



SCAPA FLOW (ON *Skalpeid Floi*, Ship Isthmus Bay) is a large area of water sheltered by the Mainland and South Isles. Scapa and places in Scapa Flow are mentioned many times in

the sagas, but it was not until the 16th century that Alexander Lindsay, pilot for James V of Scotland, did a survey of Orkney waters, including the Flow. In 1812 Scapa Flow was

suggested as a temporary rendezvous of the Royal Navy, but it was 1905 before the Admiralty took a real interest in using it.

With 92 km (57mi) of coastline and an area of about 156 km² (60mi²), it is sheltered by the island of Hoy to the west, the Mainland to the north, Burray and South Ronaldsay to the east

and Flotta to the south. The main southern entrance to the Pentland Firth is the Sound of Hoxa. To the northwest, Hoy Sound leads to the Atlantic Ocean. The formerly strongly

tidal eastern channels to the north and south of Burray were blocked in WWII by the Churchill Barriers.

The coastline consists of Middle Old Red Sandstone, with several sandy bays. In the sub-littoral the sandstone is covered by mixed sandy and mud sediments which form the majority of the floor of Scapa Flow. Since the Barriers were built the input of silt into the system has been greatly curtailed. The coastline generally shelves steeply to 20m, then more gently to over 30m and the central area is fairly level, apart from the steep-sided reefs of the Barrel of Butter and Nevi Skerry.

The fetch over the basin is restricted to less than 20km (12.5mi) which leads to a generally sheltered environment. Strong winds still cause a steep surface chop which particularly affects the moderately exposed sections in the north and east of the basin. The Churchill Barriers have greatly affected tidal flows and sediment deposition around the whole area.

Hoy Sound and the Bring Deeps, between Hoy and the Mainland, extend around the island of Graemsay and southwards to Cava, leading into the main basin of Scapa Flow. The area has strong tides and water exchange in the west, around Burra and Clestrain Sounds, but decreasing tidal streams in the Bay of Ireland and through Bring Deeps, which were formerly renowned for good fishing.



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Coaling ship was a dirty and unpleasant task

WORLD WAR I Before WWI the Navy held exercises in Scapa Flow most years, often involving up to 100 ships. Just before the start of the war, the Grand Fleet put to sea and dispersed to Scapa. Nothing had yet been done to render the harbour secure against attack and the fleet was continually under threat of U-boats or even a daring destroyer attack.

At least one U-boat penetrated Hoxa Sound in November

1914. U18 reached almost as far as the boom defence net and, seeing that there were only a few destroyers in the Flow, the Captain decided to retreat. Unfortunately for the submarine, the periscope was spotted and a minesweeper rammed and severely damaged the hull, finally forcing it to surface and surrender.

Sea defences were slowly improved with 21 blockships sunk at the eastern approach- es, anti-submarine nets sus-

ended between long lines of drifters, boom defences and various guns mounted on coastal positions. Controlled minefields were also laid and by summer 1915 the fleet was reasonably secure in its base.

The weather was often as much of a hazard as the Germans, with fog a considerable danger, while gales often caused chaos to anti-submarine nets and even severe damage to battleships. A further danger was mines, laid by German ships and submarines.

Coastal defences at the start of the war amounted to only a few 3 and 12-pounder guns hastily mounted on Hoxa and Stanger Heads. By summer 1915 new coastal defence batteries with 4in and 4.7in guns had been installed and later more powerful 6in guns came from USA.

In 1917 about 1,200 Marines were manning these guns, which were never used in anger. They had served their purpose all the same in deterring an attack by surface ves-

sels. By 1920 all the batteries had been dismantled and scrapped. Remains of several can still be seen today.

Battle of Jutland Despite the preparations there had been little contact with the enemy. Finally on 30 May 1916, news came that the German High Seas Fleet was about to put to sea. The Home Fleet left to meet up with more of the British Fleet in the North Sea, making altogether nearly 150 fighting ships. They met the 99 ships of the German Fleet on the night of 31 May/1 June. In all 14 British ships and 11 German ships were lost in this indecisive, yet effective action, which came to be called the Battle of Jutland and ensured that the German High Seas Fleet never ventured out in force again.

Aircraft were also used extensively in WWI. The Navy established a large Seaplane Base at Houton, and a Kite Balloon Station at Caldale, St Ola. These hydrogen blimps were used by ships for spotting purposes when going into action. They were deployed, carrying observers, from the decks of ships at altitudes of 150-300m.

Houton Bay Air Station Late in 1916 the Houton Bay Air Station was in action and Short seaplanes were flying submarine-hunting patrols. By early 1917 the U-boats had become a very serious threat to the conduct of the war, due to their laying of mines and the



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HMS Iron Duke - Flagship of Grand Fleet from Aug 1914 to Jan 1917



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Sopwith Camel aircraft aboard HMS Furious in 1918



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HMS Furious, was the first real aircraft carrier

Shorts 320 seaplane, one of the types used in anti-submarine patrols



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The Battle of Jutland was indecisive, but the German High Sea Fleet never ventured forth again



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HMS Hampshire was commissioned in 1905 and sank in 1916

use of torpedoes against shipping. Air power was still in its infancy and while maintenance was a problem due to lack of enough engineers and carpenters, hits were achieved on U-boats.

Experiments using the first aircraft carriers in an anti-submarine role were also conducted. HMS Campania, a converted liner, was the first such ship. Balloons proved to be an effective anti-submarine measure when flotillas of several destroyers all flying balloons worked together. The introduction of the first working depth charges was also important.

Cmdr Eto meets King George V



The Northern Patrol covered the sea area between Iceland, Scotland and Norway and intercepted 15,000 ships during World War I. The blockade was carried out by the 10th Cruiser Squadron, most of which were armed merchant ships, and in all weathers. The Squadron proved itself an effective force in the blockade of Germany and played a decisive part in ending the slaughter in the trenches.

