the royal yacht led the blue division of the fleet in a short cruise to Sandown Bay. During the visit, 12 ladies of Portsmouth asked the honour of rowing the King from the dockyard to a man-of-war and he afterwards said that his barge had been `manned' by 12 of the finest women in Portsmouth!

On 15 June 1794, Admiral Lord Howe, with the fleet and some captured French ships under his command, arrived at Spithead after his glorious victory of the first of June. On the 26th of the month, the King and Queen arrived at Portsmouth and were conveyed by royal barge to Spithead. On board the *Queen Charlotte* the King presented Howe with 3 sword richly set with diamonds. Howe, on receiving the gift, pointed to the seamen and said with emphasis : "Tis not I ; 'tis those brave fellows who have gained the victory.' This is the only authenticated review of a victorious fleet by the Sovereign immediately after the battle.

A review of the fleet took place on 25 June 1814 to celebrate the Treaty of Paris and to show the Allied sovereigns `the tremendous naval armaments which had swept from the ocean the fleets of France and Spain and secured to Britain the domain of the sea'. On this occasion, the Prince Regent was host to the Czar of Russia and the King of Prussia and the ships they inspected were very little different from those that had assembled for King George III's review, 41 years earlier. This was the last review in which only sailing vessels took part.

In March 1842, Admiral Sir Edward Codrington welcomed the young Queen Victoria and Prince Albert, accompanied by the Duke of Wellington, to a `Grand Naval Review' held in their honour. Her Majesty won the hearts of the bluejackets of HMS *Queen,* a three-decker of 110 guns, by drinking rum from a mess basin and tasting soup with one of the iron spoons used in the mess. The men cheered vociferously and the Queen, with a tear in her eye, said : `**I** feel today that I am indeed old

ABOVE: *The Coronation Review of the Fleet in 1952, from a painting by Norman Wilkinson in the National Maritime Museum. Her Majesty reviewed the Fleet from HMS* Surprise *which is seen in the right foreground.*

Ocean's youthful queen and that I am indeed surrounded by those who will uphold that title in the battle and the breeze.'

On 23 June 1845 a naval review of the Experimental Squadron at Spithead was witnessed by the Queen and Prince Albert. The squadron had been formed specially for testing the speed and seagoing qualities of ships of various designs. The Queen was embarked in her new yacht *Victoria and Albert,* a paddler, and the Board of Admiralty attended in their steam yacht, the *Black Eagle,* also a paddler.

The first royal inspection of a fleet of steam warships, held at Spithead on 11 August 1853 when war with Russia was imminent, attracted extraordinary attention and was remarkable for two facts. First, it included screw ships of the line as well as paddlers, and second, spectators were brought down from London by train. At the end of their inspection, the Queen and the Prince Consort led the fleet to sea to meet, outside the Nab, an 'enemy fleet' consisting of the three great sailing ships of the line, *Prince Regent, London* and *Queen.* They were engaged by the steamers (who, of course, won easily) and the review ended with a race back to Spithead, again won easily by the steamships.

On St George's Day 1856, led by the *Royal George* in honour of the occasion, a great naval review of the fleet by Queen Victoria took place after the return from the Baltic. The fleet mustered at Spithead numbered 254 ships of all classes, manned by over 50,000 men and carrying 1,132 guns. The squadrons were composed of 22 line-of-battleships, 16 screw frigates and sloops, 26 paddle frigates and sloops, 8 royal yachts and tenders, 7 screw mortar vessels and floating batteries, 6 troop ships, 7 sailing vessels and 188 gunboats, the latter 'puffing about like locomotive engines with wisps of white steam trailing from their funnels'. The spectacle included an attack by the gunboats on the land defences, but the sailors, firing blank cartridges, landed unopposed. At the last moment the lieutenant-governor ashore discovered that he was expected to pay for the ammunition used by the soldiers and, to relieve his pocket, withdrew every round.

On 17 July 1867 an imposing naval demonstration was made at Spithead in honour of the Sultan of Turkey, accompanied by Queen Victoria and the Viceroy of Egypt. For the first time every ship present flew the White Ensign, for the old red, white and blue squadrons were now no more and every ship in one column was either iron-built or ironclad.

On 23 July 1887, celebrations of Queen Victoria's Golden Jubilee were concluded by a naval review. New types of ship appeared, among them HMS *Collingwood* with her guns in barbettes, the large brig-rigged HMS *Inflexible* with four 80-ton muzzle-loading guns, and a Nordenfelt submarine. The torpedo had made its appearance and was carried by several torpedo boats and torpedo cruisers. A total of 136 ships were engaged and after dark all were illuminated with coloured lights.

