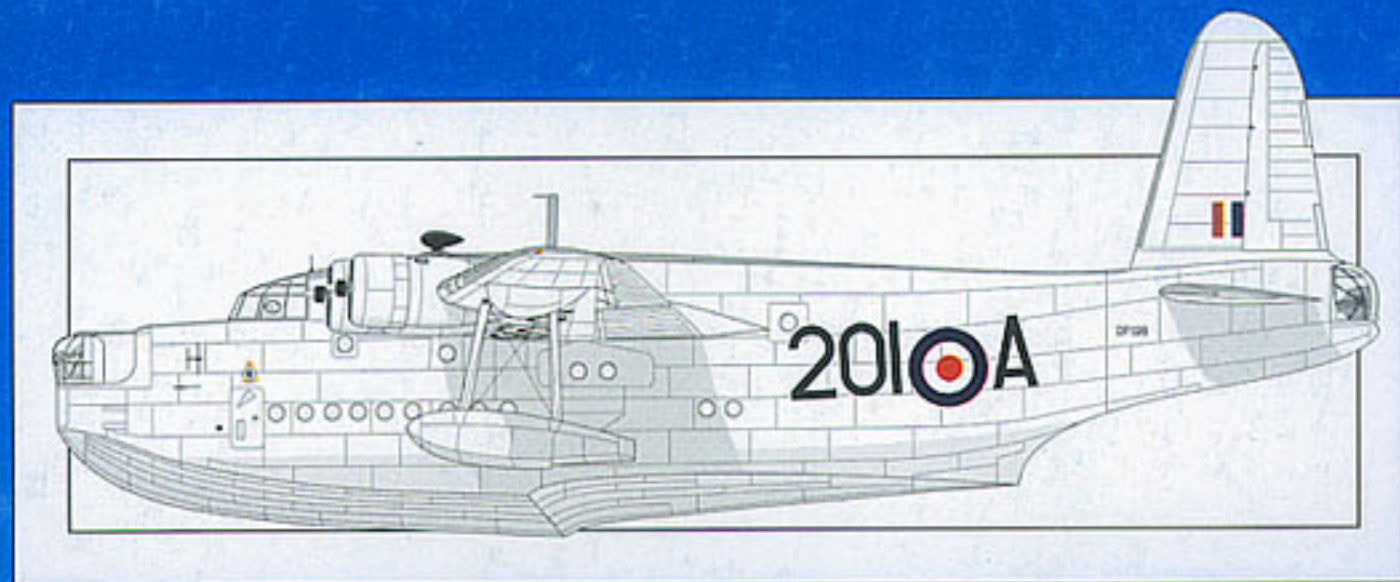




**WARPAINT SERIES No. 25**

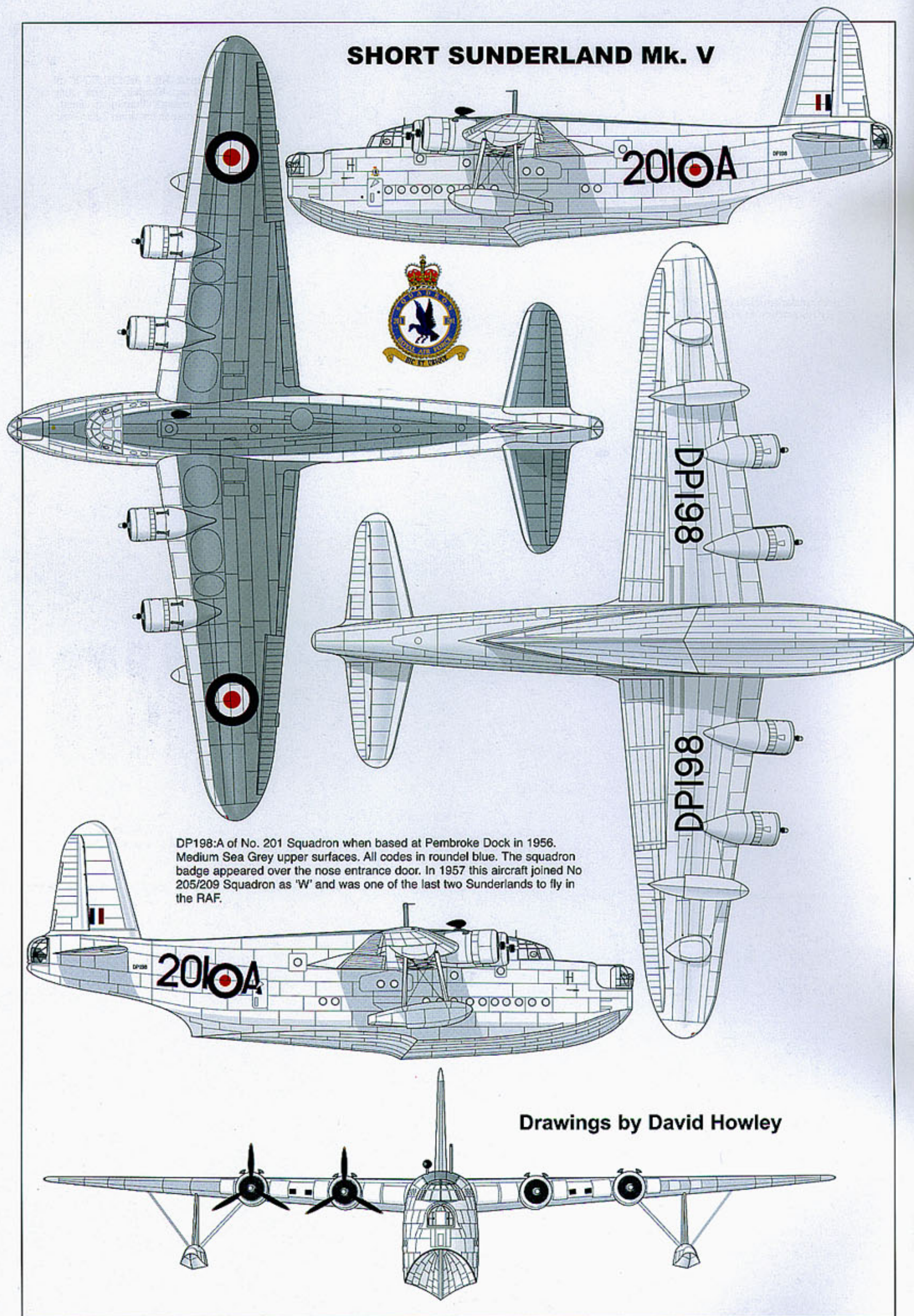
# Short **SUNDERLAND**

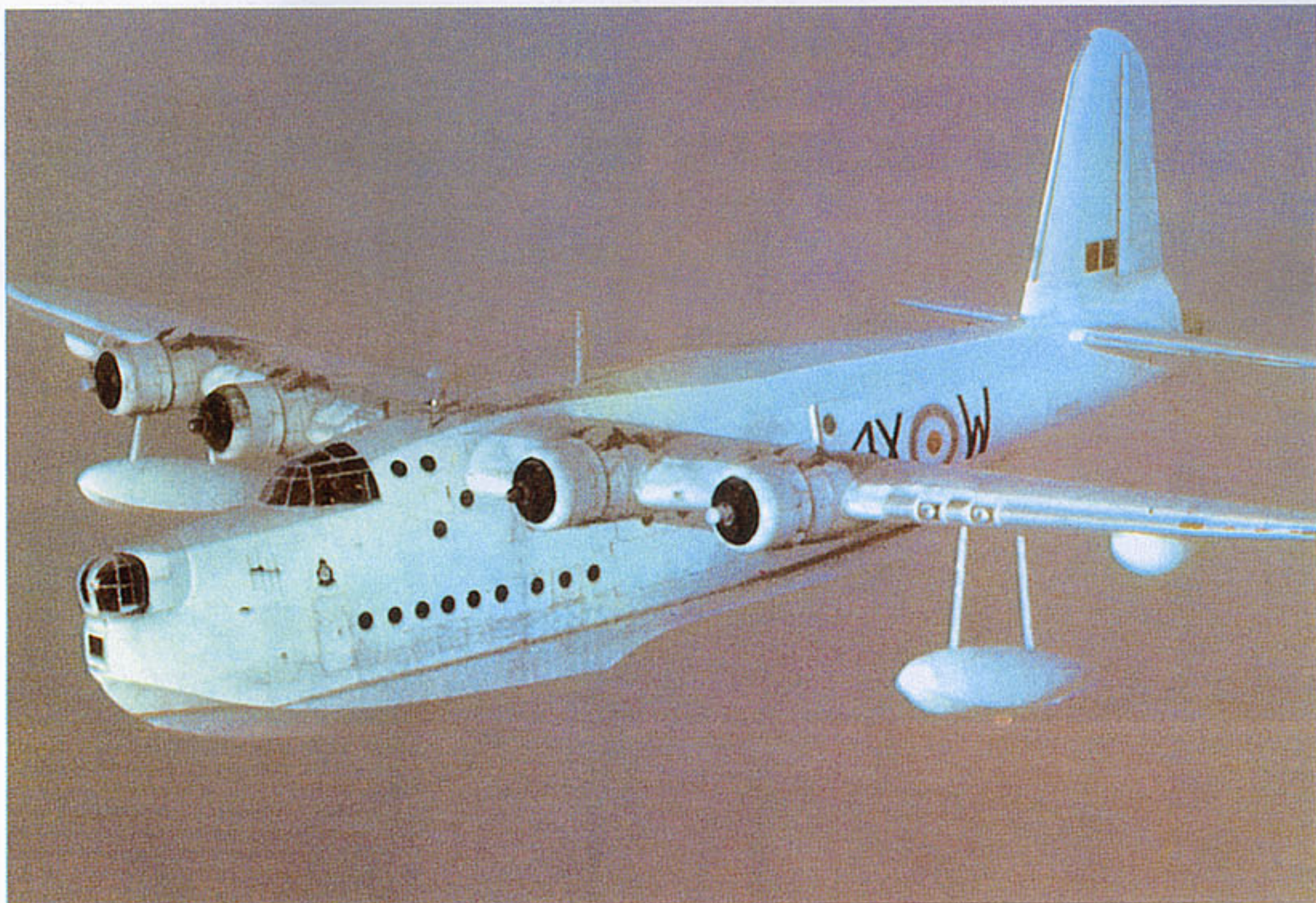
By **TONY BUTTLER** AMRAeS

The last Sunderland sortie. Before the final paying off ceremony (shown on the back page) ML797:P of No. 205/209 Squadron together with DP198, made a low level flypast over Singapore and the surrounding area on 20 May 1959 thus ending 21 years continuous service with the RAF. (Bill Whiter)



# SHORT SUNDERLAND Mk. V





# Short SUNDERLAND

By Tony Buttler AMRAeS

Today the development and manufacture of almost every new type of military aircraft is a very expensive process and, in consequence, many examples now stay in service for over 25 years. In the 1940s and 1950s things were quite different, aircraft were relatively cheap but, due to the great advances in aerodynamics and powerplants, tended to become obsolete remarkably quickly. So for a front-line military aircraft to enter RAF service before World War 2, to stay in production throughout the war, and then to stay in service until the late 1950s (and overseas through most of the 1960s) was an exceptional achievement. But then the Short Sunderland was an exceptional aeroplane.

Until the 1950s the flying boat offered great benefits both to air forces and civilian airlines. In particular it made possible

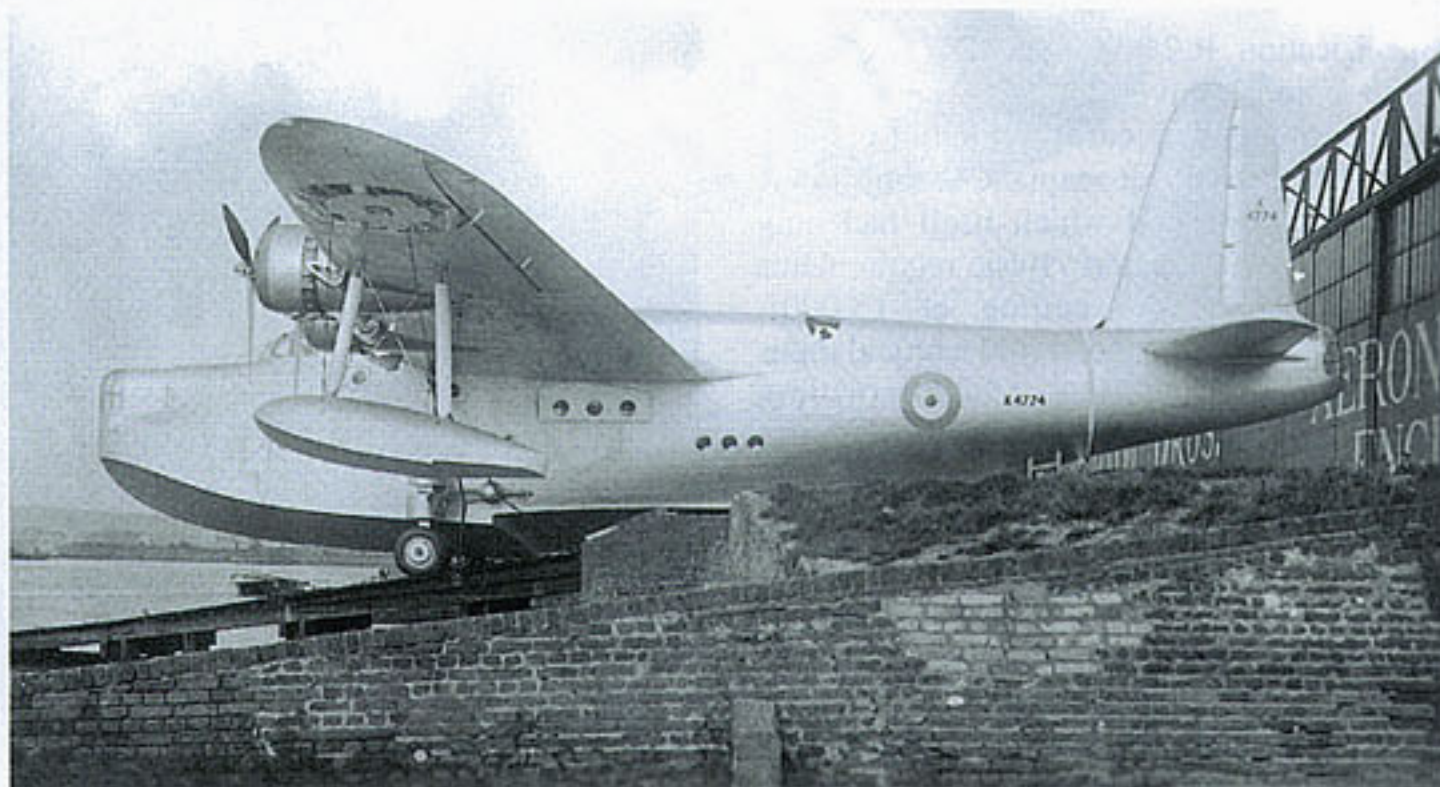
Sunderland prototype K4774 taken on the slipway at Rochester in October 1937. The machine is unarmed, it has Pegasus Xs and shows the original straight wing although the parallel airscrews are not really visible. Note the open access panels in the wing leading edges, and the original main step which was later repositioned. (Ministry of Defence)

longer range operations over the sea because the boat could take-off with a higher all-up-weight, although this was compromised a little by the poorer aerodynamics of the 'boat hull' which increased drag. In the short term it could also make use of any suitable landing area, thus maintaining an air presence when no land strip was available, but long term operations would need extensive back-up facilities.

By the mid-1930s Short Brothers, based at

Above: Sunderland Mk.5 PP117 4X:W of No. 230 Squadron seen over the Mediterranean in March 1950. It was scrapped in October 1957. (Charles Brown)

Rochester on the Medway estuary, were well established as designers of fine flying boats and the firm now followed its successes with the civilian S.23 'C' class luxury Empire boats which went into service on trans-Atlantic routes. *Canopus*, the first 'C' Class, was launched on 2 July 1936 and flown the





Above: Another view of K4774, this time pictured at MAEE Felixstowe in about August 1938. It now has the swept wing which featured on every other Sunderland, a repositioned main step on the planing bottom and Pegasus XXII engines. The double-wheel beaching chassis and tail trolley are shown to good effect. (MoD) Left: The first Mk.I Sunderland was L2158 seen here on the River Medway in May 1938. From the side one can see how the outer engines have moved slightly behind the inner units, an effect of sweeping the wing, and how the nose turret retracts backwards to facilitate mooring. This aircraft went to MAEE Felixstowe on 2 June. (Eric Morgan)

next day; it was a beautiful machine and far ahead of its time, so it was no surprise that a military boat designed concurrently should be similar in appearance and utilise the same structural techniques. The resulting Sunderland became the backbone of Coastal Command's convoy escort duties during World War 2 and was the biggest of the new types to enter service with that Command before the start of hostilities.

### IN COMPETITION

Specification R.2/33, dated 23 November 1933 and covered by Operational Requirement OR.8, called for a four-engined general purpose boat seaplane to replace the Short Singapore III which itself had only just entered production. Basic requirements included a service ceiling of 15,000ft (4,572m) and a range of 1,400 nautical miles (2,593km) when cruising at 2,000ft (610m). Armament was to include bombs plus four defensive positions each with a 0.303in machine gun or, alternatively in the bow, a 37mm shell-firing cannon. Chief designer was to be Arthur Gouge and when he and his

chief Oswald Short saw the Douglas DC-2 in the 1934 MacRobertson Air Race, any thoughts for either civil or military boats being a biplane were dismissed in favour of the American's clean mono-wing.

Projects to R.2/33 are believed to have included the Supermarine Type 232 monoplane boat with four Rolls-Royce Goshawk engines, Type 238 biplane with four Bristol Perseus and Type 239 monoplane with four Rolls-Royce Merlins, plus designs from

Blackburn and Fairey. However, those selected for flight test were the Saunders-Roe A.33 and Short S.25 and in 1934 a single prototype of each was ordered serialised K4773 and K4774 respectively. Standard Air Ministry practice was to build different prototypes and evaluate each before production began.

Saro's A.33 had a fabric covered parasol wing of General Aircraft Monospar type mounted on struts well clear of the fuselage. The high position was necessary to provide sufficient water clearance for the engines while also permitting the use of a relatively small hull to cut drag. It had

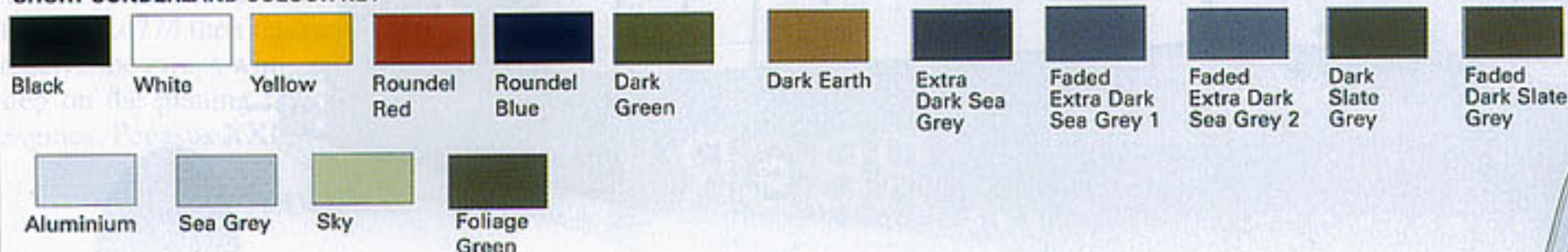


An early Sunderland banks away from the camera to show off its clean lines, then remarkably uncluttered by external equipment; this was soon to change. (Flight photo)

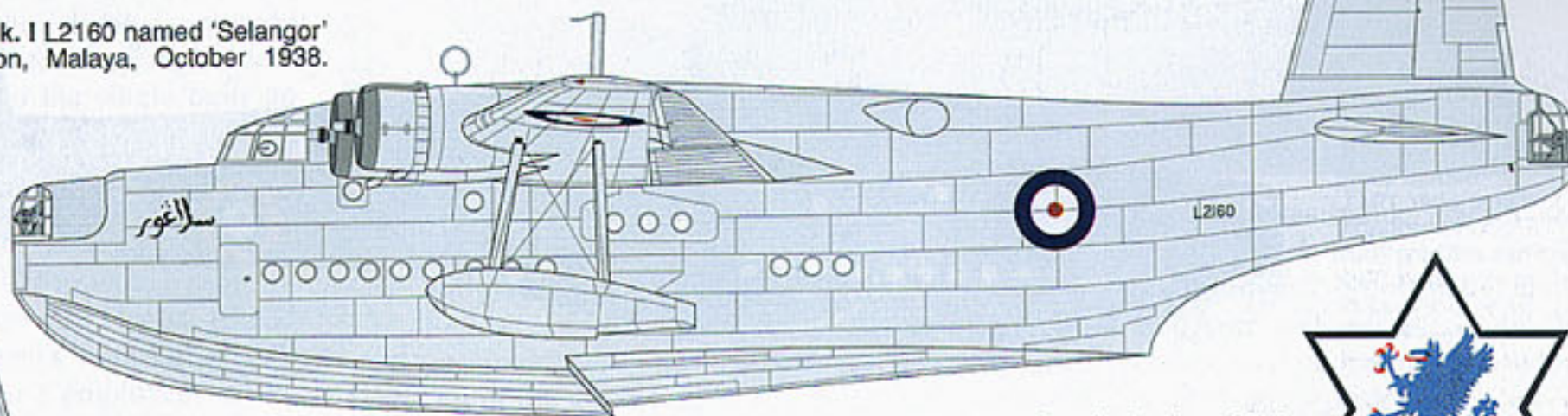
# Short Sunderland camouflage and markings

Drawings by David Howley

## SHORT SUNDERLAND COLOUR KEY



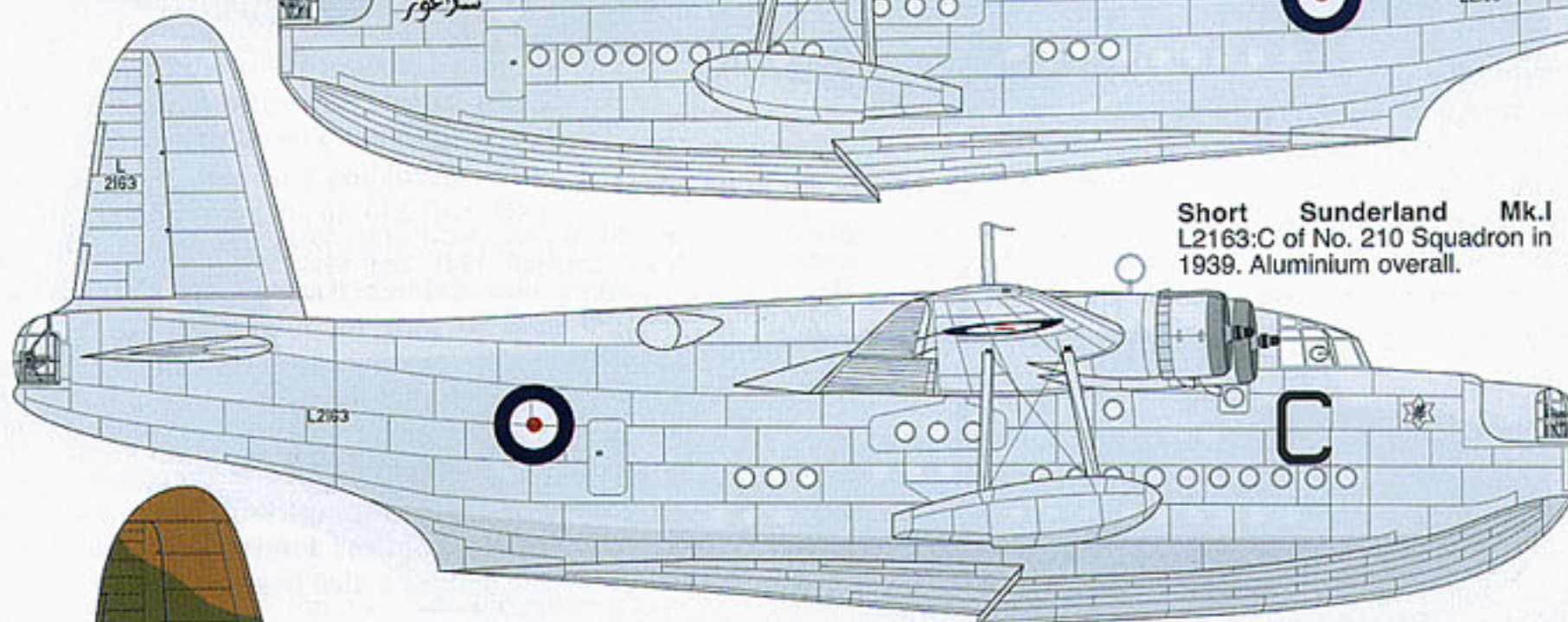
Short Sunderland Mk. I L2160 named 'Selangor' of No. 230 Squadron, Malaya, October 1938. Aluminium overall.



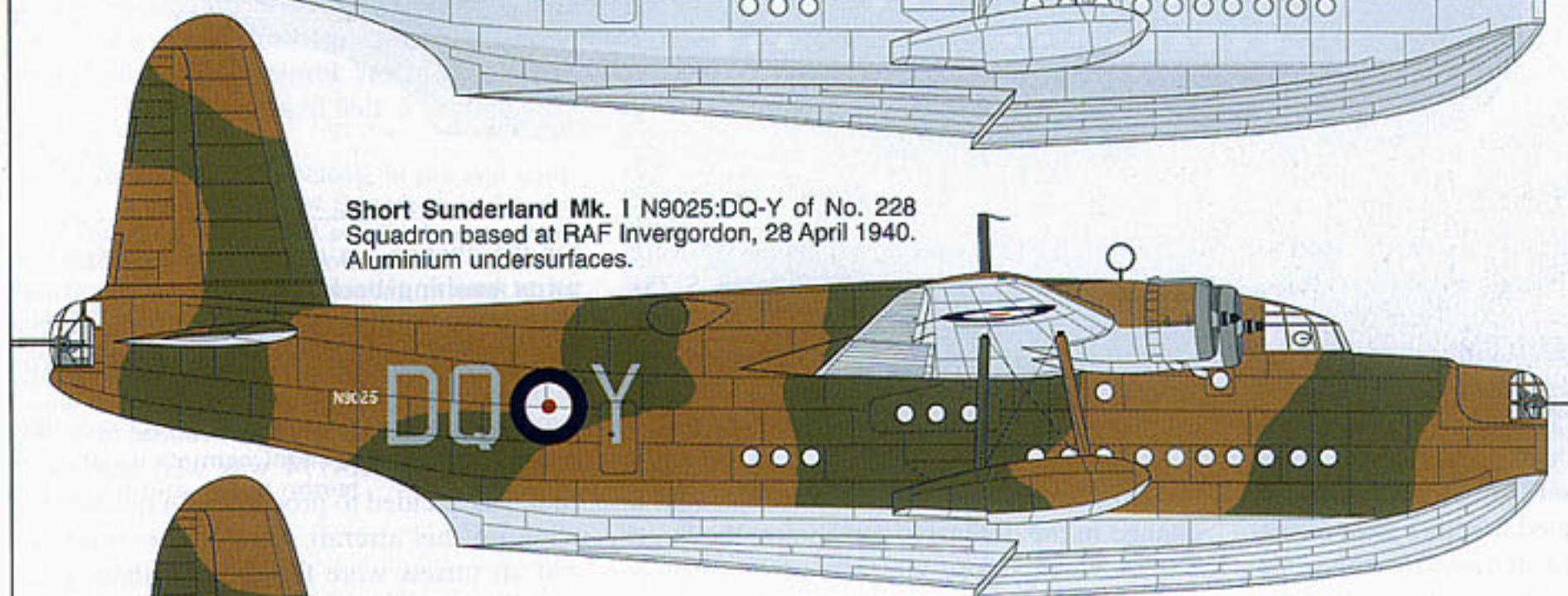
Short Sunderland Mk. I L2163:C of No. 210 Squadron in 1939. Aluminium overall.



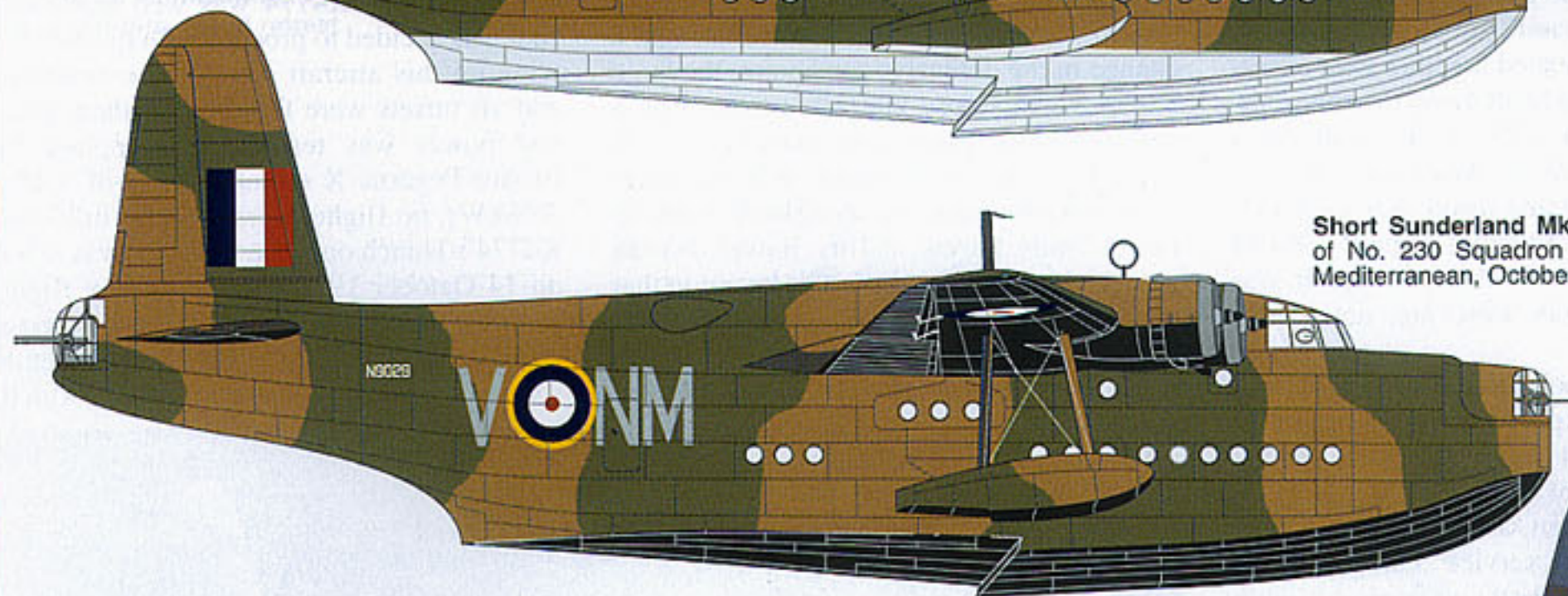
No. 201 Squadron badge on nose of L2163



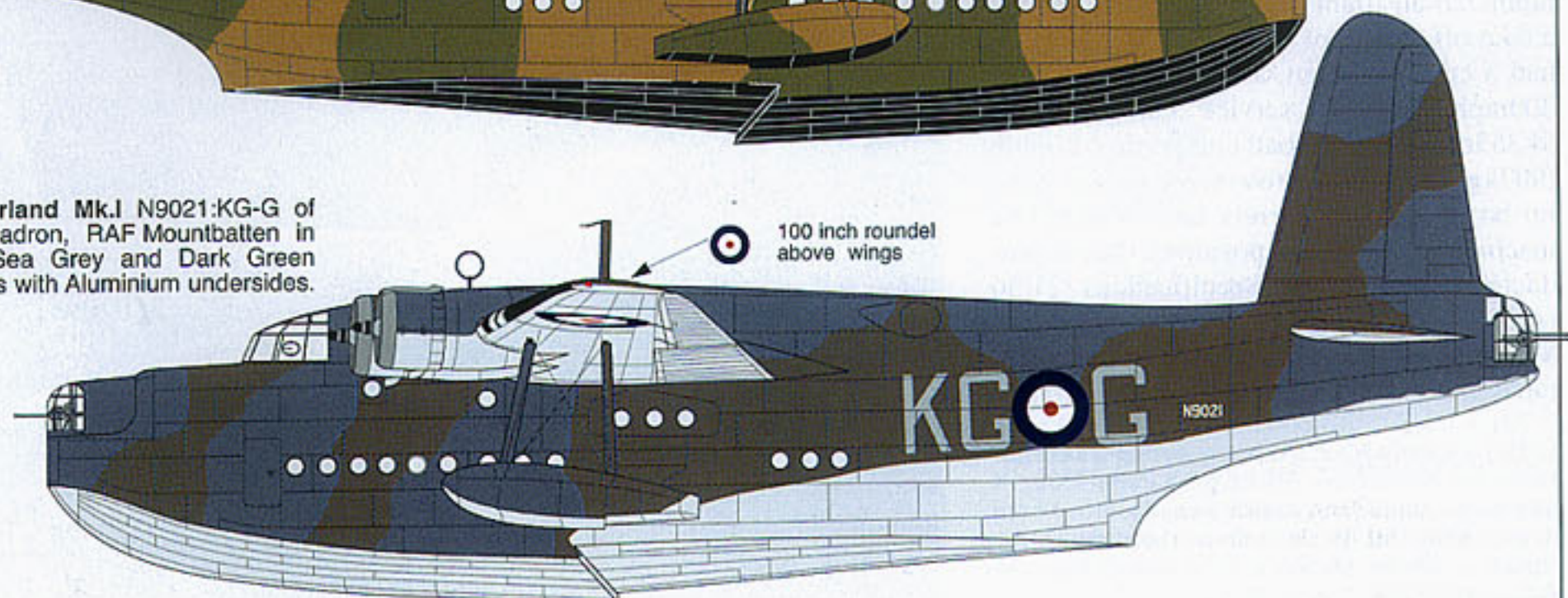
Short Sunderland Mk. I N9025:DQ-Y of No. 228 Squadron based at RAF Invergordon, 28 April 1940. Aluminium undersides.



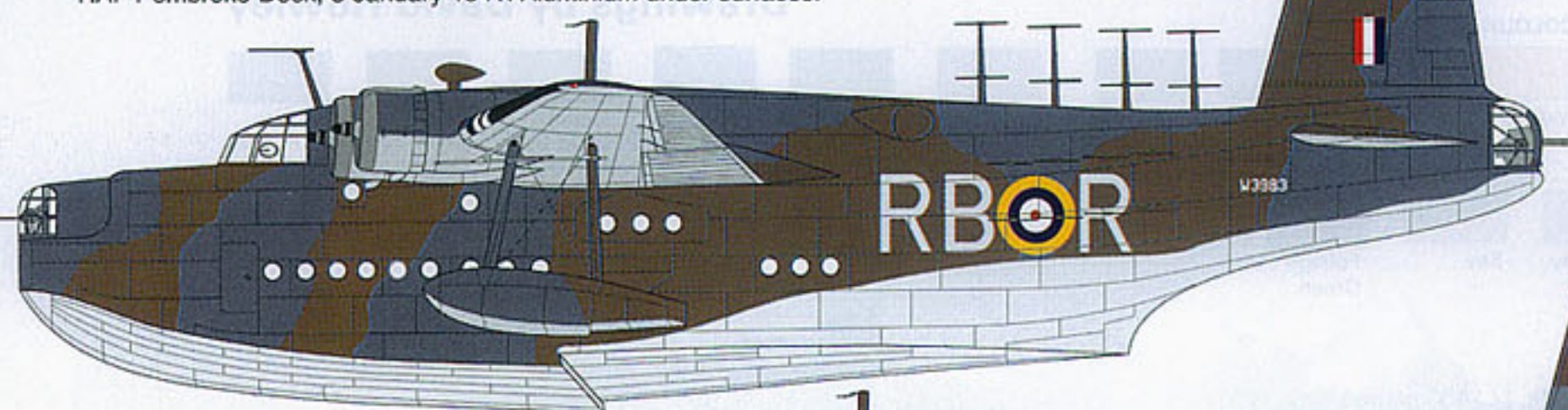
Short Sunderland Mk. I N9029:NM-V of No. 230 Squadron in the Eastern Mediterranean, October 1940.