HMS Hampshire There were tragic losses in the Scapa Flow area also. The sinking of HMS Hampshire (11,000 tons) on 5 June 1916 by submarine-laid mines underlined the need for minesweeping and anti-submarine measures. She had left Scapa Flow at 16:40 during an unseasonable force 9 gale. Kitchener, the Minister for War, was aboard on his way to confer with the Czar's government in Russia. Instead of taking the eastern route which had been recently swept for mines, she went westabout. Her two accompa-

nying destroyers were unable to keep up due to the high seas and had turned back.

About 19:40 she struck mines which had been laid by U75 off Marwick Head and sank within 20 minutes with the loss of all but 12 hands. There was much public disquiet when the Stromness lifeboat was prevented from launching, and locals were not allowed to try to help the many survivors who perished.

HMS Vanguard (19,700 tons) blew up with the loss of all but two of her crew on 9 July 1917. The deaths of over 800 men in this disaster, which was thought to be due to an internal cordite explosion, caused much rethinking in the design of British battle-ships. HMS Vanguard remains an Official War Grave. One of the men lost aboard her was a liaison officer from the Imperial Japanese Navy, Commander Kyosuke Eto, who came from Gonohe, Aomori in the north of Japan. There is a small display about Eto and the ship in the Gonohe Library.

Kitchener leaves Scapa Flow



Navigational Errors On 12 January 1918 two British M class destroyers, HMS Opal and HMS Narborough (1042 tons) ran ashore together at full speed at Windwick on the south-east side of South Ronaldsay. Weather conditions were bad, with snowstorms and a severe gale. The vessels ploughed into the rocks at speed, and there was only one survivor, Able Seaman William Sissons.

There is an interesting sequel to this sad event: "John George Halcro was clambering over the cliffs on one occasion and came across the nest of a cormorant. They scavenge bits of metal - lead and cordite from the wreck, to line their nests with. But in this particular nest was something glinting, it was a piece of metal. On closer inspection, it turned out to be the brass name plaque from a ship's ditty box, bearing the name F.Rotchell."

Years later, in 2000, a family called Rotchell were researching their Great uncle, who was known to have been lost on HMS Opal. They were amazed to hear the tale related

Sole survivor from HMS Opal



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HMS Vanguard blew up and sank off Flotta in 1917

by Willy Budge and even more to later receive the brass name plate found by John Halcro.

U-Boats On 28 October 1918, the German submarine UB116 tried to enter Scapa Flow through Hoxa Sound. It was detected by hydrophones, then by electrical detector loops on the seabed and finally sunk in the controlled mine-field off Quoyness on Flotta. The wreck was blown up during attempts to remove a live torpedo in 1975. UB116 was soon to be joined by many other German ships, during the Grand Scuttle.



HMS Vanguard memorial at Lyness



Brass plaque from HMS Opal

HMS Opal was lost off Windwick



**WORLD WAR I
PLACES TO VISIT**

Kirkwall	Orkney Museum
St Ola	Carness Battery
	Caldale Camp
Orphir	Houton Base
	Upper Sower Battery
Birsay	Marwick Head
Stromness	Ness Battery
Holm	Clett Battery
Burray	Blockship Reginald
S Ronaldsay	Hoxa Head Battery
	Windwick
Hoy	Martello Towers
	Lyness
Flotta	Innan Neb Battery
	Roan Head Battery
	Stanger Head Battery
	HMS Vanguard buoy
	Prudentia buoy



The German Fleet in Scapa Flow on 28 November 1918 by Tom Kent

ARMISTICE At the end of the First World War, under the terms of the Armistice, Germany agreed to surrender the majority of her Navy. On 21 November 1918 the British Grand Fleet, together with Allied vessels, 250 warships in all, led by *HMS Queen Elizabeth* under Admiral Beatty, set sail from the Forth to meet them.

The German High Seas Fleet in line ahead was led by *SMS Friedrich der Grösse* between the two long lines of British ships, which then turned,

sandwiching the German column. No risks were taken, guns being trained and action stations observed as they steamed initially to the Forth Estuary, before going to Scapa Flow for internment.

The first surrendered ships arrived on 23 November and the rest followed over the next weeks, to eventually number 74. Admiral von Reuter with 5,000 men stayed to undertake care and maintenance of the ships which were, "Disarmed and dishonoured", as Reuter says in his report.

There had already been mutiny in the German Navy before the end of hostilities and matters were not improved by the conditions aboard the interned vessels. The German sailors were not allowed ashore, or to visit other ships, their food was poor and the ships were not designed for long periods of living on board. Discipline was virtually non-existent, but conditions gradually improved as supplies became properly organised. The battleships and battlecruisers were anchored around Cava, while

the destroyers were moored in pairs around the west side of Fara. There was a 24 hour drifter patrol with an armed party aboard.

Soldiers' Councils were formed on each ship and they made the ships' officers jobs almost impossible until some of the more militant were shipped home. Von Reuter ended up transferring to the *SMS Emden* as things had got so bad on the flagship. Eventually the crews were further reduced to about 1,700 and all maintenance was stopped.

When the Armistice terms were discussed in Versailles in May 1919 the German Navy was clearly going to be reduced to a token force. Plans to scuttle were immediately set in motion. The Armistice was due to end on 21 June, but talks broke down a few days before this. The deadline was extended to 23 June, and agreed by a new German Government, but Von Reuter was not informed of this.



Ensign from SMS Hindenberg

The Grand Scuttle He thought that a state of war again existed between the Allies and Germany. and at 10:30 on 21 June, after the British Fleet had left its anchorage for exercises, Reuter ordered the signal *Paragraph eleven*, the code to scuttle. Preparations had already been made on all the ships to facilitate scuttling.