By 26 June 1897, Queen Victoria was too old and too frail to attend her Diamond Jubilee Review and the Prince of Wales (later King Edward VII) deputised for her. No less than 173 British warships were assembled between Portsmouth and the Isle of Wight, arranged in four lines, each about five miles in length. Outside them were two other columns, one composed of warships sent by other Powers and the other of special merchant vessels. The small *Turbinia,* Sir Charles Parsons' new venture which was to revolutionise steam propulsion in all the navies of the world, stole the show by displaying her speed and ease of manoeuvre.

The Coronation Review of King Edward, on Saturday 16 August 1902, concluded with the dispersal of the ships on 18 August. This review was the last occasion on which ships appeared with their black hulls, a red or green boot-top, yellow and white topsides, buff masts and funnels, and gilt 'gingerbread' work on bows and sterns.

On 31 July 1909 the King held the first review at which battle cruisers made their appearance, the original ship of the type, the *Indomitable,* having in the previous year made her record run to Canada and back with the King. The large number of submarines among the warships indicated the high value now placed on them.

King George V's Coronation Review on 24 June 1911 was the principal event of the year. Unlike some earlier reviews none of the 165 vessels present had been specially commissioned or brought forward from reserve. The official programme stated that 'naval estimates 19101911 total £40,603,700–a prodigious sum it may appear for preserving the integrity of the Empire'.

The most impressive review to date was the one witnessed on 9 July 1912 by members of both houses of Parliament. New elements were introduced by the presence of aerial craft (one of which made an ascent from the deck of HMS *London)* and hydroplanes (which took a prominent part in the evolutions).

On 16 July 1914, the historic anchorage at Spithead witnessed a naval spectacle that excelled in power and majesty the many imposing past fleet reviews. In all, there were some 40 miles of ships drawn up in 12 long lines, which included over 50 battleships. This special mobilisation was organised by the Admiralty ostensibly to test the efficiency of the reserve system, but actually because they foresaw the early use of the fleet in terrible earnest.

On 26 July 1924, it was a vastly altered fleet of more than 200 ships which was reviewed in Spithead. In numbers there was little difference, but in types the change was astounding. In the 1914 review there were 55 battleships, in 1924 there were 10. The battle cruisers had been reduced from 4 to 1, the cruisers from 55 to 9. The aircraft carrier appeared for the first time. Destroyers increased from 46 to 88 and submarines increased by 4. Significant of one of the great changes brought about by the war was the presence of numerous minesweepers.

In July 1935, the King reviewed ships of the Mediterranean, Home and Reserve Fleets. The review included a fly past of the Fleet Air Arm and ended with the King leading the Battle Fleet to *sea.* The liner *Lancastria* (later sunk at Dunkirk) made a special six-day voyage round from Liverpool with spectators.

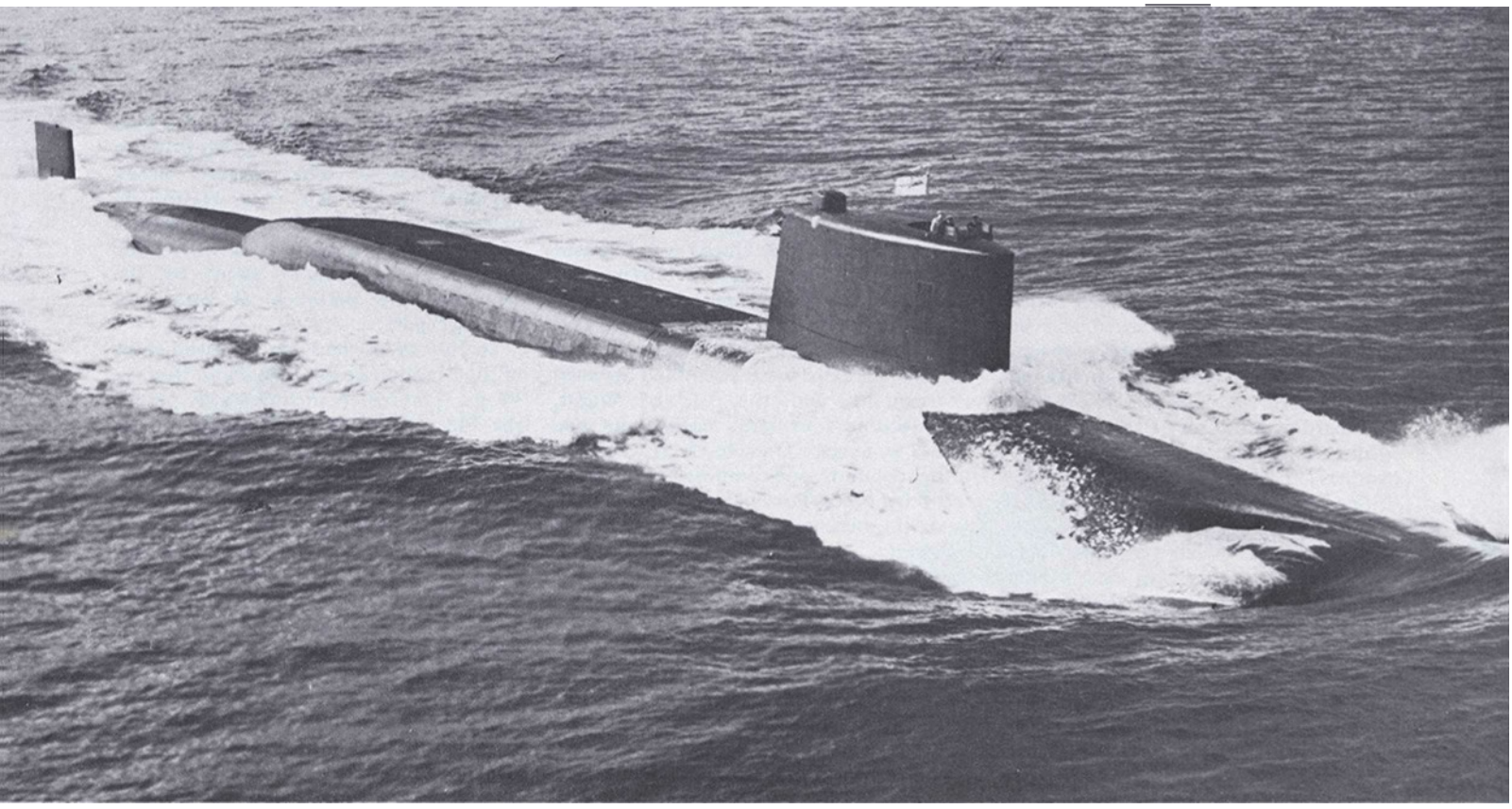
Two years later, on 20 May 1937, the ships of the fleet assembled once again in Spithead for a Coronation Review. Battleships by now were reduced to 11, while 5 carriers were present, two more than had previously been collected together at Spithead. The 60 fleet destroyers, which graced the review with their swift, slim hulls, were an added commentary on the overall cost of the battleship, for their duties were largely tied up in the essential service of escorting the bigger ships in war.