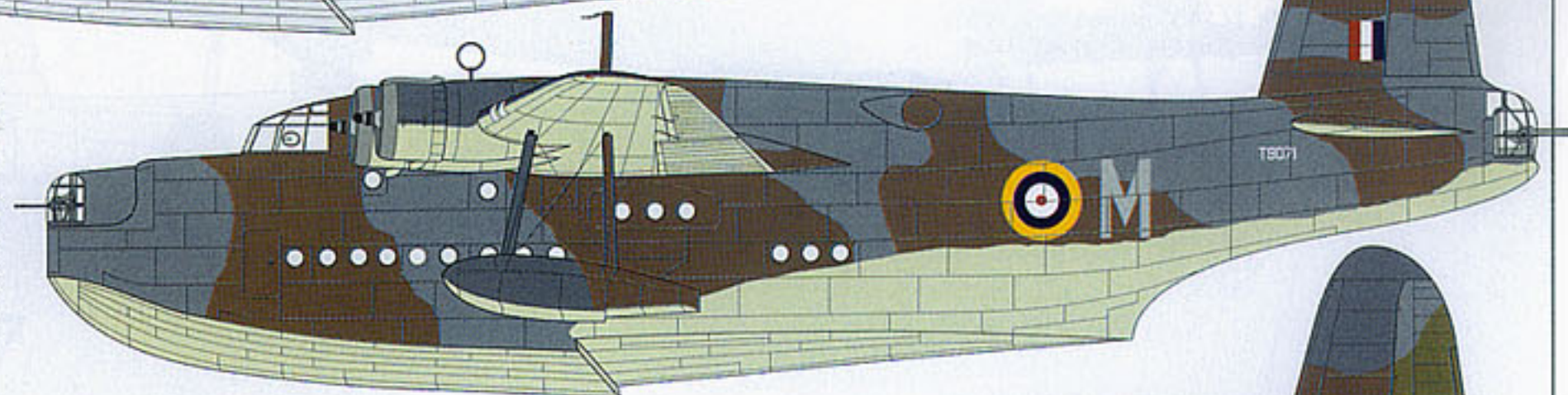
Short Sunderland Mk. I N9021:KG-G of No. 204 Squadron, RAF Mountbatten in 1940. Dark Sea Grey and Dark Green upper surfaces with Aluminium undersides.



Short Sunderland Mk. II W3983:RB-R of No. 10 Squadron RAAF, RAF Pembroke Dock, 3 January 1941. Aluminium under surfaces.

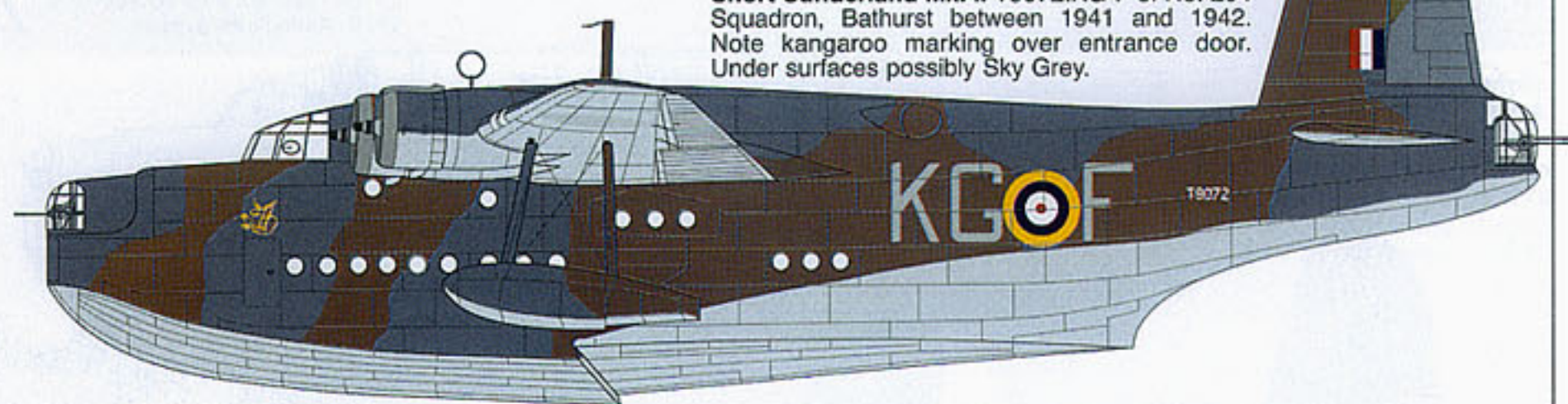


Short Sunderland Mk. I T9071:M of No. 230 Squadron, Middle East, December 1941. Finish is probably faded Extra Dark Sea Grey and Dark Slate Grey upper surfaces with Sky undersides.



Kangaroo marking over crew door on T9072

Short Sunderland Mk. II T9072:KG-F of No. 204 Squadron, Bathurst between 1941 and 1942. Note kangaroo marking over entrance door. Under surfaces possibly Sky Grey.



four Bristol Perseus XII engines, a streamlined all-metal hull and, instead of wing floats, huge aerofoil section hull-mounted sponsons to provide stability (an unusual feature in British design). K4773 first flew from Cowes on 14 October 1938, a full year after the S.25, but water performance was poor. Porpoising (nose pitching both up and down) was experienced together with excessive wave pressure build up on the sponsons. On 25 October K4773 hit the wake of a passing ferry during a take-off which made it bounce and stall and result in a wing failure inboard of the starboard engines. One of the propellers pierced the hull and it was obvious that repairs were just not worthwhile.

The A.33's normal all-up-weight was 41,500lb (18,825kg) for an endurance of 12 hours but all flight testing was performed at a take-off weight of 31,500lb (14,288kg). It had a crew of seven, a maximum speed of 200mph (322km/h), service ceiling 14,280ft (4,353m) and a warload comprising 2,000lb (907kg) of bombs, Browning machine guns in bow and tail turrets and Vickers K machine guns in beam positions. Initial production contracts to Specifications 21/36 (A.33) and 22/36 (S.25) were placed in March 1936, before completion of the prototypes, but the order for eleven A.33s serialised

L2147 to L2157 was now cancelled along with any further development. Eleven S.25s were ordered with serials L2158 to L2168 and 22/36 was issued in November to a new Operational Requirement OR.42. Shortly afterwards the type was named Sunderland.

There were few criticisms of the S.25 from the Air Ministry and RAF but one brought a change in the defensive armament; the large 37mm Vickers nose gun was replaced by a single machine gun and the rear cockpit was equipped with four Browning machine guns, both installations in enclosed rotating Frazer-Nash turrets. This move had an appreciable effect on the boat's layout in that just over four degrees of sweep had to be introduced to the main wing spar, which originally had been straight, to compensate

for the change in c.g. from the heavy tail turret pushing back the centre of pressure. This in turn forced a redesign of the lower hull to accommodate a change in the hydrodynamics.

These changes, however, evolved once the construction of K4774 was well underway so it was decided to proceed with the straight wing on this aircraft alone. The new fore and aft turrets were fitted but without guns and power was temporarily supplied by Bristol Pegasus X radial engines of 950hp (708kW); no flights were made at full load. K4774's launch onto the Medway was made on 14 October 1937 and the maiden flight, by chief test pilot John Lankester Parker, followed on the 16th. Three further flights were completed by the month's end which,

L2160, an early Mk.I, probably during a fuel jet-tison test flight from MAEE on 3 June 1938. It joined No. No. 230 Squadron in early July where it was later christened *Selangor* and its career ended in 1942 with No. 4 OTU as Instructional Airframe 3372M.



Close up of Mk.I N9024 offering detail views of the bomb aimer's window under the turret and the cockpit glass and framing. (Short Bros.)

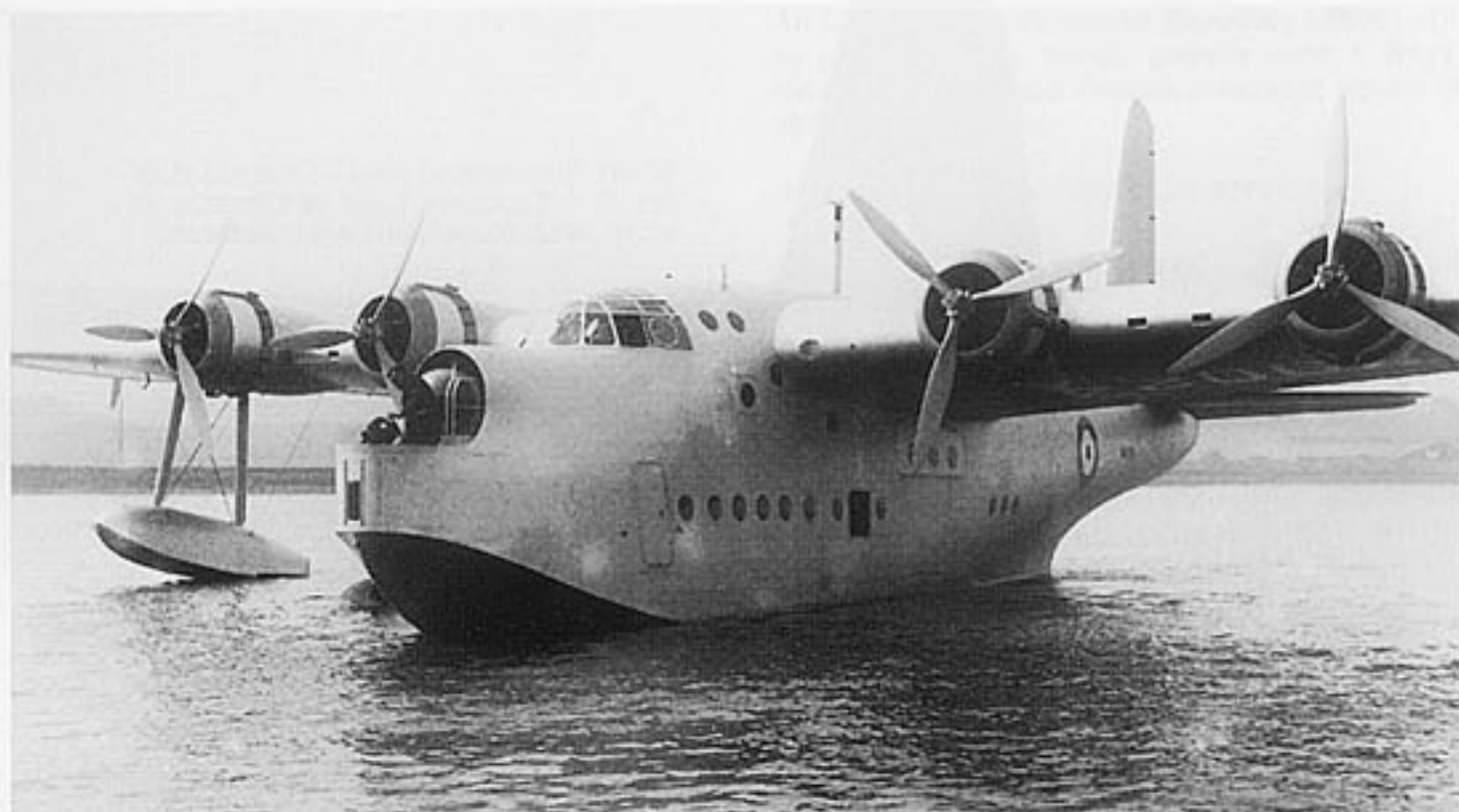
apart from exhibiting the known tail heaviness, indicated that the basic design was sound. K4774 then returned to the factory to receive the swept wing, a repositioned main step on the planing bottom and the correct engines, Pegasus XXIIIs.

## CONSTRUCTION

The Sunderland represented a significant advance in aircraft design, in particular it made the maximum use of metal skinning with hardly any fabric cover. Empire boat experience was used in the single built up wing spar made of four T-section Hiduminium extrusions braced by vertical and diagonal tubes. Apart from fabric covered Frise-type ailerons, all of the wing surface, including the roller-mounted patented Gouge flap, was metal with riveted Alclad sheeting. Arthur Gouge's retractable trailing-edge flaps were first employed on the 'C' Class and, besides the normal flap effect, they provided a substantial increase in wing area to give a 30 per cent rise in lift coefficient with the minimum of trim or drag changes.

The all-metal flush riveted wing floats were of similar construction to the Empires and were supported by two tubular struts braced by streamline wires and stainless steel cables. All control surfaces, bar the ailerons, were duplicated with a locking gear

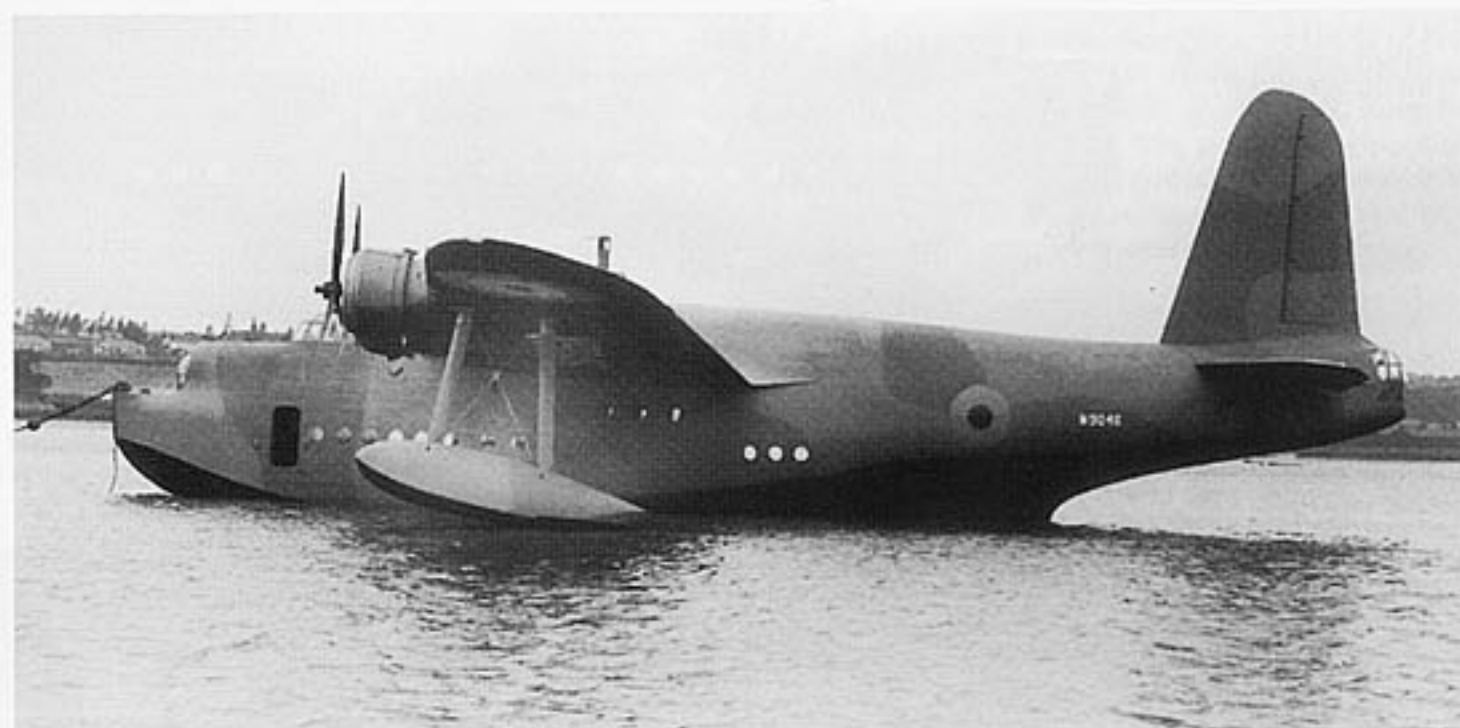
Right: Sunderland Mk.I N9046, in pre-war camouflage. It joined No. 204 Squadron in August 1939 and on 3 April 1940 survived an engagement with six Ju 88s, shooting down two, the first Sunderland air-to-air combat. It sank at its Sullom Voe moorings on 28 October after catching fire. (Short Bros.) Below: Sunderland Mk. I N9029 NM:V of No. 230 Squadron over the Greek Islands on a ship-hunting patrol against Italian forces between late 1940 and April 1941, after which German intervention turned these operations into one of retreat.



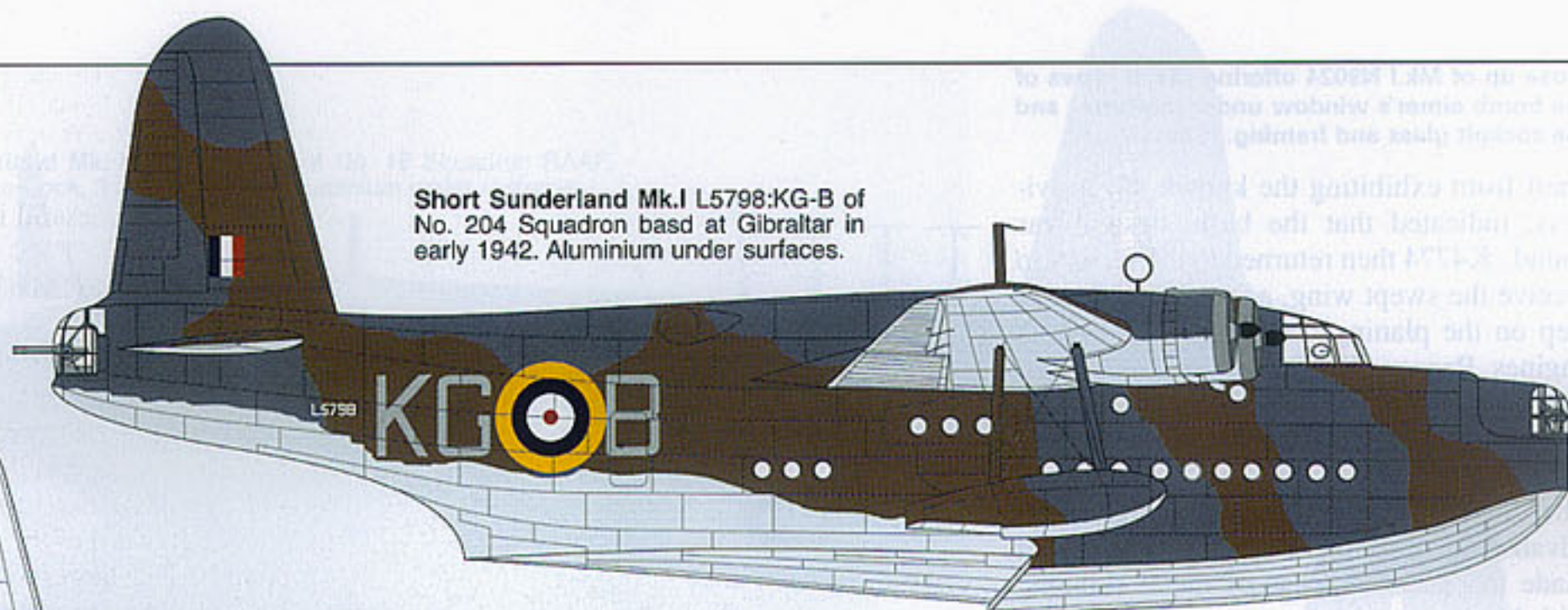
provided in the cockpit for use when the machine was moored. Both tailplane and fin were of metal construction similar to the wing but the orthodox elevators and rudder, which had mahogany inset trim tabs, had fabric aft of the leading edge.

Split into two decks the hull was built of vertical box frames forming bulkheads with the doorways. Before riveting into position its light alloy skin was anodised for

enhanced corrosion resistance against salt water. The upper deck housed the control cabin with side-by-side pilot seats, radio operator, navigator and engineer. In the extreme nose behind a hinged V-window came the bomb aimer's position and above that the turret which, on the water, could be manually retracted for mooring. There were two large entry doors, one near the bow on the port side and another on the star-



Short Sunderland Mk.I L5798:KG-B of No. 204 Squadron based at Gibraltar in early 1942. Aluminium under surfaces.

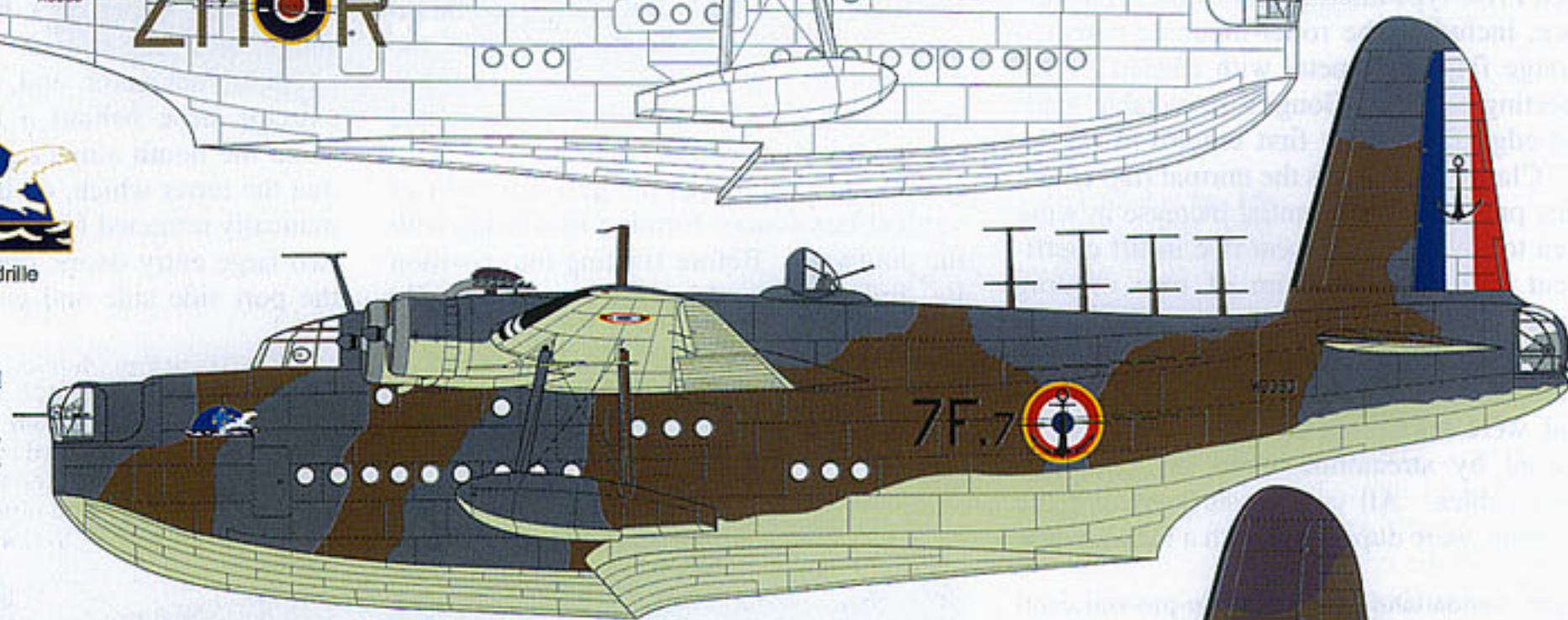


Short Sunderland Mk.II W6055:ZM-R of No.201 Squadron, September 1942



Emblem of 7F Escadrille on nose of W6080

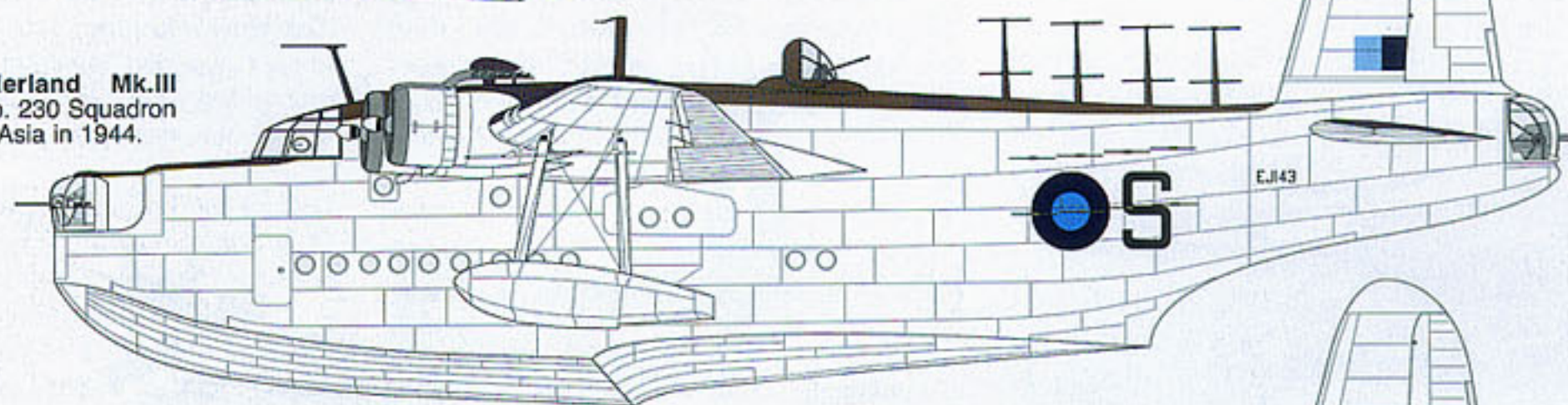
Short Sunderland Mk.III W6080:F7.7 of 7 Escadrille, Aeronavale, Dakar, in 1943.



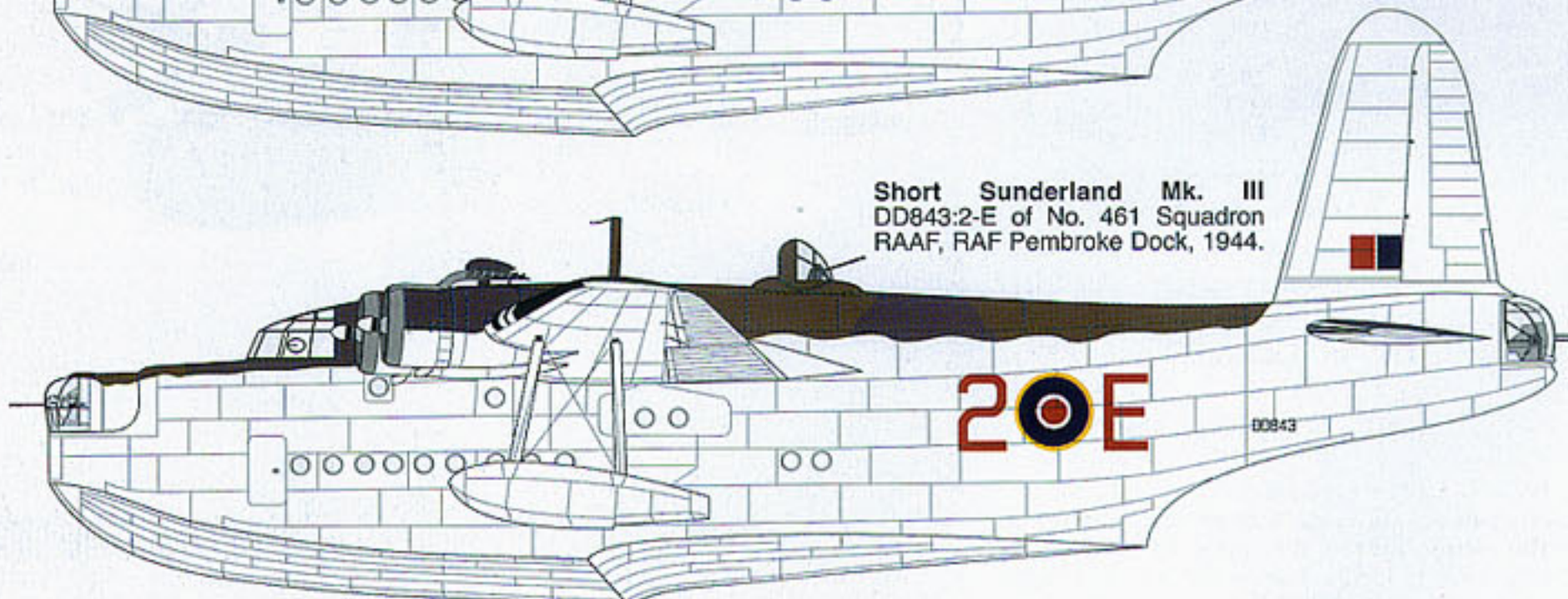
Short Sunderland Mk.III G-AGHW, (Ex-ML725), of British Overseas Airways Corporation in use between 1943 and 1944.

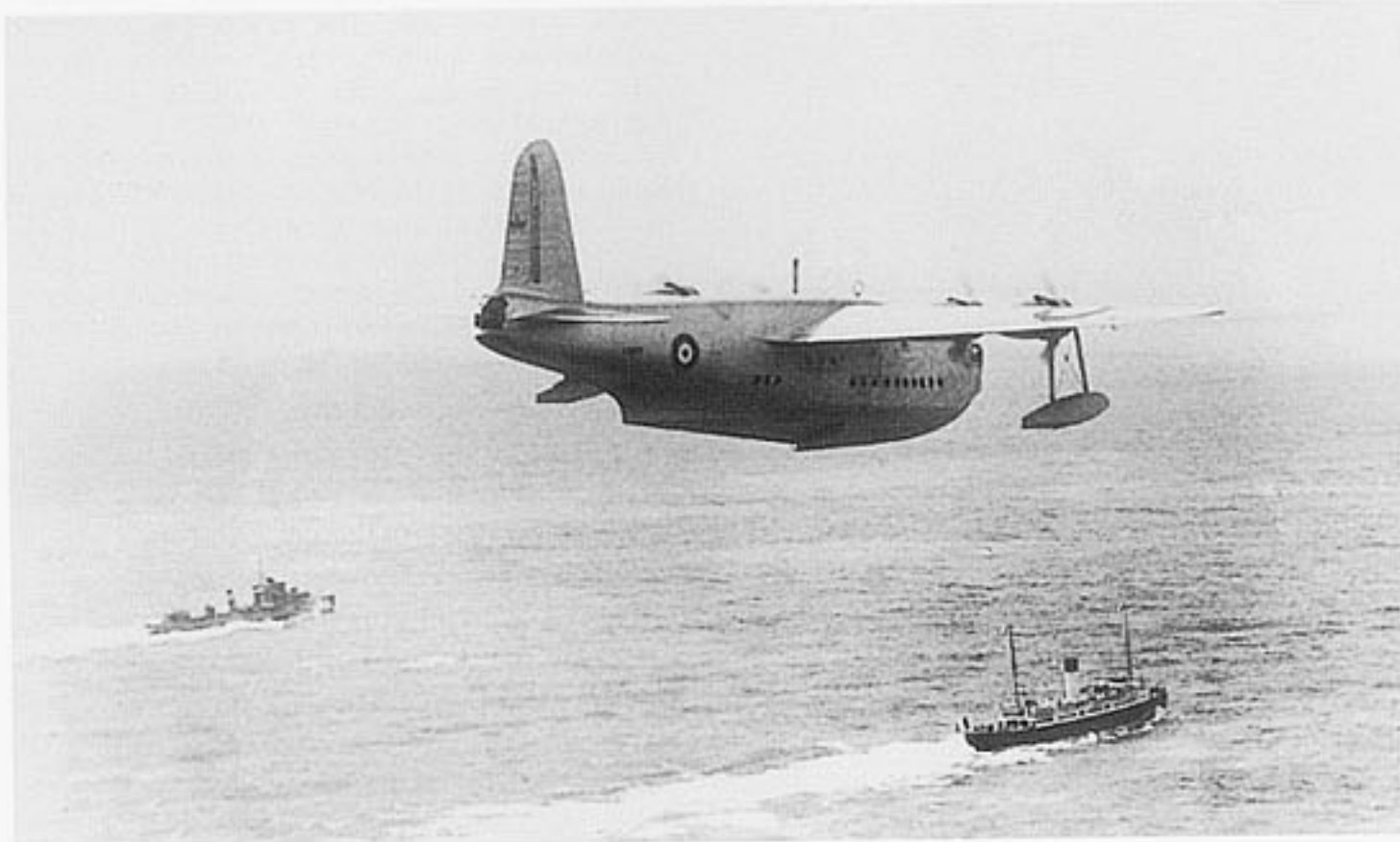


Short Sunderland Mk.III EJ143:S of No. 230 Squadron in South East Asia in 1944.



Short Sunderland Mk. III DD843:2-E of No. 461 Squadron RAAF, RAF Pembroke Dock, 1944.





An L-serialised Sunderland (possibly L5802) still in pre-war silver finish, patrols near a Royal Navy destroyer and French merchant vessel in 1940. (Bill Harrison)

which proved successful in service.

## BOMBS

All Sunderlands carried up to 2,000lb (907kg) of bombs, depth charges or mines. The weapons were carried internally on electrically operated railed racks and were wound out from this store position to the underwing inboard of the engine nacelles for dropping. The largest weapons had to be loaded outside from a boat before winching indoors but smaller anti-submarine (AS) bombs could be replenished from an internal store after an attack. At the start of the war the only available weapons for anti-submarine work were 100lb and 250lb (45kg and 113kg) bombs adapted from RAF stocks which proved to be near useless.

The need for an effective weapon was critical and standard Royal Navy Mk.VII depth charges were successfully modified with a rounded nose and tail fins for dropping from aircraft. Later a more powerful explosive called Torpex resulted in the smaller but more destructive 250lb (113kg) Mk.VIII

L2163, the sixth production Mk.I, as DA:G of No. 210 Squadron in 1939-40. Note the camouflage right down to the bottom of the hull, long fin marking style used in this period, knife edge planing bottom, the extended bomb aimer's 'V' window and newly introduced open dorsal gun mounts protected by metal windshields.

board side just forward of the rear step.

Aft of the nose turret on the lower deck was the mooring compartment where the anchor and a dinghy were stored. From here stairs led to the upper deck; at the starboard side of these stairs was the toilet, to port a gangway leading to the officer's wardroom. Further aft was the galley (complete with Primus stoves, ice chest, sink and draining board), bomb compartment, crew's quarters (with bunks) and two Vickers K guns on pillar mounts forming the midship armament (these were later replaced by swivel mounts in galley hatches); long patrols were much assisted by having the galley and rest bunks to refresh the crew. In the rear of the hull was a work bench, collapsible dinghy and stored flares and sea-markers, and the four-gun turret was fitted in the extreme stern beyond the tail. Inside several watertight bulkheads, or partial bulkheads, permitted any compartment to be flooded without the water spilling into adjacent sections of the hull.

The Sunderland was the first flying boat to be equipped with power-operated turrets. A weakness was the lack of defensive weapons beneath the fuselage so, when attacked by enemy fighters, pilots were usually forced to drop down to wave level to protect the vulnerable hull; a 'corkscrew' manoeuvre was developed, however, which enabled pilots to bear all defensive guns on the enemy while, at the same time, giving an elusive target. The gun armament was progressively increased until the Mk.V had a total of 18, the largest number on any operational British aircraft in the war.

