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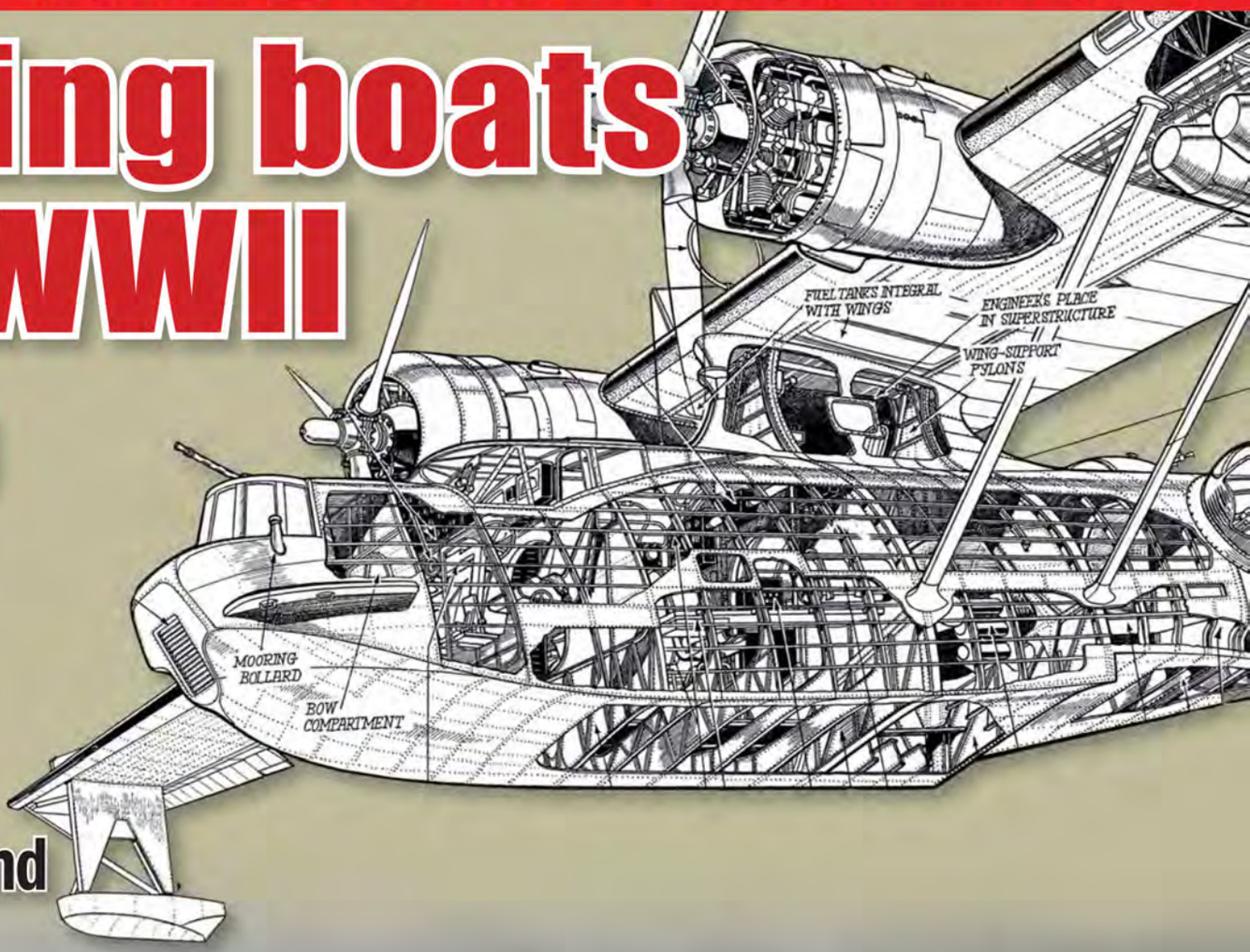

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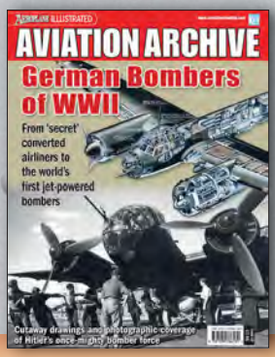

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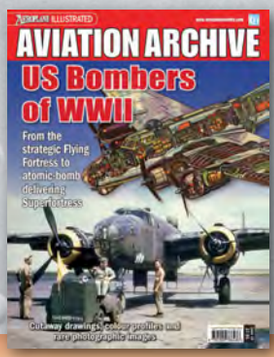

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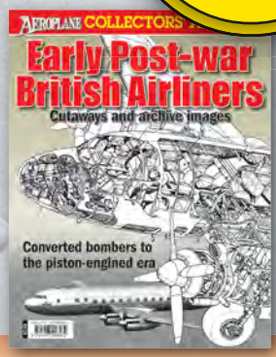

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Flying boats of World War 2

The golden era of the flying boat was at its zenith when the first shots of World War 2 echoed out around Europe. The inter-war period had established a vogue for the flying boat, driven by the colonial powers as they sought to unite their scattered empires in timescales of days rather than months. The military also saw an exciting future for these leviathans of the air and embraced the technology, pushing the manufacturers to produce bigger and better machines. Ultimately, range ruled. Maritime reconnaissance became paramount and the flying boat was the perfect machine, able to patrol the world's oceans for hours at end. After all, what other type of aircraft could operate across a staggering 70% of the world's surface without the need for securing long runways. There is no denying that flying boats helped shape the course of the war, for without their 'eyes in the sky' attacking fleets would have struck at will, U-boats would have roamed with impunity and the lives of many sailors and downed airmen would have been lost. However, confined to monotonous patrols, the flying boat became enveloped in an aura of anonymity, a lack of glamour if you like, that was at odds with their vital importance. But there was another more deadly enemy within. Advances in wartime technology quickly rendered the flying boat virtually obsolete. What had once been the sole domain of these far-ranging machines became a hunting ground. If caught out in the open, the lumbering flying boats were vulnerable and helpless, their crews often battling against the odds to survive. With faster land-based aircraft taking over their roles, gradually the flying boat was removed from the front-line, the smaller types re-inventing themselves as air-sea rescue platforms, while the long-range giants were put to good use as transports. But it was all too late. The final chapter had already been written and the epic rise and fall of the flying boat empire was complete.

Today we view these machines and their crews with the reverent nostalgia that they deserve. Wartime flying boats came in all shapes and sizes, from the compact amphibious gem of the Grumman Goose, to the undoubted heavyweight champion of them all, the Martin Mars. But if asked to name but two flying boats from this era, the answer will always be the same… the Short Sunderland and Consolidated Catalina. History has granted these machines near mythical status, but in truth the same could be said for this entire genre of aircraft. This publication pays tribute to them all. **Allan Burney**

Photographers and artists

Much of the work featured within this publication is drawn from *The Aeroplane* archives, supplemented by other sources, credited where known.

We are also greatly indebted to the artists: Andy Hay (www.flyingart.co.uk), Rolando Ugolini (airlinerart), Atsuo Nagai (nags-gallery.com) and Mark Postlethwaite (www.posart.com).

Aviation Archive Series
Flying boats of World War 2
• **Editor:** Allan Burney • **Design:** Paul Sander • **Credits/Bibliography:** William Green (War planes of the Second World War); The Aeroplane; & Flight magazine • **Publisher and Managing Director:** Adrian Cox
• **Executive Chairman** Richard Cox • **Commercial Director** Ann Saundry • **Distribution** Seymour Distribution Ltd +44 (0)20 7429 4000 • **Printing** Warners (Midlands) PLC, The Maltings, Manor Lane, Bourne, Lincs PE10 9PH.

 Published by Key Publishing Ltd, PO Box 100, Stamford, Lincs PE19 1XQ. Tel: +44 (0) 1780 755131. Fax: +44 (0) 1780 757261. Website: www.keypublishing.com **ISBN:** 978 1909786 110

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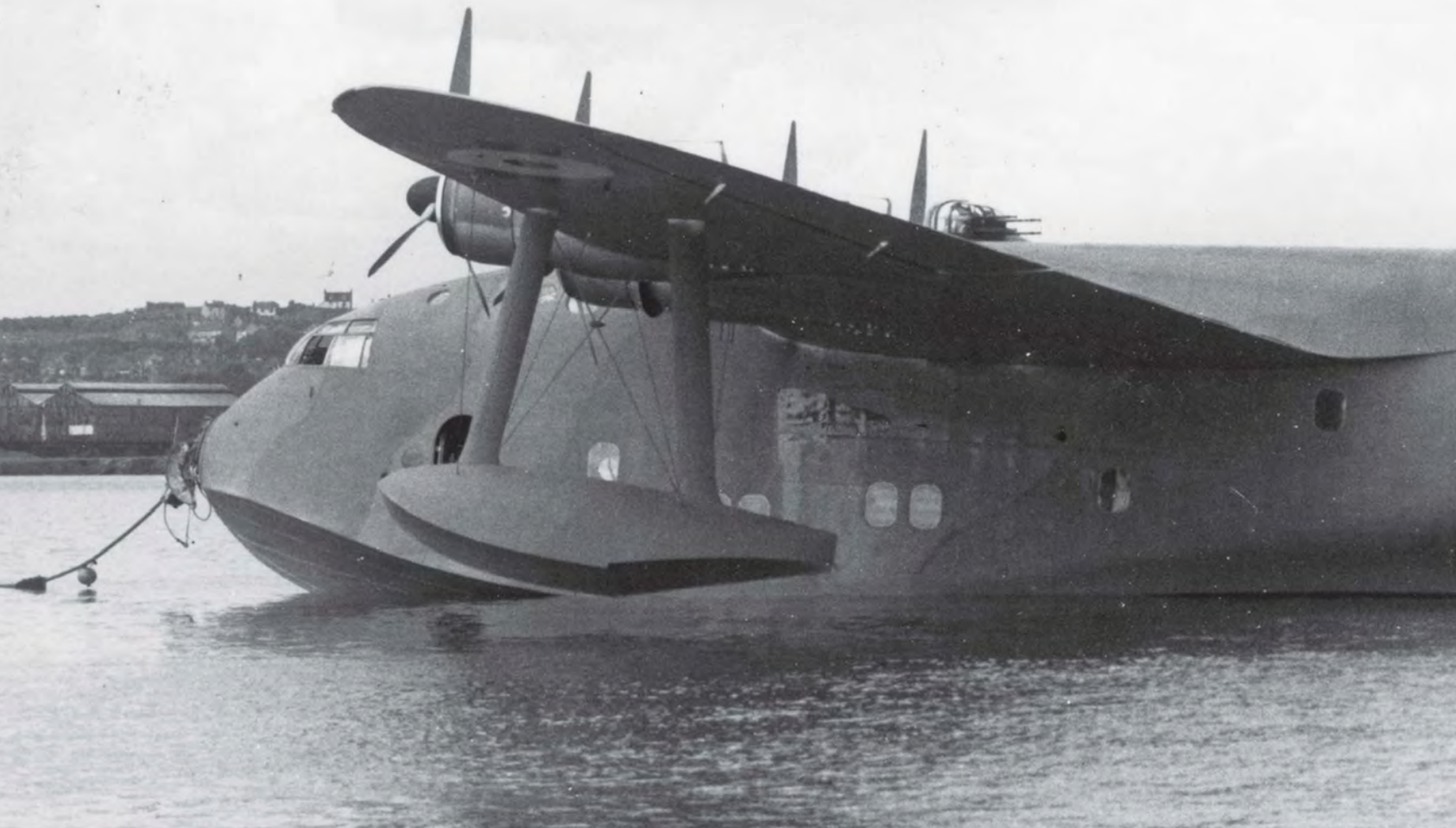
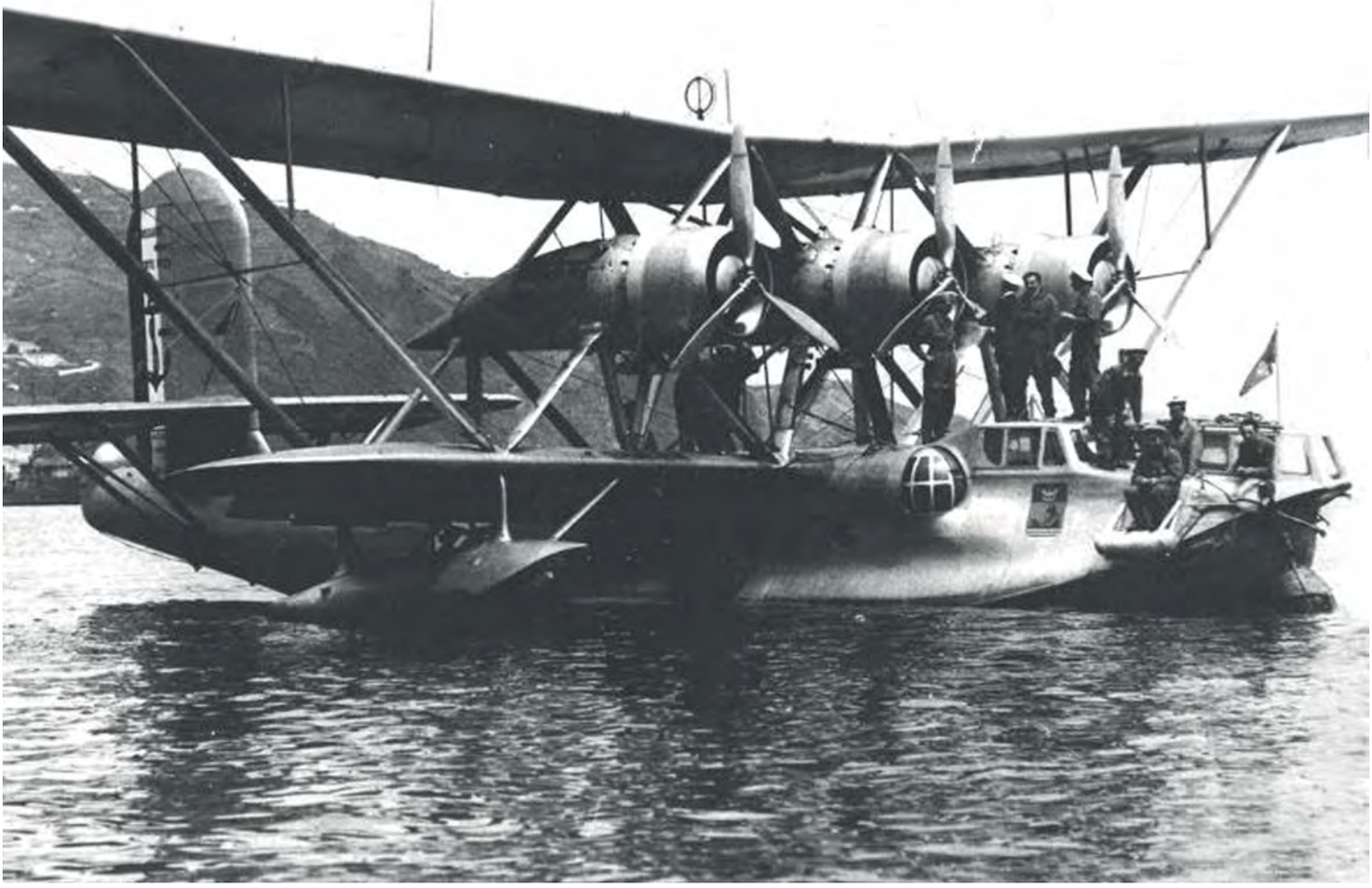




The Calcutta lineage of the Bizerte became less obvious with production aircraft that featured the revised nose section, incorporating extended cockpit glazing and distinctive gun blisters.

Breguet 521 Bizerte

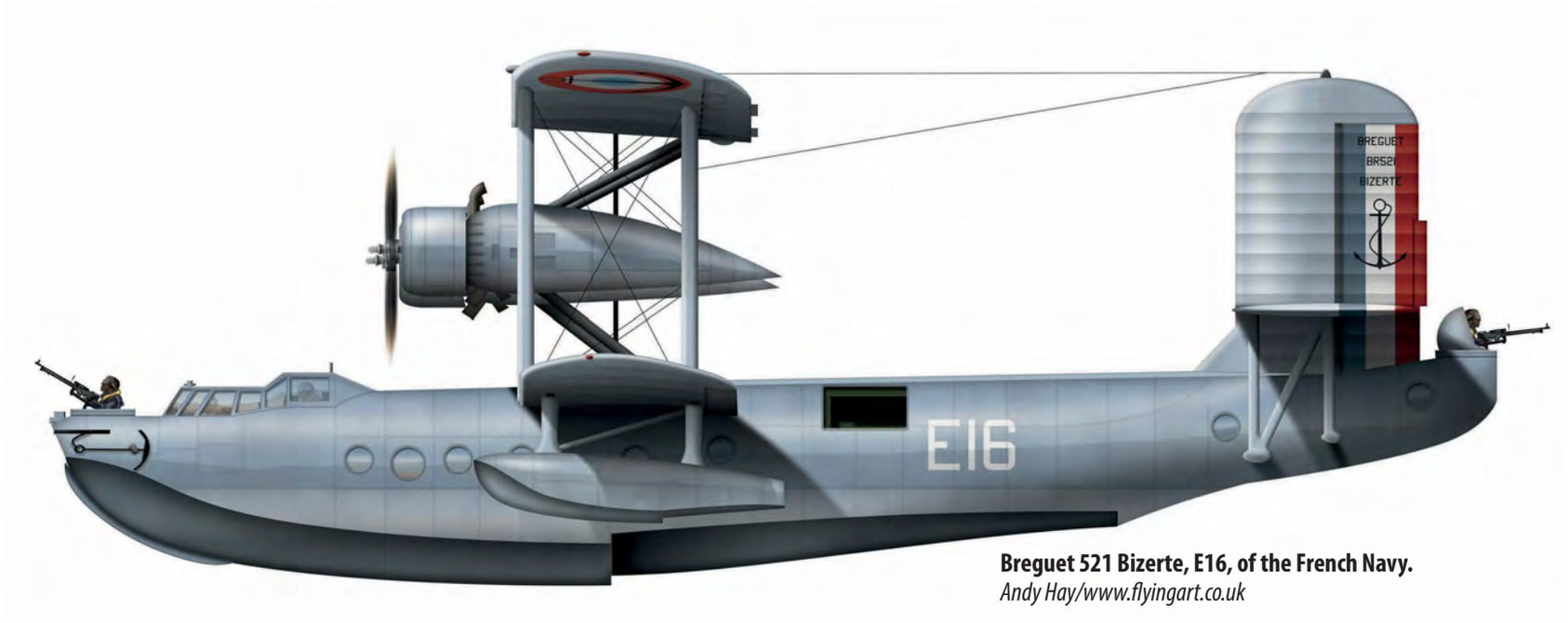
Evolved from the proven Short Calcutta, the Bizerte was an aging design quickly overtaken by technological advances. However, it was even ordered by the Luftwaffe and flew valuable long-range reconnaissance missions during the war.

Built to meet a French Navy specification for a long-range flying boat issued in 1932, the Breguet S.8/2 was a licenced version of the British Short Calcutta. The prototype first flew in September 1933 and was sent to Cherbourg for operational evaluation. Production machines became the 521 Bizerte and embodied several modifications, the principal of which were the elimination of the open bow gun position, the distinctive extension of the cockpit canopy and the introduction of blister-type gun positions in the fuselage sides aft of the flight deck.

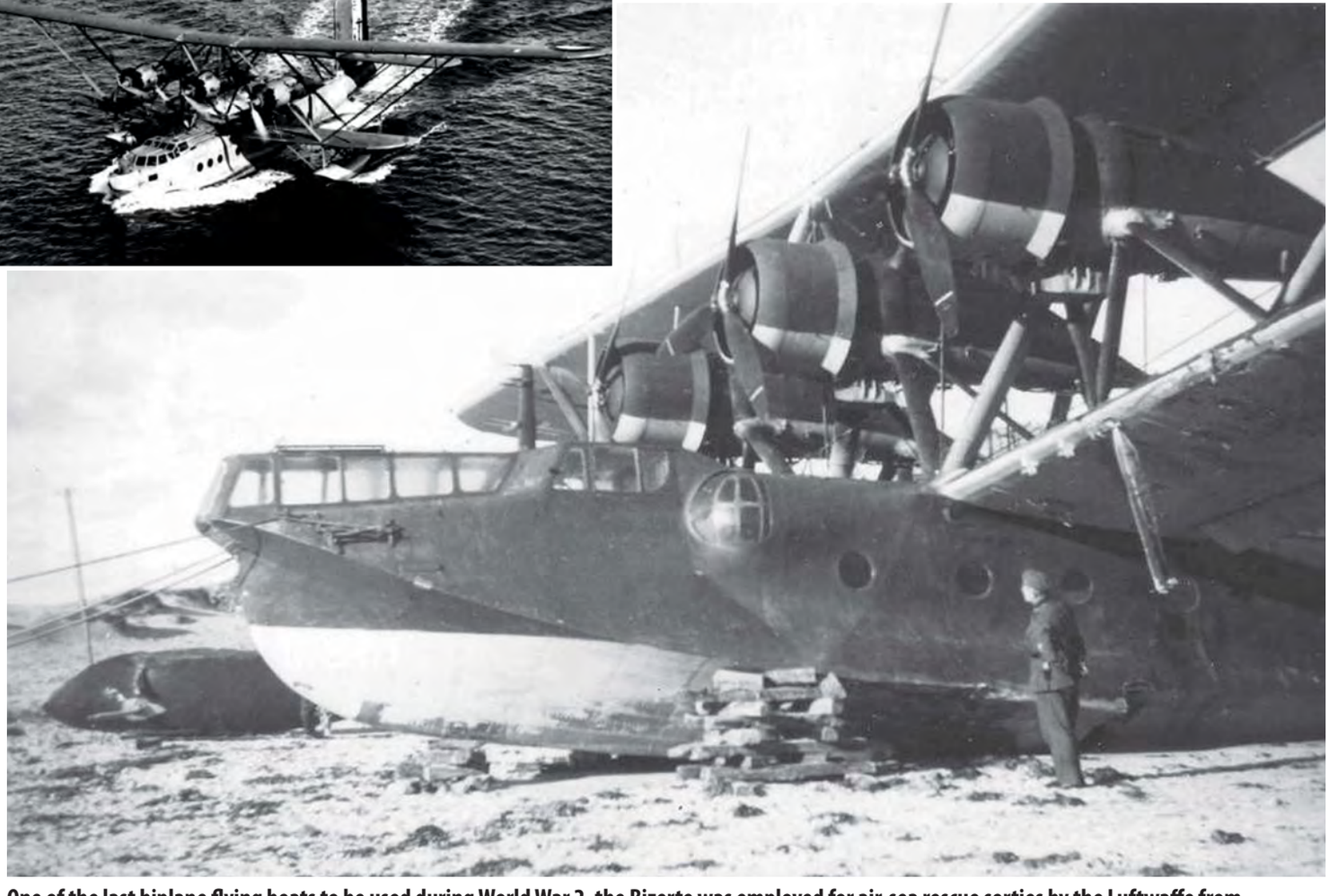
A total of 37 Bizertes were produced, which served with five squadrons of the French Navy from 1935 until 1940. Two squadrons remained in service with the Vichy Navy after the armistice, at Berre in Southern France and Karouba in Tunisia, with six aircraft each. The German Luftwaffe purchased a number of Bizertes for its Seenotdienst (Air-Sea Rescue) service in 1940, which it used to equip a squadron based at Brest on the French Atlantic coast. When Vichy France was occupied by the Germans following the Allied invasion of North Africa in November 1942, the remaining Vichy Bizertes were taken over by the Luftwaffe, allowing further Seenotdienst units to be established at Biscarrosse and Berre. Following the Allied Invasion of Southern France in August 19 44, one of the Luftwaffe Bizertes was discovered by French forces and used for communications duties until spares ran out.