The greatest, but probably the least publicised, modern assembly in Spithead occurred in early June 1944 when King George VI inspected the `D-day' Isle of Wight anchorage area. On this occasion, the lines stretched from Hurst Castle in the west to Foreland in the east, with over 800 ships, most of them landing craft and minesweepers.

On 15 June 1953, another fleet assembled at Spithead for HM The Queen's Coronation Review. It was evident how the experience of World War II had influenced naval thought and design. In the place of 11 battleships of 1937, there was one, but 8 modern carriers and a fly past of 350 naval aircraft, including jet-propelled fighters, gave emphasis to the growth and development of naval aviation in recent years. For the first time specialist landing ships and craft appeared. The ships were mainly veterans of World War II and some had seen service off Korea. HMS *Reclaim is* the only ship to be present at both 1953 and 1977 reviews.

On 28 June 1977, as the Fleet assembles once more at Spithead, this time to celebrate the Queen's Silver Jubilee, we can observe marked changes in the design and employment of different classes of ships since the Queen's Coronation Review in 1953.

HMS *Valiant* is the oldest ship's name present today. The *Valiant* first appeared in 1794 and since then a *Valiant* has been present at five other reviews. The name of HMS *London* has appeared most frequently; 1977 will be the ninth Spithead review containing a ship of that name. In all, 55 ships present today bear the names of ships which have attended previous reviews. The names live on and help to perpetuate the proud traditions of the Royal Navy.



The Submarine Service

Two hundred years ago, on 6 September 1776, Ezra Lee, a sergeant in the American Revolutionary Army, set off in a strange barrel-shaped object to make the first submarine attack in history-29 years before the Battle of Trafalgar. Lee's target was HMS *Eagle,* the flagship of the British fleet blockading New York harbour during the American War of Independence. His submarine, the *Turtle,* resembled a wooden beer-barrel, was powered by foot-operated propellers and contained enough air to remain submerged for only 30 minutes.

The method of attack was to submerge below the target, then rise up underneath its hull • and screw in an auger to which was attached a delayed-action mine. Having done that, Ezra Lee was supposed to pedal away (his pedals were connected with one of the first propellers *ever* invented), and await the destruction of the ship he had attacked. Things went wrong for Ezra Lee. He found it impossible to penetrate the *Eagle's* hull. He was probably suffering from the effects of carbon-dioxide poisoning inside his tiny craft.

