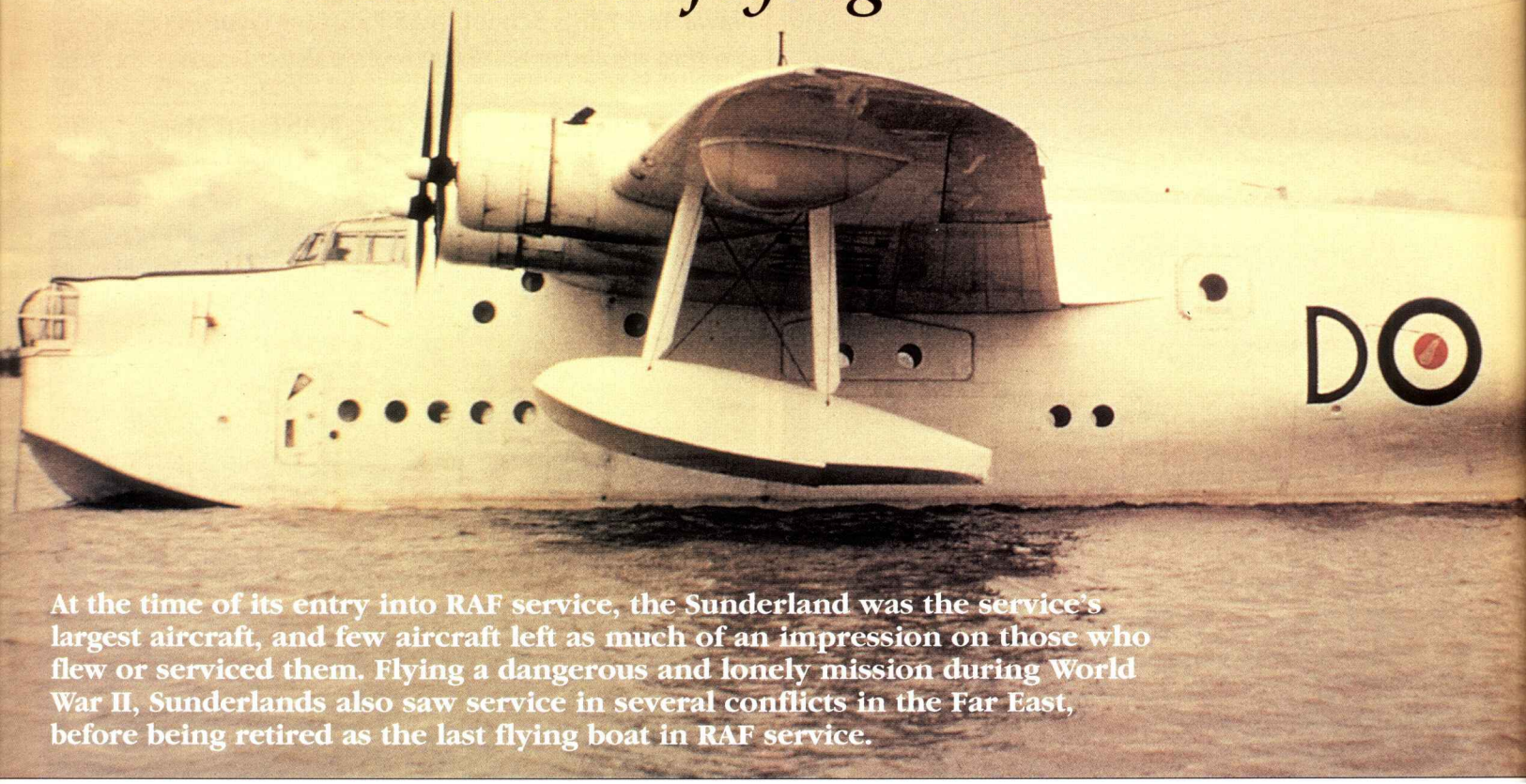
Short Sunderland

The RAF's last flying boat



At the time of its entry into RAF service, the Sunderland was the service's largest aircraft, and few aircraft left as much of an impression on those who flew or serviced them. Flying a dangerous and lonely mission during World War II, Sunderlands also saw service in several conflicts in the Far East, before being retired as the last flying boat in RAF service.

The Sunderland was the longest serving RAF aircraft of its generation, remaining in front-line service in its original role from June 1938 until May 1959. The Sunderland thereby clocked up 21 years of front-line service and outlasted even the Spitfire and Mosquito – whose longevity was largely the result of their adaptability to fulfil secondary support roles, and whose front-line careers in their original roles were short. Today, with the B-52 likely to achieve a 70-year combat career, 21 years seems modest, but in the rapidly changing world of the 1940s and 1950s, it was nearly unique.

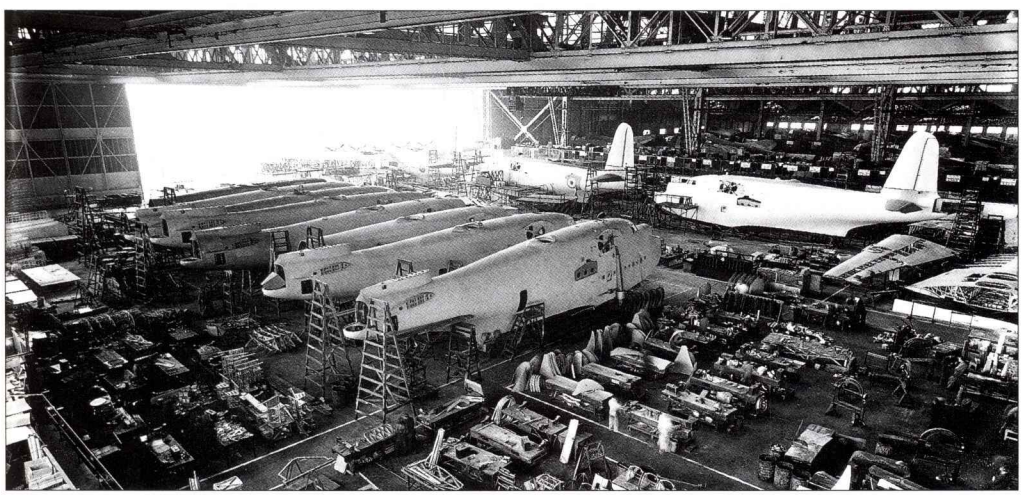
Even after the Royal Air Force discarded its last Sunderlands, the French Aéronavale kept a small number in service for another 16 months, and in New Zealand the type served on until 2 April 1967. A handful of civilian-registered aircraft continued earning their keep for even longer, with Antilles Air Boats using the type until 1978.

War against the U-boat

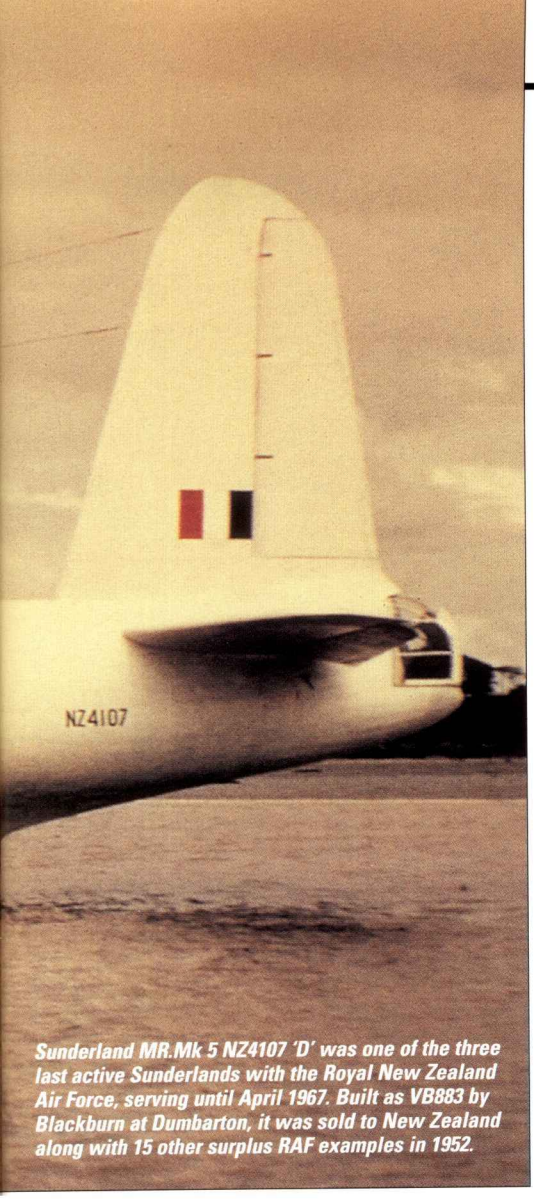
The Sunderland's extraordinary longevity is surprising, since, in truth, it was not nearly so successful as legend would have us believe. As the only aircraft to remain in front-line Coastal Command service throughout the war, and as the most important British-built Coastal Command work-horse, the aircraft was the focus of more press attention, and thereby became emblematic of the Command's war against Germany's U-boat menace.

In fact, the Sunderland was never as important to Coastal Command as were its land-based long-range patrol aircraft, and was never as effective a submarine hunter as the Command's other principal flying boat, the Consolidated Catalina, although during the course of the war Sunderlands did destroy, or share in the destruction of some 37 U-boats and Italian submarines, and inflicted damage on several others. These engagements also resulted in the shooting down of at least six Sunderlands.

Early successes against U-boats were remarkable in view of the inadequacy of the Sunderland's original anti-submarine armament. The standard anti-submarine weapon at the outbreak of war was the 100-lb (45-kg) Anti-Submarine (AS) bomb. One of these was dropped on the British submarine HMS *Snapper* on 3 December 1939, when the vessel was misidentified as a U-boat. The RAF scored a direct hit on the submarine's conning tower, but the cumulative damage amounted to four electric light bulbs in the submarine's control room, and some broken crockery in the galley. The 250-lb (113-kg) AS bomb was better, but still required a direct hit, or to explode within



Sunderland Mk V and Stirling Mk IV take shape at Belfast in 1944. Construction numbers for Belfast-built Sunderlands were mixed in with Stirlings as the aircraft were only assigned them when they were about to be rolled out of the factory. Sunderlands were also built at the Short plant at Rochester and by Blackburn at Dumbarton.



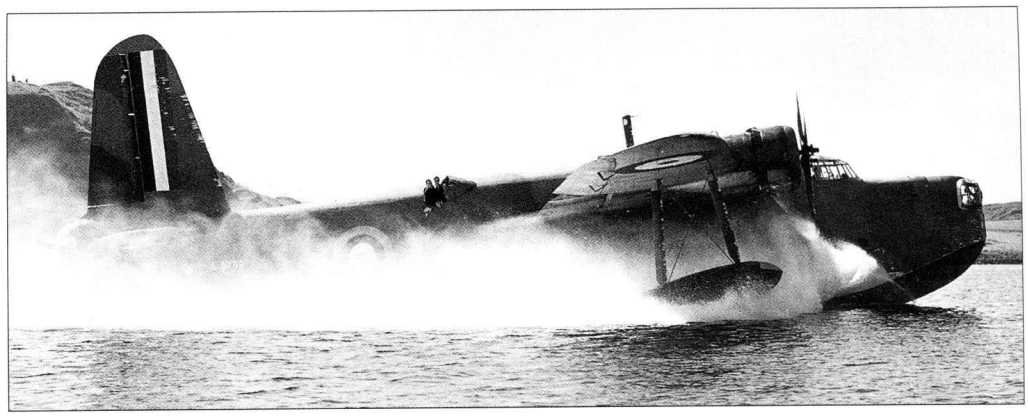
Sunderland MR.Mk 5 NZ4107 'D' was one of the three last active Sunderlands with the Royal New Zealand Air Force, serving until April 1967. Built as VB883 by Blackburn at Dumbarton, it was sold to New Zealand along with 15 other surplus RAF examples in 1952.

six feet (1.8 m) of a submarine's pressure hull to cause significant damage. Since the Sunderland lacked the distributors necessary for an accurately spaced stick of bombs, and had no effective low-level bombsight, success was somewhat unlikely. Fortunately, the U-boat arm was itself relatively weak at the start of the war, with only 27 vessels operational on 3 September 1939.

The aircraft also detected and sometimes attacked enemy ships, though its ability to do so was modest during the first months of the war, when the *Deutschland*, *Scharnhorst* and *Gneisenau* all managed to evade No. 228 Squadron's searching Sunderlands! The addition of ASV Mk I radar from August 1940 improved matters considerably, and steady improvement in radar turned the Sunderland into a much more useful maritime search aircraft. The combination of radar-equipped Sunderlands and surface ships would eventually prove fatal to a large number of enemy surface combatants.

Even after re-engining with Pratt & Whitney Twin Wasps, the Sunderland Mk V fell far short

It is impossible to tell the Sunderland story without mentioning some of the Short flying boats that preceded (and in fact, by the manufacturer's numerical designations, followed) the aircraft. Some of these, including S.23M AX659, were impressed into RAF service, while the other Imperial Airways flying boats also played a role, for the most part retaining their civil registrations. Fitted with ASV Mk I, a pair of broom sticks are also hidden under the rear turret cover to fool enemy fighters into keeping a safe distance.



Mk I L5798 was the first of the second batch built at Rochester. The advance of war saw the silver finish being replaced by a two-tone camouflage and the addition of a large fin-flash on the tail of some of the early aircraft. Two of the aircraft's crew can be seen sheltering from the breeze behind the wind shield provided for the waist position gunner. In reality, early Sunderlands lacked the effective defensive firepower required to fend off determined attackers.

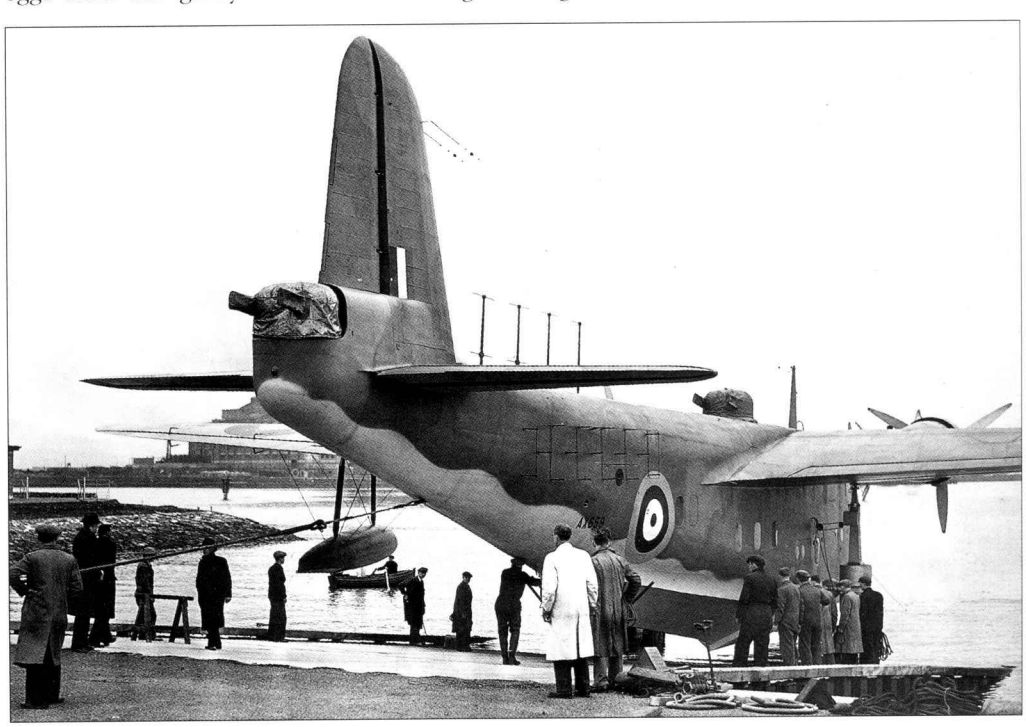
of the performance offered by the smaller, cheaper Catalina. Thus while the Sunderland Mk V could reach a ceiling of 18,000 ft (5486 m) and had a radius of 430 miles (692 km), the slower Catalina could climb well above 20,000 ft (6096 m) and had a radius of more than 600 miles (966 km).

Mid-ocean operations

Although the Sunderland was a flying boat, it required relative calm and sheltered waters to take off and land. Operation from open water was never easy, and the occasional high-profile rescues of downed aircrew or survivors from torpedoed ships in mid-ocean were fraught with difficulty and danger. The Sunderland's hull was only one sixteenth of an inch (about 16 mm) of duralumin, and was quite unable to withstand the pounding of a heavy ocean swell.

Many Sunderland crews did attempt such rescues, and some were successful, winning the participants plaudits and medals. Others were less fortunate. On 9 July 1941 Flt Lt Gil Thurston's Sunderland lost its starboard underwing float and the port outer engine and nacelle, ripped off when the aircraft landed hard on a heavy swell. But the aircraft stayed afloat, and he directed some of his crew to perch on the starboard wing to balance the aircraft. The Hudson crew he had landed to rescue was taken aboard for hot bacon and eggs from the galley while Thurston began taxying back towards the Scillies – 45 hours away at the aircraft's 3-kt taxi speed! Fortunately, British destroyers arrived on the scene and took both crews aboard before sinking the Sunderland with gunfire. The highly experienced CO of No. 461 Squadron came to grief on 11 August 1942, landing to rescue the crew of a downed Wellington. His aircraft bounced heavily on landing and sank, and all but one of the crew was drowned.

Another No. 461 Squadron Sunderland was lost in similar circumstances on 28 May 1943, bouncing three times and then stalling while landing to pick up the crew of a ditched Whitley. This time only the pilot was killed, however, and the remainder of the crew (and the Whitley crew) were picked up by a second Sunderland, flown by Pilot Officer G O Singleton. This was unable to take off, however, but stayed afloat long enough for the survivors and most of Singleton's crew to be taken on board a Free French sloop, which began to tow the Sunderland. When the tow



rope parted, Singleton opened the throttles and took off, though the heavy seas tore a seven-foot gash in the bottom of the hull, forcing him to land on the grass at Angle airfield, instead of on the water at nearby Pembroke Dock.

Although the later Sunderlands fairly bristled with 0.303-in machine-guns, the aircraft was far from the *'fliegende Stachelschwein'* (Flying Porcupine) of the propagandists. It was suggested that this nickname was almost universally used by the Germans, in deference to, and out of respect for, its supposedly formidable defensive armament. In fact, the Sunderland's reliance on rifle calibre machine-guns left it very vulnerable to cannon-armed enemy fighters, and many (23-46) Sunderlands fell to long-ranging Ju 88s and Bf 110s.

There were, though, occasions when the Sunderland was able to 'turn the tables' on its attackers – especially when these were armed with weapons of similar calibre. On 3 April 1940, the Sunderland captained by Flt Lt Frank Phillips of No. 204 Squadron was attacked by two, and then four and then six more Ju 88s, one of which was shot down by rear gunner Corporal Bill Lillie, and the rest were driven off. Despite considerable damage, which included every tank being holed, the Sunderland limped back to Invergordon. This was probably the incident after which a German pilot referred to the Sunderland as a *'fliegende Stachelschwein'*.