BREGUET 521 BIZERTE

Type: Long-range maritime reconnaissance
Crew: 8
Length: 67ft 2in
Wingspan: 115ft 4in
Powerplants: 3 x Gnome-Rhone 14Kirs1 (900hp)
Loaded weight: 33,271lb
Max speed: 149mph
Armament: 5 x 7.5mm Darne machine guns in two port and two starboard lateral positions and tail position, plus four 165lb bombs in dorsal turret and 4 x 7.5mm guns firing laterally through portholes, plus 8 x 165lb bombs



Breguet 521 Bizerte, E16, of the French Navy.
Andy Hay/www.flyingart.co.uk



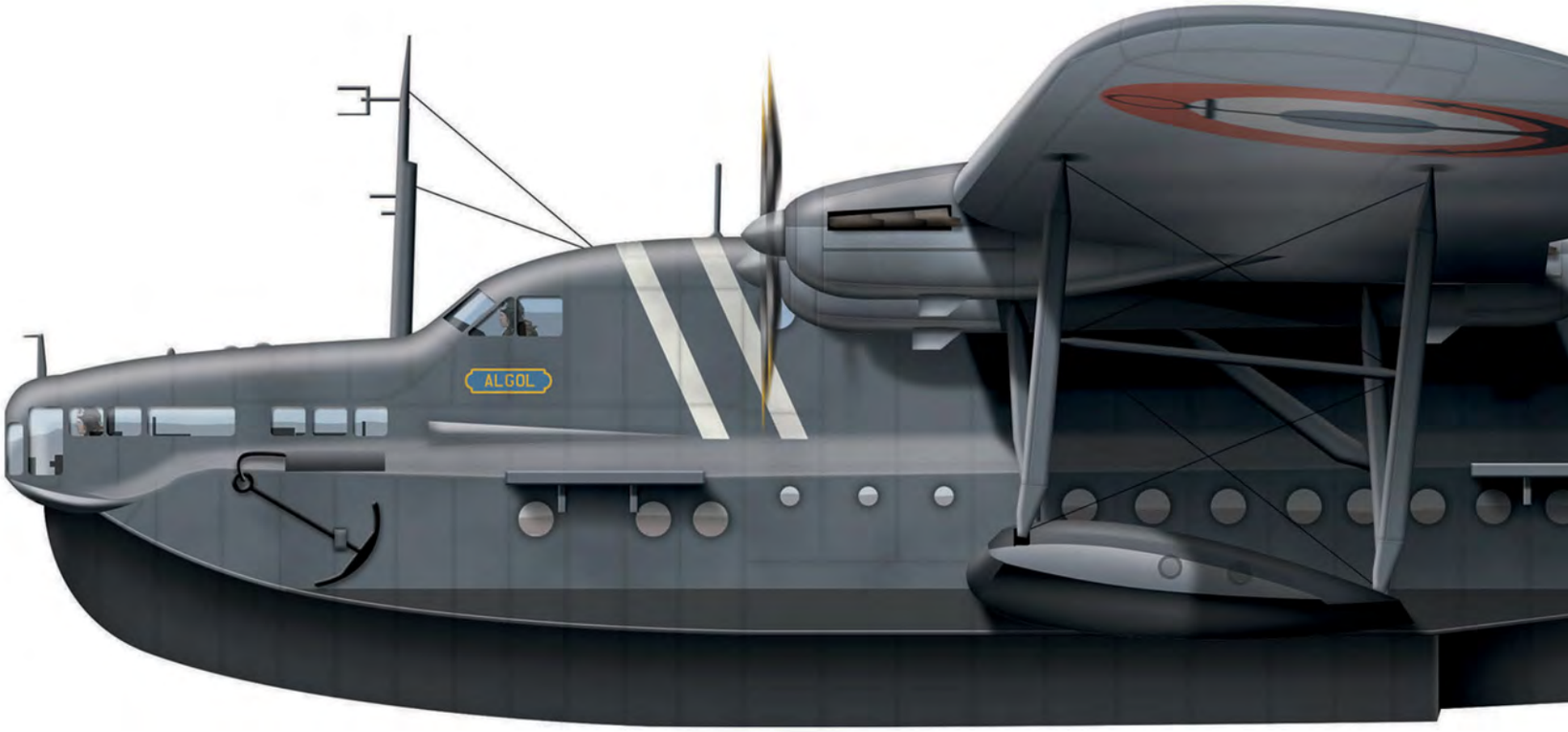
One of the last biplane flying boats to be used during World War 2, the Bizerte was employed for air-sea rescue sorties by the Luftwaffe from Lorient and Saint Mandrier. This example has lost its port float and has presumably been beached for repairs. Inset: The prototype Breguet Bizerte undergoing tests at le Havre. Note the open bow gun position that was later replaced with the type's distinctive nose glazing.

Latécoère 521-523

France's long flying boat legacy has produced many innovative aircraft, but the Latécoère 521-523 series of seaplanes were undoubtedly some of the most impressive. Although only limited in number, these six-engined giants had a brief but eventful career.

During 1930 Latécoère designed a four-engined trans-Atlantic flying boat for passenger transport as the Laté 520 to be powered by. Hispano-Suiza HS18Sbr engines of 1,000hp each. Unfortunately shortly after construction had begun, Hispano Suiza terminated the development of the engine and Latécoère was forced to redesign the aircraft to use six lower rated engines. The new flying boat received the type designation 521 as an all-metal design with a large shoulder wing that was connected with struts to low-placed sponsons. Four of the engines were housed in the wing centre section in two tandem nacelles driving tractor and pusher propellers. The last two engines were fitted in wing leading edge nacelles. The Laté 521 made its first flight in January 1935. Christened *Lieutenant de Vaisseau Paris*, it could carry 30 passengers on trans-Atlantic flights and was put into service by Air France. However, in January 1936 it was hit by a hurricane and sunk in Pensacola bay. Salvaged and completely rebuilt, it went on to establish world seaplane distance and load records, which began to attract the attention of the French Navy. At the outbreak of the war the Laté was put into service by the Aéronavale at Escadrille E6 where it was used for Atlantic patrol missions until August 1940. Later it was damaged beyond repair in August 1944 by retreating German troops. Based on the relative success of the Laté 521, the Ministry of Aviation ordered a second Latécoère flying boat (the Laté 522) for the trans atlantic routes. Fitted with more powerful engines and a redesigned nose it made its first flight on 20 April 1939 carrying the civil registration F-ARAP and the name *Ville de Saint-Pierre*. Again it was impressed for use by the Aeronavale. Just like the Laté 521, it was damaged beyond repair in August 1944 by retreating German forces.

Meanwhile, the Aéronavale had ordered three militarised versions as the Laté 523, the first of which made its maiden flight on 20 January 1938. The three Laté 523's were named *Altair*, *Algol* and *Aldebaran*. All three machines served at Escadrille E6 for maritime patrol duties in the Atlantic. *Algol* made a forced landing during a patrol mission on 18 September 1939 and had to be sunk by gunfire. The two remaining 523s were used operationally until they became unserviceable in 1942.

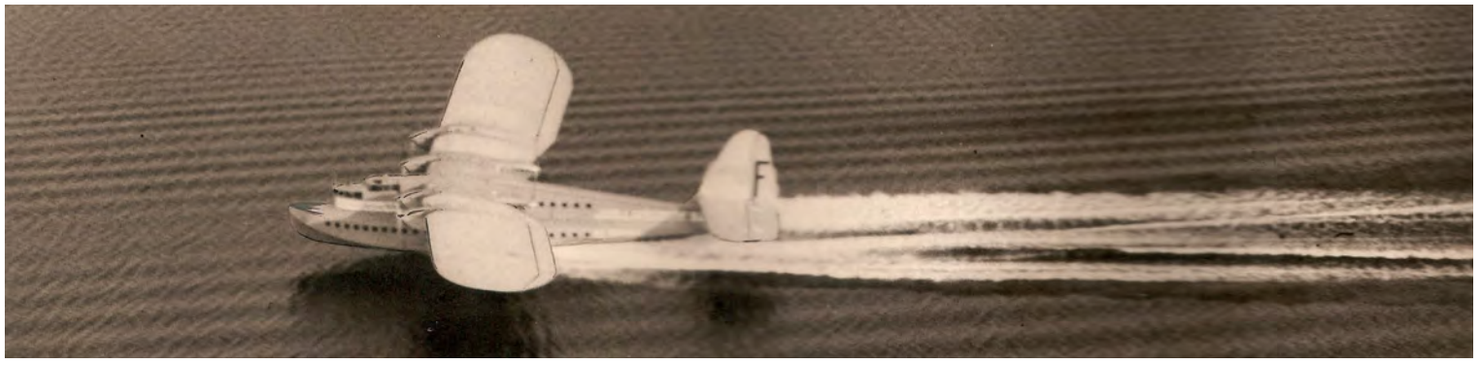


Main image: Laté 523 *Algol* was one of only three of the breed that was operated by the French Navy. While flying a patrol over the Atlantic on 18 September 1939, *Algol* made a forced landing and as towing was impossible it had to be sunk by gunfire. *Andy Hay/www.flyingart.co.uk*

Top right and right: The sole Laté 521 in its civil guise before being impressed into service in September 1939. The Laté 521 was demobilised in August 1940 but it was damaged beyond repair (along with the Laté 522) in August 1944 when the retreating German forces dynamited the hangars at Berre.

LATÉCOÈRE 523

Type: Long-range maritime reconnaissance
Crew: 14
Length: 103ft 9in
Wingspan: 161ft 9in
Powerplants: 6 x Hispano-Suiza 12Y-27 (900hp)
Loaded weight: 82,673lb
Max speed: 161mph
Armament: 1 x 7.5mm Darne machine gun in dorsal turret and four 7.5mm guns firing laterally through portholes, plus 8 x 165lb bombs



Loire 130

Even by flying boat standards, the small Loire could not be considered graceful. Nevertheless it was probably the most widely used of French seaplanes in the war. Although appearing quite obsolete and having very marginal performance for their time, quite a few Loire 130s survived the conflict and remained in post-war French service, especially in French colonies until 1951.

The Loire 130 originated from a mid-1930s requirement from the French Navy for a reconnaissance seaplane or flying boat that could also serve aboard French battleships and cruisers. Chosen in 1936 against five competitors (Bréguet 610, Gourdou-Leseurre GL-820 HY, Levasseur PL.200, Potez CAMS 120), the Loire 130's performance was deemed to be good and production orders for 150 of the machines were placed. The first prototype flew on 19 November and it entered production in 1937 to replace most shipborne seaplanes and flying boats already in service.

Of all-metal construction with fabric-covered mainplanes and tail surfaces, it had a pug-like appearance with a square cockpit above which was the bow gun position. Behind this perched high on v-struts sat the engine. The initial production order called for 40 Loire 130M (Métropole) and five Loire 130C (Colonial), the latter featuring a larger radiator and a reinforced structure to permit shallow dive-bombing.

At the beginning of World War 2, ship-based Loire 130s served aboard the seaplane carrier *Commandant Teste* and 20 cruisers, including the battleships *Dunkerque* and *Strasbourg*, while shore-based Loire 130s were stationed in Indochina, the West Indies, Dakar and Tripoli.

After November 1942, all French warships were deprived of their catapults to make way for supplementary anti-aircraft guns and the Loire 130s became shore-based, being used for coastal patrol, training and communications duties. Although the flying boat was progressively grounded, seemingly against the odds a number survived the conflict.

LOIRE 130M

Type: 3-seat shipboard observation or 7-seat communications flying boat

Crew: 3-7

Length: 37ft

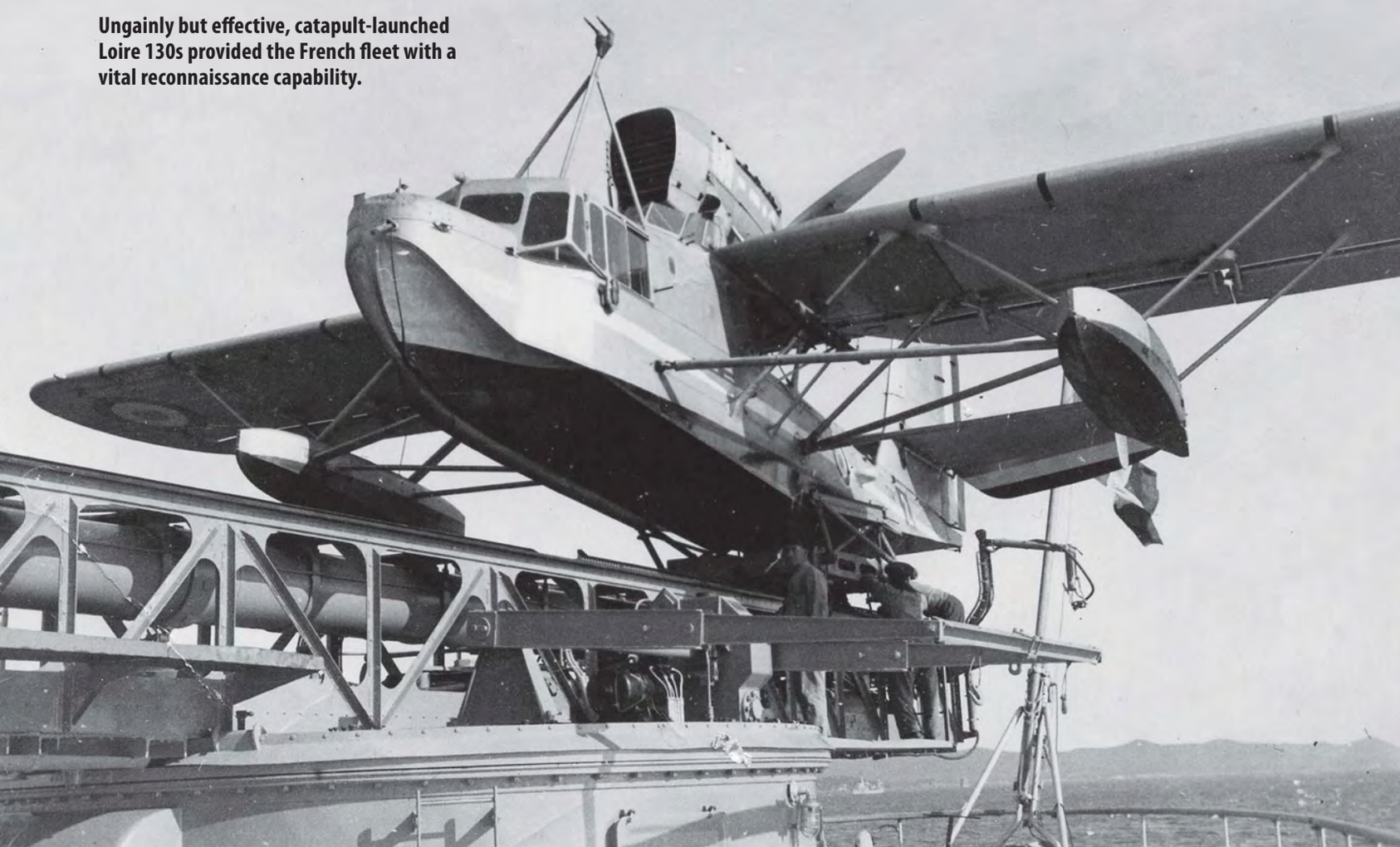
Wingspan: 52ft 6in

Powerplants: 1 x Hispano-Suiza 12X (720hp)

Loaded weight: 7,187lb

Max speed: 137mph

Armament: 2 x 7.5mm Darne machine guns in bow and dorsal positions, plus 2 x 165lb bombs



Ungainly but effective, catapult-launched Loire 130s provided the French fleet with a vital reconnaissance capability.

Potez-CAMS 141

This long-range reconnaissance flying boat of the late 1930s was intended to equip the French Navy, but only a single prototype was completed before the German invasion of France stopped production. That prototype, however, had an eventful career and served operationally from bases in French North Africa until scrapped in 1943.

Like the Breguet 730 and Latécoère 611, the Potez-CAMS 141 was designed to meet a 1935 French Navy specification for a long-range reconnaissance flying boat to supplant the Bizerte and other types approaching obsolescence. The prototype, which was built at Sartrouville and shipped to Caudebec-en-Caux for assembly, made its maiden flight on on 21 January 1938.

It was a four-engined monoplane, powered by Hispano-Suiza 12Y engines, with a braced, high aspect ratio wing mounted above the fuselage and a twin tail. It was armed with a dorsal turret carrying two 7.5mm Darne machine guns, with a further two machine guns in lateral 'cheek' barbettes and two in waist positions. After evaluation, a production order for four aircraft was placed, with a further 15 being ordered before the start of World War 2.

The prototype was christened *Antarès* by the French Navy and was delivered to Escadrille E8 in November 1939 and began flying long-range patrols over the Atlantic. No production aircraft had been completed by the time of the Armistice in June 1940, with *Antarès* being evacuated to Port Lyautey in Morocco. It was operated by the Vichy French Navy, serving with Escadrille 4E at Dakar, continuing in service until the Allied Invasion of North Africa, when after brief fighting, the French armed forces in North Africa joined with the Free French. *Antarès* continued in service, carrying out patrols over the Central and South Atlantic. On 2 June 1943, *Antarès* sank the German U-Boat U-105 near Dakar. The aircraft was finally scrapped late in 1943, by which time it had logged 1,800 flying hours.

POTEZ-CAMS 141

Type: Long-range maritime reconnaissance/bomber

Crew: 9-12

Length: 79ft 9in

Wingspan: 134ft 6in

Powerplants: 4 x Hispano-Suiza 12Y-26 (930hp)

Loaded weight: 50,926lb

Max speed: 199mph

Armament: 6 x 7.5mm Darne machine guns (2 in dorsal turret, 2 in lateral barbettes, 2 in waist positions), plus 3,300lb bomb load

Below: Potez-CAMS 141 *Antarès* of Exploration Flight 4E at Dakar in 1942, wearing Vichy markings. *Andy Hay/www.flyingart.co.uk*

Below: French flying boats might not have looked the most technologically advanced, but they did have a certain 'Je ne sais quoi'!

Blohm & Voss BV138

One of the most unconventional designs to appear during World War 2, the BV138 was the Luftwaffe's main long-range maritime patrol aircraft and served a pivotal role in supporting the U-boats prowling the Atlantic and Mediterranean. Sturdy and versatile, it was nicknamed the 'flying clog' for obvious reasons, but its official name of Seedrache (Sea Dragon) was perhaps more flattering.

The BV138 was a 'scaled-up' redesigned version of the similarly configured but inferior HP138. First flown in February 1939, the initial production version, BV138B-1, was powered by three 868hp Junkers Jumo 205D diesel engines, one mounted high above the centreline and the other two on each wing extending into the twin tail booms. The standard armament included two 20mm MG 151/20 cannons (one each in power-operated bow and stern turret), and a 13mm MG 131 machine gun high in the aft centre engine nacelle. All of this contributed to the aircraft's rather ungainly appearance.

Owing to the acute shortage of seaplanes experienced by the Luftwaffe during the invasion of Norway, the aircraft were immediately impressed into service, but structural strengthening was found to be necessary. During 1941 it was employed flying shipping reconnaissance missions over the North Sea and into the Atlantic, the type even accounting for a Blenheim and Catalina. The first of the 227 standard variant, BV138C-1, began service in March 1941 and differed in having a four-bladed propeller on its central engine and a modified radiator.

A few of the earlier 'B' model were converted for mine-sweeping and were fitted with a dural hoop energized by an auxiliary motor and given the 'MS' suffix.

BLOHM & VOSS BV138C-1

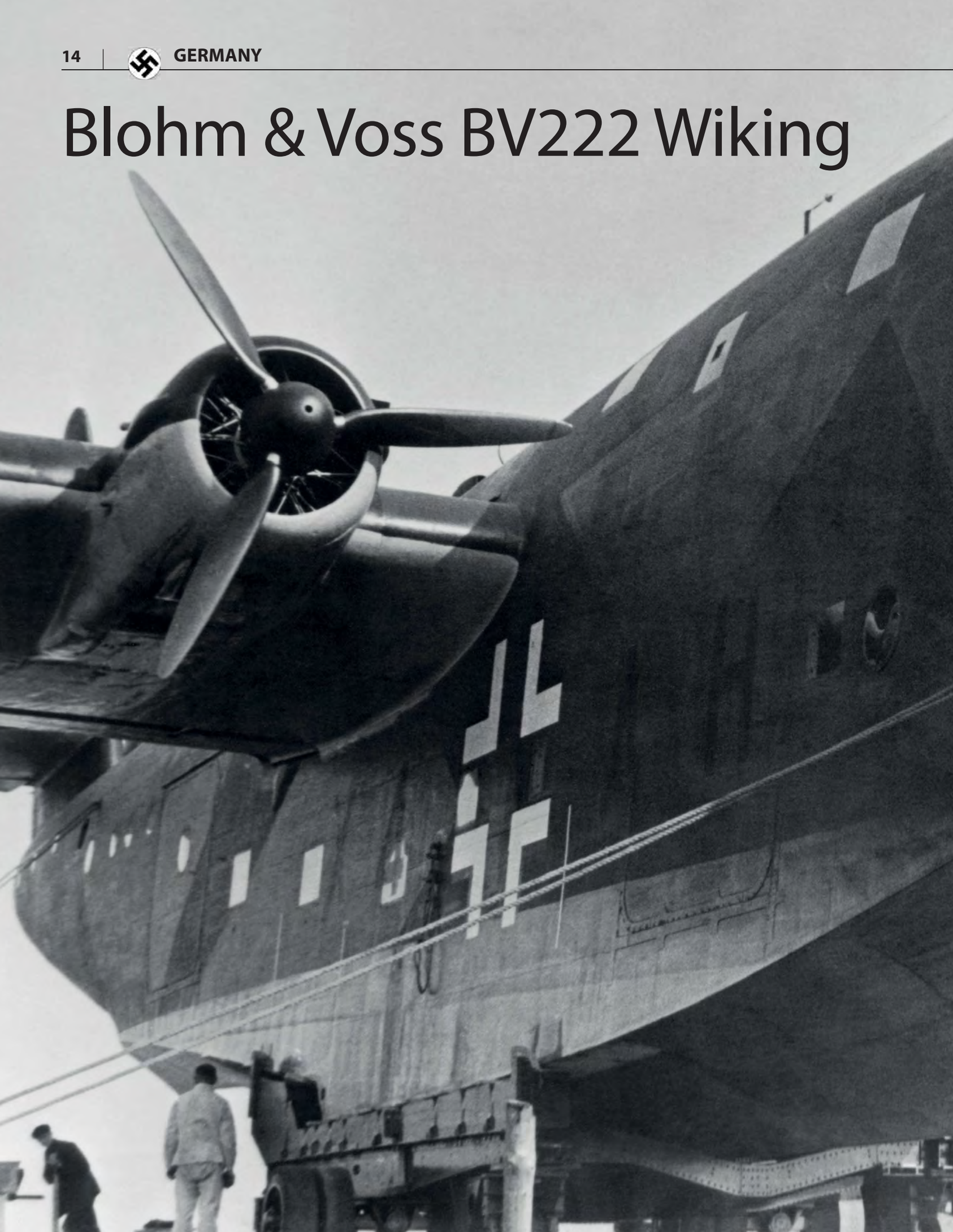
Type: Long-range maritime reconnaissance and transport
Crew: 6
Length: 65ft 1in
Wingspan: 88ft 4in
Powerplants: 3 x Junkers Jumo 250D diesels (880hp)
Loaded weight: 31,967lb
Max speed: 177mph
Armament: 1 x 20mm MG 151 cannon in each of bow and rear turrets, and 1 x 13mm MG 131 machine gun (in open position in aft of central fuselage)

Blohm & Voss BV138C-1 K6+BK of 2/Ku.FL.Gr.406, Luftwaffe, in Norway, March 1942.
Andy Hay/www.flyingart.co.uk

The unusual configuration of the BV138 is well shown by this shot taken at Hemnesfjorden, Norway, in May 1940. This is an early production aircraft featuring the three-bladed propeller on the middle engine.

