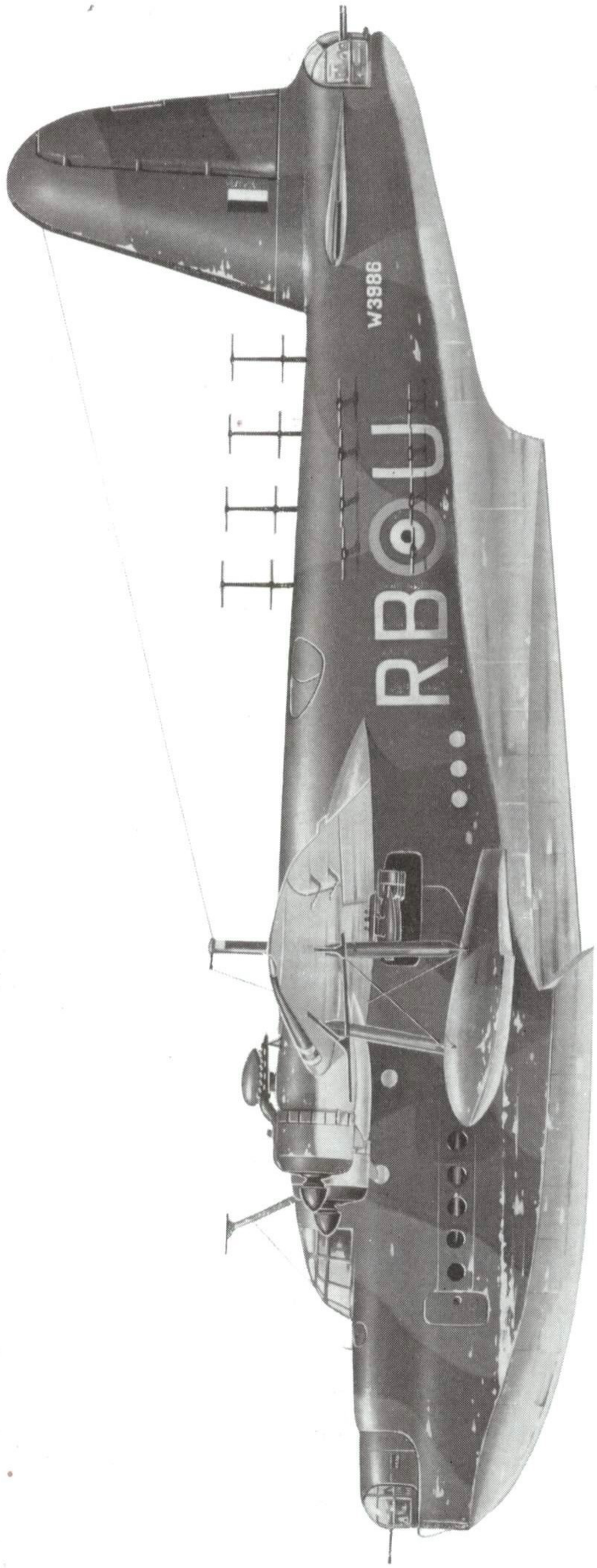
PROFILE PUBLICATIONS

The Short Sunderland



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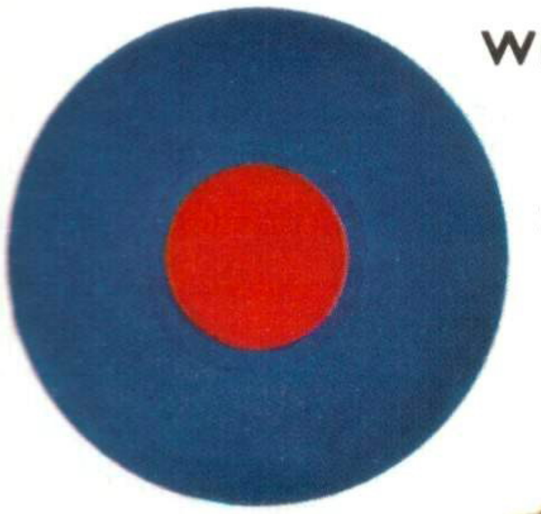
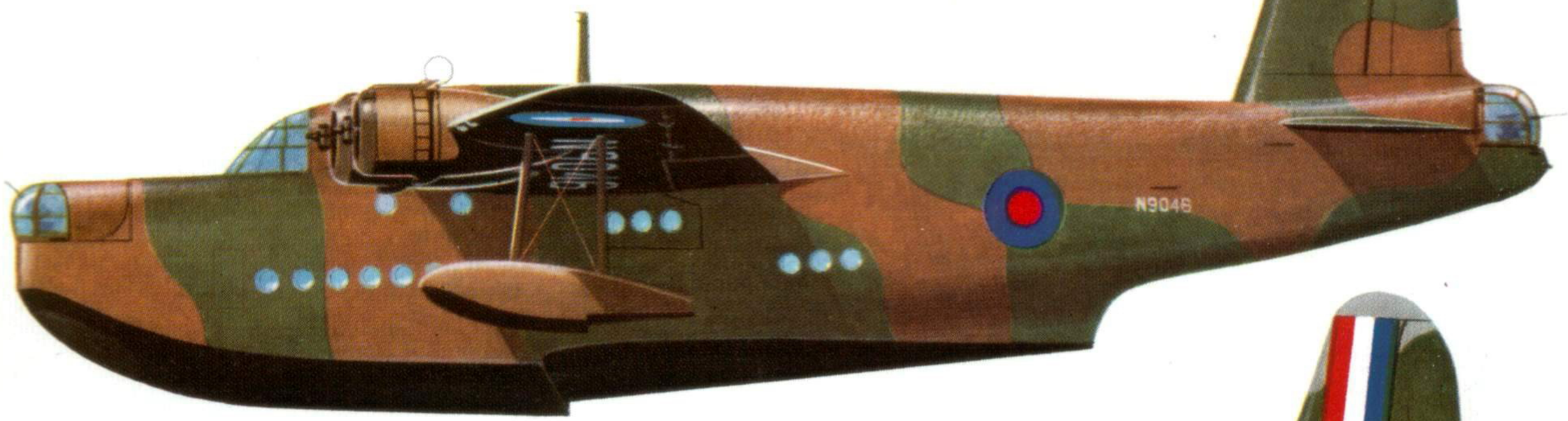


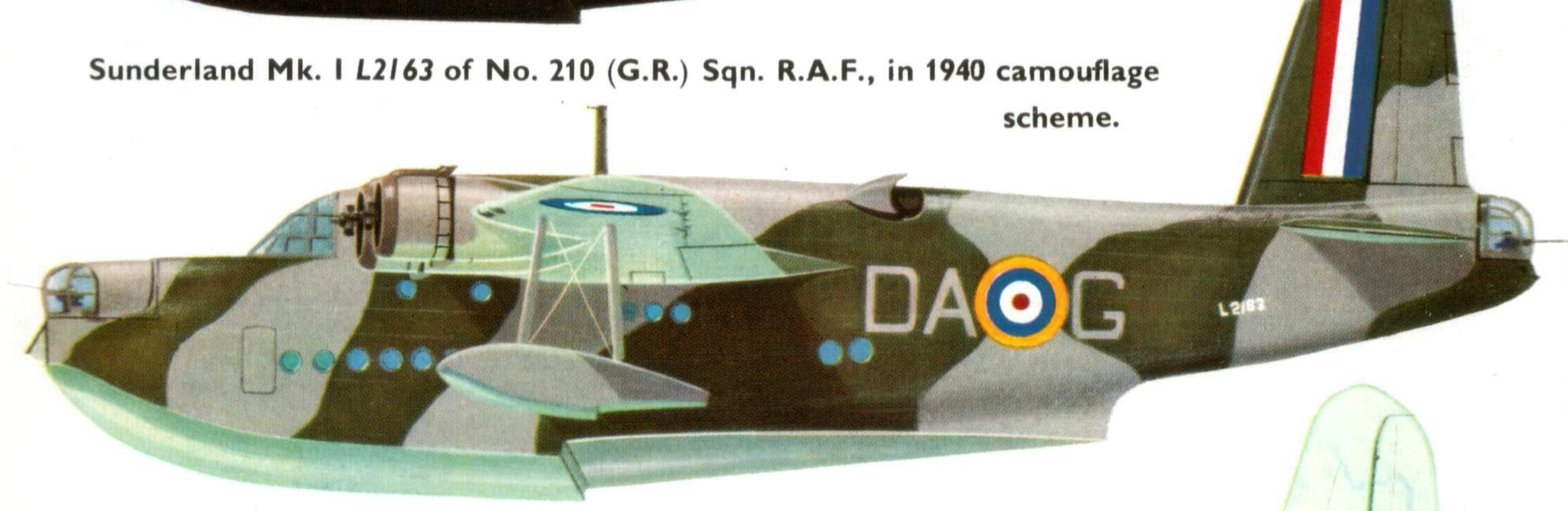
Wing upper surface roundel.

Sunderland Mk. I *L5802* of No. 204 (G.R.) Squadron R.A.F., in 1939 pre-war colour scheme.

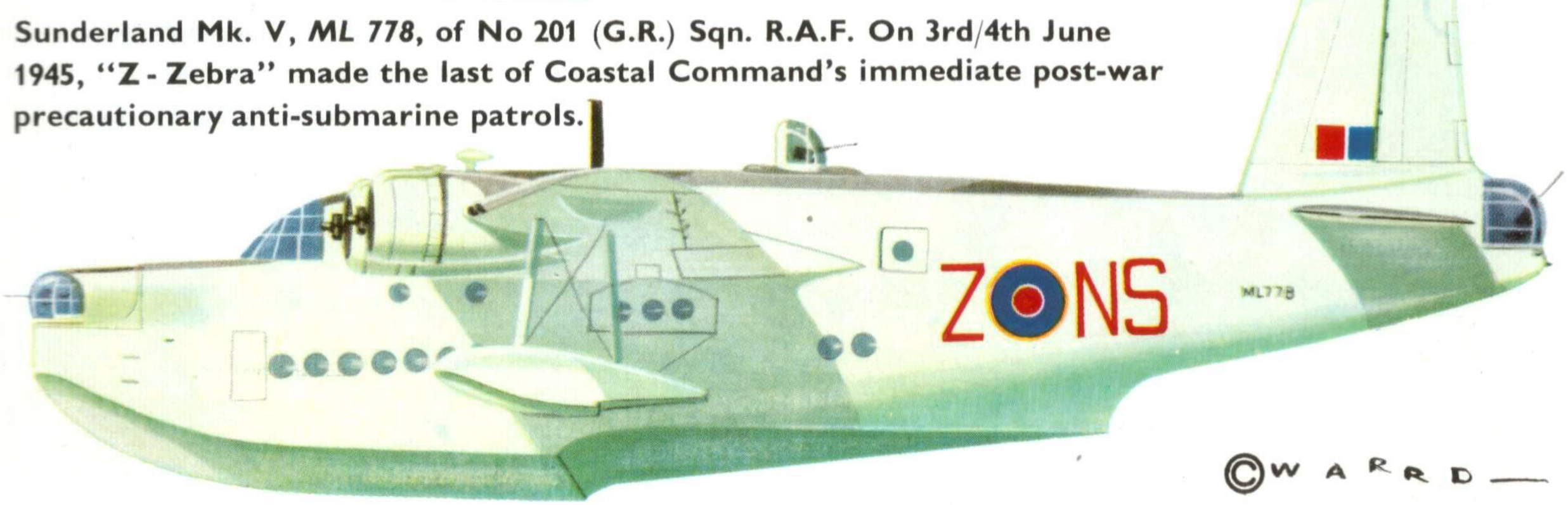
Sunderland Mk. I, *N9046*, in early wartime camouflage scheme.



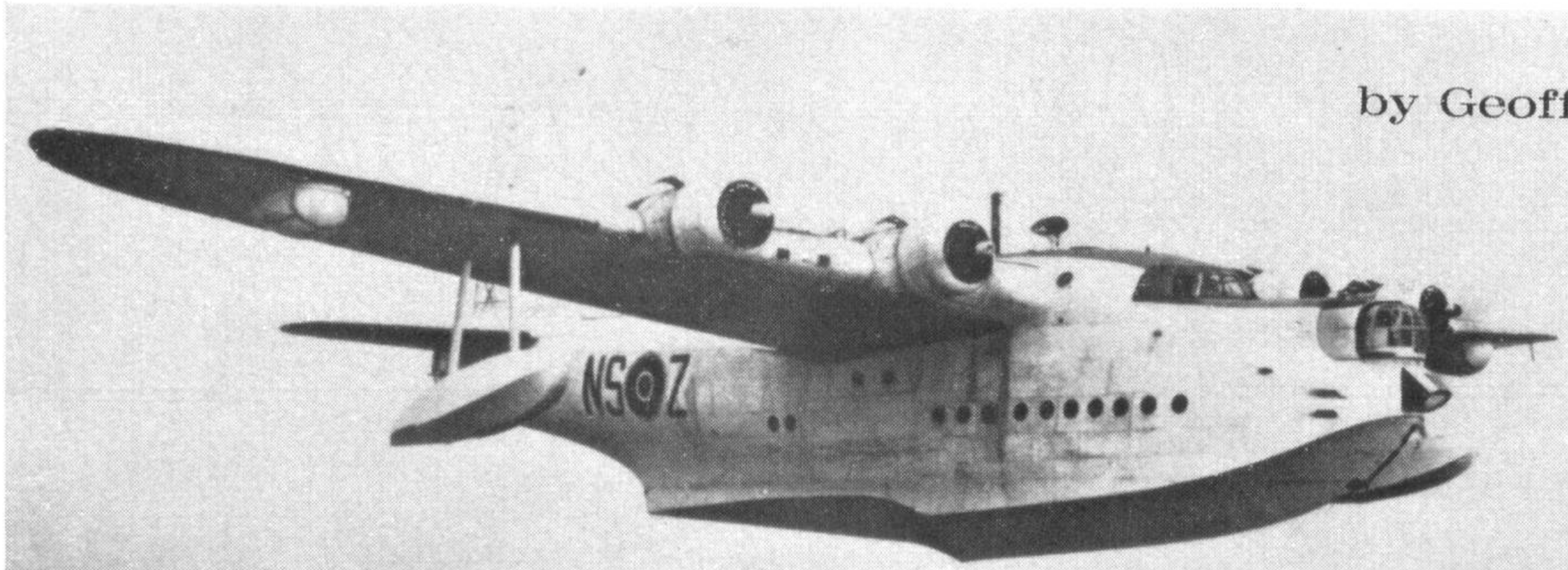
Sunderland Mk. I *L2163* of No. 210 (G.R.) Sqn. R.A.F., in 1940 camouflage scheme.



Sunderland Mk. V, *ML 778*, of No 201 (G.R.) Sqn. R.A.F. On 3rd/4th June 1945, "Z - Zebra" made the last of Coastal Command's immediate post-war precautionary anti-submarine patrols.



by Geoffrey Norris



The Short Sunderland

A Sunderland Mk. V of No. 201 Sqn., R.A.F. on patrol. At the peak of its career, the Sunderland equipped 28 squadrons; by the close of hostilities, Sunderlands had been credited with sinking 28 submarines and shared seven other "kills" with Allied surface vessels.
(Photo: Imp. War Mus. CH18020)

The Short Sunderland first flew in 1937. Today, thirty years later, passenger conversions are still flying in some parts of the world. It entered service with the Royal Air Force in 1938 as a reconnaissance aircraft with Coastal Command and was only retired from this task in 1958—twenty-one years service in the same rôle, a record for any R.A.F. machine. Until quite recently it was performing exactly the same duties with the Royal New Zealand Air Force. Whichever way you look at it, the Sunderland was quite an aeroplane.

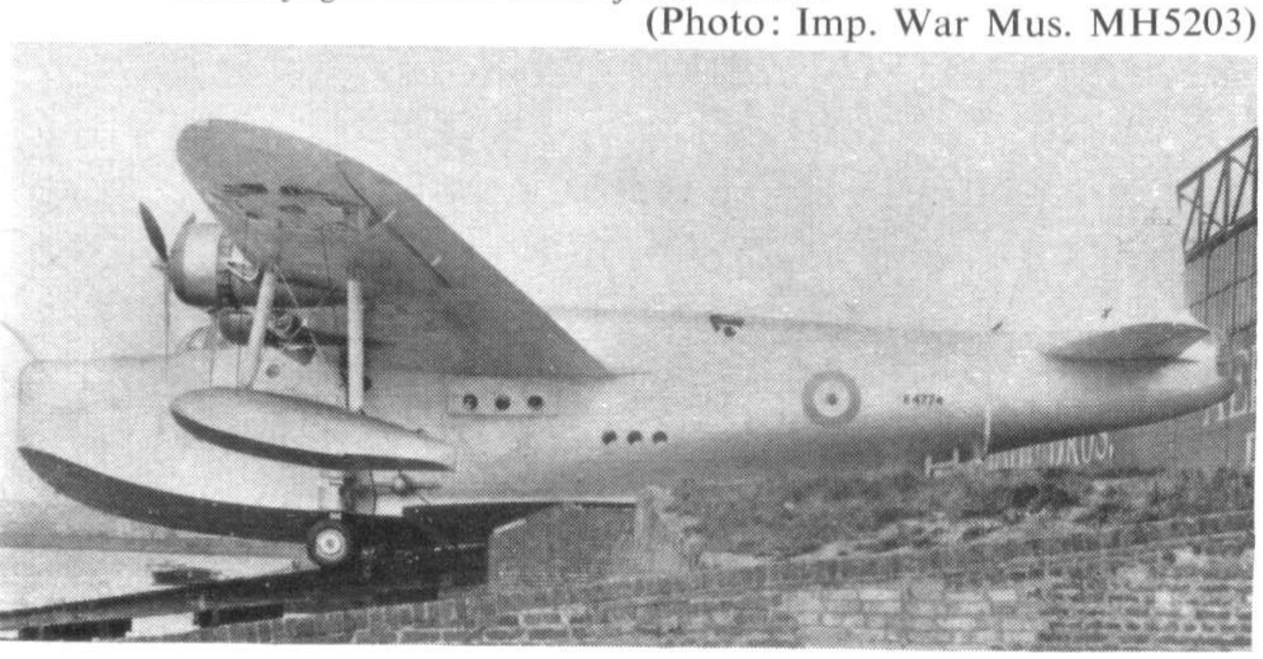
It has usually been described as a straightforward development of the Empire Class flying boats (see *Profile* No. 84) which Short Brothers built for Imperial Airways before the war, but this is not strictly correct. Specification R.2/33 was issued in November 1933, after the R.A.F. had taken delivery of the huge six-engined Sarafand flying boat also built by Shorts. It called for a long-range, general purpose flying boat with a performance equal to that of the Sarafand but more compact in size and with four engines instead of six. The new aircraft could be either monoplane or biplane.