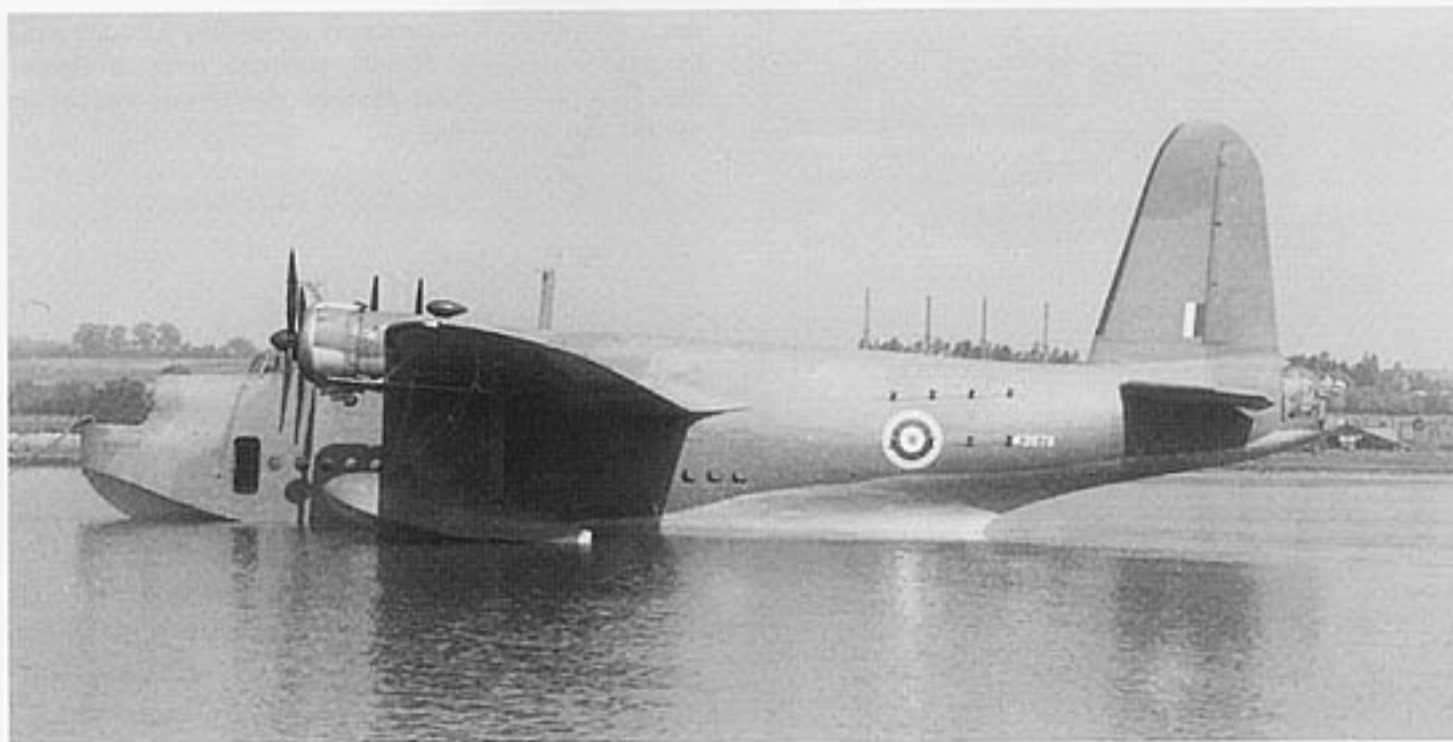
Mk.Vs had ten 0.303in machine guns housed in three Frazer-Nash turrets; four in each of the nose and tail mounts plus two in a dorsal installation first introduced on late Mk.IIs. Two 0.5in machine guns were manually operated in the beam positions (later increased to four in new hatches aft of the galley mounts and dorsal turret) and four forward-firing 0.303s were fixed in the nose, two either side behind the turret. This nose 'battery' was first employed in August 1943 by DD852 of No. 10 Squadron, this RAAF

unit having been a driving force behind fitting extra guns to combat additional defensive weapons aboard U-boats. These guns brought an increase in crew from seven to ten and some spectacular victories were achieved against faster and more powerful enemy aircraft.

In August 1940 N9050 of No. 10 Squadron participated in the testing of MDS, a secret device for locating submerged submarines by magnetic detection. The idea was to locate the sub's underwater magnetic field disturbance and showed promise but it was dropped until used again from 1943 in the American Magnetic Anomaly Detector



A Mk.I Sunderland displays its slightly swept wings and outward canted engines. A close look at the picture reveals that the censor has blotted out the radar aerials on the rear fuselage and under the wings (MAP)



depth charge which was similarly adapted for aircraft use. These became the Sunderland's prime AS weapons, a usual load comprising eight charges. Flame and smoke floats and sea markers, all standard items for work over open water, were also aboard and alternative loads later included 500lb (227kg) bombs.

Power for the Mk.I came from four Bristol Pegasus XXII nine-cylinder radial air-cooled engines rated at 1,010hp (753kW) for take-off and 840hp (626kW) at 4,000ft (1,220m). These were the latest medium-supercharged units of the Pegasus range and had standard Bristol long-chord cowlings and De Havilland three-blade two-pitch (coarse/fine) airscrews 12ft 9in (3.9m) in diameter. The Mk.V introduced the Pratt & Whitney R-1830-90B Twin Wasp 14-cylinder two-row radial, rated at 1,200hp (895kW) both for take-off and at 5,000ft (1,524m), in NACA-type cowling rings. These had Hamilton Standard three-blade constant-speed fully-feathering metal airscrews of the same diameter. All fuel was located in the wings and on the Mk.I totalled 2,025 Imp gallons (9,208lit) rising to 2,552 Imp gallons in ten tanks on the Mk.V.

The planing bottom, that part of the underside of a hull or float which is designed to

Top right: W3999 was the first true Sunderland Mk.III and was photographed at MAEE Helensburgh in April 1942 as RB:Y of No. 10 Squadron RAAF; it was shot down by an Arado 196 on 21 June over the Bay of Biscay. The new faired main step can be seen which improved performance. Right: Mk.II W3989 DQ:L of No. 228 Squadron pictured between 20 December 1941 and 7 February 1942. The outer wing Yagi aerial can be seen and the camouflage extends only part way down the hull. (Both via MAP)

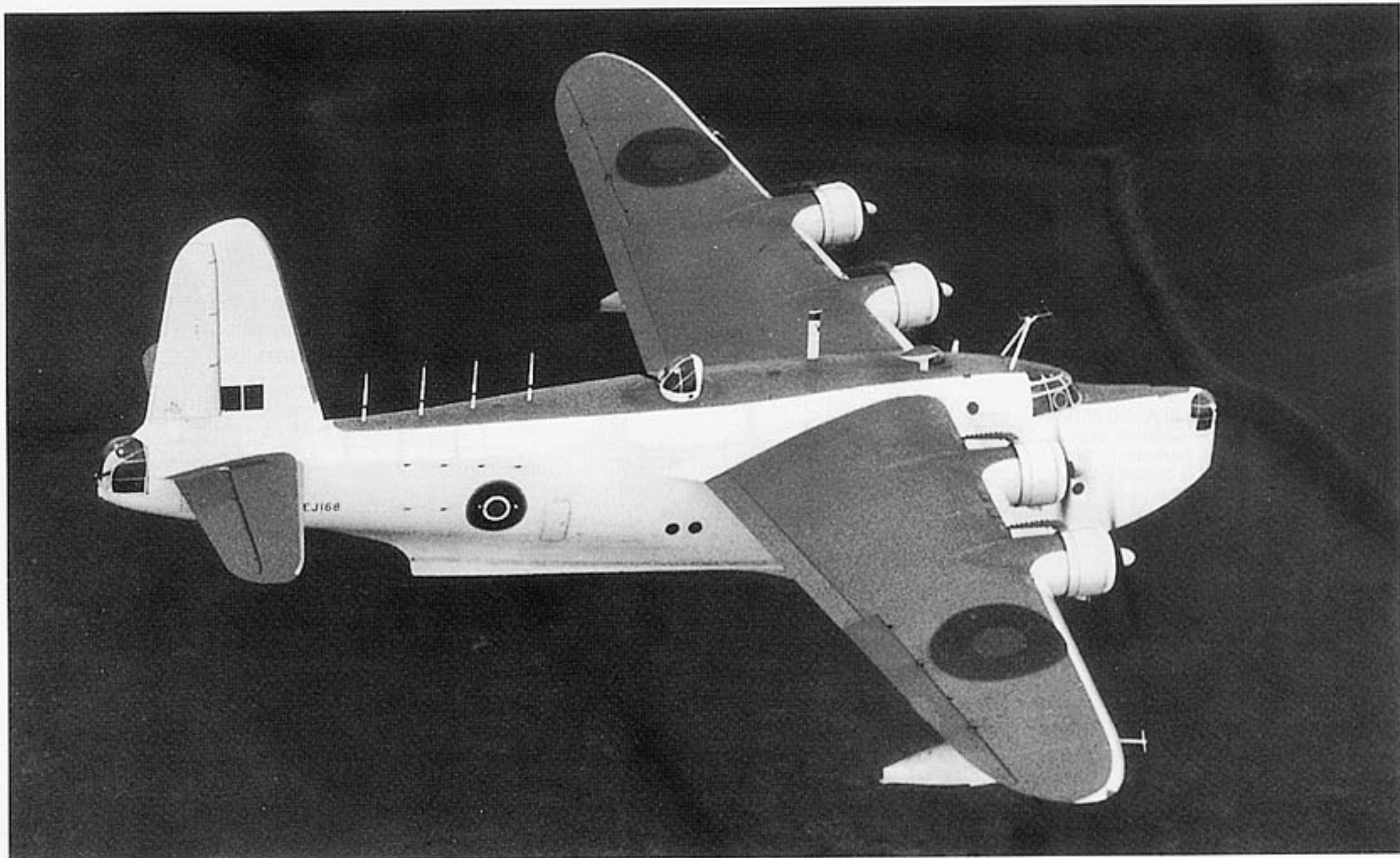
develop hydrodynamic lift, was tapered at its rear end to a vertical knife edge. In timing the Sunderland came behind the 'C' Class which allowed it to benefit from the



Left and lower left: The fourth Mk.II W3979, probably moored in the Medway, shows off the ASV.Mk.II aerials that helped to give the Sunderland its nickname 'Flying Porcupine'. Four vertical dipole receiving masts can be seen along the top of the rear fuselage, two rows of four transmitting loops on each side of the fuselage and Yagi homing aerial arrays both under the outer wings and directly above the cockpit. The retracted nose turret shows clearly. (Both Short Bros.)

former's development programme, a particular example was this improved knife-edge arrangement that replaced the transverse step of the civil machine. Only prototype K4774 had a main step equipped with a retractable fairing, operated by a member of the crew inside the bomb loading compartment. However, the Sunderland's apparent strength was deceptive; the Duralumin cladding of the planing hull was only 2mm thick so plenty of care was needed when landing in rough waters, a heavy bounce might and sometimes did tear or break the hull and cause the loss of an aircraft.

Sunderland hull shapes were tested on a Short S.22 Scion Senior seaplane, a four engine twin float machine about half of the size of a Sunderland. In 1939 one was bought by the Air Ministry for hull experiments because it appeared to make an ideal test model. The twin floats were removed and a central float fitted under the fuselage to act as a half-scale model of its big brother's planing bottom. Wing tip floats on long struts were added and the Scion Senior 'flying-boat' now serialised L9786, made a brief first flight in this form on 18 October 1939 followed by a longer trip two days later. It was sent to the Marine Aircraft Experimental Establishment (MAEE) at Helensburgh to measure hull resistance dur-



Above: Lovely view of Sunderland Mk.III EJ168 sporting Coastal Command's late-war colour scheme which helps to show up the ASV.Mk.II aerials and dorsal turret. EJ168 later joined No. 343 (Free French) Squadron and then passed into the hands of the Aeronavale in 1945. It lasted until May 1948. (Short Bros.)

ing high speed taxiing (MAEE was based at Felixstowe before the outbreak of war).

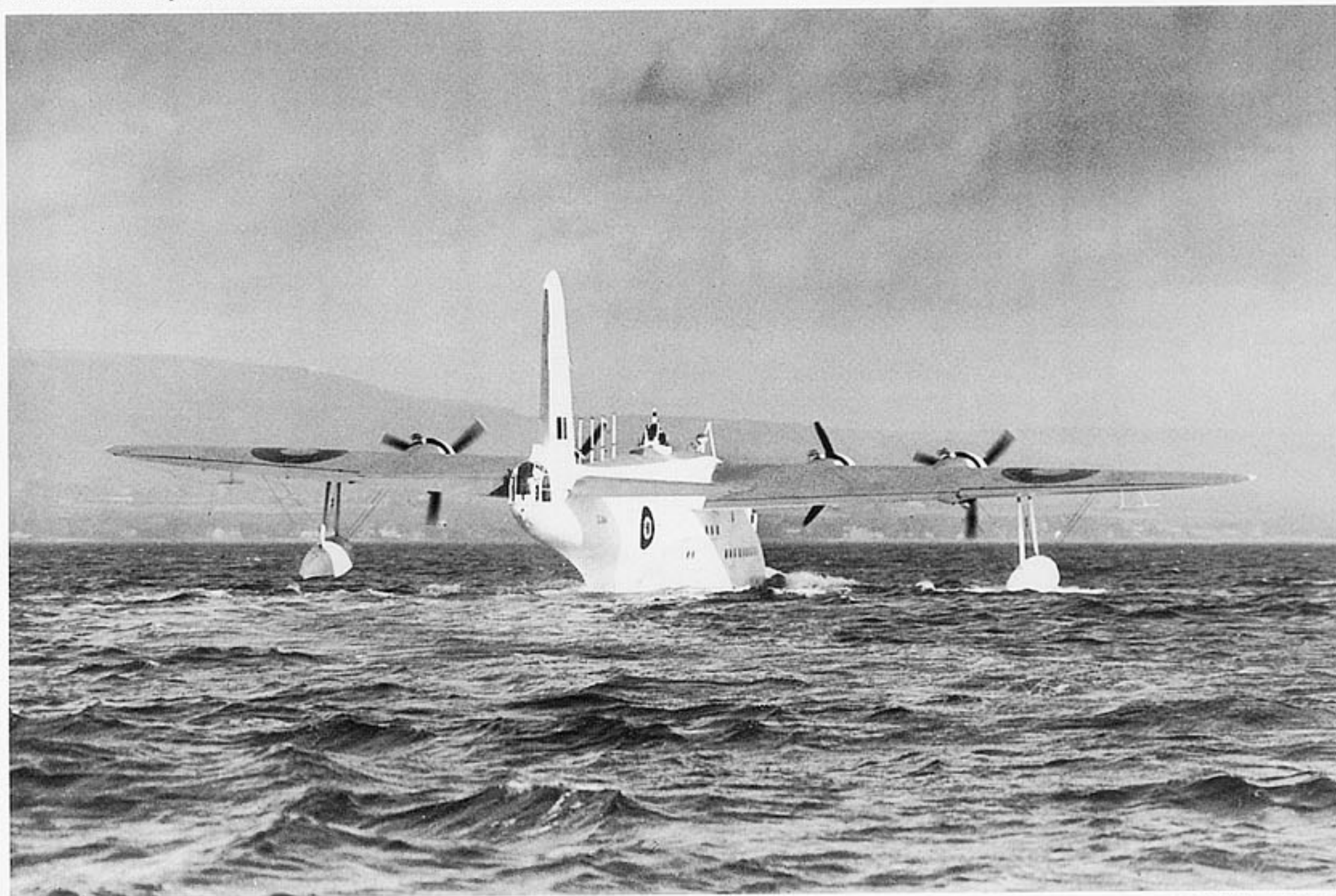
The data collected helped in the design of a faired main step introduced on the Mk.III

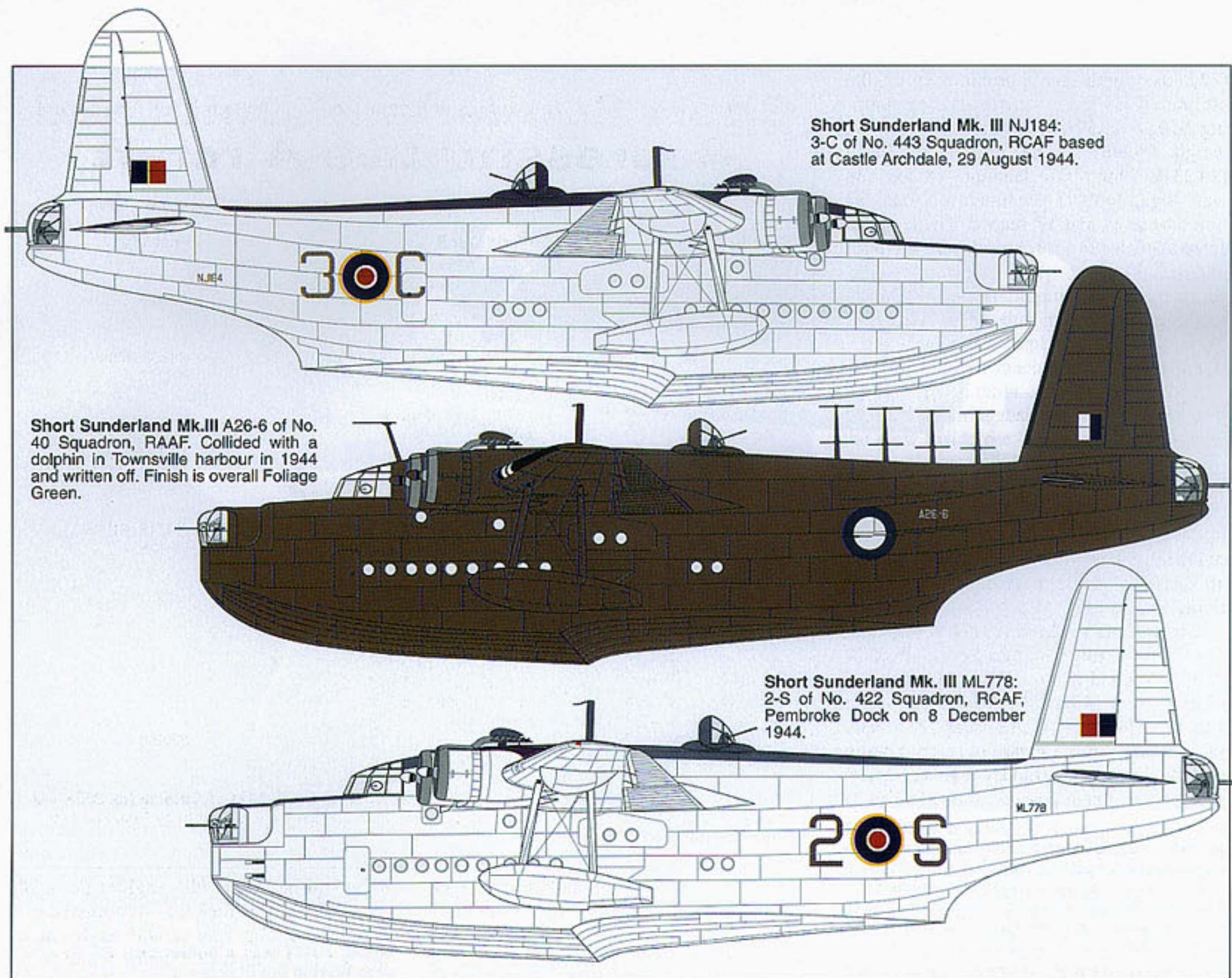
Sunderland. The Scion Senior was used for further tests until 1944 and its correlation with the behaviour of the full-size Sunderland proved far more accurate than small water tank models. In comparison Saunders-Roe's tank testing failed to indicate that its A.33 and later Lerwick boats would both perform badly on the water.

The Sunderland was far bigger than the boats it replaced. Its crew was generally

delighted to have so much room inside and the ability to walk upright was quite a novelty. Having a kitchen, 'dining room' and rest bunks helped to give the impression that this was a flying hotel. For ground move-

Below: EJ164 was a Belfast-built Mk.III and is seen taxiing out in preparation to take-off - the outer Pegasus engines are running at higher revs than the inner units. This aircraft ditched in the South Atlantic on 3 October 1944. (Short Bros.)





Short Sunderland Mk. III NJ184:  
3-C of No. 443 Squadron, RCAF based  
at Castle Archdale, 29 August 1944.

Short Sunderland Mk.III A26-6 of No.  
40 Squadron, RAAF. Collided with a  
dolphin in Townsville harbour in 1944  
and written off. Finish is overall Foliage  
Green.

Short Sunderland Mk. III ML778:  
2-S of No. 422 Squadron, RCAF,  
Pembroke Dock on 8 December  
1944.



Sunderland ML868:H, a Mk.III built by Blackburn  
at Dumbarton, in service with No. 230 Squadron  
flying over Lake Koggala in Ceylon in 1944-45. It  
shows the new planing bottom. (MAP)

ments it had a double-wheel beaching chassis that attached to each side of the hull and a tail trolley, the wheels being swivelled for side tracking.

#### TEST FLYING

After modification, K4774 next flew on 7 March 1938 and passed into the hands of MAEE at Felixstowe on 8 April. The first Mk.I production machine, L2158, flew on 21 April and the rest of the development batch were launched and flown from Rochester over a five month period. On 9 May Parker took L2158 at 44,600lb (20,231kg) weight to 13,000ft (3,962m) and then, the same day, delivered L2159 to Felixstowe to join K4774 on official trials. Once cleared for tropical use L2159 was replaced by L2158 so that it could fly to Seletar to join No. 210 Squadron. Parker took L2164 on its second flight on 6 July, taking with him some distinguished passengers including Sir Wilfred Freeman, then the Air Member for Research and Development at the Air Ministry, Arthur Gouge and Oswald Short.

On 3 June Parker undertook the contractor's fuel-jettison trials from MAEE using L2160 at a take-off weight of 48,500lb

A prickly Sunderland Mk.III, ML865:J of No. 230  
Squadron based at Koggala, Ceylon on patrol in  
1944-45 over the Indian Ocean. (MAP)



(22,000kg) with c.g. approximately on the aft limit. Two flights were made each dumping 350gal (1,591lit) of fuel to bring the weight down to the normal 44,600lb (20,231kg) for a safe landing; jettison rate was 90gal (409lit) per minute. Take-off times were 24 and 17 seconds (wind speed 15 to 20mph [24 to 32km/h]) and the pilot reported that the aeroplane's behaviour was satisfactory in every way. The take-off characteristics were further tested by MAEE in September. On 2 August preliminary night flying trials were conducted on K4774 by Sqn. Ldr. L. Martin at 41,000lb (18,598kg) weight; all tests were made in moonlight and five or six successful take-offs and landings were achieved. On 6 October the stated flying limits for the Mk.I included a maximum possible all-up-weight for all forms of flying of 45,700lb (20,730kg) at which it was recommended that the c.g. must be no further aft than 23.3 degrees aft of the c.g. datum limit.

Diving tests made in K4774 at 43,000lb (19,505kg) from heights up to 8,600ft (2,621m) found that the limits were a speed of 235 knots (435km/h) ASI or an engine speed of 2,900rpm. It was necessary to hold the control column forward in order to maintain the dive and the rudder was very heavy with no movement possible above 160 knots

A delightfully busy view of Belfast in 1943. In the foreground is veteran Sunderland Mk.I L2163 in the new colour scheme having returned to the manufacturer's on 21 April. Four new aircraft, all Mk.IIIs, are grouped behind while an immaculate Stirling bomber (possibly an EF serial) is parked to the right. Work is underway on most of these machines, note the wheeled platforms for wing access. An aircraft carrier is visible in the left background in front of the huge crane. (Short Bros.)

## Short Sunderland Units and Representative Aircraft

(Reproduced with permission from The Short Sunderland by Chaz Bowyer, Aston Publications, 1989)

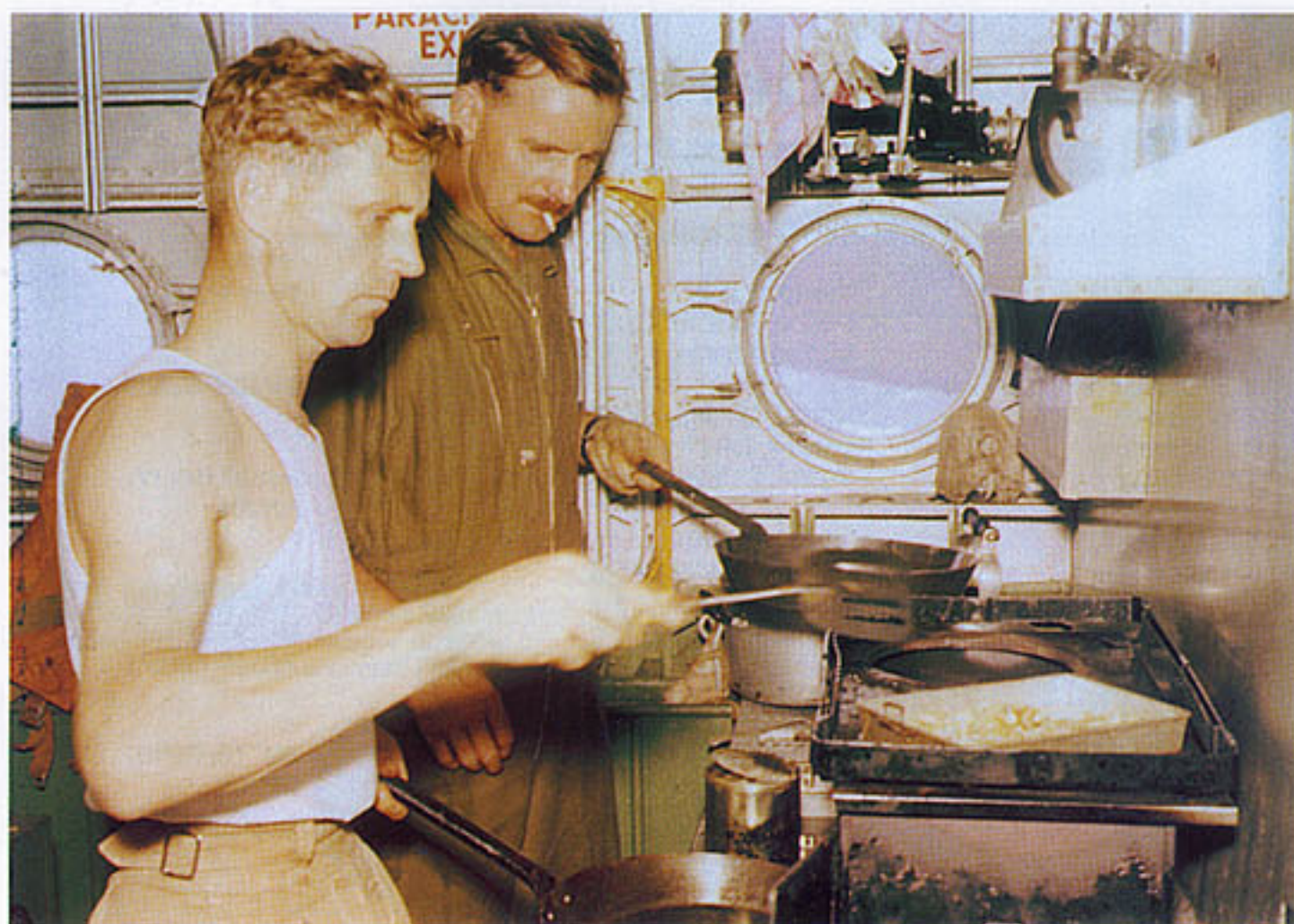
| Squadron/Unit              | World War II        | Post War             |
|----------------------------|---------------------|----------------------|
| 10 Squadron (RAAF)         | P9600, EK574, PP122 | -                    |
| 40 Squadron (RAAF)         | ML730, ML734        | -                    |
| 88 Squadron                | -                   | DP199, SZ566         |
| 95 Squadron                | N9050, DV963, DW105 | -                    |
| 119 Squadron               | W4024, DP176, EJ133 | -                    |
| 201 Squadron               | T9074, DD829 JM666  | NJ202 (Mk.IV), RN288 |
| 202 Squadron               | N6133, W4004        | -                    |
| 204 Squadron               | L5799, DV966, EK582 | -                    |
| 205 Squadron               | EJ141               | NJ265, RN269         |
| 205/209 Squadron           | -                   | ML797, VB888         |
| 209 Squadron               | L2159               | PP148, SZ571         |
| 210 Squadron               | L2163, T9073        | -                    |
| 228 Squadron               | T9046, DD834, JM678 | -                    |
| 230 Squadron               | L5801, W6078, EJ136 | JM718, PP107         |
| 240 Squadron               | -                   | PP126                |
| 246 Squadron               | W6056, DV978, EJ139 | -                    |
| 259 Squadron               | NJ259               | -                    |
| 270 Squadron               | DP190, DW109        | -                    |
| 330 Squadron (Norwegian)   | T9083, W6075, DD851 | -                    |
| 343 Squadron (Free French) | DP187, JM670, JM706 | -                    |
| 422 Squadron (RCAF)        | W4018, W6066, DV944 | -                    |
| 423 Squadron (RCAF)        | W6001, DD859, ML783 | -                    |
| 461 Squadron (RAAF)        | T9111, DD866, ML771 | -                    |
| 490 Squadron (RNZAF)       | EJ169, ML810, ML862 | -                    |
| 4 OTU/235 OCU              | N6138, DW111, ML736 | SZ568                |
| 131 OTU                    | W6056, ML842        | -                    |

No. 4 OTU was formed from the Flying Boat Training School in March 1941. It became No. 235 OCU in July 1947 and reversed to FBTS in October 1953. Sunderlands were also used by Nos. 302 and 308 Ferry Transport Units.

(296km/h). Both aileron and elevator controls were heavy but effective and throughout the dive the behaviour of the aircraft was 'excellent'. The whole structure was steady and there was no undue vibration of the controls. Longitudinal stability tests made with the c.g. forward, normal and aft showed the

aircraft to be stable with engines on or off when the c.g. was forward. At normal c.g. it was stable at high speeds, with engine on or off, but at 130mph (209km/h) found to be neutrally stable with engines on but slightly unstable with engines off. In the c.g. aft condition K4774 was unstable throughout





**Luxury Sunderland style.** All aircraft were fitted with a galley and crews cooked their own meals over Primus stoves when on long patrols over water. This rare colour picture was taken on a No. 205 Squadron aircraft when based at Seletar, Singapore. (Bill Whiter)

the speed range with engines on or off.

By 10 November L2158 had completed 61 hours 25 minutes flying and 2,725 hours at moorings and MAEE was able to declare that the general design was very good and no serious weaknesses had been revealed. The design and construction of the mainplanes and ailerons, tailplane and fin, elevators and rudder had proved 'quite satisfactory' and no serious defects in the hull structure had been found though there were some minor troubles. Excessive vibration of the bulkhead at the after end of the bomb loading station was experienced when the bomb doors in the hull sides were opened, the plywood hull floorboards had proved too flimsy and needed thickening and it was found impossible to open the bomb aimer's hatch at speeds above 150mph (241km/h) which necessitated a redesign of the hand operating gear. In addition the hull was not entirely weather-proof,

**How most remember the Sunderland.** A peaceful view of six boats moored at Pembroke Dock in the 1950s. (John Hirst)

rainwater having been found to leak excessively through the engineer's hatch.

The field of view for bombing purposes was fairly satisfactory. Both fore and aft turrets had a field of view of 180 degrees in the horizontal plane and about 135 degrees in the vertical (actual field of fire in the vertical was 105 degrees). The remainder, except directly down, was covered by the two midships gun positions but field of fire downwards was poor. Pilot view forward and to the side was excellent but neither pilot nor navigator had any view astern which was serious since it meant relying on the tail gunner to give warning of a rear attack and assistance was needed when manoeuvring in a congested harbour and preparing to take-off; an observation turret was recommended for the aircraft's captain.

In general the Sunderland's flying qualities were considered good. It was very manoeuvrable up to 150 knots (278km/h) but at higher speeds the rudder became very heavy and it was difficult to put the aircraft into a

quick turn. Both elevator and aileron controls were light and responsive over the whole speed range and all the controls were reasonably well harmonised up to about 150 knots, above that the heavy rudder was a problem and it was considered that the extreme heaviness at full speed would be a handicap to a pilot flying under active service conditions, particularly when making rapid turns near the water.

The aircraft was very comfortable to fly over long distances without automatic control, the pilot's cabin was comfortable and vibration almost negligible. Below 2,250rpm engine speed the noise was not excessive but higher levels would be fatiguing on long flights. Control near the stall was very good but as speed fell a point was reached when the aircraft lost height rapidly while still remaining under control, the pilot having no warning of the condition other than that given by his instruments. Before lateral control was lost however, a violent vibration developed through the aircraft. All tests at normal c.g. showed no vicious tendency at the stall; with c.g. slightly aft of normal a wing dropped viciously when the stall point was reached (with increased viciousness as c.g. moved back) and the aircraft showed a tendency to spin. But the vibration gave the pilot adequate warning.

The machine could be taken-off, flown and landed with the elevator trim tabs normal and no undue load was experienced on the pilot's controls, this being considered a very good feature. There was little change of trim between engines on and engines off and also remarkably little change of trim between flaps up and flaps down. From the pilot's point of view the general layout of the cockpit was absolutely excellent with all controls well placed and all instruments and indica-





tors quickly and readily visible.

### TAKE-OFF RULE

These results suggest that the Sunderland was relatively free from teething troubles. Extensive flying between October 1938 and June 1939 using L2158 and N9021 (the second aircraft from the second production batch delivered from mid-February 1939) enabled MAEE to report that a take-off at 56,000lb (25,402kg) weight was achieved in 60 seconds. The maximum recorded range and time airborne was 2,800 nautical miles (5,186km) and 20.3 hours. Normal all-up-weight was 45,700lb (20,730kg) and the limit for landing 52,000lb (23,587kg).

At 56,000lb the Sunderland reached its take-off limit with Pegasus XXIIIs, the report recommending that at such weights the tip floats should be raised 6in (15.2cm). All trials in the overload condition (about 50,000lb [22,680kg]) showed the floats were too low in the water causing increased resistance during the early stages of take-off and the bow wave formed by them threw water into the outboard airscrews. During trials at 58,000lb (26,309kg) the effect of the floats was very marked (the floats were considered a weak point and it was vital to keep them clear of rough water during take-off and landing). Mk.I dive speed was not to exceed 210 knots (389km/h) ASI and with main flaps out it was not to exceed 113 knots (209km/h). The maximum width of the Mk.I's hull was 10ft 3.2in (3.13m) at the outer edge of the step and the depth of water required to float at full load was 4ft 6in (137cm).