A Luftwaffe pilot flies his BV138 on a reconnaissance mission over the North Sea. Once it had got over its teething problems, the BV138 proved to be a reliable and sturdy workhorse, capable of withstanding a considerable amount of punishment. Indeed, one BV138 shadowing a British convoy managed to fend off fighters for 90min before still returning to base.

Blohm & Voss BV222 Wiking



There is no denying that the BV222 was big. Yet it had a looming, suggestive presence that made it seem even bigger than it really was. The BV222 had an upper deck for flight crew and a vast lower deck for cargo. The deep fuselage of the BV222 was a massive structure and was streamlined from its conical nose assembly to the tapered tail. The BV222 featured the traditional two-step, boat-like hull for slicing into and displacing sea water when taxying, taking off and landing.
via Aviation-images.com

The gargantuan BV222 Wiking (Viking) was remarkable for being one of the very few aircraft of its era with six engines. A flying boat designed with commercial aviation in mind, the BV222 was put to good use by the Luftwaffe and was the largest flying boat to reach production during World War 2.

Pre-war Lufthansa agreed to purchase three of the big flying boats and the hope was for the BV222 to carry passengers in near-luxury and at great leisure across the North and South Atlantic. Delays in construction of the aircraft and the outbreak of war in Europe altered plans by the time the seaplane made its maiden flight on 7 September 1940. Despite some slight instability and a tendency to porpoise on the water, the prototype displayed good characteristics.

Not so much a miracle of mass production as the result of pains-taking, handcrafted labour, the BV222 was a solidly-built and remarkably conventional flying-boat design constructed almost entirely of metal alloys. The BV222 began with radial engines and shifted to diesels. Slow in its development, built in limited numbers (believed to be 13), the BV222 was useful only so long as the Luftwaffe controlled the skies.

During their initial casualty-prone operations as transports in North Africa and the Mediterranean theatre, BV222 flying boats served with Lufttransportstaffel See 222 (LTS See 222) and carried 1,453 tons of supplies, 19,750 fully equipped troops and 2,491 wounded soldiers. After returning to Germany to be retrofitted with armament, surviving BV222s transferred to the control of the Fliegerfuhrer Atlantik. Flying far out over the Atlantic on U-boat co-operation tasks the five aircraft continued flying sorties from Biscarosse, France until shortly before the Allies liberated that port. Once the Allies took command of the air, the BV222 became a large, slow, and very inviting target for roving Allied fighters.

BLOHM & VOSS BV222C WIKING

Type: Long-range maritime reconnaissance and transport

Crew: 11-14

Length: 121ft 5in

Wingspan: 150ft 11in

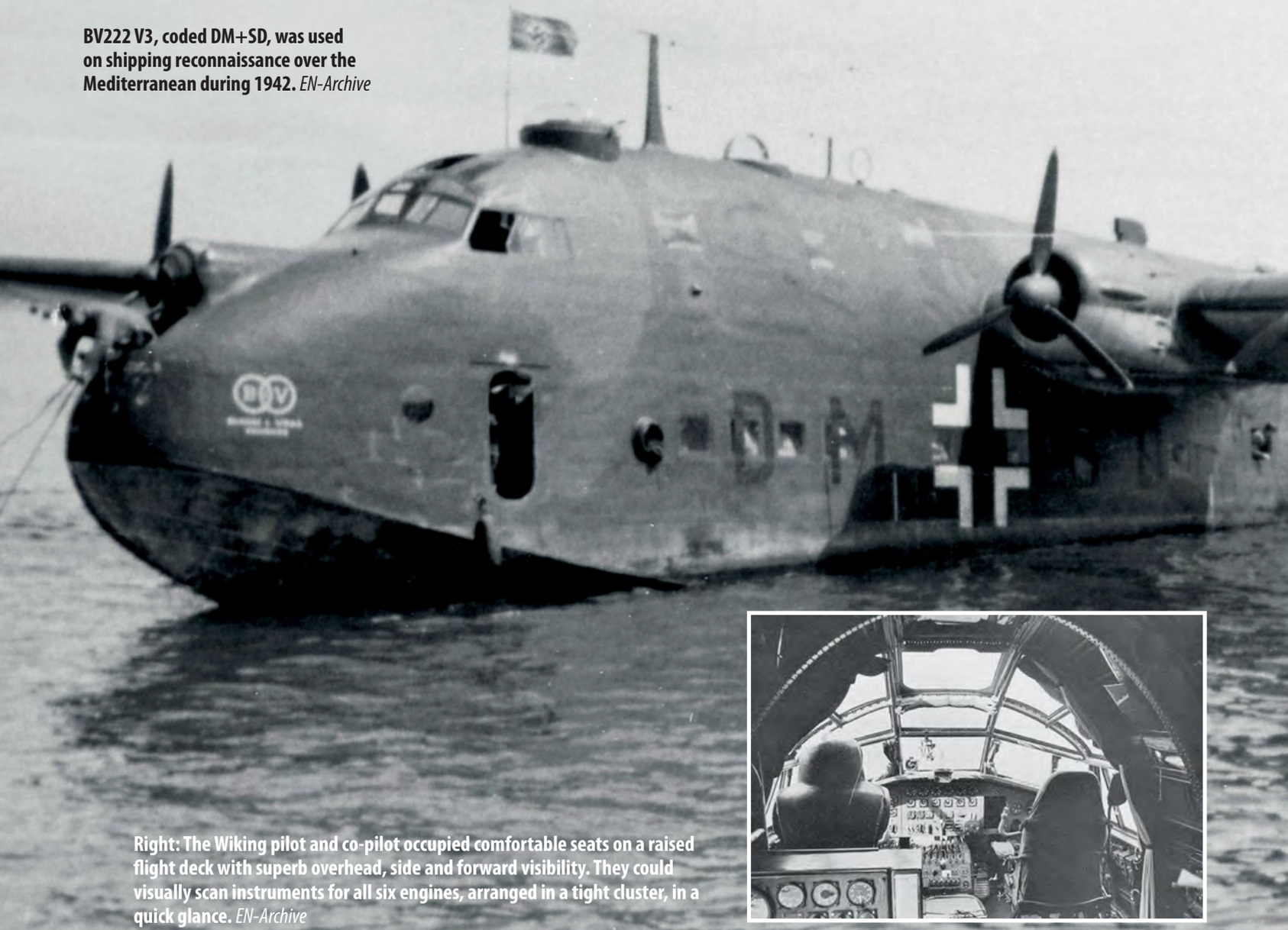
Powerplant: 6 x Junkers Jumo 207C diesels (1,000hp)

Loaded weight: 100,503lb

Max speed: 205mph

Armament: 3 x 20mm MG 151 cannon (one each in forward dorsal and two over-wing turrets), and five 13mm MG 131 machine guns (one each in bow position and four beam hatches)

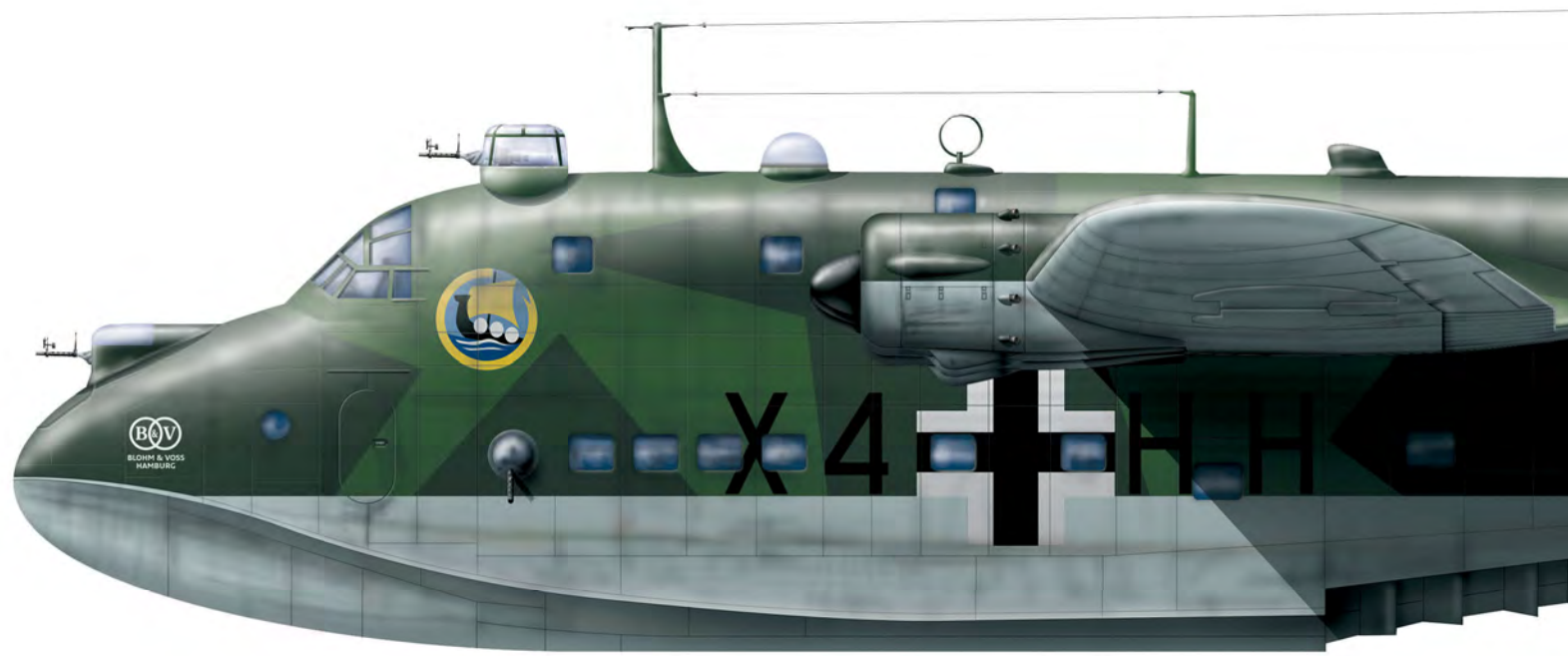
BV222 V3, coded DM+SD, was used on shipping reconnaissance over the Mediterranean during 1942. *EN-Archive*

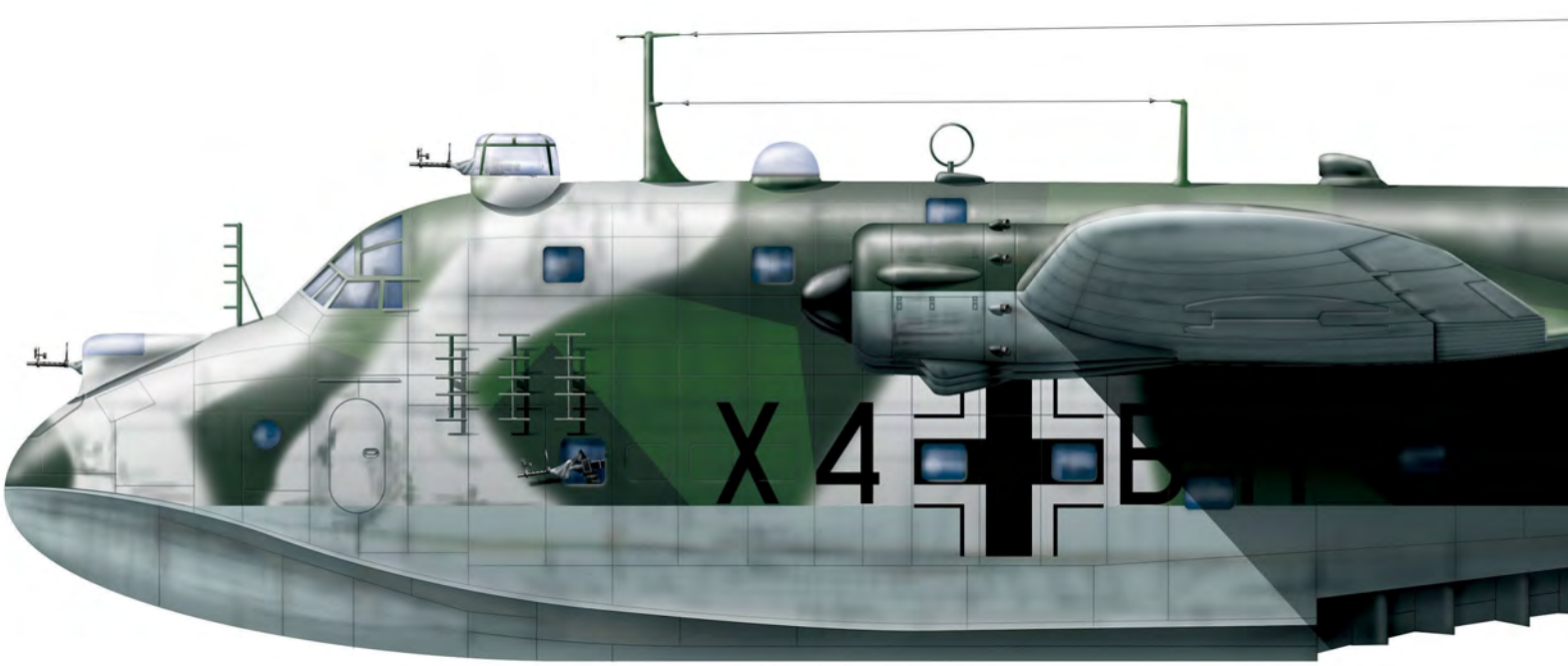


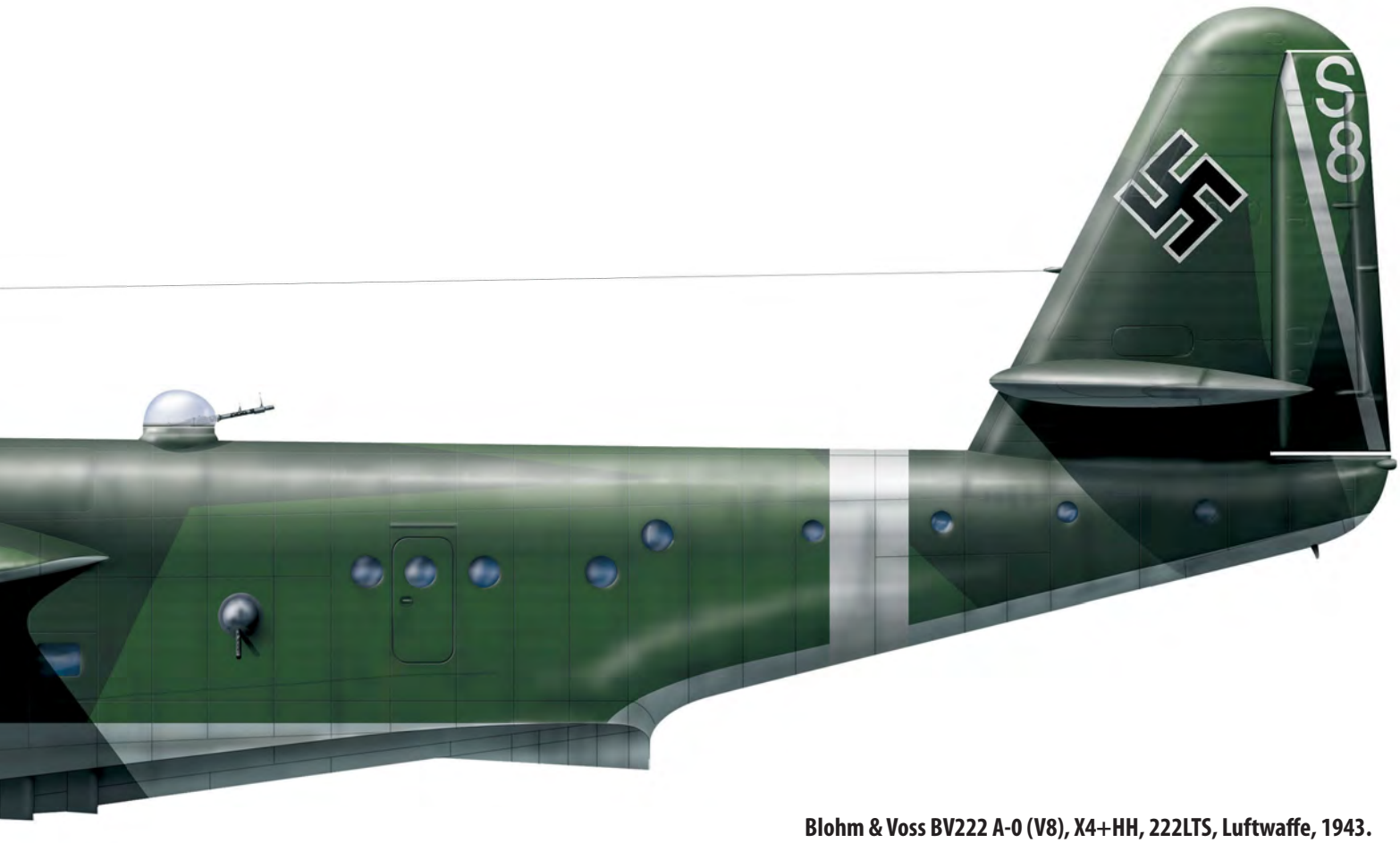
Right: The Wiking pilot and co-pilot occupied comfortable seats on a raised flight deck with superb overhead, side and forward visibility. They could visually scan instruments for all six engines, arranged in a tight cluster, in a quick glance. *EN-Archive*

The BV222 V1 during its maiden flight in August 1940 near Finkenwerder. Registered as X4+AH, it became a military freight hauler and carried supplies for the Afrika Corps. Unfortunately this Wiking's career was short-lived as it sunk in February 1943 after a collision with a submerged shipwreck while landing at Piraeus harbour in German-occupied Greece. *EN-Archive*

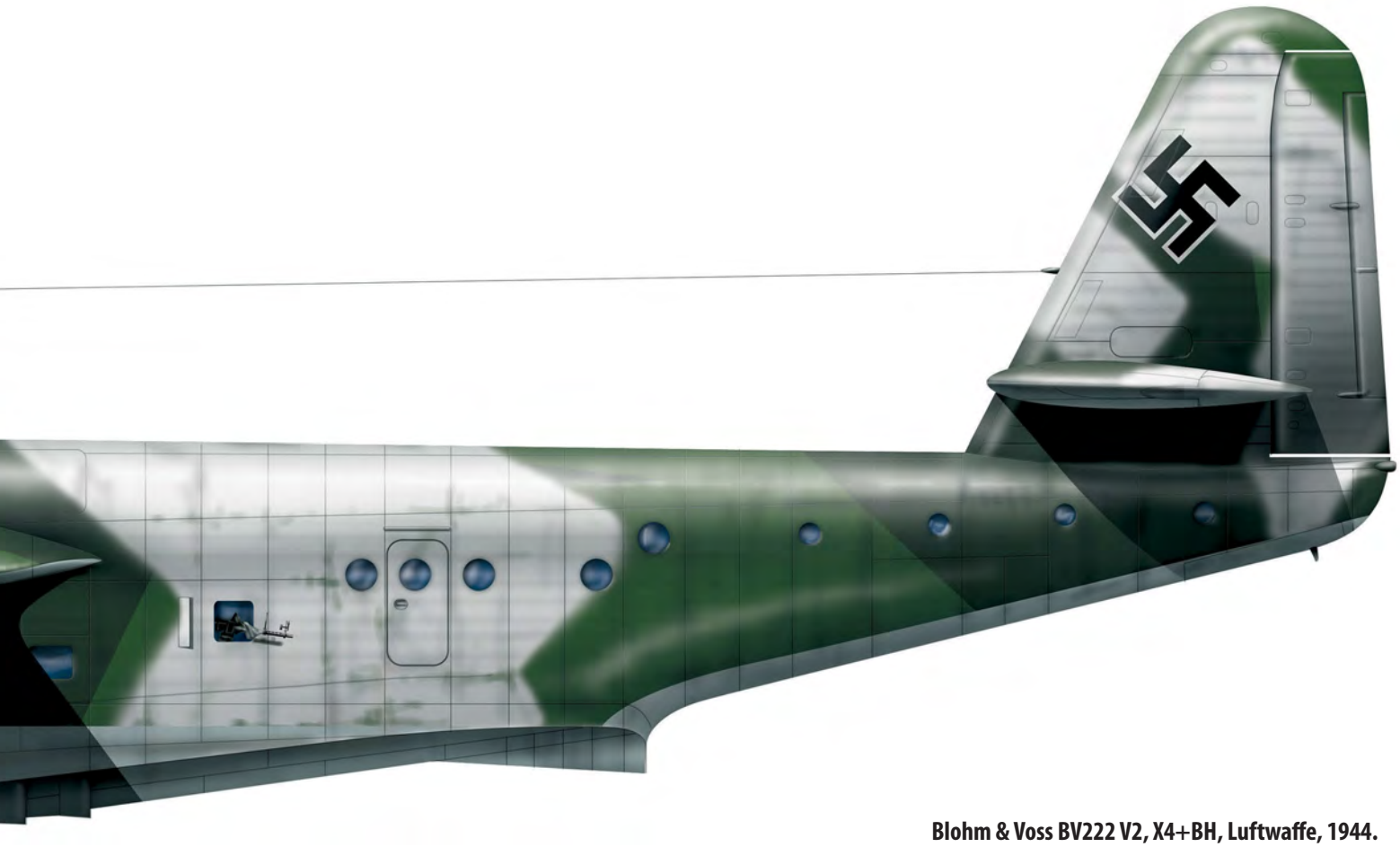
Blohm & Voss BV222 Wiking







Blohm & Voss BV222 A-0 (V8), X4+HH, 222LTS, Luftwaffe, 1943.
Rolando Ugolini/Airlinerart



Blohm & Voss BV222 V2, X4+BH, Luftwaffe, 1944.
Rolando Ugolini/Airlinerart

A photograph taken from another Wiking, shows the BV222 V8 coded X4+HH, flying at sea level over the Mediterranean on a reconnaissance mission. *EN-Archive*

Despite its size, the BV222 was a very graceful aircraft. Note the 'Wiking' badge painted just below the cockpit and the yellow fuselage band indicating the Mediterranean theatre of operations. *via Aviation-images.com*

A front view of the BV222 C-012 powered by six Jumo 207C diesel engines, which was captured by British forces in Norway. It was later flown to southern England and is seen here moored off Portsmouth having had two propellers removed and ready for the engines to undergo repairs and maintenance. The aircraft served in the RAF as VP501 with No 201 Squadron for two years before being scrapped in 1947.