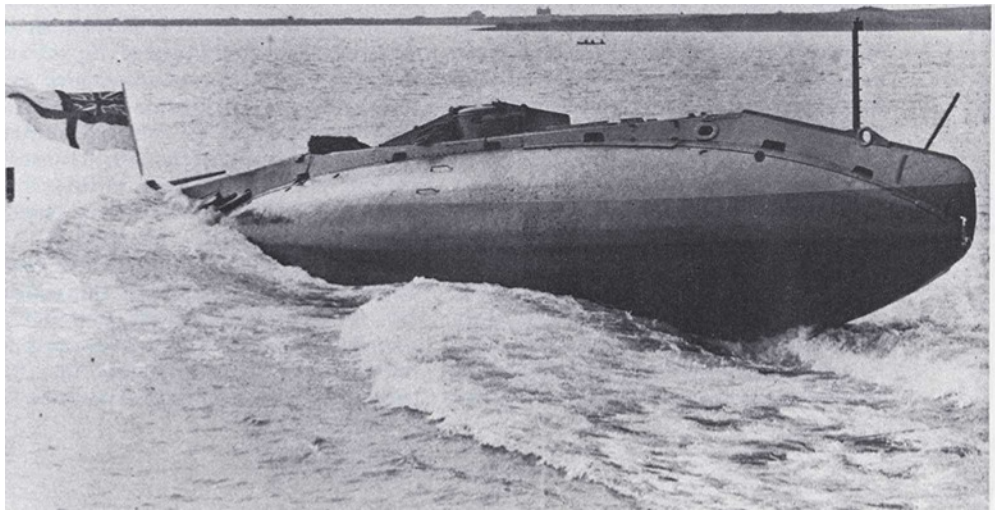
However he was sensible enough to retreat when he saw his efforts were useless, but by this time the British fleet had been alerted and one or more British rowing boats began to pursue him. Lee realised that the large explosive package on the back of his craft was slowing him down so he jettisoned it. The package blew up in the faces of the pursuing British and although it did no damage must have been very frightening. In any event it probably persuaded the British admiral-Admiral Lord Howe—to retire to the comparative safety of the outer harbour where the effect of his blockading fleet must have been much less.

The attack itself was not especially significant except that it marks the first submerged attack by any vessel against any ship. For that alone the events of 6 September 1776 are historic. What is more important is the strategic effect of this tiny unit of the revolutionary forces against an overwhelming enemy force. In brief, it proved to be a deterrent. It proved that a submarine does not necessarily have to sink a ship or even fire a weapon to achieve its aim. Sometimes its feared presence alone can be enough. In that respect, *Turtle* of 200 years ago had much in common with Britain's present-day deterrent, the nuclear-powered Polaris submarine.

However, the British Government and the Royal Navy took a long time to appreciate the value of the submarine. It was not until 125 years after the *Turtle* attack that the Royal Navy acquired its first submarine. But 167 years later, during World War II, the *Turtle's* exploit was almost exactly copied by Royal Naval midget submarines, which successfully attacked the German battleship *Tirpitz.*

Turtle was a concept in advance of its time-but the submarine story really began centuries before : it was Archimedes who formulated the principles of physical submersion in the 3rd century BC and the first recorded mention of a real submarine stems from the writings of an Englishman, William Bourne, in 1578. In the 17th century submarine designs were abundant and designers gradually concentrated more and more on the sinister purpose of a vessel which could hide beneath the waves.

After the *Turtle* exploit Britain had the opportunity to acquire its own submarine when another American, Robert



Fulton, offered his *Nautilus* design to the British Government after the French had rejected it as 'a dishonourable form of warfare.' In 1804 Fulton's submarine was examined by a committee of which Pitt was a member. Pitt's enthusiasm was scathingly dismissed by one of Britain's greatest sailors, the First Sea Lord, the Earl St Vincent, who said: 'Pitt is the greatest fool that ever existed to encourage a mode of war which those who command the seas do not want and if successful will deprive them of it.' The earl's view was to be the basis of British policy for nearly 100 years.

As the 20th century dawned six navies owned a total of 10 submarines. Eleven more were being built. France was well in the lead *with a* total of 14 built or building. The United States had two, of which the Holland-type was reckoned to be the best in the world. Even Italy, Portugal, Spain and Turkey had at least one craft each. Only in Britain was there still active discouragement.

In 1901, during exercises, the French submarine *Gustave Zede* made a mock attack on the French battleship, *Charles Martel,* and hit her with a dummy torpedo. This was a lesson in the future shape of sea power which could no longer be ignored and the British Admiralty were finally forced to reject St Vincent's policy. Five submarines of the American Holland-type were promptly ordered for the Royal Navy for intensive research into anti-submarine measures.

When HM Submarine No. 1 went down the slipway at Vickers' Barrow-in-Furness shipyard on 2 October 1901, there were still those in the Royal Navy and in the Government who hoped it would fail. At that time Britannia ruled the seas. Anything that might put a stop to such a happy state of affairs was greatly to be discouraged and, although they did not admit it, both the admirals and the politicians of the time recognised that underwater devices of any kind might very well jeopardise the existence of the mighty British battle fleets upon which the whole might and majesty of the British Empire depended. Underhand, unfair and damned un-English that was a popular view. One admiral was even publicly advocating that captured submariners in wartime should be hung as pirates.