These included jamming all watertight doors open, opening valves, portholes and hatches and disabling controls for flooding valves on deck level.

The first ship to sink was *SMS Friedrich der Grösse*, at 12:16, followed by the other capital ships, with *SMS Markgraf* being the last to go



German Fleet in Scapa Flow, winter 1918

SMS Derfflinger sank at 14:45, salvaged in 1939



SMS Bayern sank at 14:30, salvaged in 1933



German sailors abandoning a destroyer



SMS Hindenburg sank upright in shallow water





Whaler aground on the upturned hull of SMS Seydlitz

at 16:45. Some destroyers and cruisers were beached by the returning British, who also shot several of the German crewmen, including the Captain of SMS Markgraf.

The tug *Flying Kestrel* had meanwhile been on a sightseeing trip around Scapa Flow with a group of school children, who had a grandstand view. One, James Taylor, later wrote, "On Saturday June 21 1919, I rose very early, as it would never do to be late for a school treat which was to take the form of a cruise on the "Flying Kestrel" to visit the surrendered German Fleet. The thought of sailing up to them made us boys almost sick with excitement!

At long last we came face to face

Salvage work soon started after the "Grand Scuttle"



with the Fleet. Their decks were lined with German sailors who did not seem too pleased to see us. Suddenly without any warning and almost simultaneously these huge vessels began to list over to port or starboard; some heeled over and plunged headlong, their sterns lifted high out of the water.

Out of the vents rushed steam and oil and air with a dreadful roaring hiss. And as we watched, the sea became littered for miles round with boats and hammocks, lifebelts and chests....and among it all hundreds of men struggling for their lives. As we drew away from this nightmare scene we watched the last great battleship slide down with keel upturned like some monstrous whale."

Reuter and his staff were given a severe dressing down aboard *HMS Revenge*, before being marched away as prisoners of war. His reply was that, "he was sure that any English naval officer would have done the same in equivalent circumstances."

Salvage The Admiralty had said that the wrecks would be left to rot and were no hazard to shipping, but it was not long before boats started to run aground on the hulks. By 1922 the first destroyer had been salvaged and taken to Stromness. In 1923 a Shetlander bought 4 of the destroyers and had worked out a method using airbags to lift them.

Then in 1924 the Man who bought a Navy, Ernest Cox, bought SMS *Hindenberg* and SMS *Seydlitz* plus 24 smaller ships. He eventually claimed all the rest and his firm, Cox & Danks, soon set to work on salvage. 24 destroyers were lifted in 20 months, and soon attention was turned to the battleships.

SMS *Hindenberg* had settled on an even keel with her funnels and upperworks above the water. Holes were plugged, but despite several efforts it was 1930 before she was raised. Meanwhile Cox started work on SMS *Möltke*, and for the first time used compressed air to force water out. Old boilers were used as airlocks, both to allow entry by divers and to stop air leak-

ing out. In June 1927 the hulk was successfully raised and was soon followed by others.

Metal Industries Ltd took over salvage work in 1932, and were soon raising battleships with great regularity. The last accessible big ship was SMS *Derfflinger*, which lay in 45m of water and it took a year's work before she broke the surface in July 1939. It was to be 1946, however, before she was to be towed away for breaking.

Salvage work continued after World War II, but was now restricted to blasting open the remaining ships to access their precious metals, especially Copper, Brass, Bronze, Gun Metal and steel armour plating. These operations ceased by the end of the 1970s and the remaining wrecks were taken over by Orkney Islands Council for their protection.

The German Fleet today Seven large ships remain at the bottom of Scapa Flow, comprising three battleships: SMS *Krönprinz Wilhelm*, SMS *Markgraf* and SMS *König*, plus four light cruisers: SMS *Dresden II*, SMS *Cöln*, SMS *Karlsruhe* and SMS *Brummer*. There are also four destroyers and a great deal of debris scattered about. All of the ships except SMS *Dresden II* have been severely damaged by salvage work. She was largely left alone because of her late construction date, by which time Germany was short of many materials, including metals.



Diver exploring the deck of SMS Dresden



A diver explores one of the wrecks



Divers inspect a 5.9in gun on one of the battleships

SMS *Seydlitz* looked like a sleeping whale until salvaged





Scapa Flow showing positions of remaining German Fleet



SMS Markgraf sank at about 14:30 and lies at a depth of about 45m



SMS König sank about 14:00 and lies at a depth of about 35m



SMS Krönprinz Wilhelm sank about 13:15 and lies at a depth of about 40m

Battleships The three battleships are all of the *König* class, and were completed in 1914. They carried ten 12in guns in five turrets, and a secondary armament of fourteen 5.9in guns, ten 3.34in guns and five 19.7in torpedo tubes. These ships were well armoured with 13.8in main armour, while the decks had 4in plating. Conditions for the 1,136 crew were basic, unlike similar British ships which were designed to spend many months at sea.

With a displacement of 25,390 tons, length of 173m, beam of 29m and draught of 9m, these were large ships. Powered by three coal and oil fired boilers driving their 46,000SHP turbines through three propellers they could do up to 21 knots.

Today all three battleships lie upside down on the bottom of Scapa Flow. They have been ripped apart by salvage operators over the years, but still remain an impressive sight to divers. They are covered with sponges and anemones, which add to the colour and interest.

These battleships were all at Jutland, where SMS *Markgraf* and SMS *König* took many hits. None made any significant impact on the war thereafter, although SMS *Krönprinz Wilhelm* was struck by a British torpedo whilst trying to rescue U20 (which had recently sunk *Lusitania*) off Denmark. They are of particular historical significance as they are the only WWI battleships still in existence.