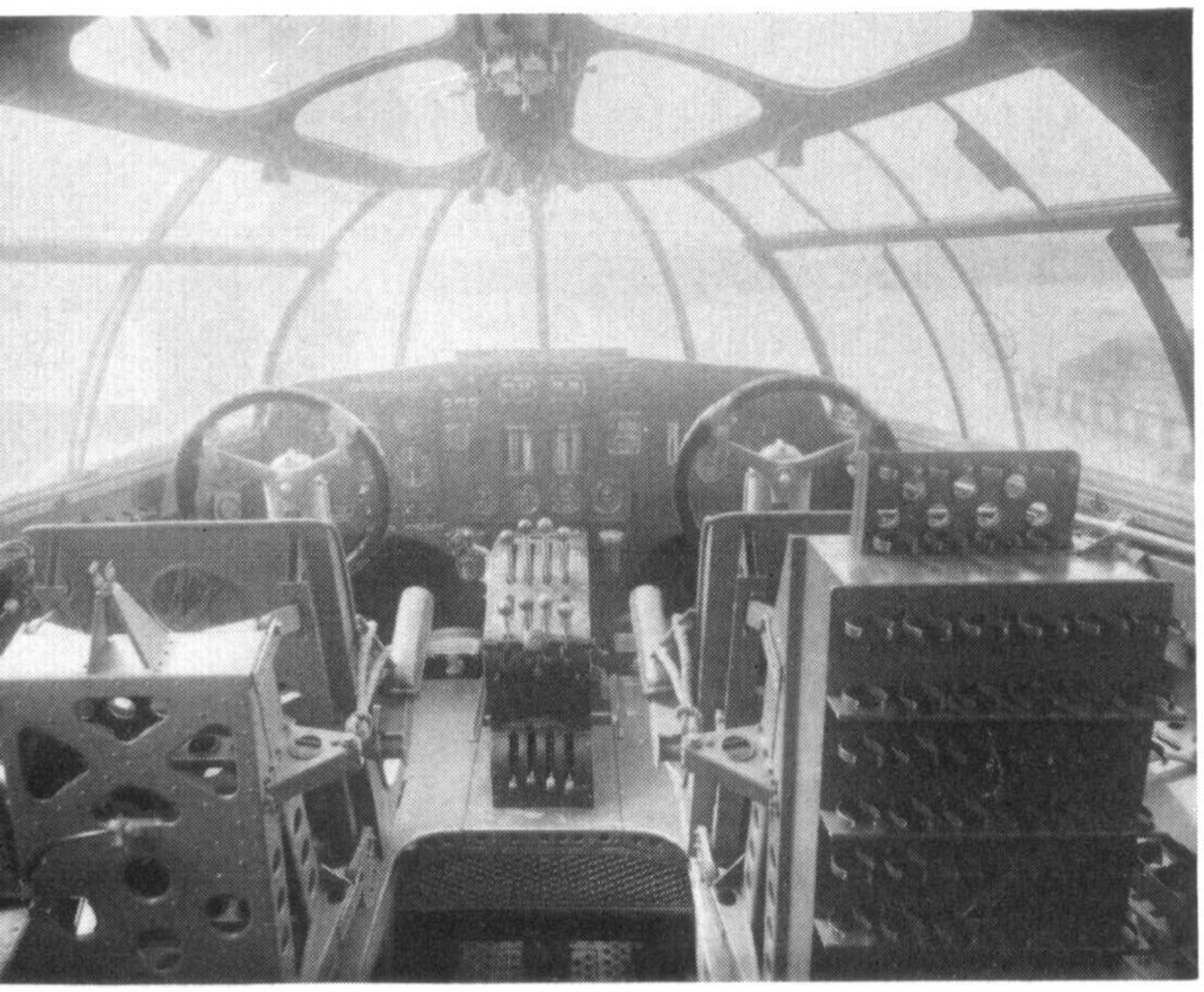
Shorts, which at that time was headed by Oswald Short with Arthur Gouge as his chief designer, was still in the early deliberation stage of the new R.A.F. flying boat when Imperial Airways issued their somewhat pressing request for the Empire Boats which were to be based on the four-engined Scion Senior which served as a half-scale flying prototype. At this time there was still no firm decision on the general geometry of the R.2/33 machine. It was not until October, 1934 that a decision was taken and this was influenced chiefly by the performance of the Douglas DC-2 in the MacRobertson race that year, Short and Gouge then came firmly down on the side of the monoplane and decided that, once again, they could do no better than base their design on the Scion Senior. From this point, however, the design and production of the Sunderland followed a line different from that of the Empire Boats. Imperial Airways were in a hurry but the R.A.F. were prepared to wait a little longer for a more sophisticated end product.

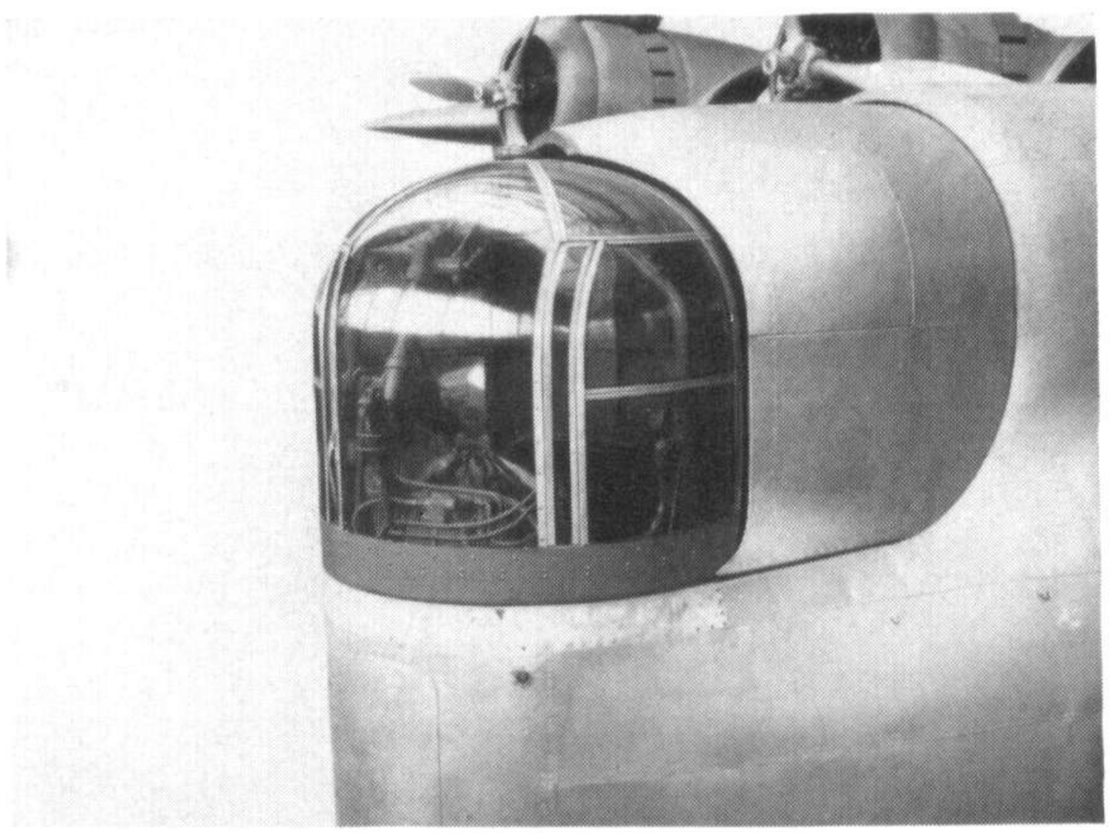
Work on the prototype, *K4774*, commenced under contract No. 351564/34 on a design known at the time only as the S.25. A similar contract had been awarded to the Saunders-Roe A.33 which had been designed to the same specification. This aircraft eventually met with an accident and left the S.25 as the sole contestant. Shorts' new flying boat looked very similar to the Empire Boats which were rapidly nearing completion, but made much more use of extrusions, some of which were not ready in time for the civil flying boats, and had an improved shape to the planing bottom with the rear step tapered to a vertical knife edge to reduce aerodynamic drag.

Proof that Shorts basic ideas were right came in June when *Canopus* the first of the Empire Class boats made a successful maiden flight. The Air Ministry's faith in Shorts was, however, displayed three months earlier when a development contract was placed for eleven more S.25 boats to specification 22/36. The critical final design conference was held around the time of *Canopus*' first flight. This was the stage at which Air Ministry and R.A.F. experts brought forward their criticisms of the design. The S.25 emerged with only one serious change: the Vickers 37 mm. shell-firing gun which had been requested for the nose turret was changed for a single Lewis or

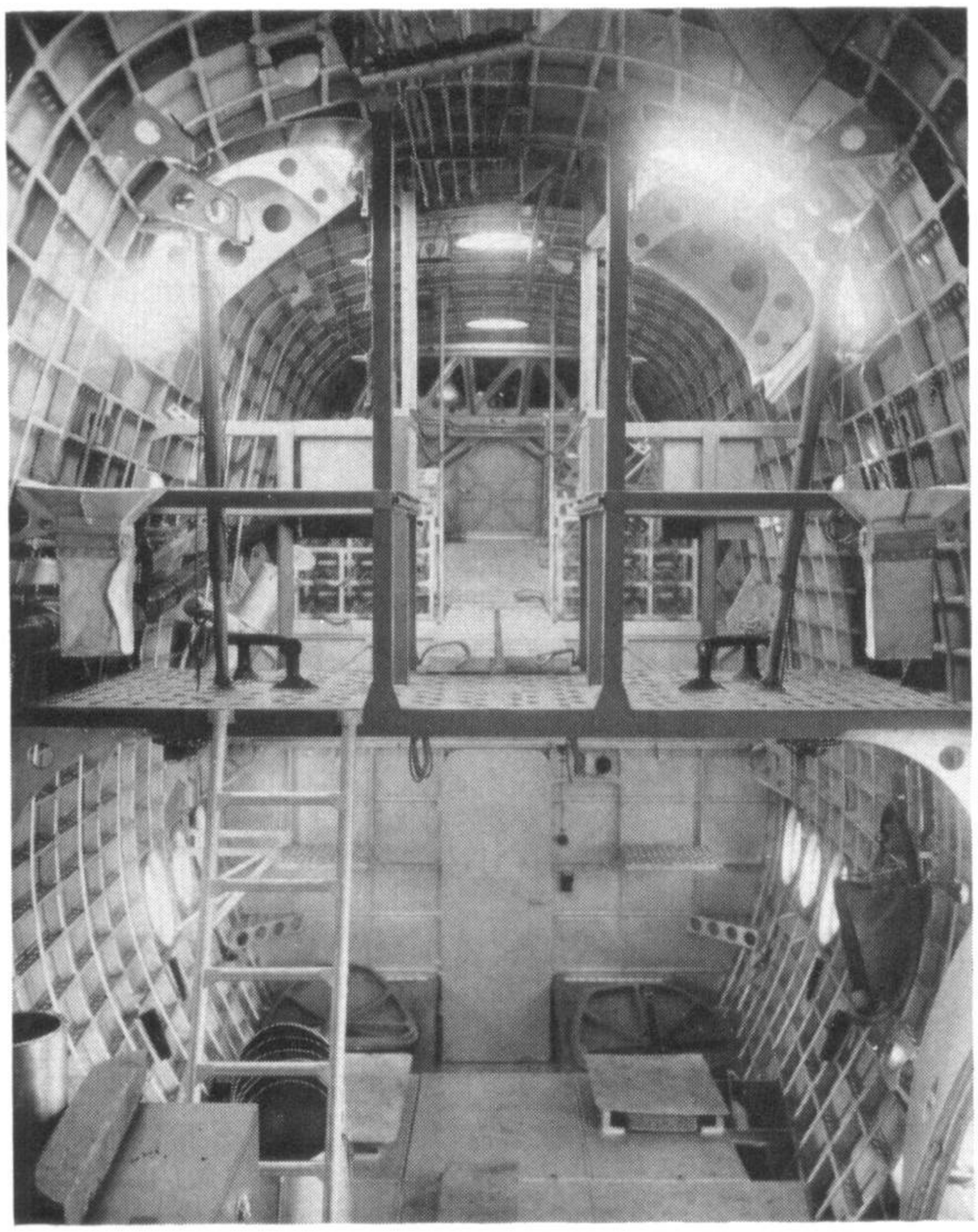
The Sunderland prototype K4774 *was launched on 14th October 1937; with John Lankester Parker at the controls she made her maiden flight on the 16th of the month.*
(Photo: Imp. War Mus. MH5203)