However, submarines found, a champion in the form of Admiral Jacky Fisher, the man responsible for the building of the massive Dreadnought battleships that formed the spearhead of the British Fleet during World War I.

FACING PAGE (above): *Britain's most devastating weapon : the nuclear propelled ballistic missile Polaris submarine. None of the ships of her class will be at the Review—all are deployed on deterrent duty 24 hours a day.* (below): *The Royal Navy's first submarine, Holland Boat No. 2, launched in 1902.*
RIGHT: *A stern-on view of a Polaris submarine.*

In 1904 Admiral Fisher wrote: 'It's astounding to me, perfectly astounding, how the very best amongst us absolutely failed to realise the vast impending revolution in naval warfare and naval strategy that the submarine *will* accomplish

Thereafter submarines never looked back. They became more efficient and more self-sufficient. There were many setbacks in the early days and some tragic losses but steadily the Royal Navy's confidence, experience and knowledge grew and by 1914 the submarine service was formidable, effective and efficient.

For more than 100 years since the American Civil War, submarines had been thought of merely as harbour defence vessels and a counter to blockading ships. The German submarine, U-9, put paid to that 'defence only' concept a few days after the opening of hostilities in World War I. In less than an hour this lone submarine, operating in the North Sea well away from her base, sank three British cruisers, *Aboukir, Cressy* and *Hogue.*

This traumatic demonstration for the British gave massive impetus to the submarine-building programme. As a result naval strategy had to be drastically changed. The Fleet had to steam at high speed, zigzag and be escorted by destroyer screens at all times. Later in the war its operations were severely restricted in the North Sea and it was considered too dangerous for it to go into the southern part at all. The Germans, however, concentrated their U-boats directly against commerce and by April 1917 they were sinking merchant ships at such a rate that defeat for the Allies was in sight.

U-boats were defeated but only just as a result of a huge Allied effort, both naval and civil and based on the convoy system. It was, however, a very close run thing, and the U-boats proved themselves something which a greatly superior battle fleet, on which sea power had depended for centuries, had been helpless to counter. By attacking commerce the submarine had become a potentially war-winning weapon.

British submarines were not without their successes during World War I. They were particularly active in the campaign around Turkey. Four Victoria Crosses were won by submarine commanders in these waters. Submarine E-14 was so successful in its attacks that the Turks believed they were being invaded.

One of the most heroic operations by a British submarine was its part in the immobilisation of the U-boat base at Bruges. In 1917 Allied merchant ship losses reached the staggering total of nearly 4,000,000 tons – most of it caused by U-boats operating from the base.

A daring plan to immobilise the base was set for St George's Day 1918. A key to this famous attack on Zeebrugge was the destruction of a viaduct which would prevent reinforcements getting to the harbour defence positions. Submarine C-3, commanded by Lieutenant Richard Sandford, was filled with explosives and ordered to ram the viaduct. Having run the final mile under full view of the German guns, Sandford ploughed his submarine through the girders of the viaduct, lit the five-minute fuse, then he and his five crew members made their escape in a small boat. Under heavy fire Sandford and two of his crew were wounded but were saved by the shattering explosion as C-3 blew up.

Between the wars apart from some rather odd designs there was little development in the submarine field in Britain. Britain's between-the-war attitude towards the submarine is reflected in the stands she took at two international conferences in 1922 and 1930 in pressing for the abolition of the submarine as a weapon of war. Britain received scant support for her proposals but did succeed in getting agreement that submarines would never again be used for commerce-raiding.

However, during World War II U-boats came as near to winning as in World War I by concentrating on merchant shipping and again were only narrowly defeated. Underwater detection equipment (ASDIC), radar, the convoy system and American shipbuilding potential were mainly responsible.

Allied submarines suffered terrible losses also, but achieved great successes sinking approximately a third of the Japanese Navy's warships and contribu-

ting largely to the defeat of Rommel in North Africa by cutting off his supply line in the Mediterranean.

It was in the Mediterranean that HM Submarine *Upholder,* commanded by Lieutenant-Commander David Wanklyn, failed to return after 24 brilliant wartime patrols. The Admiralty took the unprecedented step of publishing a special communiqué praising *Upholder* and all her crew for their long and arduous duty in the Mediterranean. 'The ship and her company are gone but the example and inspiration remain.' Wanklyn had already established himself as a brilliantly successful submarine commander when on his seventh patrol he sank several large merchant ships, even though his listening gear was out of action. For this patrol Wanklyn was awarded the Victoria Cross but he went on to score even more successes before his boat was lost.

In spite of their small size Royal Navy midget submarines scored many successes against the enemy.