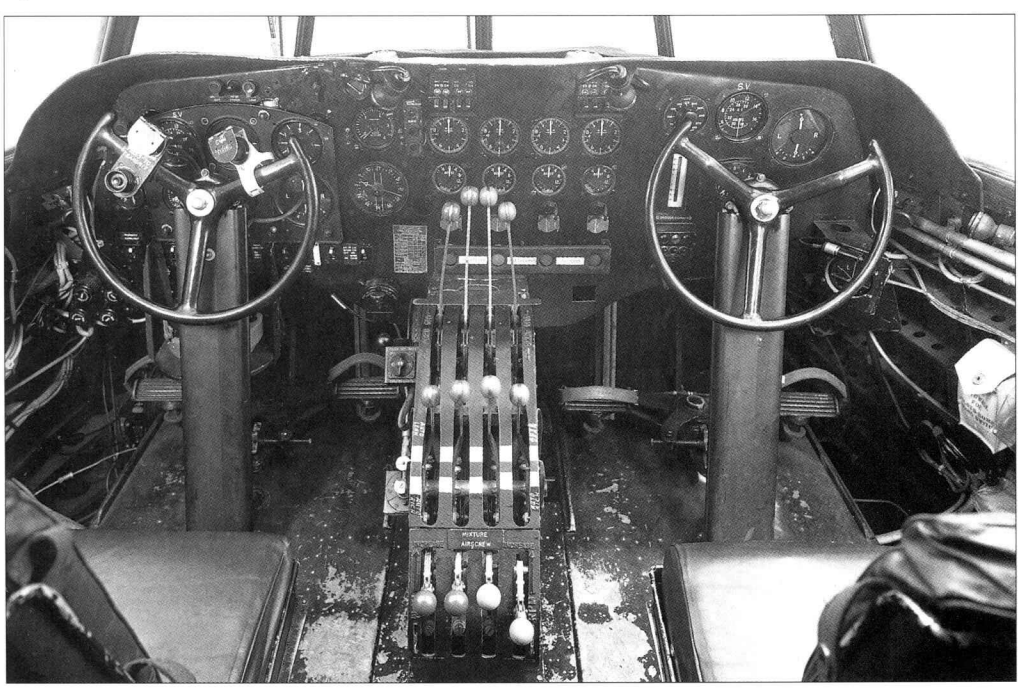
On 15 July 1940, Flt Lt Hugh Birch of No. 10 Squadron, RAAF, attacked five He 111s that were attacking the SS *City of Limerick* just south of Bishop's Rock. His crew set one of the Heinkels alight and the rest fled. On 14 August 1941, No. 10 Squadron's Flt Lt Vic Hodgkinson manoeuvred his Sunderland well enough for his gunners to drive off an Fw 200, which left the fight trailing dense smoke and shedding large pieces of debris.

Although it saw active service throughout the war, production was initially very slow, and the force grew only very slowly. In July 1940, for example, Coastal Command had only 34 Sunderlands spread between Nos 10 (RAAF), 204, 210 and 228 Squadrons (more served with No. 230 Squadrons overseas). During 1940, only 20 Sunderlands were delivered to the RAF – a quantity far below that required simply to replace attrition losses, not least after December's loss of nine aircraft! Things were little better in 1941, when deliveries totalled 34 aircraft.

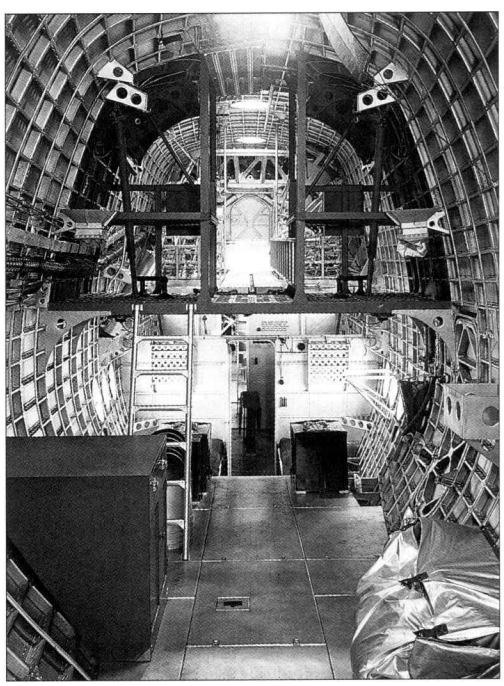
During 1939 and 1940, the Sunderlands achieved relatively few successes, although it proved immensely useful as a transport aircraft during the ill-fated Norwegian campaign, shuttling in vital supplies and personnel into Norway's fjords, and bringing out the wounded.

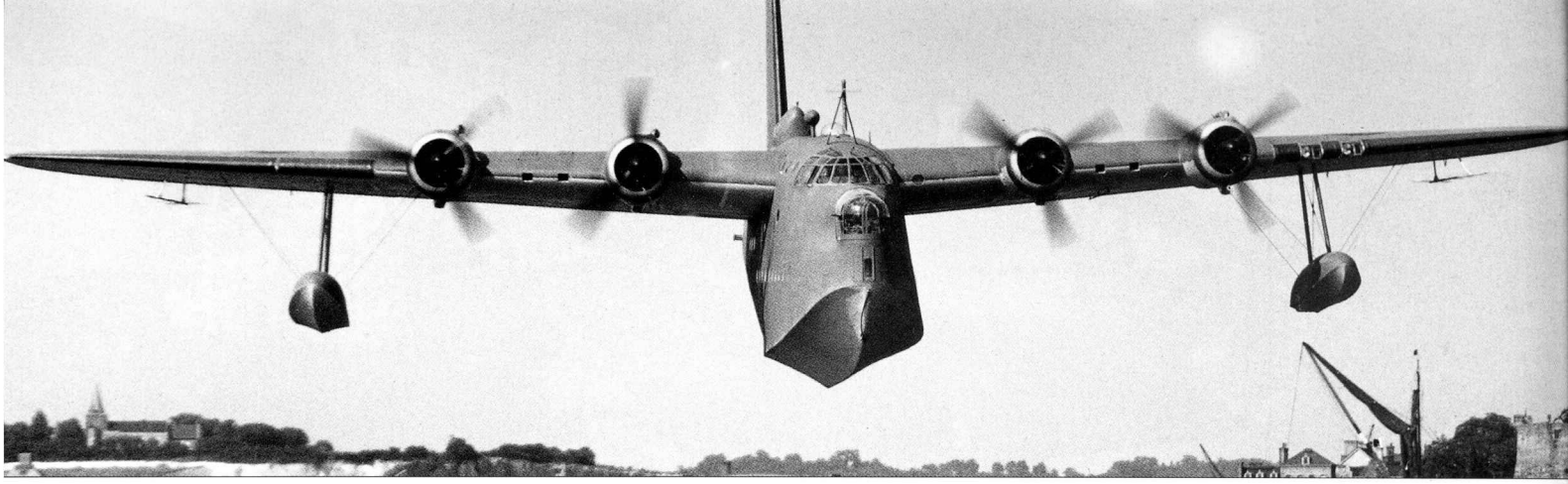
The addition of new anti-submarine weapons in August 1940 did make a difference to the Sunderland's effectiveness. The simple expedient of adding an aerodynamic nose cone and stabilising tail fins to the standard Royal Navy 450-lb (204-kg) depth charge produced a

The cockpit of the Sunderland Mk V differed little from any land-based aircraft, with the engine controls in the centre and repeated basic flight info dials for both the pilot (sitting on the right) and the co-pilot. Some of the BOAC aircraft had an inscription reminding their pilots to inquire if all hatches had been secured before take-off.



This is the view forward from the rear section inside a Sunderland Mk I. The aircraft was well appointed inside, and in many cases overseas the crews preferred to live on the aircraft. The general good finish and lack of 'creature comforts' in this aircraft means it had yet to be delivered to an operational squadron.





Left: The Sunderland was the last of the RAF's silver flying boats of the inter-war years. With the onset of war, Mk I L2160 would soon wear a less attractive, if more practical, scheme. The Sunderland wore several different schemes in World War II in line with Coastal Command standards, the majority settling on the supposedly Herring Gull-inspired white undersides and grey/green uppers (as worn by Mk III '2-E' of No. 422 RCAF Sqn, right) by the mid-war point, with the amount of white increasing in the later war period. Some darker schemes also appeared (including this Mk III, above) noticeably for war service in the Far East.

useful and potent AS bomb, four of which could be carried by a Sunderland. A similar modification produced a new 250-lb (113-kg) AS bomb (also known as the Mk VIII depth charge), eight of which could be slung on the Sunderland's bomb racks, with two more in the hull as 're-loads'. The Mk VIII would subsequently become available in quantity, and became one of the 'war-winning' weapons in the Battle of the Atlantic.

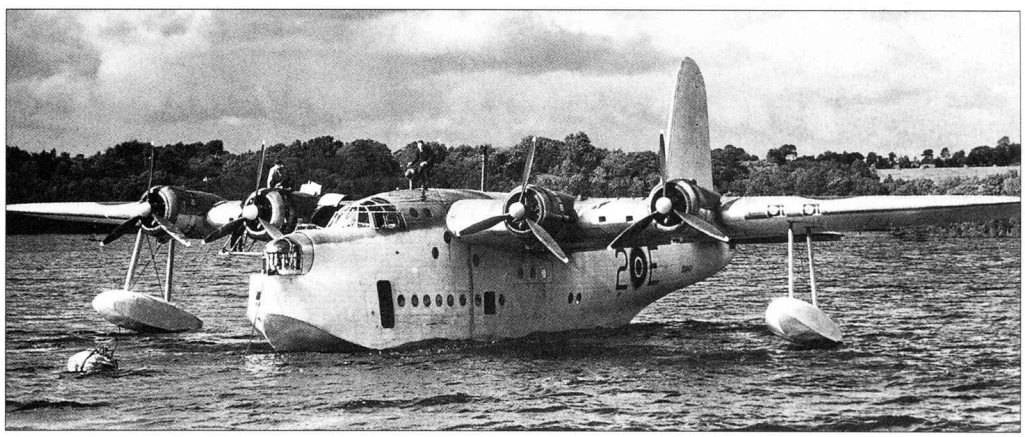
A turning point

1941 saw the home-based Sunderland force dwindle to only two squadrons, with No. 228 having left for Alexandria in June 1940, and with No. 204 moving to Reykjavik in April 1941 (then on to West Africa in July). Although the tonnage of shipping lost to U-boats continued to rise, 1941 marked a turning point in the anti U-boat war, with a significant increase in U-boat losses, and with operational control of Coastal Command passing to the Admiralty, allowing more effective co-operation between ships and aircraft.

Coastal Command also gained a new commander, with ACM 'Ginger' Bowhill being replaced by Sir Philip Joubert. Joubert was a technocrat, with a real interest in and grasp of radio and radar, and was responsible for much of the innovation that would build on Bowhill's early work. Under Joubert Coastal Command ordered the Leigh Light (little used on the Sunderland, but of pivotal importance on other types) and centimetric radar, and Joubert was also responsible for the new predominantly white colour scheme, with dark grey top surfaces, which was (according to legend) based on the camouflage of the Herring Gull!

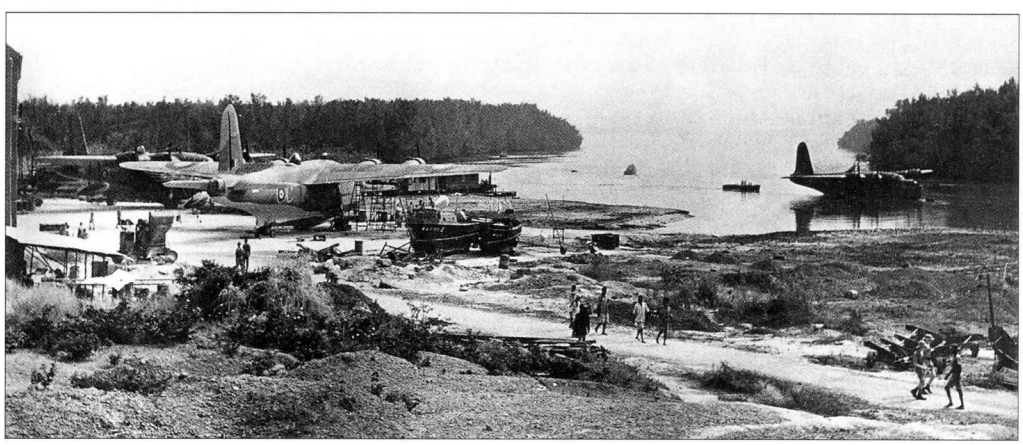
There was also a shift in emphasis away from direct convoy escort to active ASW patrols, concentrating on the choke points through which enemy submarines had to pass in order to reach their hunting areas. The Sunderland played a crucial part in these operations, especially after the introduction of ASV Mk II radar on the Sunderland Mk II.

Even before the United States officially joined the war, its ships and aircraft began actively searching for U-boats in July 1941, reporting their positions in plain language on agreed frequencies – and thereby acting as extra 'eyes' and 'ears' for the British forces.

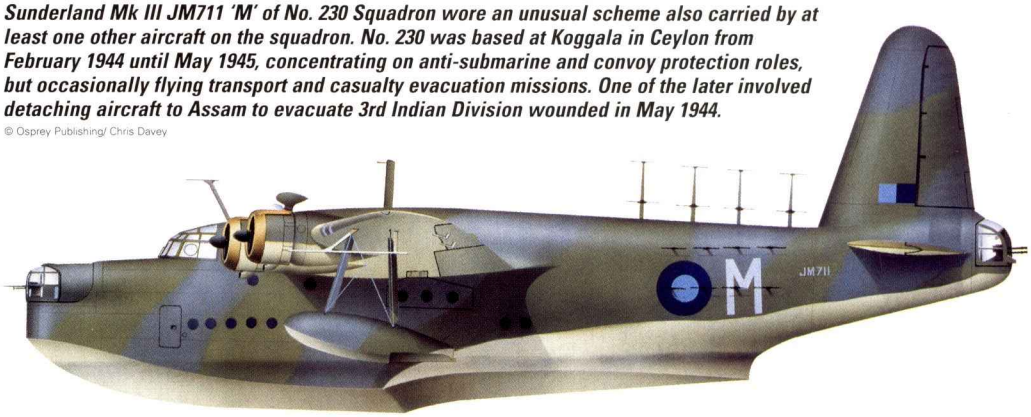


But the Sunderland remained a relatively minor part of Coastal Command's strength. Until October 1941 (when No. 228 Squadron returned from the Mediterranean), there were only two home-based squadrons, No. 10 (RAAF) operating from Pembroke Dock with six Sunderlands and a borrowed Catalina and No. 201 operating from Lough Erne with an average of three aircraft available on any given day. The Lough Erne-based aircraft had to transit to the Atlantic via a narrow corridor through neutral Ireland's airspace. By the end of the year there were seldom more than 24 Sunderlands available for operations.

Sunderlands were based in the majority of theatres during World War II. West Africa Command in 1943 (when this scene was captured) could boast Nos 95, 204 and 343 (Free French) Squadrons, joined by No. 270 from December. Sunderlands were based at Bathurst in the Gambia, Dakar in Senegal, and Jui in Sierra Leone. Mk III 'C' and the aircraft in the water have had their 'stickleback' antennas 'removed' by the wartime censor.



Sunderland Mk III JM711 'M' of No. 230 Squadron wore an unusual scheme also carried by at least one other aircraft on the squadron. No. 230 was based at Koggala in Ceylon from February 1944 until May 1945, concentrating on anti-submarine and convoy protection roles, but occasionally flying transport and casualty evacuation missions. One of the later involved detaching aircraft to Assam to evacuate 3rd Indian Division wounded in May 1944.



Factory-fresh Mk IIIs EJ168, EJ169 and EJ170 sit on the slipway at Belfast. Each is fitted with the ASV Mk II 'stickleback' antenna array on the top and side of the rear fuselage, and the Yagi direction-finding gear under the wings and above the cockpit. The Pegasus Mk XVIII engines of this batch have the long flame-dampening exhaust pipes. Others had much simpler exhausts.

Short's production of the Sunderland was trebled during 1942, though it remained relatively modest, at only 114 aircraft delivered to the RAF. This did, however, more than balance the year's loss of 24 Sunderlands and, in concert with a growing availability of new aircrew from the Empire Air Training Scheme, allowed an expansion of the force, which gained five new UK-based Sunderland squadrons (Nos 119, 246, 422, 423, and 461), though two were destined to be short-lived.

This modest production tally reflected the Air Ministry's policy of ordering the aircraft in tiny batches, and Short's pre-occupation with building Stirling bombers. Bomber Command's needs were always accorded a higher priority than those of Coastal Command, and its AOC-in-C, Sir Richard Peirse, argued strongly that the Battle of the Atlantic was an irrelevant sideshow. Few seemed to heed Joubert's forecast that without a dramatic reduction in the loss of allied shipping, Britain had little more than a year's grace before inevitable collapse. The appointment of a new and even more resolutely selfish Bomber Command chief, Sir Arthur Harris, only exacerbated the turf war between the two Commands. But with Harris energetically resisting Coastal Command's demands for more land-based Liberators, Fortresses and Wellingtons, the Sunderland continued to shoulder a significant part of Coastal Command's operational burden.

Coastal Command strikes back

Fortunately, reduced losses and growing ship construction figures allowed new tonnage to overtake losses for the first time in June 1942, though the loss of experienced seamen was harder to replace, and the U-boat arm could draw some comfort in the fact that it was sinking more tonnage per U-boat lost.

Such comfort was shattered in June 1942, with the introduction of Leigh Light-equipped Wellingtons and of Sunderlands equipped with ASV Mk II radar. These finally removed the U-boat's sanctuary of darkness, forcing them to transit the Bay of Biscay submerged, except when charging batteries, sapping crew morale.

Dönitz concentrated his U-boats in mid-Atlantic whenever possible, where even the Liberator had little endurance, and with the introduction of the Metox radar warning device, U-boat contacts and sightings diminished. Behind the scenes, long-term measures were put in place which would swing the tide of the war more firmly against the U-boat. At the Casablanca Conference Britain and the USA finally decided that their resources would be 'first and foremost' directed at the defeat of the German submarine menace.

Coastal Command gained a new commander in February 1943, in the person of Sir John Slessor, who saw annual Sunderland production reach a record high of 202 aircraft. Many of these went to overseas squadrons, however, and Coastal Command's home-based Sunderland force actually lost one squadron, though unit establishments were increased from nine aircraft (which had seldom been achieved in practice) to 12. By the end of the year Mount Batten still housed No. 10 Squadron, RAAF, while Pembroke Dock accommodated No. 461 Squadron. Castle Archdale (as Lough Erne had become) had three squadrons (Nos 201, 228 and 423), while Nos 330 and 422 were based at Oban.

With the introduction of aircraft-carried anti-submarine torpedos and with the aid of Ultra (intelligence from the German Navy's coded Enigma signals traffic), U-boat losses rose rapidly, and in May 1943, after losing 41 U-boats (23 to aircraft including five to Sunderlands), Dönitz even re-deployed his Wolf Packs to the Azores, South America and the Caribbean, giving the Atlantic convoys a brief respite and giving his submarines a better chance of survival.

In the Bay of Biscay the heavily armed Ju 88s of V./KG 40 stepped up their efforts against lone Sunderlands and Liberators, hunting in packs of six or eight aircraft. Occasionally, Sunderlands escaped using the sanctuary of cloud, and on 2 June 1943, the No. 461 Squadron aircraft captained by Flt Lt J.C. Walker successfully fought back, downing three of the eight attacking aircraft and then limped back to beach near Penzance. Walker and his crew had little time to enjoy the DSO, DFC and two DFMs they won however, most being killed when their aircraft was shot down by six Ju 88s on 13 August. Throughout the rest of the year, the Ju 88s were to exact a growing toll.

The U-boats were fitted with *Schnorkels* during the autumn of 1943, which allowed them to remain submerged even when charging their batteries. Even the near simultaneous introduction of ASV Mk VIC radar on the Sunderland could not fully compensate, since a submarine snorkel was an immensely difficult target for radar, especially in rough seas.