By November 1939 there was a need to

**Sunderland Mk.III ML828:RB-C of No. 10 Squadron RAAF seen with the crew awaiting pick-up by the launch after they had landed following a patrol. The squadron was based at Plymouth Sound at the time the picture was taken, in early 1945. (IWM)**

determine the maximum all-up-weight at which a Sunderland could safely take-off without damaging the airscrews. Early handling tests had discovered that during take-off in a choppy sea, even at normal load, a

**Weary looking ML876 at Belfast; this is a Mk.IIIA since it has an ASV.Mk.IVc radar scanner in an enclosed radome under the outer wing. Despite its appearance, ML876 had quite a career; with turrets faired over it became a civil airliner in 1946 under British registration G-AGWX (not the full Sandringham upgrade) before being acquired by Uruguayan airline CAUSA as CX-AKF. It is seen here as NS:O of No. 201 Squadron which places the date after 17 April 1944. Note the ports for the fixed nose guns directly beneath the retracted turret and another aircraft carrier, possibly HMS Glory which would have been fitting out at Belfast at about this time. (Short Bros.)**



# Short Sunderland and Seaford Production and Serial List

**Prototype** (1 built): K4774 built at Rochester

**Sunderland Mk.I** (89): L2158 to L2168, L5798 to L5807, N6133, N6135, N6138, N9020 to N9030, N9044 to N9050, P9600 to P9606, P9620 to P9624, T9040 to T9050, T9070 to T9078 built Rochester; T9083 to T9090, T9109 to T9115 built at Dumbarton

**Sunderland Mk.II** (1 prototype + 43): T9083 (prototype converted from Mk.I), W3976 to W3998 Rochester, W6000 to W6004 Dumbarton, W6050 to W6064 built at Belfast

**Sunderland Mk.III** (1 prototype + 462): T9042 (prototype converted from Mk.I), W3999 to W4004, W4017 to W4037 Rochester, W6005 to W6016, W6026 to W6033 Dumbarton, W6065 to W6068, W6075 to W6080 Belfast, DD828 to DD867 Dumbarton, DP176 to DP200 built at Windermere, DV956 to DV980 Rochester, DV985 to DV994, DW104 to DW113 Belfast, EJ131 to EJ145 Rochester, EJ149 to EJ158 Windermere, EJ163 to EJ172 Belfast, EK572 to EK596 Dumbarton, JM659 to JM689, JM704 to JM722, ML725 to ML774, ML777 to ML795 Rochester, ML807 to ML831 Belfast, ML835 to ML884, NJ170 to NJ194 Dumbarton, NJ253 to NJ258 Belfast, PP135 to PP144 Dumbarton

**Sunderland Mk.IV (Seaford GR.Mk.1)** (10): MZ269, MZ271 (prototypes), NJ200 to NJ207 Rochester (NJ208 to NJ219 built as Solent)

**Sunderland Mk.V** (2 prototypes + 154): ML765, ML839 (prototypes converted from Mk.III), ML796 to ML801 Rochester, NJ259 to NJ277 Belfast, PP103 to PP132 Rochester, PP145 to PP164 Dumbarton, RN264 to RN273 Rochester, RN277 to RN306 Dumbarton, SZ559 to SZ584, SZ598 to SZ599 Belfast, TX293 Rochester, VB880 to VB889 Dumbarton

**Sunderland Mk.III Converted to Mk.V** (88): Examples DP198, EJ155, JM717, ML780, ML816, ML866, NJ182, PP414

**Cancelled** (93): AX936 to AX950, AX973 to AX997, NE836 to NE855, TW774 to TW803, TX294 to TX296

(Mk.IV [Seaford] NJ220 to NJ239 plus 160 more also cancelled)

## Exports:

**RNZAF:** Mk.III ML792 to ML795 as NZ4101 to NZ4104 in 12.44; Mk.5 PP110, RN280, VB883, ML814, DP191, PP129, VB880, VB881, PP124, SZ561, SZ584, EJ167, RN286, RN306, PP143 & RN291 as NZ4105 to NZ4120 in 1952.

**SAAF:** Mk.V - NJ262, PP125, PP109, RN279, RN296, RN305, NJ258, NJ263, ML798, RN281, NJ266, PP156, NJ259, RN295, PP104 as 1701 to 1715 in 1945, plus PP153 not allocated new serial.

**Aeronavale:** Wartime No. 343 Squadron Mk.III 'loan' aircraft transferred to French ownership in 11.45 included DP187, EJ135, EJ163, EJ168, EK587, JM689, ML835, ML851, ML854, ML871 & ML874. Later transfers (Mk.IIIIs or 5s) - ML750 & NJ172 in 1947, ML757, ML764, ML778, ML779, ML781, ML796, ML799, ML816, ML819, ML820, ML821, ML824, ML866, ML872 & NJ170 in 1951, ML739, ML877, NJ182 & NJ190 in 1952, and ML800, RN284, SZ571, SZ576 in 1957. They retained their RAF serials in French service.

## Civil Conversions:

Representative Aircraft L5800 (to BOAC 1940/41), DD834 (to Dodero as Sandringham 2 LV-AAO Argentina 1945), JM720 (to DNL Norway as Sandringham 6 LN-IAW Bukken Bruse 1946), ML751 (to Transport Command as OQZJ, to BOAC 1.44, became Hythe G-AGJJ Henley, to Aquila Airways 2.49), ML761 (to TEAL New Zealand as Sandringham 4 ZK-AMB Tasman 1946, to Ansett Australia as VH-EBW 1949), ML818 (to BOAC as Sandringham 5 G-AHZE Portsea 1947).

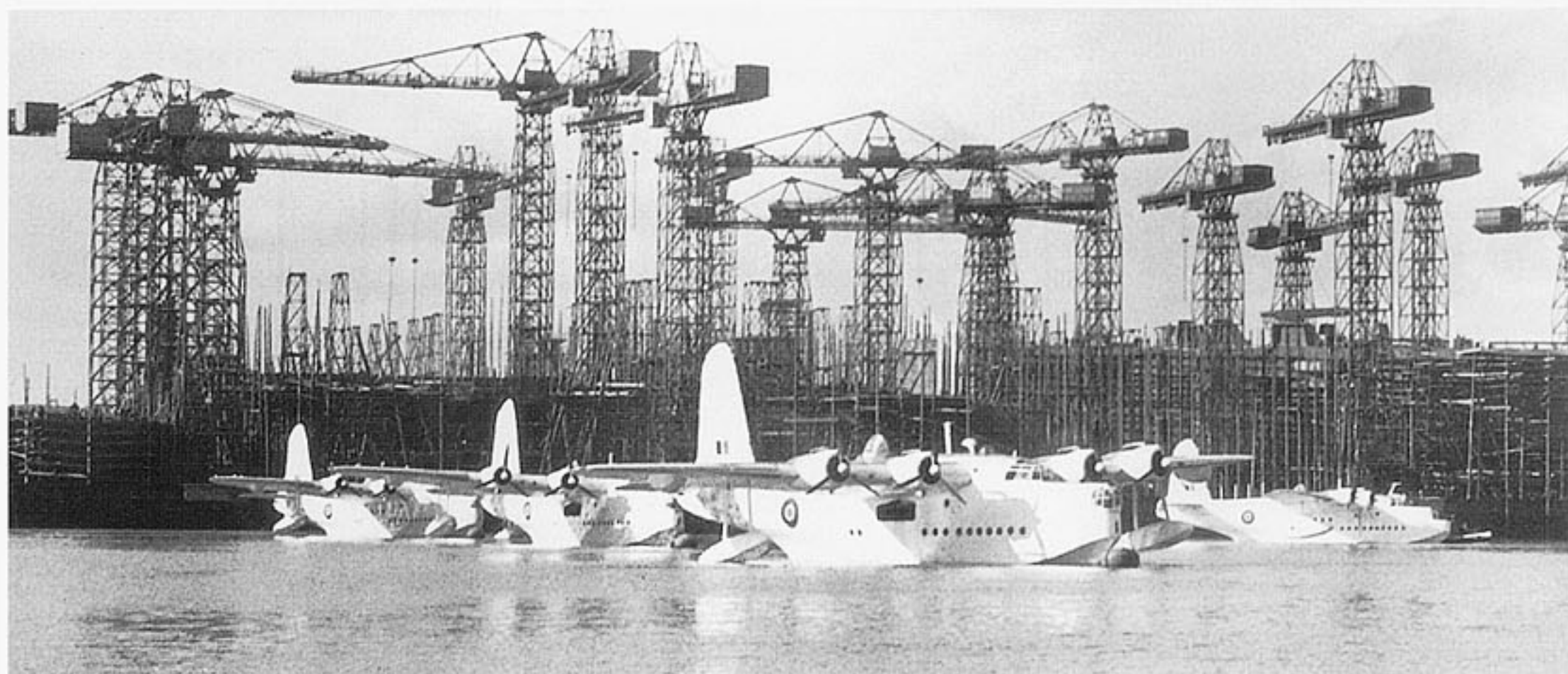
## Instructional Airframes:

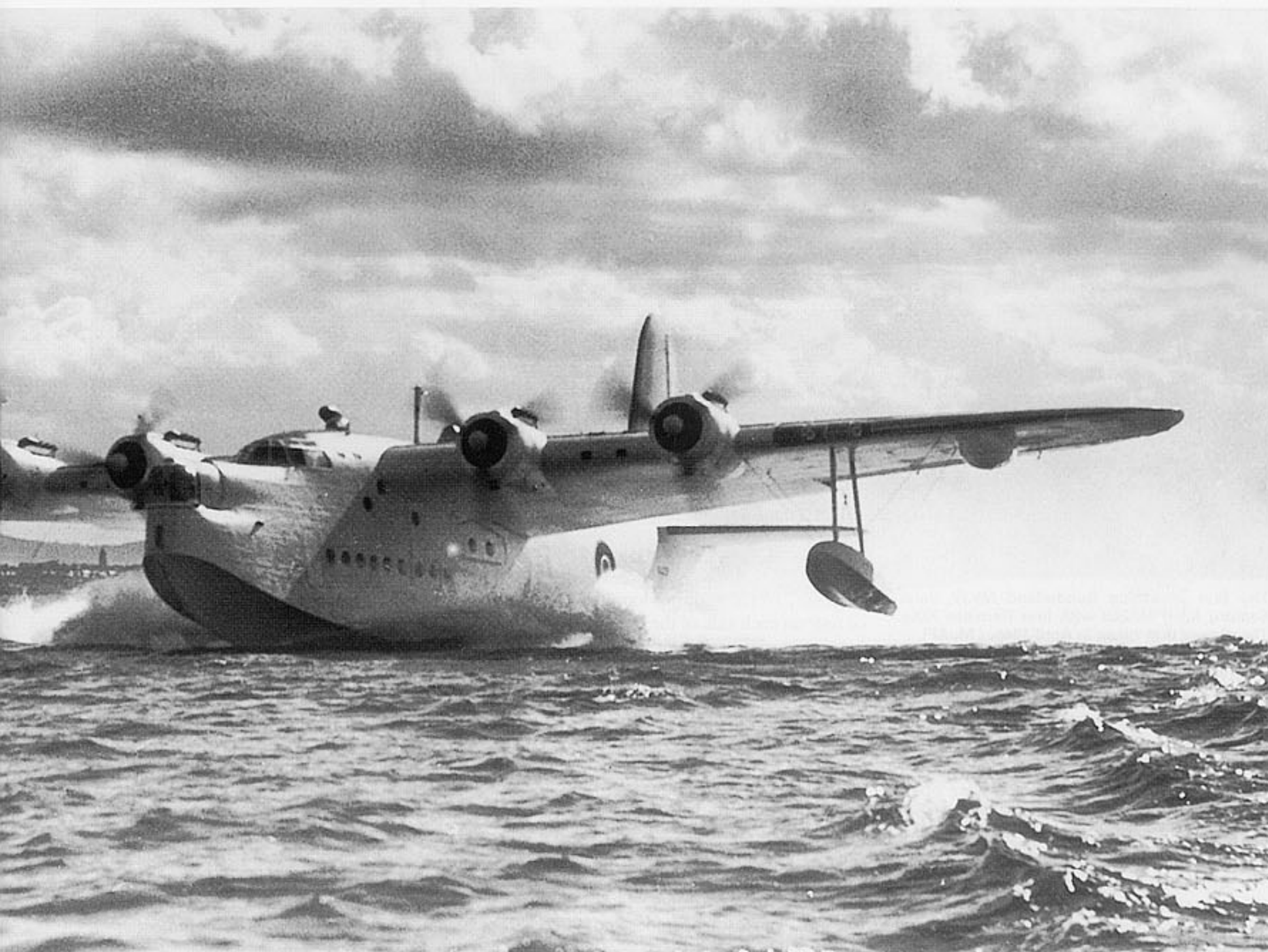
Examples Mk.I L2160 as 3372M (1942), Mk.II W3991 as 5016M (1945), Mk.III DD856 as 5716M (1945), Mk.5 RN272 as 6534M (1947).



good deal of water was thrown into the discs of the inboard airscrews and on one occasion these were damaged. Instructions were issued to MAEE pilots that when the sea was choppy the early part of the take-off run should be made on the outboard engines only and no further damage to airscrews occurred. More tests were made at different weights between November and January 1940 to clarify this.

**Below:** Four Sunderland Mk.IIIIs moored at Belfast ready for delivery in 1943. (Short Bros)





They showed that with the correct method a Sunderland could get off without inboard airscrew damage at weights up to 56,000lb. The procedure was as follows:-

- a). use outboard airscrews until the speed reached about 20 knots (37km/h),
- b). pull the stick back fully and open up the inboard engines slowly,
- c). when the bow wave was well behind the airscrews open up the inboard airscrews fully.

The method was successfully applied in a choppy sea with waves of about 1ft (30.5cm) and also in a flat calm. It was clearly limited by the water conditions and in rougher water the weight would need to be less for a safe take-off. Strong winds, however, might help by reducing the amount of throttle opening necessary on the inboard units to bring their airscrews clear of the water. Careful handling of the inboard engines was critical but this became the standard technique for take-off.

During 1943 MAEE tested some rocket projectiles (RPs) on a Mk.III. A 'mini-aero-foil' or rack with four RP rails was fitted to either side of JM681 just aft of the forward entry door in an attachment similar to that on the Liberator bomber. When waterborne these sat about 5ft (152cm) above the water. Sunderland WH:R of No. 330 Squadron at a German research centre on the Baltic just after the end of the war in Europe. In the foreground is a six-engine Blohm und Voss Bv 222 Wiking flying boat. (Alan W. Hall)

line and were loaded from a dinghy with relative ease. Trials included the firing of 160 RPs, plus another eight whilst afloat, and the arrangement proved to be satisfactory for operational use and a rigid firing platform. A full salvo did make some rivets pop out and on two occasions a porthole was blown in.

### FIVE VERSIONS

In June 1936 Short Brothers had collaborated with shipbuilders Harland and Wolff to set up a new aircraft manufacturing facility

Pure nostalgia. Few can forget the grace and beauty of a Sunderland taking off. This Mk.IIIA shows its style in rather blustery conditions. (Eric Morgan)

at Belfast called Short and Harland Ltd. Even before Empire and Sunderland production began, Rochester had become cramped and unable to cope with the demands of full production.

The first Belfast-built Sunderlands were ordered in 1940 but Blackburn Aircraft's Dumbarton factory, tied in with the Denny shipyard on the Clyde estuary to become the second line to open after Rochester,





The first prototype Sunderland Mk.IV (later Seaford Mk.I) MZ269 with four Hercules XIXs. The picture was taken in April 1945. (MoAP)

received orders from late 1939.

The first of 89 Mk.Is entered service in June 1938 and by the outbreak of war four Squadrons, Nos. 204, 210 (the first recipient, at Pembroke Dock), 228 and 230 (the first unit to fully convert, at Seletar), were operating the type. Some Mk.Is were the first to have the single K guns in special dorsal mounts protected by metal windshields.

In 1940 it was anticipated that the Sunderland would be replaced by the twin-engined Saro Lerwick but this machine's performance was so poor that the plan was never implemented. However, the Lerwick's weaknesses only came to light after Shorts had dismantled the Sunderland's jigging which ensured that for a long period in 1940 there was a severe and unexpected restriction to the production of long-range flying boats in Britain. This shortage was eased a little by the requisition of some British Airways Empire boats but it is reflected in the delivery rates. Forty were on RAF charge at the start of the war with nine more by year's end. Total deliveries for 1940 and 1941 were just 20 and 32 respectively, then increasing to 114 (1942), 202 (1943) and 196 (1944).

The Mk.II was introduced in 1941 but only 43 were built. This had the Pegasus XVIII with two-speed superchargers and later incorporated the new two-gun dorsal turret described earlier, which was based on the Blackburn Botha mounting and replaced the two open K-gun mountings aft of the wing. The arrangement became standard on the Mk.III. Most Mk.IIs had the new anti-surface vessel (ASV) Mk.II 1.5m radar which externally introduced four vertical dipole receiving masts along the top of the rear

The fifth production Seaford GR.Mk.I NJ205, probably at Rochester in 1946; note the enlarged fin compared to the standard Sunderland arrangement and the different mid-upper turret. NJ205 flew with BOAC as Solent 3 G-AKNS *City of Liverpool* and then passed to MAEE as WM759 in 1951. It was scrapped at Hamworthy in 1954. (MAP)

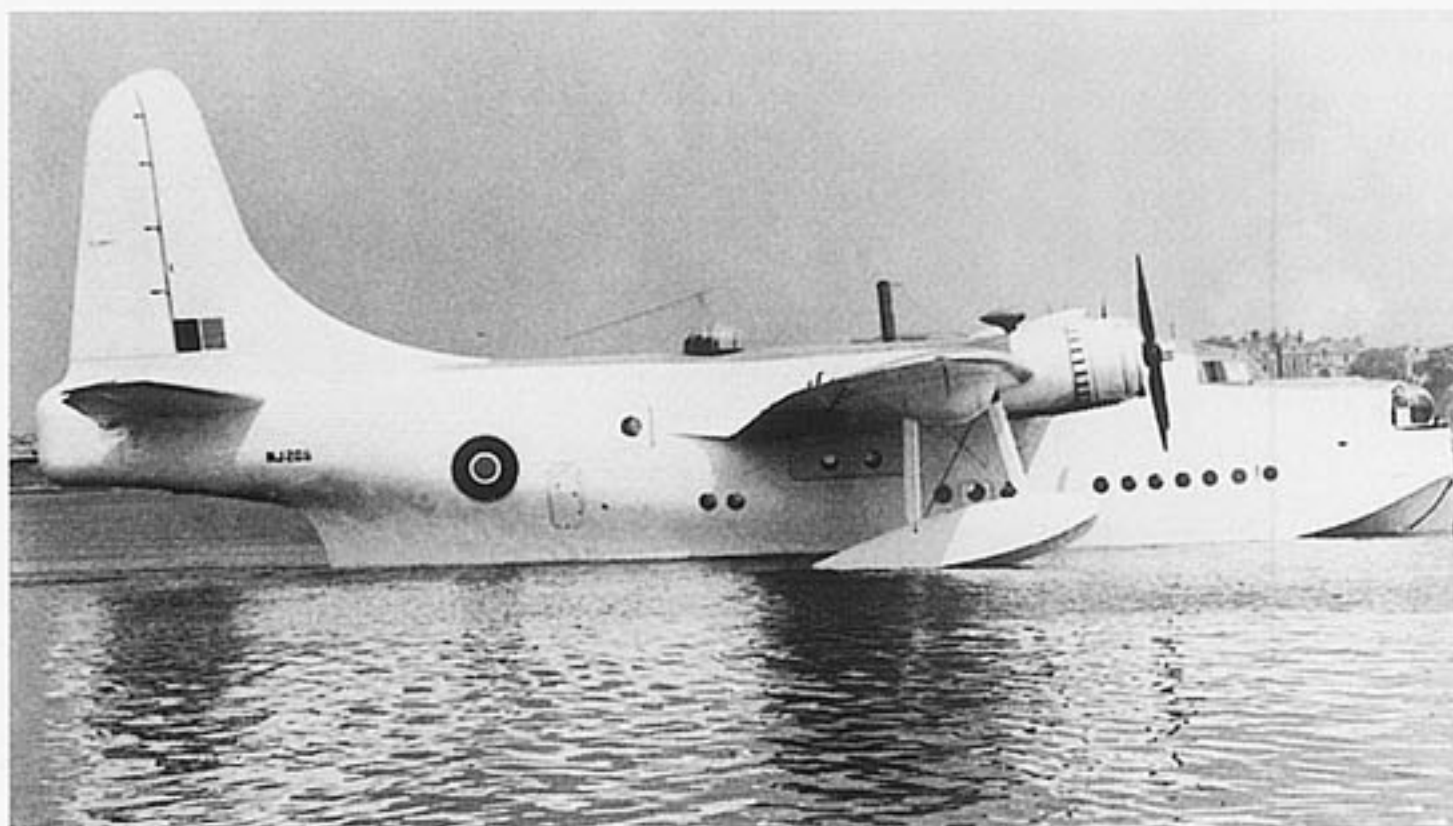
fuselage, 16 transmitting loops in two rows of four on each side of the fuselage plus Yagi homing aerial arrays both underwing and directly above the cockpit. To the Germans the Sunderland became known as the *Fliegende Stachelschwein*, the 'Flying Porcupine', a term reflecting its apparent prickly appearance from these external aerials and its ability to pump ever more lead at an enemy from an increasingly heavy armament.

Belfast started production with Mk.II W6050 which was launched on 10 April 1942 and flown two weeks later. But by far the most numerous Sunderland (462 new-build) was the Mk.III, the prototype T9042 getting airborne on 28 June 1941. This was a Mk.I converted at Rochester; the first true Mk.III was W3999 flown on 15 December 1941. Various refinements included the improved planing hull tested on the Scion Senior, the last major change to the Sunderland's airframe; it lasted into the 1960s with virtually no further alterations.

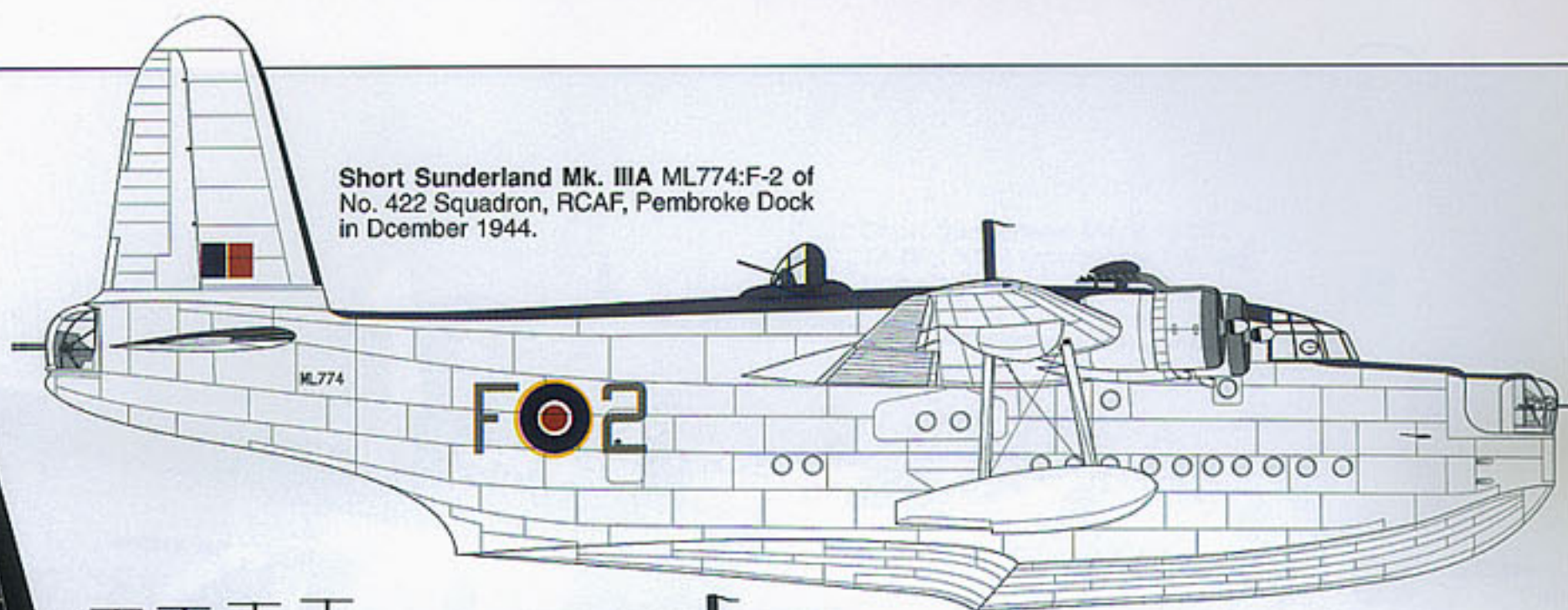
It was long known that a flying boat's main step accounted for considerable air drag and this new faired arrangement was found to decrease this drag by about 10 per cent without serious disturbance to the hull's hydrodynamic performance. However, the format was imperfect since at high weights it devel-

oped the new phenomenon of 'skipping'. The up and down pitching on the water known as porpoising was generated by fore-and-aft fluctuations in pressure on the submerged part of the hull but previously this had been confined to the forebody ahead of the main step. The faired step allowed development of suction and pressure fluctuations along the whole length to create this new problem which was also known as 'bounce porpoising'. As a result the Mk.III and all subsequent Sunderlands were better aerodynamically but 'dirtier' in the water. Satisfying the needs of boat and aircraft design together was not easy.

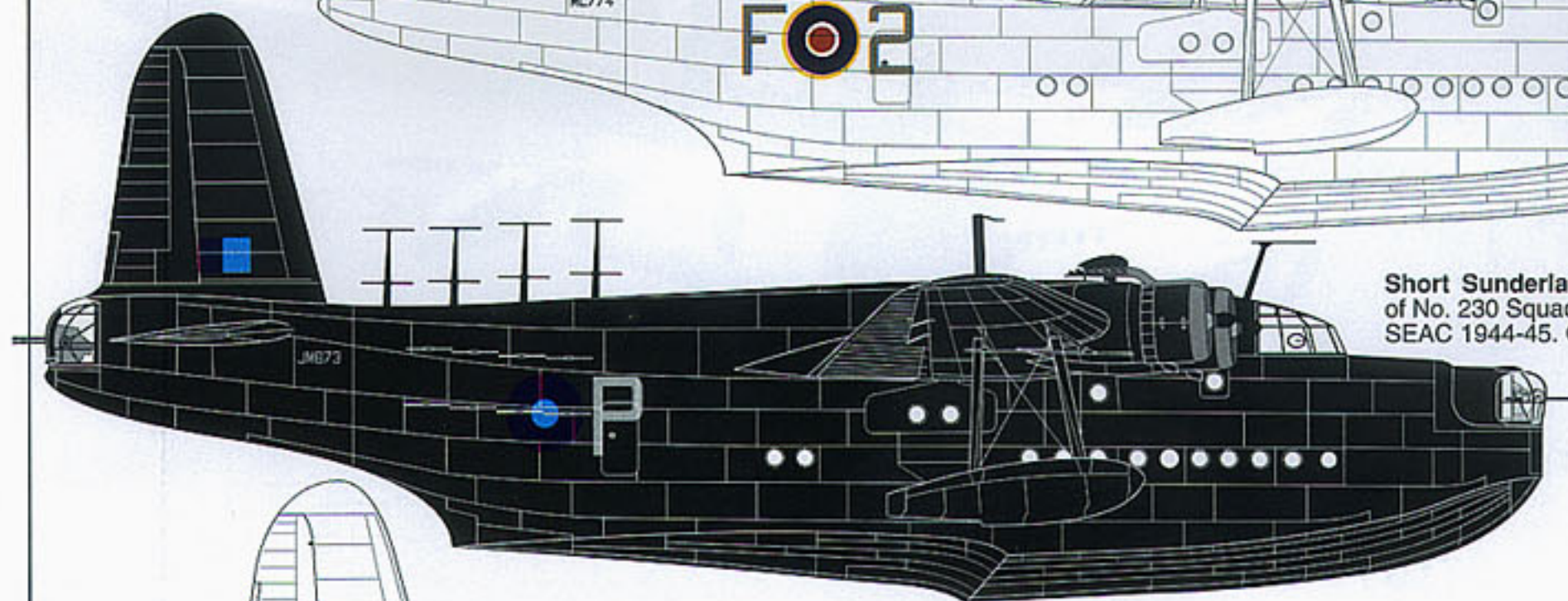
To give U-boats more time to dive to safety the Germans developed the FuMB1 'Metox' radar search receiver that could detect ASV.Mk.II waves and warn if an aircraft was in contact. This worked so well that approaching Sunderlands began to find the blips disappearing from their radar screens before they could get close to the target. The solution was an adaptation of the centimetric H2S system used by Bomber Command as the ASV.Mk.III which allowed the flying boat to detect U-boats at night and this was introduced in the Sunderland Mk.III from early 1943.



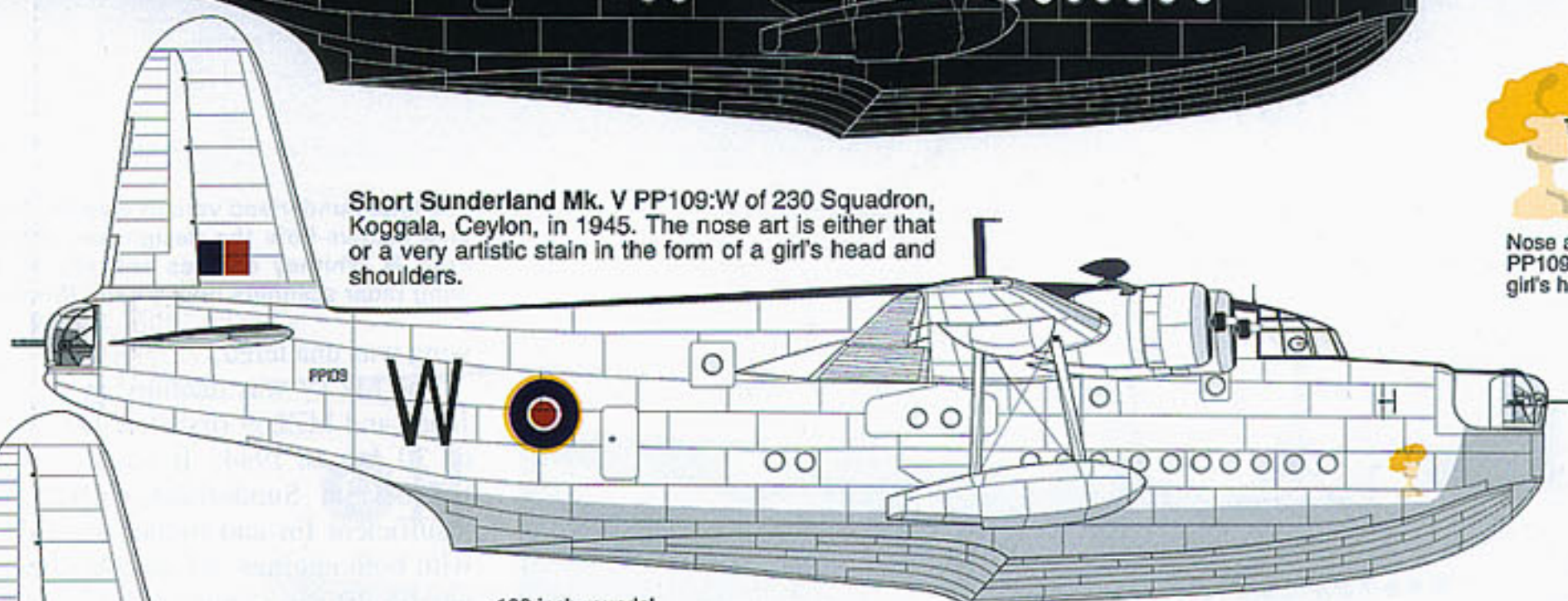
Short Sunderland Mk. IIIA ML774:F-2 of No. 422 Squadron, RCAF, Pembroke Dock in December 1944.



Short Sunderland Mk. III JM673:P of No. 230 Squadron. Flown by CO in SEAC 1944-45. Overall night finish.



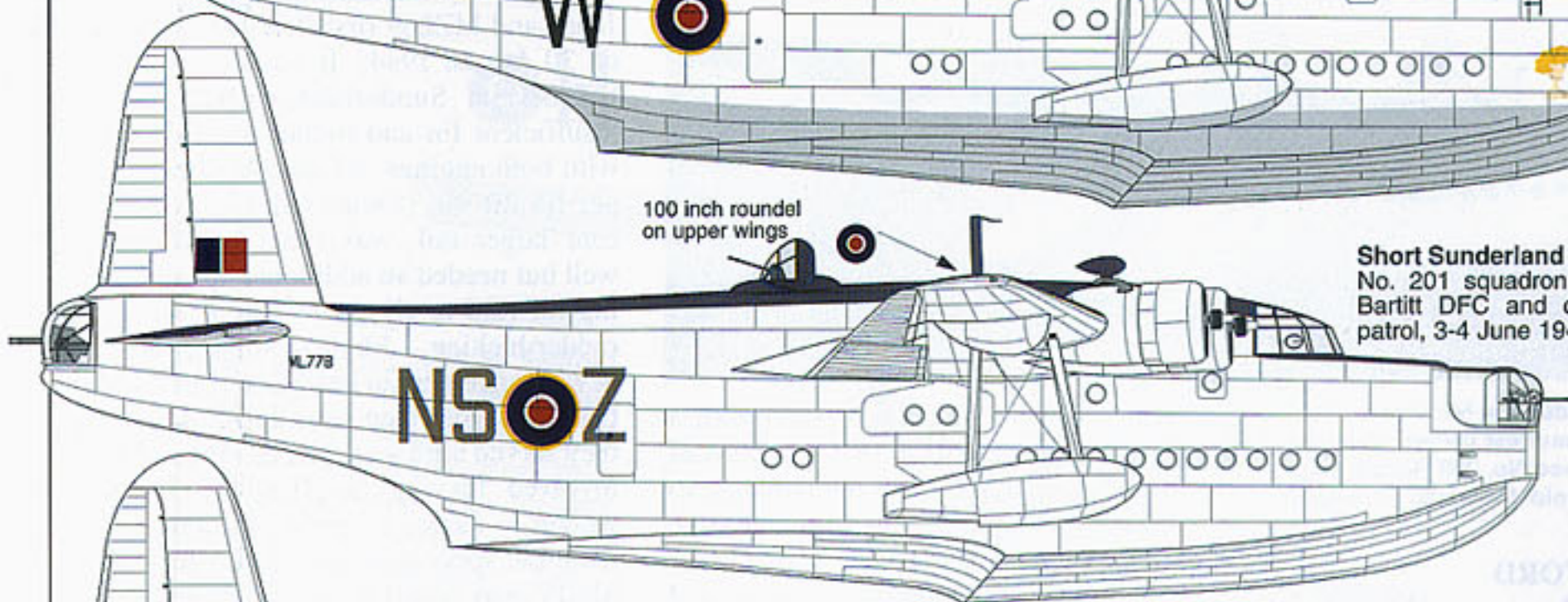
Short Sunderland Mk. V PP109:W of 230 Squadron, Koggala, Ceylon, in 1945. The nose art is either that or a very artistic stain in the form of a girl's head and shoulders.