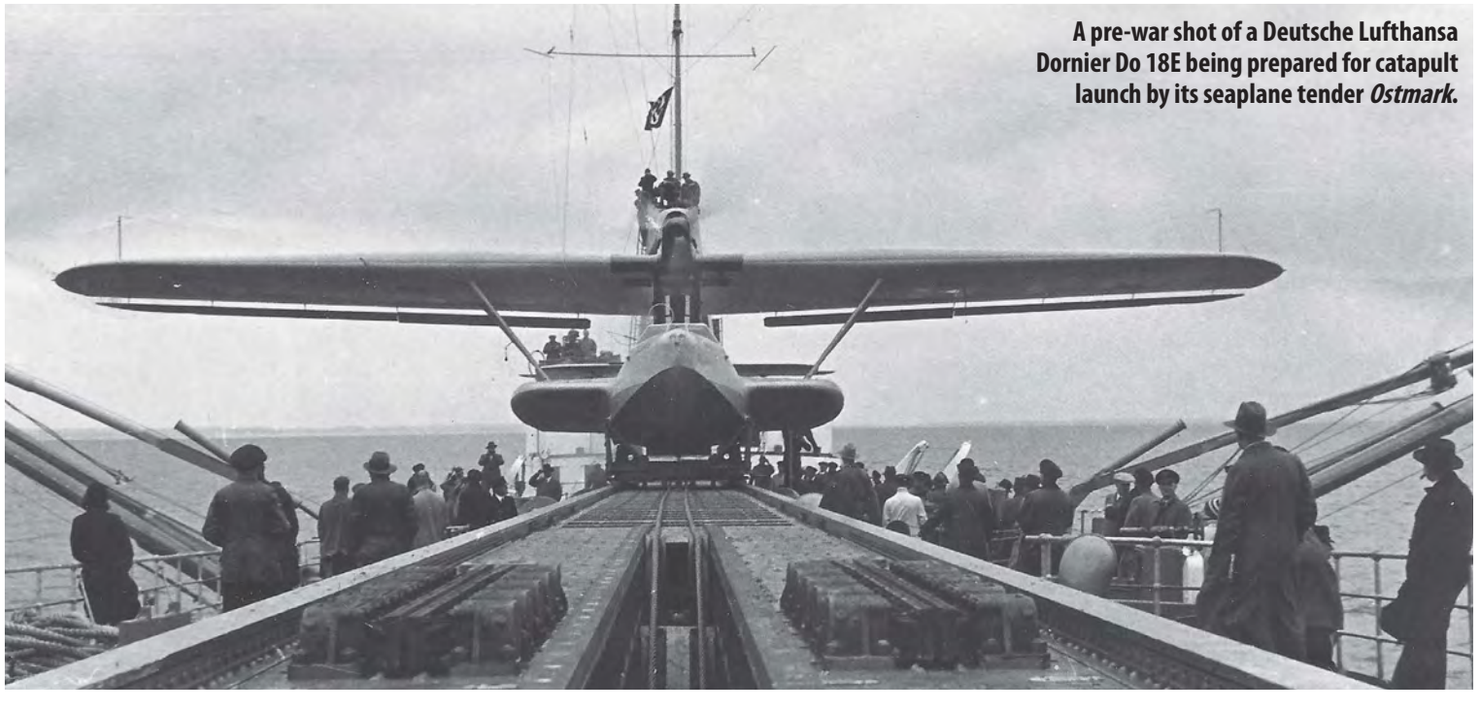
Dornier Do 18

The Dornier Do 18 has the dubious distinction of being the first German aircraft to be shot down by a British fighter in World War 2. Already obsolete when the conflict began, it was slow and vulnerable, but only a few years earlier it had been a record-setting ground breaker.

Developed directly from the highly successful Wal (Whale) series of Dornier flying boats, the Do 18 retained a similar configuration, with a metal hull fitted with characteristic sponsons and powered by two engines above the wing in a push-pull layout. Originally produced as a trans-Atlantic mail carrier, the first prototype flew on 15 March 1935. The first machines were delivered to Deutsche Lufthansa for operation over the South Atlantic under the designation Do 18E and an experimental Do 18D was converted especially to break distance records. The first military variant was the Do 18D, which entered Luftwaffe service in 1938 and barely 100 were built before production ceased in 1940 with the Do 18H model. Although already outdated when war broke out, the Dornier Do 18 was the only flying boat in Luftwaffe service, with 62 operating with five squadrons, mainly flying North Sea reconnaissance missions. It was one of these that became the first kill for British aircraft when it was intercepted by nine Fleet Air Arm Blackburn Skua fighter-bombers of 803 NAS flying from HMS *Ark Royal* on 26 September 1939. The flying boat was able to make an emergency landing but was sunk by a destroyer.

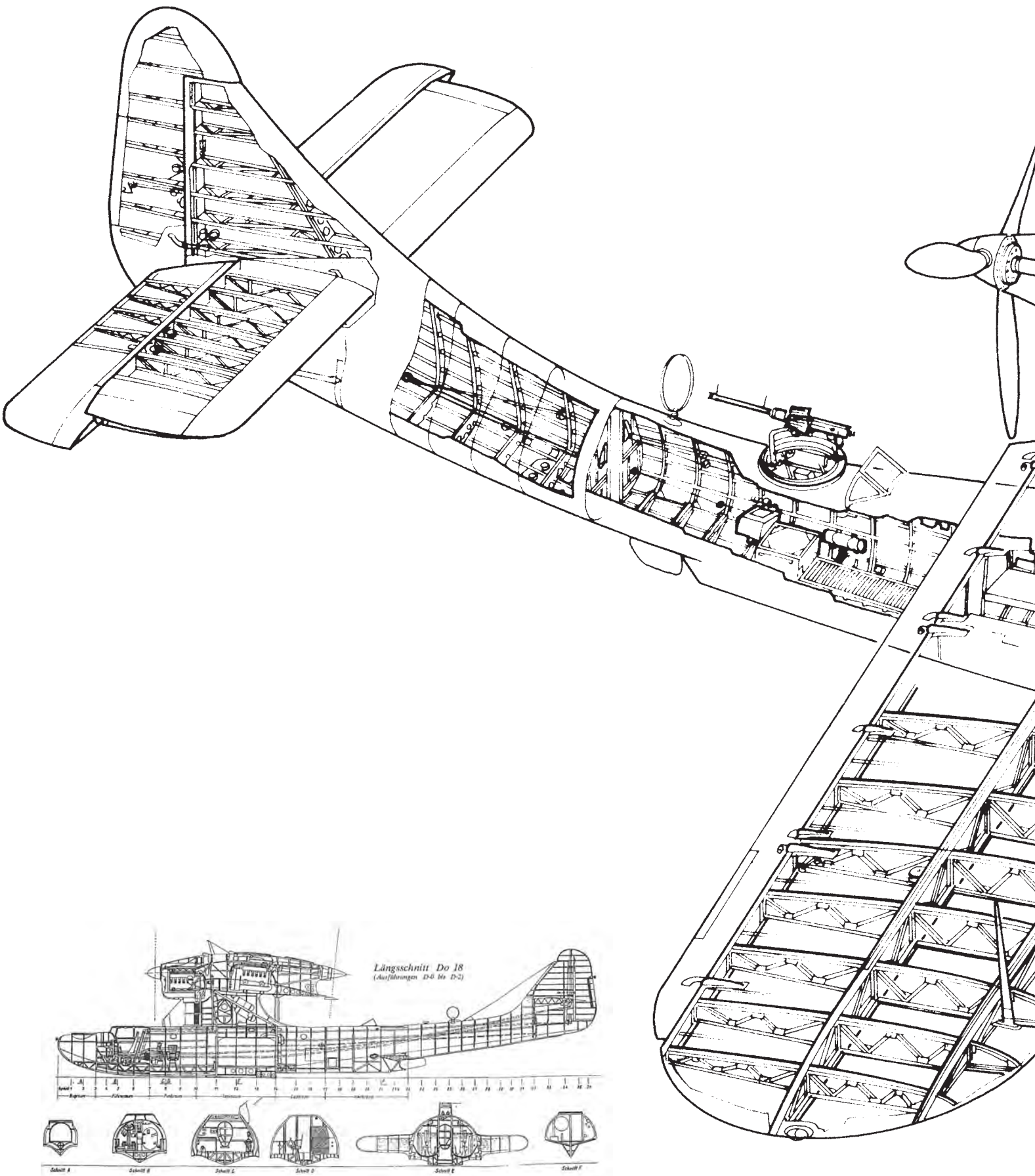
The underpowered flying boat was soon relegated to training and the air/sea rescue role and by the middle of 1941 only one squadron was still operational, its role taken over by the more-capable BV 138.

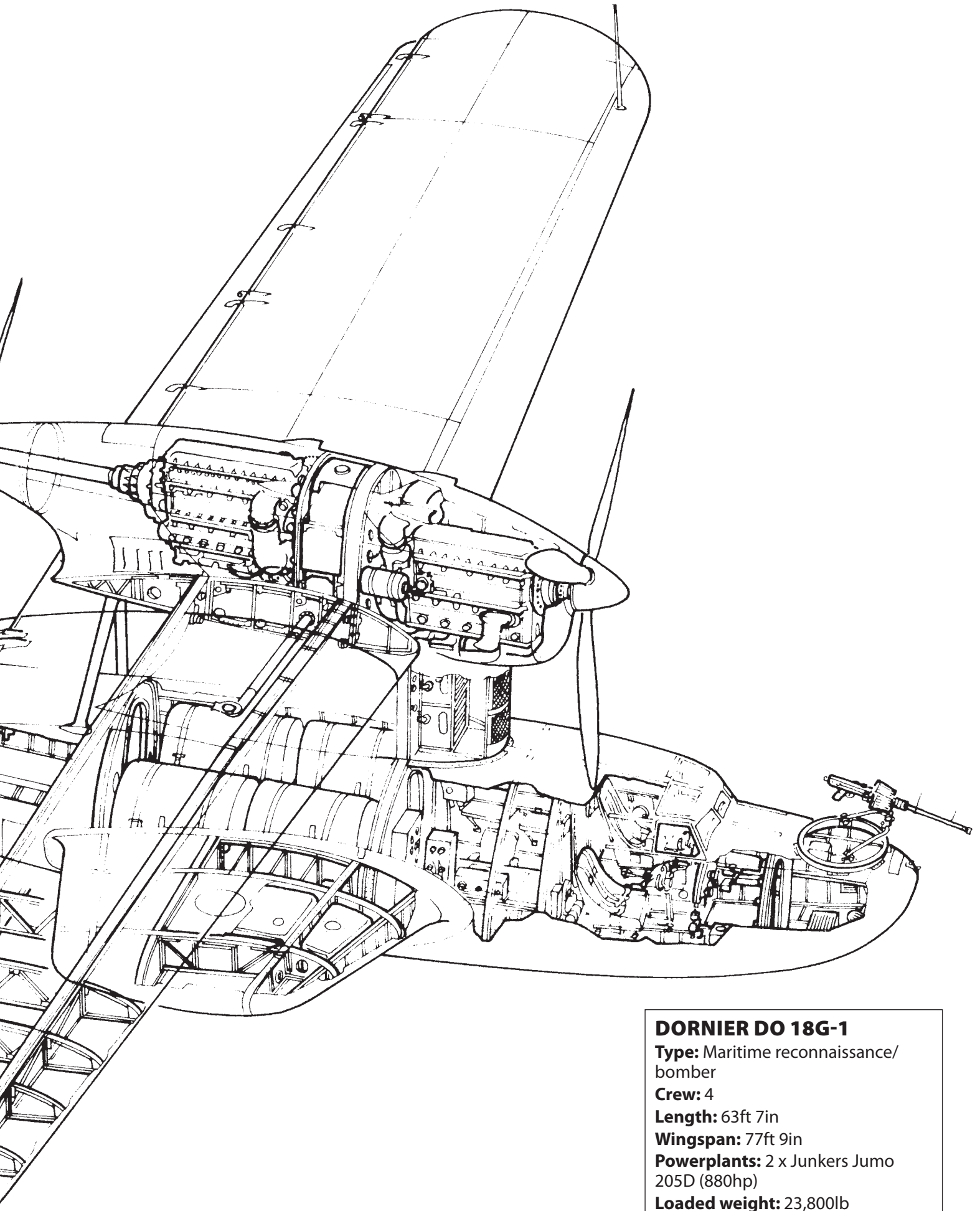
Record-breaking Dornier D-ANHR is reflected in the stillness of the water. This Do 18D was taken off the military production line and had its wingspan increased to establish a seaplane distance record of 5,219 miles in 1938.



A pre-war shot of a Deutsche Lufthansa Dornier Do 18E being prepared for catapult launch by its seaplane tender *Ostmark*.

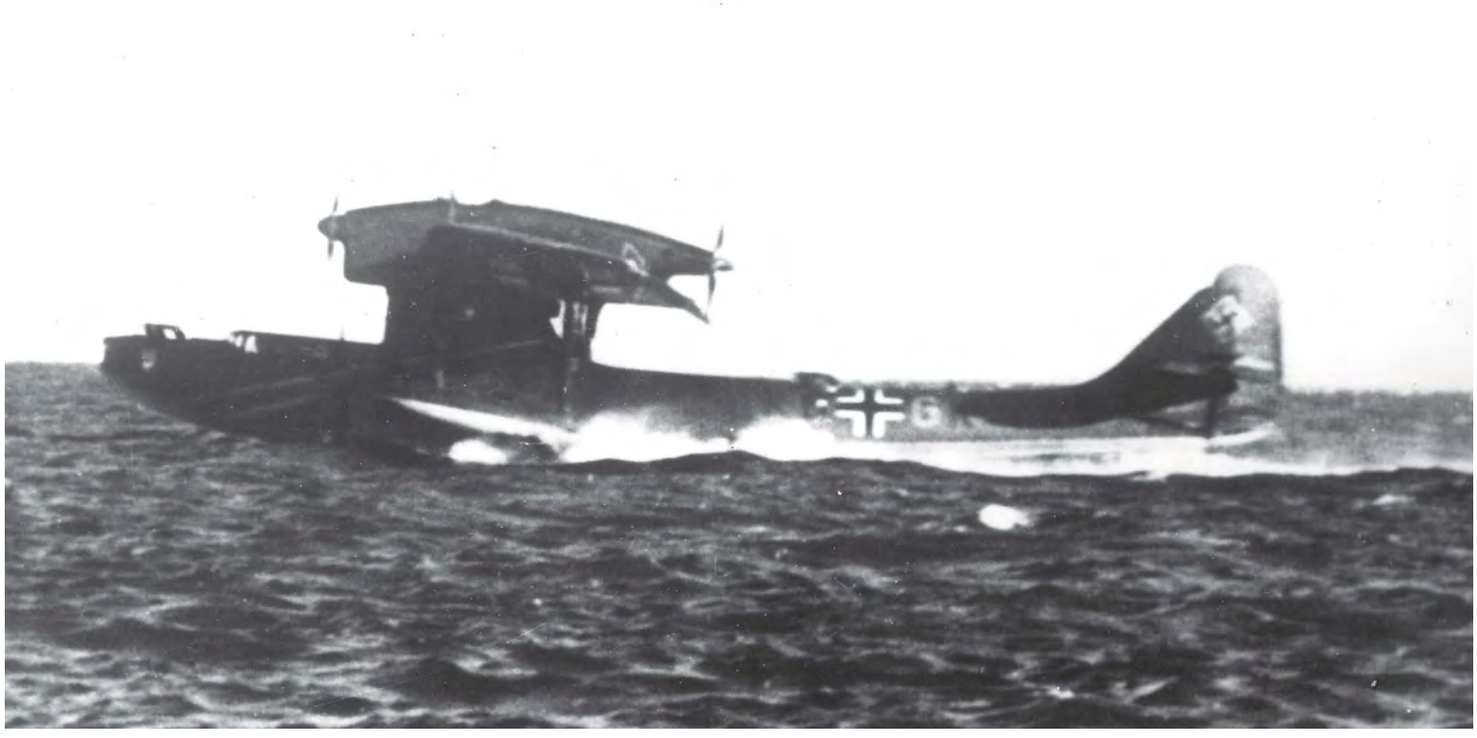
Dornier Do 18





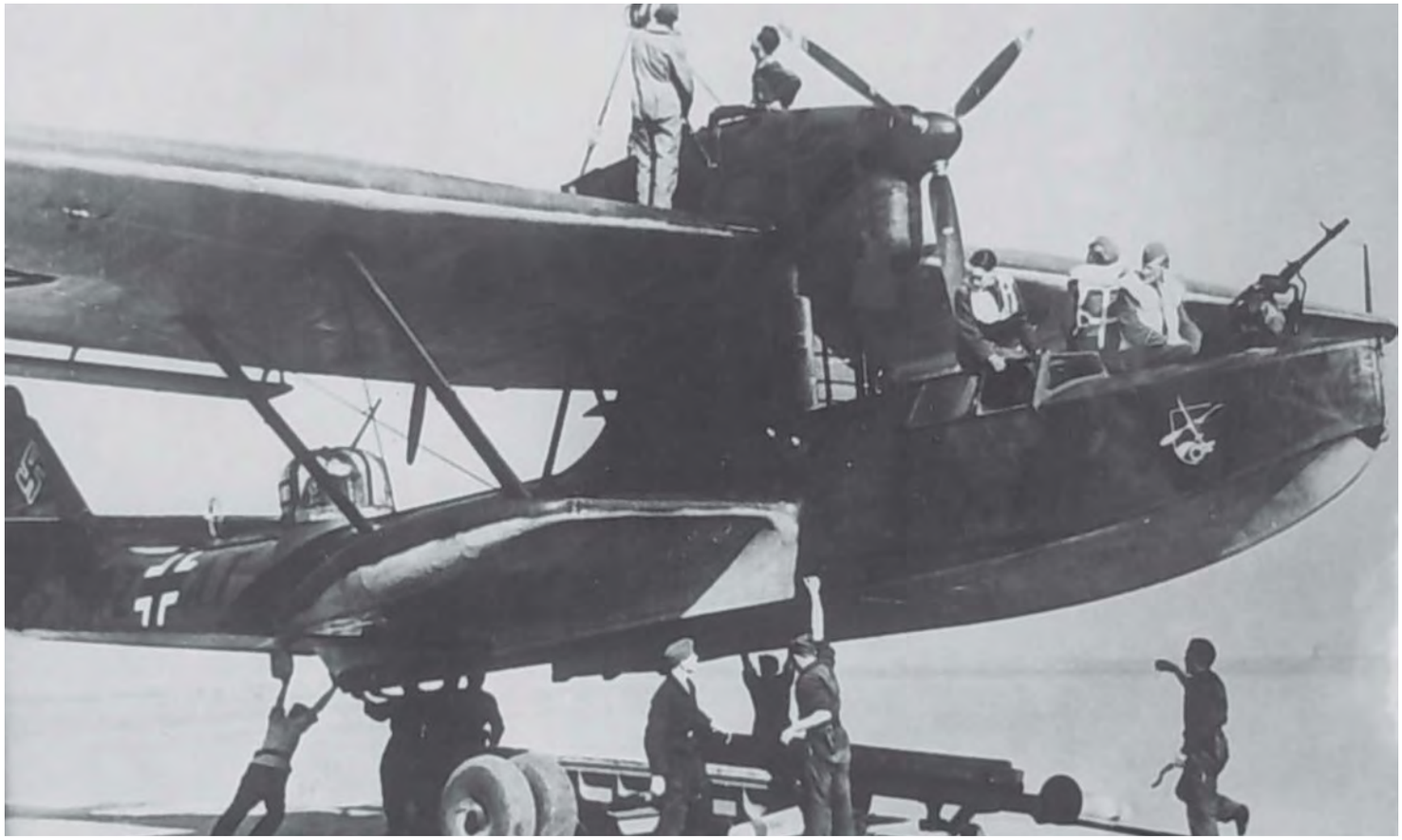
DORNIER DO 18G-1

Type: Maritime reconnaissance/ bomber
Crew: 4
Length: 63ft 7in
Wingspan: 77ft 9in
Powerplants: 2 x Junkers Jumo 205D (880hp)
Loaded weight: 23,800lb
Max speed: 165mph
Armament: 1 x 13mm MG 131 machine gun in bow position and 1 x 20mm MG 151 cannon in dorsal turret, plus 4 x 110lb bombs



This rare shot of a Dornier Do 18 was published by the British press in 1940 and carried a caption typical of the propaganda of its time: 'About to start another murderous raid on the defenceless fishing fleets. A Nazi bomber-seaplane about to take-off from its base on another of the numerous raids which the Nazis have carried out on defenceless fishing vessels, belonging mainly to the smaller neutrals… or perhaps this time it is another lightship that they might have in mind'.

A Dornier Do 18D on the catapult ready for another mission. Although already outmoded by the beginning of the war, the Dornier Do 18 represented the Luftwaffe's sole maritime reconnaissance seaplane at the time.



A Dornier Do 18G-1 on the French channel coast early in 1942. This version was armed with a power-operated dorsal turret.

Death of a Dornier. This picture taken from a Blenheim shows the pilot of a Dornier taking evasive action, skimming the water with the front and rear gunners trying to bring their guns to bear on their attacker, the cowling of one engine of which can be seen close to the camera in the lower right-hand corner. Moments after this shot was taken the Blenheim pressed home its attack and the Dornier crashed into the sea out of control with black smoke streaming from its engine.

Dornier Do 24

The Do24 was one of only a few aircraft to serve operationally with both Allied and Axis forces during World War 2. The flying boat's origins lay in a Dutch Navy requirement to replace its aging Dornier Wals being used in the Dutch East Indies, but the Do 24 went on to provide Nazi Germany with useful service during the conflict. The excellence of the basic aircraft was such that the Do 24 remained in production into mid-1944 with a total of 279 being built.

Dornier launched design work on the Do 24 flying boat in 1935 with development being funded by the Dutch government. The result was an all-metal parasol monoplane with a broad-beamed hull and stabilising sponsons. Twin tails were mounted on the upswept rear of the hull, while three wing-mounted tractor configuration engines powered the aircraft. Up to 1,200kg (2,600lb) of bombs could be carried under the aircraft's wings, while defensive armament consisted of three gun turrets, one each in nose, dorsal and tail positions.

Four prototype Do 24s were completed, and the first of these to fly was the third in line, the V3. This aircraft, and the subsequent V4, were powered by Wright R-1820-F52 Cyclone engines, in order to provide commonality with the Martin Model 139WH-1 bombers also operated by the Netherlands. The other two prototypes, V1 and V2, were outfitted with the Jumo 205 engine.