Cruisers The four other ships are all similar. SMS *Brummer* was the smallest (4,308 tons, 139m long, 13m beam by 6m draught, 42,797SHP and speed 28 knots), while SMS *Dresden II* and SMS *Cöln* (5,531 tons, 153m long, 14m beam by 6.5m draught, 49,000SHP, speed 29 knots) are of the *Dresden II* class.

SMS *Karlsruhe* (*Königsberg II* class, 5,440 tons, 139m long, 14m beam by 6m draught, 37,885SHP, speed 28 knots) is similar to SMS *Cöln* and SMS *Dresden*. All of these ships were lightly armoured and armed with eight 5.9in guns (four on SMS *Brummer*) plus up to 200 mines.

All 3 of these vessels were quite new, having been built between 1915 and 1917. Lightly armoured fast mine-laying cruisers, they were designed to disrupt merchant shipping. They had limited success due to Britain's overwhelming control of the sea surface for most of the war. Submarines proved far more successful in destroying shipping, whether by torpedoes or minelaying.

All of these ships are today of great interest to the many recreational divers who come to explore them every year. Although they may not have been very successful in their planned missions, they have proven to be of lasting appeal in their present role.



SMS Cöln is in good condition and lies at about 35m



SMS Dresden II was salvaged less than others and lies at about 35m



SMS Karlsruhe has been much salvaged but is a shallow dive at about 26m



SMS Brummer is largely intact forward and lies at about 36m



HMS Royal Oak at speed off Scapa Flow

WORLD WAR II Scapa Flow at the outbreak of World War II was still very lightly defended. Many of the blockships sunk in World War I to block the eastern approaches had been shifted by the tide, or had disintegrated due to the effects of sea and wind. There were gaps between them in Kirk Sound, through which a submarine could pass. More blockships had been procured and there were plans for coastal defences, but by early October 1939 these had still not been put in place.

The Germans noticed this by photo-reconnaissance and Commodore Dönitz, in charge of the U-boat command, decided to attempt an attack on Scapa Flow. *U47*, commanded by Lt. Gunther Prien was selected to undertake the mission. It left Wilhelmshaven on 8th October. The German Navy also dispatched *Gneisenau*, *Köln* and nine destroyers to the North Sea to lure out the British Navy. They succeeded in drawing out several battle-

ships, cruisers and destroyers from Rosyth and Scapa on 8th October.

No contact was made and all units returned to port. However, the British battleships returned to Loch Ewe rather than Scapa. Thus the daring submarine mission was sabotaged by its own Navy before Prien even reached Scapa Flow. The arrival was carefully timed to coincide with a new moon, when high water at Kirk Sound was about 23:30. The plan was to enter at slack water, before the

strong west-going ebb tide had built up.

The lighthouses at Rosness and Pentland Skerries were turned on at 22:00 on the 12th, no doubt due to shipping movements, but also allowing Prien to have an accurate position. The next night at about midnight, *U47* crept into Kirk Sound, passed the most northerly blockship on the surface, snagged a cable, came free and was soon in Scapa Flow, unobserved despite the noise of her diesel engines and the lights of a turning car shining on them.

On the night of the 13th October 1939 there were in fact about 50 British warships in Scapa Flow, including the new *HMS Belfast*, and several other cruisers. Destroyers, as well as many supply ships, auxiliaries and so on were also there, but no modern capital ships or aircraft carriers.

Most were anchored at the western side of the Flow, near Lyness, except for the old battleship *HMS Royal Oak* and the venerable sea-plane carrier, *HMS Pegasus*, which were moored in Scapa Bay, below Gaitnip. *HMS Royal Oak*, with her considerable anti-aircraft firepower was there as local air defence for Netherbutton radar station, as shore-based AA was not yet installed in quantity.

Although there was no moon, the Northern Lights were bright that night, thus allow-



Kirk Sound with blockships, which was successfully negotiated by U47

ing Prien to see the two ships to the north. At about 01:00 and from about 3,000m he fired three shots, and one hit the *HMS Royal Oak* at the bow inflicting little apparent damage, but causing both anchor chains to run out.

In fact the crew thought it was an internal explosion in a paint store. After reloading, three more torpedoes were fired and a few minutes later the ship was rocked by three detonations. The *HMS Royal Oak* sank within 15 minutes with the loss of 833 crew out of a total of about 1,200 officers and men.

That so many were saved was due partly to the prompt action of the crew of the drifter *Daisy II*, which was moored alongside, as well as the quick response of *Pegasus* in getting its boats off to aid in the rescue work. The calmness of the weather that night also helped greatly. The vast majority were rescued by the *Daisy* and Skipper Gatt was awarded the DSC for his part.

Meanwhile *U47* slipped away on the surface, this time taking the south side of Kirk Sound and within a short time she had stemmed the strongly running ebb tide and made good her escape. The next day

HMS Royal Oak underway from starboard quarter



Torpedo propeller from wreck site



German U-boat U47 - model in Stromness Museum





Fuel oil leaking out of the wreck is a pollution hazard and is being removed by the Royal Navy

an old steamer, the *Lake Neuchatel* was sunk in Kirk Sound, too late to save *HMS Royal Oak*. Prien and his crew were given a tremendous welcome in Germany. He was invested personally by Hitler with the Knight's Cross of the Iron Cross, which became the traditional decoration for exceptional U-boat commanders. Meanwhile Dönitz was promoted to Rear Admiral.

A few days later the Luftwaffe carried out bombing raids and it was not until March 1940 that the Home Fleet returned to Scapa Flow, by now heavily defended by anti-aircraft and coastal batteries, improved minefields, indicator loops and more blockships.

Churchill himself had the magnanimity to admit that Prien and his crew had carried out "a magnificent feat of arms". Although the loss of *HMS Royal Oak* was tragic for those lost, it was a salutary lesson for the British Navy and was to result in Scapa Flow being made into a safe base for the Home Fleet.