With a new AOC-in-C (ACM Sir Sholto Douglas) arriving in February 1944, Coastal Command continued to slowly gain an upper hand over the U-boats. The Kreigsmarine lost 60 U-boats during the first three months of 1944, sinking only 54 allied ships during the same period. Sunderlands accounted for three of the U-boats, including the *U-625* on 10 March, which was attacked by WO WF Morton of No. 422 Squadron. Before abandoning his sinking submarine, the captain of the *U-625* flashed a message in Morse to his attacker. This was read off as 'F-I-N-E-B-O-M-B-I-S-H'! On 22 March Dönitz abandoned Wolf Pack tactics, which seemed to have done little more than provide the British with a concentration of targets. Thereafter, the U-boats operated singly and autonomously, reducing their effectiveness but making them harder to find.

From April, increasing numbers of U-boats began trying to penetrate the Channel, in antic-

Sunderland Mk III

No. 330 (Norwegian) Squadron, Sullom Voe

The Mk III
The Mk III Sunderland was the version built in the greatest numbers, with a total of 461 built. It was the variant of the aircraft that would see the most service in World War II, but was quickly retired at the end of hostilities.

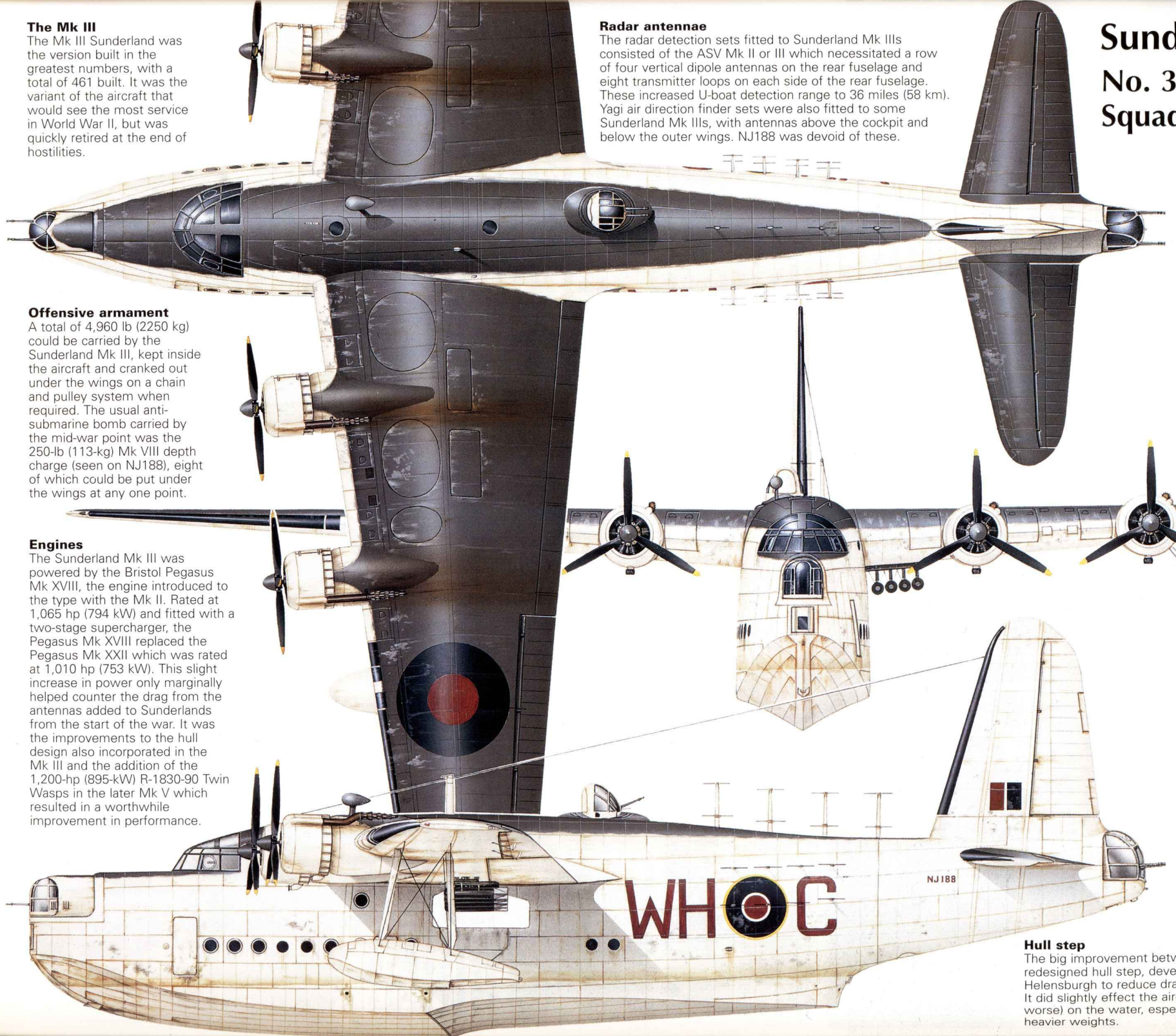
Radar antennae
The radar detection sets fitted to Sunderland Mk IIIs consisted of the ASV Mk II or III which necessitated a row of four vertical dipole antennas on the rear fuselage and eight transmitter loops on each side of the rear fuselage. These increased U-boat detection range to 36 miles (58 km). Yagi air direction finder sets were also fitted to some Sunderland Mk IIIs, with antennas above the cockpit and below the outer wings. NJ188 was devoid of these.

Built at Dumbarton by Blackburn Aircraft, NJ188 was delivered as a Mk III but was later fitted with Twin Wasp engines, bringing the aircraft up to Mk V standard. After RAF service it was modified as a Sandringham 5 and delivered to BOAC as G-AHZF before passing to Qantas in July 1951 as VH-EBY.

NJ188 shared in the destruction of a Type VIIC U-boat on 25 November 1944. While being flown by the crew of Lt J Buer, the aircraft's radar picked up a contact, but was unable to attack because of poor visibility. The information was passed on to a RAF Liberator and some Royal Navy warships, which sunk *U-322*. At the time NJ188 was serving with No. 330 (Norwegian) Squadron, wearing the code 'G'.

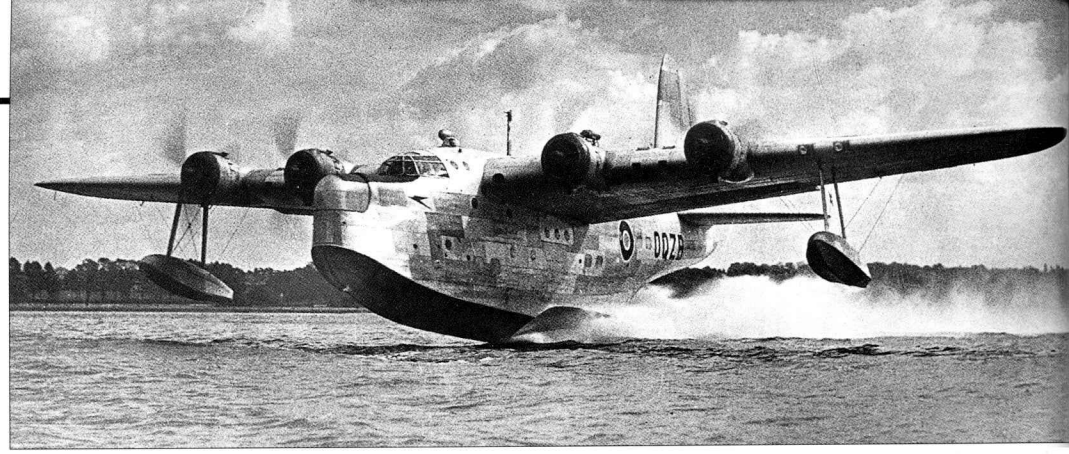
Offensive armament
A total of 4,960 lb (2250 kg) could be carried by the Sunderland Mk III, kept inside the aircraft and cranked out under the wings on a chain and pulley system when required. The usual anti-submarine bomb carried by the mid-war point was the 250-lb (113-kg) Mk VIII depth charge (seen on NJ188), eight of which could be put under the wings at any one point.

Engines
The Sunderland Mk III was powered by the Bristol Pegasus Mk XVIII, the engine introduced to the type with the Mk II. Rated at 1,065 hp (794 kW) and fitted with a two-stage supercharger, the Pegasus Mk XVIII replaced the Pegasus Mk XXII which was rated at 1,010 hp (753 kW). This slight increase in power only marginally helped counter the drag from the antennas added to Sunderlands from the start of the war. It was the improvements to the hull design also incorporated in the Mk III and the addition of the 1,200-hp (895-kW) R-1830-90 Twin Wasps in the later Mk V which resulted in a worthwhile improvement in performance.



Protective armament
The Sunderland's 'flying porcupine' legend was used for all it was worth for propaganda purposes. The aircraft was heavily armed but the 0.303-in calibre of the weapons carried was ineffective against the cannon-armed fighters the aircraft was likely to meet. NJ188 has the FN.7 mid-upper turret, nose and tail turrets but was not fitted with the four guns mounted in the lower nose.

Hull step
The big improvement between the Mk II and Mk III was the redesigned hull step, developed by the MAEE at Helensburgh to reduce drag while the aircraft was in the air. It did slightly effect the aircraft's performance (for the worse) on the water, especially when it was operating at heavier weights.



Few aircraft blurred the distinctions between military and civil aircraft as much as the Sunderland. This BOAC Sunderland Mk III from October 1943 wore the RAF roundel and Transport Command codes 'OQZB' to allow it to transit through Egyptian airspace. BOAC used a total of 16 Mk IIIs during World War II.

ipation of an Allied invasion of continental Europe. The eastern end of the Channel was shallow and heavily mined, and the Sunderlands concentrated their efforts over the western Channel and South West Approaches. They accounted for one U-boat in April, two in May (with two further submarines being forced to return to base with heavy damage) and two in June. Four more were sunk during July and August. Only No. 330 Squadron remained aloof from the effort, continuing to operate from Sullom Voe out over the Atlantic.

U-boat losses became alarmingly high during late 1944 and early 1945, and their successes became more and more infrequent. Finally, on 9 May 1945, the U-boats were ordered to surrender by Dönitz, being instructed to surface and fly a black or blue surrender flag while making for designated Allied ports. There was a real fear that some fanatical commanders would refuse these orders, and the Sunderlands continued their patrols until the last aircraft (flown by No. 201 Squadron's CO Wg Cdr J Barrett) received the order to return to base at one minute after midnight on 4 June. Interestingly, Barrett had also flown one of the Sunderland's first high-profile missions of the war, while serving with No. 228 Squadron as a Flight Lieutenant. On 18 September he had flown one of two Sunderlands dispatched to rescue survivors from the tramp steamer *Kensington Court*, shelled by a surfaced U-boat 70 miles (113 km) from the Scillies.

In other theatres

The Sunderland was not restricted to participating only in the Battle of the Atlantic – it saw service in virtually every theatre.

The Mediterranean had traditionally been an area of interest for the RAF's flying boat squadrons, guarding the vital trade routes to the Far East, via the Suez Canal and Arabian Gulf, and reinforcing British forces in Egypt and the Middle East. While the RAF's first Sunderland squadron was re-equipped in the Far East and the second at home, the third unit – No. 228 Squadron – was always intended to be based in the eastern Mediterranean. After conversion at Pembroke Dock, No. 228 Squadron moved to Alexandria, Egypt, in June 1939, but returned to Pembroke Dock on 8 September, since the Middle East looked like being a sideshow in the war.

The fall of France and Italy's entry into the war changed the situation almost overnight, giving Axis forces easy access to the Mediterranean and threatening Britain's vital supply lines to the Middle East, India, Singapore and Australia. No. 230 Squadron had already been sent from Seletar, Singapore, to Alexandria, arriving in Egypt on 6 May 1940, and No. 228 Squadron rushed back to the Mediterranean on 10 June 1940 (the day Italy joined the war) transiting via Malta, where its overnight moorings were bombed only hours after the Sunderlands had departed.

Early Sunderland operations in the Mediterranean accounted for two Italian submarines, but attracted opposition from Italian and Vichy French fighters, the latter becoming particularly active after the Royal Navy's bloody pre-emptive strike against the French fleet's battleships at Oran.

A No. 230 Squadron Sunderland played a vital role in the Battle of Cape Matapan, shuttling back and forth between the opposing fleets and sending vital intelligence reports to Admiral Cunningham. Admiral Iachino resorted to begging for fighter support "to get this shadowing aircraft off our backs as soon as possible", but no such assistance arrived, while an error by the Sunderland's navigator led directly to the discovery of a second Italian fleet. In the ensuing battle, Cunningham's superior intelligence picture proved pivotal, and three of eight Italian cruisers were sunk, with the battleship *Vittorio Veneto* suffering damage.

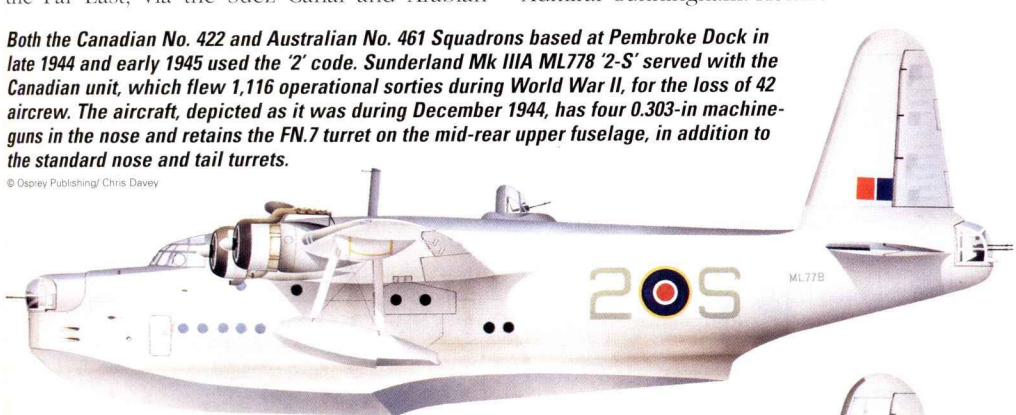
In the wake of Germany's invasion of Greece, the Sunderlands of Nos 228 and 230 Squadrons were heavily involved in the evacuation of allied personnel, including the Greek royal family, and repeated the same grim duty when Crete had to be evacuated after the German airborne invasion. On one occasion a Sunderland carried no fewer than 74 troops, as well as its own ten-man crew, from Crete to Alexandria. The Sunderland left the Mediterranean in January 1943, replaced by land-based aircraft operating from Malta, North Africa and Egypt.

In West Africa, several squadrons of Sunderlands closed huge areas of ocean to enemy submarines, and thereby prevented U-boats from sinking allied ships which might otherwise have been 'easy meat', even though they failed to sink a single U-boat in the theatre. Before No. 95 Squadron's three Sunderlands were reinforced in mid-1941, a small group of U-boats operating in West Africa accounted for half of the German submarine arm's tonnage during May 1941, but losses then plummeted after proper ASW cover was established. Though there were no Luftwaffe fighters in the area, the Sunderlands did not go unmolested, frequently coming under attack from Vichy French fighters based in neighbouring French colonies. From March 1943, one of the Sunderland units in West Africa was the Free French No. 343 Squadron.

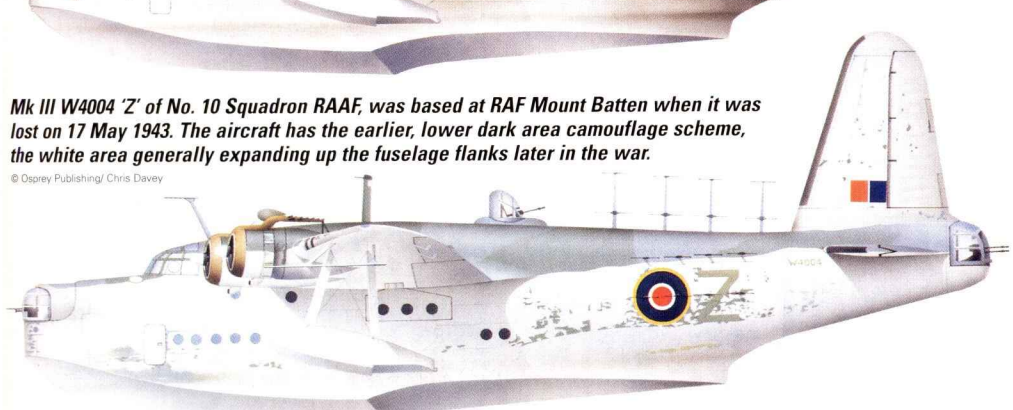
Operations in East Africa proved equally effective. Before the arrival of the Twin Wasp-powered Mk V, Sunderlands operating in Africa, the Indian Ocean and the Pacific suffered major engine reliability problems. The Pegasus XVIII had proved relatively trouble-free in the Atlantic, but on RAF Sunderlands in the Indian Ocean, valve stems tended to stick, snap off and then fall into the cylinder with catastrophic results. The fault lay with local oil supplies, which allowed waxy deposits to build up on the hot valve stems.

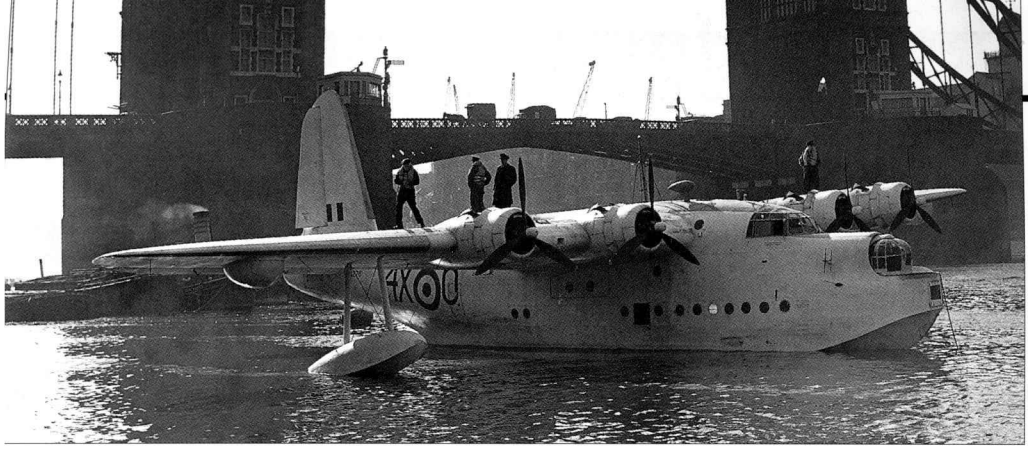
Before the war, equipping overseas units with Sunderlands had been accorded a high priority, such was the suitability of the flying boat for the Colonial Policing role. No. 230 Squadron at Seletar was actually the RAF's first Sunderland unit, but with the outbreak of war, priorities changed. No. 230 Squadron moved to the Middle East in May 1940, and even after Japan's declaration of war, no Sunderlands were re-deployed, handicapping the Royal

Both the Canadian No. 422 and Australian No. 461 Squadrons based at Pembroke Dock in late 1944 and early 1945 used the 'Z' code. Sunderland Mk IIIA ML778 'Z-S' served with the Canadian unit, which flew 1,116 operational sorties during World War II, for the loss of 42 aircrew. The aircraft, depicted as it was during December 1944, has four 0.303-in machine-guns in the nose and retains the FN.7 turret on the mid-rear upper fuselage, in addition to the standard nose and tail turrets.



Mk III W4004 'Z' of No. 10 Squadron RAAF, was based at RAF Mount Batten when it was lost on 17 May 1943. The aircraft has the earlier, lower dark area camouflage scheme, the white area generally expanding up the fuselage flanks later in the war.