Test results were good, with the new flying boat proving capable of operating from extremely rough open seas In 1937 the MLD signed a contract for 60 Do 24s — 12 aircraft to be built by Dornier at Altenrhein (Do 24K-1) and 48 Do 24K-2s to be built by Aviolanda. However, by the time Nazi Germany invaded the Netherlands on 10 May 1940, only 25 of the Do 24K-2s had been delivered. Nevertheless, the infrastructure and partially completed airframes would provide the Luftwaffe with a very useful windfall. Under German control,

The tranquil scene of Dornier Do 24T-2 W.Nr. 53 coded CM+IS moored off the coast at Cherbourg around 1942-43. Provided for stability on water, the sponsons were a design feature that dated back to the very first Dornier flying boats. In the Do 24 each sponson accommodated six fuel cells. *EN Archive*

the Dutch production line continued to turn out aircraft, most under the designation Do 24T-1, while another production line for the Do 24 was established in the old CAMS factory at Sartrouville, France. This line was operated by SNCAN and was able to produce another 48 Do 24s for the Luftwafffe. After the liberation, this facility produced a further 40 Do 24s, which served with the French Navy until 1952.

Before Germany had occupied the Netherlands, 37 Do 24s had been sent to the Netherlands East Indies, where they operated alongside Catalinas. After the Japanese invasion, a handful of surviving Do 24s were transferred to the Royal Australian Air Force, but by the end of March 1942, almost all the remaining MLD flying boats had been destroyed, including nine Dorniers lost in a Japanese air attack after they had been evacuated to Broome in Australia.

In Luftwaffe service the Do 24 was prominent with 1., 2. and 3./Seenotgruppe based at Biscarosse near Bordeaux and Berre near Marseilles on the west and south coasts of France respectively. Other aircraft were active in the Aegean and in the Black Sea. It is believed that at least 11,000 personnel were rescued by Do 24s during the course of World War 2, of which around 5,000 were Allied.

DORNIER DO 24T

Type: Maritime reconnaissance and transport/air sea rescue

Crew: 5-6

Length: 72ft 2in

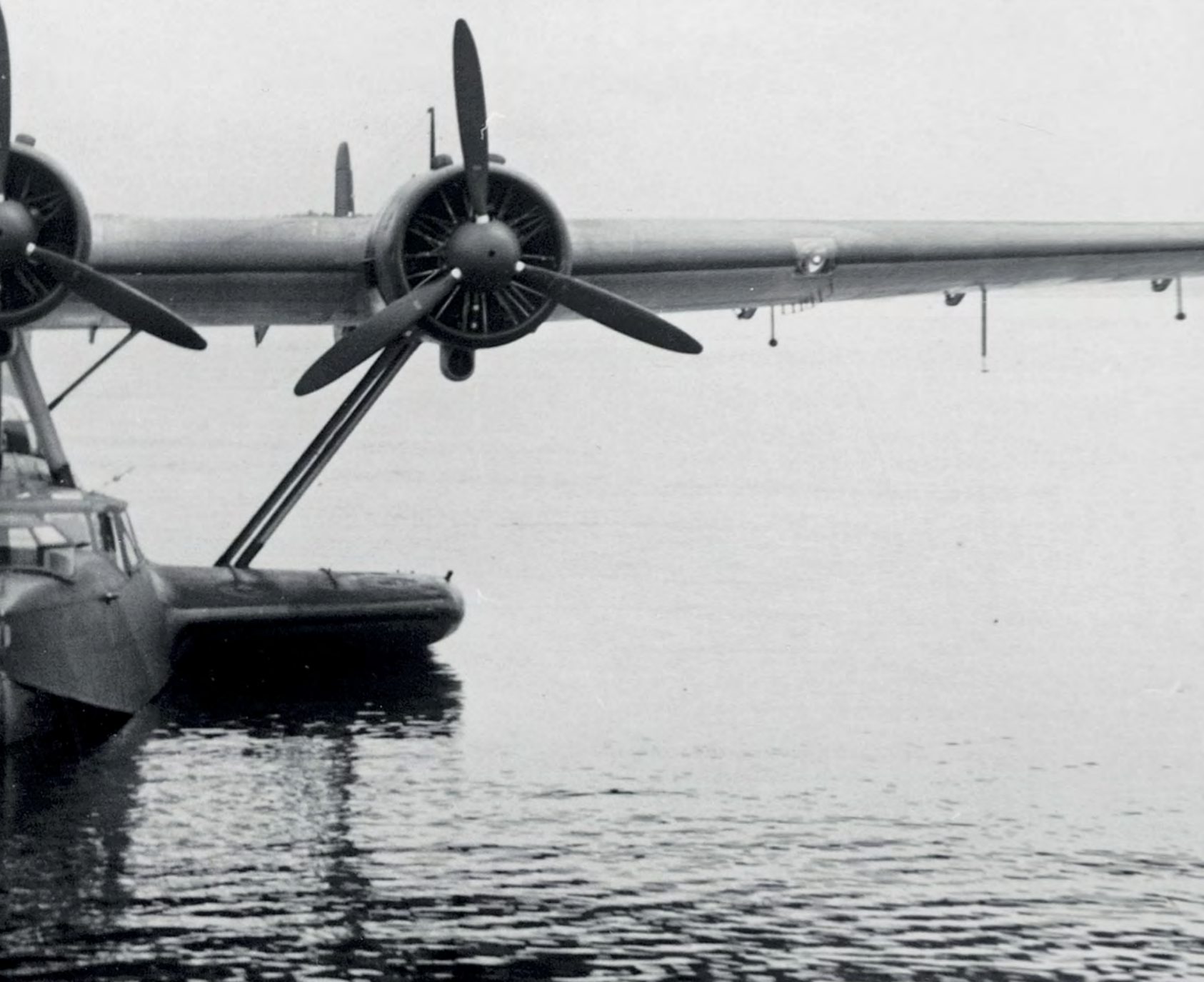
Wingspan: 88ft 7in

Powerplants: 3 x BMW/Bramo Fafnir 323R-2 (1,000hp)

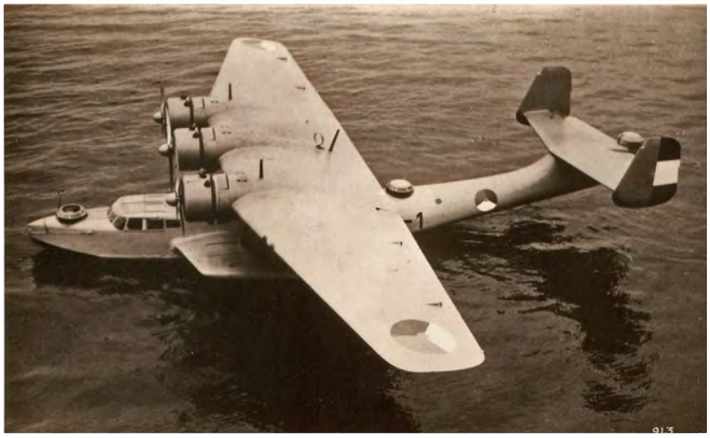
Loaded weight: 40,565lb

Max speed: 211mph

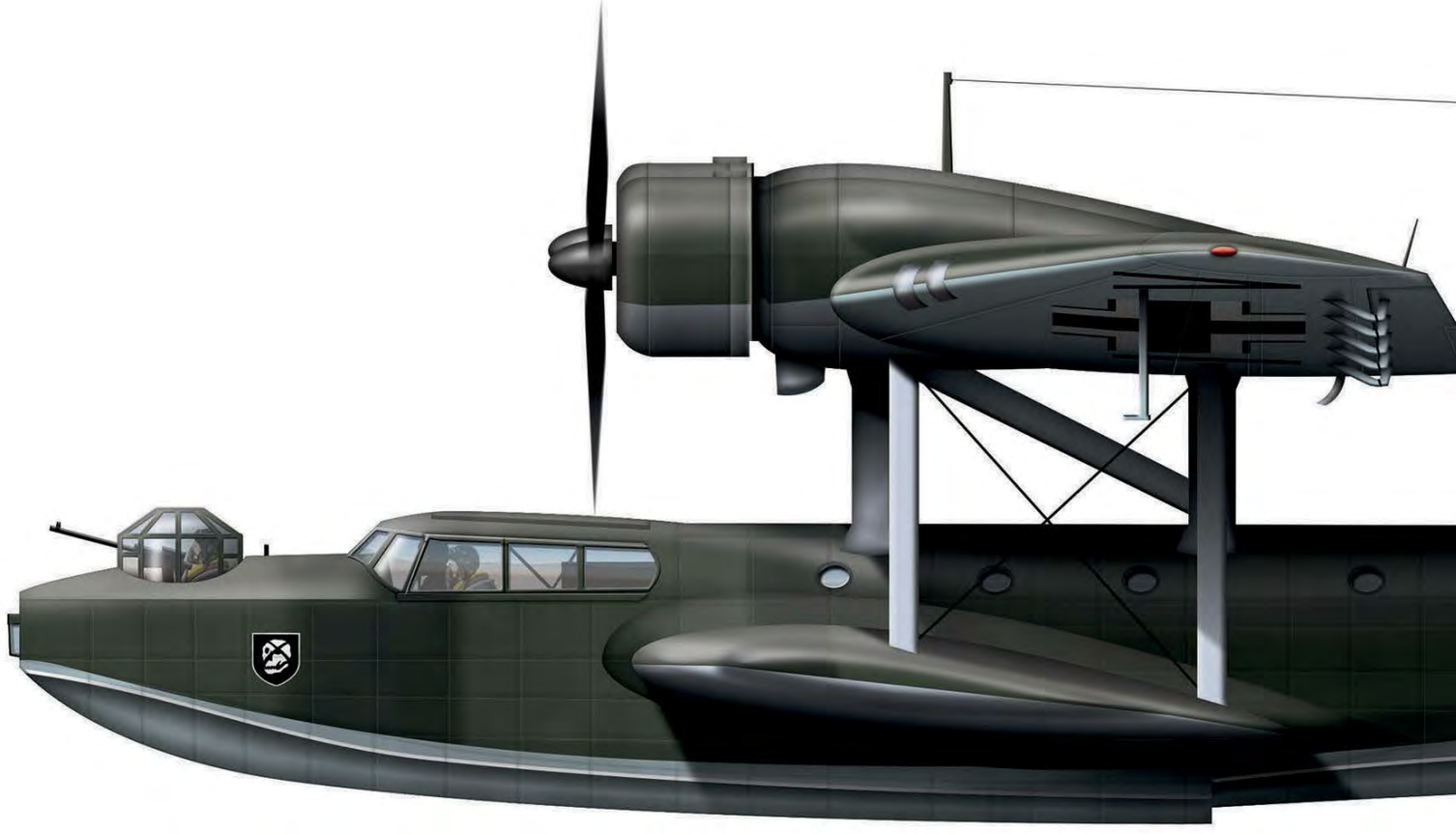
Armament: 1 x 7.9mm MG15 machine gun in bow and tail positions and 1x 20mm MG151 cannon in dorsal turret, plus 12 x 110lb bombs



When the Luftwaffe first began air-sea rescue operations with the Do 24N-1 the aircraft was unarmed and protection was instead entrusted to the flag of the International Red Cross. After a number of attempts by the British to shoot down the Do 24s, the flying boats adopted a more warlike camouflage.

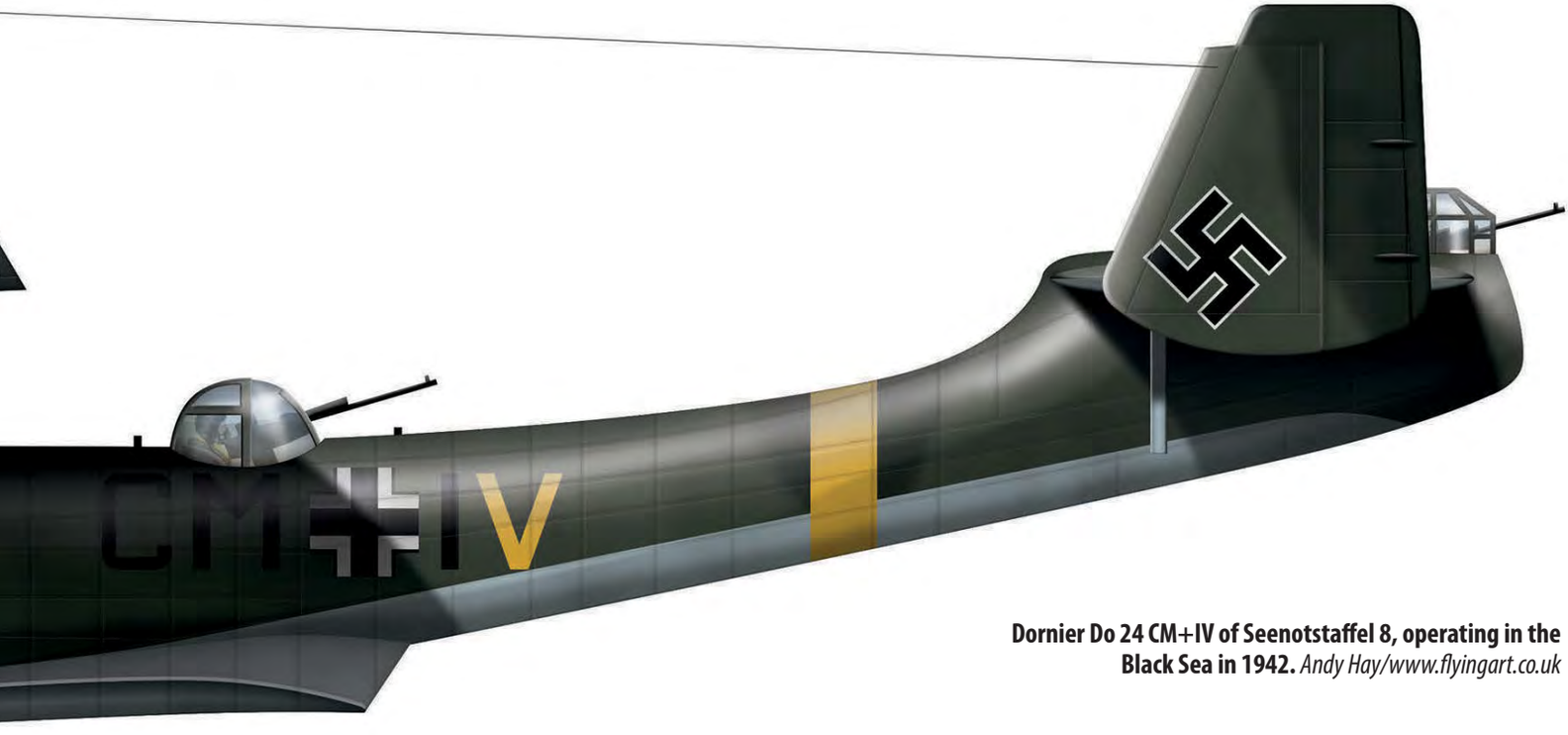


Thirty-seven Dutch- and German-built Do 24s had been sent to the East Indies by the time of the German occupation of the Netherlands in June 1940. Until the outbreak of war, these aircraft would have flown the tri-colour roundel, but later Dutch aircraft flew a black-bordered orange triangle insignia. In one particularly notable incident, a Dutch Dornier was credited with sinking the Imperial Japanese Navy destroyer *Shinonome* on 17 December 1941 while the ship was escorting an invasion fleet to Miri in British Borneo. The Do 24 hit the warship with two bombs that detonated her aft magazine.

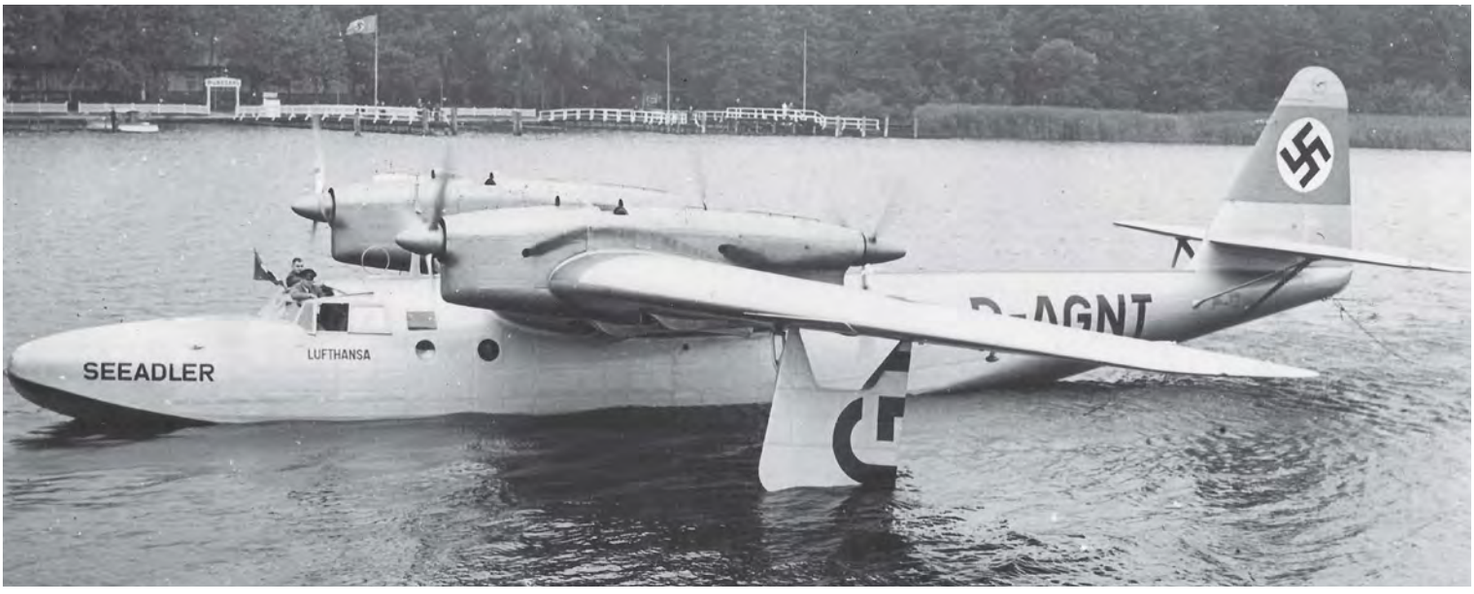


A sight that was welcomed by many downed aircrew during World War 2, no matter what side they were fighting for. This Dornier Do 24N-1, KD+GJ, is heading off on a patrol along the German coastline. *EN Archive*

Making a splash. This Do 24K-2 has just landed in rough seas and shows how effective the fuselage side floats were to keep the aircraft afloat. *EN Archive*



Dornier Do 24 CM+IV of Seenotstaffel 8, operating in the Black Sea in 1942. *Andy Hay/www.flyingart.co.uk*



Despite the swastika on its tail, the Dornier Do 26 was originally intended for commercial use with Lufthansa on the trans-atlantic routes.

Dornier Do 26

Regarded by many as the most beautiful flying boat ever built (a claim that we would find hard to refute), the elegant gull-winged Dornier 26 was originally designed for use on the North Atlantic mail service by Deutsche Lufthansa. Only six were built and none survived the conflict.

In 1937, Deutsche Lufthansa ordered three of Dornier's revolutionary new flying boats for trans-Atlantic airmail purposes. Of all-metal construction, the graceful aircraft embodied several unusual features, the most noteworthy being the engine installation. Its four Junkers Jumo 205C diesels were mounted in tractor/pusher pairs in tandem nacelles located at the joint between the dihedral and horizontal wing sections. The rear (pusher) engines could be swung upwards through 10 deg during take-off and landing, to prevent contact between the three-blade airscrew and water spray.

The first, Do 26A D-AGNT V1 *Seeadler*, made its maiden flight on 21 May 1938, followed later in the year by D-AWDS V2 *Seefalke*. The third aircraft, Do 26B D-ASRA *Seemöwe* was completed shortly before the start of World War 2 and all three were impressed into military service. Three other examples (V4-V6) were built as Do 26Cs for the Luftwaffe with more powerful engines; the original three aircraft were similarly converted for military service.

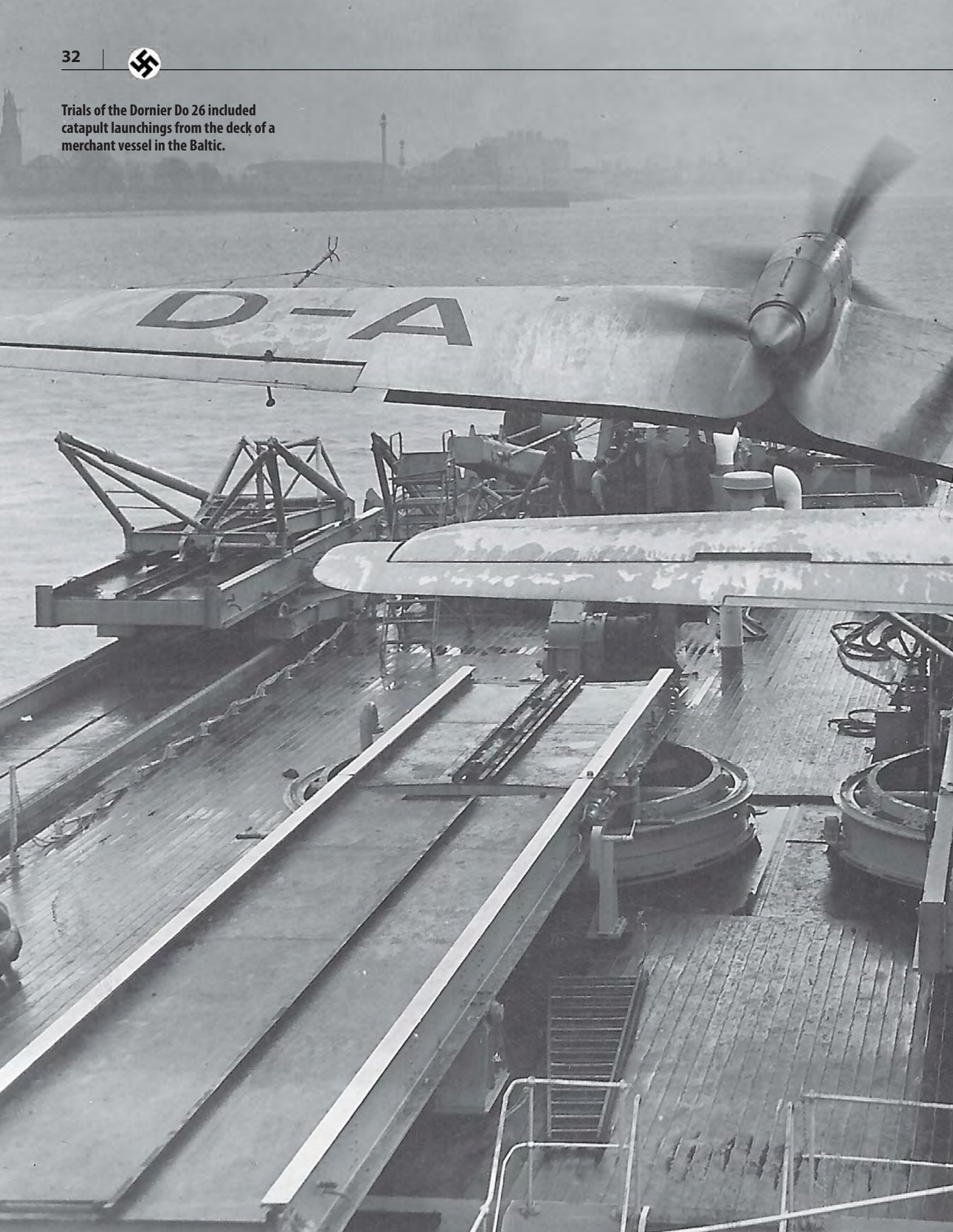
With the invasion of Norway in April 1940, all six Dornier Do 26s were pressed into service operating from Norwegian fjords in the transport and communications role. However, within a month, three had been shot down. Later in the year, V5 was lost on 16 November 1940 after being launched at night from the catapult ship *Friesenland* in Brest, France. The fate of V4 and V6, which in 1944 were still assigned to the Test Unit (German: Erprobungsstelle) in Travemünde, is unclear.