In 1943 heavy German warships were using Norwegian fiords as bases from which to attack trade routes to the North Atlantic. In an attempt to strike the German raiders, six midget submarines, known as X-craft, were sent to force an entry into the protected anchorages. After travelling for 10 days and covering 1,000 miles, two midget submarines commanded by Lieutenant Donald Cameron and Lieutenant Godfrey Place arrived at their objective within minutes of each other on 22 September and attacked the battleship *Tirpitz* in Kaa fiord. Cameron and Place released their charges and attempted to escape, but by this time the German defences were aware of their presence and a heavy counter-attack resulted in both men having to scuttle their craft. They were awarded the Victoria Cross.

Another midget submarine succeeded in sinking the Japanese cruiser *Takao* in the Johore Strait, Singapore, by placing limpet mines under the great ship's hull. The captain, Lieutenant Ian Fraser, and the ship's diver, Leading Seaman Joseph Magennis, were also awarded the Victoria Cross.

These attacks bore a marked similarity to the exploit of the *Turtle* in the American War of Independence.

Submarines were used for a variety of tasks during World War II. Their natural stealth made them ideal for cloak-and-dagger operations—landing spies, commando raids, picking up important refugees and escapers from the enemy coast. Submarines also used their `invisibility' to sneak close inshore to bombard enemy shore installations, trains, tunnels, viaducts, jetties, and even shore batteries. The submarine's need to surface periodically for a 'breath of air' was still its weakness however.

In spite of their defeat the Germans had led the field in submarine development and, by 1944, had perfected the schnorkel-fitted high-speed underwater craft, on which the diesel-electric submarines in service with the Royal Navy today are largely based. If this type had come into service earlier in large numbers the Germans could have won World War II. The schnorkel, or snort, as it is known in the Royal Navy, enabled submarines to 'breathe' without surfacing and, for the first time ever, to remain submerged for several weeks. The British fleet adopted this system after World War II and made it extremely effective.

At the Coronation Review of 1953 the submarines taking part were among the most important units of the fleet. But 10 years later the Royal Navy entered the nuclear age and the whole concept of submarine warfare altered once again.

Nuclear power at last freed the submarine from any dependence on the earth's natural atmosphere. It gave the submarine an almost unlimited endurance, high underwater speed and a vast source of electrical power with which to operate the increasingly complex and sophisticated forms of sensors, computers and other electronic aids to their fighting capabilities. The nuclear submarine, able to control her own atmosphere, could dive into the ocean's depths and remain submerged for weeks—circumnavigating the world underwater if need be.

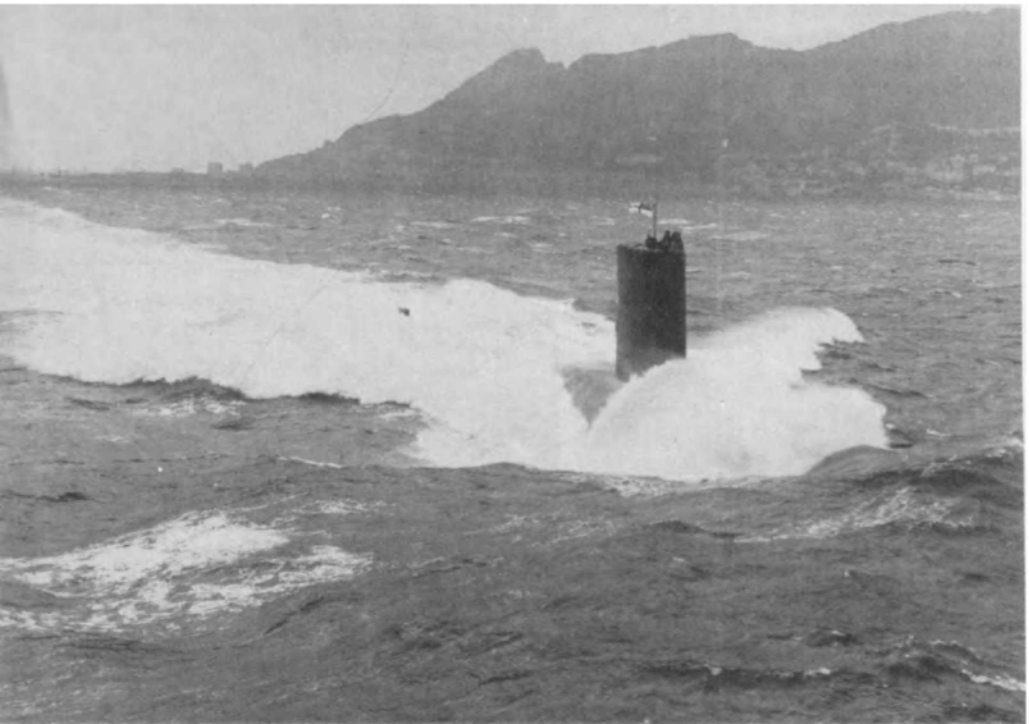
Today the Royal Navy has nine nuclear-powered attack submarines in service. Three others are under construction and there are plans for even more advanced classes of this type. There are four nuclear-powered Polaris submarines which carry Polaris missiles which form Britain's contribution to the NATO strategic deterrent. In addition there are 18 diesel-electric submarines.