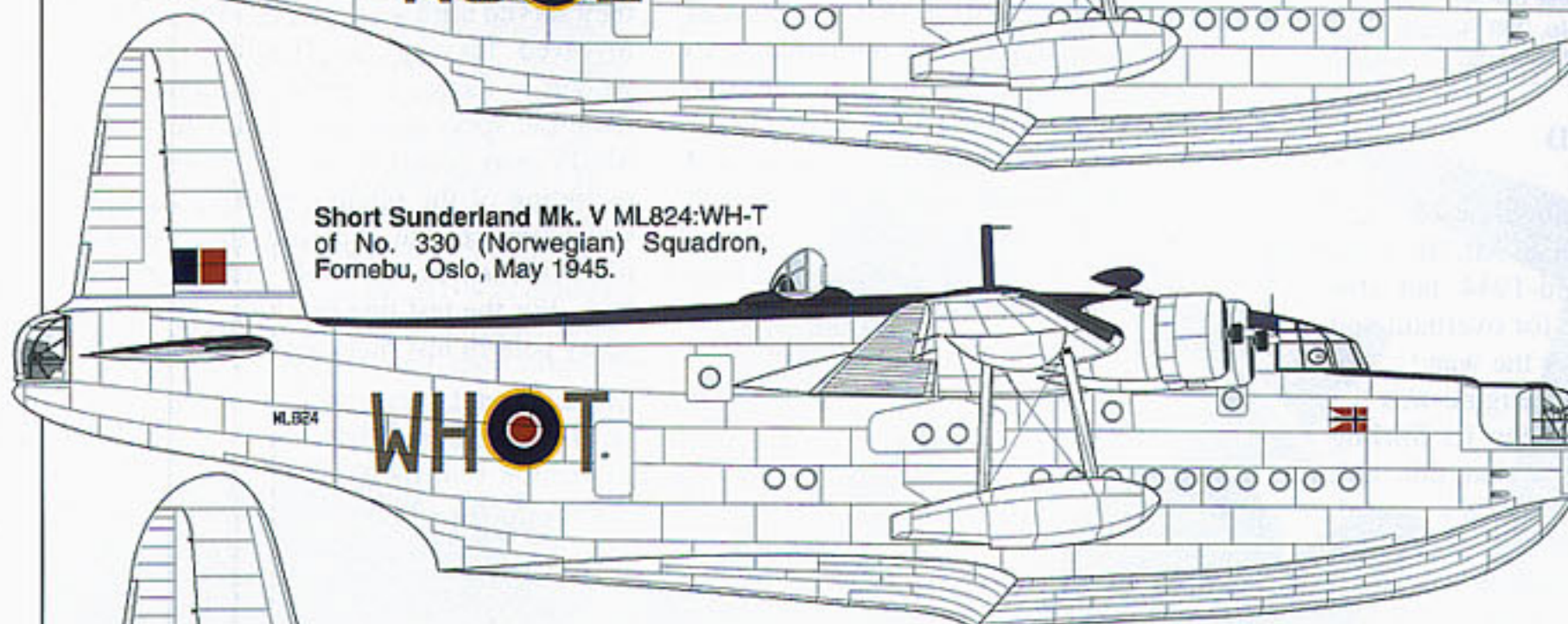
Nose art on PP109 of a girl's head

100 inch roundel on upper wings

Short Sunderland Mk. III/V ML778:NS-Z of No. 201 squadron. Flown by Wg.Cdr. J. Bartitt DFC and crew on the final war patrol, 3-4 June 1945. P&W engines.

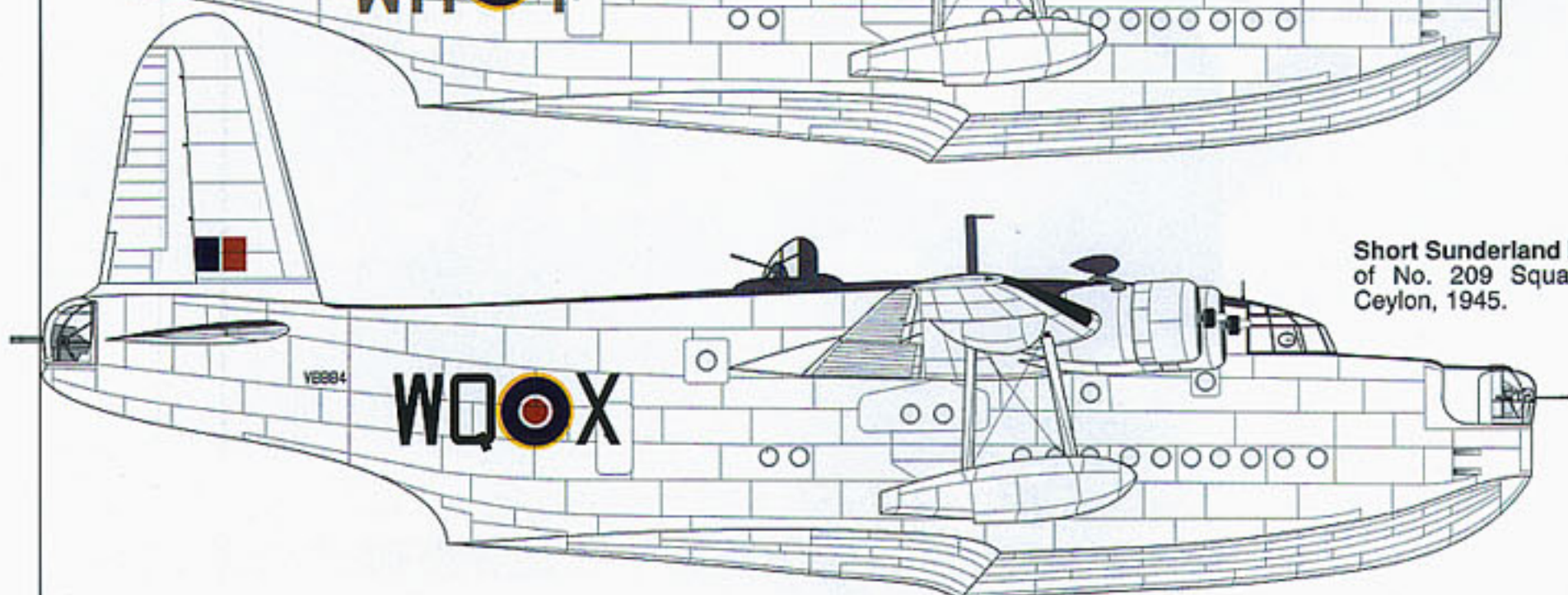


Short Sunderland Mk. V ML824:WH-T of No. 330 (Norwegian) Squadron, Fornebu, Oslo, May 1945.



Norwegian flag on ML824.

Short Sunderland Mk. V VB884:WQ-X of No. 209 Squadron, at Koggala, Ceylon, 1945.





The final Sunderland variant was the Mk.V. This view shows how the design has evolved with Pratt & Whitney engines and enclosed underwing radar scanners now fitted. (Short Bros.)



PP105 was the ninth production Mk.V to be built at Rochester and had a modest career. Pictured in November 1944 it joined No. 209 Squadron in March 1945 and was sold for scrap in March 1947. (MoAP)

### SEAFORD

A new Shorts factory at Bowness on Lake Windermere built a number of Mk.IIIIs from September 1942 until mid-1944 but this facility was used primarily for overhaul and heavy repairs; it closed after the war.

A more powerful Bristol engine was the Hercules which Shorts used on its Stirling bomber and it was realised that this unit could improve the Sunderland's speed. Work began in late 1941 shortly after Japan entered the war and the resulting Mk.IV, to Specification R.8/42 of November 1942, had 1,700hp (1,268kW) Hercules XIXs and four-blade De Havilland propellers. Orders followed for two prototypes and 40 production aircraft serialised MZ269, MZ271 and NJ200 to NJ239.

Changes to the airframe were minimal but included 3ft 3in (99cm) of additional hull length, 1ft (30.5cm) more maximum beam, a

carefully redesigned planing bottom with a 3in (7.6cm) deeper main step and almost five degrees of dihedral on the tailplane to help clear it of spray. A powerful defensive armament comprised twin 0.5in Browning machine guns in Frazer-Nash nose and Glenn Martin tail turrets, single 0.5s on each side of the hull in beam hatches, two fixed forward-firing 0.303 Browning machine guns in the nose and twin 20mm Hispano cannon in a Bristol mid-upper turret. The

wing was unaltered.

The Mk.IV was intended to serve against Japan and MZ269 first flew from Rochester on 30 August 1944. It was discovered that the normal Sunderland vertical tail had insufficient fin and rudder for yaw control with both engines out on one side so a bigger fin 2ft 9in (84cm) taller, plus a 20 per cent larger tail, was fitted which worked well but needed an additional dorsal fin fairing forward to eliminate a new problem of rudder-locking. Flight testing cleared the new arrangement in late March 1945 and the two prototypes then passed to MAEE where they served until scrapped in 1947. One trial involved taxiing at 80,000lb (36,288kg) weight to assess propeller and tail damage from the spray patterns created because the Mk.IV was found to suffer from resonance pounding of the planing bottom, caused by wave impact, and skipping after landing at high incidences, the only real problems it had. For the test one machine carried black spray pattern test markings along its hull.



Sunderland Mk.V RN299 4X:P of No. 230 Squadron, seen in the Pool of London, with the Tower Bridge on the left, at a Battle of Britain celebration in 1946. This aircraft was not scrapped until October 1957. (MAP)

Short Sunderland Mk. V RN272:  
TA-D of No. 4 Operational Training  
Unit, Pembroke Dock, 1945.

Short Sunderland Mk. V RN296:  
MR-B of No. 35 Squadron, South  
African Air Force, Congolla  
Dockyard, Durban early 1945.

Short Sunderland Mk. V RN297:H  
of No. 88 Squadron, Hong Kong  
November 1947.

This upgrade was retitled the S.45 Seaford GR.Mk.1 but with the rise in maximum weight to 75,000lb (34,020kg) restricting the planned improvements in performance there was little point in putting it into service once the Pacific war was over. Speed gain over the Mk.III was only about 32mph (51km/h). Just the first eight production Seaford Mk.IIs were finished, without tail turrets, most having brief trials with No. 201 Squadron in spring 1946. Unarmed NJ201 was evaluated by Transport Command as a trainer/transport under code OZZA and then went to MAEE with NJ200. It received the nose and tail of the new Solent airliner and NJ202 to NJ207 were fully converted into Solents in 1948. Of the others, NJ208 to NJ219 were completed as Solents for BOAC; the rest were not built.

The last Sunderland was the Mk.V of which 154 were built new and another 88 converted from other marks. A weakness of the Pegasus XVIII was the need to run it almost continuously at combat rating which reduced each engine's service life, a situation brought about primarily by the weight of so much extra equipment. In addition many examples were reconditioned ex-Bomber Command engines and the wear and tear brought overheating and failures. Early on the lack of non-feathering propellers had caused some blades to shear off in flight and all of this gave much anxiety to the crew.

Plan view  
showing  
interim and  
final camouflage  
demarkations

Plan view of  
1943 pattern  
Extra Dark Sea  
Grey and later  
Medium Sea  
Grey (post war)  
showing 'B'  
and 'C' roundels

Plan view of  
'A' pattern  
camouflage  
(B is the mirror)  
showing  
'A' and 'B'  
type roundels.  
'A' type carried by  
L and N serialled  
aircraft.



Sunderland Mk.V RN282 UT:N of No. 461 Squadron RAAF in the spring of 1945. This machine then served with the RAF until scrapped in May 1958. (Alan W. Hall)

A more powerful alternative was most desirable and in early 1944 work began fitting ML765 at Rochester, and ML839 of No. 10 Squadron at Mount Batten, with the Pratt & Whitney Twin Wasp as the Mk.V. The four engines supplied to No. 10 had originally been earmarked for a trial in Bristol Beauforts. They flew in March and on 4 May respectively and were highly successful; a fully loaded Sunderland could now fly safely with both airscrews feathered on one side, something not possible before. The first production was ML796 which also had the new ASV.Mk.IVc radar. The Yagi aerials under the outer wings were replaced by split scanners in enclosed flush-fitting radomes, a feature already on the last Mk.III making them Mk.IIIAs. This apparatus's planned position indicator now pro-

vided what was essentially a map of the area over which the aircraft was flying rather than the primitive screen displays of older ASVs.

Nos. 228 and 461 Squadrons were the first recipients of the Mk.V in February 1945 where they were painted 'Coastal White'. It was too late for this variant to make a mark against the U-boats but, as described later, there would be plenty to do after the war. Normal cruise endurance rose from 13.5 hours for the Mk.III to 15 hours for the V though one South African Air Force machine, on maximum economy settings, completed a flight of three minutes under 20 hours in July 1948. It landed with fuel left for a further hour having achieved a consumption better than one mile per gallon.

A total of 749 Sunderlands were built, 331 including the prototype at Rochester, 250 at Dumbarton, 133 by Short and Harland, Belfast, and 35 at Windermere. Production began before the war started in Europe and

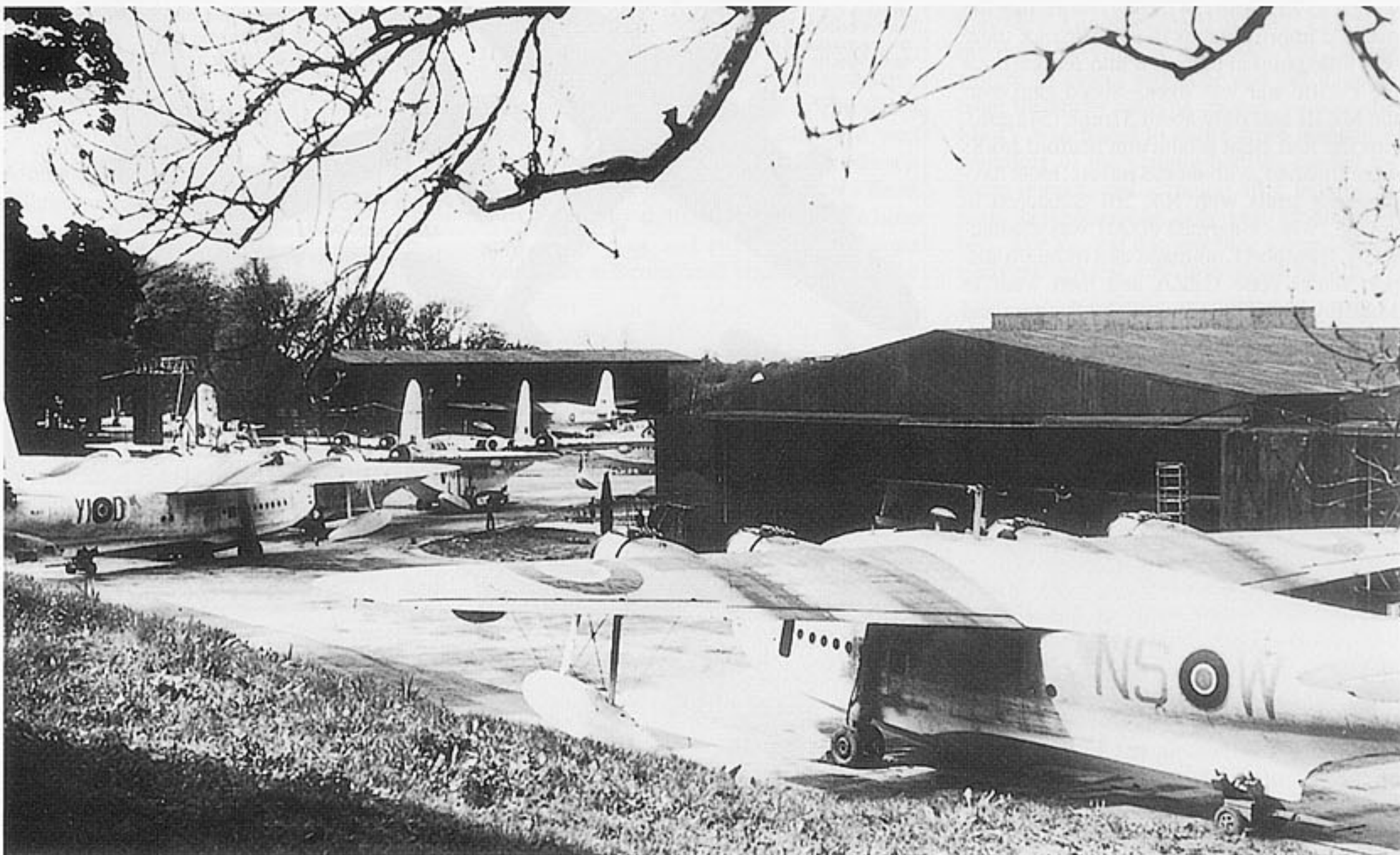
closed after the end of hostilities.

## ATLANTIC ROLE

The Sunderland was an extremely effective anti-submarine aircraft and it will probably always be most remembered for its work against German submarines in the Battle of the Atlantic. The principle job was to protect Allied shipping, particularly merchant vessels in convoy, but such was the capability of the Sunderland that it also found much employment as a transport and supply aircraft and as an air-sea rescue type. Ninety per cent of patrols comprised very long and often dull and boring ocean trips either escorting convoys or searching open sea for U-boat contacts but operations near France or across the Bay of Biscay, after that country's fall, became the favoured submarine route to the Atlantic. Here Sunderlands were always threatened by enemy aircraft. Occasionally the search for submarines was interrupted by searches for Germany's large surface warships or its merchant blockade runners when they attempted to reach the open ocean.

Early operations included reconnaissance and transport trips around Norway by aircraft of Nos. 204, 210 and 228 Squadrons based temporarily at Sullom Voe and Invergordon (later renamed Alesund). Once this campaign was over and France had fallen the workload over the Western Approaches and Atlantic rose appreciably. Sunderland bases for the battle included Mount Batten, Pembroke Dock, Stranraer,

**The UK Maintenance Unit for Sunderlands was at Castle Archdale. Here a variety of different versions mingle in the hangar area. In the foreground are two Mk.IIIIs the right being EJ150 from No.201 Squadron whilst that on the left, coded YI:D, belonged to No. 423 Squadron RCAF (via MAP)**





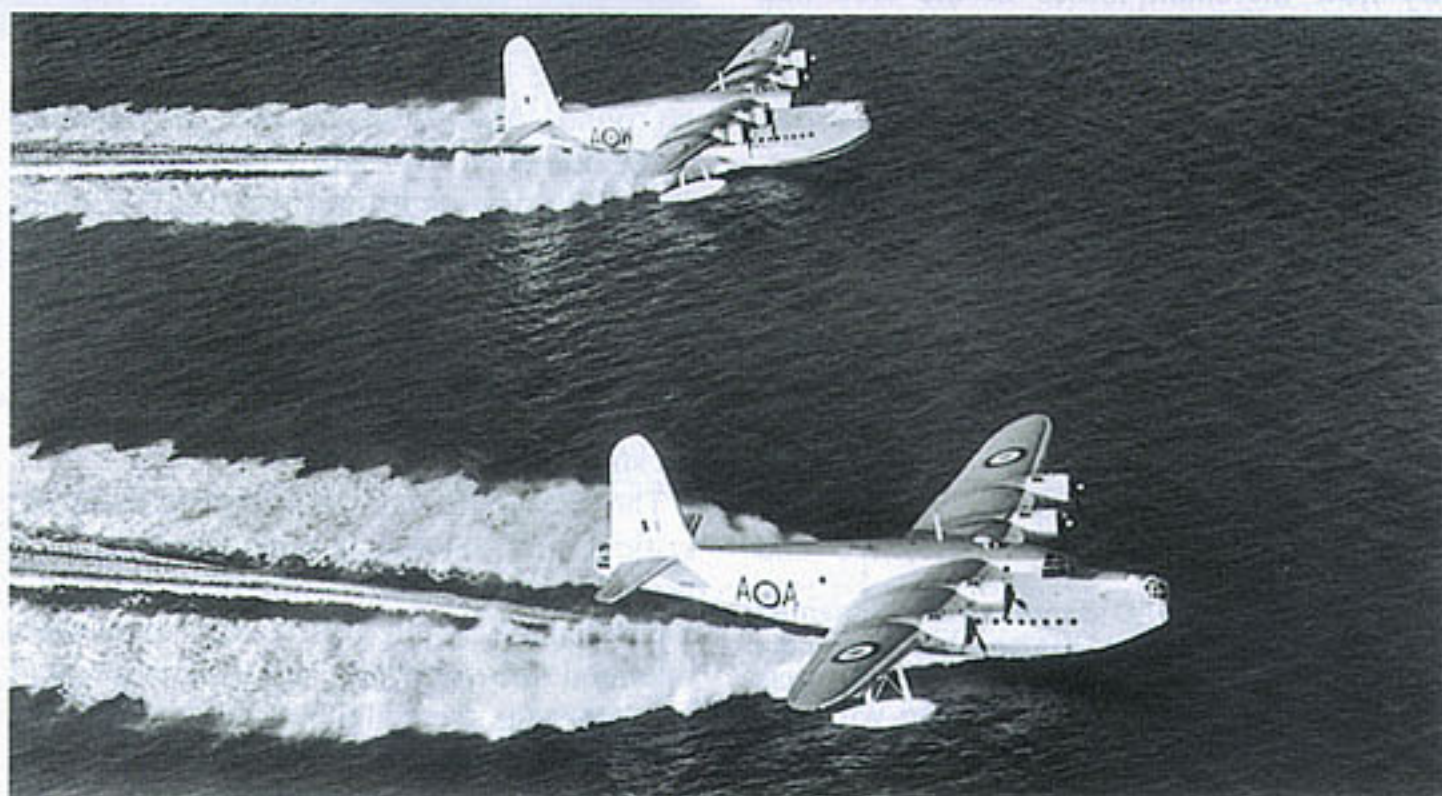
**A No. 205/209 Squadron Sunderland Mk.V being refuelled at China Bay, Trincomalee, Ceylon. (Bill Whiter)**

Lough Erne (later renamed Castle Archdale), Oban, Bowmore, Hamworthy (Poole) and Sullom Voe, plus Reykjavik and Gibraltar. Not all were ideal moorings, Oban for example suffered greatly in winter from fog and low cloud and many lacked full facilities when first established.

The main Sunderland Operational Training Unit, No. 4 OTU, was initially based at Wig Bay from March 1941 and this venue also became the home of No. 57 MU which, from October 1943, became the primary flying boat servicing and storage Maintenance Unit in Britain.

The first squadron to equip after the war began was No. 10 RAAF, this unit having originally intended to return to Australia with its new mounts. But it stayed in Britain under the direct control of the Australian Air Board which gave it more freedom to act promptly than was often possible under Coastal Command. For example when France capitulated in June 1940 it was a No. 10 boat that flew Lord Gort and Duff Cooper to Morocco to secure the co-operation of the Free French in North Africa. No. 10 operated from Mount Batten in Devon for most of the war until disbandment in October 1945. The next Sunderland RAF unit to form was No. 201 Squadron in 1940.

The first U-boat success came on 30 January 1940 when U-55 was scuttled during an attack by a No. 228 Squadron Sunderland having already been damaged by surface ships. But there were few kills or assists to warship kills in 1941 as the whole concept of AS warfare, with properly equipped warships and aircraft in sufficient numbers, only gradually came together as resources allowed and as the experienced



**Above: Two Sunderland Mk.5s of No. 201 Squadron leave characteristic wakes during a multiple take-off demonstration in the 1950s. (Flight photo) Below: A special patrol. Sunderland DP200 B:Z of No. 230 Squadron from Pembroke Dock, passes over the then brand new Royal Yacht *Britannia* as it passed Gibraltar on the Queens first overseas tour on 11 May 1954. (MAP)**



Right and below right: Two views of Sunderland Mk.III ML793 with faired over turrets. The taxiing shot shows how much a Sunderland sinks down into the water, the 'high speed' view reveals how the boat sits-up out of the water before it reaches the take-off point. This machine was delivered to the RNZAF in December 1944 becoming NZ4102; it later served with civil airlines TEAL and ANSETT. (Both Short Bros.)

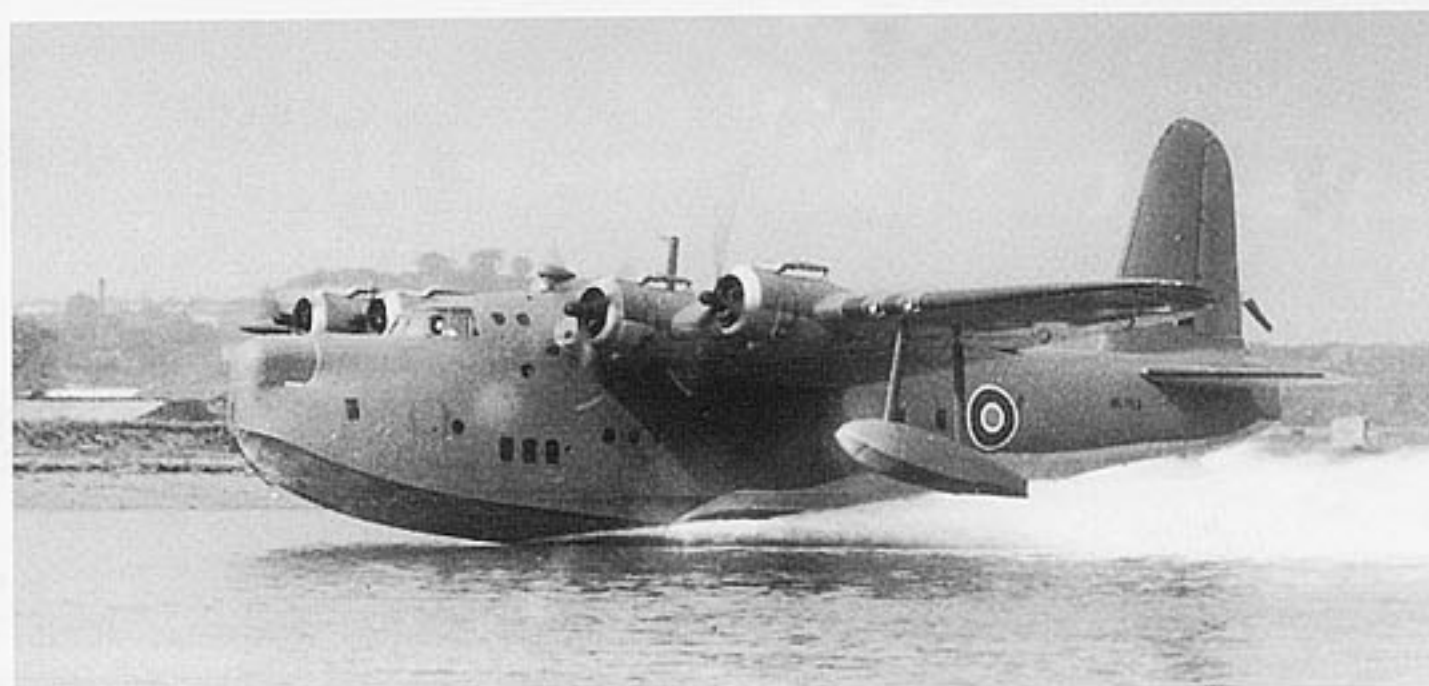
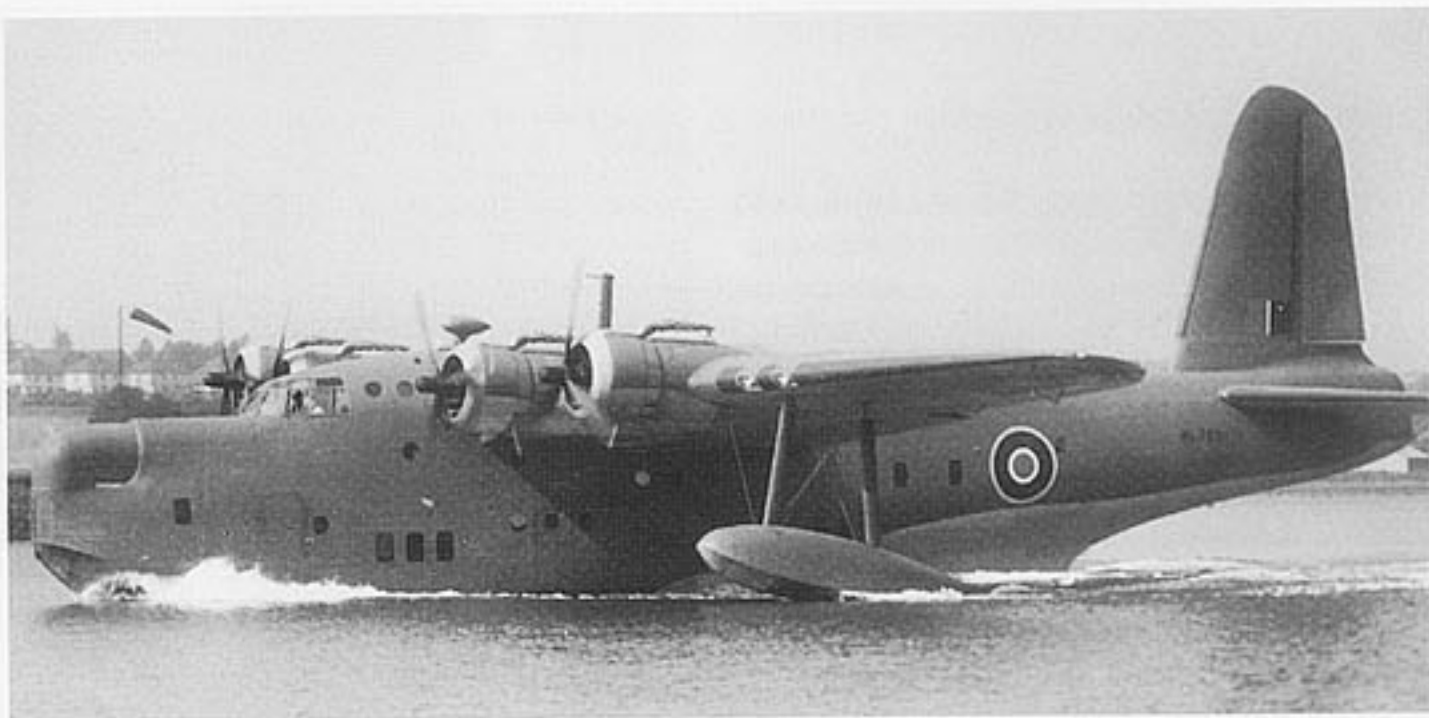
gained was absorbed.

The need to reroute Allied supply lines around South Africa, because Italy's entry into the war prohibited traffic through the Mediterranean, brought increased U-boat activity in the Central and South Atlantic. This was first met by Sunderlands based near Freetown on the West African coast and once enough flying boats and Lockheed Hudsons became available it was possible to harass these submarines effectively. Until the formation of No. 270 Squadron, No. 343 Free French Squadron and No. 490 RNZAF Squadron, Nos. 95 and 204 were the principle Sunderland squadrons in this theatre. Aircraft were also based at Apapa, Dakar, Freetown, Jui or Bathurst during these operations.

From September 1941 No. 204 began to meet opposition in the form of Vichy French Mohawk fighters based in Senegal but on 29 September N9044 shot down two out of four of these attackers while on a recce mission. By now merchant losses in the area had eased, due in part to the RAF's presence but also the Navy had sunk many of the U-boat's supply ships and other submarines had returned to the North Atlantic. However, one incident saw a Sunderland rescue 56 survivors from a sunken ship and take five miles (8km) to get airborne. Little enemy action was encountered from 1942 onwards but a fine deterrence job was completed and there were Sunderland losses from the area's treacherous weather.

By spring 1941 Coastal Command's resources were heavily overstretched and

G-AHZB was a BOAC Sandringham 5 named *Portland* (the name is on the nose). It began life as Sunderland Mk.III NJ171 at Dumbarton, was converted to Mk.V standard serving with No. 228 Squadron and then joined BOAC in May 1946. It crashed at Bahrain on 22 August 1947. (Short Bros.)

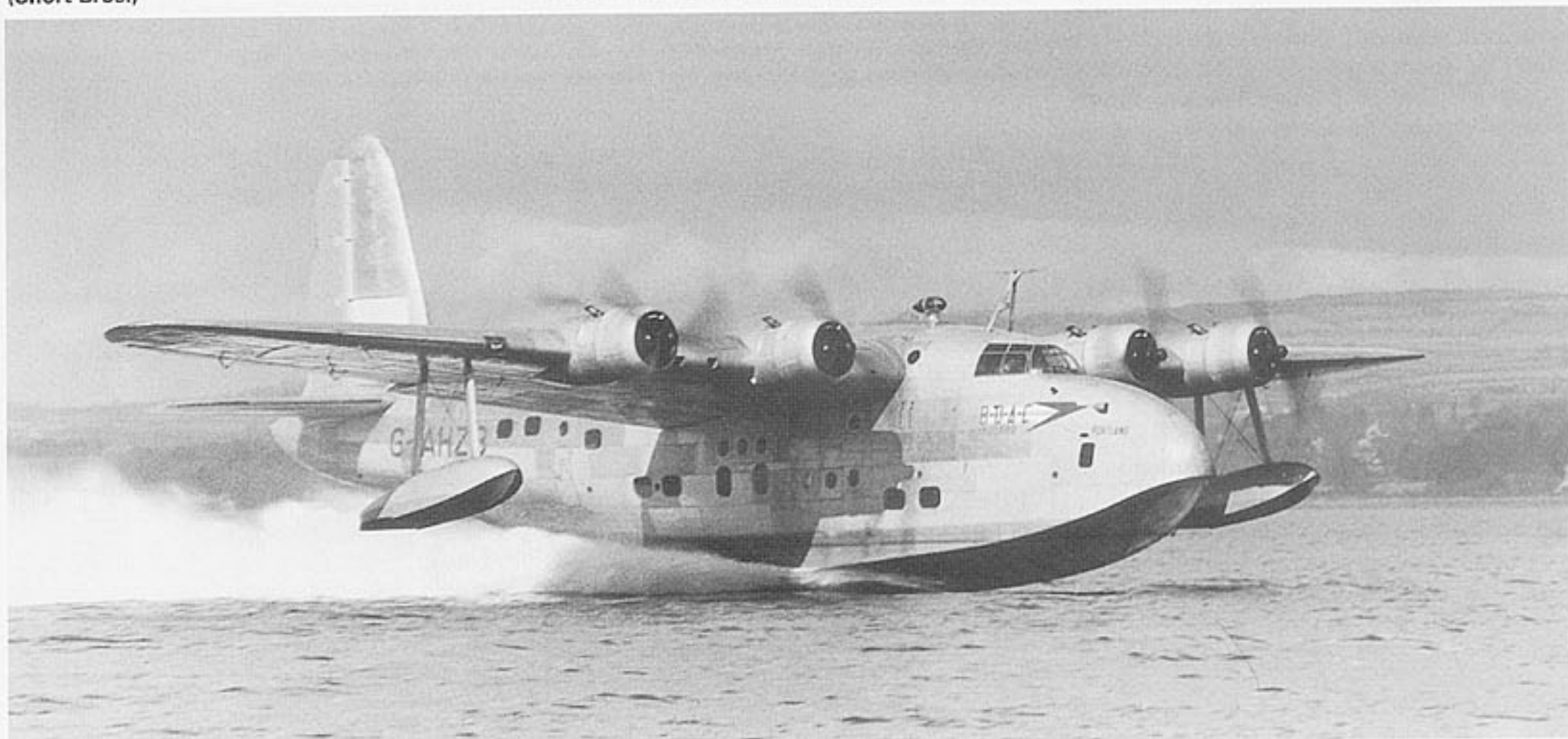


there were just not enough Sunderlands to go round. Also those available only had the early and basic ASV Mk.I radar fitted from 1940; the new and improved Mk.II did not arrive until mid-1942. During 1942 deliveries to the hard pressed units improved and five new Squadrons, Nos. 461, 423, 246, 119 and 422 formed or converted to the type when only two, Nos. 95 and 202, had come on strength in 1941.