Left: In the late 1940s and early 1950s during Battle of Britain week in September, one could usually see a Sunderland moored next to Tower Bridge in the heart of London. In 1950 No. 201 Squadron's RN270 '4X-O' had the honour.

Below: Food is unloaded from Sunderland GR.Mk 5 VB889 of No. 201 Squadron on Lake Havel in Berlin, Germany, in 1949 during Operation Plainfare – the Berlin airlift. While the load-carrying capability of the Sunderland was limited, it was able to carry corrosive materials such as salt, as the airframes were well protected for day-to-day overwater operations.

Navy's efforts by depriving it of long-range 'eyes'. It was not until 1943 that Sunderlands ventured east again, when No. 230 Squadron moved to Dar-es-Salaam in Tanganyika.

In East Africa, personnel proved even more vulnerable than aircraft and engines, due to the plagues of yellow fever and malaria-infested mosquitoes. A detachment in Madagascar had a severe problem with cases of gonorrhea, which echoed the epidemic among the indigenous population.

As the focus of the war in the Pacific shifted eastwards, No. 230 Squadron moved from East Africa to Ceylon, from where its Sunderlands flew against Japanese coastal shipping which supported and supplied enemy forces in Burma. Two of the squadron's Sunderlands were detached to the Brahmaputra river. For 32 days the Sunderlands ferried 537 wounded Chindits back from Lake Myitkyina (miles behind enemy lines), one aircraft being lost at its moorings, and the other narrowly escaping destruction when strafed by Japanese fighters while taking off for its final flight back to Allied territory. No. 230 Squadron re-equipped with Sunderland Mk Vs in January 1945, and these flew transport and anti-shipping missions in support of the Allied liberation of Burma.

Peacetime force levels

Post-war, the Sunderland force drew down rapidly, so that between April 1945 and March 1946, eleven squadrons (Nos 10 (RAAF), 95, 204, 228, 240, 259, 270, 422, 423, 461 and 490 Squadrons) disappeared from the rolls, with two more (the Norwegian No. 330 and the French No. 343) being transferred to their newly liberated countries.

This left two UK-based Sunderland Squadrons (Nos 201 and 230 at Calshot) and No. 88 Squadron in Hong Kong, No. 205 Squadron in Ceylon, and No. 201 in Singapore. No. 4 (Coastal) OTU remained at Calshot for training, becoming No. 235 OCU in 1947. Even with the transfer of refurbished aircraft to new foreign operators there were sufficient Mk Vs to allow the retirement of the earlier versions.

The Sunderland GR.Mk 5 (as it soon became) enjoyed an active post-war career. From July until December 1948 Nos 201 and 230 Squadrons were heavily involved in the Berlin Airlift, backed up by the civil Hythes of Aquila Airways. They operated between Finkenwerder on the River Elbe and Lake Havel in Berlin, carrying 4½ tons (4572 kg) of supplies into Berlin on each trip, and flying out laden with manufactured goods and refugees. The Sunderland's cargo included 2,500 tons (2.5 million kg) of highly-corrosive salt, which would have been difficult and dangerous to carry in an aircraft not designed for operation in a salt-laden atmosphere. The Sunderland operation was brought to a close when the Havel froze, and did not re-start in the spring because airspace was saturated.

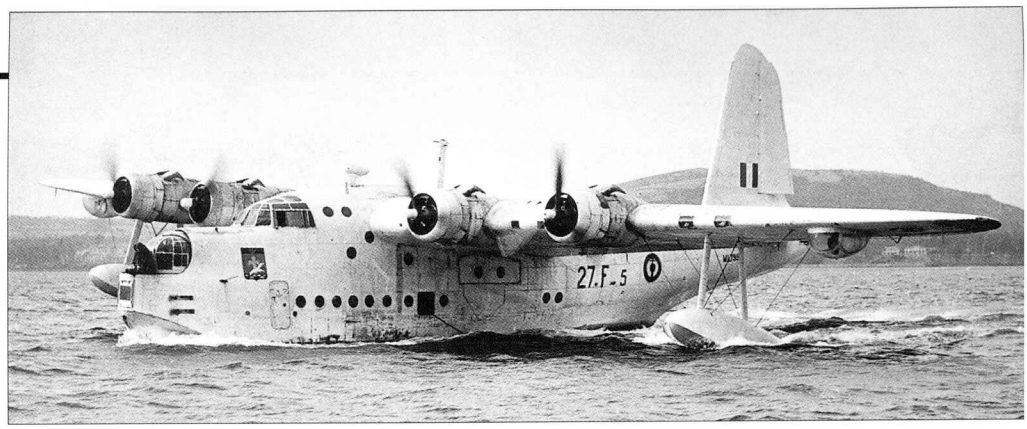
The UK-based Sunderland units were heavily involved in supporting the British North Greenland Expedition from 1952-54, and remained active until disbandment in 1953 (No. 235 OCU) and 1957.

With three FEAF Sunderland units, the type was an early mainstay of operations against communist insurgents in Malaya, and was active from the start of Operation Firedog on 17 June 1948. Initially the Sunderlands of Nos 205 and 209 Squadrons operated in the bomber role, with crew members throwing small fragmentation bombs through the aircraft hatches before proper bomb racks could be re-installed. Relieved in the bomber role by Lancasters and Lincolns deployed from UK-based squadrons, the Sunderlands then began flying maritime patrols, searching for the Chinese junks and freighters which were re-supplying the Chinese Malayan Communist Party guerrillas.

No. 88 Squadron in Hong Kong had initially served in the transport role, its aircraft entirely stripped of armament, but it reverted to maritime duties in 1948 when BOAC took over the routes it had served. One of the unit's Sunderlands (flown by Flt Lt Ken Letford, DSO, DFC) was involved in the Yangtse Incident, flying supplies and a doctor to HMS *Amethyst*, trapped by Communist Chinese forces as it tried to navigate down the Yangtse. The Sunderland came under heavy and accurate fire each time it landed, but survived the operation. The frigate eventually made a successful break for the sea, and Letford received a bar to his DFC. No. 88 Squadron then evacuated 121 British nationals from Shanghai – the task which had originally been given to *Amethyst*.

No. 88 Squadron then went on to participate in the Korean War, principally operating in the transport role, before withdrawing to Seletar, Singapore, to join FEAF's other two Sunderland units. No. 88 Squadron disbanded in 1954, but

This scene at RAF Calshot in 1948 shows Sunderland GR.Mk 5s belonging to both Nos 201 and 230 Squadrons, and No. 235 OCU (coded 'NS', '4X' and 'TA' respectively) on the slipway and hardstandings. The round building, often mistaken for a Martello tower, is Calshot Castle. Calshot closed as an RAF flying facility around 1953. The last UK Sunderland facility was the maintenance unit at Wig Bay, to which aircraft passed on the disbandment of the UK squadrons, stored for possible use with the Far East Air Force.



Sunderlands swelled the ranks of several foreign operators after World War II. The French Navy retained its RAF-supplied examples after the war and bolstered them with the purchase of 19 Mk Vs in 1951. This example is ML799 serving with Flottille 27F, when it was based at BAN Saint Mandrier.

the remaining squadrons remained committed to Operation Firedog, merging to form a single No. 205/209 Squadron on 1 January 1955 due to a shortage of aircraft. The combined unit became No. 209 Squadron on 1 March 1958, and flew its last Sunderland operation on 14 May 1959, with a farewell flypast the next day.

Even that was not the end of the Sunderland's military career, since the French Aéronavale retained a trio of aircraft until January 1962, and the RNZAF managed a declining fleet of aircraft until April 1967, bringing to an end an operational career that had lasted just short of 30 years.

In retrospect

The Sunderland's post-war usefulness and longevity, together with skilful wartime propaganda, helped to weave a legend around the Sunderland, and if the true story was less glorious, there could still be no doubting the type's historical significance. Moreover, while the Sunderland was encumbered with real weaknesses and flaws (alongside its undoubted strengths), then that only reflects greater glory on the brave men who flew the aircraft, and who undertook a difficult, unglamorous and frequently unpleasant task with unmatched professionalism, determination and courage.

Coastal Command's war was never easy for the public to understand, and its success or failure was never easy to measure. It was never a matter of counting how many aircraft had been shot down, nor of counting the tonnage of bombs dropped on enemy targets. It was sometimes tempting (not least for the media) to concentrate on the sinking of enemy ships and submarines as an indicator of success, but even this was misleading. Coastal Command's real success lay in convoys coming through without loss, or with lower losses, and in denying the enemy freedom to operate in a particular stretch of ocean. Simply preventing the enemy from fulfiling his objectives is hard to quantify and hard to present in an up-beat way, and the Command was therefore largely ignored by the press. The Sunderland did play a major part in this unsung battle, even if the majority of crews completed their tours without ever encountering the enemy, or became part of the grim statistics of 'non-operational losses'.

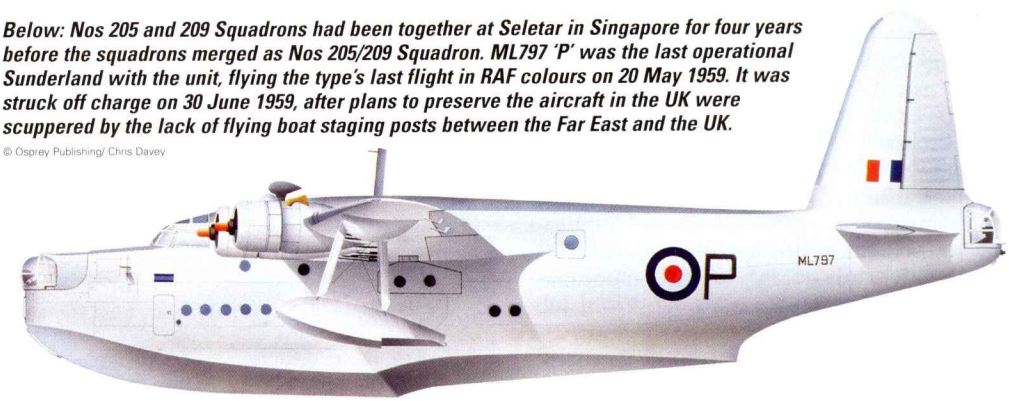
The CO of No. 423 Squadron, Wg Cdr L G J Archambault, later recalled that he: "flew like a son-of-a-gun, never saw anything, never shot at anything, nobody shot at me and I never saw a German!" And his experience was probably more typical than those who did find and attack an enemy U-boat, or who fought for their lives against enemy fighters.

Simply 'being there' mid-ocean, fighting against hostile weather, fatigue, cold, boredom and mechanical unreliability as much as against enemy aircraft or ships, is what won the Battle of the Atlantic, and the Command's endless uneventful patrols were far from unproductive, since they had a truly devastating effect on the enemy's ability to wage war at sea.

Also, the Sunderland did have an undefinable magic, which won it the love and respect of its crews, which in turn helped maintain their morale at an astonishingly high level. The Sunderland force quickly cultivated its own unique identity, often living aboard their surprisingly well-appointed aircraft, and emphasising a nautical 'tradition'. Cap badges and uniform buttons went unpolished and verdigris was regarded as a badge of honour, while a typical Sunderland crew often looked more like the crew of a small fishing boat than an RAF bomber crew. RAF regulations forbade the growing of beards, but Sunderland captains did take great pride in their seamanship, and formed the basis of the RAF's well-regarded sailing association.

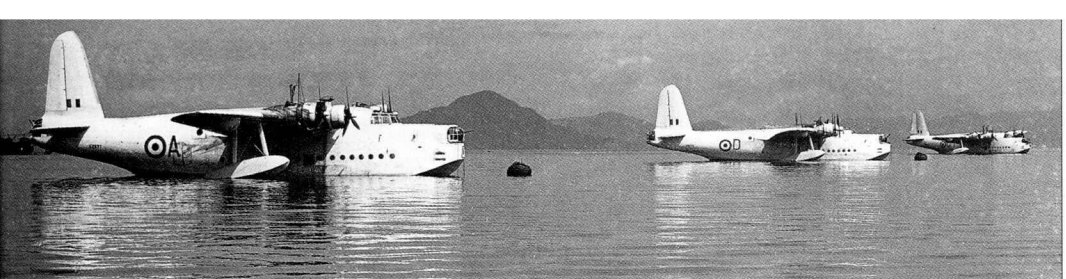
Jon Lake

Below: Nos 205 and 209 Squadrons had been together at Seletar in Singapore for four years before the squadrons merged as Nos 205/209 Squadron. ML797 'P' was the last operational Sunderland with the unit, flying the type's last flight in RAF colours on 20 May 1959. It was struck off charge on 30 June 1959, after plans to preserve the aircraft in the UK were scuppered by the lack of flying boat staging posts between the Far East and the UK.



No. 230 Squadron Mk 5 PP117 coded '4X-W' is seen on patrol in early 1950 (above right). The unit was the last UK-based squadron, disbanding on 31 July 1957 at Pembroke Dock. The final RAF operator was No. 205/209 Squadron, based at RAF Seletar, Singapore, where these Mk 5s are seen awaiting the scrapman in May 1959 after the type's RAF service had ended (below left).

Below: SZ577 'A', RN377 'D' and 'G' rest at moorings in company with a US Navy PBM somewhere in the Far East in the late 1940s/early 1950s. Sunderlands were one of the few RAF types to play a role in the Korean War, being deployed to Iwakuni in Japan for patrols off the Korean coast.



Sunderland variants

Short S.23/M 'Empire'

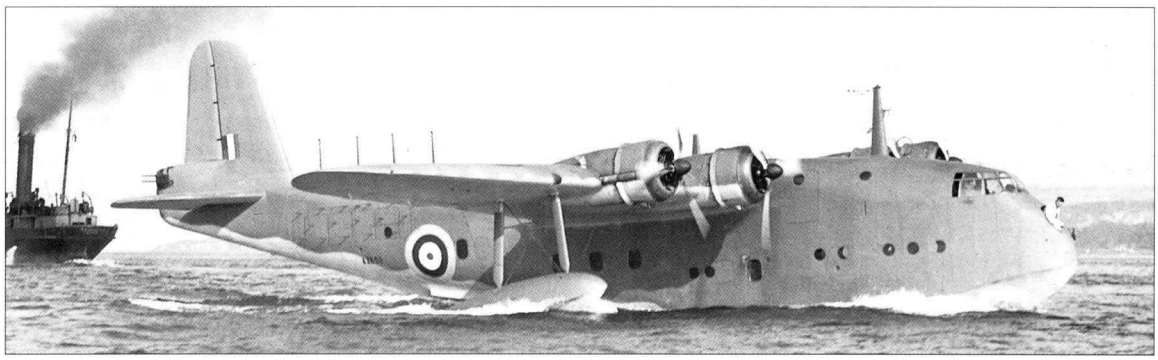
A pair of S.30/Ms destroyed in Narvik was replaced by two older 'Empire' boats, which were impressed by the RAF in July 1940. These aircraft were more extensively modified, being flown to Short's Belfast yard for modification in September 1940.

Like the S.30/Ms, the aircraft were fitted with ASV radar, with a rudimentary 'stickleback' antenna array above the fuselage, and with further antennas on the sides of the rear fuselage. They also gained armour protection around the flight deck and inner fuel tanks, and were fitted with a pair of Boulton Paul Type A four-gun turrets. One of these was fitted above the centre fuselage, offset to starboard, with the other in a new tail fairing. The latter required the rudder to be cropped at its lower edge. Sliding hatches were provided underwing, to allow six 430-lb (195-kg) depth charges to be run out sideways on new bomb racks.

The aircraft entered service with No. 119 Squadron at Pembroke Dock. AX659 was lost on 22 August 1941, while flying with No. 201 Squadron, while AX660 moved on to No. 413 Squadron at Stranraer before being returned to British Overseas Airways Corporation (BOAC) in December 1941.

Serial	C/n	Notes
AX659	S.841	ex-G-AETY *Clio*
AX660	S.846	ex-G-AEUD *Cordelia* returned to BOAC

Two of the 28 S.23 C-class 'Empire' flying boats built for Imperial Airways served briefly with the RAF, this example being AX659. The large aerial arrays of the early ASV radars (right) degraded the performance of the S.23Ms (and Sunderlands) but greatly increased the aircraft's chances of coming into contact with a U-boat.



Short S.26/M

The £87,325 purchase price of the S.26 (more than double that of the £41,000 S.23) had been subsidised by the Air Ministry, on condition that the aircraft would be immediately available to the RAF in time of war.

The three aircraft were commandeered within days of the handover of the first aircraft to Imperial Airways on 24 September 1939. Their civilian crews were similarly 'press-ganged' – being gazetted as RAF officers before being posted to Stranraer for training in the maritime reconnaissance role.

The three aircraft were immediately converted to military standards, the second without having ever flown in its planned civilian fit.

As S.26Ms, the three aircraft gained armour plate around the inner tanks and crew positions. Underwing racks were provided for up to eight 500-lb (227-kg) bombs, while there was stowage in the hull for eight smoke floats, 28 flame floats and 20 reconnaissance flares,, with a launch chute behind the aft step.

The aircraft also gained three powered Boulton Paul BPA Mk II turrets, each with four Browning 0.303-in guns and 600 rounds per gun. Two turrets were fitted above the fuselage, one amidships between the spar frames, and one further aft offset to starboard. The third turret was fitted in the tail, behind the rudder, projecting up from an extended stern-cone.

Golden Horn was flown briefly as G-AFCK before conversion by Short at Rochester, while G-AFCJ remained unflown. *Golden Horn* and *Golden Fleece* were then re-serialled as X8273 and X8274, respectively. X8273 flew in its new guise on 13 May to check the effect of the tail turret on stability. *Golden Fleece* followed on 8 July, fully converted. The tail turret produced significant turbulence, and a fairing was introduced, which smoothly faired the turret into the root of the tailfin. The rudder's base had to be cropped to accommodate this.

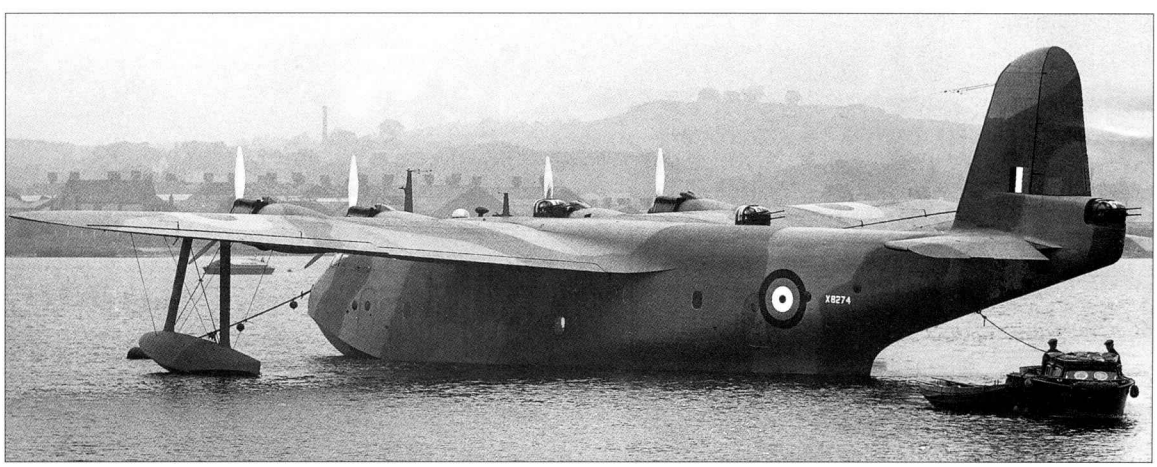
In August 1940 X8273 and X8274 were then delivered to Blackburn at Dumbarton, where they were fitted with further equipment, and with a prominent 'stickleback' antenna array above the rear fuselage. The unconverted *Golden Hind* underwent evaluation by the MAEE at Helensburgh during July 1940, before joining the other aircraft at Dumbarton on 17 September, becoming X8275. Blackburn undertook the full conversion of this third S.26M, including the installation of gun turrets and armour.