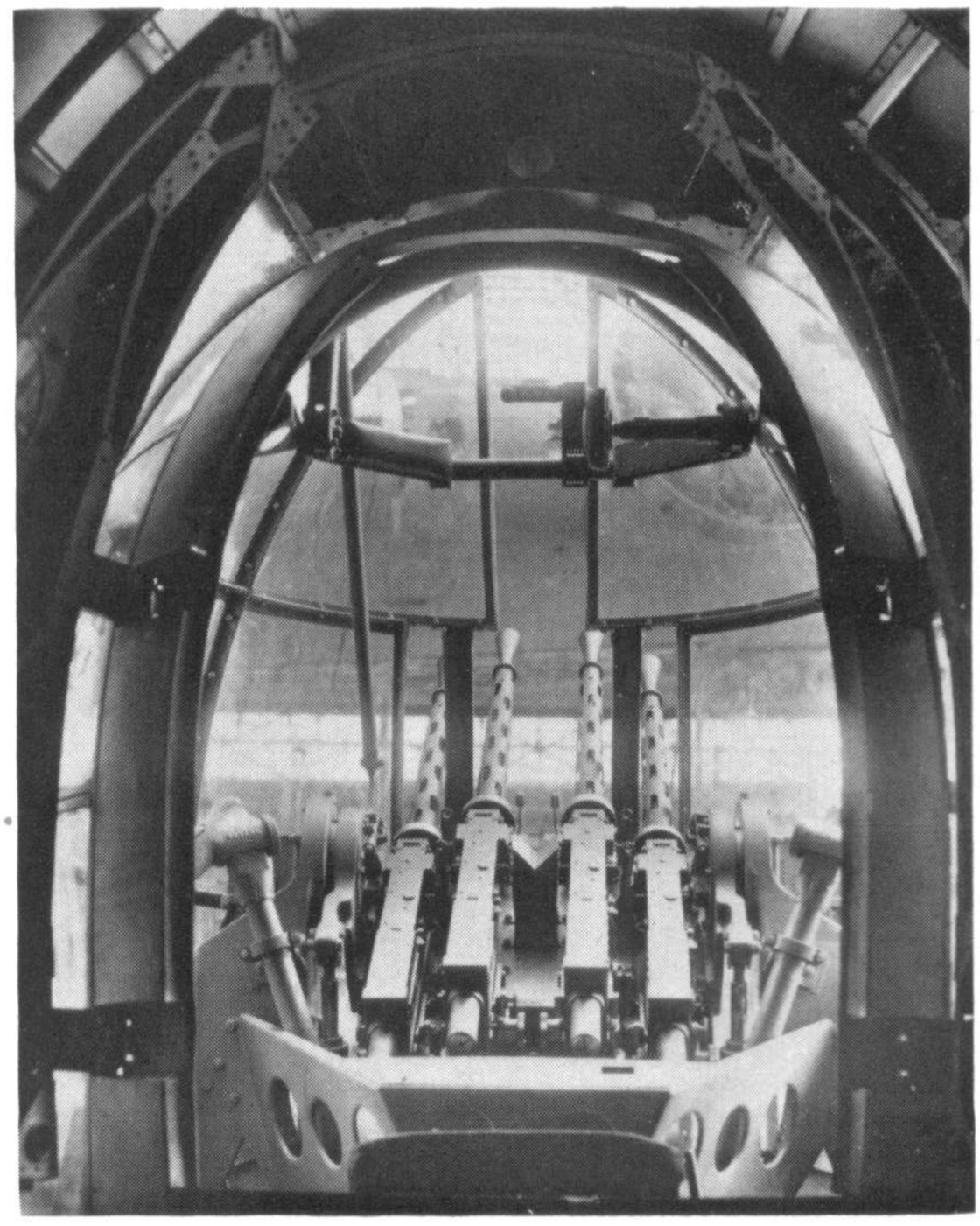




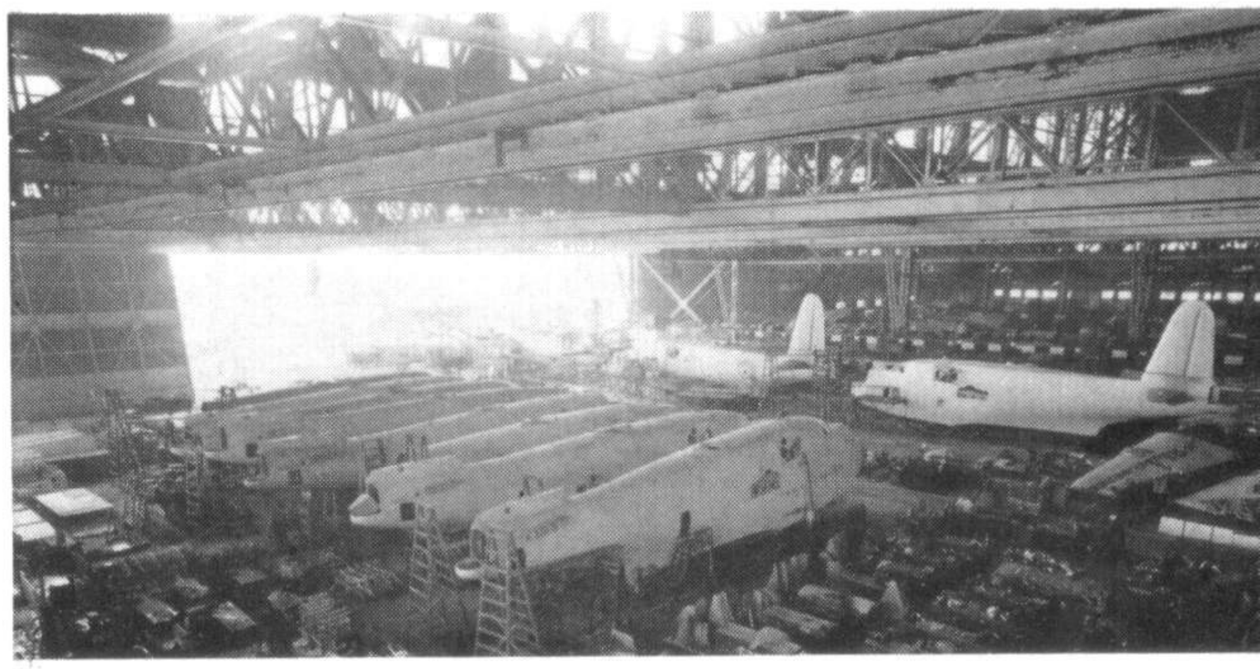


Details of the Sunderland prototype; illustrated here are the cockpit interior, the mid-gunners' stations (looking forward), the F.N.11 nose turret, and internal and external views of the four-gun F.N.13 tail turret. (Photos: Crown Copyright)





Vickers K-gun in an F.N.11 turret and the single Lewis gun originally specified for the tail turret was deleted in favour of a new F.N.13 four-gun turret. The result was a significant rearwards shift of the centre of gravity. It was decided to compensate this by sweeping the wings back through $4\frac{1}{4}$ degrees, a move which was to give the Sunderland its characteristic outward thrusting engines. It also meant that the main step had to be moved back a corresponding amount and this, in turn, changed the depth of the step and caused further modifications to maintain hydrodynamic performance. These changes were not immediately incorporated on the prototype which at the time was in an advanced state of completion, but were to be built into all subsequent aircraft.



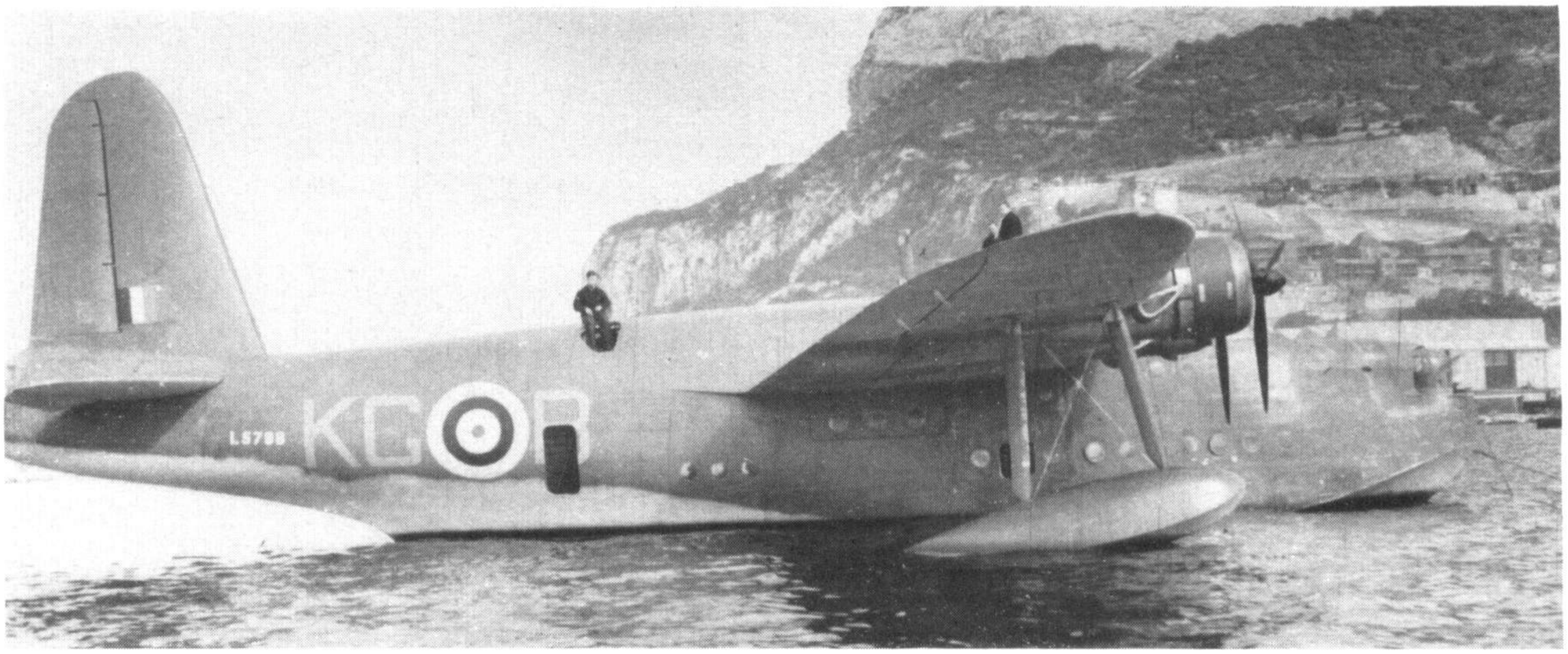
Sunderland production at Belfast during a peak wartime period.
(Photo: Short Bros. & Harland)

PROTOTYPE AIRCRAFT

K4774 was completed by October, 1937, and by this time named *Sunderland*, emerged from Shorts No. 3 Shop at Rochester to be launched on the 14th of that month. The 1,010 h.p. Pegasus XXII engines which were to power the aircraft were not yet available and *K4774* commenced her initial taxiing and flight trials with Pegasus X's of 950 h.p. each. The first flight with John Lankester Parker at the controls and Harold Piper as co-pilot was made on 16th October. It lasted 45 minutes and Parker made a second flight of the same duration on the same day. A total of four flights was accomplished within the space of a week and, after a total of 3 hours 45 minutes in the air Parker announced himself satisfied with the basic design with the expected reservations about tail heaviness which had been partly counteracted by forward ballast. After this short series of initial flights *K4774* went back into the shops for the modifications caused by the change of turret armament and, at the same time, to have its Pegasus XXII engines installed. The aircraft was ready for flight testing again by 7th March 1938, and just over four weeks later, on 21st April *L2158*, the first of the development batch of Sunderland Mk. Is was taken into the air for the first time. The prototype's tests had by this time been completed by Shorts and *K4774* had been flown to the M.A.E.E. at Felixstowe for further testing on 8th April. It was joined there by the second production aircraft, *L2159* on 9th May. This aircraft was cleared for tropical service and, on 28th May was picked up by Flight Lieutenant Hughes and a crew from No. 210 Squadron for ferrying out to Seletar. The flight was accomplished in record time via Gibraltar, Malta, Alexandria, Habbaniyah, Bahrein, Karachi, Gwalier, Calcutta, Rangoon and Merguil to arrive at Seletar. There it was officially handed over to No. 230 Squadron in exchange for a Singapore III which was ferried back to the United Kingdom.

The R.A.F.'s new Sunderland Mark I was an all-metal monoplane of 44,600 lb. all-up-weight powered by four Bristol Pegasus XXII engines each of 1,010 h.p. and driving de Havilland (Hamilton) three-bladed two-pitch airscrews. Top speed was 210 m.p.h. at 6,500 ft. and the aircraft cruised at 178 m.p.h. at 5,750 ft. It had a wing span of 112 ft. 8 in.,

A Sunderland Mk. I, L2163, *DA-G of No. 210 Sqn., R.A.F. One of three squadrons equipped with the Sunderland at the outbreak of war, No. 210 scored several "firsts". F/Lt. Ainslie and his crew made the first Sunderland operation of the war in* L2165*; an uneventful patrol on 3rd September 1939. The following day F/Lt. Harrison's* L5579 *was the first Sunderland to come under fire—from British anti-aircraft gunners. On the 8th of the month F/Lt. Hyde made the first (unsuccesful) anti-submarine attack in* N9021.
(Photo: Imp. War Mus. CH795)



Mk. I L5798 *of No. 204 Sqn., with the Rock of Gibraltar in the background.* (Photo: Imp. War Mus. CM2309)

was 85 ft. 8 in. long and had a hull depth of 17 ft. 9 in. Armament comprised the nose and tail guns already mentioned plus two mid-ship gun stations with hand-held Vickers K-guns firing through cut-outs in the upper sides of the hull. Four 500 lb. bombs or eight 250 lb. bombs could be loaded on carriers suspended from rollers mounted in two box beams extending from the centre line of the hull top decking and out through the inboard regions of the main-planes. The bombs were carried inside the hull and propelled out and under the mainplanes by a worm and rack mechanism coupled to hand-operated winches.

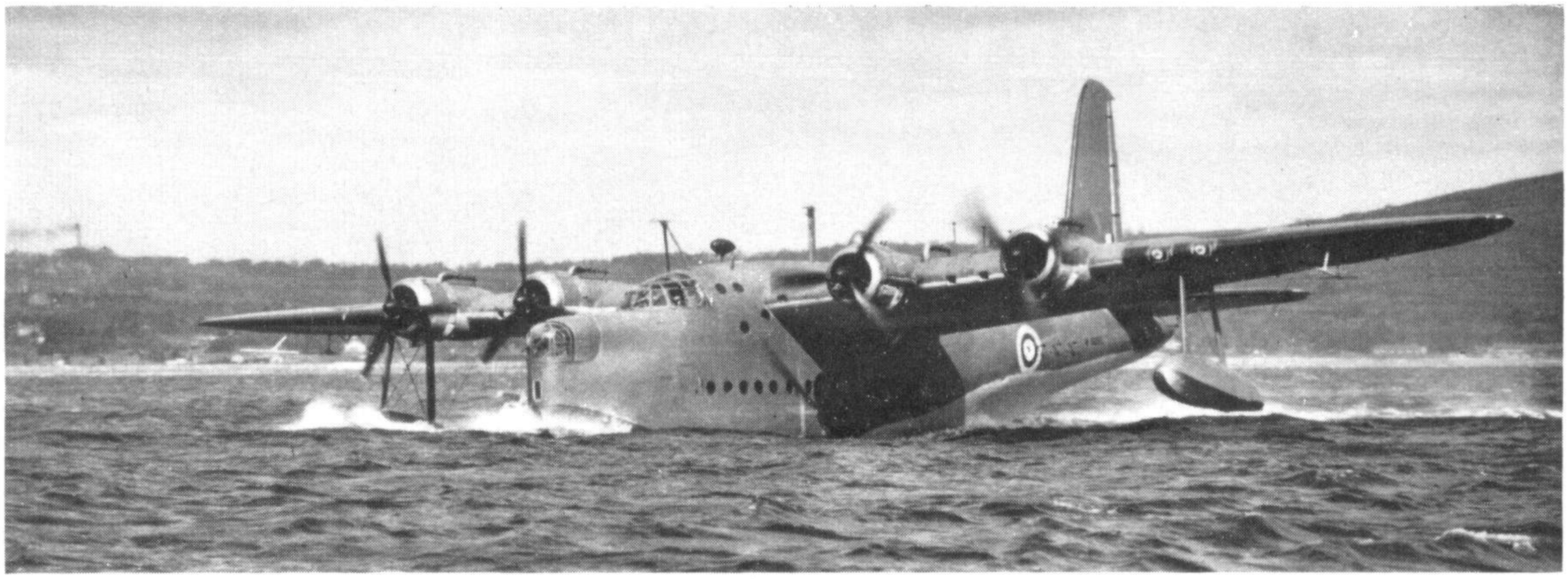
The wings were of all-metal cantilever box construction, generally similar to those of the Empire Boats and using a main spar formed by two pairs of tapering 'T' section extrusions braced vertically and diagonally with tubes to form a front and rear truss. Both wings and flaps were covered with sheet metal but only the leading edge portion of the Frise-type ailerons employed metal skins and the trailing edge portion was fabric covered.

The engine nacelles were built into the leading edge of the wing and were of circular monocoque construction. Accessibility to the engines was good and was either through the removable cowling or through doors in the fireproof bulkhead. The all-metal wing-tip floats were carried on two single struts braced diagonally with streamlined wires while side loads were transmitted through flexible stainless steel cables. Three fuel tanks were carried in each wing, one inboard of the inner engine, one between the two engines and one outboard of the outer. These tanks rested on wooden grids fitted between the bottom booms and access was via cut-out panels in the top sheeting of the wing.

Tailplane and fin construction closely followed that of the wings and, again the moving surfaces were largely fabric covered. Both horizontal and vertical tail surfaces were attached to stub sections on the rear hull by bolts in expanding bushes—a method which made removal a simple and speedy operation.

The main dissimilarity between the Sunderland and the Empire Class boats was in the hull with the R.A.F. aircraft having a deeper forefoot, tapered rear step and the flight deck set back to accommodate the retractable bow turret. The Sunderland hull was constructed mainly of aluminium-coated light alloy which was anodically treated before riveting into position. The skeleton framework consisted of channel section vertical frames interconnected by longitudinal intercostal "Z" section stiffeners, one of which would form the main floor bearer. The main step of the planing bottom was shaped to a broad "V" in plan view and the rear step faired into a vertical knife edge. The centre keelson was continuous and

W6050 *taxiing near Queens Island; the Mk. II variant introduced a twin-gun dorsal turret, Pegasus XVIII engines, and a new F.N.4a tail turret with 1,000 r.p.g.* (Photo: Short Bros. & Harland)



all stiffeners terminated at the frames which were slotted to fit over the keelson. Countersunk rivets were used on exterior surfaces. The main spar frames were of box section.

A double deck layout was employed in the forward fuselage with the entrance door and wardroom situated below the flight deck. Forward of the wardroom was the mooring compartment on a raised deck. This contained the anchor and its winch, a mooring ladder and a "J" type dinghy. It also housed the bomb sight and forward-hingeing bomb-aimer's window above which was the front turret.