Submarines of all types are among the most powerful vessels in the world. But most important, they are masters of the deterrent. Deterrence is an overworked and little understood word nowadays. We tend to think of it in terms of the nuclear deterrent—Polaris.

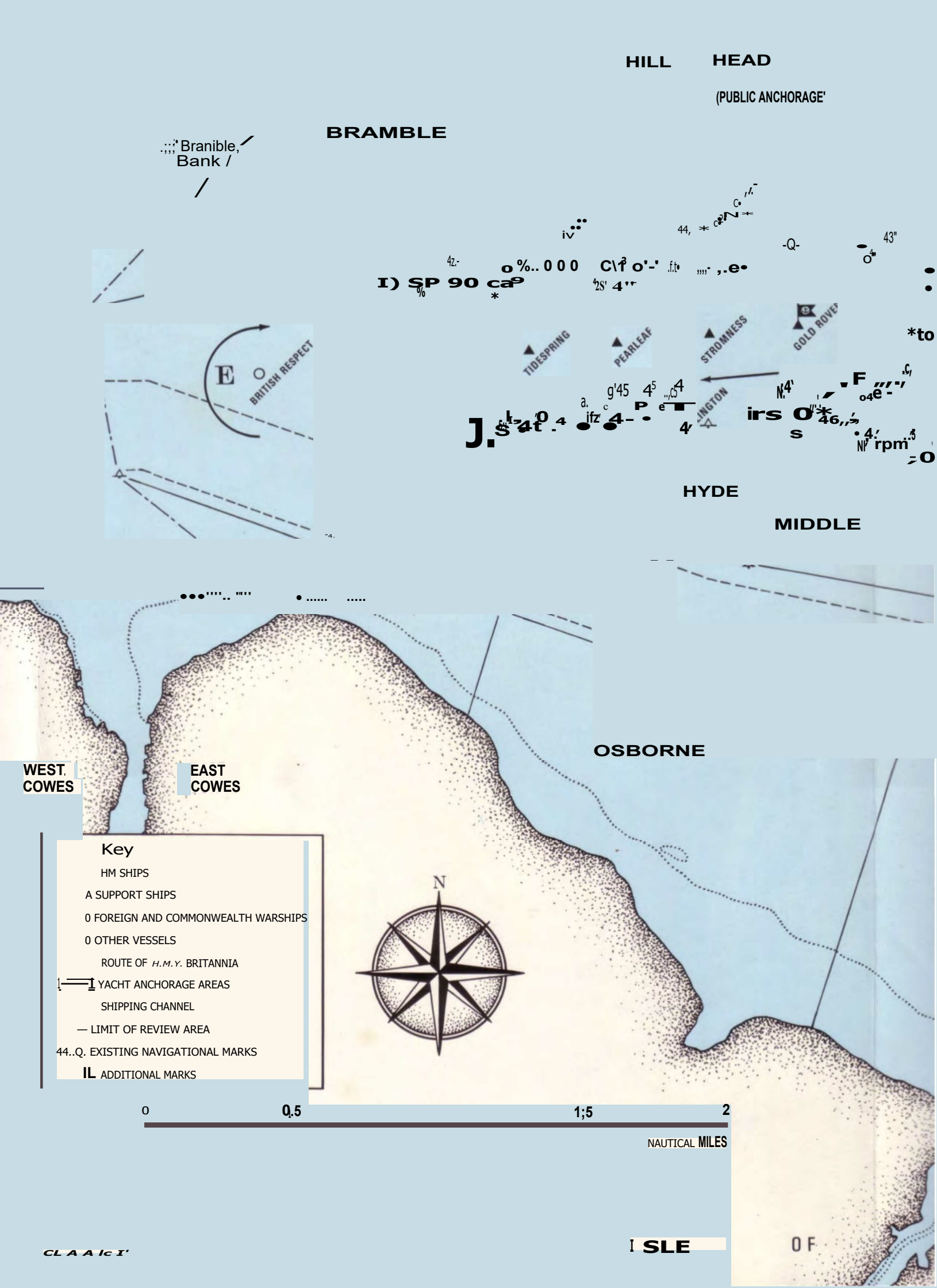
There is no doubt that Polaris and its successors are the most effective deterrents against world war that have ever been devised, but deterrence is not simply a matter of threatening an enemy with total destruction. The modern submarine, nuclear or diesel-electric, is able to act in the role of a speed-trap or to look from behind hidden windows or to listen discreetly to whatever is in the air. It can do so in waters where a potential enemy may wish to operate or off a coastline where a potential or actual enemy is hoping to mount some kind of warfare. If the potential or actual enemy suspects that a submarine is in the vicinity, that submarine becomes a very, very effective deterrent. Furthermore, the submarine, lying passively in wait like a crocodile, is ready and able to switch to the offensive at a moment's notice. It is already where the naval staff require it to be and it is hidden and extremely difficult to find.