X8274 was the first to be converted, emerging from the Dumbarton works on 19 November, followed by X8273 on 13 December and X8275 on 22 February 1941. The first two aircraft then went to Stranraer for the fitting of ASV radar, joining 'G' Flight at Bowmore on Loch Indaal, Islay, on Christmas Eve 1940 and 5 February 1941, respectively. By the time X8275 arrived on 10 April (after ASV and armament trials at Helensburgh), the unit had become No. 119 Squadron.

The three aircraft subsequently joined No.10 Squadron, RAAF, at Mount Batten, being used mainly for special transport flights to Gibraltar, Malta and Egypt. One aircraft was lost in June, and the other two were withdrawn for repairs, re-entering service at Bowmore in September. The aircraft were returned to BOAC following the disbandment of No. 119 Squadron on 6 December 1941.

Serial	C/n	Notes
X8273	S.873	ex-G-AFCK *Golden Horn*, returned to BOAC
X8274	S.872	ex-G-AFCJ *Golden Fleece*, lost 20 June 1941
X8275	S.871	ex-G-AFCI *Golden Hind*, returned to BOAC

If events had gone differently, the S.26Ms would have been just another of Imperial Airways' flying-boat transports, plying the routes of empire. Instead all three served in the anti-submarine role with the RAF and transport role with the RAAF. X8274 sits on its moorings in August 1940, prior to being fitted with ASV radar.



Short S.30M 'Empire'

Two S.30s were impressed by the RAF in October 1939. These were allocated to the Special Duty Flight at Invergordon, for trials with ASV radar, and were hurriedly fitted out for their new role, gaining a prominent 'stickleback' antenna array and a rudimentary defensive armament of seven free-mounted Vickers K guns. Extra 'machine-guns' in the tailcone of each aircraft were actually dummies fabricated from broomsticks.

During five months and 400 flying hours of patrols, V3138 detected one enemy ship with its radar, but in April 1940 both aircraft were hurriedly stripped of their radar and were pressed into service to support the Allied operations in Norway as special transports. On 5 May 1940 the two aircraft were attacked at their moorings at Bodø by four Heinkel He 115s. V3138 was burned out, but V3137 was able to taxi out of the harbour before being holed and run aground by the captain on soft mud. The aircraft was then patched up and towed to shelter, where it was finally destroyed by incendiary bombs on 6 May 1940. The loss of the Short S.30Ms was made up for by impressing a pair of Short S.23s as S.23Ms in July 1940.

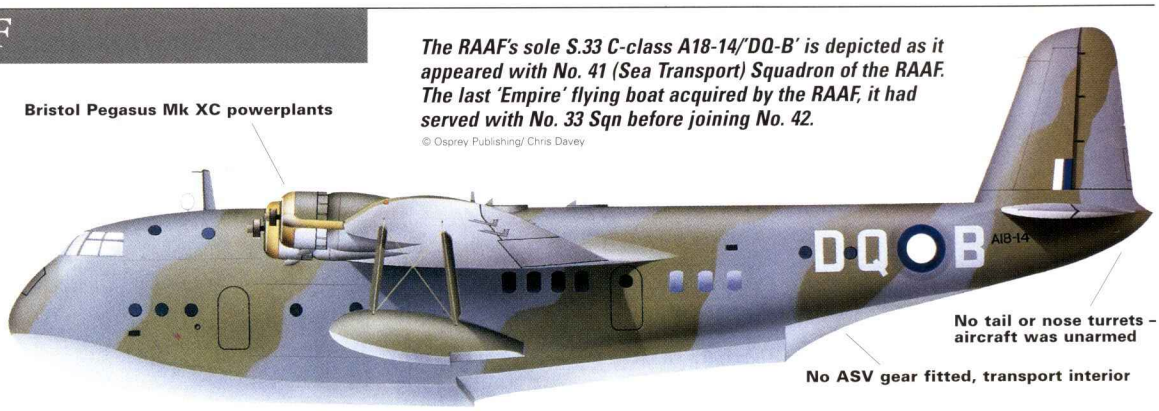
Serial	C/n	Notes
V3137	S.880	ex-G-AFCU *Cabot*
V3138	S.881	ex-G-AFCV *Caribou*

Short 'Empire' RAAF

Four S.23s and and a single S.33 'Empire' flying boats were impressed by the RAAF and given provision for the carriage of up to four 500-lb (227-kg) bombs or depth charges, though these were seldom carried. At least two of the aircraft subsequently received camouflage colour schemes. The five aircraft served with Nos 11, 13, 20, 33 and 41 Squadrons. A18-12 and A18-10 were written off after landing accidents in July and August 1942, while A18-11 was destroyed during a Japanese air raid on Broome in March 1942. The surviving pair was returned to Qantas in mid-1943.

The 'missing' A18-1 to A18-9 serial numbers were originally to have been allocated to the nine Sunderlands bought for No.10 Squadron, though these aircraft were retained in the UK, and retained their RAF serial numbers.

The RAAF's sole S.33 C-class A18-14/'DQ-B' is depicted as it appeared with No. 41 (Sea Transport) Squadron of the RAAF. The last 'Empire' flying boat acquired by the RAAF, it had served with No. 33 Sqn before joining No. 42.



Serial	C/n	Notes
A18-10	S.811	ex-G-ADUT *Centaurus* to RAAF 25.9.39
A18-11	S.843	ex-G-AEUA *Calypso* to RAAF 25.9.39
A18-12	S.878	ex-G-AFBL, VH-ABF to RAAF 29.6.40
A18-13	S.877	ex-G-AFBK, VH-ABB to RAAF 29.6.40 to Qantas 13.7.43
A18-14*	S.1025	ex-G-AFPZ *Clifton* to RAAF 9.3.42 to Qantas 15.6.43

**S.33 C-Class 'Empire', all other four RAAF aircraft were S.23 C-class 'Empires'*

Short S.25 Sunderland prototype

While Imperial Airways ordered 14 'Empire' Boats 'off the drawing board' (even increasing this order to 28 before an aircraft had flown) the RAF pursued a more cautious approach, requiring a competitive evaluation of two prototypes – one the S.25, the other the anachronistic-looking, parasol wing Saunders Roe A.33.

The S.25 was far more than a military version of the basic S.23 type design – not least because the RAF itself required a more modern and sophisticated aircraft, and required superior corrosion protection and much better maintainability and interchangeability of components between aircraft. It made extensive use of extrusions (not available in time for the civil 'Empire' Boats), and was built to much tighter limits. The company also placed more emphasis on reducing drag in the air than on reducing drag or improving handling in the water, and the rear step was therefore tapered to a vertical knife edge. Compared to the 'Empire' Boat, the S.25 had a more aft-set flight deck, leaving room in the nose for the retractable bow turret, and used flat Triplex glass panels in the canopy, rather than the 'Empire' Boat's curved perspex windscreen. The S.25 also had a larger tailfin. Despite its greater weight, the S.25 had slightly smaller overall dimensions than the S.23, with a shorter wingspan and length. To simplify manufacture at Rochester, jigs for the Sunderland were painted yellow, while Empire jigs were red, and stores requisitions were colour-coded.

Nor was the S.25 prototype 'rushed into the air', with the customer examining variations of the Short proposal which featured minor changes in armament. These armament options included one design with four (open) gunner's cockpits, each with a single 0.303-in machine-gun, with a fixed 37-mm COW gun in the nose (or with two downward-firing COW guns amidships).

Finally, the Air Ministry opted for a more modern arrangement, with a power-operated FN.11 turret in the nose, containing a single 0.303-in machine-gun, and with provision for single Vickers K guns to be fired from cut-outs high on the upper fuselage sides. Finally, a four-gun FN.13 turret was selected for the tail position. Plans to fit the 37-mm COW gun as an anti-ship or anti-submarine weapon were quietly dropped, and the aircraft's offensive armament was limited to four 500-lb (227-kg) or eight 250-lb (113-kg) bombs or depth charges. These were hung on carriers suspended from rollers mounted in box beams which extended outwards from the centreline and through the inner section of the mainplane. A worm and rack mechanism (with hand-operated winches) was used to hoist the bombs out through hatches in the fuselage sides under the wings.

The final armament scheme was selected late in the design process, with the FN.13 tail turret imposing such a rearward shift in the centre of gravity that the wing had to be swept back and the main step had to be moved aft on production Sunderlands, though it was too late to change on the prototype, which emerged with a straight wing and a forward step.

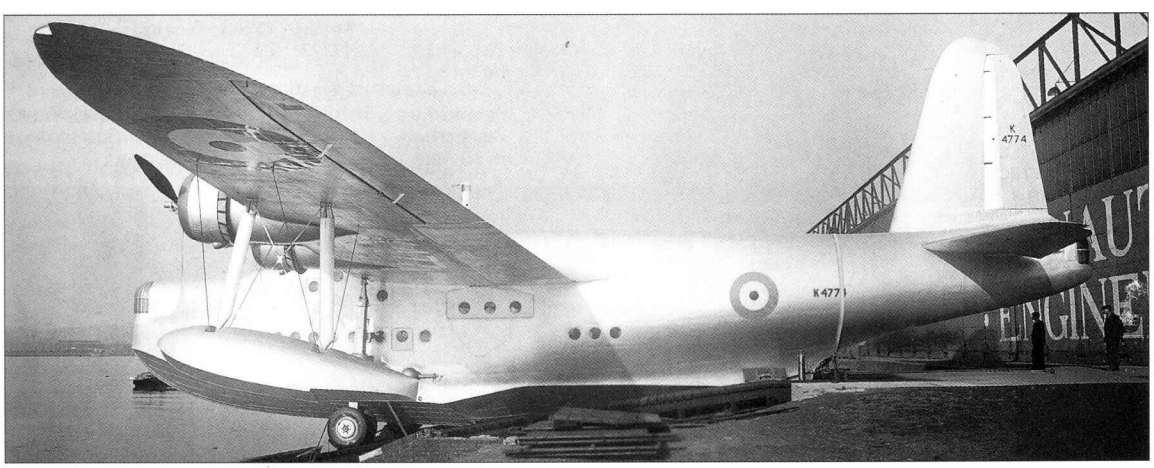
The prototype emerged from the No. 3 shop at Rochester on 14 October, and flew for the first time on 16 October. The aircraft was powered by 950-hp (709-kW) Bristol Pegasus X engines, rather than the planned 1,010-hp (753-kW) Pegasus XXIIs.

After a short series of four test flights, which were pronounced "wholly satisfactory" (apart from the "expected tail heaviness") by test pilot John Lankester Parker, the aircraft went back into the workshops to receive the necessary wing sweep and hull modifications, re-emerging to fly again in its new guise on 7 March 1938.

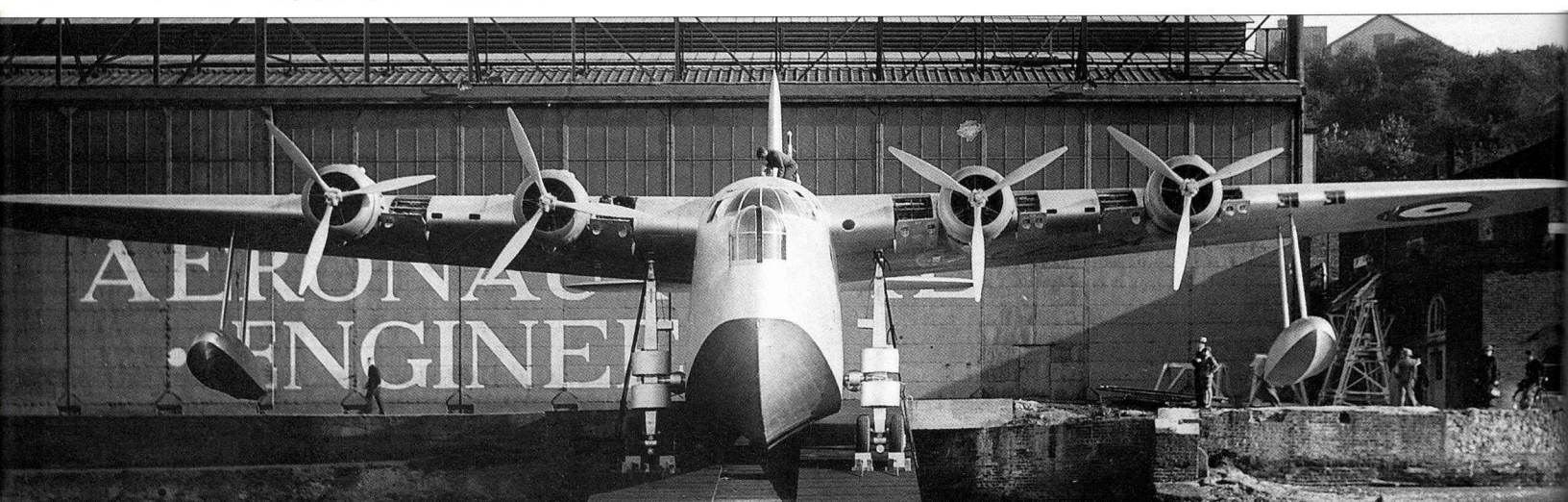
By then, the prototype was virtually equivalent to the production Mk I.

Serial	C/n	Notes
K4774	S.803	built at Rochester

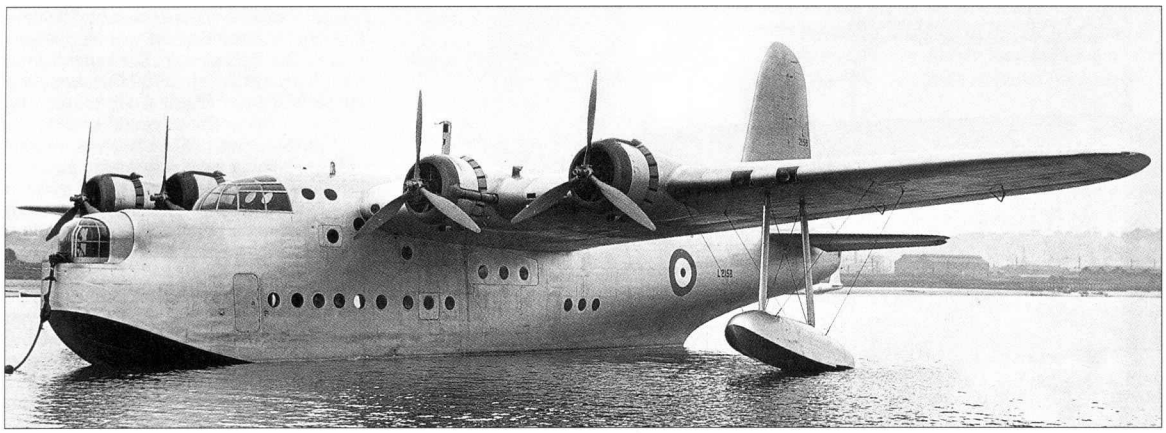
Sitting on the slipway at Rochester in October 1938, K4774 displays the unswept wing and original hull step.



Viewed from the front the prototype Sunderland's similarity to the later Short Imperial Airways flying boats is unmistakeable.

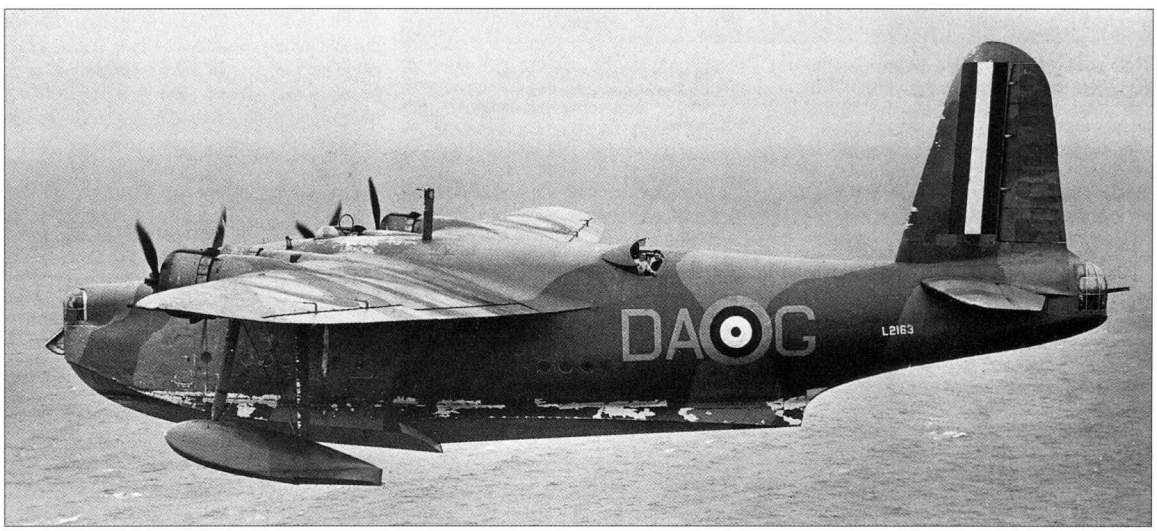


Short S.25 Sunderland Mk I



The first production Sunderland Mk I, seen here moored at Rochester in 1938 prior to being handed over to the RAF, differed from the prototype in having a swept leading edge on the wing and a redesigned lower-fuselage hydroplaning step. A second example (probably the prototype) is visible in the distance under the tail of L2158.

During the production run of the Mk I gunner's positions were introduced each side of the upper rear fuselage. The position had its own wind shield that closed flush with the fuselage when not in use. While giving some protection to the upper side of the Sunderland, the aircraft was still lightly defended below.



The Short S.25 was not the outright winner of the evaluation of the two competing prototypes, with Saunders Roe receiving an order for 11 developed examples of the A.33 for further evaluation, even before either prototype had flown. This order paralleled the first order for production Sunderlands, and the serial block L2147-2157 was reserved. In fact, Saunders Roe withdrew from the competition following a wing failure on its prototype and various other problems, including a tendency to porpoise on the water. The first of the production Sunderlands flew for the first time on 21 April 1938, only days after the prototype had re-flown in its new configuration. The second production aircraft (L2159) was quickly delivered to the MAEE at Felixstowe to share the official trials and evaluation with the prototype.

Crews from No. 210 Squadron at Pembroke Dock ferried the first production Sunderlands to Singapore from 9 June, re-equipping No. 230 Squadron and flying back their ageing Singapore Mk IIIs. The first aircraft arrived at Seletar on 22 June, and the squadron had received its full complement of eight aircraft (three of which had been paid for by the Sultans of the Federated Malay States) by the end of September. Two of the remaining three Sunderland Mk Is were issued to No. 210 Squadron.

With the cancellation of the Saro A.33, the planned production batch was replaced by an order for 10 further Sunderlands (L5798-5807), and further orders soon followed.

By the outbreak of war, Nos 204, 210 and 228 Squadrons had converted to Sunderlands, No. 228's aircraft being the first to introduce gunner's positions in the beams, with single Vickers K guns swinging out through hatches which could be protected using metal wind shields.

The next unit to re-equip was the RAAF's No. 10 Squadron. Australia had ordered Sunderlands before the war, and had dispatched No. 10 Squadron's crews to train in the UK and then ferry back its first nine aircraft (P9600-9606, P9620-9621, allocated Australian serials A18-1 to A18-9). In the event, Australia decided to leave No.10 Squadron in the UK, as part of its contribution to the war effort.

One Sunderland Mk I, P9623 of No. 95 Squadron, was interned by the Portuguese after force landing in Portuguese waters. The aircraft was repaired, re-floated and put back into service with the Portuguese Air Force.