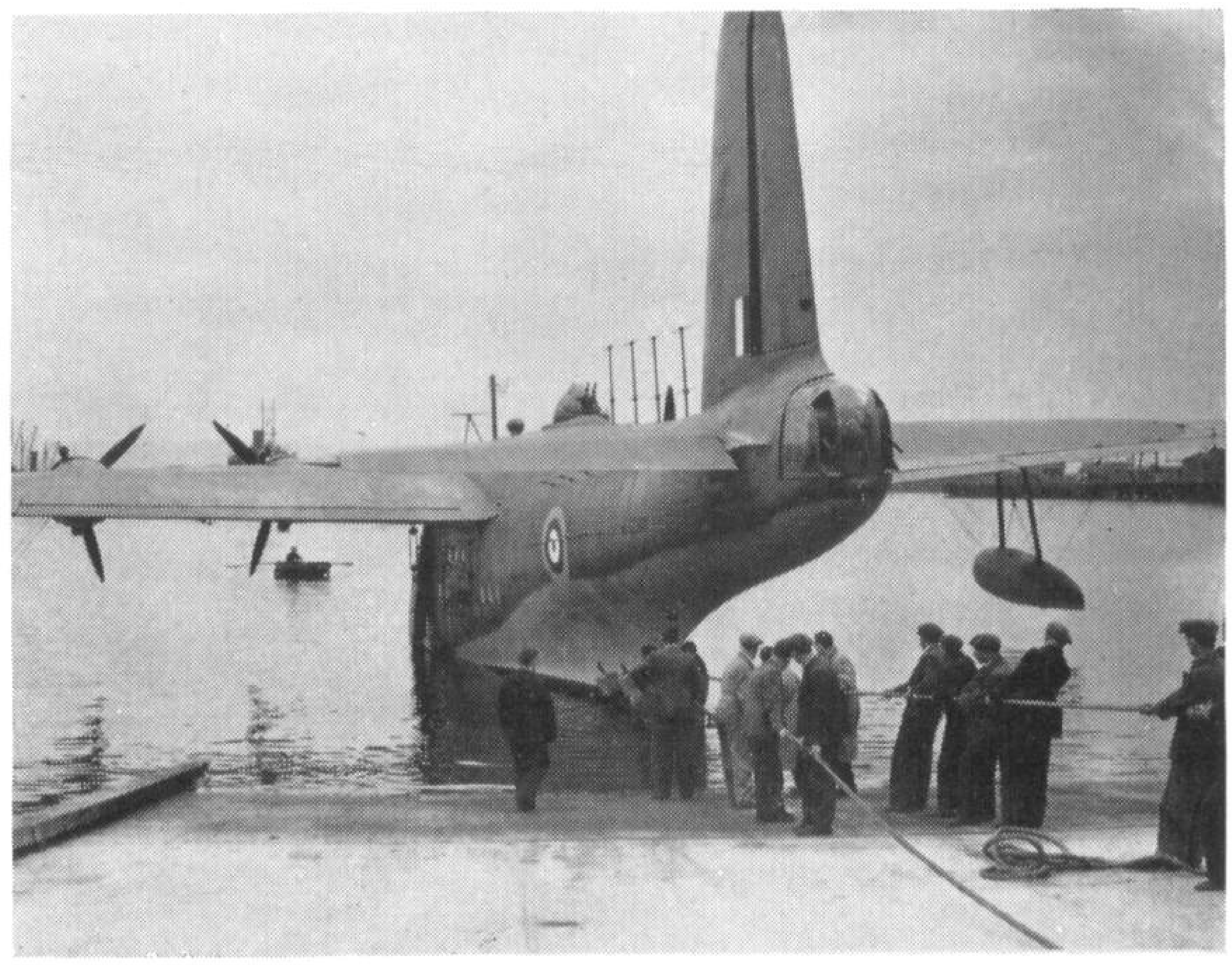
The flight deck was reached either by a companion way adjacent to the forward entrance door or via a ladder in the galley just aft of the wardroom. There was accommodation for two pilots, an engineer and a navigator/radio operator. Each pilot had a wheel-type control column with the top section hinged so that it could be lowered to improve instrument visibility. The instrumentation for pilots on early Sunderlands was somewhat basic, comprising ASI, altimeter gyro-compass and gyro-horizon, rate of climb indicator and turn and bank. The engines were represented with boost gauges and r.p.m. indicators. Trim controls were situated in the roof between the two pilots and the aircraft carried a Mark IV 3-axes autopilot.

The galley, which was on the lower deck just aft of the wardroom carried drogue stowage compartments and the trailing aerial in addition to the type of culinary equipment which was to be expected. The crew quarters were at the aft end of the lower deck next to the galley and contained two bunks and a table in the forward of the two compartments and two bunks in the other. Aft of this again was a catwalk to the rear turret. On the upper deck there was another catwalk from the flight engineer's station to the mid-gunners' platform but this was replaced by a companionway when a mid-upper turret was introduced.

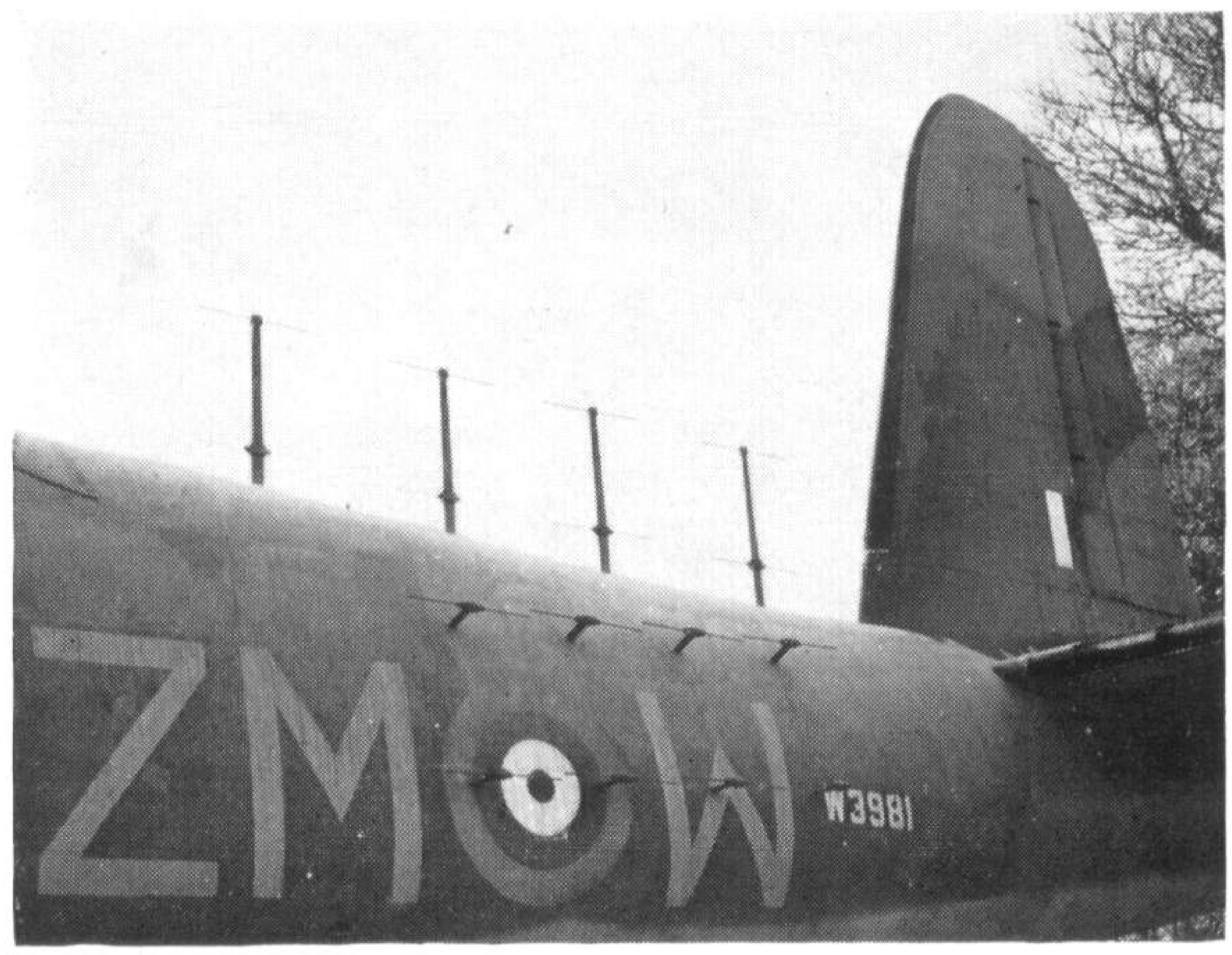
IN SERVICE

At the start of World War Two there were three Squadrons operational with Sunderlands, all in home waters. These were Nos. 210, 204 and 228 Squadrons. The first Sunderland operation began at 05.00 hours on 3rd September 1939, the first day of the war. Flight Lieutenant Ainslie and his crew took off in *L2165* of No. 210 Squadron based at Pembroke Dock to patrol the shipping routes into Milford Haven. It was an uneventful, cold and cheerless trip—the prototype for the majority of flights which were later to be made by hundreds of Sunderland aircraft. A little more excitement came the following day when Flight Lieutenant R. P. A. Harrison and Sunderland *L5579* of No. 210 Squadron were erroneously fired on by British anti-aircraft guns while returning from a patrol. Luckily the gunner's shooting matched their ability in aircraft recognition.

The same Squadron gained the honour of making the first aerial attack against a U-boat on 8th September when Flight Lieutenant E. L. Hyde and his crew in *N9021* sighted a periscope feather south-west of Lizard Head. Hyde attacked this submarine and another which he sighted soon afterwards but the eight bombs he dropped produced no dramatic effects. The honour of first making the headlines fell to No. 228 Squadron on 18th September when three of their aircraft received an SOS call from the tramp steamer *Kensington Court* which had been

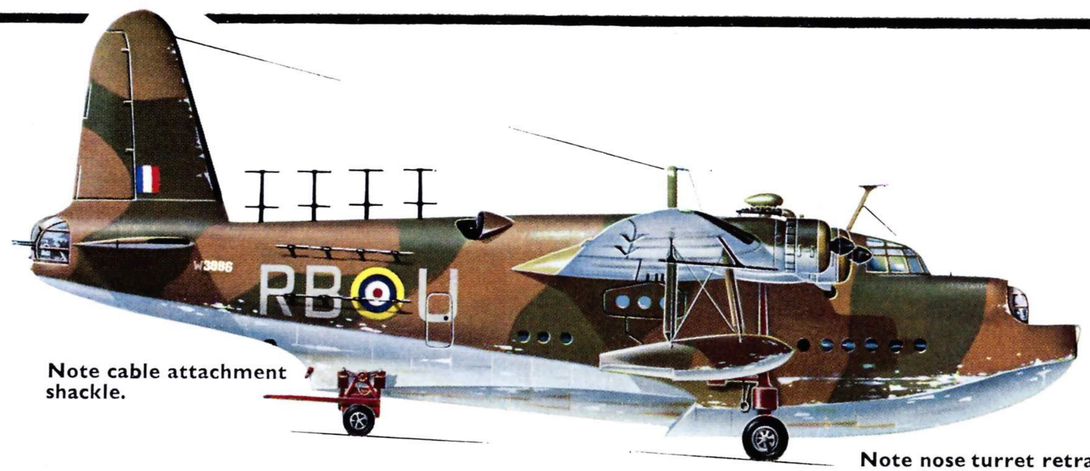


Launching W6050, *the first Belfast-built Mk. II, on 10th April 1942.* (Photo: Short Bros. & Harland)



The Botha-type dorsal turret of a Mk. II and (above) *ASV Mk. II radar fitted to a Sunderland Mk. II, in this case* W3981 *of No. 201 Sqn.* (Photos: Short Bros. & Harland)

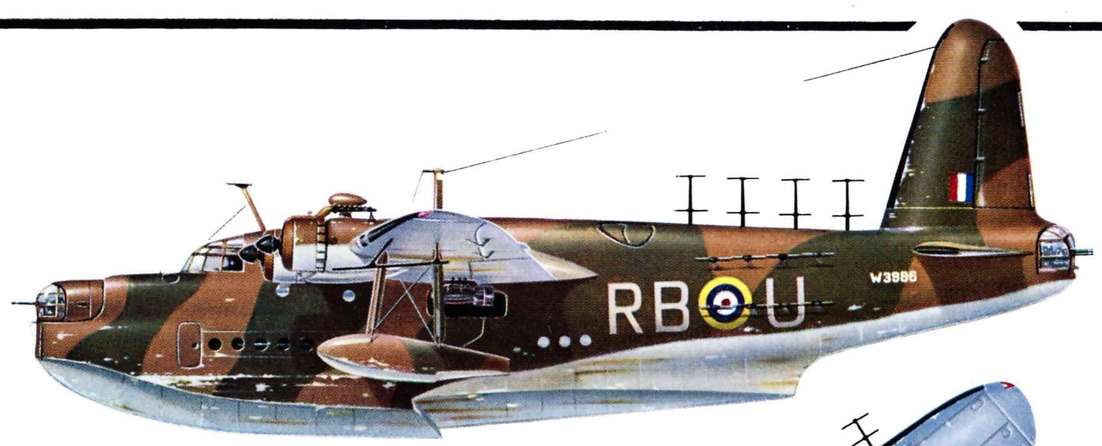
KEITH BROOMFIELD

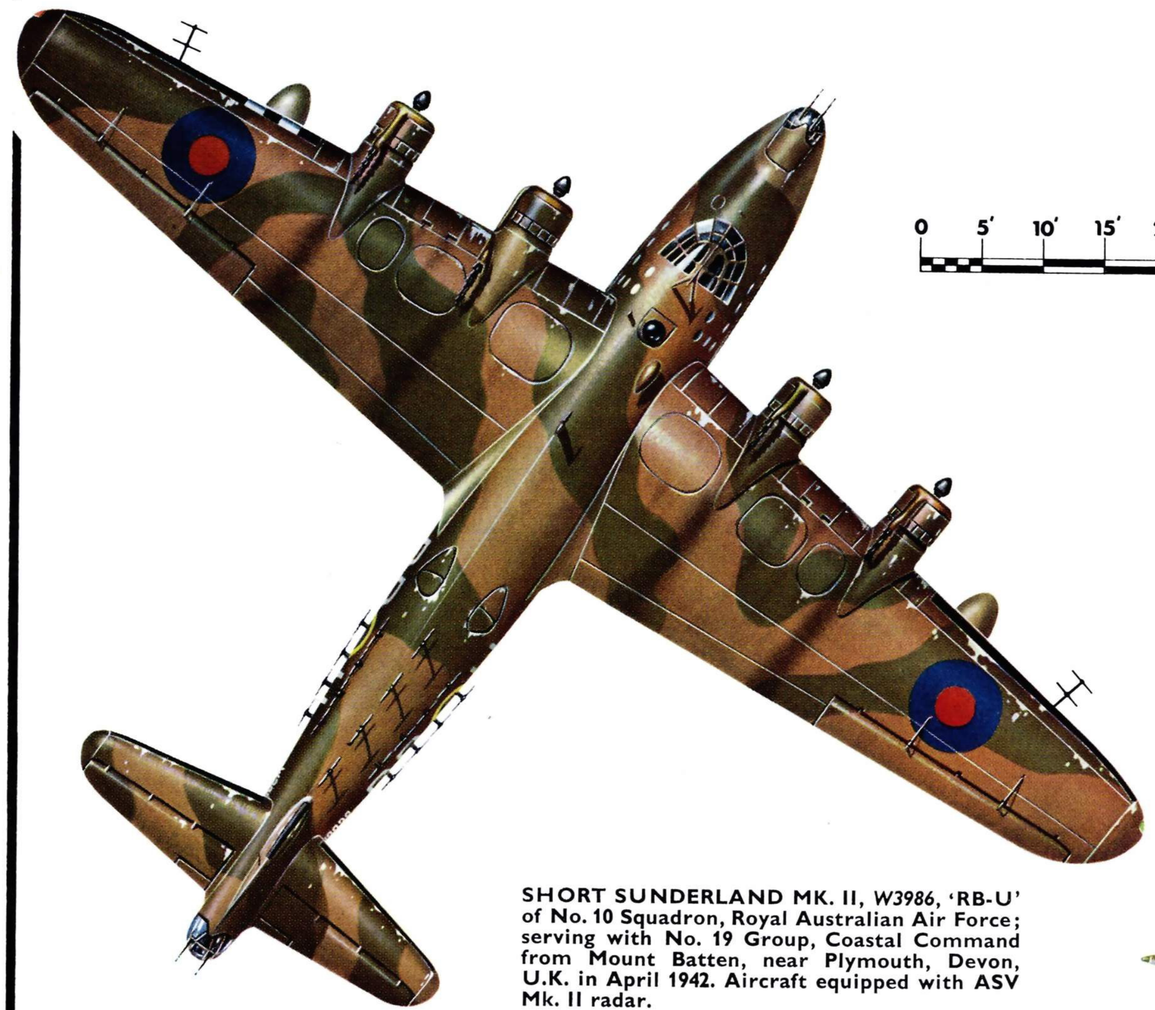


Note cable attachment shackle.

Beaching gear in position.

Note nose turret retracted to facilitate mooring.