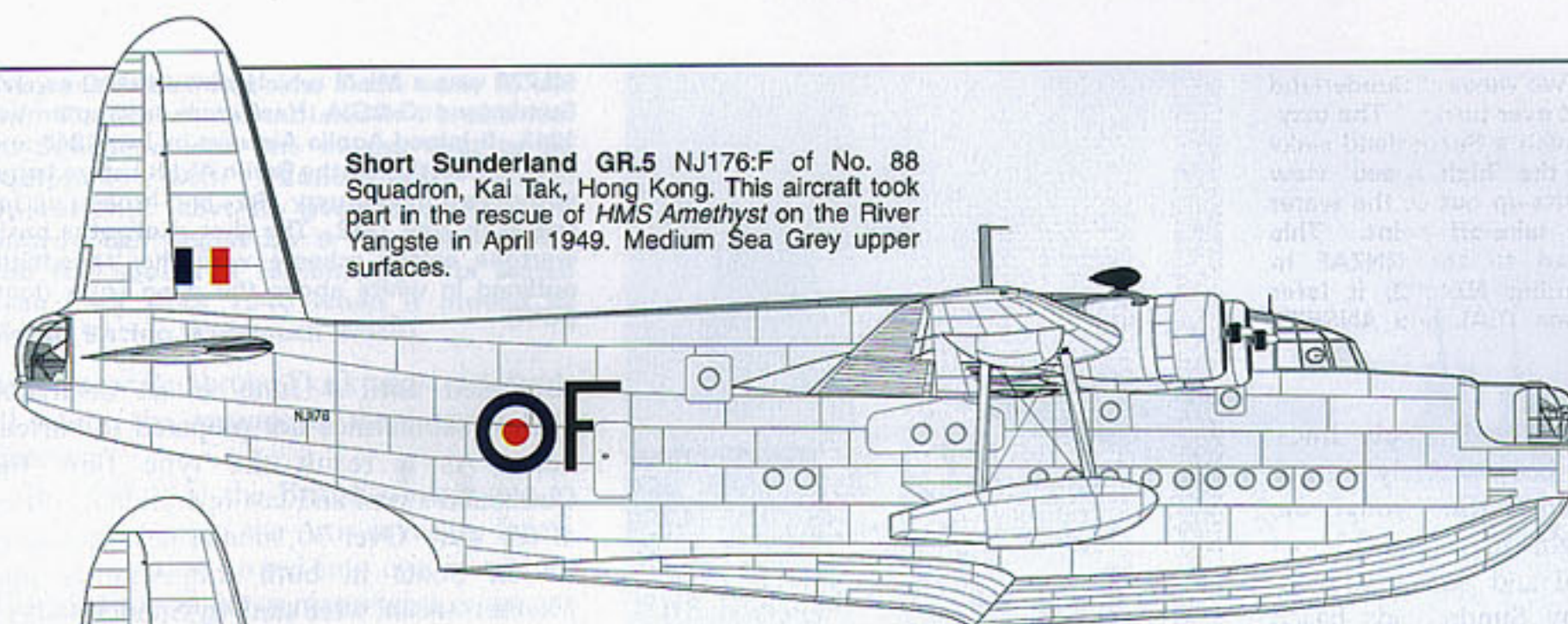
The period through to spring 1943 was the critical time as the U-boat force reached peak strength. Command reliance on the Sunderland was huge since only three units operated the American built Catalina and just one the very long range land-based Liberator; the latter was to eventually give total air cover for convoys right across the

Atlantic, filling the mid-ocean 'Air Gap' left after America entered the war in December 1941. But No. 201 Squadron's arrival at Lough Erne in Ireland in September 1941 was a big step forward as flying boats could now protect convoys much further out from the UK.

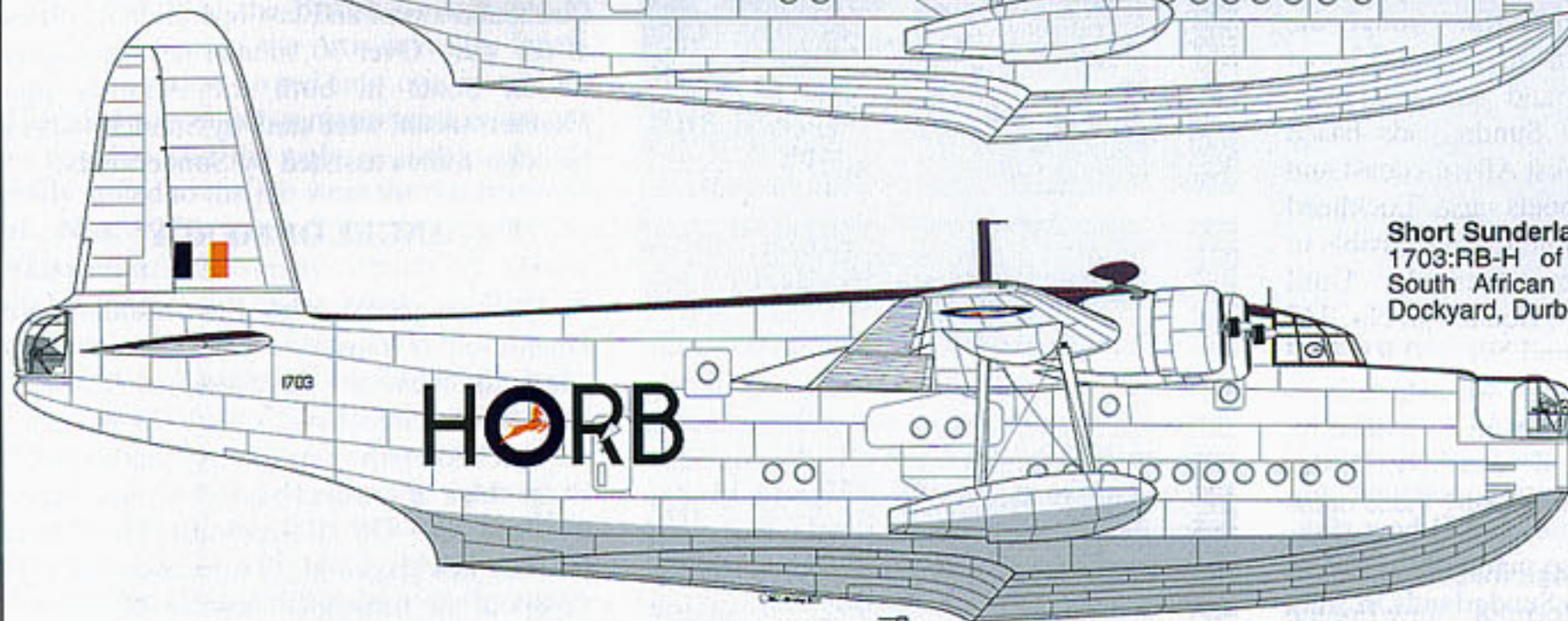
Visual sightings of U-boats began to increase and No. 10 Squadron attacked eight in April 1942 but made no sinking. No submarines were sunk by UK-based Sunderlands in 1942 but some were damaged and even an unsuccessful attack could be beneficial in that the submarine might lose contact with a convoy. In addition once submerged, escort ships could be guided by the Sunderland to the enemy's diving area - good co-operation between the surface and



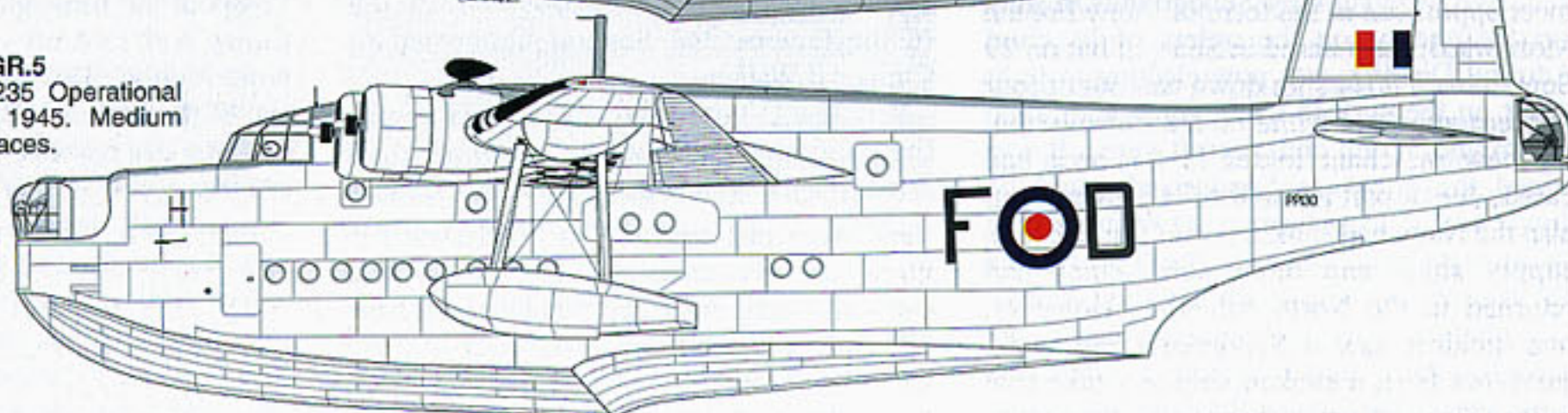
Short Sunderland GR.5 NJ176:F of No. 88 Squadron, Kai Tak, Hong Kong. This aircraft took part in the rescue of *HMS Amethyst* on the River Yangste in April 1949. Medium Sea Grey upper surfaces.



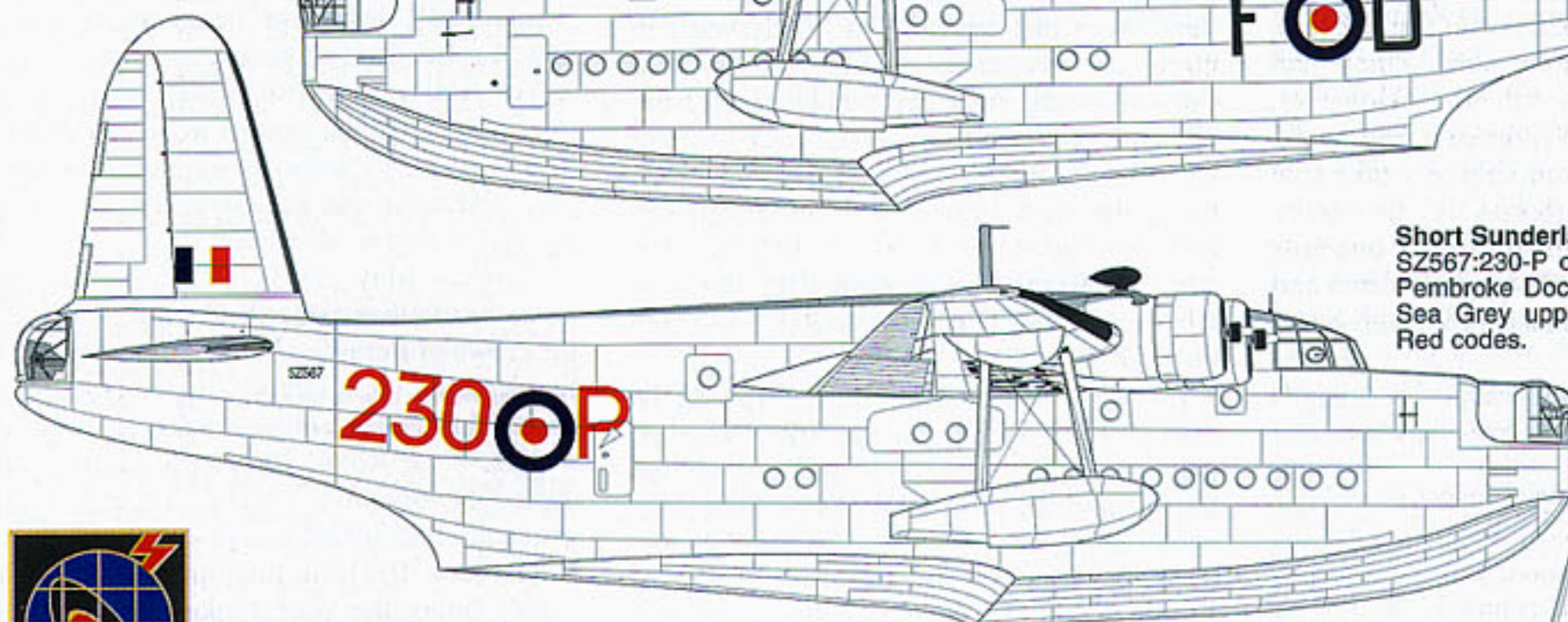
Short Sunderland Mk. 5 1703:RB-H of No. 35 Squadron, South African Air Force, Congella Dockyard, Durban in the early 1950s.



Short Sunderland GR.5 PP130:F-D of No. 235 Operational Conversion Unit in 1945. Medium Sea Grey upper surfaces.

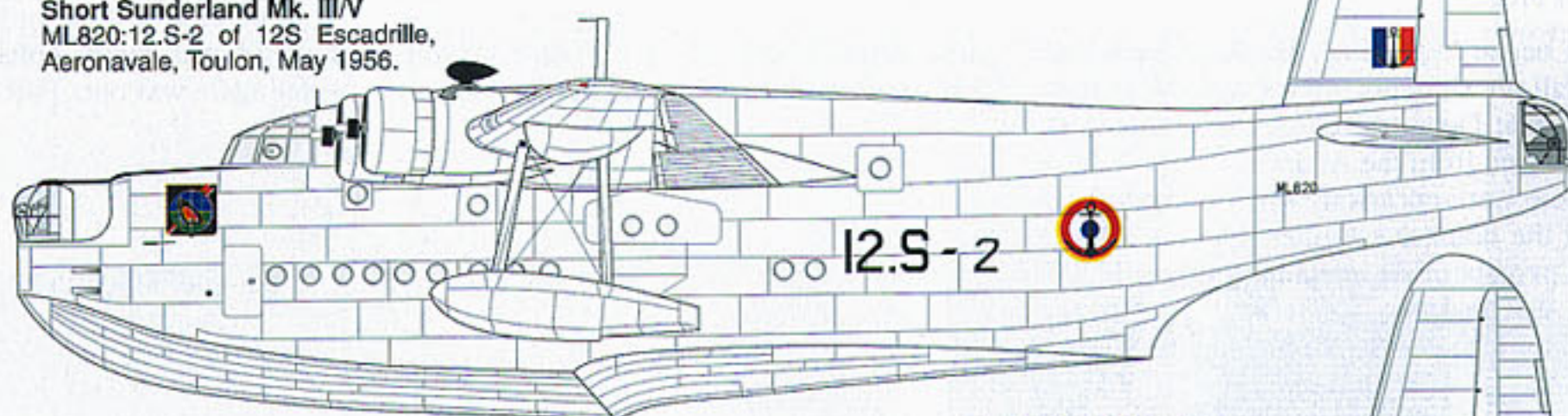


Short Sunderland GR.5 SZ567:230-P of No. 230 Squadron, Pembroke Dock, late 1956. Medium Sea Grey upper surfaces. Roundel Red codes.

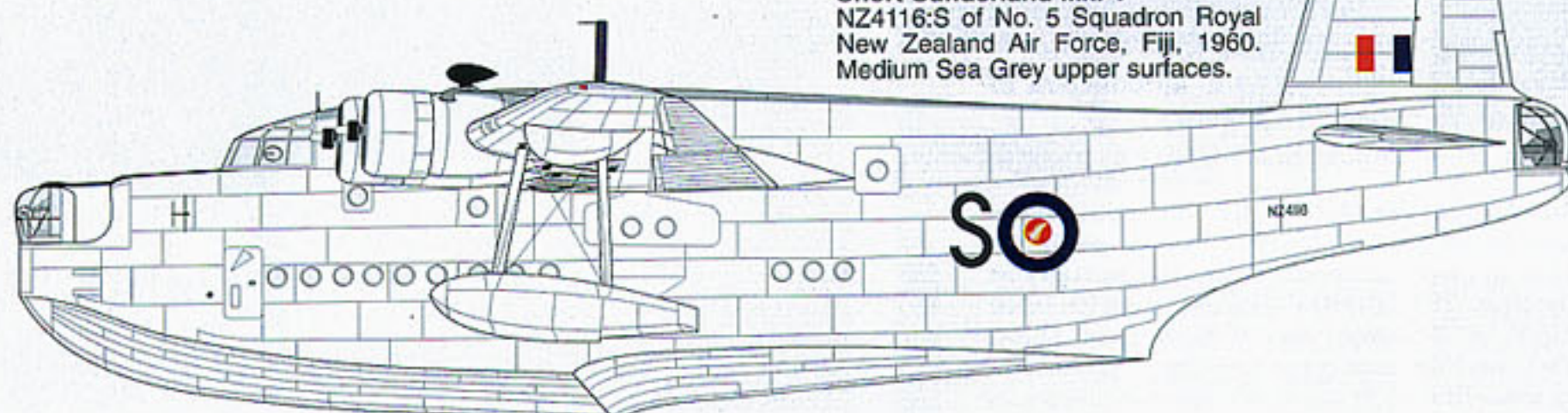


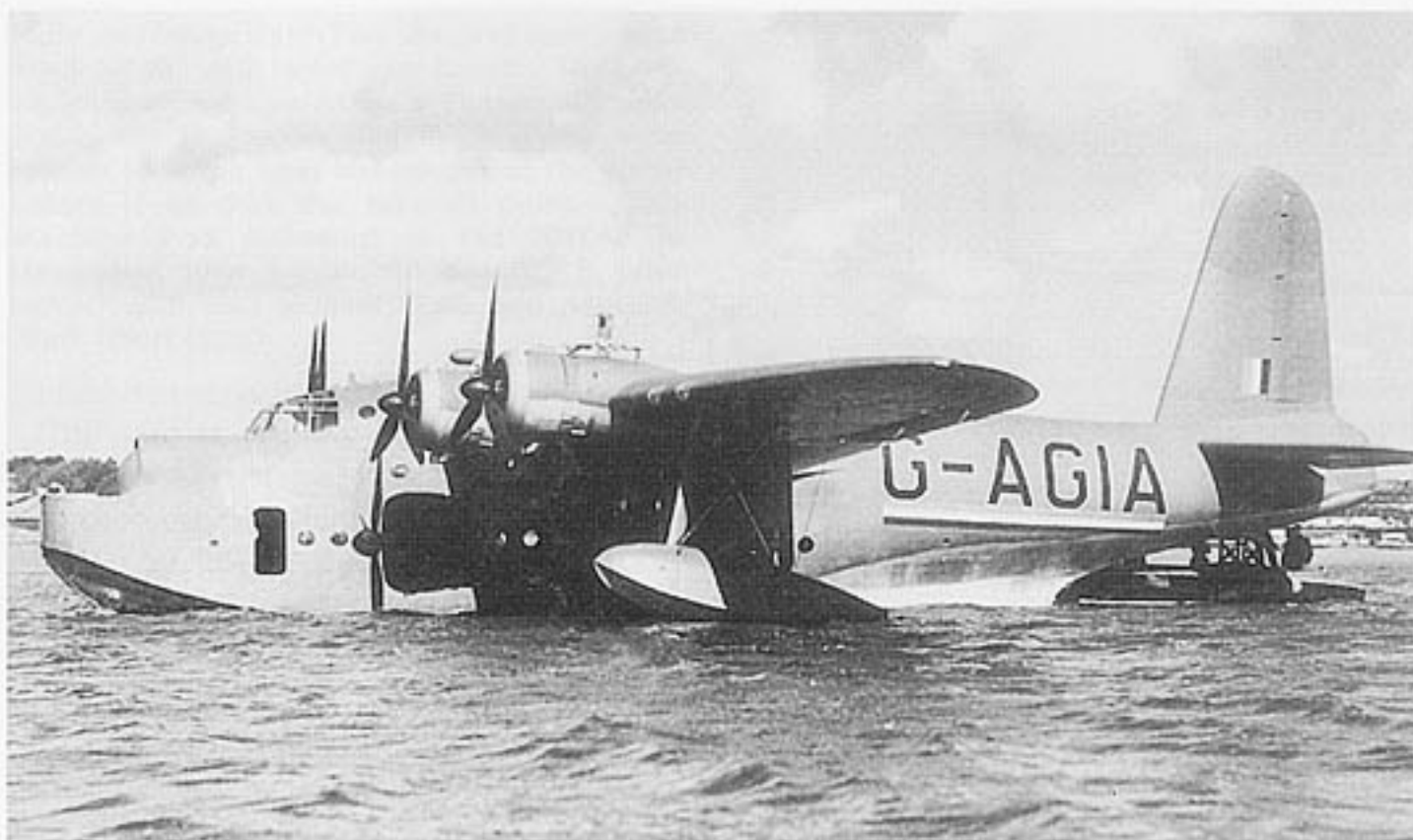
Badge of 12S Escadrille on nose of ML820

Short Sunderland Mk. III/V ML820:12.S-2 of 12S Escadrille, Aeronavale, Toulon, May 1956.



Short Sunderland Mk. V NZ4116:S of No. 5 Squadron Royal New Zealand Air Force, Fiji, 1960. Medium Sea Grey upper surfaces.





ML728 was a Mk.III which joined BOAC as civil Sunderland G-AGIA *Haslemere* in September 1943. It joined Aquila Airways in July 1948 and flew 118 sorties on the Berlin Airlift before being withdrawn in February 1951 and broken up for spares in July 1952. The shot shows the basic wartime colour scheme with the 'speedbird' outlined in white above the open entry door. (APN)

airborne elements of a convoy's escort was vital.

Operations over the Bay were stepped up in 1943 when the far more capable ASV Mk.III arrived. In late spring merchant ship losses at last began to fall and U-boat sinkings from all causes rose markedly. No less than five were sunk by Sunderlands in May but the enemy, on the orders of its chief Admiral Doenitz, was now electing to fight it out on the surface using some additional 20mm and 37mm anti-aircraft guns. It was hoped the attacking Sunderland could be downed or at least thrown off from making an accurate attack and the result was some hot gunnery duels between the combatants.

A difficulty for the Sunderland was the need to attack quickly before a submarine could dive. This meant the pilot was rarely able to plan his attack and pick a suitable angle of approach though such opportunities increased once the enemy began to stay and fight. An ideal attack was a pass at 50ft (15m) and about 15 degrees to the submarine's course so that a stick of depth charges would straddle the target. For the Sunderland crews flying into a hail of cannon shells must have been terrifying but the idea of so many defensive guns on the aircraft was to pump back as much lead as possible in return. Casualties were heavy on both sides but the effectiveness of the U-boats began to decline. By June, such was the fall in shipping losses against U-boat losses that Doenitz ordered the submarine's withdrawal from the Atlantic.

There were occasions when a Sunderland filled the defensive fighter role; on 3 April 1940 two out of six attacking Junkers Ju 88s were downed by Sunderland N9046 off Norway. In fact many Ju 88s and other types were destroyed in an impressive list of kills, three out of eight 88s (with another severely damaged) were shot down by EJ134 over the Bay of Biscay on 2 June 1943. The onset of these fierce attacks saw the introduction of the galley mounted 0.5in guns.

For protection, U-boats began to traverse

the Bay in groups but co-operation between Allied aircraft and naval forces resulted in many losses; all three of one 'convoy' being sunk on 30 July 1943. First U-461 was dispatched by Sunderland W6077, by a strange coincidence aircraft 'U' of No. 461 Squadron, U-462 fell victim to a Halifax bomber and U-504 was destroyed by vessels of the famous 2nd Support Group led by Captain J.Walker.

Very few U-boats were encountered during the autumn but quite a number of Sunderlands were shot down by German fighters. In January 1944 U-boats returned to the Western Approaches equipped with Schnorkel 'breathing' tubes but two were lost to Sunderlands.

When the D-Day landings began Coastal Command's primary objective was to protect the invasion fleet under Operation Cork which was highly successful, two more U-boats becoming Sunderland victims on the night of 6-7 June. Once the invasion forces had broken out they pushed the U-boats back to safe ports in Norway and this, together with the ability to stay submerged with the Schnorkel, meant less contacts were made, but the risk of attack by German aircraft off France was also reduced.

By 1945 much of the anti-submarine action was concentrated to the north of Britain and centred on stopping U-boats entering the North Atlantic. The European war ended on 8 May but Sunderland patrols

continued until 4 June as an insurance against submarines not prepared to surrender. As a result the type flew the Command's first and last operational sorties of the war. Over 30 submarines, including Italian boats in both the Atlantic and Mediterranean, were sunk by Sunderlands or by other forces assisted by Sunderlands.

### 'ANGEL OF MERCY'

Apart from patrol work Sunderlands were much used as transports and they evacuated hundreds from the invasions of Norway, Yugoslavia, Greece and Crete. Many times they picked up the survivors of sunken merchant ships or crashed aircraft by landing in the open sea. On 18 September 1939, with the war just days old, two rescued the survivors of the torpedoed steamer *Kensington Court*; both took off very overloaded but got home safely. This was the first air-sea rescue of the war and the aircraft's first contribution to the conflict but landing on the open sea was not officially supported as the Sunderland's hull was never designed to take the hammering it received from large waves and some aircraft were consequently lost. If possible the aircraft would direct surface vessels to those needing rescue but throughout the war and beyond many pilots risked landing to save lives.

On 26 May 1943 T9114 of No. 461 Squadron flew out into the Atlantic to rescue the crews of a crashed Whitley and a crashed Sunderland. It alighted and got everyone aboard but could not get off because of the weight. *La Combattante*, a Hunt class destroyer operated by the Free French, arrived to take off all except a skeleton crew; it then took T9114 in tow but after four and a half hours the rope broke in worsening weather. Plt. Off. G.O.Singleton got T9114 airborne after a three mile (4.8km) run but the hull was badly holed and landing on water again was out. Fortunately he reached



**Sunderland Mk.V G-BJHS civil conversion was based in the Antilles before paying a visit to England where it landed initially at Calshot. This picture was taken on its ferry flight to Chatham on 20 November 1984. The weather was poor and the flight made at around 800 ft most of the way. (Francis Prins)**

**Busy scene at Pembroke Dock early in the war. The Royal Australian Air Force's No. 10 Squadron was one of the first to be equipped with Sunderland Mk.IIs. Operational sorties over the Western Approaches began on 5 December 1939 and the squadron remained in its Welsh base until April 1940 when it moved to Mount Batten, Plymouth (MAP)**

Angle near Pembroke Dock and crash landed safely; the courage of these crews was amazing.

In April 1941 the British were trying to help Greece resist the Axis invasion forces but the situation turned into one of retreat. The need was to get as many servicemen out as possible and the only available aircraft really suited to the job were the Sunderlands of Nos. 228 and 230 Squadrons at Alexandria. A steady stream of rescue flights began, in many cases resulting in overload take-offs. One, T9084 captained by Flt. Lt. H.Lamond, successfully got away from Kalamata on 25 April with 82 passengers and ten crew aboard, assisted by a low fuel state and distributing the passengers evenly to keep the aircraft balanced. The Greek Royal Family and many civilian refugees were also evacuated by these aircraft.

The next invasion target was Crete and from 14 May the process was repeated. T9050 made one journey back to Egypt with 74 plus its crew and the operations ended when aircraft from both squadrons flew their last ferry trips to Alexandria. Five unarmed BOAC Sunderlands also went to Crete at the height of the evacuation and brought off large numbers of British soldiers and airmen. Much was learnt during these trips about the Sunderland's maximum load and performance limits.

These were not the last wartime evacuations. In May 1944 two Sunderlands of No.

**Tranquility. The water is dead calm allowing perfect reflections at China Bay where a detachment of No. 205/209 Squadron was based for a period after the war. (Bill Whiter)**



230 Squadron, now based at Koggala in Ceylon, were despatched to Burma to rescue 537 Chindit casualties from behind enemy lines and take them to Dacca. This took 32 days and was achieved by landing on Lake Indawgyi; every trip was made in constant danger of discovery by the Japanese. In early 1945 the squadron showed its ability to fly in plenty of heavy equipment, about 5,000lb (2,268kg) a trip, to support the Burma campaign. After the Japanese surrendered the Sunderlands in this theatre, from Nos. 205, 209, 230 and 240 Squadrons, were involved in the repatriation of Allied prisoners-of-war. Once civilian life had returned many of these boats were left to deteriorate at their moorings until broken up at either Koggala, or Seletar near Singapore.

#### MEDITERRANEAN, MIDDLE AND FAR EAST

Air protection of Britain's sea routes through the Mediterranean to the Suez Canal and Red Sea, including her bases at Alexandria, Gibraltar and Malta, was the responsibility

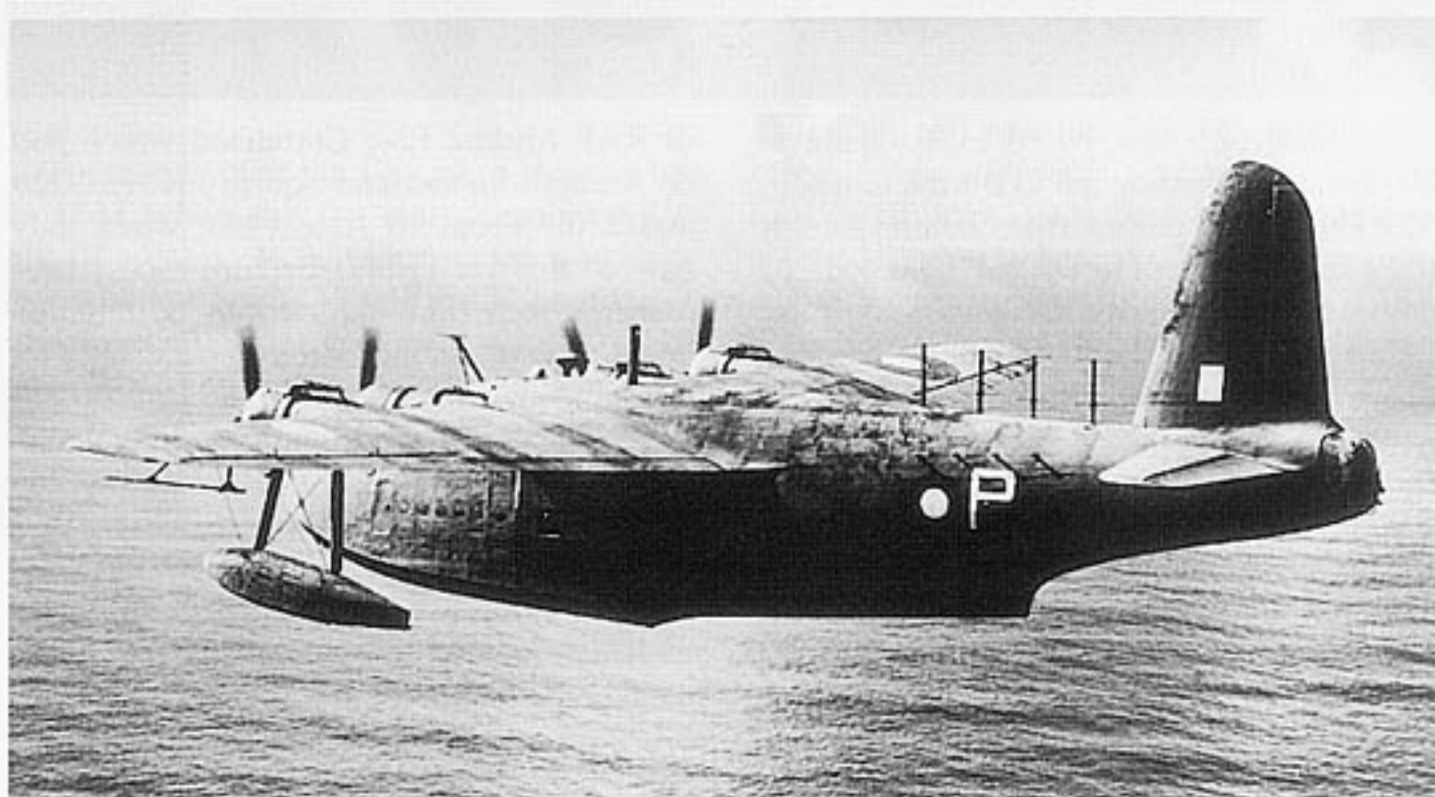
of RAF Middle East Command which had on strength Sunderland Squadrons Nos. 228 and 230. From 10 June 1940, when Italy entered the war against Britain, enemy submarines were rare targets but two Italian boats, *Argonauta* and *Rubino*, were sunk by the same aircraft, L5804, in the last days of the month. General maritime reconnaissance and anti-shipping patrols became the staple diet bar the rescue operations described above and some Sunderlands were claimed by Italian Fiat and Macchi fighters.

Several No. 228 Sunderlands were detached to Malta for selected periods where one duty was to shepherd flights of Hurricane fighters flown in from carriers to help defend the island. On 27 March 1941 one of Malta's Sunderlands detected part of the Italian battle fleet at sea, the intelligence supplied leading to the Royal Navy's victory at the Battle of Matapan. No. 230 detached some of its aircraft to Scaramanga in Greece to hunt for enemy shipping and provide general transport services. The only other unit based for any length of time in this theatre was No. 202 Squadron at Gibraltar during





Three of the 15 Sunderland Mk.Vs allocated to No. 35 Squadron, South African Air Force which were based at Congella Dockyard, Durban. This picture, taken in late 1945, still shows them in their RAF serials which were later changed to the range 1701 to 1715. Interestingly they were also coded in what were No. 10 Squadron, RAAF markings. (Alan W.Hall)



All-black Sunderland III JM673:P belonged at that time to No. 230 Squadron, RAAF. It was used in the Pacific area by the squadron commander who specialised in dawn and dusk attacks. The code is thought to be light blue with SEAC roundels and fin flash. (MAP)

much of 1942; one of its machines sank the submarine *Alabastro* on 14 September. On 17 September 1940 a Sunderland from No. 228 became a 'fighter' when it deliberately attacked and shot down a Cant Z.501.

Towards the end of the Burma campaign in 1945 anti-shipping operations were confined to No. 230 Squadron attacking Japanese vessels, usually relatively small craft, off the coasts of Siam and Tenasserim. Having begun the war at Seletar as the first squadron with a full complement of Sunderlands, No. 230 moved to the Mediterranean, then Ceylon and Burma, before returning to Seletar in late 1945. It was the only fully operational Sunderland unit based in either Ceylon or Burma during the war but it was never fortunate to find an enemy submarine in these areas while on patrol duties. This much travelled unit then moved to the UK and it disbanded in July 1957 after flying Sunderlands for longer than any other RAF squadron, 19 years.

### CIVIL SERVICE

The British Overseas Airways Corporation (BOAC) was formed by the merger of Sunderland Mk.5 NZ4115, ex SZ584:Q of No. 5 Squadron RNZAF. This aircraft has since been preserved though not in its original colours. (APN)

Imperial Airways and British Airways and began operation in April 1940. At the outbreak of war the RAF had no Transport Command and BOAC was tasked with the role of air transport in the European Zone. The Empire boats were a modern and vital component of BOAC's fleet but in the short term no new aircraft would be available so odd Sunderlands were loaned for brief periods until December 1942 when six Mk.III's, JM660 to JM665, were officially transferred and converted to basic civilian standards for passenger and cargo carriage. The first flew in this form on 26 December and six more, JM722 and ML725 to ML729, followed in late summer 1943 and another 12 (ML751 to ML756 - Jan/Feb and ML786 to ML791 - July/Aug) in 1944. They all received civil registrations.

RAF Transport Command came into being

on 25 March 1943 but it did not control BOAC's Sunderlands which until 25 October were flying to West Africa. From this date they switched to the longer UK to Karachi via Cairo route which required flight through Egypt's militarised zones, so the boats received temporary military codes, JM660 for example becoming OQZR; in May 1944 the route was extended to Calcutta. Almost immediately these Sunderlands made history when one took Lord Wavell to India, the first Viceroy to fly to the country to take up office; the outgoing Lord Linlithgow flew home in a Sunderland and much publicity was made of these events.