Much controversy raged at the time about the sinking of the *HMS Royal Oak*. This was finally resolved when local divers Eric Kemp and Davie Gorn, diving near the wreck, found the remains of the propellers and gearboxes of two torpedoes of the type used by German U-boats in 1939. One of these may be seen in Stromness Museum.

The Admiral's Barge lies next to the ship's hull



Eric Kemp



Eric Kemp

HMS ROYAL OAK TODAY

HMS Royal Oak, an official war grave, lies in about 27m of water, beneath the Gaitnrip cliffs. She is marked by a green buoy and her position is clearly seen from the oil slick caused by fuel leaking from her bunkers. Diving on her without permission is prohibited. There is a memorial to the men who lost their lives in the tragedy in St. Magnus Cathedral and a memorial garden has been established at Scapa Beach.

The ship lies upside-down at about 45° to the seabed. The masts broke off when she turned over and the main guns are stuck into the seabed. The spotting top lies next to the

Secondary 6in gun mounting on side deck

ship, as do the remains of the Admiral's Barge. The shape of the ship shows up clearly on a modern echo sounder and can often be seen from the air.

Every year the Admiralty holds a ceremony over the wreck and divers place an ensign in position in remembrance of the crew who were lost. Survivors and relatives of the crew are often present at this time. In 1996 the wreck was surveyed in detail as the amount of fuel oil still emanating from her tanks as the ship slowly corrodes was causing concern.

The Royal Navy has already removed much of this pollution hazard by pumping the oil out of the many tanks.



Navy ship removing oil

The spotting top lies next to the ship



Peter Rowlands



Eric Kemp

Diver examines the breach of one of the 15in main guns



Bell and memorial in Cathedral



Buoy over wreck of HMS Royal Oak

HMS ROYAL OAK
Battleship Royal Sovereign Class

Constructed HM Dockyard, Devonport, laid down 1914, completed 1916

Displacement Design 25,750, finally 29,150, full load 35,000 tons

Measurements Length 186m, beam 26.5m increased to 30.5m, with anti-torpedo blisters, draught 10m

Propulsion Originally designed to be coal-fired, this class was changed to oil-fired during construction

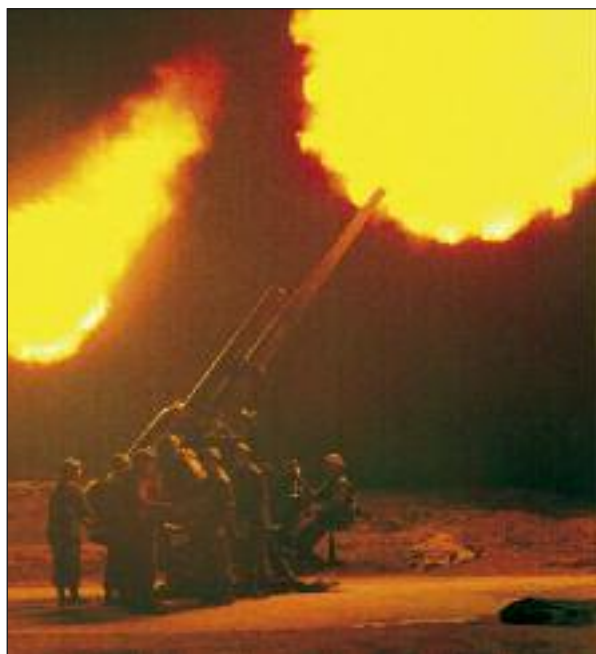
4 sets of Parsons steam turbines to 4 propellers

Performance 40,000 SHP and 23 knots

Armour Main belt 10in, armour deck 1.75in, increased to 4in at refit, Turrets 11in, control top 10in

Armament eight x 15in main armament in twin turrets; eight x 6in secondary; eight x 4in AA high/low angle; two pom-pom AA mountings 8 x 40mm; two 4-barrelled 0.5in AA machine guns

Refits Refitted several times, *HMS Royal Oak's* last major refit was in 1934/35, equipment was updated and 900 tons of extra deck-armour added. This reduced her buoyancy and stability and made her an even wetter ship. She had a catapult for a spotter-plane, new gun direction and new radio equipment fitted. In 1937 she was reckoned to be the best-equipped Royal Sovereign class battleship. By 1939 she was obsolete.



IWM lights were also installed in many coastal positions.

Many of these coastal batteries remain prominent in the landscape today, having survived a massive tidy up of wartime relics. Virtually all are situated in places with panoramic views. Ness Battery in Stromness is the best preserved and retains its hutted accommodation.

Anti-aircraft (AA) defences were also hugely increased. Eventually there were over 80 heavy (HAA) guns as well as nearly 40 light (LAA) positions around Scapa Flow, together with over 100 searchlights.

The British Barrage Balloon Command was set up in 1938. The purpose was to protect targets such as ports and key industrial areas from low flying aircraft. The idea was to discourage torpedo and dive bombers from attacking warships moored in Scapa Flow. The balloons were also supposed to make attacking aircraft fly higher where AA guns might be more effective. Scapa Flow had up to 80 barrage balloons, out of a UK

Coastal defences were extended and improved to cover the main entrances of Hoxa, Switha and Hoy Sound and were backed up by new controlled minefields and indicator loops to detect and destroy intruders. Coastal gun batteries were improved and many new sites were built. Nineteen were in operation by June 1940, with more to follow. New search-

DEFENCE Two days after the sinking of *HMS Royal Oak* the Germans made their first air attack on Scapa Flow. *HMS Iron Duke* was seriously damaged and the first enemy aircraft, a JU88, was brought down by AA fire. The Admiralty and the Army reacted quickly and by mid-1940 defences against underwater, surface and air attack were all greatly strengthened.