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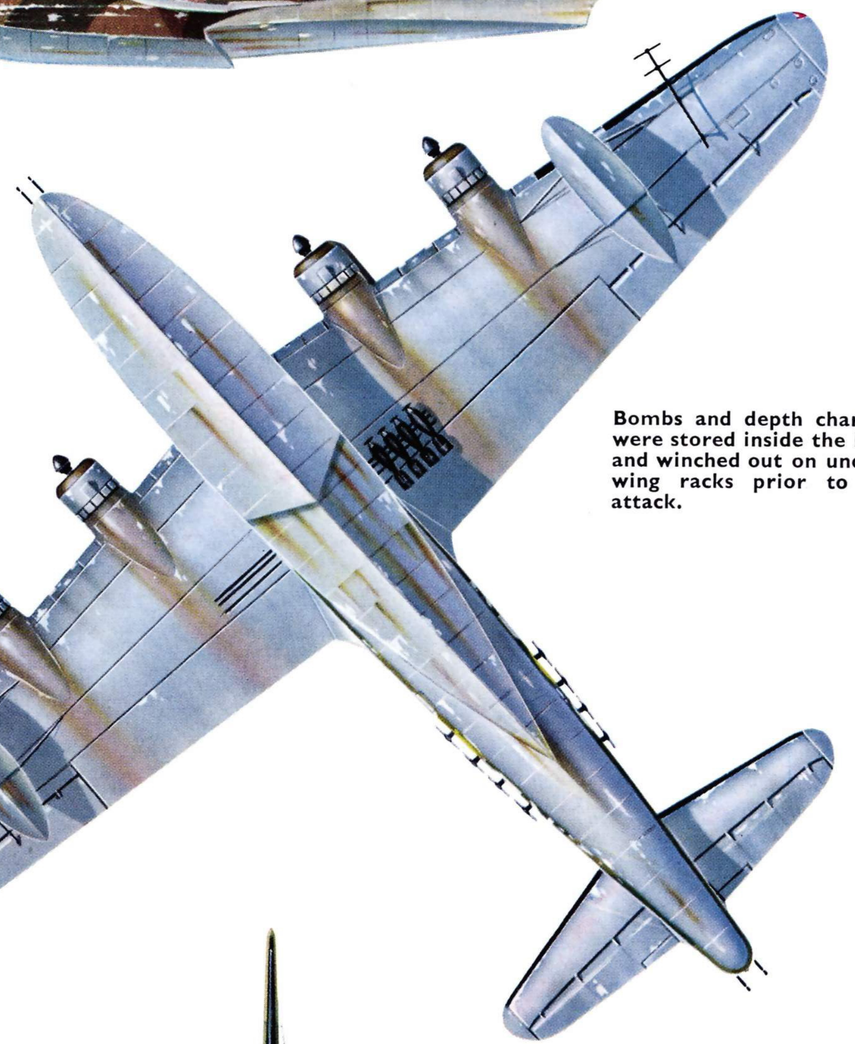
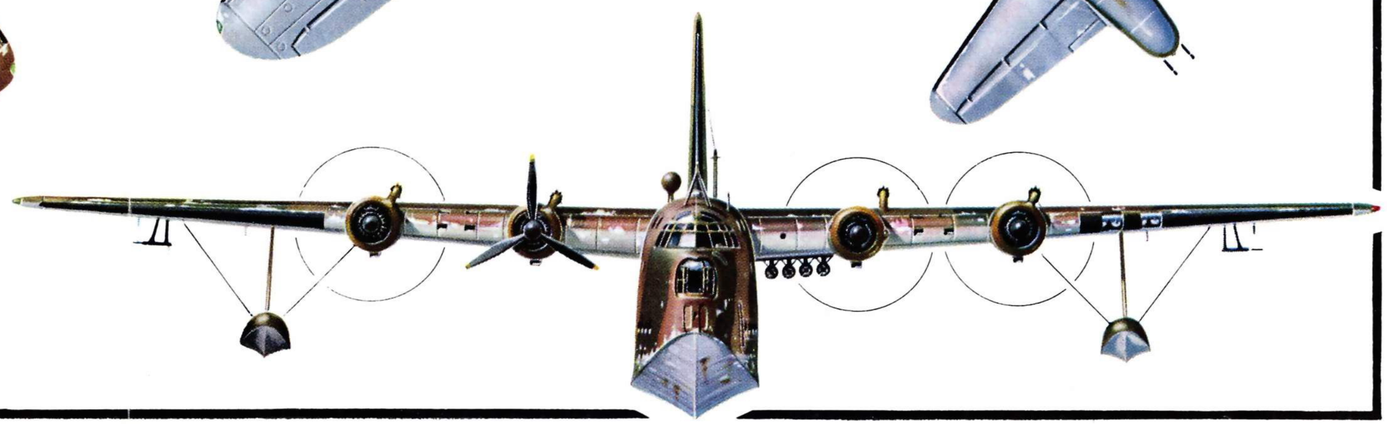
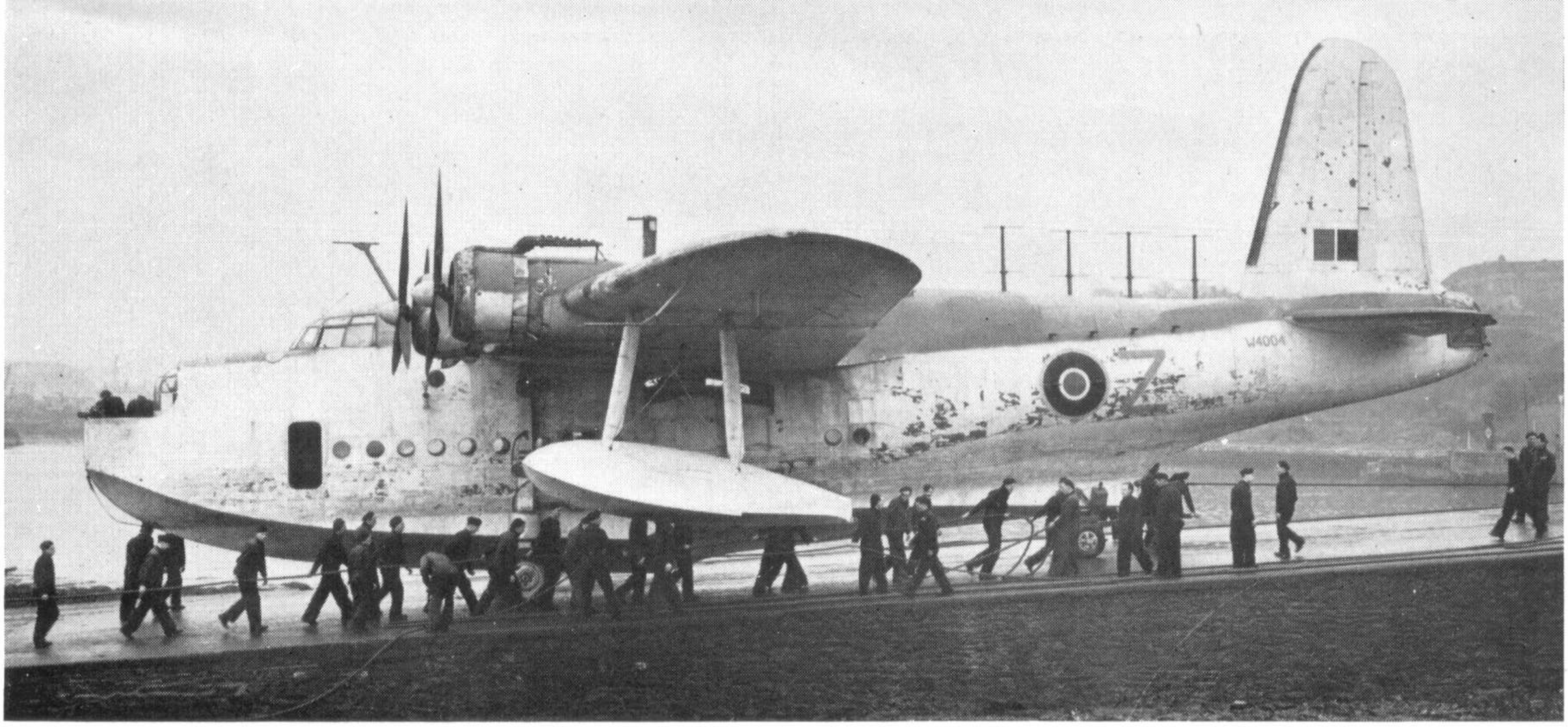


Bombs and depth charges were stored inside the hull and winched out on under-wing racks prior to an attack.

SHORT SUNDERLAND MK. II, *W3986*, 'RB-U' of No. 10 Squadron, Royal Australian Air Force; serving with No. 19 Group, Coastal Command from Mount Batten, near Plymouth, Devon, U.K. in April 1942. Aircraft equipped with ASV Mk. II radar.





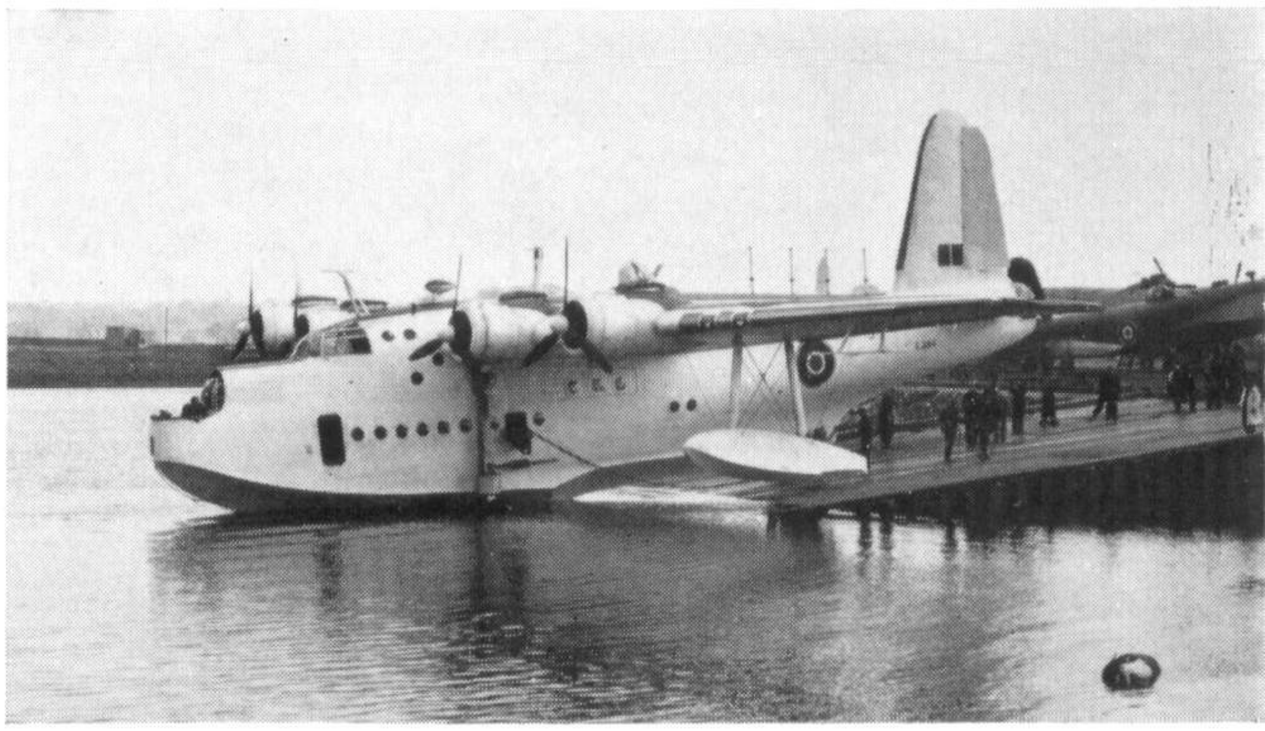
Well-known study of a very "operational" Mk. III, W4004, *being beached; the immaculate factory finish did not survive many Atlantic Patrols.* (Photo: Imp. War Mus. CH16145)

torpedoed. First on the scene was Flight Lieutenant Thurstan Smith who found the steamer sinking by the bows and her crew of 34 all clinging to a single life raft. He landed nearby to try and pick up some of the men. A second Sunderland captained by Flight Lieutenant John Barratt then arrived overhead and, after a brief R/T conversation with his colleague below, Barratt set off on an anti-submarine patrol of the area while Smith edged as close as he dare to the dangerously overcrowded life raft. The heavy swell could easily have sent the raft crashing through the Sunderland's hull if it approached too near and so the survivors had to be ferried across, four or five at a time, in the aircraft's two dinghies. With 21 seamen eventually on board and already dangerously overloaded, Smith signalled to Barratt that he was taking off. It was then Barratt's turn to alight and pick up the remaining survivors. Despite their overweight condition, both aircraft flew back to Mount Batten safely.

FURTHER DEVELOPMENT

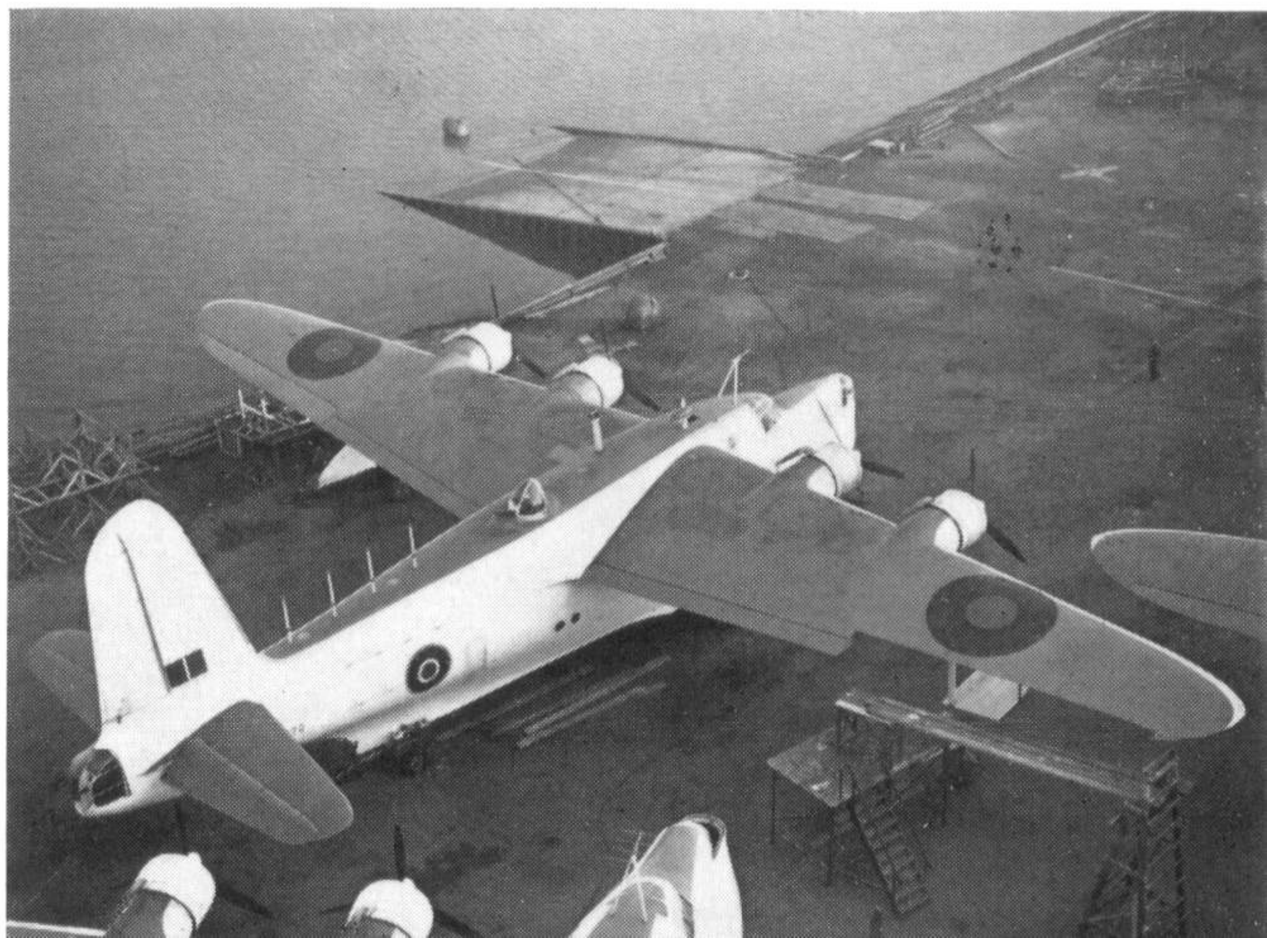
Meanwhile production and development continued at Shorts' Rochester factory although Sunderlands were ordered only in comparatively small batches. A second production line was set up by Blackburns and Denny Brothers at Dumbarton on the Clyde. A total of 75 Sunderland I's were built by Shorts and a further 15 by Blackburns when an improvement in performance was made by replacing the Pegasus XXIIs with Pegasus XVIIIs with two-speed superchargers. At the same time a two-gun Botha-type F.N.7 turret replaced the two open K-gun mountings and the F.N.13 tail turrets with 500 rounds per gun were replaced by the F.N.4a which carried 1,000 r.p.g. The resulting aircraft was the Sunderland II. 23 of these were built by Shorts, commencing with *W3976* and five by Blackburns (*W6000-W6004*). The majority of Mark IIs also carried the four vertical dipole masts and 16 transmitting loops of A.S.V. Mk. II radar along the rear of the hull as well as the central and underwing Yagi homing aerials. Short Brothers and Harland entered Sunderland production with the Mark II with a batch of 15 aircraft (*W6050-W6064*), the first of which was launched on 10th April 1942.