A Vice-regal Sunderland was specially fitted out by BOAC for the trip. Compartment 'B', the RAF crew room, was upholstered and given six chairs that could convert into two bunks. Grey hide covered the walls and ceiling and a pile carpet was on the floor; the bunk curtains were bright blue and white. A wardrobe was provided and compartment 'C', the old pantry and drogue store, became a toilet and washroom. Compartment 'D' with the bomb doors, normally the bomb and engine spares store, was upholstered with six seats that could turn into four bunks. Aft was a state-room with twin bunks, chair, desk, wardrobe and washbowl, then the pantry with electric kettle, hot-plates and refrigerator. The crew's upper deck quarters were extended aft beyond the normal mid-ships limit to the pantry to provide accommodation and stowage room. The crew comprised Captain, First Officer, Navigation Officer, two Radio Officers, two Engineer Officers and Steward.

A normal civil Sunderland conversion involved stripping out all military gear and armament and installing bench seating, the work being undertaken at Rochester. Only two examples were lost during the war and afterwards the survivors were modified to an improved standard as the Hythe class; camouflage and RAF markings were replaced by overall white. However, the former ML788 (as G-AGKX) received a modified nose and tail and an altogether more comfortable



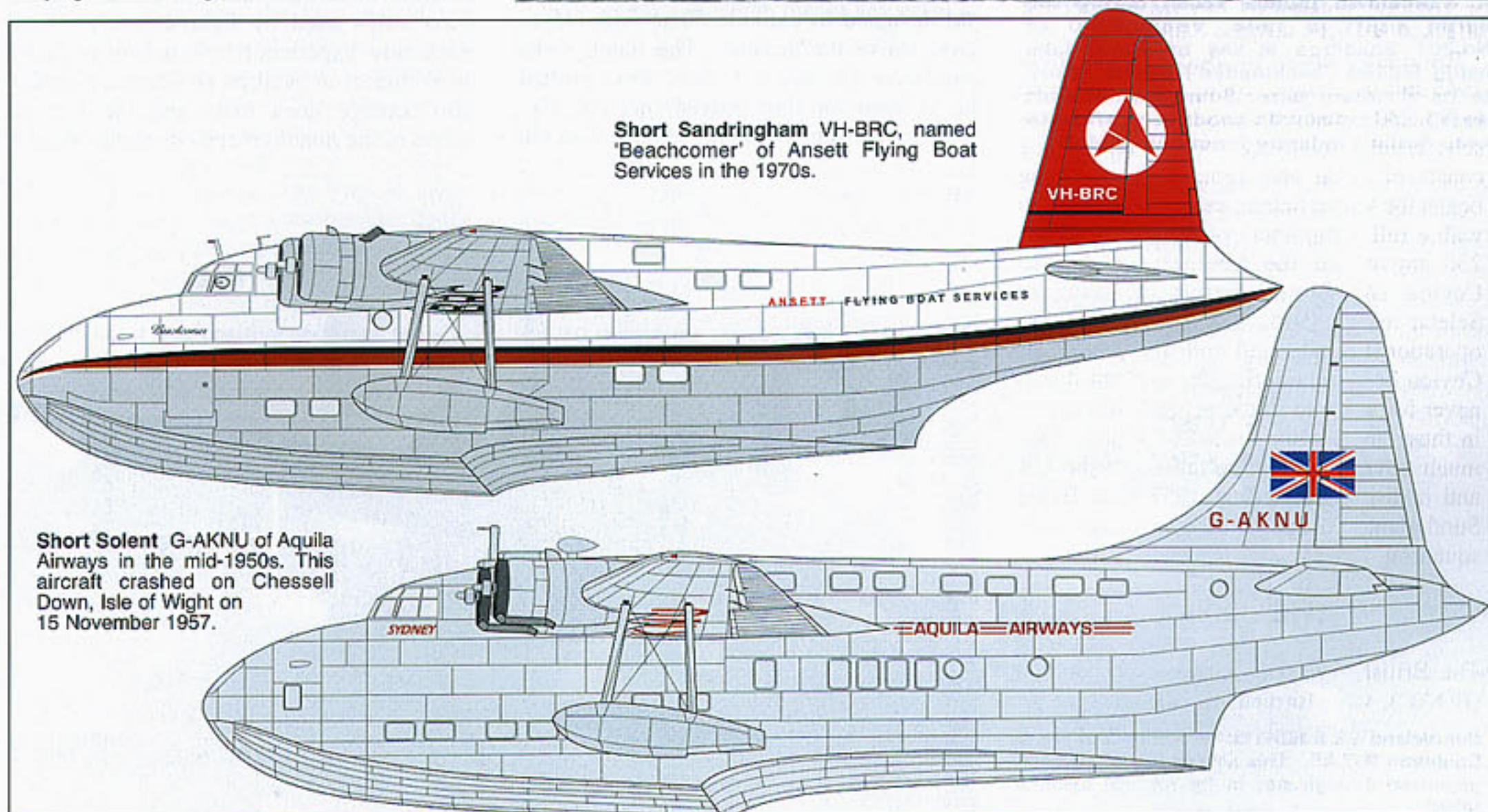
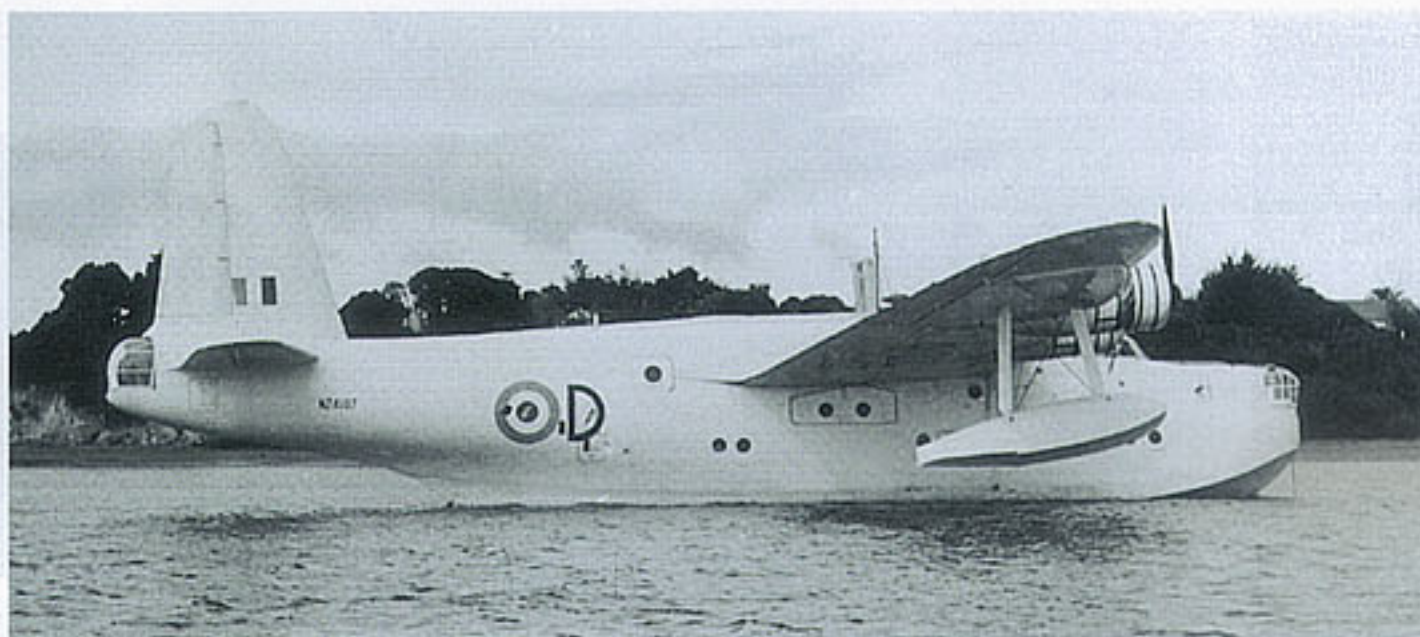
Right: RNZAF Sunderland Mk.5 NZ4107 was the former VB883 transferred in 1952. On 2 April 1967 this aircraft flew the last official RNZAF flight; it was scrapped the following August. (MAP)

internal layout as the Sandringham I. It was relaunched on 28 November 1945 and named *Himalaya*. These post-war developments had dining facilities (the Sandringham also had a bar) and could take up to 24 passengers, luggage and 6,500lb (2,948kg) of mail.

Five Sunderlands were modified as Sandringham 2s and 3s from late 1945 onwards for an Argentine airline and were not scrapped until 1967. Tasman Empire Airways of New Zealand had four Sandringham 4s and in 1947 BOAC leased nine Sandringham 5s with three further 7s of improved capacity in 1948. Norwegian airline DNL bought five Sandringham 6s. These aircraft were modified with rounded noses and rear fuselages replacing the turrets but the cost of this treatment was beyond some customers. Instead one Uruguayan airline acquired two Sunderland IIIs and a V without changes to nose and tail fairings and two more Vs went to Argentina. Three civilised RAAF Sunderlands entered commercial service after the war and several Australian airlines eventually used Sunderlands and Solents. One flew until 1970 in the hands of a French Polynesian airline.

BOAC's aircraft were supplemented by the Solents modified from Seafords and the three types served on many routes taking in South Africa, Australia, New Zealand, Hong Kong, China, Japan, India and Pakistan. The airline's flying boat operations ended on 10 November 1950 but ten Hythes (and later on *Himalaya* and some Solents) were acquired by the British airline Aquila Airways. Most of the surviving Aquila

Above right: Sunderland Mk.5 RN284 in Aeronavale colours about to touch down. Note the Gouge Flap and the radar scanner covers. (Short Bros.) Right: Another view of RN284, taxiing in after a flight.





Mk.5 SZ576 A:A of No. 201 Squadron. Note the extended Gouge Flap. The picture was probably taken in the Mediterranean as the three crew members on top of the fuselage are scantily clad. (MAP)

Hythes were withdrawn and scrapped in 1952-53 but ex-JM660 lasted until July 1956.

### POST WAR SERVICE

After the war RAF Sunderland duties were carried out almost entirely by Mk.Vs as the GR.Mk.5 and later MR.Mk.5. Sunderland production was terminated after VJ-day and SZ599 was the last example launched, at Belfast on 14 June 1946. The end of the war in Europe saw six out of seven Coastal Command Sunderland Squadrons either disbanded or transferred; No. 201 only survived to operate Sunderlands until 1957. Many aircraft were withdrawn and either stored or scrapped; only the Mk.V was retained. There was a need for the RAF to keep some boats, however, to maintain a presence in the various parts of the Empire and for general communications, passenger and freight work. By the end of 1946 the only operators were Nos. 201 and 230 Squadrons at Calshot (and No. 4 Operational Training Unit), No. 88 at Kai Tak, 205 at Koggala and 209 at Seletar.

From 5 July 1948 a valuable contribution was made to the Berlin Air Lift by a Sunderland shuttle service landing on Havel See, a lake in West Berlin. Aircraft from Nos. 201 and 230 Squadrons, plus civilian

**A well-known picture taken during the Berlin airlift in 1948. VB889:NS:D of No.201 Squadron is seen on Havel lake being loaded ('backloaded') for its return to its Hamburg base. Some RAF aircraft were backloaded with goods in an effort to keep Berlin's industry functioning (MoD)**

Hythes, flew in from Hamburg until winter ice prevented operations after 15 December. Between these dates they airlifted 4,500 tons (4,572 tonnes) of supplies to Berlin and evacuated over 1,100 children, a favourite load being 10,000lb (4,536kg) of bulk salt since land aircraft were more susceptible to corrosion from this type of cargo. Turn-around to return was normally accomplished inside 15 minutes.

Next came the incident beginning on 21 April 1949 when the British frigate *HMS Amethyst* ran aground on the banks of the River Yangtze after damage by fire from Chinese communist artillery involved in the war against the nationalists. While under fire, Sunderlands ML772 and NJ176 from No. 88 Squadron were able to alight next to the warship and deliver a doctor, replacement crew members and much needed supplies. The *Amethyst* later escaped but as the communists approached Shanghai, No. 88's aircraft moved in again to evacuate British personnel and refugees.

In June 1948 a state of emergency was declared in Malaya because of growing guerrilla warfare against the British. Action against these Communist insurgents brought Far East Air Force Sunderlands of Nos. 205 and 209 Squadrons back into a bombing role as they were adapted to carry up to 112 20lb (9kg) anti-personnel fragmentation bombs which were dropped from 8,000ft (2,438m) and designed to explode 50 to 75ft (15 to 23m) above the ground. The bomb racks could take 16 each but many were pushed out by hand and they proved very effective as a harrowing weapon. Once Lincoln

bombers arrived, the Sunderlands reverted to their regular maritime patrols searching for rebel supply vessels.

Due to its Malaya commitments the RAF was able to contribute little to the Korean War. Just the three Sunderland squadrons were offered, Nos. 88, 205 and 209, the only RAF aircraft to become directly involved in the conflict. These were employed on maritime reconnaissance patrols against enemy shipping and other activity along the Korean coast, air-sea rescue work and, when required, the protection of amphibious forces, the squadrons working on a rotation arrangement with their Malaya movements. Flying from Iwakuni in southern Japan for Korean service, they operated day and night, often in awful sub-zero weather conditions. No. 88 soon became the primary Korean Squadron with troop transport added to its list of duties.

Other post-war highlights included aircraft from Nos. 201 and 230 Squadrons taking teams of scientists to Greenland in 1951, the work also required the air-lifting of supplies and the collection of the teams; a second expedition (called the British North Greenland Expedition) arrived home in August 1954. When a Sunderland landed on a Greenland fjord in July 1951 it was the first time an RAF aircraft had landed on such a stretch of water in that country. During the 1950s there were many other occasions when Sunderlands gave assistance, an earthquake in the Greek islands being but one example.

### WHAT WAS IT LIKE?

Not many today can remember what it was like to see a big flying boat on the move over water; most, like the author, only know of concrete or tarmac runways or the smaller grass strips used by light aviation. Few pilots now experience how it feels to 'sail' their aircraft as well as fly them. Happily film footage does exist and the feature movie of the *Amethyst* episode shows what a





gentle and delicate operation a Sunderland landing could be, particularly when the boat first 'sits' on its planing step, still held half out of the water by the wings; at this point there was no bow wave, the disturbed water is further aft. One might imagine that a take-off was all power and flying spray but it was not always like this.

A fighter pilot who always wanted to fly a Sunderland was Flight Lieutenant Norrie Grove, DFM. He got his chance in the early 1950s on a transit flight from Hong Kong to Seletar but on this occasion the surface was so flat and calm that the boat would not unstick on the first take-off run, such was the adhesive tension of the water. Fortunately the attempt produced enough waves to break up the surface and the second go proved successful (a flat calm could also give difficulties for landing since it was hard to judge height due to the water's mirror-like quality). Handling it during the flight (the trip was made entirely at 1,000ft [305m]) he found it a big contrast to his much lighter fighters but it was positive and more responsive on the controls than he had expected. He describes it as a lovely aeroplane which, when sitting on the water, looked like a great swan. Also, for someone used to a small cockpit, going up and down stairs and peeling potatoes on board felt quite unusual.

Those who flew the Sunderland a good deal report just how sweet the controls were - they always had complete confidence the plane would do what it was asked; it was a delight to fly. Ailerons and elevators were light, the rudder a touch heavier. There was the peculiar characteristic of a slightly nose-down attitude in normal flight and conventional methods of attempting level flight resulted in the loss of both airspeed and

height. The automatic pilot, called George, was indispensable on long sorties while any new pilot could be surprised by his seat's height above the water. Perhaps the only variable between marks came in handling, the Mk.I having variable pitch propellers, Mk.II and III constant speed units and the V fully feathering; the Pratt & Whitney engines themselves were rather more 'modern' than the Pegasus but both combined long range with reliability.

Unless there was a need for shore-based servicing the Sunderlands would be moored at their anchorage which meant any crew or maintenance servicemen had to arrive and depart by boat. It also meant the aircraft were open to the elements and all that might entail on a sea coast; at least 26 examples were wrecked at their moorings or sunk by gales. Like any ship, a Sunderland that spent too long in the water could also find it had barnacles attached to the hull which added extra drag so the boat would have to be landed periodically to be cleaned. There was no rudder for water travel, steering was effected by changing the direction or power level of the engine throttles.

Its sea-keeping was excellent and the fact it was a 'boat' just added to that feeling of being different. The crew became a close-knit family (the 'Flying Boat Union') and some described it as like living on a yacht because they were quite self-sufficient, could live on board without the regulations of camp life (it was very adaptable as a house-boat) and could call in at any suitable coastal base they wanted or needed to. Any opportunity to fish to supplement the usual rations was always welcome. Service aboard Sunderlands was quite different to just about every other RAF aircraft; in many

**No. 201 Squadron Sunderland Mk.V 201:F at Pembroke Dock in the 1950s. Note the Squadron badge over the doorway. (John Hirst)**

ways it was completely unique.

#### EXPORTS, EXPERIMENTS AND END

The Sunderland's war service in Australian, Canadian, French, New Zealand and Norwegian squadrons was followed up by the acquisition of ex-RAF boats by several Air Forces. The first was the RNZAF which in December 1944 received four Mk.IIIIs, ML792 to ML795 (reserialled NZ4101 to NZ4104). The country's island make-up made them ideal for general transport duties and communications with other isolated Pacific communities. Another 16 Mk.IIs followed in 1952 becoming NZ4105 to NZ4120 and they served with Nos. 5 and 6 Squadrons. No. 5 kept examples until 1967 when, on 2 April, NZ4107 (ex-VB883) flew the last official RNZAF flight. With this extended employment the Sunderland was able to complete nearly 29 years of air force service. Most were broken up on withdrawal but NZ4115 (ex-SZ584) is preserved.

The next recipient was the South African Air Force whose No. 35 Squadron was formed from No. 262 RAF Catalina Squadron in February 1945. It received the first of 16 Mk.Vs in April but only 15 entered service (Nos. 1701 to 1715) as ex-PP153 was badly damaged on arrival and a serial never allocated. The full complement was active until 1955 but only one, 1710 (ex-RN281), lasted until 1957; it flew the last official SAAF flight on 8 October.

The other post-war military operator was France. From 1943 No. 343 RAF Free

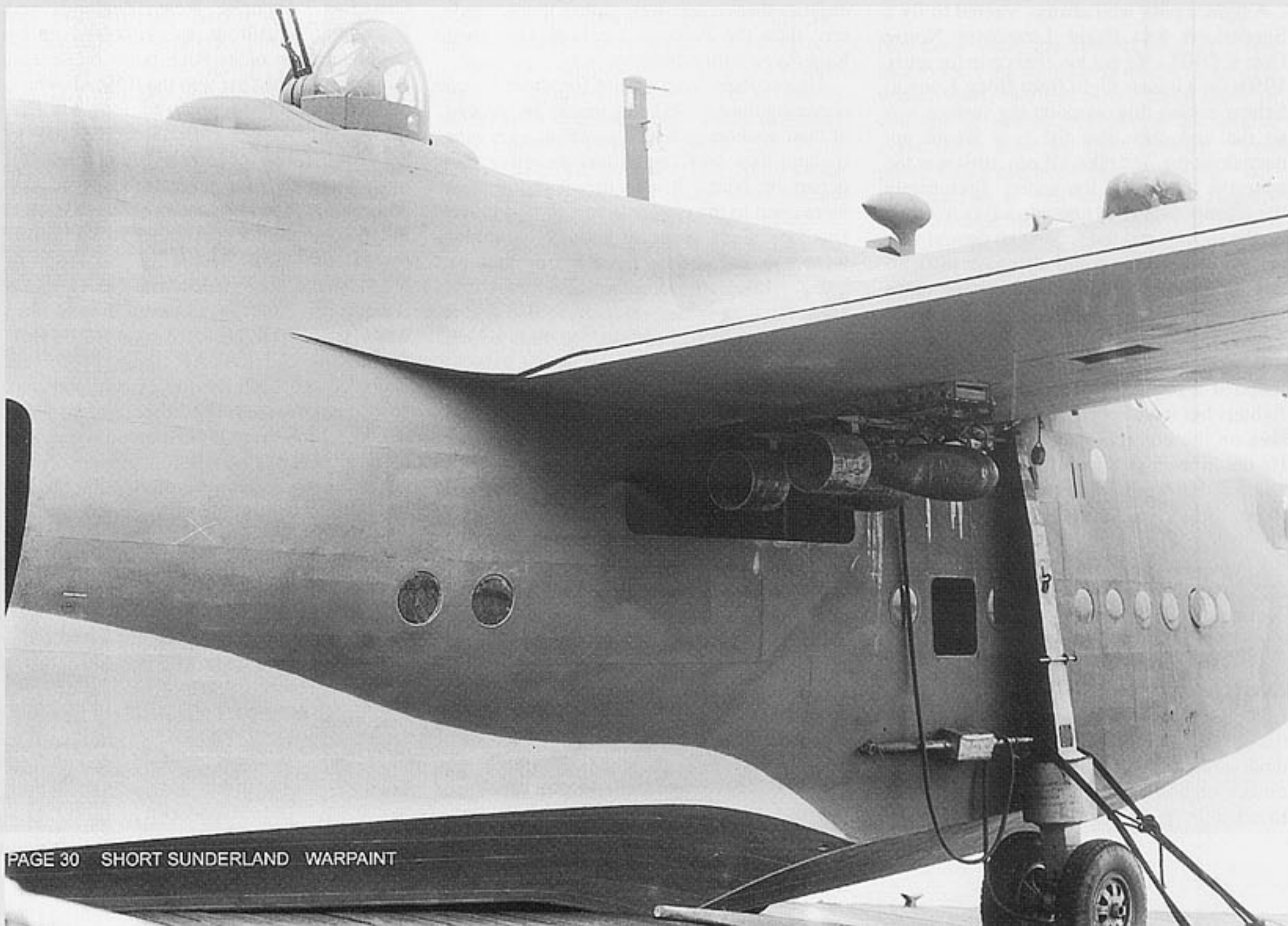
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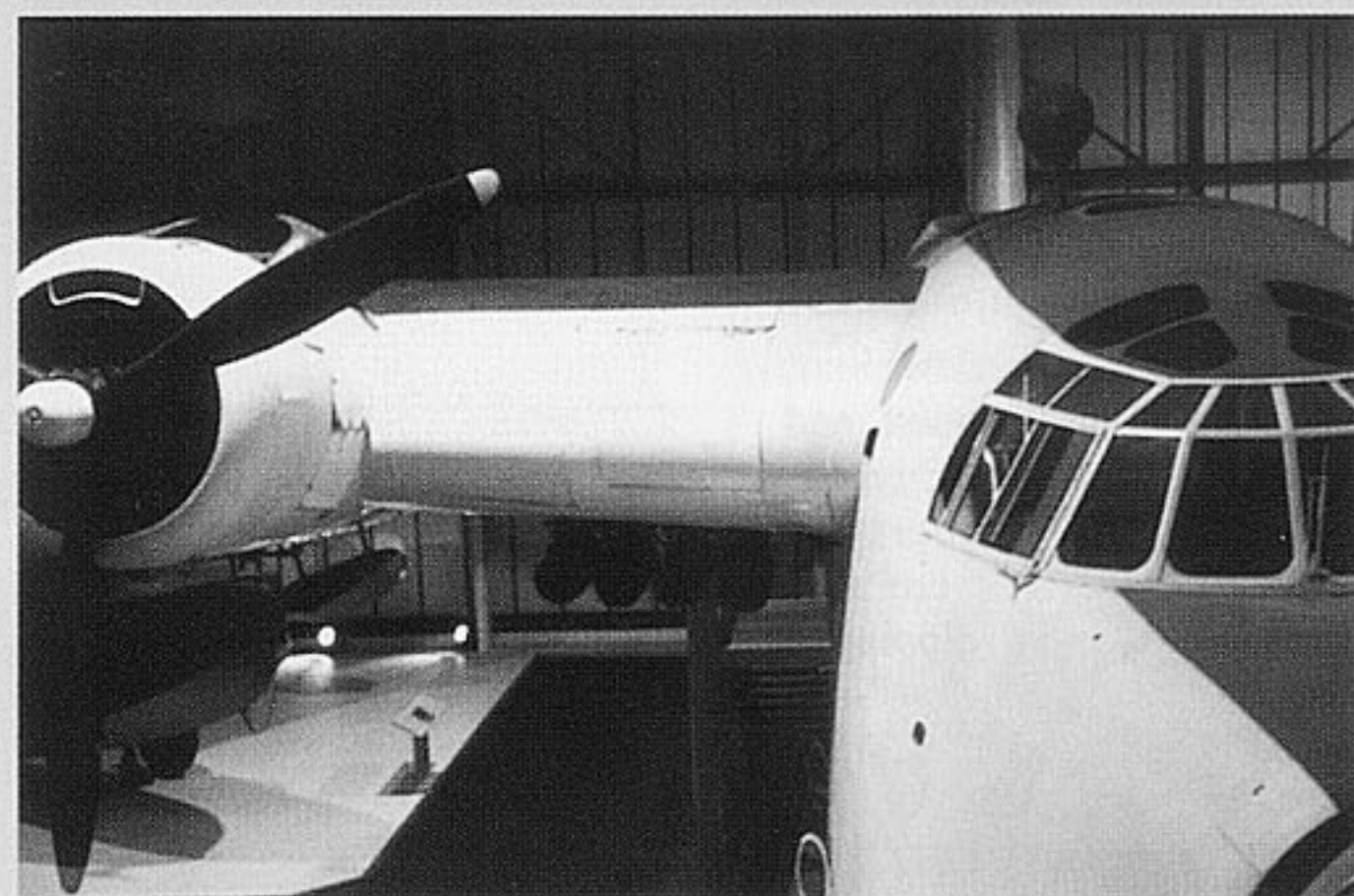
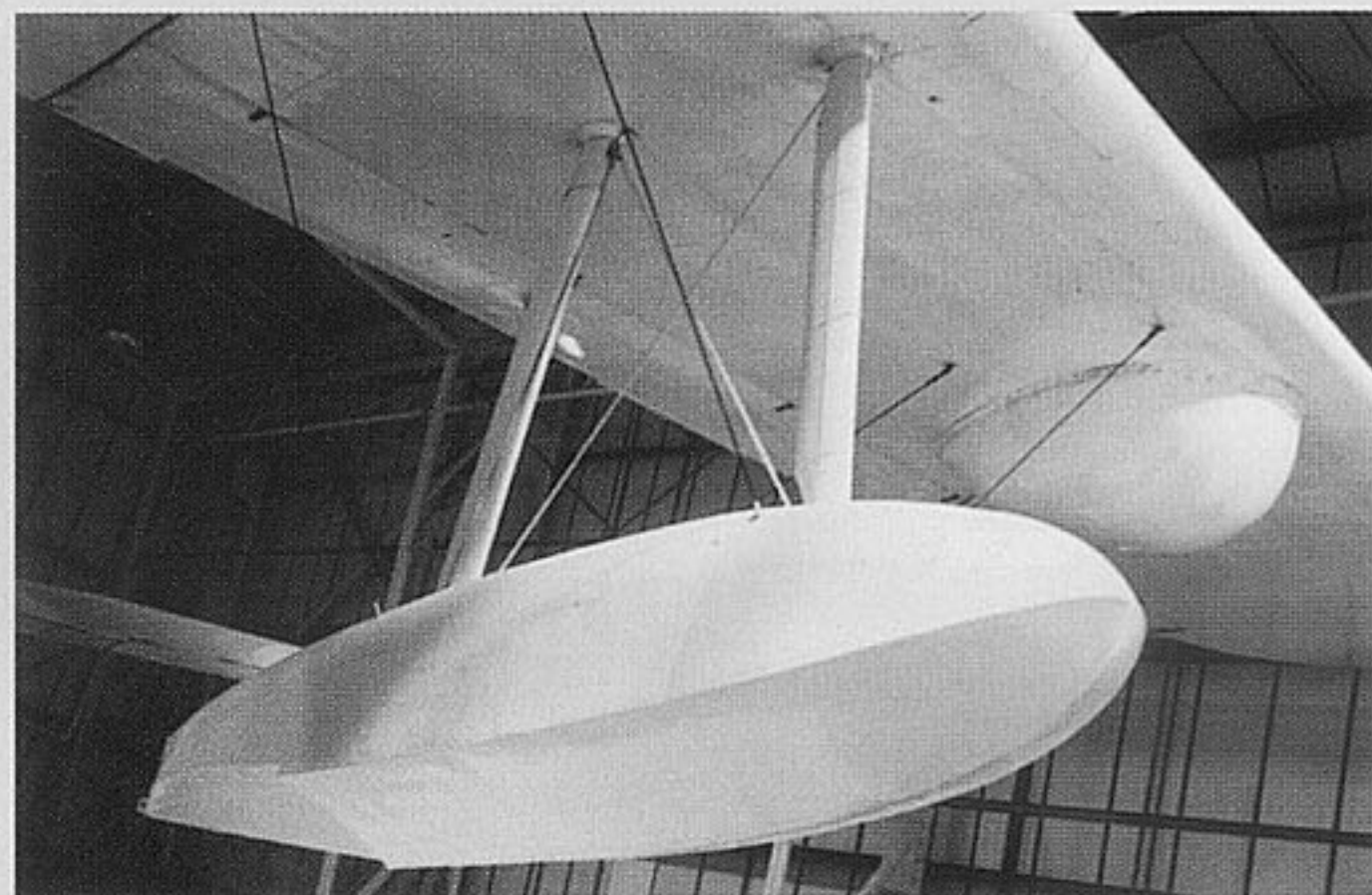
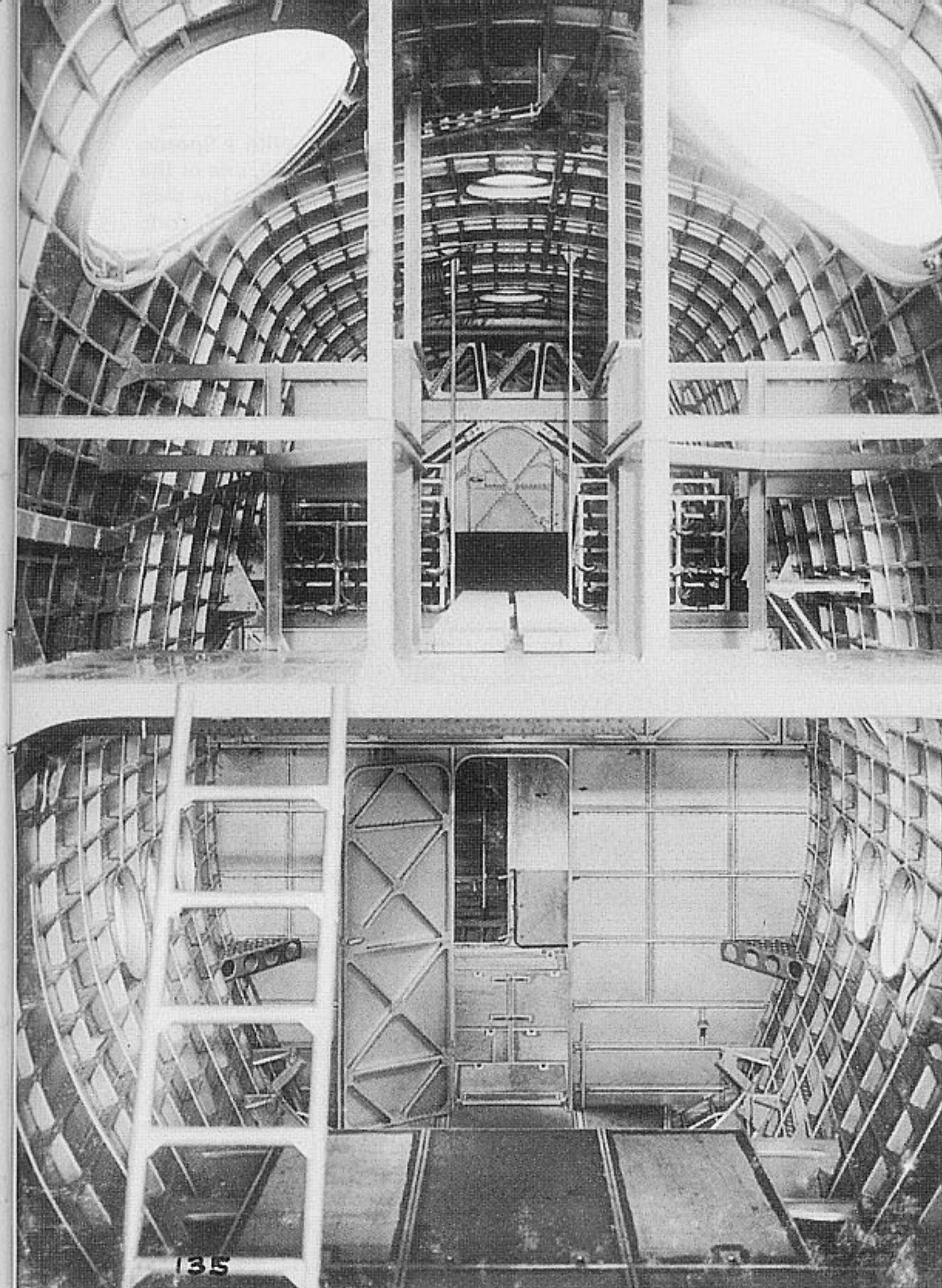


# Short SUNDERLAND in detail

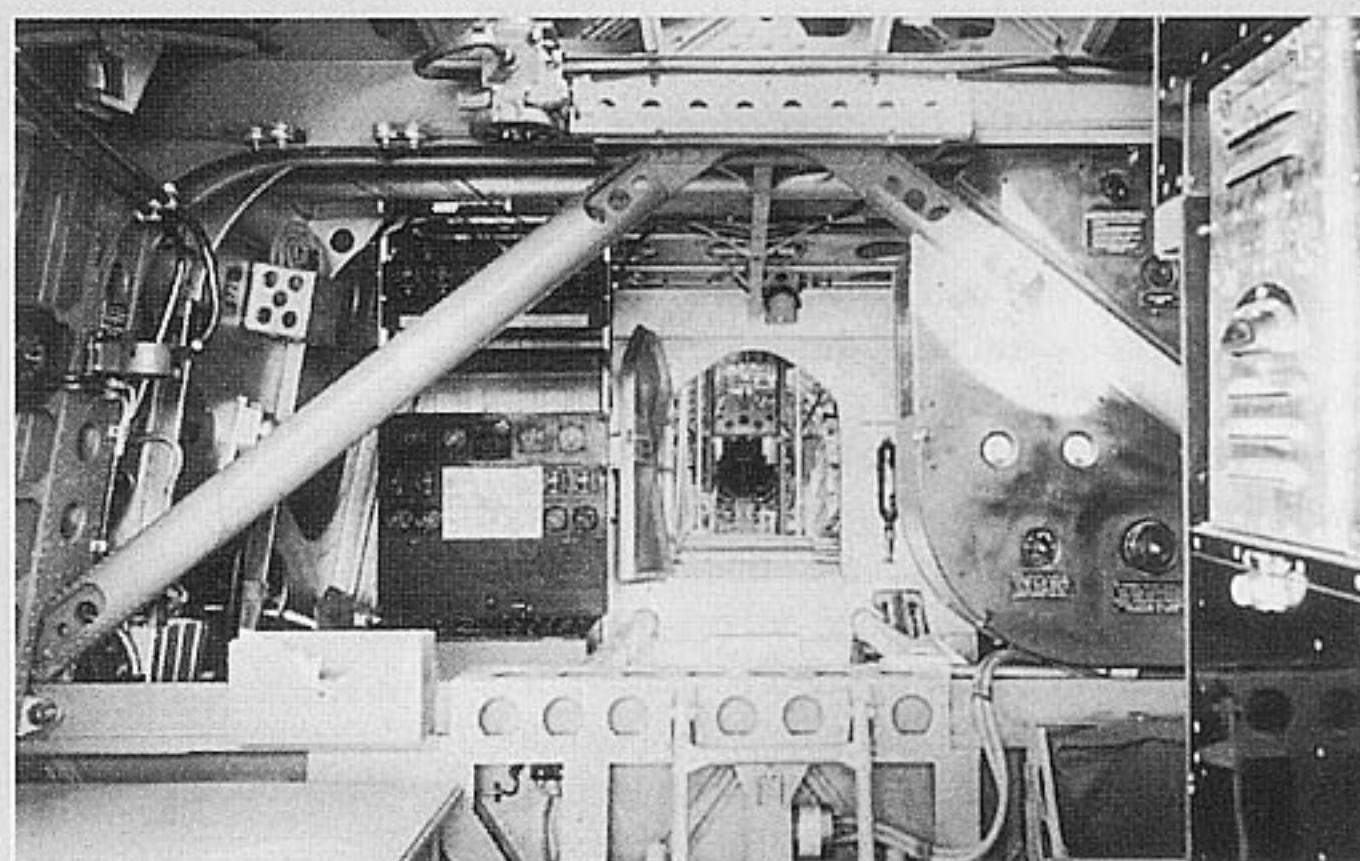
Short Bros. photographs unless stated

Above: Manufacturers photo of the first Sunderland Mk.V built at Rochester. ML796 was eventually passed to the French Aeronavale but was returned to the UK and is now preserved at the IWM, Duxford. Below: A host of close up external detail on a Mk.III showing the beaching trolley, bomb racks extended and the mid-upper turret which was similar to that used on the early Stirlings and Blackburn Botha. Right: The fuselage interior of a Mk.I looking forward. Note the upper and lower decks. (Short Bros)