Gunnery training at Yesnaby



Gunner with shell

total of over 3,000 by 1944.

A large number of personnel was needed to install and operate all this equipment and a huge programme of hut building, road making and other infrastructure thus ensued. Eventually many of these installations were directed by gun-laying (GL) radar. Operations were all controlled from the former *Black Building* in Kirkwall.

Air Raids The defences had their first trial in mid-March 1940-with a substantial air raid, the first major attack on a British target by the Luftwaffe. After the invasion of Norway in April 1940 the Germans were only 300 miles away, and thus posed a much greater threat to Scapa Flow. There were regular sorties over Orkney, but little damage ensued. Several enemy aircraft were brought down by AA fire or RAF fighters.

After the failure of the Luftwaffe in 1940 against the RAF and the invasion of Russia in June 1941 the German aerial threat was greatly diminished, but the U-boat menace was increasing.

Gunner loading a 6 pounder rapid firing gun



Launching a barrage balloon in WWII

Scapa Flow remained a crucial naval base throughout the Battle of the Atlantic. During 1943 and 1944 searchlights, AA guns,

barrage balloons and personnel were transferred to defend London from V1 flying bombs.



The "Scapa barrage" in action before radar coverage was improved

There were many searchlights around the coast





Netherbutton, Holm, the most northerly of the "Chain Home" radar sites

Radar was a crucial part of British air defence in WWII. It was developed in the 1930s and by 1939 the whole of the east coast from Portland to Scapa Flow was covered by the first such network. This was to prove crucial in the Battle of Britain,

Chain Home (CH) was also known as Air Ministry Experiments Station Type 1. It transmitted a beam about 1000 wide at 20-50MHz with a

power of 1-2MW. The array was fixed, with 4 110m high metal towers which held the transmitting array and 4 73m high wooden towers holding the receiving aerials. Aircraft could be detected up to 120mi (190km) away. However below 5,000ft CH was ineffective.

The station at Netherbutton in Holm was operational by June 1939. A second CH station was built at Lopness in Sanday which came into service by

March 1942. This site had all round coverage and a power of 2MW. It was called RAF Whalehead. The Netherbutton station was initially a temporary installation with parts taken from several other sites. It was upgraded later in 1939 and by July 1941 its all round coverage had been fully calibrated. After WWII the station was upgraded with new equipment, but by 1955 RAF Netherbutton was obsolete and closed.

WWII Radar equipment in the Orkney Wireless Museum



WWII Chain Home Low equipment



Chain Home Low (CHL) was installed to fill lack of low level cover available from the fixed CH system. CHL was developed from the CD (Coastal Defence) radars that were first installed to detect shipping in 1939. These radars used rotating aerials on a single mast, with a frequency of 200MHz and a peak power of 150kW.

In Orkney there were CHL stations at Crustan in Birsay, on The Ward in Deerness and on Ward Hill on South Ronaldsay. CHL allowed the detection of aircraft flying at 500ft from up to 25 miles, but German pilots soon learned to evade detection by going below 100ft.



Operator at a radar screen - their judgement was crucial

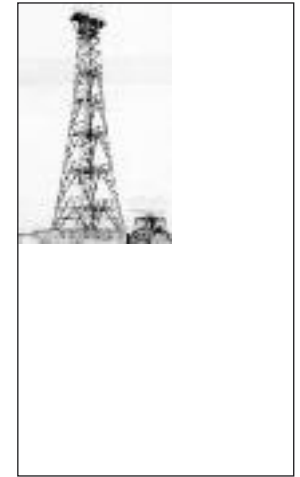
RAF Netherbutton transmitter pylons were 110m high



CHEL By 1943 these installations were upgraded by Chain Home Extra Low equipment which used cavity magnetrons to generate microwave beams. These could detect aircraft flying at less than 100ft from over 30mi.

Data from all of these was fed into the Ground Control Interception Station (GCI), which was ultimately in the *Black Building* near Kirkwall, now demolished by the Council. From here AA guns and fighter aircraft were controlled whenever enemy aircraft intrusions were detected.

Orkney Wireless Museum, in Kirkwall, has displays, equip-



Chain Home Low mast

ment and information about WWII radar and other historical radio and electronic aspects of the war.

Chain Home radar coverage in 1939





Supermarine Spitfire V of no 72 squadron

AIRFIELDS With the looming threat of war, the Air Ministry and the Admiralty surveyed the country for suitable sites for air bases. Between them four locations were selected. Three squadrons of Hurricanes were based at Wick from February 1940. This airfield was operational by September 1939 and was a busy Coastal Command station throughout the war.

RNAS Hatston (*HMS Sparrowhawk*) was opened in 1939 as a Fleet Air Arm base, one of the first airfields in UK to have a hard runway. It was from here that 800 Squadron's *Skuas* operated anti-shipping patrols in 1940. On 10th April 1940 16 of them dive-bombed the German cruiser, *Königsberg* (5,600 tons) at Bergen with the loss of only one aircraft. She was destroyed, the first major warship to be sunk by air attack.

US Devastator dive bombers from USS Wasp at HMS Sparrowhawk, 1942



JWM

Needless to say the Admiralty did not take heed of its own lesson. In 1941 *HMS Repulse* and *HMS Prince of Wales* were sent to Singapore after the Japanese invasion of Indo China. Both were promptly sunk by bombs from aircraft.

From late 1940 Hatston was used mainly by squadrons based on aircraft carriers for repairs and training. It had the distinction of hosting the aircraft and crew from *USS Wasp* while they were en route to Malta in April 1942, the first British base to do so in WWII. Later the *USS Ranger* used the Hatston for the same purpose.

The many aircraft types which used the base included among others *Skuas*, *Rocs*, *Walrus*, *Swordfish*, *Albacores*, *Martlets*, *Avengers*, *Barracudas*, *Spitfires* and *Seafires*.