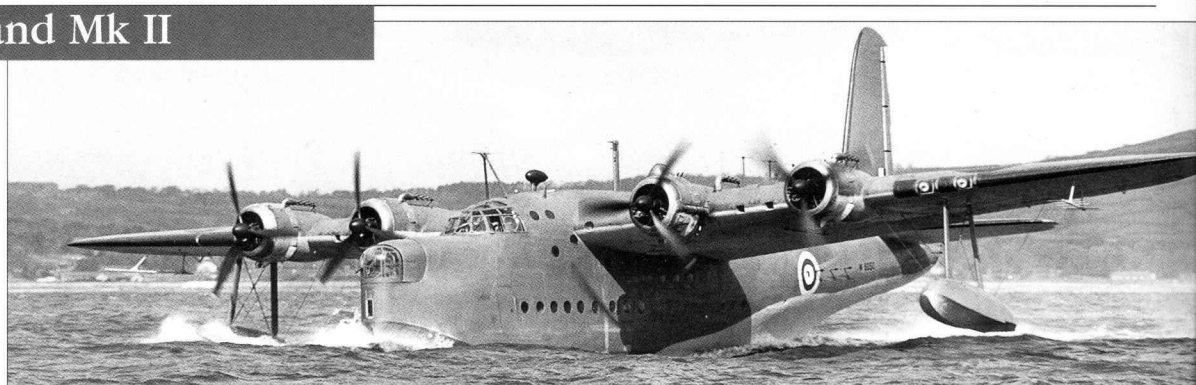
Serial	C/n	Built at
L2158-2168	S.860-870	Rochester
L5798-5807	S.887-896	Rochester
N6133	S.897	Rochester
N6135	S.898	Rochester
N6138	S.899	Rochester
N9020-9030	S.1004-1014	Rochester
N9044-9050	S.1015-1021	Rochester
P9600-9606	S.1028-1034	Rochester
P9620-9624	S.1035-1039	Rochester
T9040-9050	S.1140-1150	Rochester
T9070-9078	S.1151-1159	Rochester
T9083-9090	none	Dumbarton
T9109-9115	none	Dumbarton

Sunderland I L5802 'SE-F' in June 1941 when it was serving with No. 95 Squadron from Freetown, Sierra Leone. Prior to joining No. 95 Sqn, L5802 had served with Nos 210, 204 and 201 Squadrons, and it later went on to fly with No. 461 Squadron and No. 4 (Coastal) OTU. It was destroyed on the evening of 16 January 1943 attempting to land at Alness in the dark.

Short S.25 Sunderland Mk II

The addition of 1,065-hp (794-kW) Pegasus XVIII engines with two-stage superchargers in place of the original Pegasus XXIIs resulted in the

The antennas for the Yagi direction-finding system are located above the cockpit and below the wings outside of the floats, seen here on the first Belfast-built Sunderland Mk II.



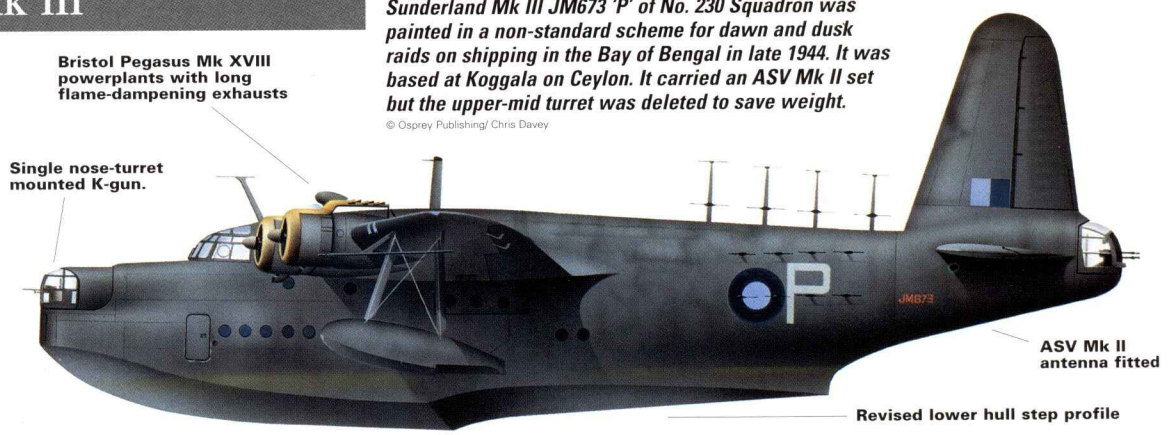
Sunderland Mk II W6055 'ZM-R' was flown by No. 201 Squadron in September 1942 from Castle Archdale. Fitted with the full suite of ASV equipment, it lacked the mid-upper gun turret, retaining the Mk I's faired gun positions on the fuselage flanks. W6055 survived World War II only to be scuttled on 11 December 1946 at Loch Ryan.

Sunderland Mk II. The new variant also replaced the open dorsal gun mountings with a two-gun FN.7 turret (as used on the Blackburn Botha), while the original FN.13 tail turret (with 500 rounds per gun) was replaced by a Manchester-type FN.4A, which had double the ammunition capacity. Blackburn-built Mk I T9083 served as the prototype, though most production was by Shorts at Rochester and Belfast.

The first Belfast-built Sunderland Mk II featured 1.7-m (176-MHz) Long Range ASV (ASV Mk II) radar, which had a range of about 36 miles (58 km). Aircraft fitted with ASV Mk II were fitted with four dipole receiving masts above the rear fuselage, and with eight transmitting loop antennas on each side of the fuselage, as well as Yagi homing antennas under each wing and above the forward fuselage. Most Mk IIs were similarly equipped.

Serials	C/n	Built at
W3976-3998	S.1160-1182	Rochester
W6000-6004	none	Dumbarton
W6050-6064	SH.51-65	Belfast

Short Sunderland Mk III



Sunderland Mk III JM673 'P' of No. 230 Squadron was painted in a non-standard scheme for dawn and dusk raids on shipping in the Bay of Bengal in late 1944. It was based at Koggala on Ceylon. It carried an ASV Mk II set but the upper-mid turret was deleted to save weight.

Trials by the MAEE at Helensburgh, using the Sunderland prototype (K4774) and a converted Scion Senior (L9786), resulted in the design of a new, 'faired' main step (without the abrupt, right-angled 'break') which significantly reduced drag. The fairing chosen had a 6:1 ratio, which saved 10 percent of the total air drag, without (it was believed at the time) appreciably affecting hydrodynamic performance. In fact, the Sunderlands fitted with the faired main step were much 'dirtier' in the water than the 'Empire' boats and the original Sunderlands, and at high weights suffered from 'skipping' or 'bounce-porpoising'.

Installation of the new faired step resulted in the Sunderland Mk III, which was otherwise identical to the Mk II, at least in its original form. The Sunderland Mk III received a number of modifications in service, however, many of which resulted in no change of designation.

The addition of ASV Mk II radar and Torpex-filled depth charges had led to a dramatic increase in U-boat contacts and sinkings during the summer of 1942, but was immediately countered by increased enemy fighter cover of the Bay of Biscay, and by the addition of Metox radar warning gear to the U-boats.

In response, Coastal Command deployed a new centimetric radar, ASV Mk III, developed from Bomber Command's H_2S bombing radar. This used the same antenna array as ASV Mk II, and resulted in no designation change to aircraft equipped with the new radar. It was deployed from March 1943.

Despite the addition of the beam guns on late Mk Is and the Botha-type FN.7 mid-upper turret on the Mk II, the Sunderland remained ill-equipped to defend against attacks from below or ahead, and had no means of suppressing defensive fire from surfaced U-boats (many of which were well-armed with 20-mm and 37-mm cannon on the foredeck and conning tower) apart from a single 0.303-in machine-gun in the front turret.

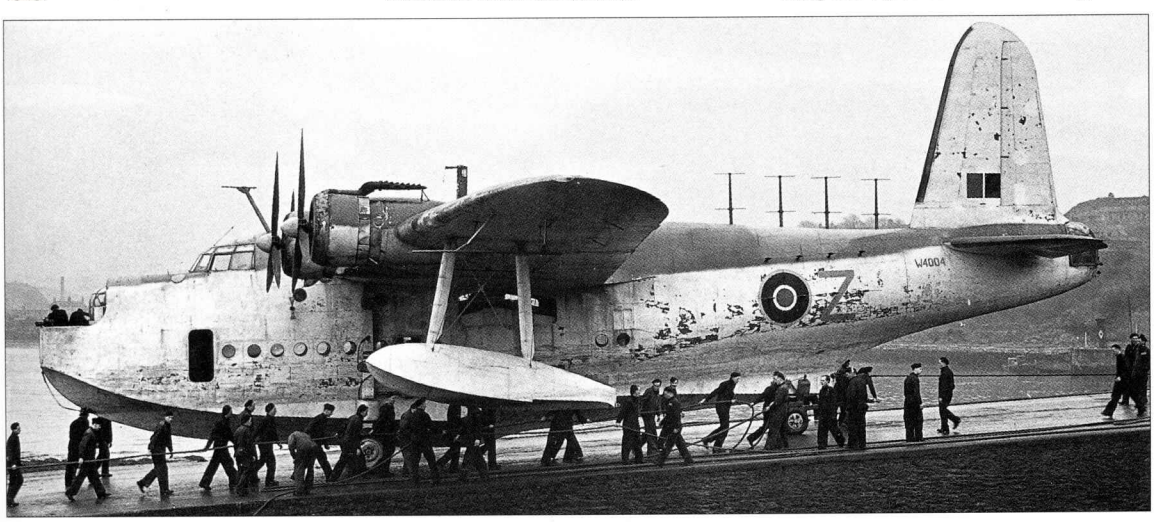
The original single K-gun in the nose turret was soon replaced by twin belt-fed Brownings, while Vickers K-guns fitted in the galley hatches provided a counter to beam attacks from below. No. 10 Squadron (RAAF) modified its aircraft with the new gun positions at the initiative of its CO, Wing Commander Hartnell, before the modification was officially approved by Coastal Command and subsequently extended to all Sunderlands.

To further increase the weight of forward fire available to the Sunderland, Wing Commander Hartnell, and Group Captain Alexander, the CO of RAF Mount Batten, undertook trials with additional fixed nose guns. After trials of a single gun and twin guns, the station made a trial installation with four extra 0.303-in machine-guns in the nose, and this was demonstrated to Coastal Command's senior technical officers. Late in 1943 it was approved as a production modification for all future Sunderlands. This left the Sunderland with no fewer than 14 0.303-in machine-guns.

This was impressive, but the 0.303-in Browning lacked reach, and was not an adequate defence against cannon-armed enemy fighters. The addition of two 0.50-in machine-guns in the beam, aft of the mid-upper turret helped, though the skilled enemy pilot could still hang back, just outside machine-gun range and progressively tear the Sunderland to pieces with 20-mm cannon shells. The 'Flying Porcupine' legend was thus little more than morale-boosting propaganda.

Serials	C/n	Built at:
W3999-4004	S.1183-1188	Rochester
W4017-4037	S.1189-1209	Rochester
W6005-6016	none	Dumbarton
W6026-6033	none	Dumbarton
W6065-6068	SH.66-69	Belfast
W6075-6080	SH.69-75	Belfast
DD828-867	none	Dumbarton
DV956-980	none	Rochester
DV985-989	SH.76-80	Belfast
DV990-994	from SH.605*	Belfast
DP176-200	none	Windermere
DW104-113	from SH.663*	Belfast
EJ131-145	none	Rochester
EJ149-158	none	Windermere
EJ163-172**	from SH.762*	Belfast
EK572-596	none	Dumbarton
JM659-689	none	Rochester
JM704-722	none	Rochester
ML725-774	none	Rochester
ML777-795	none	Rochester
ML835-884	none	Dumbarton
NJ170-194	none	Dumbarton
PP103-132	none	Rochester
PP135-144	none	Dumbarton

** Many batches of Belfast-built Sunderlands had sequential serial numbers, but had major gaps between construction numbers, because these were allocated when aircraft were ready for final inspection, so that Sunderland and Stirling c/ns became intermingled.*
*** EJ166 was burnt out during construction*



Many different Mk III configurations existed over the years of service, with different armament and either none, Mk II or III ASV. This weather-beaten example (No. 10 Sqn, RAAF) retains the mid-upper turret and an ASV set.

Short Sunderland Mk IIIA

Telefunken developed the Naxos radar warning sensor to counter the centimetric H2S radar and its ASV Mk III derivative, and this had a detection range of about 8 km (5 miles) – just about long enough for a quick-witted U-boat commander to crash-dive and avoid trouble, although it originally had no way of detecting whether the enemy radar was approaching, nor from which direction, and thus could not be used to determine whether it represented a serious threat.

The British therefore developed a new 9-cm wavelength ASV radar, which would be hard to detect using existing equipment, and which offered improvements in detection range and discrimination. ASV Mk VI also featured an attenuator (code-named Vixen), allowing signal strength to be reduced to 'fool' a German submarine into thinking that the aircraft carrying the radar was not getting nearer, and even that it might be flying away.

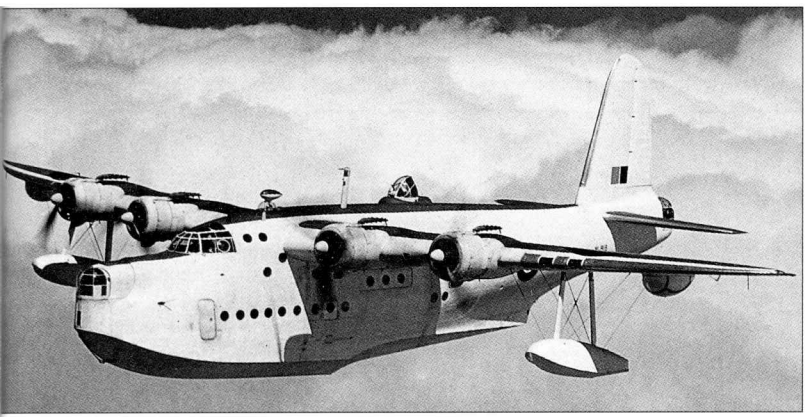
The new radar had simple split scanners housed in underwing radomes, and thus did not require the drag-inducing Yagi antennas, dipoles and transmitter loops associated with the earlier ASV radar sets.

Though primarily associated with the Sunderland Mk V, ASV Mk VI was also fitted to the final batch of Belfast-built Mk IIIs, which thus became known as Mk IIIAs. Most of these aircraft were subsequently re-engined, thereby becoming full Mk Vs.

Serials	C/n	Built at:
ML807-831	from SH.882*	Belfast
NJ253-257	from SH.1159*	Belfast

Plus conversions from Mk III
** construction numbers mixed with those of Stirlings.*

Sunderland Mk IIIA ML814 served with No. 330 (Norwegian) Squadron as 'WH-A' during April 1945 from the unit's base at Sullom Voe in the Shetlands. During November 1945 the squadron returned to Norwegian control, but ML814 returned to the UK and then to the RNZAF. It survives today with Kermit Weeks's collection at Polk City, Florida. © Osprey Publishing/ Chris Davey



Mk IIIA ML818 flies above the clouds. The IIIA was a stepping stone from the Mk III to the V, made possible by the emergence of the ASV Mk VI in late-1943. The scanners or this system were fitted in the inverted dome structures underneath the outboard wings, greatly reducing the drag from the multitude of aerials required by the previous systems.

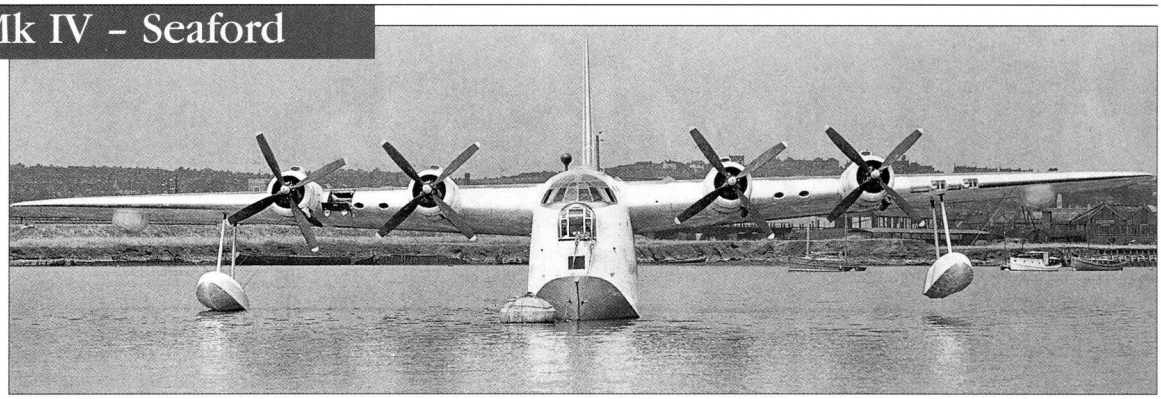
Short Sunderland Mk IV – Seaford

The poor performance of the Pegasus-powered Sunderland soon led to calls for a faster version, powered by the Hercules engine used by the Stirling bomber. It was recognised that this would require a heavier, strengthened airframe structure, and a redesigned planing bottom, but a new specification (R.8/42) was drawn up, and Short at Rochester received orders for two prototypes (MZ269 and MZ271) and an initial batch of 30 production aircraft (NJ200-229), all to be powered by 1,700-hp (1268-kW) Hercules Mk XIX engines driving 12-ft 9-in (3.9-m) four-bladed de Havilland fully feathering airscrews.

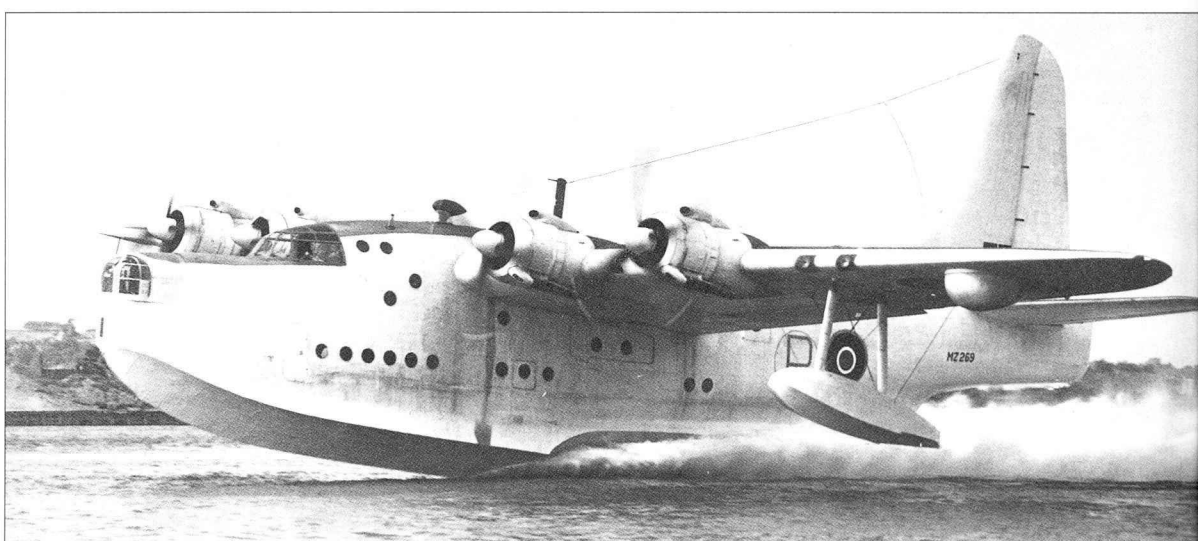
Every effort was made to avoid unnecessary changes, and to maximise the use of existing tooling. This was achieved with the wing, which was unchanged except for the use of heavier gauge materials, though the hull required major changes.