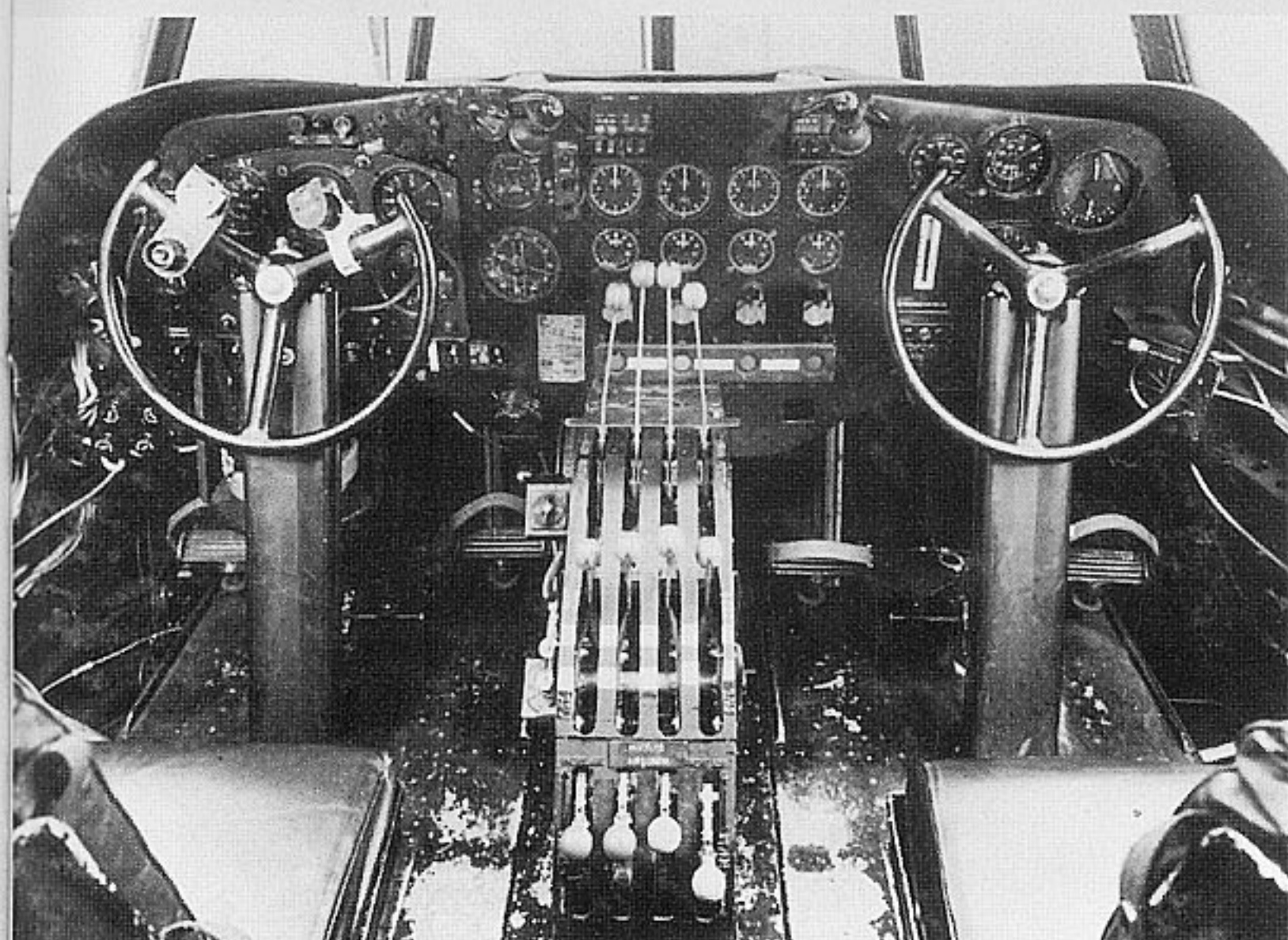


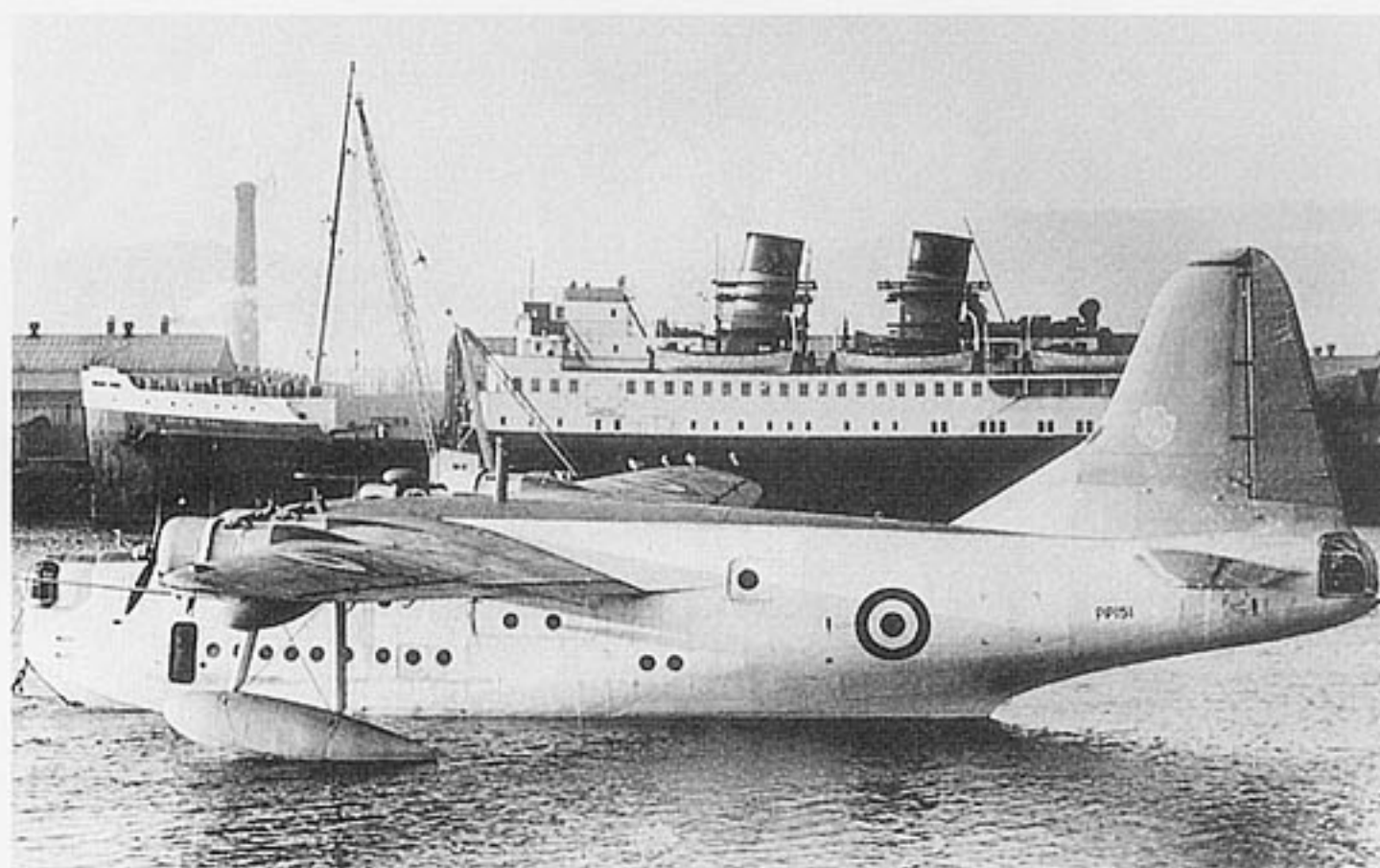


Top: Port side float of Mk.V ML824 preserved at the RAF Museum, Hendon, showing the detail of the bracing wires and the position and shape of the radome under the port wing. Below: Close up of the cockpit and inner starboard engine. The outline of the drop down panels used for engine servicing whilst on the water can be seen. Note also that the depth charges have been placed outboard on their racks. (Author)



Top left: ML824's starboard Twin Wasp engines. (Author) Lower left: The exact version of Sunderland is not known in this instrument panel cockpit picture but it is one of the later ones as otherwise the gunsight would not be in evidence. Above: Looking to the rear from the navigator's position with the rear turret in the distance. Below: Cabin interior, upper deck, looking to the rear in a Solent flying boat in BOAC service. (Short Bros.)





Sunderland Mk.5 PP151 as fitted with a Sperrin aerodynamic test rudder in late 1950, one of the few used for experimental purposes. The ship in the background is the *MV Duke of York*. (MAP)

When the Sunderland was finally stood down from RAF service it had established a record at that time for longevity of continuous operation in a single front line role, 21 years, as well as being the RAF's last flying boat. It was replaced in the main by land-based Avro Shackletons, an aircraft which, from a British point of view, sounded the death knell for the military flying boat. The Queen, as the Sunderland was affectionately known, was a truly remarkable aeroplane. Sadly the only example still flying today, ML814, lives in America in the ownership of Kermit Weeks.

Below: Three aircraft of No. 201 Squadron flying over the coastline of Northern Ireland in the 1950s. The closest, NS:H, is RN285. (MAP) Bottom: RN270:K of No. 205/209 Squadron in the hanger at Seletar in 1958; it was Struck-Off-Charge in September of that year and scrapped. (Bill Harrison)

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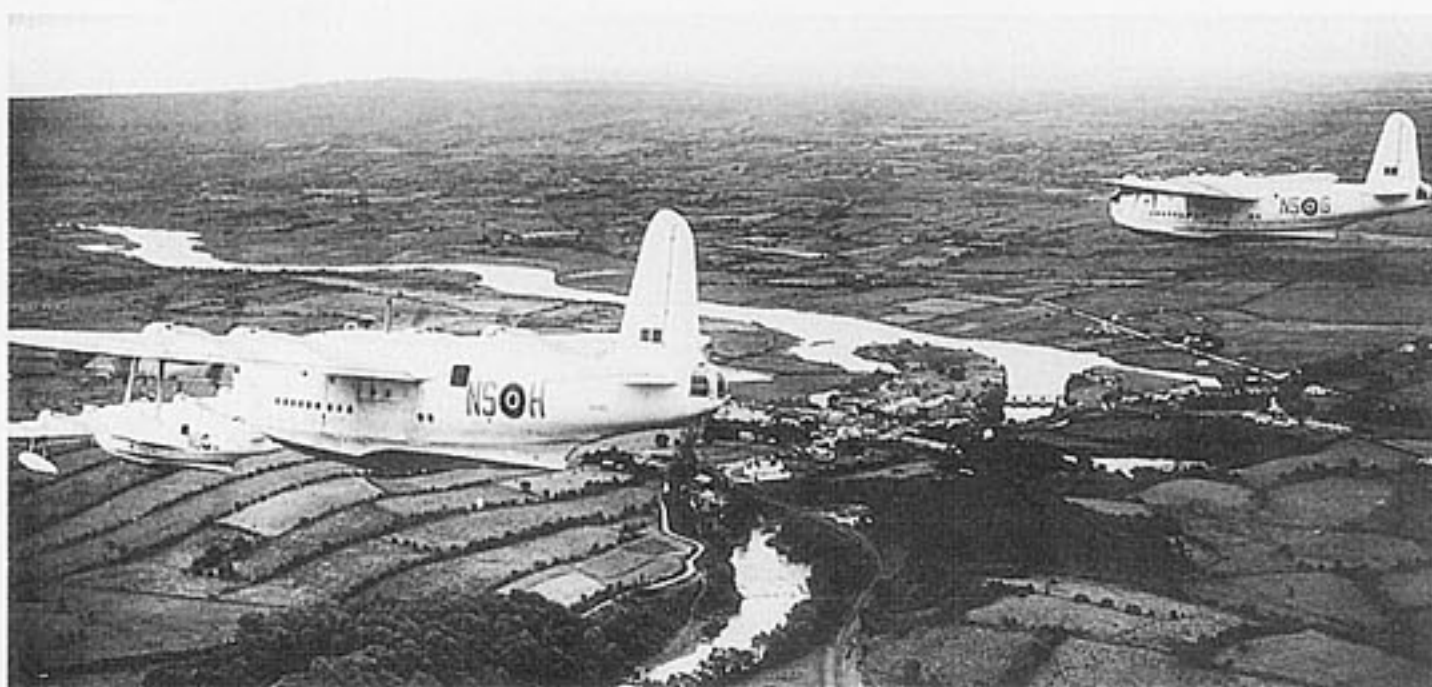
French Squadron flew Sunderlands out of Freetown and Bathurst and in November 1945 the unit transferred to the Aeronavale complete with its aircraft as Flottille 7FE. Twenty-five more were transferred between 1947 and 1957 equipping Escadrilles 12S, 50S and 53S, and Flottille 7FE was renumbered 7F and then 27F. Withdrawal began in 1960 but two, ML796 and RN284, lasted until 30 January 1962. One example, ML824, was returned to the UK and today forms a component of the RAF Museum at Hendon.

A few Sunderlands were used on experimental trials. The last Rochester and Belfast Mk.Vs, TX293 and SZ599 respectively, went direct to MAEE and in July 1948 the latter was given a 1 in 16.75 main step fairing. A forward set of ducts were so positioned as to encourage early breakaway at the step whilst a rear set was to provide ventilating air to the estimated point of maximum afterbody suction; both sets of ducts were ventilated naturally from openings in the sides of the hull. The handling of SZ599 was found to differ very little from that of the standard Mk.V, severe instability and skipping were experienced when the vents were sealed but when opened to a sufficient area close behind the main step the phenomenon was non-existent. This was a step forward in hull design suggesting that near stepless hulls of minimal drag might be possible but the world-wide transition to land-based aeroplanes was too far advanced for this knowledge to make an impression.

TX293 and PP162 were used to measure impact loads on planing bottoms and also to test the powered controls of both the Short Shetland and Saro Princess flying boats. Finally in November 1950 Shorts Belfast fitted PP151 with a special aerodynamic-servo rudder to test the design for use on the firm's Sperrin jet bomber.

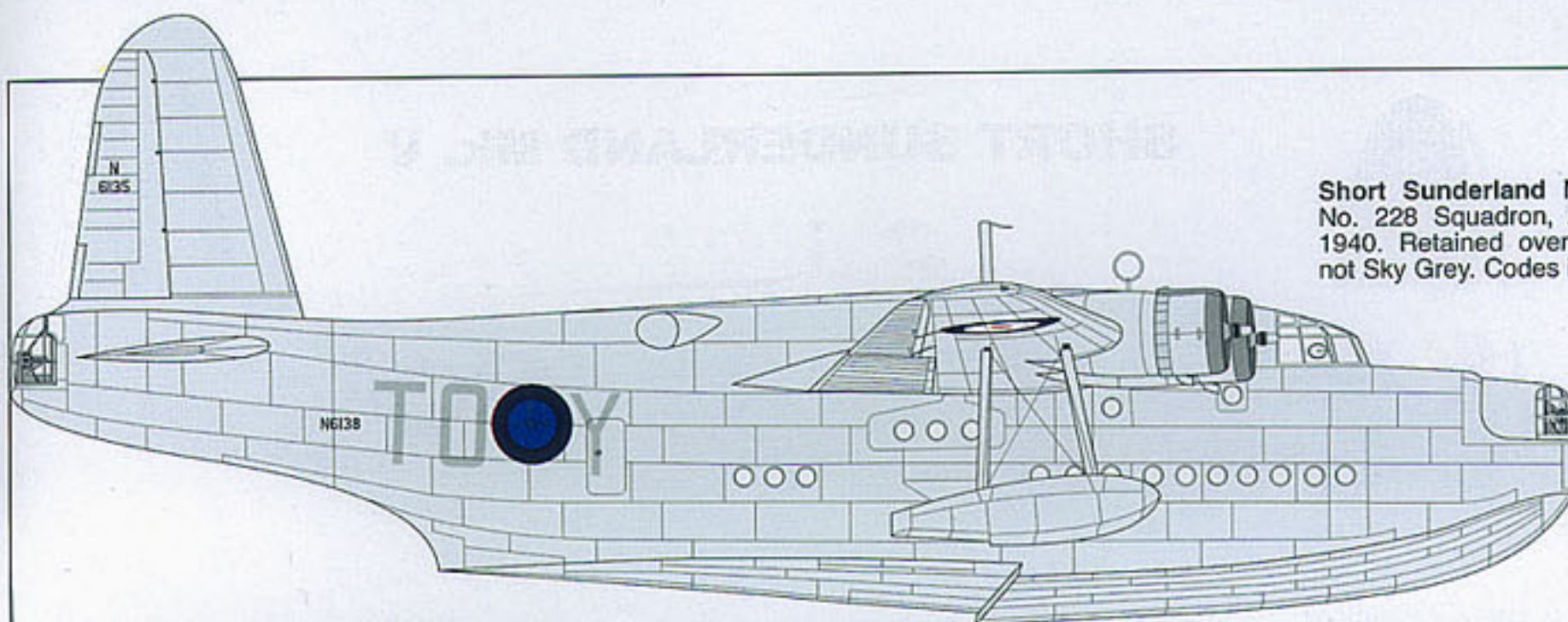
RAF withdrawals accelerated during the 1950s and the last UK unit to disband was No. 230 Squadron at Pembroke Dock on 31 July 1957 but a few of its aircraft were transferred to the 'Kipper Fleet' in Seletar. There available aircraft had fallen to such levels that Nos. 205 and 209 Squadrons were merged on 1 January 1955. ML797:P flew the final official RAF Sunderland flight on

20 May 1959 after which the survivors were stored, and then were scrapped at Seletar.



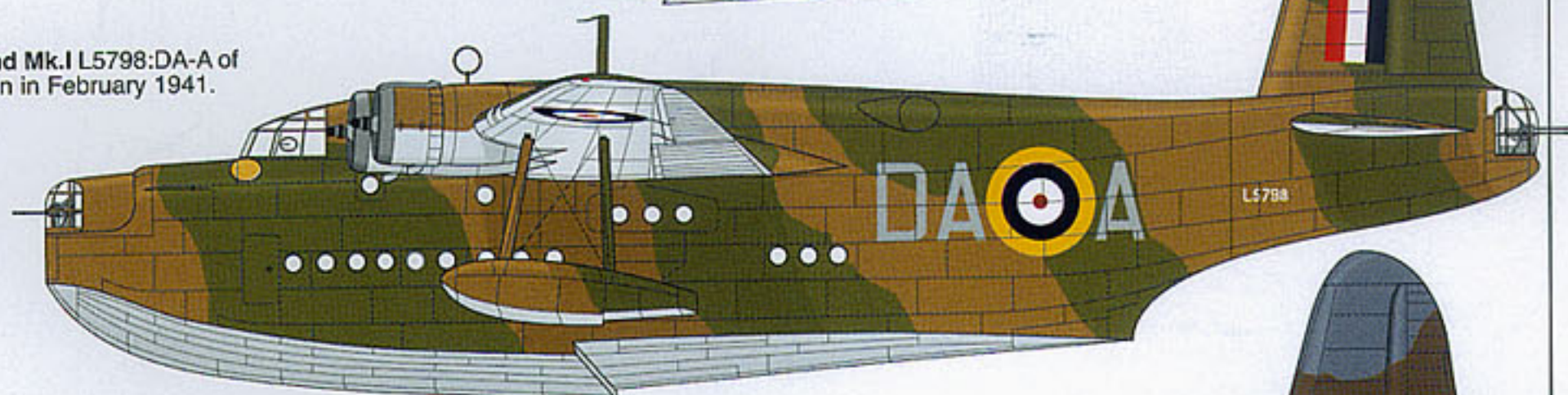
## Short Sunderland kits and accessories

| Scale | Type                  | Manufacturer     | Reference | Remarks                                 |
|-------|-----------------------|------------------|-----------|-----------------------------------------|
| 1:72  | Sunderland III        | Airfix           | 6001      | Complete kit                            |
| 1:72  | Sunderland 5          | Aeroclub         | E072      | P&W Twin Wasp engines                   |
| 1:72  | Sunderland I, II, III | Engines & Things | 72023     | Pegasus engines for early variants      |
| 1:72  | Sunderland 5          | Engines & Things | 72071     | P&W Twin Wasp engines                   |
| 1:72  | Sunderland III, IV, 5 | Engines & Things | 72146     | Underwing radomes                       |
| 1:48  | Sunderland III        | Fonderie         | FM6006    | Injection moulded kit To be released    |
| 1:48  | Sunderland III, IV    | Sinifer          | SIN4801   | Resin moulded kit                       |
| 1:32  | Sunderland            | ID Models        | 3273      | Vacuform kit suitable for most variants |

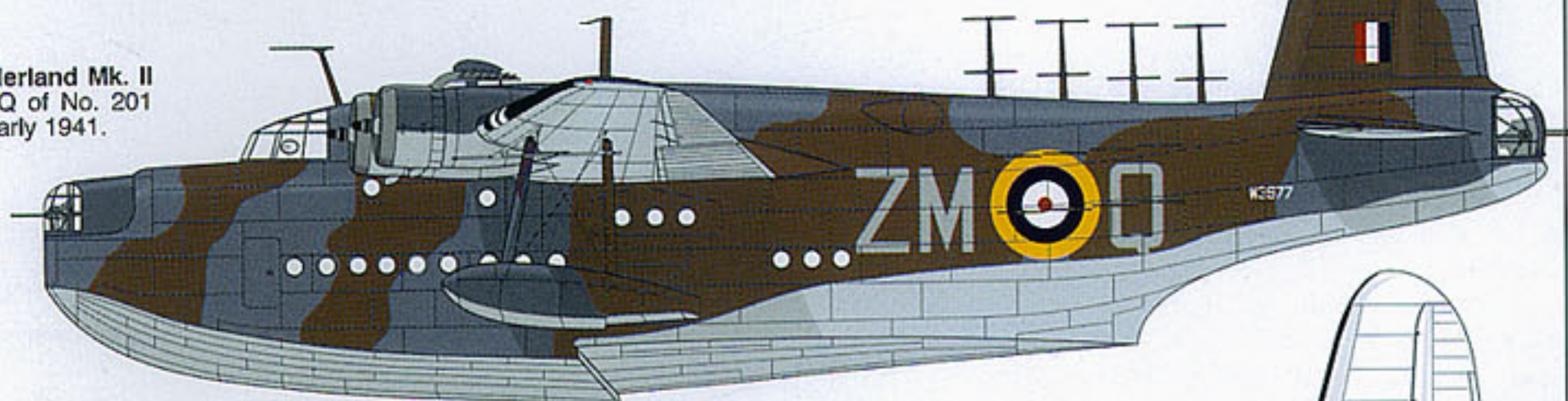


Short Sunderland Mk.I N6138:TO-Y of No. 228 Squadron, Aboukir, Egypt, July 1940. Retained overall Aluminium finish, not Sky Grey. Codes in Medium Sea Grey.

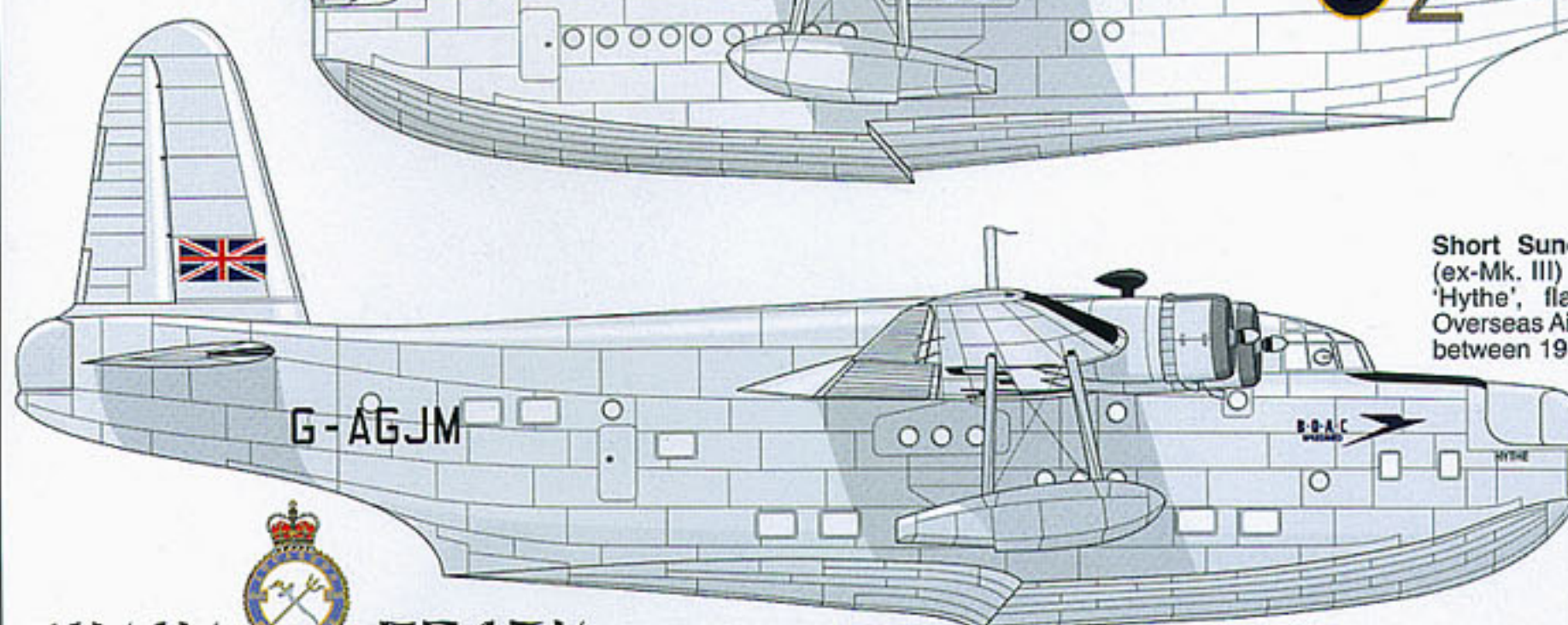
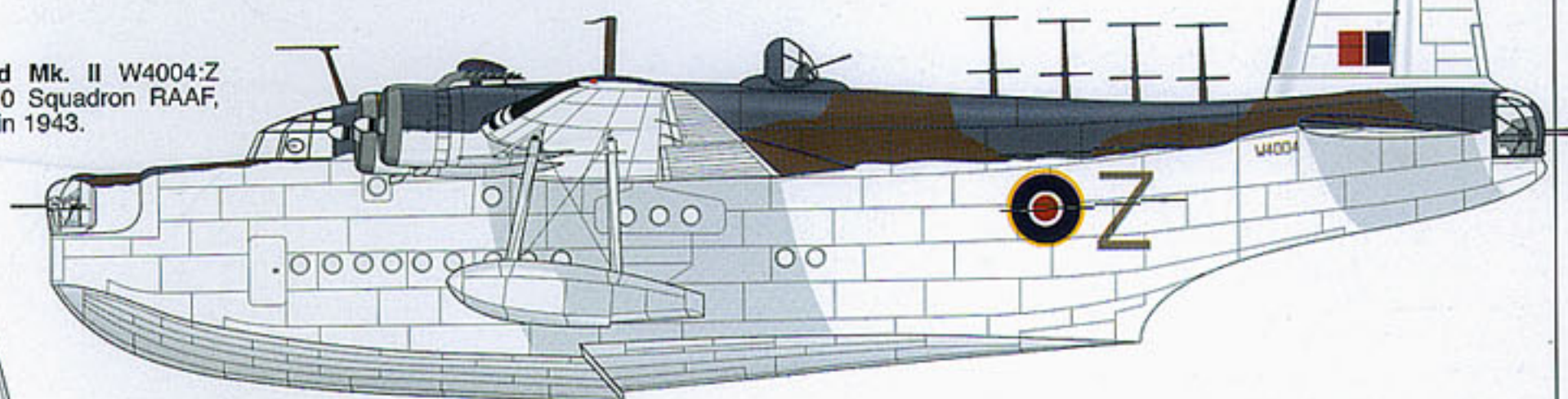
Short Sunderland Mk.I L5798:DA-A of No. 210 Squadron in February 1941.



Short Sunderland Mk. II W3977:ZM-Q of No. 201 Squadron early 1941.



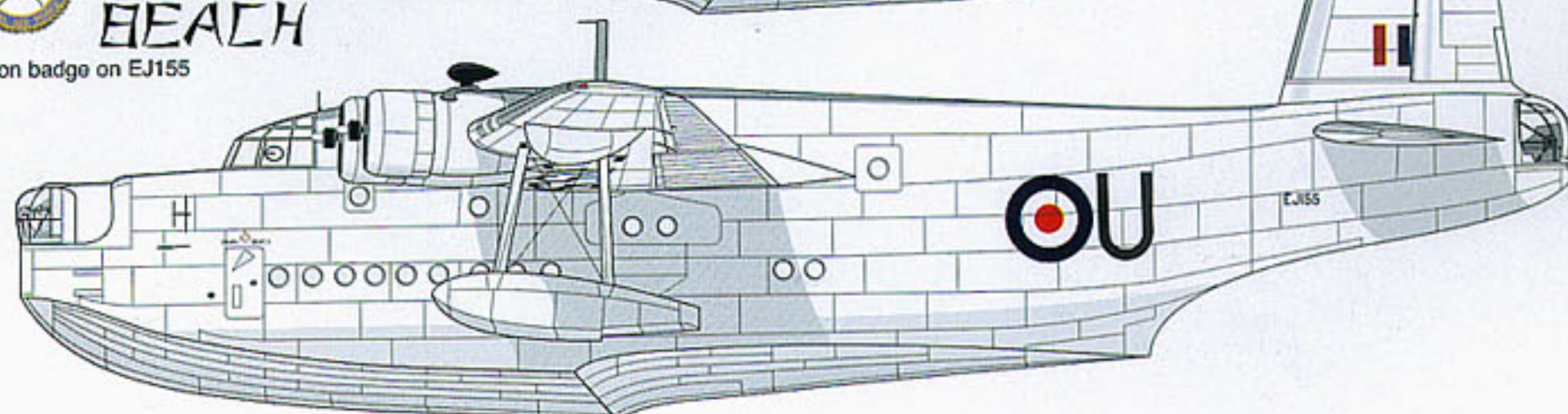
Short Sunderland Mk. II W4004:Z probably of No. 10 Squadron RAAF, RAF Mountbatten in 1943.



Short Sunderland Hythe Class (ex-Mk. III) G-AGJM, named 'Hythe', flagship of the British Overseas Airways Corporation fleet between 1946-1949.



Short Sunderland GR.5 (Modified Mk.III) EJ155:U named 'Tawaw Beach' of No. 205 Squadron, Seletar, Singapore, February 1955.





Top: Sunderland ML797P, the last aircraft of its type to serve with No. 205/209 Squadron at Seletar, Singapore, about to be hauled out of the water on 20 May 1959. Above: The aircraft was the subject of a formal ceremony in which a guard of honour was present and a paying off pennant displayed attached to the tail. Below: Initially all of No.205/209's Sunderlands were brought ashore and put in storage but eventually they had valuable items such as engines and equipment removed and the hulls sold to local scrap metal merchants. (Bill Whiter)

## Short Sunderland and Seaford Technical Specification

(Sunderland Mk.IV = Seaford GR.Mk.1)

### Dimensions:

Span: Mk.I & II 112ft 9in (34.37m),  
Mk.III, IV & V 112ft 9.5in (34.38m).  
Length: Mk.I & II 85ft 7in (26.08m),  
Mk.III 85ft 4in (26.01m),  
Mk.IV 88ft 7in (27.00m),  
Mk.V 85ft 3.5in (26.00m).  
Wing Area: Mk.I - III & V  
1,488sq.ft(138.38sq.m) with 1/3 flaps

### Maximum Weight:

Mk.I 56,000lb (25,402kg),  
Mk.II & III 58,000lb (26,309kg),  
Mk.IV 75,000lb (34,020kg),  
Mk.V 60,000lb (27,216kg).

### Powerplant:

Mk.I Four 1,010hp (763kW) Bristol Pegasus XXII,  
Mk.II & Mk.III Four 1,050hp (783kW) Bristol Pegasus XVIII,  
Mk.IV Four 1,700hp (1,268kW) Bristol Hercules XIX,  
Mk.V Four 1,200hp (895kW) Pratt & Whitney R-1830-90B Twin Wasp.

### Performance:

Maximum Speed:  
Mk.I 209mph (336km/h) at 5,000ft (1,524m),  
Mk.II 205mph (330km/h),  
Mk.III 210mph (338km/h),  
Mk.IV 242mph (389km/h),  
Mk.V 213mph at 5,000ft (1,524m).  
Ceiling:  
Mk.I 15,000ft (4,572m),  
Mk.III 17,200ft (5,243m),  
Mk.IV 13,000ft (3,962m),  
Mk.V 17,900ft (5,456m).  
Still Air Range:  
Mk.I 2,800nm (5,186km),  
Mk.IV 2,690nm (4,982km),  
Mk.V 2,980nm (5,522km).

### Armament:

Mk.I, early Mk.II 1 x 0.303in nose, 4 x 0.303in tail, 2 x 0.303in beam, 2,000lb (907kg) bombs or DC,  
Late Mk.II, Mk.III 2 x 0.303in nose, 4 x 0.303in tail, 2 x 0.303in dorsal, 2,000lb bombs or DC,  
Mk.IV 2 x 0.5in nose, 2 x 0.303in nose (fixed), 2 x 0.5in tail, 2 x 0.5in beam, 2 x 20mm dorsal, 2,000lb bombs or DC,  
Mk.V 8 x 0.303in nose (4 fixed), 4 x 0.303in tail, 2 x 0.303in dorsal, 2/4 x 0.5in beam, 2,000lb bombs or DC