Militarisation of the Dornier Do 26 was not particularly kind to its shapely looks. While the pilot may not have appreciated having his view partially obscured by the large powered turret, he would have welcomed the firepower.

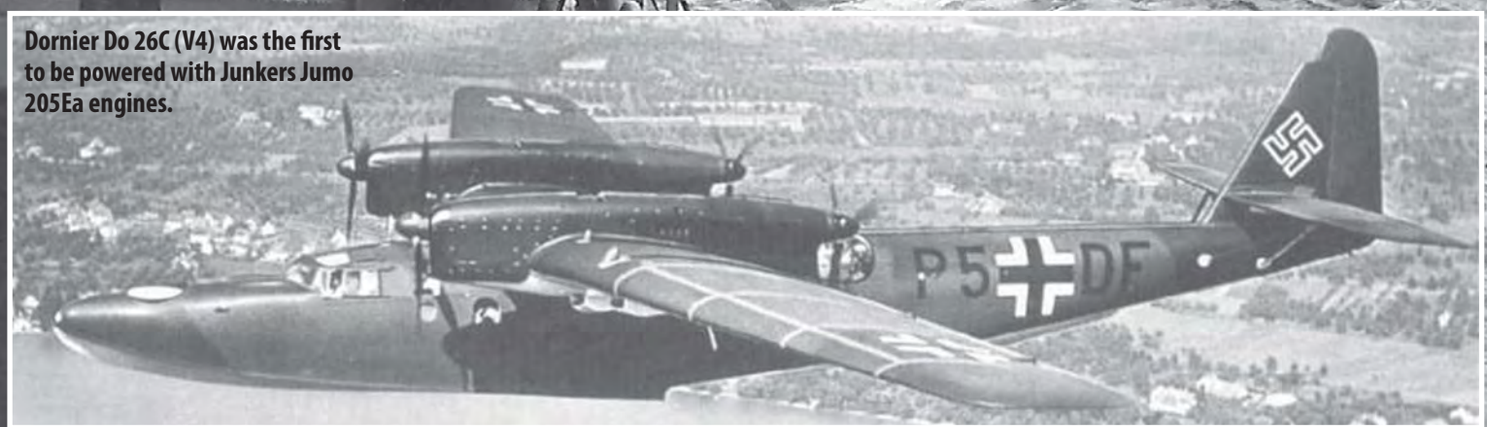
The clean aerodynamic lines of the first Dornier Do 26A *Seeadler* (Sea Eagle), illustrating well the gull-wing and the tandem tractor/pusher arrangement of its four engines.

DORNIER DO 26

Type: Long-range transport
Crew: 4
Length: 80ft 8in
Wingspan: 98ft 5in
Powerplants: 4 x Junkers Jumo 205Ea diesels (700hp)
Loaded weight: 44,090lb
Max speed: 208mph
Armament: 1 x 20mm MG151 cannon in power-operated bow turret and 3x MG15 machine guns in waist and ventral positions



Trials of the Dornier Do 26 included catapult launchings from the deck of a merchant vessel in the Baltic.



Dornier Do 26C (V4) was the first to be powered with Junkers Jumo 205Ea engines.

Saro A.27 London

The product of another age, the biplane Saro A.27 London flying boat followed the practice established by British flying boat designers from the mid-1920s. Although only 31 were built, the type was still in service at the outbreak of World War 2, performing vital patrols over the North Sea and the Mediterranean.

The Saro A.27 was designed to Air Ministry specification R.24/31, which called for a twin-engined general-purpose coastal reconnaissance flying boat featuring robustness, low maintenance costs and simplicity of construction. As a result the aircraft featured an all-metal corrugated hull and fabric-covered wing and tail surfaces. Aft of the bow mooring/gunnery position, a raised side-by-side dual control enclosed cockpit gave way to a wardroom equipped with two bunks, and the navigation position. Aft again were the crew cabin, dorsal defensive post and tail gunner's position. The prototype (K3560) was flown for the first time in 1934 powered by two 750hp Bristol Pegasus III radials. A production order was placed in March 1935, the name London being officially adopted.

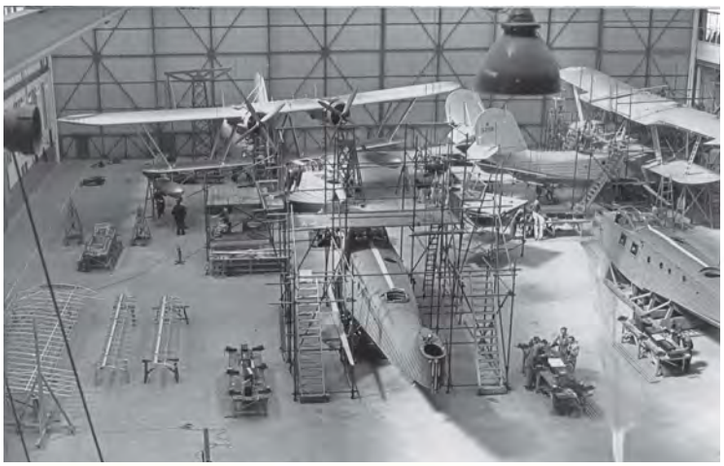
The first deliveries began in March 1936 and from the eleventh aircraft onwards were powered by Pegasus X engines and given the designation London Mk II. Three London squadrons existed when World War 2 broke out, No 202 (Malta), No 201 (Sullom Voe) and No 240 (Invergordon) patrolling home waters around Scotland and the Isles and east to Norway. During mid-December 1939, No 240 Squadron's K5911 encountered nine Heinkel He111s of KG26 over the Shetlands. Attacked, the London damaged one of its aggressors though the pilot was killed in the exchange. The co-pilot landed in heavy seas and eventually managed to return to base. The aging Londons were withdrawn from front-line duties over 1940-41.

SARO LONDON II

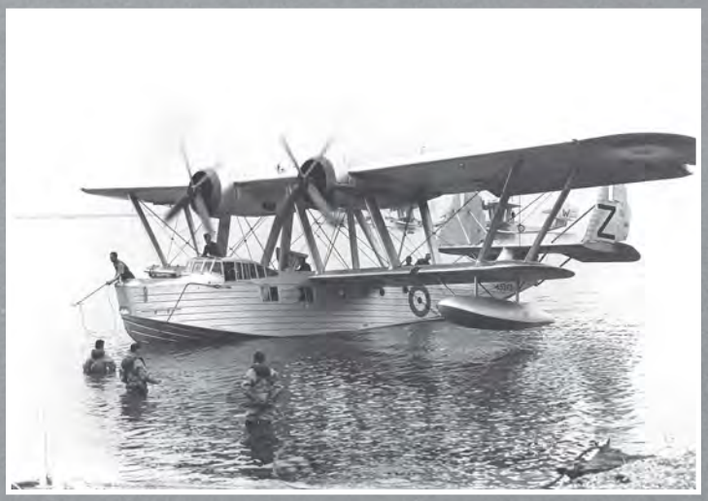
Type: General-purpose coastal reconnaissance
Crew: 6
Length: 63ft 7in
Wingspan: 80ft 10in
Powerplants: 2 x Bristol Pegasus X (920hp)
Loaded weight: 18,400lb
Max speed: 142mph
Armament: 3 x swivelling 0.303in Lewis machine guns, plus 2,000lb bombs, mines or depth charges

Main: A Saro London climbs away from the choppy waters of the Solent during an early test flight in the mid-1930s. Note the polygonal cowlings of the Pegasus III engines, which reveal this aircraft to be a Mk I.

Right: The final assembly line of the Saro London Mk II in East Cowes, clearly showing the all-metal hulls and fabric-covered wing of the flying boat's construction. Although already outdated by the start of World War 2, the sturdy London struggled on manfully until newer aircraft such as the Lockheed Hudson and Short Sunderland assumed its duties.



The rather unequal encounter between a London and Heinkel He111 that is recounted in the text.



The Saro London entered service in 1936 with No 201 Squadron and this example, K5262, was photographed at Calshot in October of that year while operating with the unit.

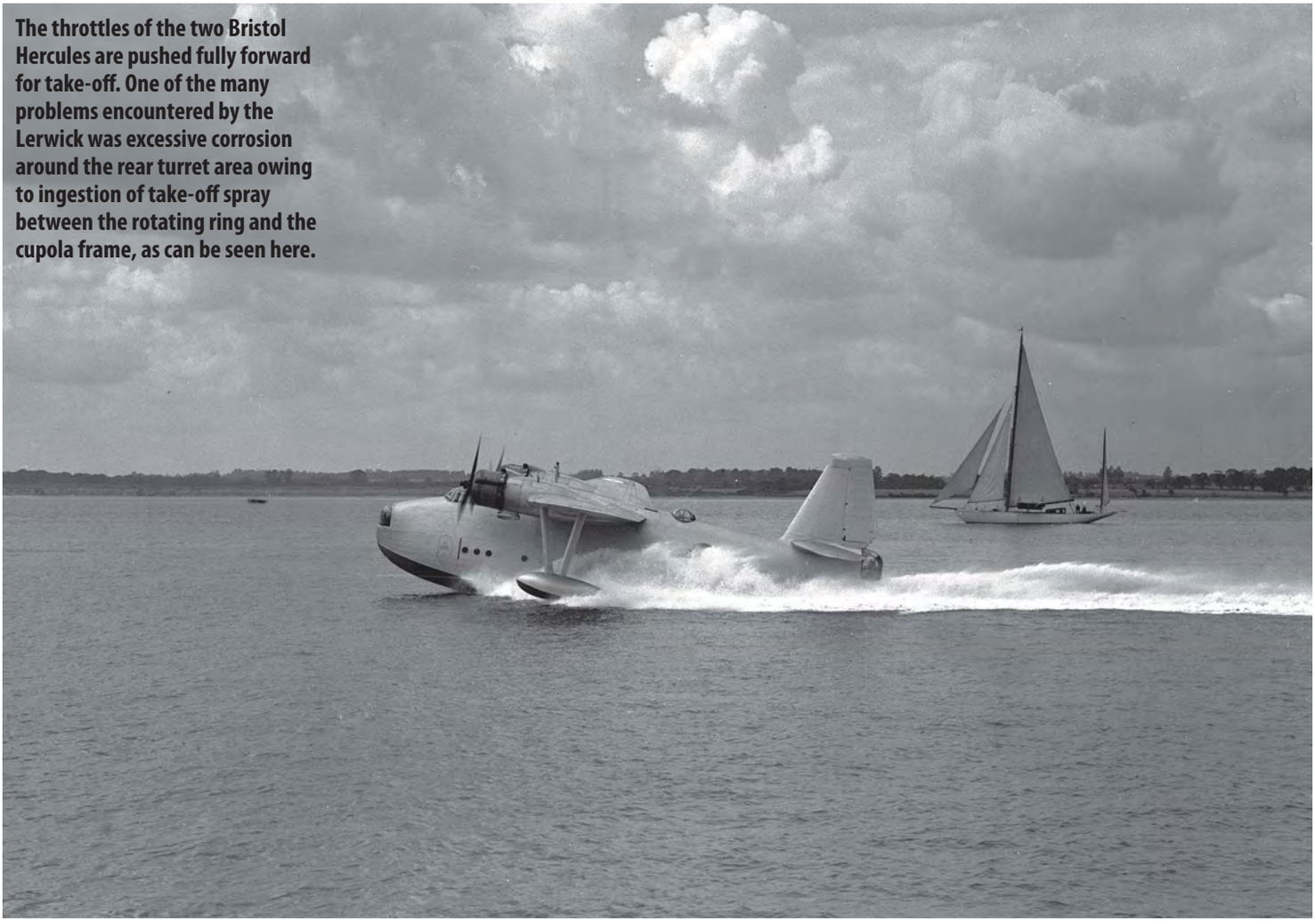
The majestic sight of a pair of Saro Londons 'in the cruise', highlighting the basic but rugged nature of these flying boats that always looked old before their time.

One can almost hear the distinctive sound of the Pegasus engines in this evocative scene from the mid-1930s as a London begins its take-off run at Calshot.

Saunders-Roe (Saro) Lerwick L7250 displaying its barrel-chested lines on the slipway at East Cowes. Many of the Lerwick's problems can be attributed to the fact that it was ordered off the drawing-board without the benefit of a prototype. Sadly the design was irrevocably flawed and the aircraft was practically doomed from the start.

SARO LERWICK

Type: Medium-range reconnaissance
Crew: 6
Length: 63ft 7in
Wingspan: 80ft 10in
Powerplants: 2 x Bristol Hercules II (1,375hp)
Loaded weight: 28,500lb
Max speed: 216mph
Armament: 3 x turrets housing 0.303in machine guns, plus 4 x 500lb bombs, mines or depth charges



The throttles of the two Bristol Hercules are pushed fully forward for take-off. One of the many problems encountered by the Lerwick was excessive corrosion around the rear turret area owing to ingestion of take-off spray between the rotating ring and the cupola frame, as can be seen here.

Saro S.36 Lerwick

Often regarded as the baby Sunderland, the Saro A.36 Lerwick was not blessed with any of the virtues of the larger flying boat and became an unmitigated failure of World War 2. Of the 21 aircraft built, nearly half were lost to accidents and the type was withdrawn from front-line service in May 1941.

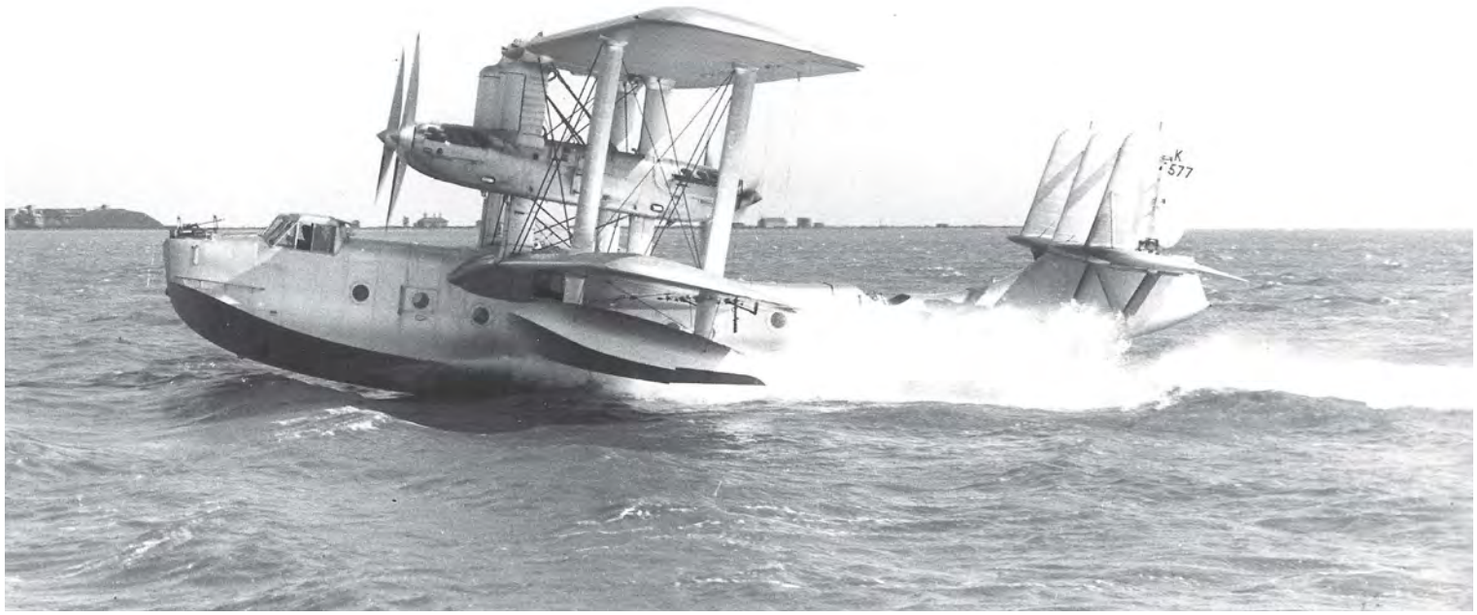
Born from Air Ministry Specification R.1/36 for a medium-range flying boat for anti-submarine, convoy escort and reconnaissance duties, the S.36 was designed to replace the RAF's aging biplane flying boats such as the Saro London and Supermarine Stranraer. Named after the town of Lerwick, the new aircraft was a compact twin-engined, high-winged monoplane of all-metal construction, with a conventional flying boat hull, powered by two Bristol Hercules radial engines. For defence it was equipped with three powered gun turrets, nose, dorsal and tail.

The first production Lerwick (L7248) was completed during the summer of 1938, but it was immediately obvious that the basic design was flawed, suffering from an unstable hull and bad aerodynamics. Numerous adjustments, including the addition of a greatly enlarged single fin and an increase in the wing angle of incidence, failed to remedy its undesirable characteristics, which also included a vicious stall.

Modern technology is not always the answer! Here a carrier pigeon is about to be released from the rear door of a Lerwick during operations in 1941.

Despite its shortcomings, the Lerwick entered service with No 209 Squadron at Oban late in 1940, but it was not long before tragedy struck. On 20 February, L7523 stalled during approach and hit the water hard, capsizing with the loss of all on board. Operations against the enemy were not a great success either; on only two occasions were U-boats attacked by a Lerwick and neither submarine was damaged. Losses continued to mount and during the type's brief period of service, eight Lerwicks were lost to accidents and one aircraft disappeared in fine weather. Not surprisingly, the crews of No 209 Squadron shed no tears when their Lerwicks began to be replaced by Catalinas in April 1941. The Lerwick's career was brought to a sadly appropriate end on 21 October 1942 when the first example crashed into a hillside near Dumbarton.

An early production Short Singapore III, K4577, with its twin tandem power arrangement and triple fins and rudders. Operating with No 203 Squadron, this aircraft was holed and beached at Um Rasas during April 1938, but survived to participate as a decoy moored out at Aden in June 1940.



Short Singapore III

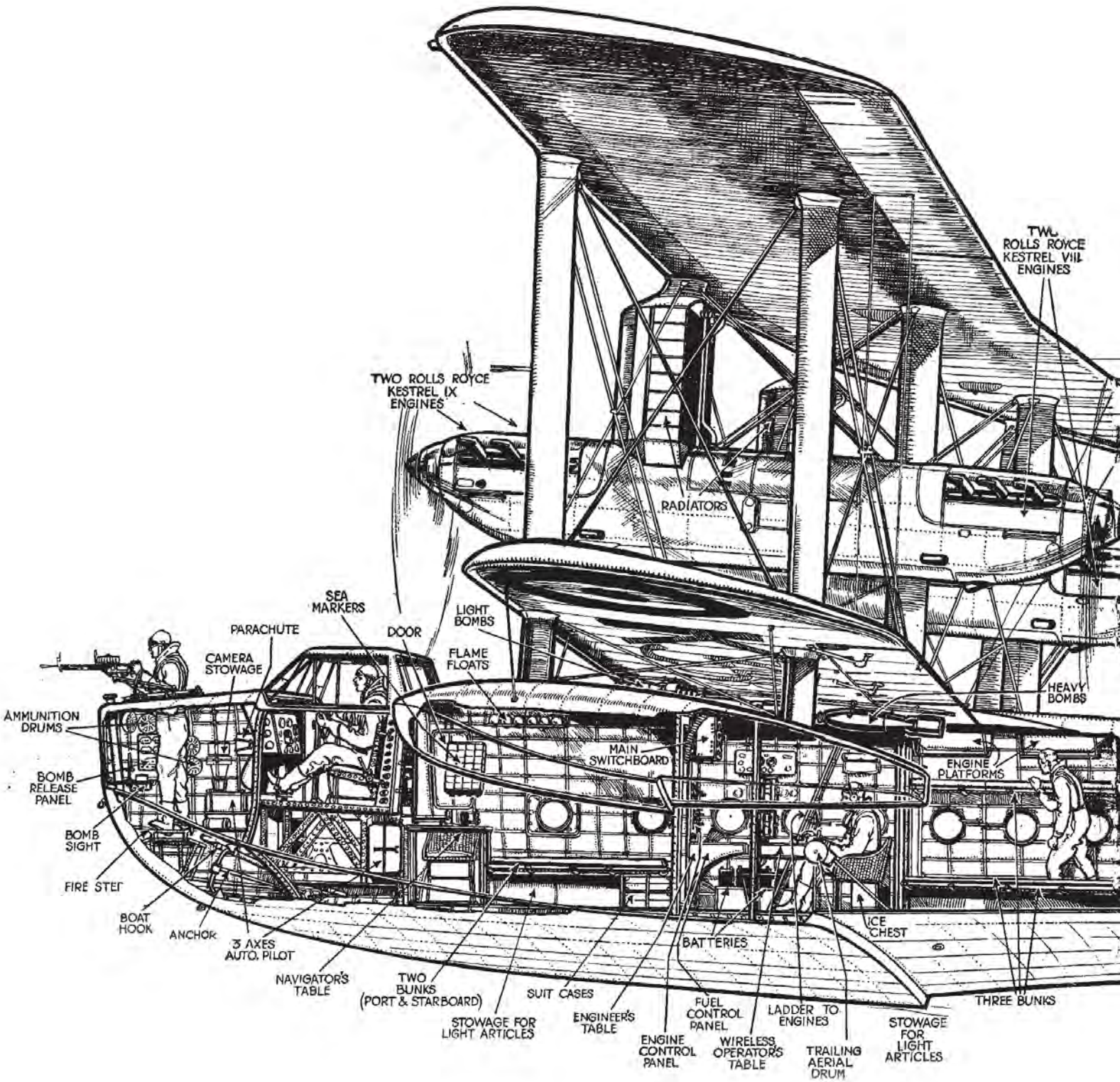
The Singapore III was the oldest of an illustrious group of biplane flying boats still in RAF service at the start of World War 2. Though hopelessly outdated, the type soldiered on in service and some examples were still flying in 1945 as trainers.