To compensate for the wider planing bottom (achieved by adding flared chines) required by the heavyweight Sunderland Mk IV, the length of the forebody was increased by 3 ft (91 cm), and the afterbody was increased by 5 ft 6 in (1.68 m). At the same time, the main step was deepened by three in (7.62 cm), and the angle between the fore and aft keels was steepened, though the main step fairing retained the same 6:1 ratio as that of the original Sunderland Mk III. The overall hull length was only increased by 39 in (99.06 cm), however, with 36 in (91.44 cm) of this being accounted for by a new bay added forward of the wing root. This allowed a high degree of commonality between the Sunderland Mk III and Sunderland Mk IV above the planing bottom.

Empty weight was increased by 8,000 lb (3628 kg), but MTOW was increased by 19,000 lb (8618 kg), more than compensating for the Sunderland IV's heavier defensive armament. The aircraft had a Brockhouse-built FN.83 nose turret, a Bristol B.17 mid-upper turret and a Glenn Martin tail turret, each electrically powered and each fitted with twin 0.50-in Brownings, while 0.50-in Brownings were also fitted in the beam positions, with two forward-firing 0.303-in Brownings in the nose above the chines. The aircraft was fitted with a dihedral tail (about 5°) to increase spray clearance.

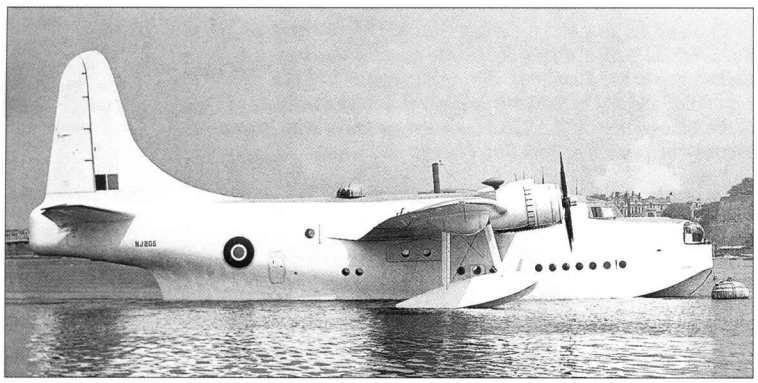


Above: The Sunderland Mk IV featured a major redesign of the airframe (longer, deeper fuselage and a new tail) and new powerplants in the shape of the Hercules Mk XIX. NJ205 (along with six others) was converted to Solent 3 configuration, serving as G-AKNS* City of Liverpool *with BOAC before being sold to the Ministry of Aviation as WM759.



The first prototype Seaford rides the step before lift-off. Large spinners were fitted to the prototypes, being replaced by smaller examples on the production aircraft.

Short Sunderland GR.Mk V



The majority of Seafords built were completed with a faired-over rear turret. NJ205 has smaller spinners than those of the first prototype and retains the mid-upper turret. The later item was one of those removed from NJ201 for its evaluation by Transport Command in a near Solent 1 state of modification.

The Mk IV was primarily intended for service in the Far East, where the shortcomings of the Pegasus-engined aircraft seemed most stark, but as a result, the programme was not treated with the same urgency as the Mk V, which was viewed as an immediate and urgent replacement for the Mk III in Europe, to be rushed into service before the war in Europe ended.

The Mk IV prototype's hull was finished by the end of 1943, and the aircraft was completed in May 1944, but it then did not fly until 30 August 1944. The aircraft was soon found to need greater fin and rudder area for assymetric (engine-out) flying, and a 33-in (83.82 cm) taller fin was fitted, together with a 20 percent bigger tailplane and a dorsal fin fillet to prevent rudder locking.

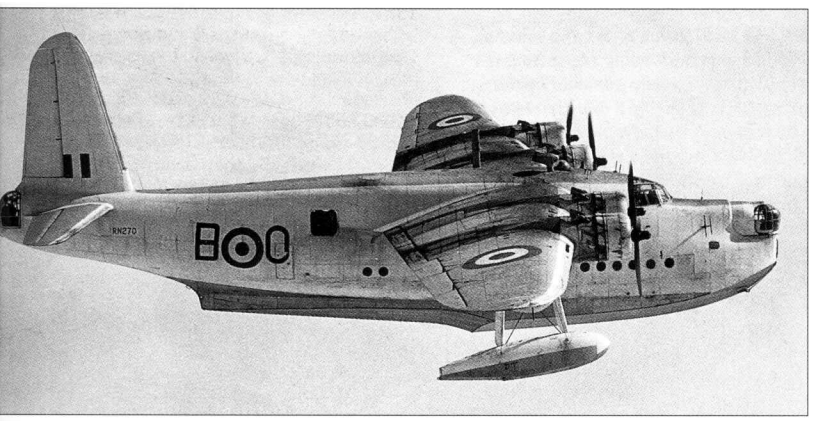
Production was stopped after only eight aircraft, and even these lacked their planned Martin tail turrets and Bristol mid-upper turrets. With only eight production aircraft available, there were clearly too few Seafords to be useful, and the advantages of the type over the earlier Sunderland were not sufficient to warrant putting it into full-scale production – not least when there was a pool of more than 100 Sunderland Mk Vs available to meet the RAF's post-war requirements.

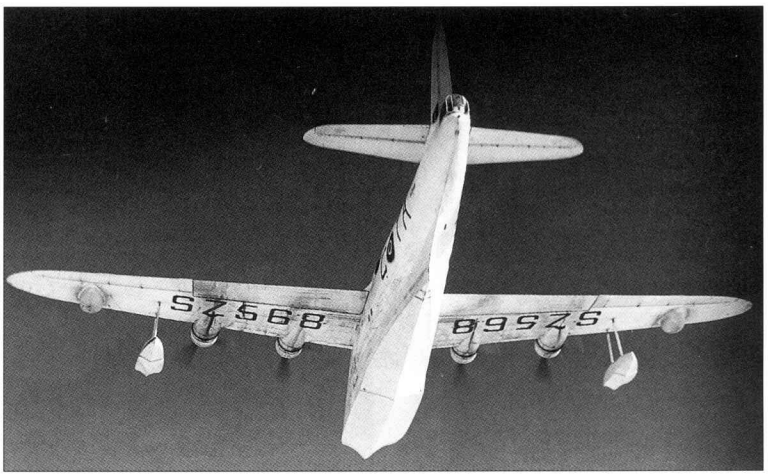
The aircraft underwent operational trials with No. 201 Squadron, and proved impressive, though they were prone to 'skipping' when alighting at high incidence, and the performance advantage offered was not enough to justify production.

NJ201 was delivered as an unarmed transport/trainer for evaluation by Transport Command, and was briefly loaned to BOAC as G-AGWU from December 1945 until February 1946. Later, the aircraft had its nose and tail turrets removed, and was fitted with fully streamlined nose and tail fairings and the later V-braced floats. NJ200 was retained at Felixstowe for trials, along with NJ201.

Later still, NJ201 was sold to Aquila Airways, and converted to full Solent 3 standards. NJ202-207 were modified to Solent 3 standards, and were leased to BOAC.

Serials	C/n	Built at:
MZ269	none	Rochester
MZ271	none	Rochester
NJ200-207	S.1292-1299	Rochester





Above left: The main difference introduced by the Mk V was the replacement of the Pegasus engines of the older versions with Twin Wasps, giving the Sunderland more power. While older variants had used a variety of different exhaust pipe designs, the Mk V standardised on the 'cow horn' type. The airframe itself was virtually identical to the Mk IIIA, retaining the underwing blister for the ASV Mk VI (above). Early Mk Vs retained the mid-upper turret, but post-war aircraft usually discarded it.

While it took nearly three years to develop the Sunderland Mk IV, the original planned replacement for the Mk III and earlier versions, the actual replacement was developed in about six months. This was the Sunderland Mk V, which unusually emerged (at least partly) from a service modification.

With the weight of increased armament, armour and radar, the Sunderland Mk III was distinctly under-powered and, even at full boost, the Pegasus engine was inadequate to give the Sunderland any more than a modest performance. Consequently, the type was routinely operated at very high power settings with a consequent effect on engine reliability and life.

Short was initially reluctant to fit more powerful engines, worried that the existing main wing spars might not be strong enough to permit such a modification, and concerned that the development of another all-new version might severely disrupt deliveries. Despite this, the company did work on the design of alternative engine installations, and when Group Captain Jim Alexander, the station commander of RAF Mount Batten, asked for permission to re-engine one of his aircraft with Pratt & Whitney Twin Wasp engines (already in widespread use within Coastal Command on Catalinas and Liberators), he was surprised to find that Short had already calculated that the spars would permit this, and was even more astonished to be told to go ahead.

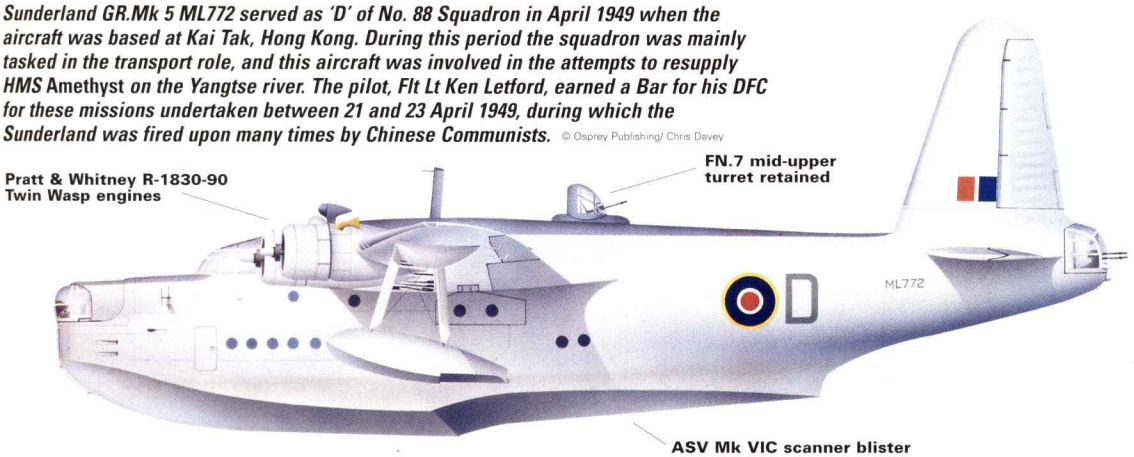
Thus, while Short re-engined the unfinished ML765 on the production line with 1,200-hp (895-kW) Pratt and Whitney R-1830-90 Twin Wasp engines at its factory, RAF Mount Batten did the same to one of the operational Sunderlands of No. 10 Squadron, RAAF, using a quartet of engines supplied by the Ministry of Aircraft Production, and instruments and fittings scrounged from crashed and damaged Liberators at RAF St Eval. The Mount Batten aircraft, ML839, began test flying on 4 May 1944, two months after the prototype.

The squadron's pilots were not happy with the cropped propellors supplied by the Ministry of Aircraft Production, and obtained new airscrews from a pair of Catalinas. With these in place, the aircraft completed a 100-hour test programme and then returned to operations, still with its new engines.

The results were impressive, although even with its new engines the Sunderland remained something of a heavyweight, and with reduced enemy fighter opposition in many sea areas (with the loss of airfields in France) many aircraft had their Botha-type mid-upper gun turret removed and faired over. Otherwise, the GR.Mk V was essentially a re-engined GR.Mk IIIA, with the same ASV Mk VIC radar and underwing radomes.

Nevertheless, the improvement in performance offered by the Sunderland Mk V was obvious, and all existing contracts for Mk IIIs were quickly switched to cover the new version, and 154 were built before production ended. More were produced through the conversion of existing Sunderland Mk IIIs. The type re-equipped Nos 228 and 461 Squadrons, entering service at the end of 1944, although No. 10 Squadron, whose pioneering work had done so much to produce the new

Sunderland GR.Mk 5 ML772 served as 'D' of No. 88 Squadron in April 1949 when the aircraft was based at Kai Tak, Hong Kong. During this period the squadron was mainly tasked in the transport role, and this aircraft was involved in the attempts to resupply HMS* Amethyst *on the Yangtse river. The pilot, Flt Lt Ken Letford, earned a Bar for his DFC for these missions undertaken between 21 and 23 April 1949, during which the Sunderland was fired upon many times by Chinese Communists.



Longest serving of all Sunderland variants was the Mk V, which changed little externally during its service career.

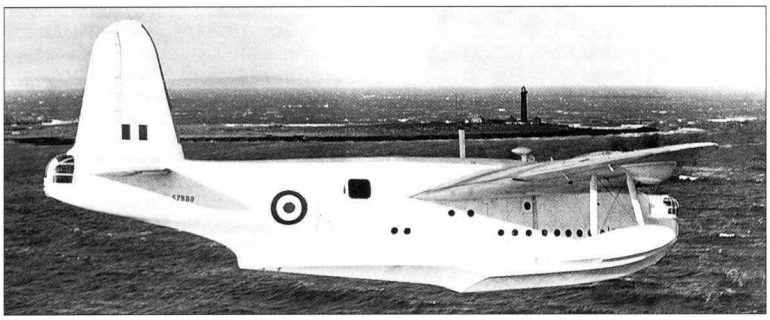
Serials	C/n	Built at:
ML765 (con)	none	Rochester
ML796-801	none	Rochester
ML839 (con)	none	Mount Batten
NJ258-277	from SH.1212*	Belfast
PP145-164	none	Dumbarton
RN264-273	none	Rochester
RN277-306	none	Dumbarton
SZ559-584	from SH.1462*	Belfast
SZ598-599	from SH.1462*	Belfast
TX293	none	Rochester
VB880-889	none	Dumbarton

Plus about 33 conversions from Mk III and Mk IIIA. All Dumbarton aircraft were built by Blackburn.

** Many batches of Belfast built Sunderlands had sequential serial numbers, but had major gaps between construction numbers, because these were allocated when aircraft were ready for final inspection, so that Sunderland and Stirling c/ns became intermingled.*

version, had to wait until June 1945 for its first 'official' Mk Vs. Post-war, the Sunderland GR.Mk V (later GR.Mk 5) became the standard version, and the earlier Pegasus-powered aircraft were quickly declared obsolete.

Short Sunderland Mk V testbeds



A number of Sunderland Mk Vs were converted for test and trials duties during the 1940s and early 1950s. These included PP162 and TX293, both equipped with transducers for measuring impact loads on the planing bottom and used for trials by the MAEE at Felixstowe. Others were used to test the Swift Synchromo powered controls developed for the Shetland, and for the Boulton Paul powered controls developed for the Saunders Roe Princess.

Between November 1950 and May 1951 Short flew PP151 fitted with the fin and rudder from the Short Sperrin, to test that aircraft's proposed servo tab system. The last Sunderland to fly, Belfast-built SZ599, was given a fully-faired main step, with a naturally ventilated afterbody, and this was used for trials which showed that very low-drag, near-stepless hulls were practicable.

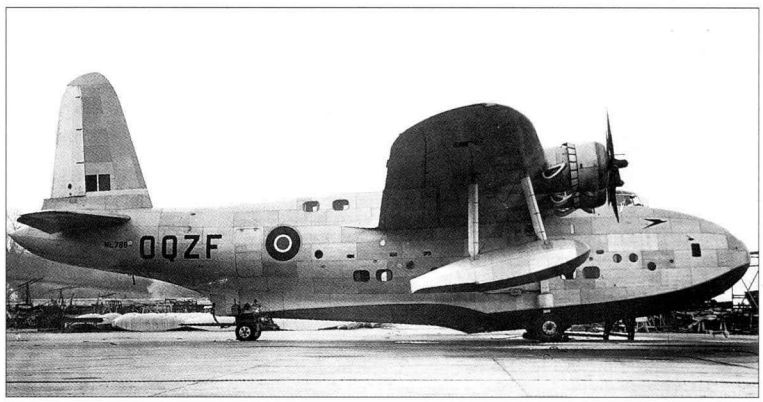
The last Sunderland Mk V produced by Short at Belfast, SZ599, was used to test a low-drag main step (although this was not fitted at the point this photograph was taken). Like many of the late-build Mk Vs it lacks the mid-upper turret and has no guns in the front and rear gun turrets.

Short Sandringham 1

A single BOAC Sunderland III (G-AGKX, but still wearing military markings as ML788/'OQZF') was returned to Short Brothers at Rochester, where it was fitted with a new streamlined nose and tail fairings, giving it the same basic profile as the C-Class flying boat. The aircraft accommodated 24 day or 16 sleeper passengers on the lower deck with a dining salon and a cocktail bar on the upper deck. The aircraft was re-launched on 28 November 1945, received its Certificate of Airworthiness in January 1946, and was returned to BOAC in June 1946 after trials with RAF Transport Command. In BOAC service, the aircraft was named *Himalaya*. After service with BOAC, the Sandringham 1 was used by Aquila.

Serials	BOAC name	Fate
ML788/G-AGKX	*Himalaya*	to Aquila

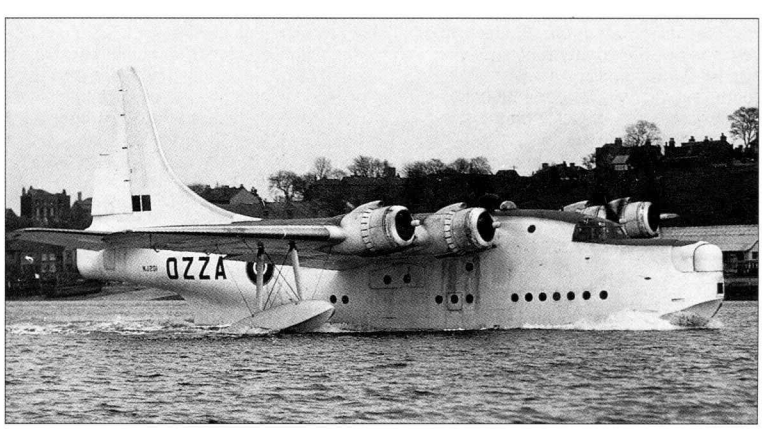
As the Lancaster had spawned the Lancastrian, so the Sunderland produced the Sandringham. On the hardstandings at Rochester prior to being handed over to Transport Command for evaluation, the Sandingham 1 featured faired-over nose and rear turrets, and larger windows for the redesigned passenger-carrying interior. The BOAC 'Speedbird' logo is visible on the nose of the aircraft.



Short Solent 1

The Seaford was felt to be a better basis for civil development than the Sunderland/Sandringham, and Short Brothers therefore drew up a design for a Seaford-based airliner, known as the S.45A Solent 1. This aircraft was squarely aimed at BOAC, and featured five cabins – three on the lower-deck and two on the upper – with a further promenade cabin on the lower deck. These cabins seated six day passengers, or four night. Twelve aircraft were ordered by the Ministry of Civil Aviation, before BOAC's requirement changed, and the aircraft were revised as Solent 2s. The second production Seaford, NJ201, which was used for Transport Command and BOAC evaluation as 'OZZA' and G-AGWU, was not a true Solent at that time, though it was later converted to full Solent 3 standards, with 'Empire/Sandringham' nose and tail fairings. In total, seven surplus Seafords (NJ201 to NJ207) were converted as Solent 3s, with six going to BOAC and the seventh produced (NJ201) going to Aquila Airways.

While not a true Solent 1, Seaford NJ201/'OZZA' was the closest to it to fly, with faired-over nose and tail turrets. As such it was briefly evaluated by Transport Command before being sold onto the civilian market.