In short, submarines have become, over the years, an exceedingly effective deterrent with other forms of defensive forces. Nuclear submarines obviously have enormous advantages by means of their virtually unlimited endurance at high speed and their capability of travelling vast distances undetected. But it must not be thought that the diesel-electric submarines are outdated: they have more problems when operating in enemy-controlled areas, but their chances of success and survival rate highly in the face of the weapons available to units opposed to them.

The *Turtle,* 200 years ago, showed the way towards a submerged deterrent that is unique in modern warfare.



HMS Warspite, a *fleet submarine. Ships of her class are nuclear propelled but conventionally armed and they provide the Navy with its most deadly anti-submarine weapon. Of great endurance, they can cruise around the world undersea without surfacing.*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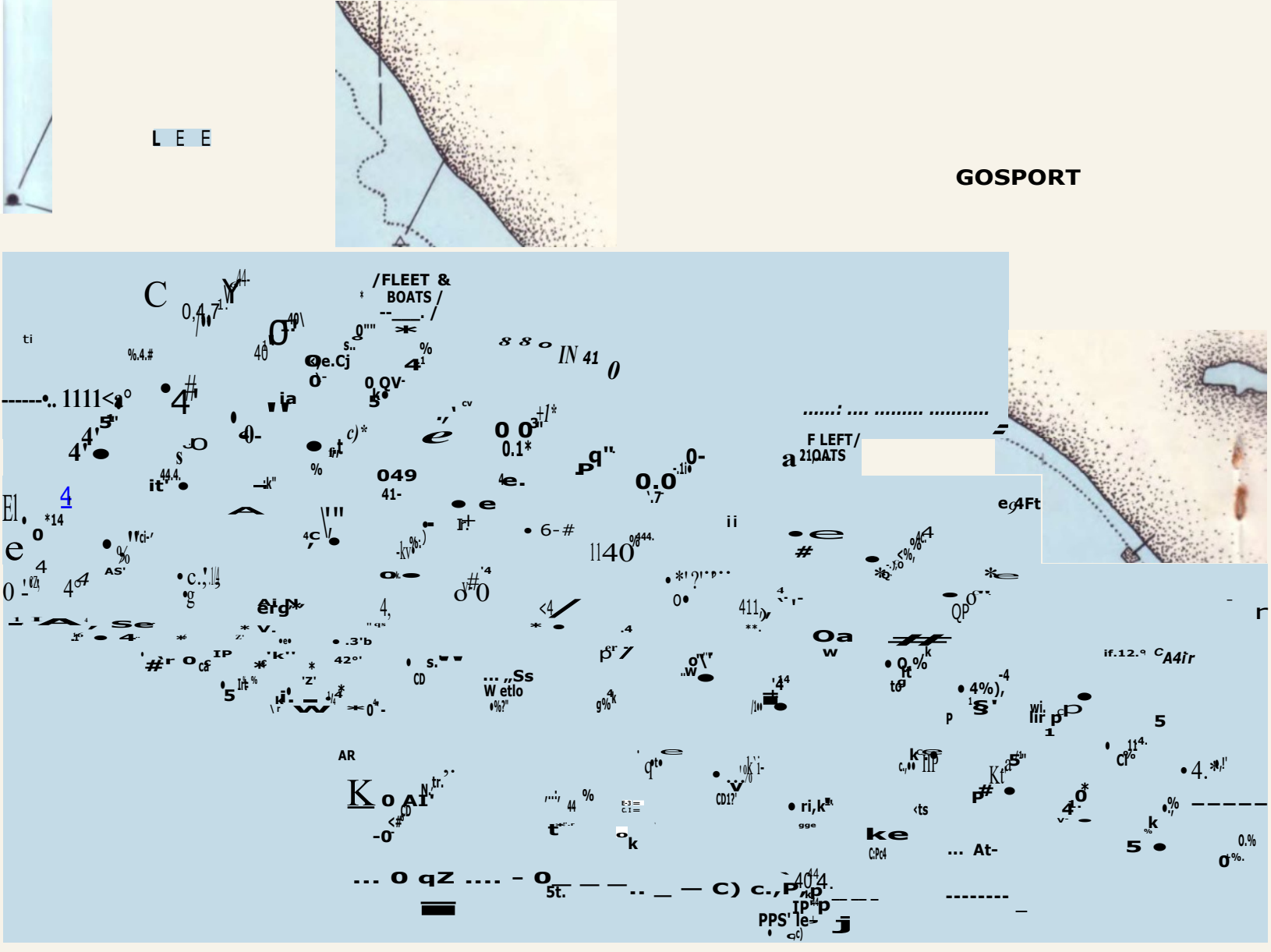
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