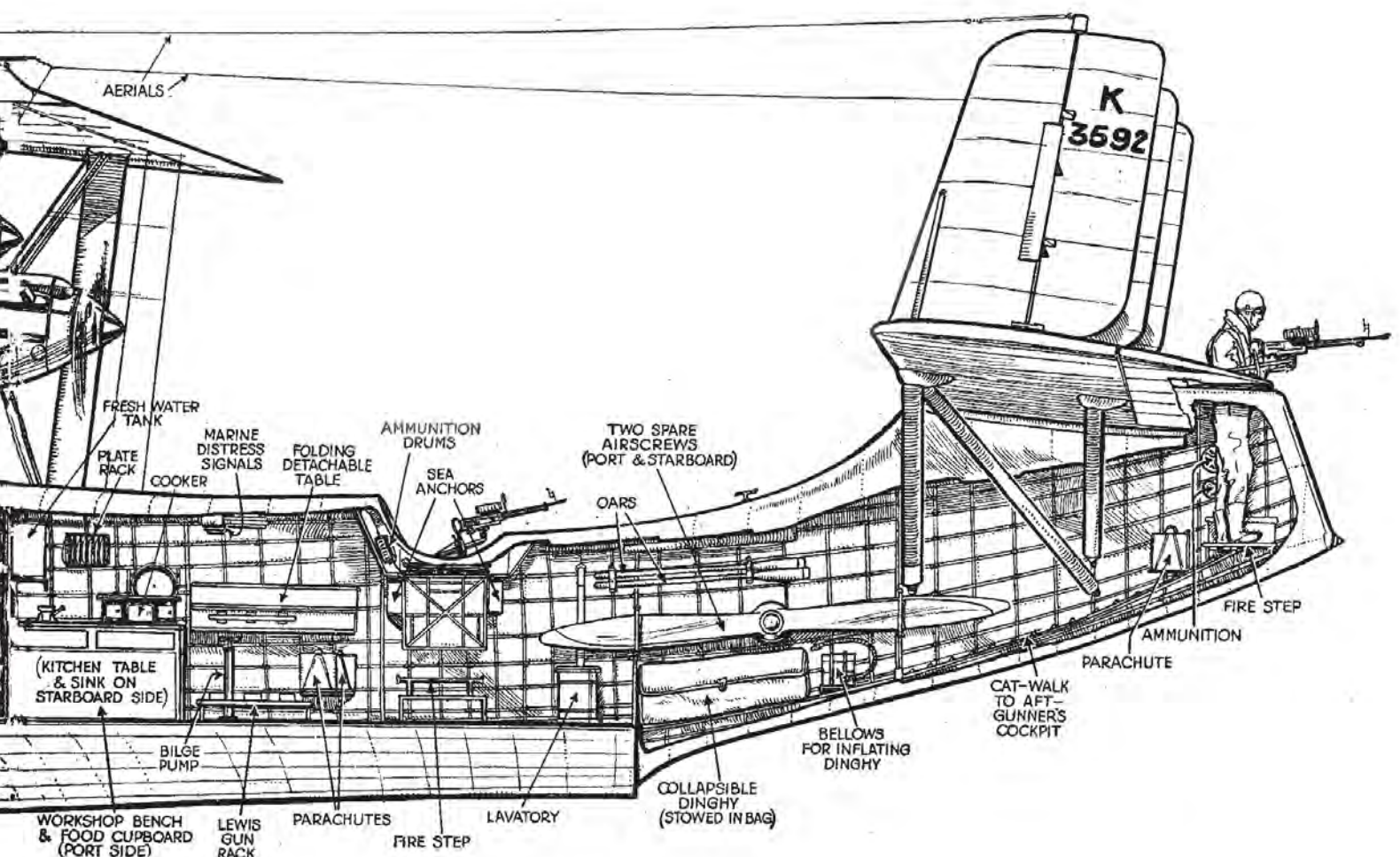
Always looking old before its time, the Singapore III stemmed from the original twin-engined S.5 Singapore of 1926 and the experimental four-engined S.12 Singapore II. The resulting S.19 Singapore III featured all-metal hulls and fabric-covered flying surfaces. They were powered by four 675hp Rolls-Royce Kestrel IXs mounted between the wings in two tandem push-pull pairs. The crew of six was located in a central cabin and fore, aft, and midships open gun positions (Vickers or Lewis machine gun). The first Singapore III flew on 15 June 1934 and although obsolescent by the time the first aircraft entered service with No 210 Squadron in January 1935, the type arrived just in time to benefit from the arms race and 37 were built.

Although replacement of the Singapore was well underway by the outbreak of World War 2, 19 saw service with No 203 Squadron, patrolling the Persian Gulf and Aden until replaced by Blenheims. Appropriately, the final examples in RAF service were operated out of Singapore before they found their way to No 5 Squadron RNZAF in Fiji. Here they accounted for a Japanese submarine and conducted several air sea rescues before being replaced by Catalinas in April 1943.

The essence of a byegone era. A synchronised take-off by Singapore IIIs presents the photographer with this memorable image.

Short Singapore III

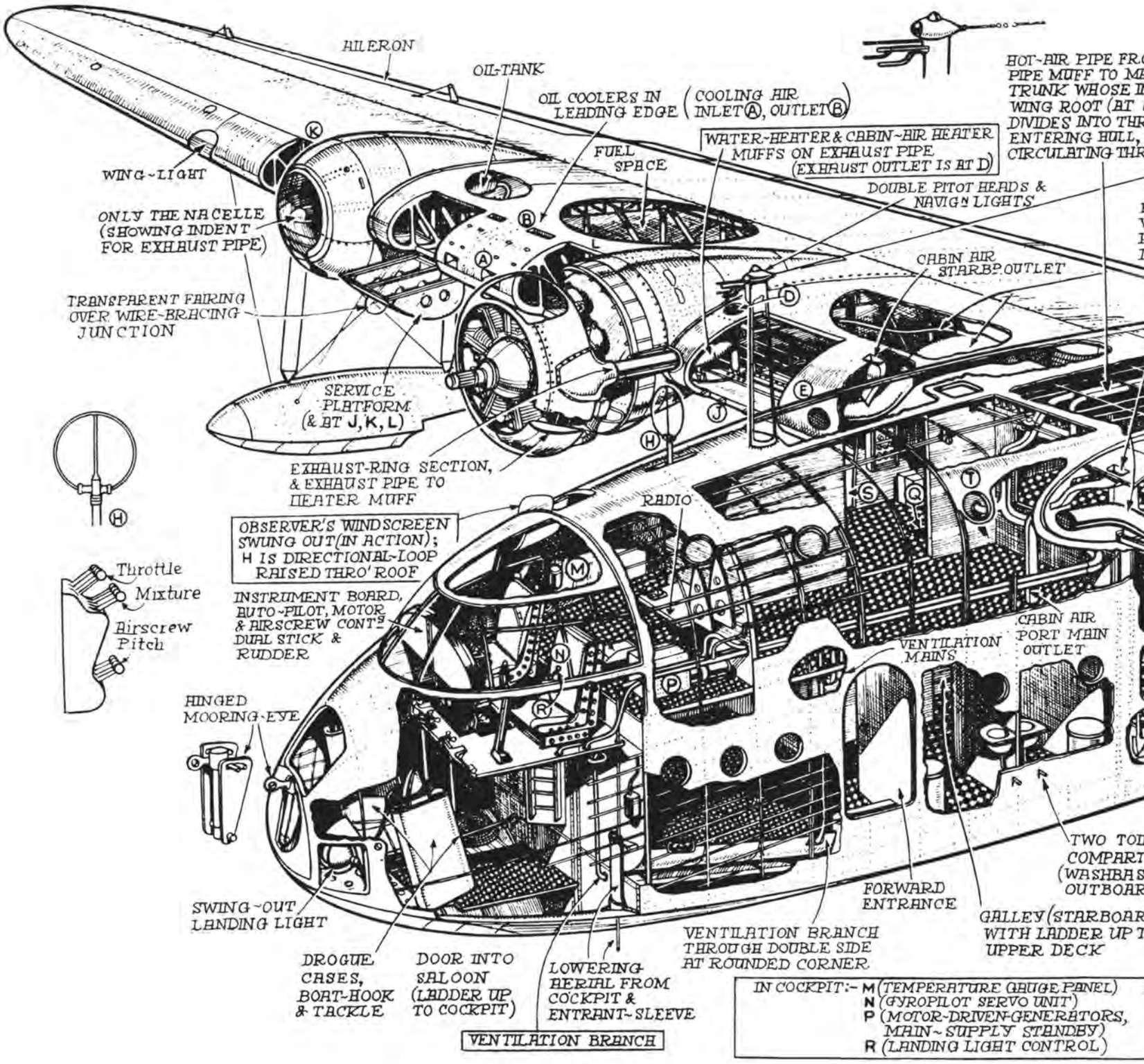




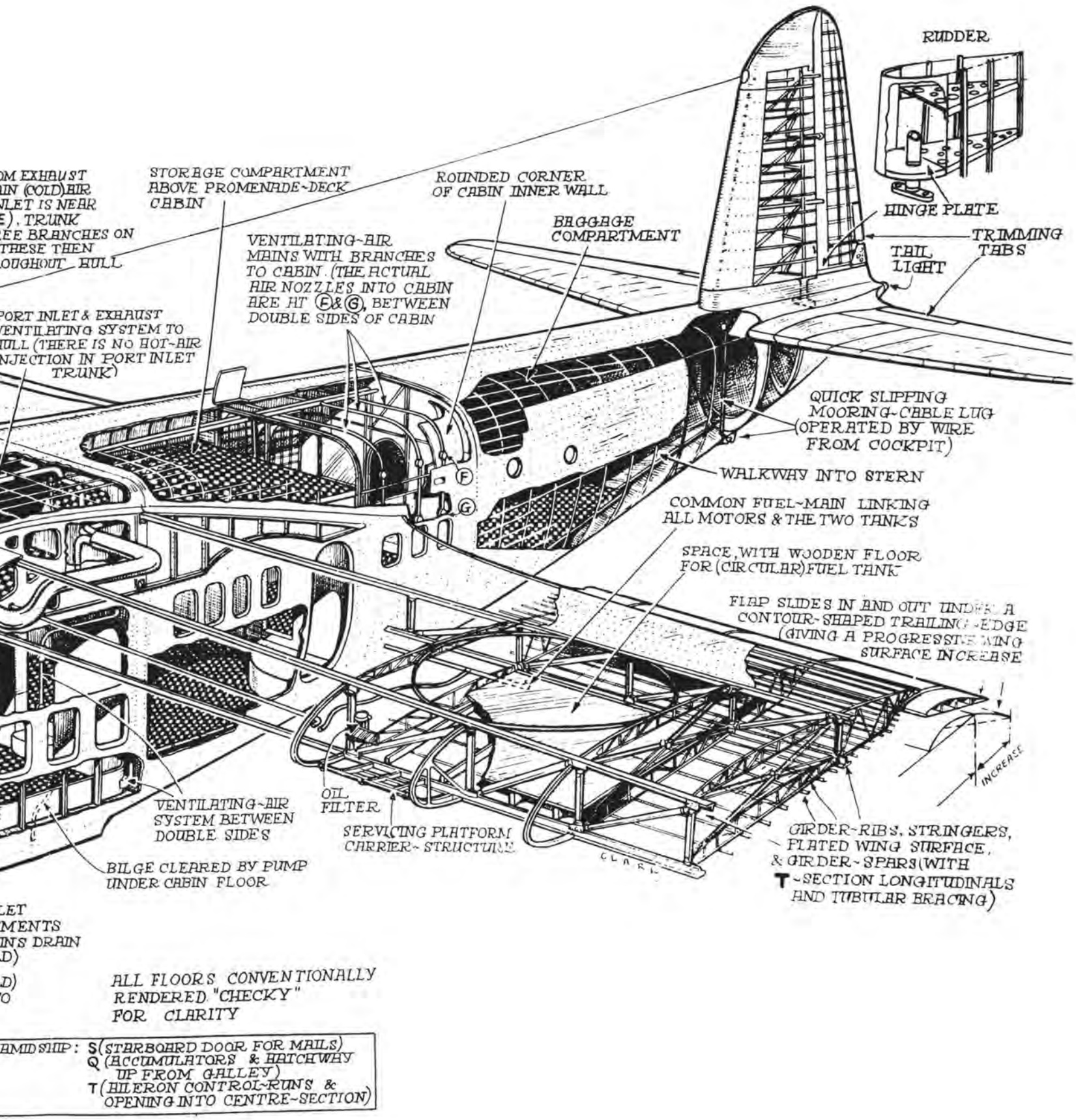
SHORT SINGAPORE III

Type: General reconnaissance
Crew: 6-7
Length: 64ft 2in
Wingspan: 90ft
Powerplants: 4 x Rolls-Royce Kestrel VIII/IX (730hp)
Loaded weight: 27,500lb
Max speed: 145mph
Armament: 3 x swivelling 0.303in Lewis machine guns, plus 2,000lb bomb load

Short Empire Class



A sectioned view of one of the thirty twenty-ton flyi
Rochester) Ltd., for Imperial Airways Ltd., to be used
and on to New Zealand, from England to South Af
States. Two were already



ng boats which are to be built by Short Bros. (Bedford and on the British Empire Air Routes, from England to Australia rica and possibly from England to Canada and the United flying at the end of October 1936.

Two of the majestic Short 'G' Class flying boats nearing completion at Rochester. Originally intended for transporting up to 2 tons of mail over distances up to 2,500 miles, the three completed 'G' Class Empires were quickly impressed into military service and militarised with defensive turrets.

The golden age of the commercial flying boat was at its zenith when the first shots of World War 2 echoed out. The Short Empire series of 'C' flying boats were busy traversing the globe in all their graceful and luxurious glory, but when their country called, they were militarised and impressed into service as long range maritime reconnaissance platforms. The larger 'G' series quickly followed their elder siblings into service.

The Short 'C' Class Empire flying boat represented a monumental step forward in seaplane design when it first got air under its wings in 1936. Thirty nine of the mighty machines were built for Imperial Airways and Qantas Empire Airways to ply the trade routes, designated S23s and S30s. During October 1939, the acute shortage of maritime patrol flying boats led to S30s *Cabot* and *Caribou* being impressed as V3137 and V3138, joining G Flight at Bowmore on Islay. They were used as transports during the Norwegian campaign but at Bodo both were bombed and destroyed. Two S.23s, *Clio* and *Cordelia* were subsequently taken over as replacements, these becoming AX659 and AX660. Both were modified for the marititme reconnaissance role under the designation S.23M, ASV radar equipment was installed and turreted defensive armament was provided in dorsal and tail positions. Both joined No 119 Squadron patrolling between Islay and Iceland, but *Clio*, was lost after an engine failure.

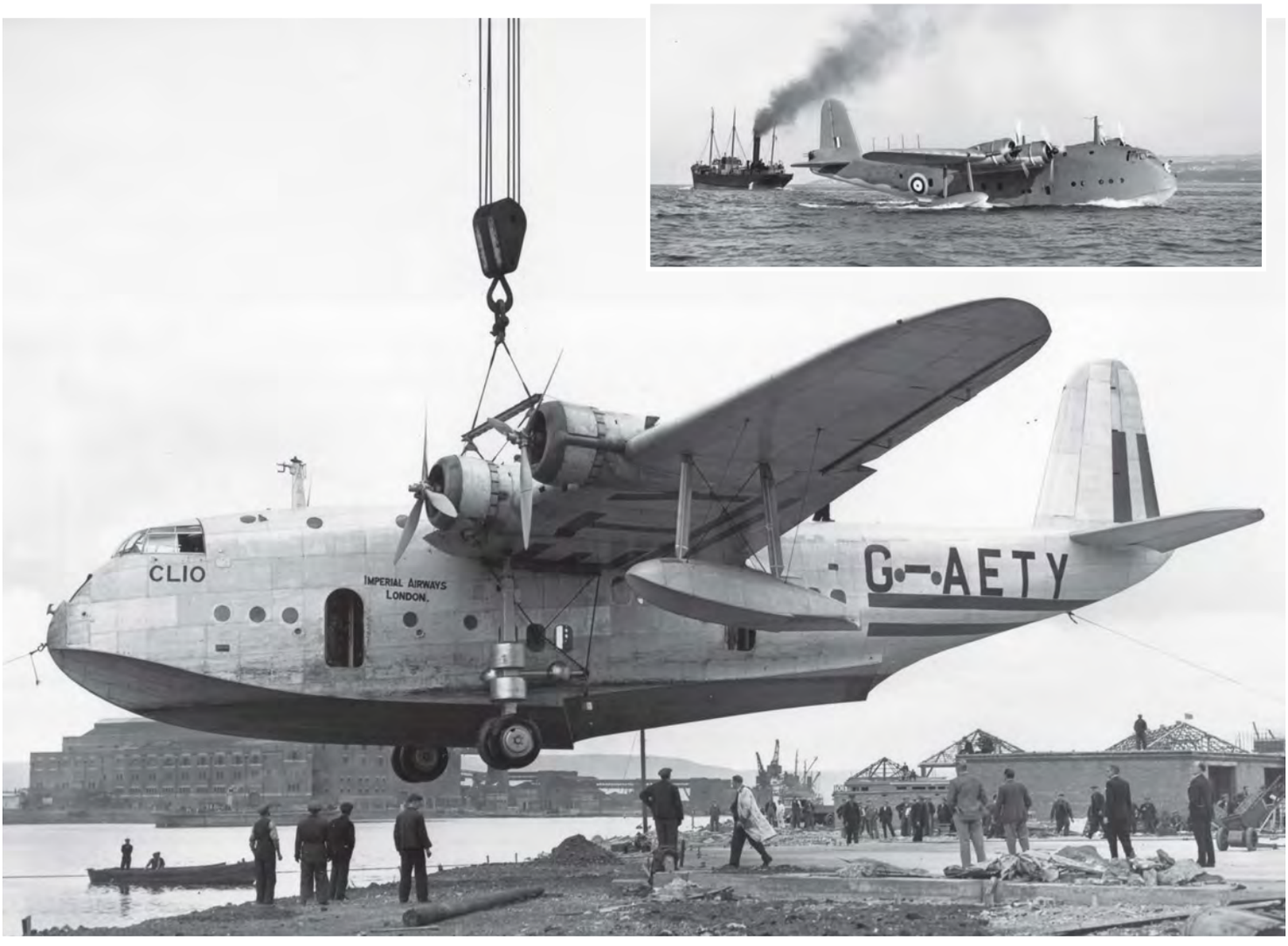
Meanwhile, the first of the significantly bigger Short S.26 'G' Class Empire flying boats was flown in June 1939 and all three aircraft, *Golden Hind*, *Golden Fleece* and *Golden Horn* were impressed into service as X8275, X8274 and X8273 respectively. They were fitted with two dorsal turrets, each mounting four machine guns, a tail turret aft of the rudder also with four guns, underwing racks for eight 500lb bombs, radar and armour plate for the crew area. By April 1941, the aircraft had joined No 119 Squadron, but X8274 was lost on 11 June 1941 while detached to No 10 Squadron RAAF following a double engine failure. The remaining two machines were returned to BOAC and were re-civilianised and used to fly priority passengers and diplomatic mail. *Golden Horn* crashed at Lisbon following an engine failure.

SHORT 'C' CLASS

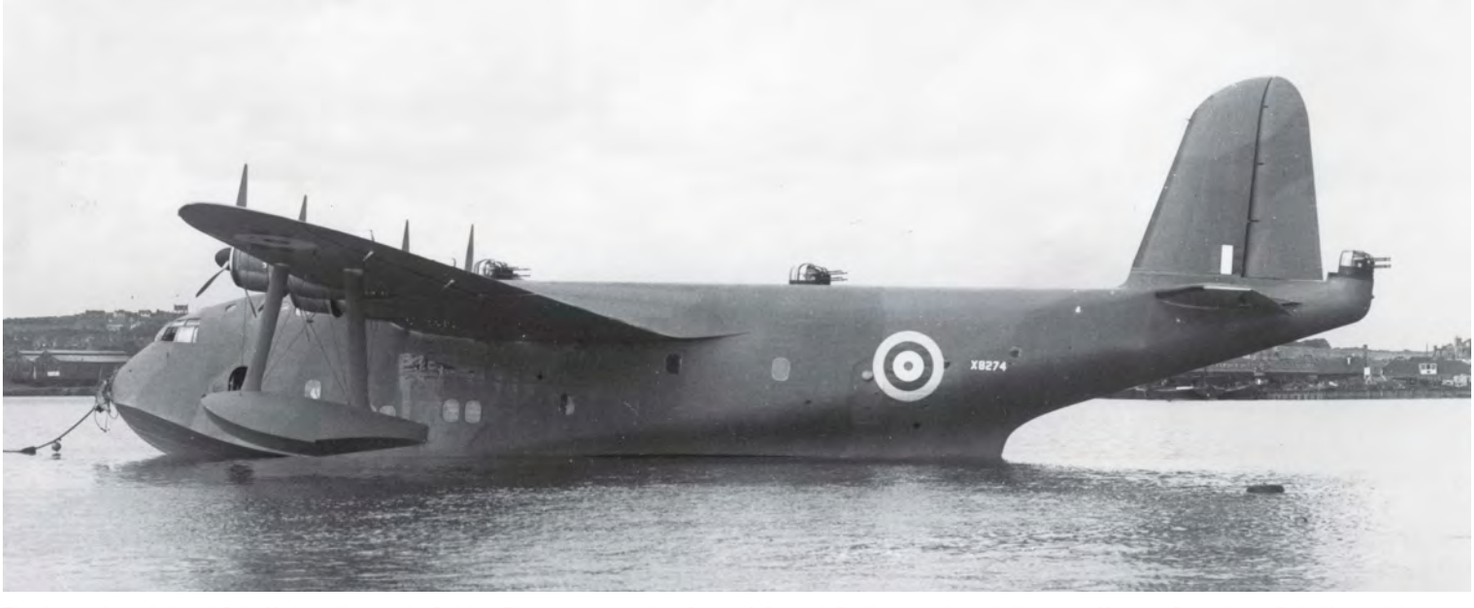
Type: Maritime reconnaissance
Crew: 6-7
Length: 88ft
Wingspan: 114ft
Powerplants: 4 x Bristol Pegasus Xc (920hp)
Loaded weight: 40,500lb
Max speed: 200mph
Armament: 2 x Boulton Paul turrets each with 4 x 0.303in Browning machine guns, plus 2,000lb bomb load

SHORT 'G' CLASS

Type: Maritime reconnaissance
Crew: 7-8
Length: 103ft
Wingspan: 134ft 4in
Powerplants: 4 x Bristol Hercules IV (1,380hp)
Loaded weight: 74,500lb
Max speed: 209mph
Armament: 3 x Boulton Paul turrets each with 4 x 0.303in Browning machine guns, plus 2,000lb bomb load



Short 'C' Class S.23 Clio flying boat before and after militarisation. As AX659, Clio was fitted with ASV radar equipment (hence the proliferation of aerials over its rear fuselage) and defensive dorsal and tail turrets. The aircraft crashed into high ground near Bowmore, Loch Indaal, on 22 August 1921 after an engine failure.



The imposing sight of S.26 X8274 (formerly Golden Fleece) moored at Queen's Island, Belfast, before delivery to No 119 Squadron. Bristling with Browning machine guns in three turrets, the heavy defensive armament was never put to the test. Sadly, the aircraft was lost on 11 June 1941 off Cape Finisterre when it alighted with two blazing engines and its hull was breached.