The Sunderland prototype was first cleared at an all-up-weight of 44,600 lb. and in 1939 this was increased to 45,700 lb. This increase adversely affected hydrodynamic performance. The main step in the hull also produced a considerable amount of air drag and, while Sunderland Mk. Is and Mk. IIs were being produced and put into service a series of experiments had been taking place at the M.A.E.E. Helensburgh in which both the Scion Senior and the



EJ164, *a Belfast-built Mk. III; note retracted nose turret.* (Photo: Short Bros. & Harland)

Mk. III EJ170 *after completion; this aircraft eventually became a Sandringham.* (Photo: Short Bros. & Harland)



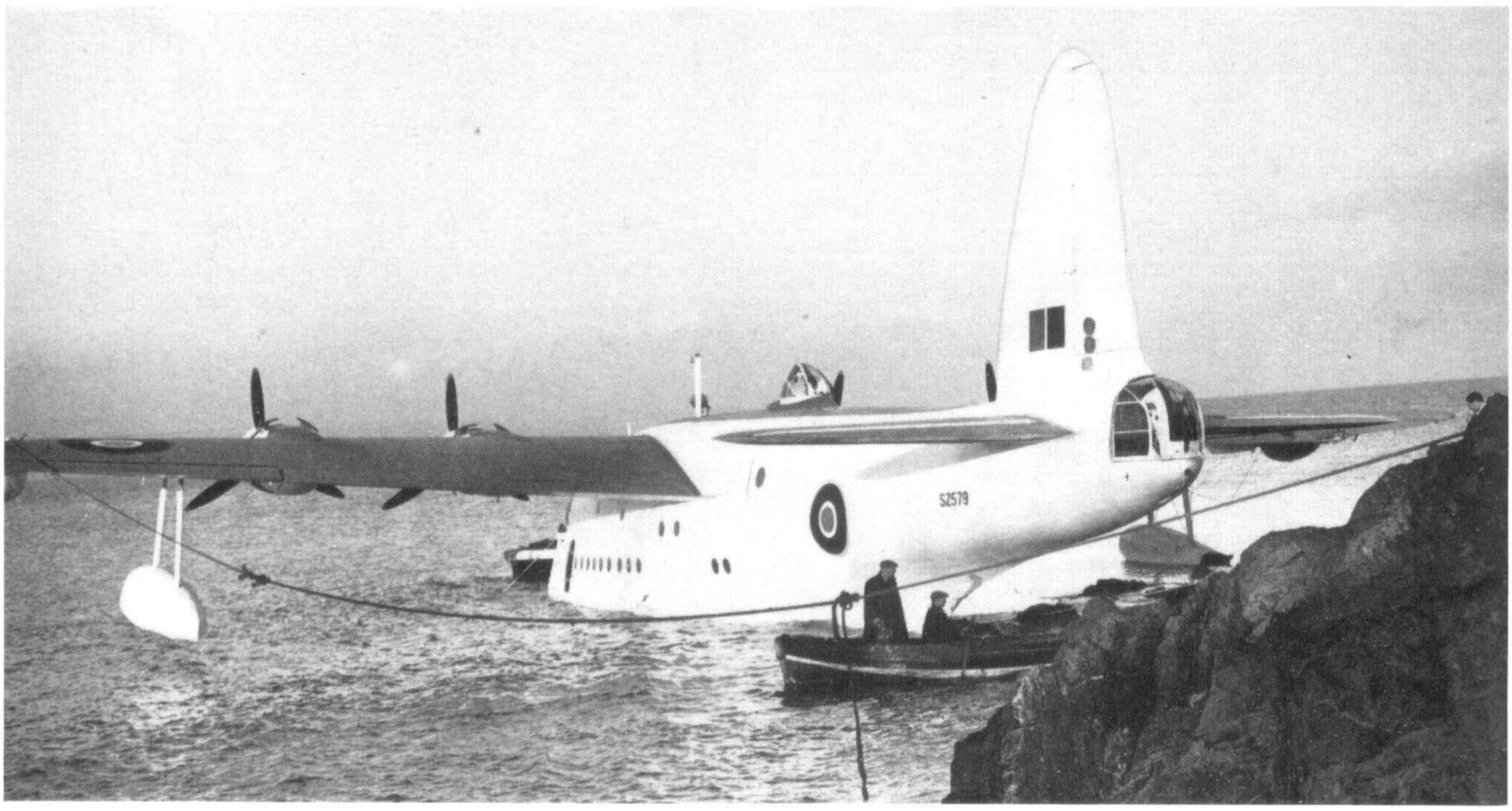
The Short Seaford was intended to be an improved version of the Sunderland, initially known as the Sunderland Mk. IV, powered by the 1,700 h.p. Hercules engines then in use in the Short Stirling bomber. Armament was to be eight ·50 calibre machine guns and two 20 mm. cannon. Only eight of the first production batch (scheduled at 30 machines) were completed; performance was disappointing, the Seafords/Sunderland Mk. IV's mainly ending up as Solent airliners for B.O.A.C. (Photo: Imp. War Mus. MH5143)

Sunderland prototype, *K4774* were involved. The results were a faired main step which saved some ten per cent of the total air drag with no corresponding adverse effect on the hydrodynamic performance of the hull. These improvements were first incorporated on the production line at Rochester on *T9042*, a Mark II which thus became the prototype Mark III. The first production Mk. III was *W3999* which was first flown at Rochester on 15th December, 1941. These were the last airframe alterations to be made on the Sunderland the design of which remained virtually static for the remaining twenty five years of its Service life. Only engines and equipment changed. All-up-weight of the Mark III was increased to 58,000 lb.

U-BOAT KILLERS

During the first few months of the war attacks on U-boats by Sunderlands had given only inconclusive and disappointing results. The 250 lb. and 500 lb. bombs with which the aircraft were armed were by no means perfect anti-submarine weapons and there was no depth charge suitable for carriage in the Sunderland. Nevertheless results were eventually achieved. On the last day of January 1940 Sunderland 'Y' of No. 228 Squadron bombed *U-55* which had been already damaged by Naval depth charges. Rather than risk further damage the Captain scuttled the U-boat. The honour of making the first complete kill, however, went to a Sunderland of No. 10

Sunderland Mk. V SZ579 *after a brief encounter with the Scottish coast.* (Photo: Short Bros. & Harland)



SUNDERLAND PRODUCTION CHART

ROCHESTER

Serials	No. of air-craft	Mark	Notes
K4774	1	—	Prototype.
L2158-2168	11	I	
L5798-5807	10	I	
N6133	1	I	
N6135	1	I	
N6138	1	I	
N9020-9030	11	I	
N9044-50	7	I	
P9600-9606	7	I	
P9620-9624	5	I	
T9040-9050	11	I	*T9042* converted to Mk. III Prototype.
T9070-9078	9	I	Total of 75 Mk. I's built at Rochester.
W3976-3998	23	II	
W3999-4004	6	III	
W4017-4037	21	III	*W4037* became Sandringham 7.
DV956-980	25	III	*DV964* became Sandringham 2.
EJ131-145	15	III	
JM659-689	31	III	*JM660-665* became *G-AGER-AGEW* with B.O.A.C.
JM704-722	19	III	*JM714, 715, 718* and *720* became Sandringhams. *JM722* became *G-AGHY* of B.O.A.C.
ML725-774	50	III	*ML725-729* became *G-AGHW-AGIB* of B.O.A.C. *ML751-756* became *G-AGJJ-AGJO* of B.O.A.C. *ML739, 757* and *764* to *Aéronavale*. *ML761* became Sandringham 4.
ML777-795	19	III	*ML779, 778* and *781* to *Aéronavale*. *ML783-784* became Sandringham 5's. *ML786-791* became *G-AGKV-AGLA* of B.O.A.C. Total of 186 Mark IIIs built at Rochester.
MZ269	1	IV	Prototype.
MX271	1	IV	Prototype.
NJ200-207	8	IV	*NJ201* became *G-AGWU*. *NJ202-207* became *G-AKNO, AKNP, AKNR, AKNS, AKNT*, and *AKNU* respectively–all Solent 3's. *NJ208-219* became Solent 2's before completion as Seafords and are not counted in Sunderland total. *NJ230-239* allotted but aircraft never built. Total of 10 Mark IVs.
ML796-801	6	V	*ML796, 799* to *Aéronavale*.
PP103-132	30	V	*PP110, 124* and *129* became *NZ4105, 4113* and *4110* respectively.
RN264-273	10	V	
TX293	1	V	
			Total of 47 Mark V's at Rochester.

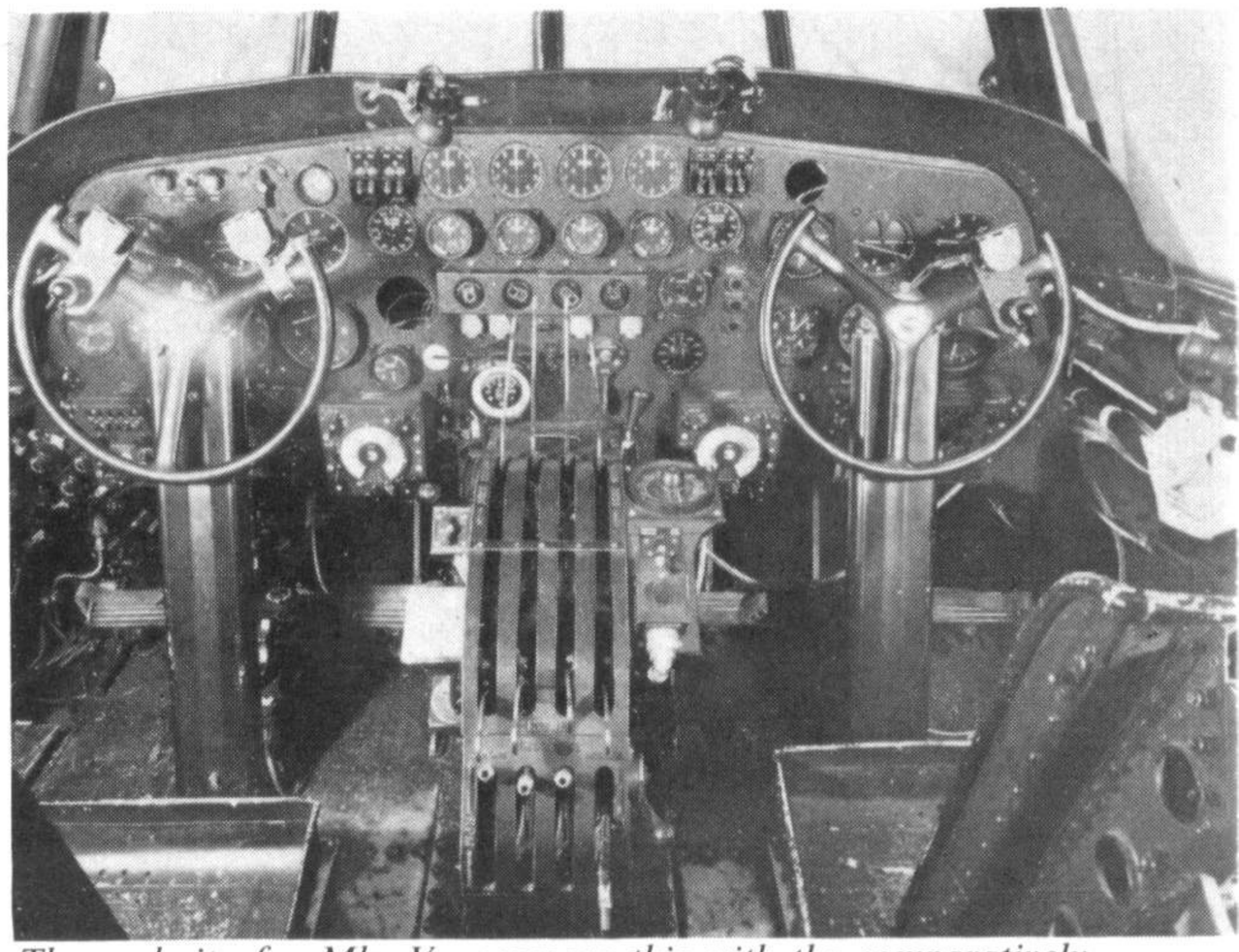
Total Rochester production of all Marks was 341 aircraft.

SHORT BROTHERS, WINDERMERE

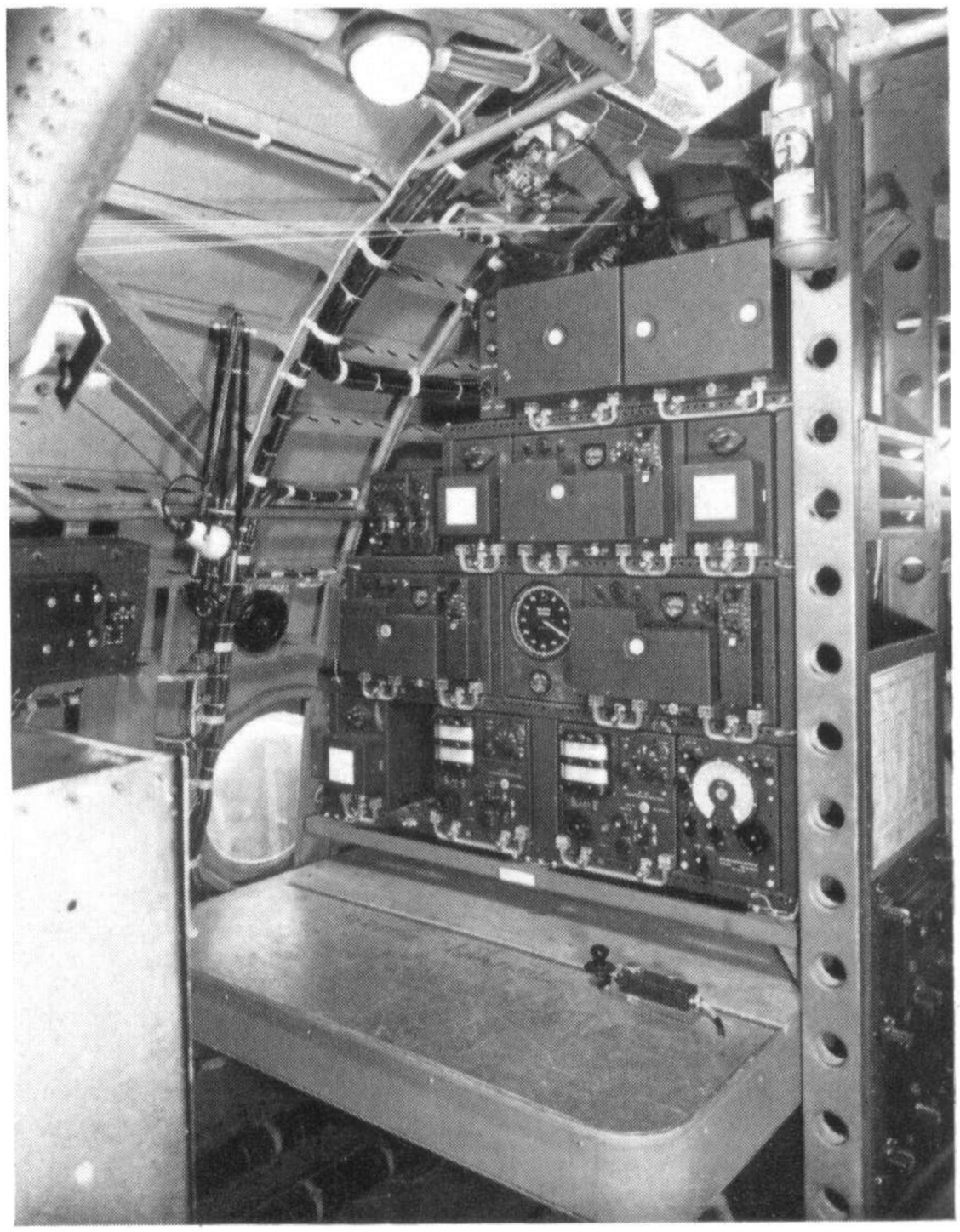
Serials	No. of air-craft	Mark	Notes
DP176-200	25	III	*DP191* became *NZ4109*. *DP195* became Sandringham.
EJ149-158	10	III	*EJ156* became Sandringham.

Total Windermere production was 35 aircraft.

(*Continued on page 16*)



The cockpit of a Mk. V—compare this with the comparatively bleak simplicity of the prototype's "office" (below) *the navigator/wireless operator station in an R.N.Z.A.F. Sunderland Mk. V.* (Photos: Short Bros. & Harland)



(R.A.A.F.) Squadron on 17th July 1940.

The exhilaration of making a kill is typified in the following report by Flying Officer E. R. Baker. On 16th August he was Captain of Sunderland *P9624* on convoy escort duty when his co-pilot, Pilot Officer Bowie, sighted a submarine three hundred yards away on their port side.