Short Solent 3 (PD.3 ASW Solent

Short responded to the RAF's R.2/48 requirement for a maritime reconnaissance flying boat with two separate Preliminary Designs (PD.2 and PD.3). Preliminary Design 3 described a proposal to convert redundant Solent airliners to ASW and maritime reconnaissance configuration – basically turning them back into Seafords, albeit fitted with the latest role equipment and weapons.

In connection with this proposal, a single Solent 3, G-AKNS, was loaned to the MAEE (Marine Aircraft Experimental Establishment) as WM759 for extensive trials. These were flown from Felixstowe, Gibraltar and Tangier, at weights of up to 84,000 lb (38102 kg), and focused on the aircraft's handling characteristics in heavy swell, while also exploring spray damage to propellers and leading edges.

In the end, the decision was taken to concentrate efforts on the development of landplanes for the Maritime Reconnaissance and Anti-Submarine Warfare roles, and the PD.3 programme was quietly terminated.

Sunderland operators

No. 230 Squadron was the first RAF Sunderland unit. L2160 **Selangor** *was one of four paid for by the Federated Malay Sultanates.*

Royal Air Force

The Sunderland entered service with the RAF when the first production aircraft was delivered to the MAEE at Felixstowe on 25 April 1938, joining the prototype which had arrived 17 days earlier. The first unit to convert to the Sunderland Mk I was No. 230 Squadron in June 1938, although the aircraft were delivered by No. 210 Squadron crews to No. 230's base at Seletar, Singapore. This outpost was also to be the home to the last unit, No. 209 Squadron Detachment, which flew the last operational sortie (in DP198) on 14 May 1959, followed by a farewell flypast the next day.

Operational units

No. 88 Squadron
Formed at Kai Tak on 1 September 1946 from No. 1430 Flight using Sunderland GR.Mk 5s, operating from Iwakuni during the early phase of the Korean War. On 24 June 1954 it moved to Seletar, Singapore, and disbanded on 1 October 1954.

No. 95 Squadron
Moved to Pembroke Dock on 16 January 1941 after forming the previous day at Oban with Sunderland Mk Is. Left for Freetown, Sierra Leone on 17 March 1941, then to Jui on 9 April 1942, re-equipping with Sunderland Mk IIIs in August 1942. Relocated to Bathurst on 7 March 1943 and disbanded there on 30 June 1945.

No. 119 Squadron
Formed from G-Flight on 13 March 1941, using C- and G-Class flying boats. In April 1942, after the old Imperial Airways aircraft had become unserviceable, it reformed as a Catalina ferry unit at Lough Erne. Reformed at Pembroke Dock in late 1942 on Sunderland Mk II/IIIs, but disbanded on 17 April 1943.

No. 201 Squadron
First Sunderland Mk Is arrived on 13 April 1940 at Invergordon, before moving to Lough Erne on 18 September 1941. Gained Mk IIs from May 1941 and Mk IIIs in January 1942. Between 3 March and 3 November 1944 it was based at Pembroke Dock before returning to Lough Erne, gaining Mk Vs in February 1945. Went back to Pembroke Dock on 3 August 1945, Calshot on 1 April 1946, and back to Pembroke Dock on 17 January 1949. Disbanded on 28 February 1957.

No. 202 Squadron
Initially started to get Sunderland Mk Is in April 1939 at Kalafrana, Malta, but lost them soon after. On 20 December 1941, when based at Gibraltar, it re-gained Sunderland MK I/II/IIIs, operating them until 20 September 1942.

No. 204 Squadron
From Saro London to Sunderland Mk I from 8 June 1939 at Mount Batten, moving to Sullom Voe on 2 April 1940, and Reykjavik on 5 April 1941, getting Mk IIs two months later. The squadron moved to Bathurst on 28 August 1941, got Mk IIIs from September 1942 and moved to Jui on 28 January 1944, where it disbanded on 30 June 1945. Mk Vs were used from April 1945.

No. 205 Squadron
Gained Sunderland GR.Mk 5s in June 1945 at Koggala, Ceylon. To Seletar on 15 September 1949, with a brief stay at Iwakuni between October 1950 and May 1951 before returning to Singapore. Absorbed into No. 209 Sqn in 1955 as No. 205/209 Squadron.

No. 205/209 Squadron
No. 205 and 209 Squadron merged on 1 January 1955 at Seletar, Singapore. Became No. 209 Squadron Detachment on 1 March 1958 as the number of servicable aircraft declined. Last operational sortie flown on 14 May 1959, with a farewell flyby the next day.

No. 209 Squadron
Having used individual Sunderlands alongside its Catalinas, No. 209 Squadron became an all-Sunderland GR.Mk 5 unit in February 1945, based at Kipevu, Kenya. To Koggala, Ceylon, on 21 July 1945, to Kai Tak on 27 October 1945, then to Seletar 1 September 1946. No. 209 merged with No. 205 on 1 January 1955, becoming No. 205/209 Squadron.

No. 210 Squadron
Sunderland Mk Is received by No. 210 Squadron on 3 July 1938 at Pembroke Dock, to Tayport in October 1938, then Invergordon, then Oban on 13 July 1940. To Catalinas in April 1941.

No. 228 Squadron
From November 1938 Sunderland Mk Is replaced Stranraers at Pembroke Dock. To Alexandria, Egypt, on 5 June 1939, but returned to Pembroke Dock on 10 September 1939, but then back out to Alexandria in June 1940 and Aboukir in September. The unit moved to Kalafrana, Malta, from 13 September, then Aboukir again from March 1940, followed by Bathurst in August 1941, getting Mk IIs in November 1941. To Oban in March 1942 (Mk IIIs joining the unit from May 1942), Lough Erne in December 1942, and Pembroke Dock in May 1943. Disbanded on 4 June 1945, having used GR.Mk 5s for the last four months.

No. 230 Squadron
Began conversion to the Sunderland Mk I in June 1938 at Seletar, Singapore. To Penang on 15 October 1939, Koggala February 1940, Alexandria from May 1940 (plus detachments around the Med), and Aboukir in June 1941. To Dar-es-Salaam in January 1943, Koggala February 1944, Akyab April 1945, and Redhills Lake in July 1945, returning to Seletar on 30 November 1945. To Castle Archdale in March 1946, Calshot April 1946, and Pembroke Dock from February 1949. Disbanded on 31 July 1957 as the last UK Sunderland unit.

No. 240 Squadron
Started trading in Catalinas for Sunderland GR.Mk 5s in July 1945 at Redhill Lake, but disbanded in March 1946 at Koggala.

No. 246 Squadron
Formed at Bowmore on 1 September 1942, but disbanded on 30 April 1943. Used Mk IIs and IIIs.

No. 259 Squadron
Began to convert to the Sunderland Mk Vs on 9 March 1945, but disbanded on 30 April 1945.

No. 270 Squadron
To Sunderland Mk IIIs in December 1943, based at Apapa, Nigeria, disbanding on 30 June 1945.

No. 330 (Norwegian) Squadron
Sunderland Mk II/IIIs replaced Northrop N-3PBs and Catalinas in No. 330 (Norwegian) Squadron from 9 February 1943 at Oban. Moving to Sullom Voe on 12 July 1943 it remained there until 30 May 1945 when it returned to Stavanger in Norway, transferring to Royal Norwegian Air Force control on 21 November 1945.

No. 343 (Free French) Squadron
No. 343 Squadron formed on 29 November 1943 from Flottille 7F, which had itself formed through the merger of the 3E and 4E Escadrons of Flottille 1 in October 1943. These units equipped with Sunderlands from July 1943, following the transfer of French forces in North Africa to Allied control. Moving between Dakar, Bathurst and Freetown before transferring back to French Navy control on 27 November 1945.

No. 422 Squadron RCAF
No. 422 Squadron RCAF formed at Lough Erne on 2 April 1942, gaining its first Sunderland Mk III in November and flying its first operational sorties on 1 March 1943. It moved to Bowmore on 8 May 1943 and St Angelo on 3 November 1943 before returning to Castle Archdale (as Lough Erne was renamed) on 13 April 1944, then going to Pembroke Dock on 4 November 1944. It disbanded on 3 September 1945, having given up Sunderlands in July 1945.

No. 423 Squadron RCAF
No. 423 Squadron RCAF, was formed at Oban on 18 May 1942, getting Sunderland Mk IIs and IIIs two months later. It moved to Castle Archdale on 2 November 1942, and disbanded on 3 September 1945, although it ceased to fly the Sunderland in June 1945.

Training units

During World War II Sunderland crews were trained by No. 4 (Coastal) Operational Training Unit (OTU) at Invergordon from December 1941. It was partnered by No. 131 (Coastal) OTU at Killadeas in May 1944, but the Sunderland component of this unit joined No. 4 (C) OTU in February 1945. On 31 July 1947 No. 4 (C) OTU became No. 235 (Flying Boat) Operational Conversion Unit based at Calshot, disbanding into the Flying Boat Training School at Pembroke Dock on 17 October 1953, itself existing until 5 October 1956.

Other Sunderland training units included the Coastal Command Flying Instructors School, which in 1945 had a flying boat det at Killadeas (later based at Alness), using a pair of Mk Vs. Later it became the Coastal Command Instructors School, disbanding on 1 April 1946. Two Ferry Training Units flew Sunderlands: No. 302 from 12 January 1944 based at Castle Archdale and Killadeas, and No. 308 at Pembroke Dock, later absorbed into No. 302, before that unit was disbanded on 1 April 1946.

Miscellaneous units
Sunderlands were used in small numbers by various trials organisations, including the Marine Aircraft Experimental Establishment, the Air-Sea Warfare Development Unit's det at Calshot and the Bombing Trials Unit at West Freugh. Earlier, G-Flight had used ex-Imperial Airways flying boats before becoming No. 119 Squadron on 13 March 1941. No. 1430 (Flying Boat Transport) Flight used five Sunderland GR.Mk 5s from 5 August 1946 at Kai Tak, becoming No. 88 Squadron on 1 September 1946. Also 'B' Flight of the AHQ Communications Flight Iraq and Persia operated Sunderland Mk IIIs from Lake Habbaniya, Iraq, in 1945.

Post-war the Sunderland GR.Mk V was the only version retained. This example, SZ568, was delivered after hostilites ended and spent its time with second-line units. It is seen during its time with No. 235 OCU in the early 1950s.

South African Air Force

Some 16 Sunderland MR.Mk Vs were delivered to the SAAF in 1945, though one of these (PP153) was damaged beyond repair in Durban harbour before it could even receive a SAAF serial number. The aircraft were known locally as Sunderland 5s, and equipped No. 35 Squadron, wearing the unit's 'RB' codes. The aircraft were used to ferry home South African troops from Egypt, and then for routine patrol duties. The squadron briefly operated a float-equipped Anson for training (the only known Anson floatplane) though this was soon retired. Some of the Sunderlands were scrapped in 1955, though one was damaged beyond repair in 1950, and two were grounded after accidents in November 1956 and August 1957. The Sunderland was finally retired from SAAF service on 27 September 1957.

Sunderland 5 1710 'RB-D' of No. 35 Squadron SAAF approaches the mooring boat, with the inner engines shut down. The Sunderland was replaced by the Shackleton MR.Mk 3 in SAAF service.

Serial	Ex-RAF	Code
1701	NS262	RB-Q
1702	PP125	RB-K
1703	PP109	RB-H
1704	RN279	RB-F
1705	RN296	RB-M
1706	RN305	RB-O
1707	NJ258	RB-?
1708	NJ263	RB-P
1709	ML798	RB-?
1710	RN281	RB-D
1711	NJ266	RB-?
1712	PP156	RB-J
1713	NJ259	RB-?
1714	RN295	RB-N
1715	PP104	RB-?

Aéronavale

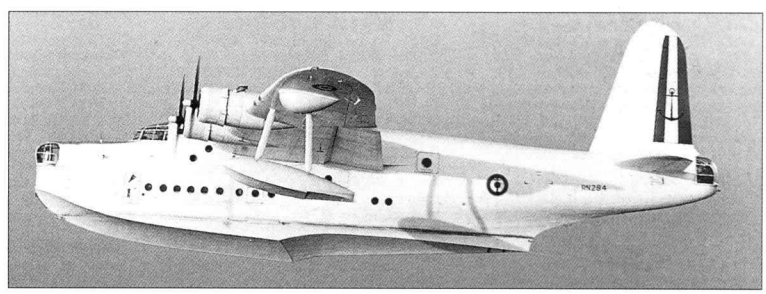
Some 19 Sunderland Mk 5s were refurbished for the French Aéronavale at Belfast in 1951, these aircraft joining the survivors of No. 343 Squadron's wartime Sunderlands, retaining their RAF serial numbers in French service. One of No. 343 Squadron's first pilots was a former Vichy French fighter pilot who had been awarded the Croix de Guerre for downing an RAF Sunderland. In fact, the aircraft had been badly damaged but not shot down, and to the Frenchman's astonishment, he found that one of his instructors on No. 4 Coastal OTU had been the pilot of the aircraft, N9044, which he was actually flying on the training unit.

Moving between Dakar, Bathurst and Freetown, No. 343 Squadron settled in Senegal, and transferred back to Aéronavale control on 27 November 1945 as Flottille 7FE. Most of the new Sunderlands were delivered to Flottille 7FE, which became Flottille 7F and later Flottille 27F. The unit was based at BAN Saint Mandrier, where it was briefly co-located with the training unit Escadrille 12S, which included a number of Sunderlands. The survivors were replaced by 10 Marlins, which arrived in Dakar from 8 May 1959.

Three Sunderlands returned to France on 17 February 1960, joining Escadrille 50S at Lanvéoc-Poulmic, near Brest, which had received two Sunderlands in July 1958, two more in October, and one in January 1959. The type had also served with 53S.

Two Sunderlands remained in Aéronavale service until 30 January 1962, when the type was finally retired. ML824 was subsequently flown to Britain and presented to the Sunderland Trust, for display at Pembroke Dock, though it eventually reached the RAF Museum at Hendon. Another former French Sunderland, ML796, became a bar at La Baule in Brittany, before being acquired by the Imperial War Museum at Duxford in 1976.

Example Aéronavale aircraft included ML796, ML824 and RN284



Blackburn-built RN284 served with the RAF's No. 201 Squadron and No. 235 OCU before being sold to the French Navy.

Royal Australian Air Force

Australia purchased nine Sunderland Mk Is (A10-1 to A10-9, although the serials were not taken up, the aircraft retaining those allocated by the RAF) prior to the beginning of World War II and these aircraft formed the equipment of No.10 Squadron, Royal Australian Air Force (RAAF), which stayed in the UK as part of Australia's contribution to the war effort. Its first aircraft arrived at Pembroke Dock on 11 September 1939, before the unit moved to Mount Batten on 1 April 1940, going back to Pembroke Dock between May 1941 and January 1942 when it, again, returned to Mount Batten. Operations ceased on 1 June 1945, with the unit disbanding on 26 October 1945. Also in the UK, No. 461 Squadron RAAF formed at Mount Batten on 25 April 1942, going first to Hamworthy Junction (3 September 1942) then Pembroke Dock on 20 April 1943, where it disbanded on 31 October 1945. It flew Sunderland Mk IIs from establishment until May 1943, Mk IIIs from August 1942 and Mk Vs from February 1945, with examples of the later marks being used at the time of disbandment.

In the southern Pacific theatre, No. 40 Squadron RAAF operated six Sunderland Mk IIIs mainly in the transport role from 31 March 1944 from Townsville, moving to Rathmines, Port Moresby on 30 April 1944. Four Short S.23 and a single S.33 were also flown by Nos 11, 13, 20, 33 and 41 Squadrons in a similar capacity.

Aviação Naval

On its way to West Africa on 14 February 1941, Sunderland Mk I P9623 'DA-E' of No. 95 Squadron captained by Flt Lt Evison was forced to land in Portuguese territorial waters after encountering a cyclone. The aircraft was repaired and entered Portuguese Navy service as 136 with the Aeronautical Naval Centre (CAN) at Bom Sucesso, Belem, surviving until 8 March 1944 when there was an inflight engine explosion, although it landed safely using only its port engines.

Royal New Zealand Air Force

No. 490 Squadron RNZAF was formed at Jui in West Africa on 28 March 1943 on the Catalina Mk IB, exchanging these aircraft for Sunderland Mk IIIs in May 1944. The unit disbanded at Jui on 1 August 1945. A total of four Mk IIIs (NZ4101 to NZ4104, named *Tainui*, *Tokomaru*, *Mataatua* and *Takitimu*) was modified as transport with faired-over nose and tail cones from late 1944, ferrying New Zealand crews from their base at Hobsonville to Espiritu Santo, Fiji. They were operated first as the Sunderland Flying Boat Section, soon becoming the Flying Boat Transport Flight and, in November 1945, the Sunderland Flying Boat Transport Squadron. Originally camouflaged, post-war they were operated in a bare metal scheme, but were sold on the civil market in 1947.

New Zealand bought 16 refurbished Sunderland MR.Mk 5s in 1952, and these were delivered from 1953. Most were ex-RAF aircraft, though NZ4115 was formerly G-AHJR with BOAC. The aircraft equipped No. 5 Squadron at Lauthala Bay, Fiji, and No. 6 Squadron and the Maritime OCU at Hobsonville. The Sunderlands operated in the transport and maritime roles, proving uniquely useful for their ability to reach the furthest flung islands in the Fijian group. Initially operating with No. 5 Squadron's 'KN' codes, or with No. 6 Squadron's 'XX' codes they soon reverted to single individual letter codes.

Four Sunderlands were withdrawn from use and placed in storage during the late 1950s, and the Territorial No. 6 Squadron disbanded in July 1957. The loss of an aircraft in November 1959 and another in 1961 left six with No. 5 squadron in Fiji and three or four with the MOCU at Hobsonville. The MOCU became the Maritime Reconnaissance and Support Unit in April 1962, and was disbanded in February 1965, when No. 5 Squadron returned to Hobsonville with four Sunderlands, leaving a two-aircraft detachment in Fiji. Sunderland conversion training ended in October 1965, and the Lauthala Bay detachment reduced to one aircraft in 1966, before closing on 31 March 1967, the final Sunderland returning on 2 April. Three Sunderlands survived the type's retirement, but the aircraft retired to display duties at the Coast Guard HQ at Northland had to be demolished after suffering vandalism, and the aircraft

Tainui was the first of four Mk III Sunderlands used by the RNZAF in the transport role from late 1944.

displayed at Hobsonville met a similar fate. This left only NZ4115, displayed at the Museum of Transport and Technology in Auckland.

Serial	Ex-RAF	Codes/fate
NZ4105	PP110	KN-A, KN-C, A; wfu 8/66
NZ4106	RN280	KN-G, B; wfu 5/67
NZ4107	VB883	KN-F, XX-D, D; wfu 5/67
NZ4108	ML814	KN-B; wfu 12/63, to Ansett ground instruc (INST 183) at Hobsonville
NZ4109	DP191	KN-C; wfu 65
NZ4110	PP129	KN-F; wfu 10/59, to
NZ4111	VB880	XX-B; w/o 11/59
NZ4112	VB881	KN-A, L; wfu 4/66
NZ4113	PP124	KN-D, XX-D; wfu 5/67
NZ4114	SZ561	XX-A, P; wfu 2/67
NZ4115	SZ584	KN-B, Q; wfu 12/66 to MOTAT
NZ4116	EJ167	KN-C, S; wfu 2/67 to Northland Coastguard
NZ4117	RN286	KN-K, T; w/o 8/61
NZ4118	RN306	XX-A; wfu 65
NZ4119	PP143	XX-B; wfu 10/62
NZ4120	RN291	KN-Z, XX-Z,C; wfu 8/66