RNAS Twatt airfield (*HMS Tern*), in Birsay, became operational in 1941 and was used mainly as a training station. Work was started in April 1941 to build 4 concrete runways, all of which were over 700m long. Many of the buildings can still be seen today. The control tower survived a demolition team and there are plans to restore it as a museum.



Blackburn Skua - the first aircraft to sink a large warship by bombing

Over 4,000 personnel were taught in its Fighter Director School from 1943. Pilots, air traffic controllers and radar operators well all trained here, in what had become a safe rear area. At least 20 different types of aircraft were based here or transited.



JWM

Fairey swordfish lined up on the apron at Hatston

Some of the first helicopters were based here in 1945. The *Sikorsky R4 Gadfly* was the first helicopter to land on a warship, in April 1945. Sub Lieutenant Bristow of 771 Squadron set his float equipped aircraft down on a turret of *HMS Anson* in Scapa Flow, thus demonstrating the possibilities of these machines in naval operations.



Grumman Avengers lined up on the apron at Hatston

Hatston control tower in WWII



Sikorsky Gadfly landing on HMS Anson April 1945



JWM



Supermarine Spitfire of 164 Squadron at Skeabrae in 1942

With the development of increasingly effective ship and airborne radars setting up and calibration was crucial. Several aircraft were based at Twatt for just this duty. Helicopters proved to be very suitable for this type of work.

RAF Skeabrae was an RAF station which was built in 1940. It was initially a Naval Airstation, the first squadron arriving in October 1940. On Christmas Day 1940 a *Martlet*

patrol from here sighted a *JU88*. It was forced down in Sandwick. This type became the first US fighter to shoot down an enemy aircraft in WWII.

In early 1941 Skeabrae was taken over by the RAF, when three squadrons of *Hurricanes* arrived. *Spitfires*, *Blenheims* and *Beaufighters* were among the aircraft types based here. The airfield had 3 runways, each of 850m. It was considered for development as a modern air-

RAF Skeabrae under construction in 1940



TWMM

port to support oil exploration developments in the 1970s but nothing came of the idea.

Although the control tower was demolished in the 1980s, numerous buildings remain. These include the Operations Building, a Power House, the Fire Station and the Decontamination Centre. The Cinema is in particularly good condition. Dispersal banks, air raid shelters and the runways are all prominent.

RAF Grimsetter, now Kirkwall Airport, became operational in October 1940. It was used as a satellite to Skeabrae, but in June 1943 132 Squadron moved here with *Spitfires*. Two other RAF squadrons operated here until the station was taken over by the Royal Navy and renamed *HMS Robin*.

A large variety of carrier-based aircraft used the airfield for training and working-up. In all over 20 squadrons during the conflict with aircraft types including *Swordfish*, *Walrus*, *Seafire* and *Avengers*. In 1948 Grimsetter became Orkney's civil airport..

RAF Castletown opened in May 1940 at Thursidtoft near Dunnet Bay in Caithness. It became part of 13 Group, Fighter Command, initially with *Hurricanes* of 504 Squadron. Later convoy protection and coastal patrols were operated from here. Finally the main emphasis became air-sea rescue.

RAF Wick was requisitioned at the start of WWII and by late September 1939 803 Squadron were patrolling Scapa Flow with *Skuas*. Hard runways, hangars and many other buildings were constructed. It became a Coastal Command airfield, the first RAF squadron being 269 with *Avro Ansons*. One of these aircraft sank a U-boat off Cape Wrath in December 1939. In 1940 43, 111 and 504 Squadrons all arrived, equipped with *Hurricanes* to defend Scapa Flow. Once the Orkney airfields became operational Wick ceased to be a fighter base and reverted to its Coastal Command role.

Aircraft Types The RAF and FAA operated a large number of different aircraft from Orkney bases in WWII. Old fashioned types such as the *Skuu* and *Swordfish* proved very effective at disabling large warships. *Spitfires* acted as a strong deterrent to enemy bombers. But Scapa Flow's main job in WWII was to be a secure naval base. Aircraft carriers were able to have their machines serviced and crews rested in safety.

Remains of a crashed Grumman Avenger, Kirkwall Bay



Eric Kemp



Former CO Rotherton revisits RNAS Twatt



Grumman Martlet taking off from an aircraft carrier in Scapa Flow



Junkers JU88 downed by 804 Squadron from Skeabrae 25th December 1940

Fairey Swordfish proved to be very effective torpedo bombers



TWMM



HMS Victorious was based at Scapa Flow for much of WWII, mostly on convoy defence duties

The Battle of the Atlantic commenced at the outbreak of WWII and was fought ferociously throughout. To have any chance of winning the war Britain needed supplies of food, raw materials, oil and manufactured goods, especially armaments. After the capitulation of Norway and France in 1940, U-boats could operate freely across the Atlantic.

Many factors influenced the outcome of the war but the reality of the Battle of the Atlantic

was mundane and brutal. It was about protecting merchant shipping from attack by U-boats. In WWII the Allies lost 2,452 merchant ships, 175 warships and nearly 104,000 men in the North Atlantic, mostly to submarines.

RAF Coastal Command lost 5,866 crew and 1,777 aircraft. Of the 1,162 U-boats built in Germany, 696 were sunk by the Allies and another 88 were otherwise lost. 25,870 German crew died, 76% of the total who

served. Germany could build 20 or more U-boats per month and Britain could only afford to lose so many cargoes, ships and crews.

Enigma The breaking of the Nazi Army and Naval Enigma codes did much to help the Allies. In May 1941 U-110 was captured afloat off Cape Farewell in Greenland. The Enigma machine and code books were retrieved. Again in October 1942 U-559 was forced to surface after being depth

Arming an Albacore with a torpedo



Observer at sea

charged for 16 hours in the eastern Mediterranean. The latest Enigma machine and code books were recovered, but with the loss of two brave Royal Navy personnel.