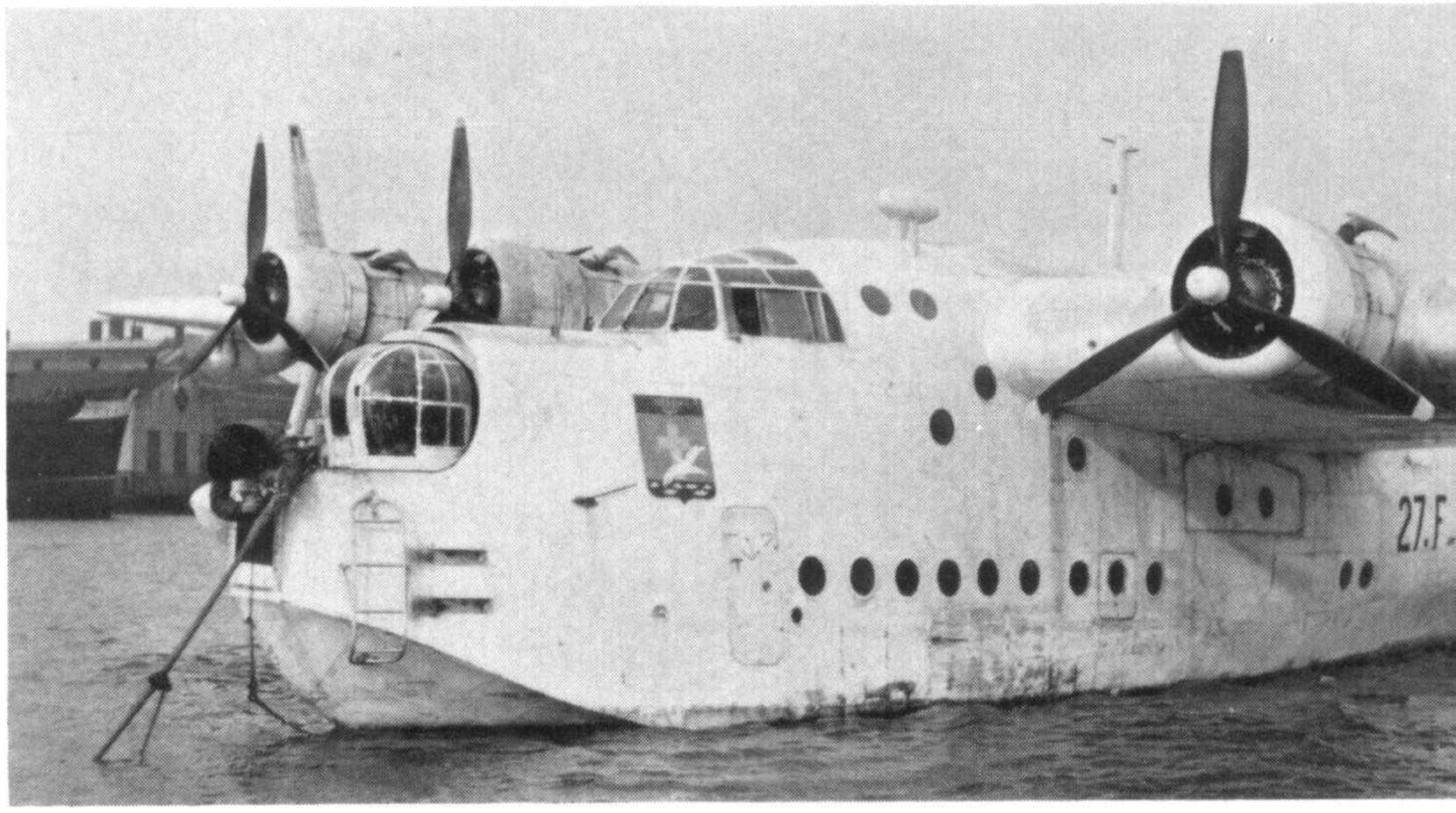
It was already partly submerged, ran Baker's subsequent report, *and when we had got over the spot it had completely submerged but I let off a salvo of bombs which went off just underneath the U-boat.*

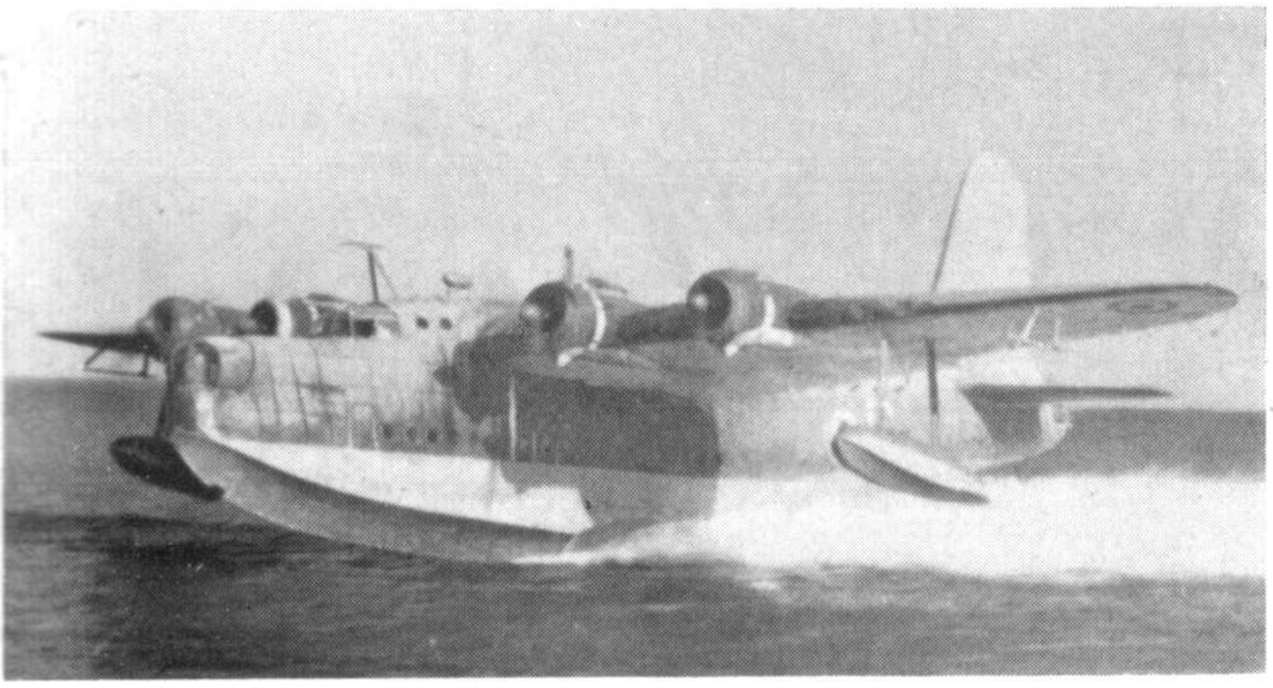
It was terrific. The surface of the sea seemed to shudder for yards around and then blew up. In the middle of the foam was the submarine. It was tilted over and its decks awash. It sank again before I could get back to it but I dropped another salvo in the middle of the foam.

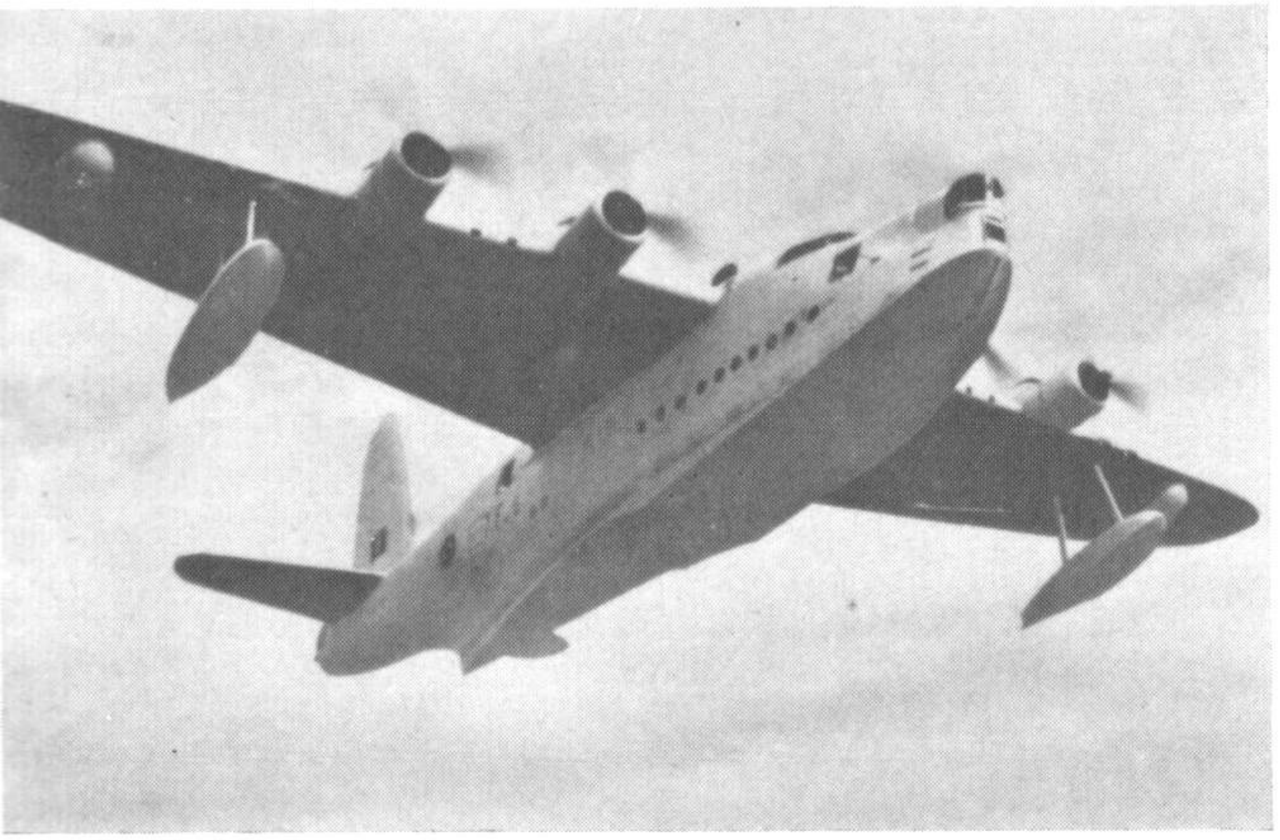
The submarine was blown to the surface again, but this time it came so far up that I could pretty nearly see daylight between it and the sea. It came up on an even keel then turned over on its side and sank. Just to make sure I dropped a third salvo and this time there were huge bubbles of air and masses of oil.

But the Sunderland had other adversaries besides enemy submarines. On more than one occasion it tangled with enemy aircraft and usually gave a good account of itself. The first air action in which a Sunderland was involved was on 3rd April 1940 when Flight Lieutenant Frank Phillips on convoy patrol in the North Sea, was attacked by six Ju 88's

Some of nineteen Sunderlands reconditioned at Belfast in 1951 for the French Aéronavale *and operated by* Escadrille 7F *from Dakar until 1960.* (Photos: Short Bros. & Harland; Jean Cuny)







(see *Profile* No. 29) which had obviously decided to down the Sunderland first and then attack the convoy at leisure. The Sunderland was, of course, extremely vulnerable on the underside and Phillips immediately dived to sea level to protect his belly. The six enemy aircraft split up and began beam and tail attacks. The range of their guns was superior to those of the Sunderland and it was necessary to sit out their fire until the range had closed to 500 yards or less. Corporal Lillie, the rear gunner, held off until an attacking Ju 88 was only 100 yards away and the first burst from his four-gun turret shattered the enemy aircraft which burst into flames and immediately crashed into the sea. Both Lillie and the beam gunners then concentrated on a second Ju 88 which was soon diving away streaming black smoke. The four remaining aircraft seemed then to quietly disappear.

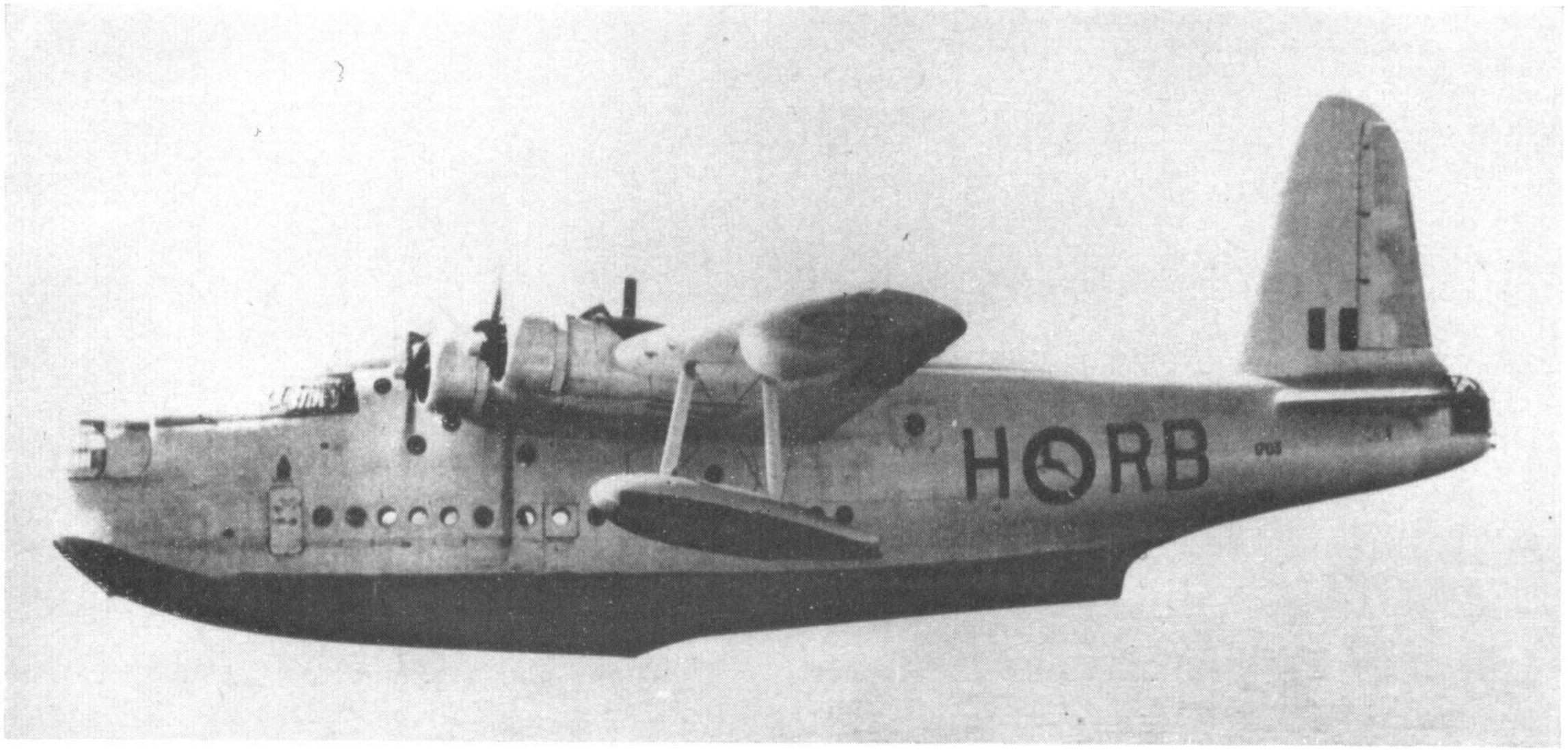
The success of the Sunderland in aerial combat lead to the story in the Luftwaffe that it was armed with 20 mm. cannon and the respectful nickname of "The Flying Porcupine" was given to it. The name may have been given for mistaken reasons but it was nevertheless, apt.

FURTHER IMPROVEMENT

Although the Sunderland was giving every satisfaction in Service, means of improving the aircraft were continually sought and one method suggested in 1942 was a faster and heavier variant which used the 1,700 h.p. Hercules engines of the Stirling. Orders were placed for two prototype aircraft at Rochester (*MZ269* and *MZ271*) and thirty production aircraft (*NJ200-229*) of a variant initially known as the Sunderland IV. Fairly extensive modifications were involved and, as these would obviously take some time the new aircraft was programmed for service in the Pacific. The whole structure was heavier—maximum all-up-weight was increased yet again by 19,000 lb. to 75,000 lb.—and the hulls had larger planing bottoms with the beam loading being kept more or less the same by the addition of 3 ft. to the forward hull. Nearly 5 degrees of dihedral were given to the tail plane to increase spray clearance.

Armament was to comprise a Bristol B.17 Mk. II mid-upper turret carrying two 20 mm. Hispano cannon, a Brockhouse nose turret and a Glenn Martin tail turret each to carry twin 0·5 in. Brownings. Two more 0·5 in. Brownings were carried in beam hatches on each side of the hull and two more 0·5 in. Brownings fixed just above the chines in the nose and firing forward.

The prototype Sunderland IV was first flown at Rochester on 30th August 1944 and difficulty in controlling was found when two engines were cut on the same side. Extra fin and rudder area were therefore fitted together with an extension to the fin leading edge to prevent rudder locking. Performance was generally disappointing and only marginally better than that of the Sunderland Mark V which had overtaken it. Only eight of the first production batch were completed, given the new design index number of S.45 and renamed Seaford. These aircraft were given a brief operational trial with No. 210 Squadron. None of them were ever fitted with the Glenn Martin tail turrets. One of these aircraft, *NJ201* was given a



Sunderland M.R. V of No. 35 Squadron, South African Air Force. After the war the unit was based at Congella, Durban, Natal.
(Photo: S.A.A.F. Official via A. Blake)

faired in nose and loaned to B.O.A.C. with the registration *G-AGWU* for evaluation as a civil transport and later six of the completed production Seafords were sent from Rochester to Short and Harland at Belfast for conversion into Solent airliners for B.O.A.C.

FINAL VARIANT

The last new variant of the Sunderland (there were many conversions) was the Mark V already mentioned. One snag with the Sunderland III was that its Pegasus engines were run almost continuously at combat ratings with a consequent deterioration of service life. The Australians of No. 10 (R.A.A.F.) Squadron suggested that the 1,200 h.p. Pratt and Whitney Twin Wasp engines used on Hudsons and Catalinas (see *Profile* No. 183) would give the Sunderland a valuable reserve of power. Short Brothers were given permission to investigate this and *ML765*, a Mark III was taken from the Rochester production line early in 1944 and fitted with Twin Wasps. At the same time four Pratt and Whitney nacelles were delivered to Mount Batten for the similar conversion of Blackburn-built *ML839*. Both aircraft were successfully flown and, for the first time it was discovered that a fully-loaded Sunderland could be safely kept in the air with two airscrews feathered on the same side. This new variant was the Sunderland Mk. V which was put into production as soon as possible, commencing with *ML796* at Rochester. The new variant also incorporated the new 9 cm. radar, A.S.V. Mk. VIC with split scanners under the wing tips which had already been installed in the last batches of Pegasus engined boats to be completed. Sunderland Mk. V's entered Service in February, 1945 with Nos. 228 and 461 Squadrons at Pembroke Dock.

Sunderland production was terminated after VJ-Day and the last production line to run down was that at Belfast where Short and Harland launched *SZ599* on 14th June 1946. But its life was by no means over. When the war had started the R.A.F. had three Sunderland Squadrons and this total had grown to 28 at the end of hostilities. This total ebbed down to five with the run-down of war forces—Nos. 201 and 230 at Calshot (and, later, Pembroke Dock), No. 88 at Hong Kong and Nos. 205 and 209 at Singapore.

There was still plenty of work for these remaining flying boats. During 1948 those based in the U.K. played their part in thwarting the Russian blockade of Berlin and carried out a shuttle service to Lake Havel in the British sector, carrying food supplies. A year later they were back on active service again when aircraft from Nos. 88, 205 and 209 Squadrons took part in the Korean War, carrying out patrols over the Yellow Sea from Iwakuni. The Sunderland was the only aircraft flying in R.A.F. colours during this conflict. The same three squadrons also took part in the campaign against Malayan terrorists, making many sorties over the jungle carrying up to 200 anti-personnel bombs at one time.

Between 1951-54 Nos. 201 and 230 Squadrons found some exacting work of a different nature when they undertook to supply the British North Greenland expedition. 1952 was a record year when five aircraft ferried 280 tons of supplies from Young's Sound on the north-east coast of Greenland to Britannia Lake, only 800 miles from the Pole itself. In 1954 the Sunderlands flew the whole expedition, including the husky dog teams, back to Pembroke Dock.

The run-down of the remaining R.A.F. Sunderland Squadrons started in 1954 when No. 88 Squadron re-formed with Canberras. In January the next year Nos. 205 and 209 Squadrons were combined at Seletar and the two U.K. Squadrons were disbanded in 1957. From January, 1958 Shackletons began to replace the flying boats in Singapore and the last official flight made by an R.A.F. Sunderland was carried out by *ML797* on 20th May that year to end twenty-one years of very active service with the Royal Air Force.

But even this was not the end of the Sunderland. Nineteen aircraft had been reconditioned at Belfast for the French *Aéronavale* in 1951 and a further 16 were overhauled at Wig Bay for the R.N.Z.A.F. The French aircraft served with *Escadrille* 7FE at Dakar until the last three were withdrawn from

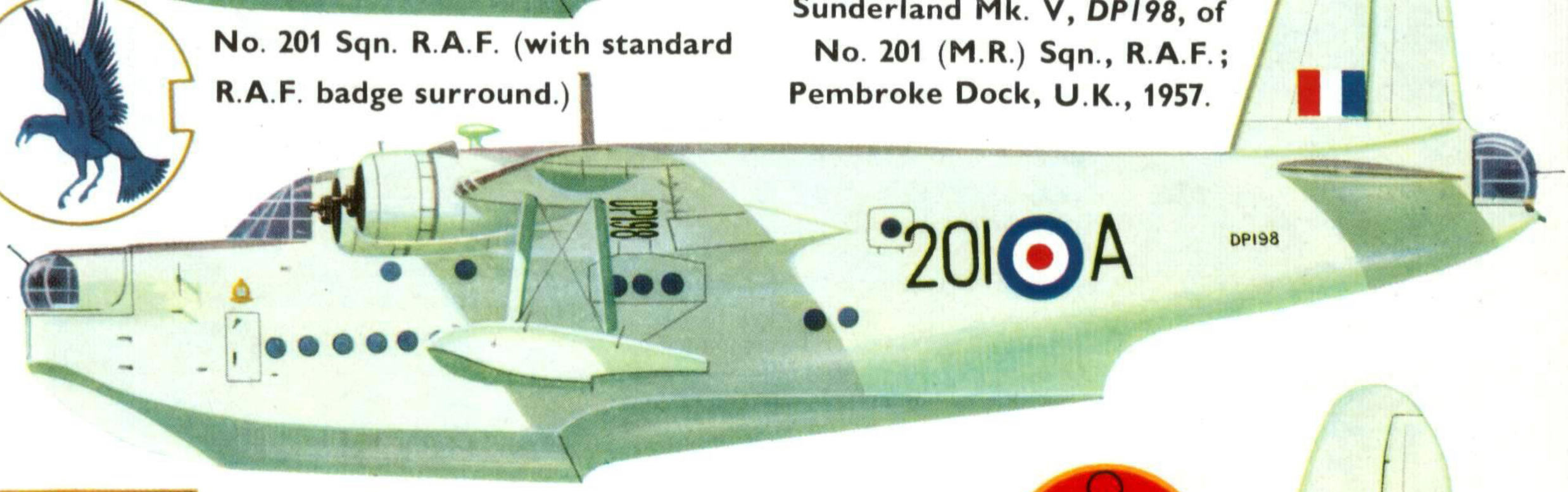
S.A.A.F.

Sunderland Mk. V, *1703* of No. 35 Sqn., South African Air Force; Congella, Durban, South Africa, 1952.

Sunderland Mk. V, *NZ4118*, of No. 6 (M.R.) Sqn., Royal New Zealand Air Force, 1956.

No. 201 Sqn. R.A.F. (with standard R.A.F. badge surround.)

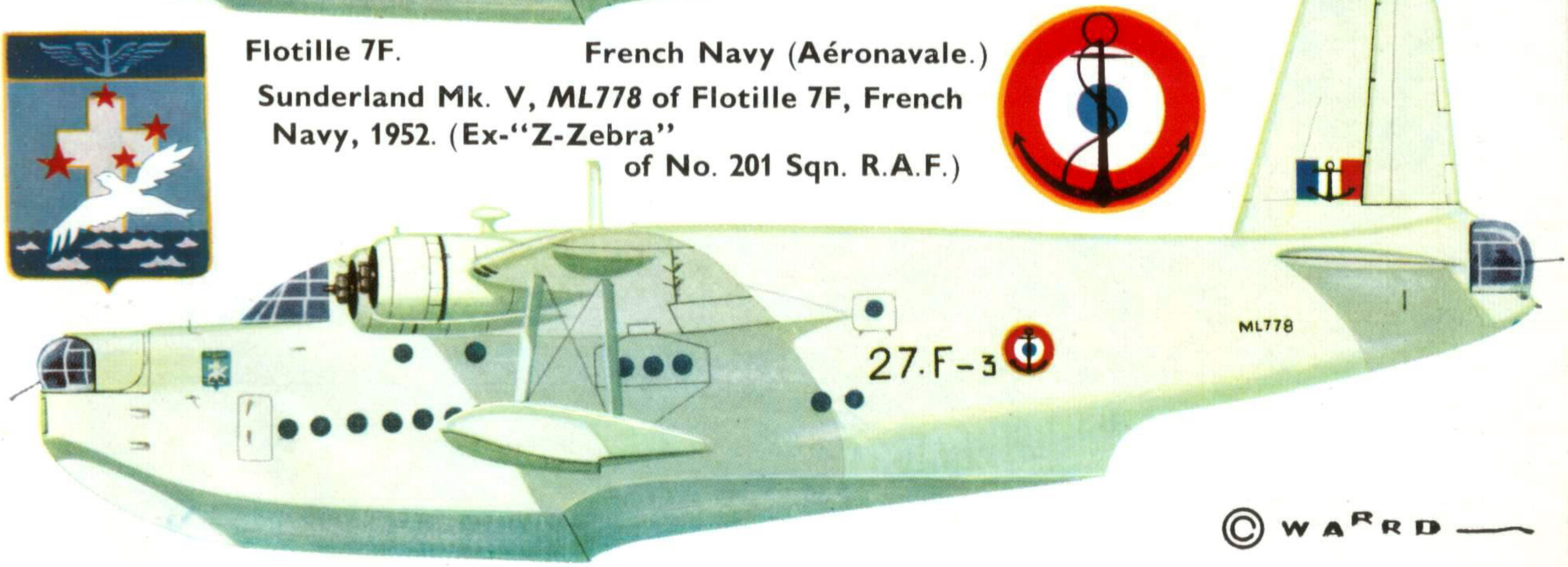
Sunderland Mk. V, *DP198*, of No. 201 (M.R.) Sqn., R.A.F.; Pembroke Dock, U.K., 1957.

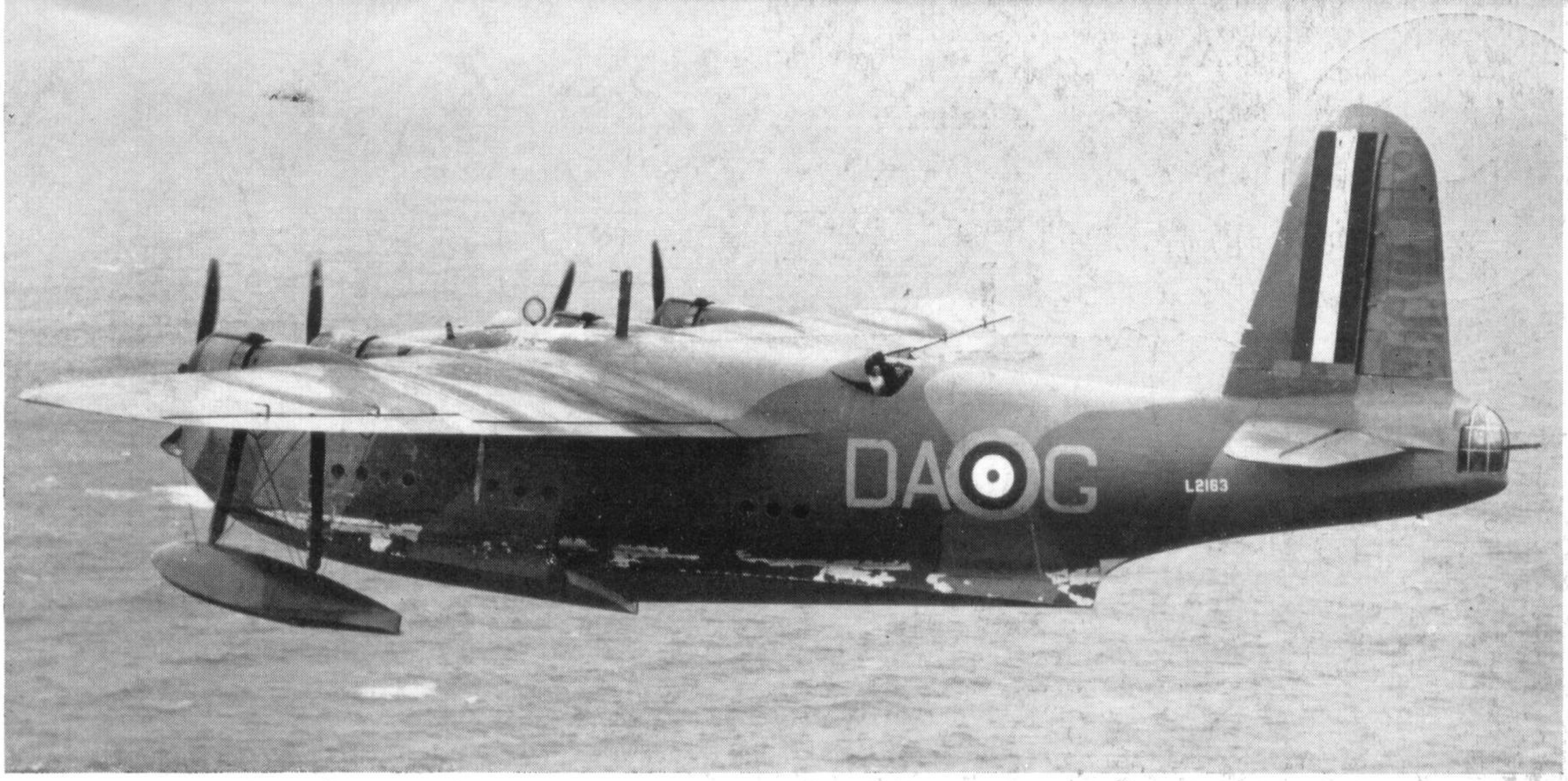


Flotille 7F.

French Navy (Aéronavale.)

Sunderland Mk. V, *ML778* of Flotille 7F, French Navy, 1952. (Ex-"Z-Zebra" of No. 201 Sqn. R.A.F.)





Another view of L2163, *DA-G of No. 210 Squadron. The upper beam gun ports are clearly shown, as is the early camouflage scheme.*
(Photo: Imp. War Mus. CH805)

service in 1960. One of these, *ML824*, was presented to Peter Thomas's Sunderland Trust and was flown to Pembroke Dock in March, 1961. There, under the expert and loving care of Squadron Leader F. E. Godfrey, who was an Intelligence Officer with Sunderlands during the war, it is on permanent public display, a worthy, if somewhat inconviently placed memorial to a very great aircraft.

The New Zealand Sunderlands served with No. 5 (M.R.) Squadron at Hobsonville, Auckland and Lauthala Bay, Fiji until they were finally replaced by Lockheed Orions last year. The fate of the last six aircraft had not been completely resolved at the time of writing. The available boats are, *NZ4017*, *NZ4112*, *NZ4113*, *NZ4114*, *NZ4115*, *NZ4116* and *NZ4120*. Almost certainly one of these aircraft will be going to the Museum of Transport and Technology at Western Springs, Auckland, and there seems a fair chance that one might be preserved in Canada and another in Great Britain. The new R.A.F. Museum is reportedly showing some interest in this project.

The complete Sunderland history does, of course, include the various conversions which were made from a very successful aircraft—the Solents, Sandringhams and Hythes but, apart from showing the conversions made during production in the Sunderland Production Chart, we must reluctantly agree that this really would be another story.

SPECIFICATION—SUNDERLAND MARK V

Dimensions: Span, 112 ft. 9½ in.; length, 85 ft. 4 in.; height to top of fin, 32 ft. 10½ in.; nett wing area, 1,487 sq. ft.; gross wing area 1,687 sq. ft.; max. beam, 9 ft. 9 in.; max. depth, 17 ft. 9 in.

Power Plant: Four 1,200 h.p. Pratt and Whitney R-1830-90B (also 90C and 90D) Twin Wasp 14 cylinder two row radial air cooled engines in NACA-type cowlings with controllable flaps. Hamilton Standard three-blade, fully feathering metal airscrews of 12 ft. 9 in. diameter. Maximum fuel capacity in wings, 2,552 Imp. Gal.

Weights: Tare weight, 37,000 lb.; removable equipment, 4,300 lb.; crew, 1,800 lb.; bombs, fuel and oil, 16,900 lb.; max. take-off weight, 60,000 lb.; wing loading at max. all-up-weight: 35·6 lb./sq. ft.

Performance: Maximum speed at 5,000 ft.—213 m.p.h.
Economical cruising speed—177 m.p.h. at 12,250 ft.
Rate of climb at sea-level—840 ft./min.
Service ceiling—17,900 ft.
Still air range at 134 m.p.h. at 2,000 ft. with 2,552 Imp. gal.—2,980 miles.

Production Chart (contd.)

SHORT AND HARLAND, BELFAST

Serials	No. of air-craft	Mark	Notes
W6050-64	15	II	
W6065-68	4	III	
W6075-80	6	III	
DV985-994	10	III	
DW104-113	10	III	
EJ163-172	10	III	*EJ167* became *NZ4116*. *EJ170-172* became Sandringhams.
ML807-831	25	III	*ML809*, *818* and *828* became Sandringhams. *ML814* became *NZ4108*. *ML816*, *819*, *820*, *821* and *824* to *Aéronavale*. Totals: 15 Mark IIs, 65 Mark IIIs.
NJ253-277	25	V	*NJ253* and *257* became Sandringhams.
SZ559-584	26	V	*SZ561* and *584* became *NZ4114* and *4115*.
SZ598-599	2	V	Total: 53 Mark Vs.

Total Belfast production was 133 aircraft.

BLACKBURN, DUMBARTON

Serials	No. of air-craft	Mark	Notes
T9083-9090	8	I	
T9109-9115	7	I	
W6000-6004	5	II	
W6005-6016	12	III	
W6026-6033	8	III	
DD828-867	40	III	*DD834* and *841* became Sandringhams.
EK572-596	25	III	*EK579* became Sandringham.
ML835-884	50	III	*ML838*, *840* and *843* became Sandringhams. *ML866*, *872* and *877* passed to *Aéronavale*.
NJ170-194	25	III	*NJ171*, *179* and *188* became Sandringhams. *NJ170*, *182* and *190* to *Aéronavale*.
PP135-144	10	III	*PP143* became *NZ4119*.
PP145-164	20	V	
RN277-306	20	V	*RN280*, *286* and *306* became *NZ4106*, *4117* and *4118* respectively.
VB880-889	10	V	*VB880*, *881* and *883* became *NZ 4111*, *4112* and *4107* respectively.

Total Blackburn production was 15 Mk. I, 5 Mk. II, 170 Mk. III and 50 Mk. V. =240 total.

Total Sunderland production at all factories was 749 aircraft. This total does not include *NJ208-219* which were never completed as Seafords or Sunderland IV's.

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