This allowed the codebreakers at Bletchley Park to resume reading Nazi Naval signals. Later the US Navy captured U-505 intact along with its latest codes. It now resides at the Museum of Science in Chicago.

Anti-Submarine Warfare developed along several lines. These included electronic devices such as SONAR, RADAR and HF/DF, which could locate U-boats. Depth charges dropped by aircraft and new shipboard weapon such as Hedgehog and Squid also helped.

The main contributory factor to the defeat of the U-boats was the combination of the above with continuous air cover. This was provided partly by long range aircraft such as Catalinas, Sunderlands and Liberators. Aircraft carriers with destroyer escorts were also used in numbers to escort convoys.

Naval Battles Several dramatic set-piece naval battles originated from Orkney. The Kriegsmarine had relatively few surface ships, but their fleet was modern and powerful. It was seen as a serious threat if it were able to break out into the Atlantic and attack convoys. This was especially the case during 1941 and 1942 when merchant shipping losses were already very high.



HMS Fury leads other Ashanti class destroyers



Cruiser HMS Belfast in Scapa Flow



Corvettes such as HMS Lotus were an important part of convoy protection

Cruiser HMS Berwick leaving Scapa Flow via the Hoxa "gate"





IWM

Bismarck Sinking These included the sinking of the *Bismarck* in May 1941. Her departure from Bergen was first spotted by a *Martin Maryland* from Hatston. A task force including *HMS Hood*, *King George V* and the carrier *Victorious* set out from Scapa Flow. The heavy cruisers *Norfolk* and *Suffolk* found and shadowed the German ships by radar.

HMS Hood was sunk by superb gunnery from the Bismarck



Bismarck with her bows down, firing at British battleships



Scharnhorst was a formidable battleship with 11in guns

During a 20 minute battle *Hood* was sunk and *King George V* damaged. However *Bismarck* had also taken hits to her bow, and had problems with a boiler room and electric plant. *Swordfish* from *HMS Ark Royal* managed to disable her rudders by a lucky torpedo hit and the ship became unmaneuverable.

Bismarck was hit by up to 400 large calibre shells from *HMS Rodney* and *King George V*. She was scuttled by her crew, of whom only 110 survived out of a complement of 2,200.

Scharnhorst Sinking The Battle of the North Cape ensued when the *Scharnhorst*, a 38,000ton battleship, was sent to intercept a convoy off northern Norway. A Royal Navy squadron led by *HMS Duke of York* intercepted and sank the *Scharnhorst* on 26th December 1943. Only 36 survived out of a crew of 1,968.

Admiral Bruce Fraser stated, "Gentlemen, the battle against the *Scharnhorst* has ended in victory for us. I hope that any of you who are ever called upon to lead a ship



IWM

Tirpitz was destroyed by bombing in 1944 at Alten Fiord,

into action against an opponent many times superior, will command your ship as gallantly as the *Scharnhorst* was commanded today."

Scharnhorst was sunk by superior intelligence, radar and firepower. The British were able to read all of the radio traffic and had far superior radar.

Tirpitz sinking By 1944 the Germans had only one remaining operational capital ship, the *Tirpitz*. She was the sister ship to *Bismarck* and was completed in 1941. With a full load weight of 52,000 tons and a formidable armament, range and strength she was considered a serious threat by the Royal Navy.

From early 1942 *Tirpitz* was stationed in Norway as a threat to the Russian convoys. In 1943 she was attacked and damaged by British mini submarines, and thereafter was the target of several RAF strikes. Eventually in 1944 an attack by *Lancasters* with 12,000lb *Tallboy* bombs caused the ship to capsize and become a total loss. During all this time she had tied down major Royal Navy resources.

HMS Duke of York sank Scharnhorst on 26 December 1943



IWM



IWM

U-boat surrenders in 1945 off the Pentland Skerries

Scapa Flow Naval Base The large number of personnel involved during WWII in Orkney resulted in a profusion of camps, roads, piers, buildings and other structures, some of which remain in use today. Most of the unsightly remains have now either been cleared away or have simply merged with the landscape.

The garrison reached over 40,000 men and women at its maximum, excluding the crews of warships and merchantmen, which could have numbered an additional 40,000 men at times. The many Army personnel may never have fired a gun in anger, but as a secure forward base in the Eastern North Atlantic it was eminently situated to help win the Battle of the Atlantic.

WORLD WAR II SITES TO VISIT

Kirkwall	Black Building (site)
	Hatston airfield
St Ola	Carness bty
	Grimsetter airfield
	Scapa, oil tanks
Orphir	Houton Head
Rendall	Queenamuckle bty
Birsay	Northside radar
	Twatt airfield
Sandwick	Yesnaby gun training
	Skeabrae airfield
Stromness	Ness bty
	Links bty
Holm	Clett bty
	Netherbutton radar
	Graemeshall bty
	Rockworks camp
Tankerness	Rerwick Head bty
Deerness	battery site
	radar site
Lamb Holm	Italian Chapel
	Churchill Barriers
	Lamb Holm bty
Burray	Northfield bty
	Hunda barrier
South Ron	Balfour, Hoxa bty
	Ward Hill radar site
	Cara bty
Hoy	Scad Head bty
	Skerry bty
	Scad Head AA bty
	South Walls radar
	Lyness
Graemsay	Oxan Point bty
Flotta	Buchanan bty
	Stranger Head bty
	Gate bty
	Innan Neb bty
	Golta bty
	Neb bty
	Piers and old cinema
Fara	AA batteries
Sanday	Lopness radar
Shapinsay	Castle bty
	Galtness bty
	bty=coastal defence battery