Short Sunderland

Few would argue that the iconic Sunderland marked the zenith of the military flying boat. When it first entered service it represented perhaps the greatest evolution in flying boat technology and became the most powerful and widely used aircraft of its genre. Instrumental in countering the U-boat threat in the North Atlantic, it also served with distinction in all theatres of the conflict and remained in RAF operation until 1959 — the last and the greatest of its breed.

As is evidenced by its graceful but strong lines, the Sunderland owed much to the genes of its commercial successor, the S23 'C' Class Empire flying boat. However, a deeper hull and the provision of Fraser-Nash power-operated turrets in the bow and tail, radically altered the external appearance, giving it a more bullish profile. Its cockpit was moved further aft and its thick wings slightly swept back, carrying four nacelle-mounted Bristol Pegasus engines. Bombs, mines and depth charges were stored internally and mounted on railed racks, which could be wound out from the interior of the hull to the undersides of the wings, inboard of the engine nacelles.

The Sunderland I began to enter service in the summer of 1938 and was progressively introduced into RAF Coastal Command's squadrons during the early months of the war replacing the obsolescent biplanes. Its impressive defensive armament soon earned it a healthy respect from the Luftwaffe, who dubbed the aircraft the 'flying porcupine'. This was demonstrated for the first time on 3 April 1940 when a Sunderland operating off Norway was attacked by six German Junkers Ju88s, destroying one, seriously damaging another and fighting off the rest. As British anti-submarine measures improved, the Sunderland began to inflict losses as well, the type's first unassisted kill of a U-boat being on 17 July 1940. The big flying boat also proved itself invaluable in the

There are few finer sights than a Sunderland beginning its take-off run at sea. This aircraft, EJ164, is a late production Mk III and went on to serve with No 270 Squadron in Africa. The aircraft was lost following a ditching in the South Atlantic in October 1944.

Left: The first prototype of the aircraft that was to become the Sunderland, photographed on the slipway at Short's Rochester plant. K4774 made its maiden flight on 16 October 1937.

Mediterranean theatre, flying many evacuation missions during the German seizure of Crete. One flew the reconnaissance mission to observe the Italian fleet at anchor in Taranto before the famous Royal Navy Fleet Air Arm's torpedo attack on 11 November 1940. With the propaganda machine working flat out, the Sunderland began to achieve a mythical status that was at odds with the vulnerable nature of a large flying boat.

The 75 Sunderland Is were followed by 58 Sunderland IIs (built by Short Brothers and Blackburn), but deliveries really got into their stride with the Mk III (407) that introduced the dorsal turret, uprated engines and a modified hull. The type's 'stickleback' ASV Mark II radar enabled the flying boats to attack U-boats on the surface and in response the German submarines began to carry radar warning receivers. Kills fell off drastically until the ASV Mark III radar was introduced in early 1943, which used antennas mounted in blisters under the wings outboard of the floats. The Germans also tried to counter the Sunderland threat by fitting U-boats with one or two 37mm and twin quad 20mm flak guns, making the big flying boat very vulnerable during its low-level depth charge run. While Sunderlands could suppress flak to an extent by hosing the U-boat with their nose turret guns, the U-boats had the edge by far in range and hitting power. The RAF responded by installing a fixed battery of four 0.303in guns in the nose fired by the pilot, and this became standard on the final variant, the Mk V, which was introduced in 1943. This mark was also the first to be powered by Twin Wasp engines.

By the end of the war, no fewer than 28 Sunderland squadrons were serving with the RAF and when production ended in in 1945, 721 of this classic flying boat had been built.

SUNDERLAND V

Type: Long-range maritime reconnaissance/bomber

Crew: 10

Length: 85ft

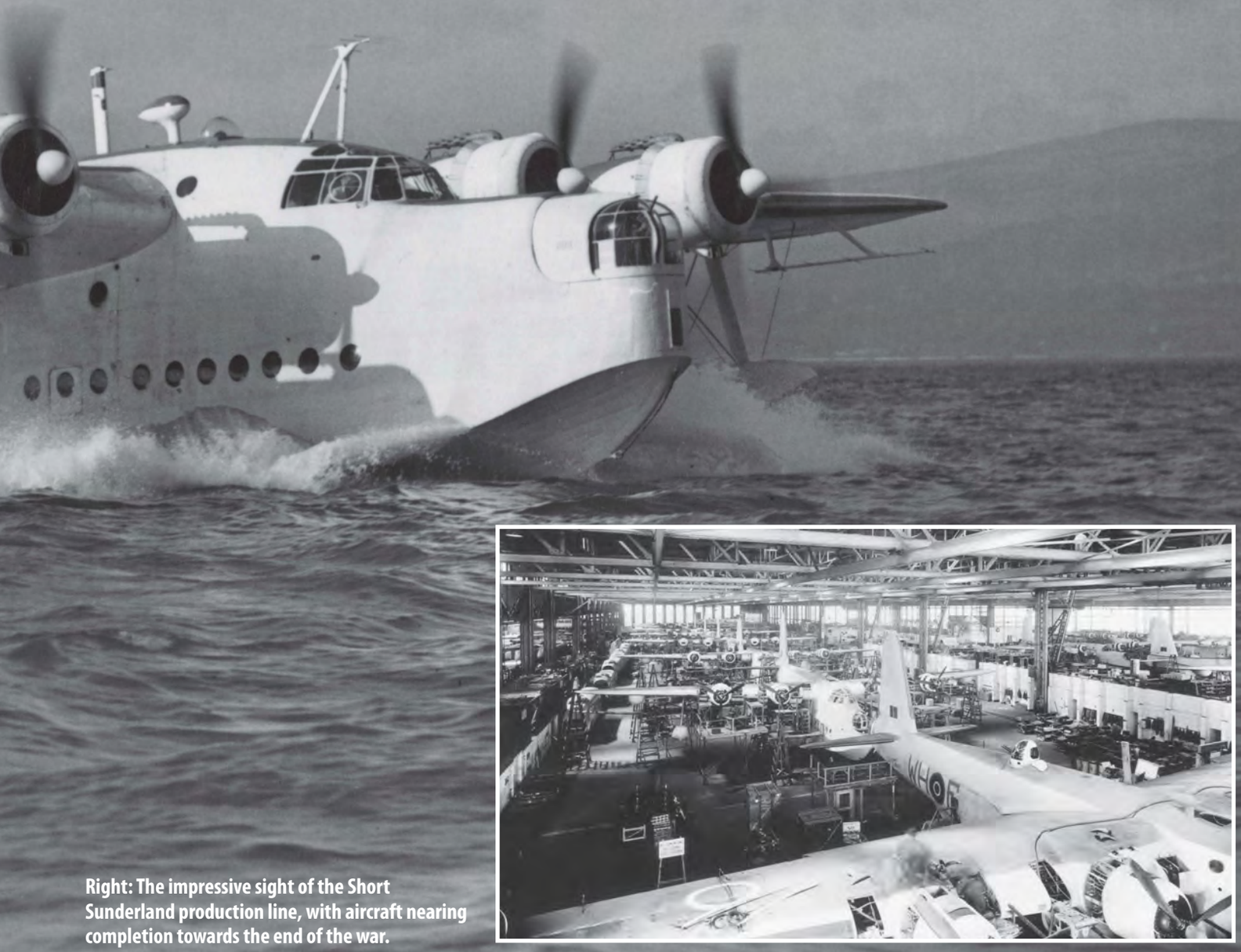
Wingspan: 112ft 10in

Powerplants: 4 x Pratt & Whitney R-1830-90B Twin Wasp (1,200hp)

Loaded weight: 60,000lb

Max speed: 207mph

Armament: 2 x fixed forward-firing 0.303in machine guns, 2 x 0.303in in power-operated bow turret, 1 x 0.5in machine gun in each beam position and 4 x 0.303in in power-operated tail turret, plus a 4,960lb load of bombs, mines and depth charges.



Right: The impressive sight of the Short Sunderland production line, with aircraft nearing completion towards the end of the war.

Sunderland strike. A No 461 Squadron RAAF Sunderland attacks a Type VII U-boat in the Atlantic in mid-1943.
Painting by Mark Postlethwaite/www.posart.com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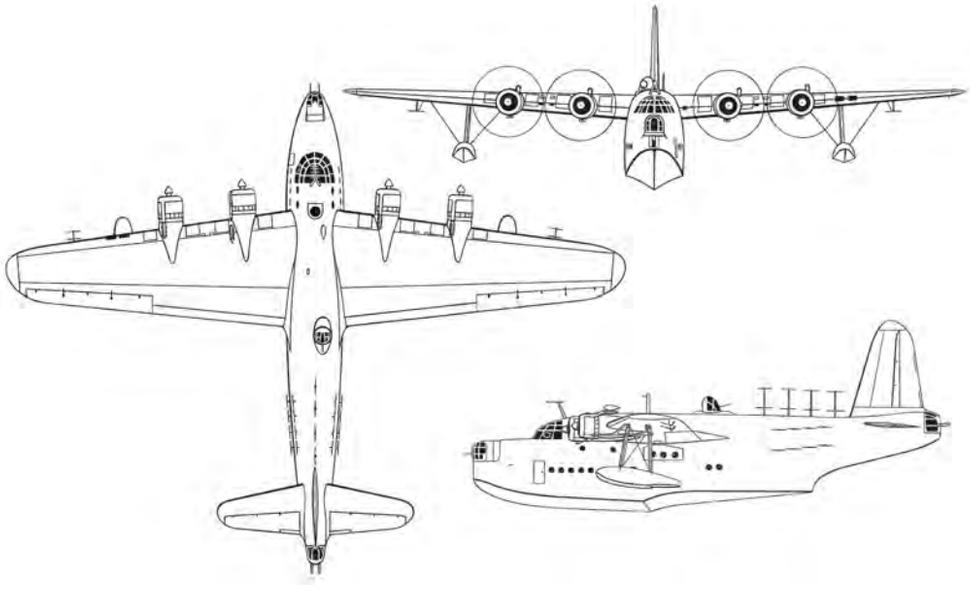
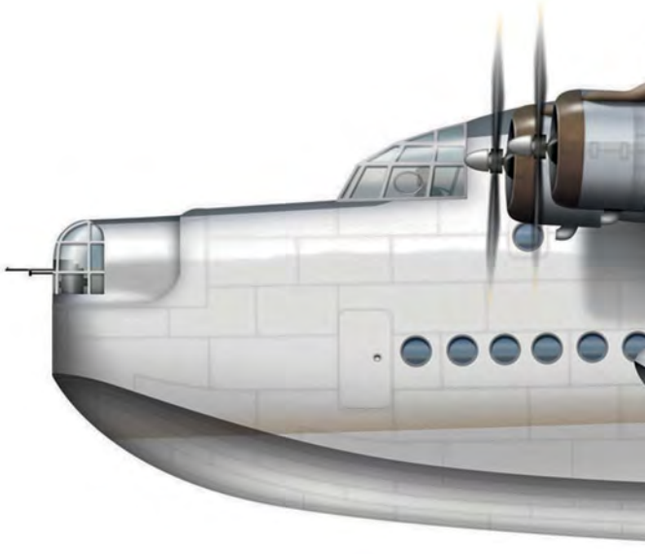
MARK POSTLETHWAITE '08

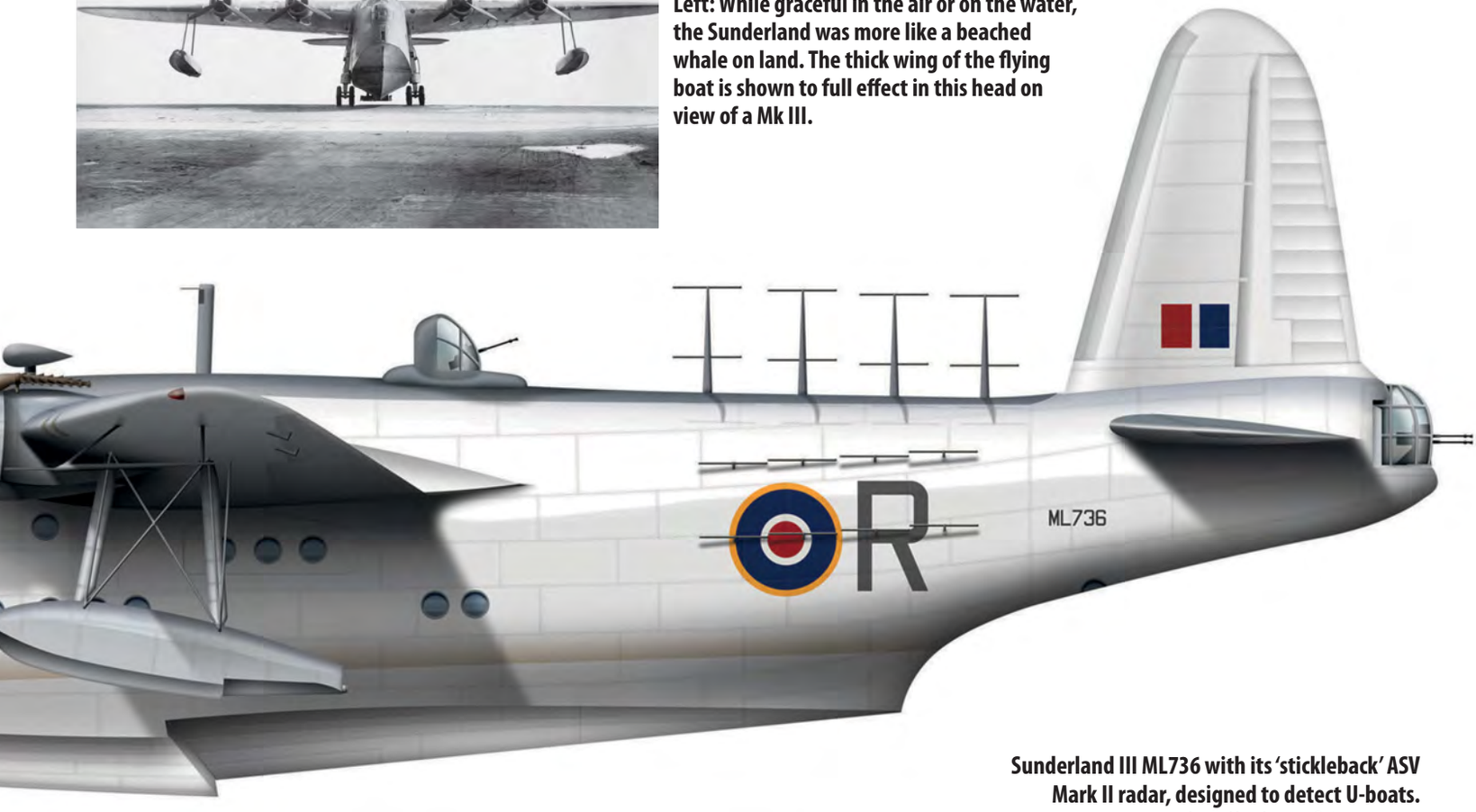
The spacious flight deck of an early Sunderland in 1939, giving its pilots an impressive panoramic view, a necessity for the type's maritime mission.





Eye in the sky. Sunderland I L2163 of No 210 Squadron watches out for a Canadian troop convoy in 1941. Note the forward-hinging bomb aimer's window below the nose turret and the upper gun hatches of the early mark.

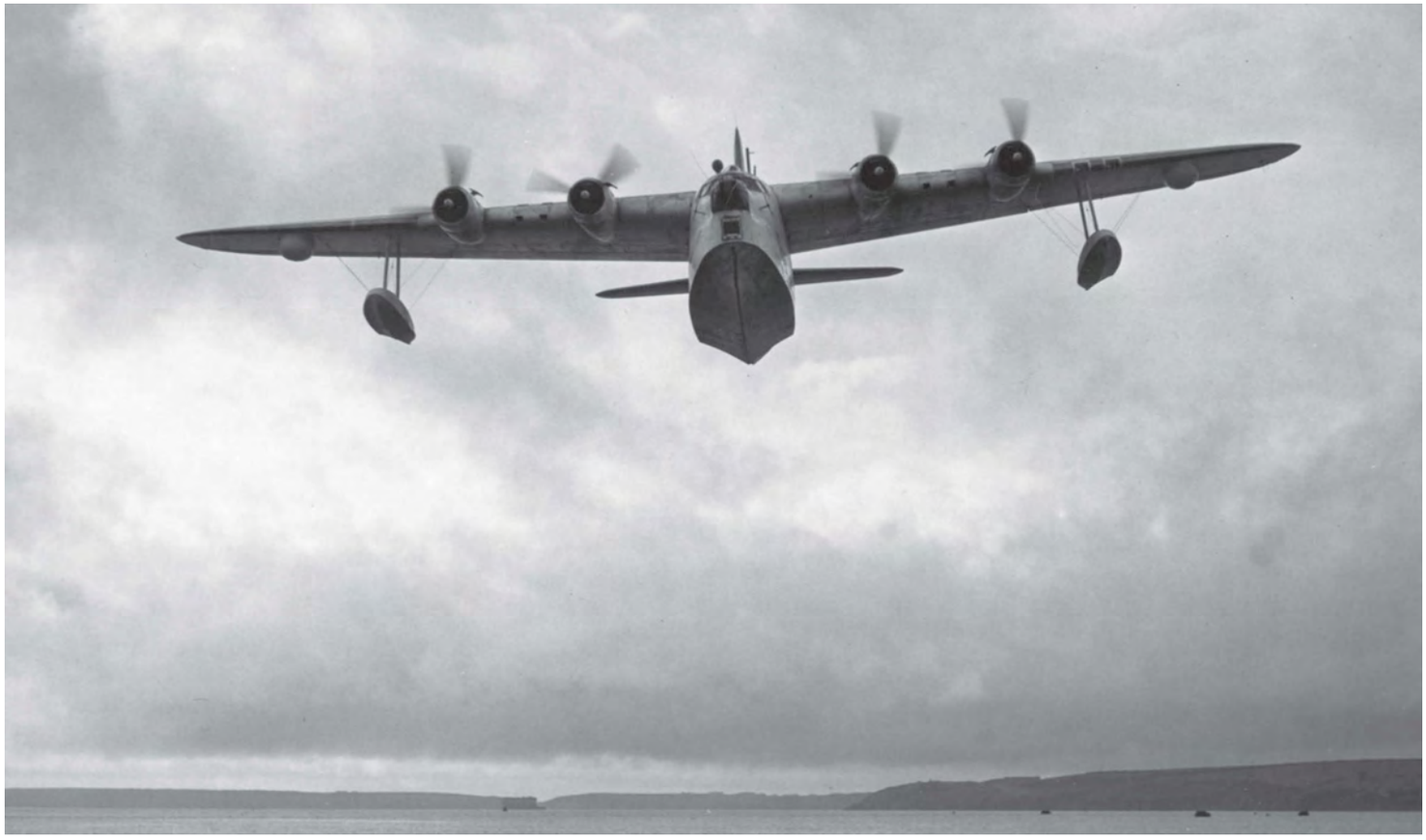
Left: While graceful in the air or on the water, the Sunderland was more like a beached whale on land. The thick wing of the flying boat is shown to full effect in this head on view of a Mk III.



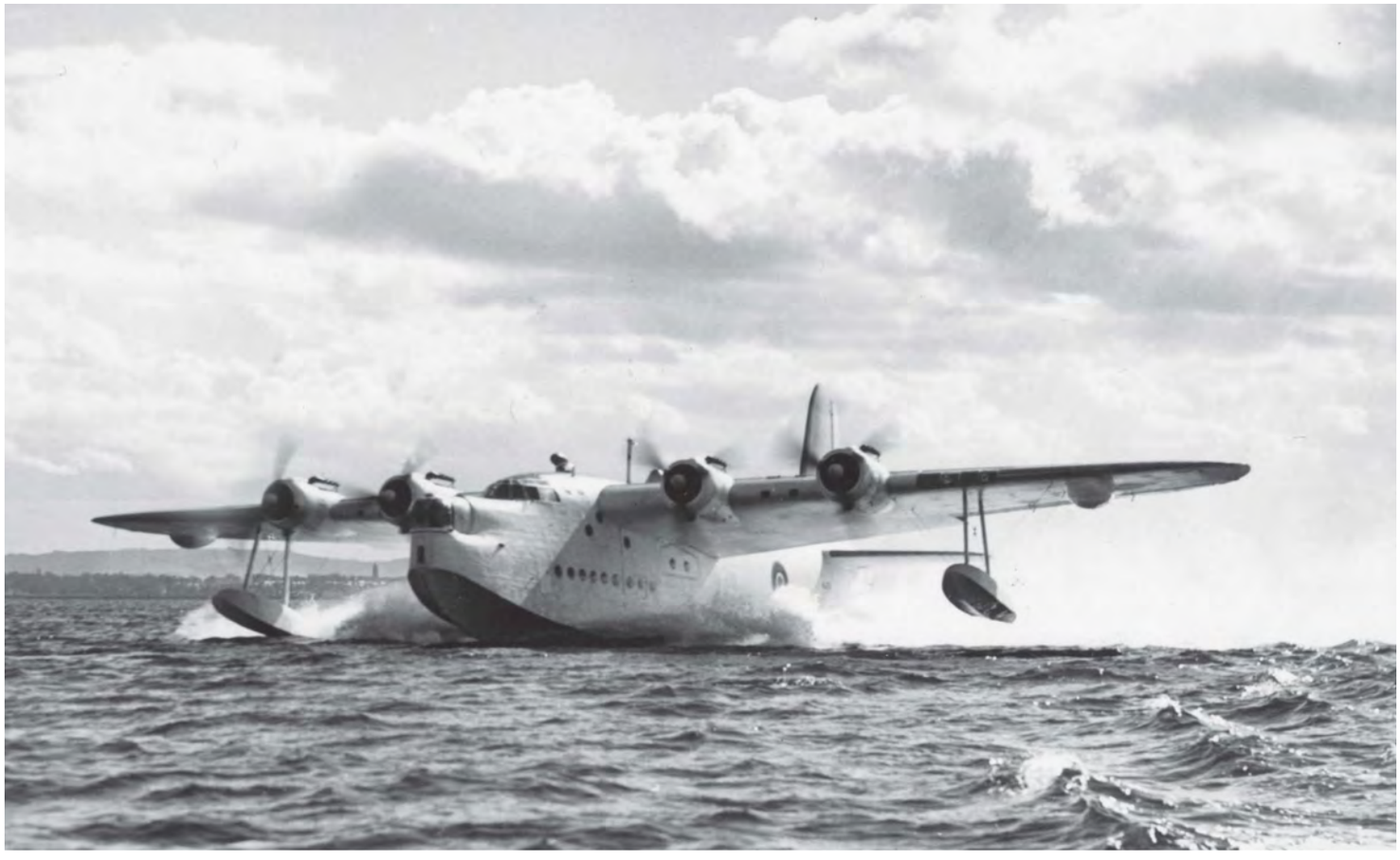
Sunderland III ML736 with its 'stickleback' ASV Mark II radar, designed to detect U-boats.
Andy Hay/www.flyingart.co.uk

The horrors of war seem a long way away in this serene view of Sunderland V ML818 as it banks away from the camera.

Searching for U-boats. A Sunderland loses its scale against the vastness of the ocean as it heads out on a patrol over the North Atlantic.

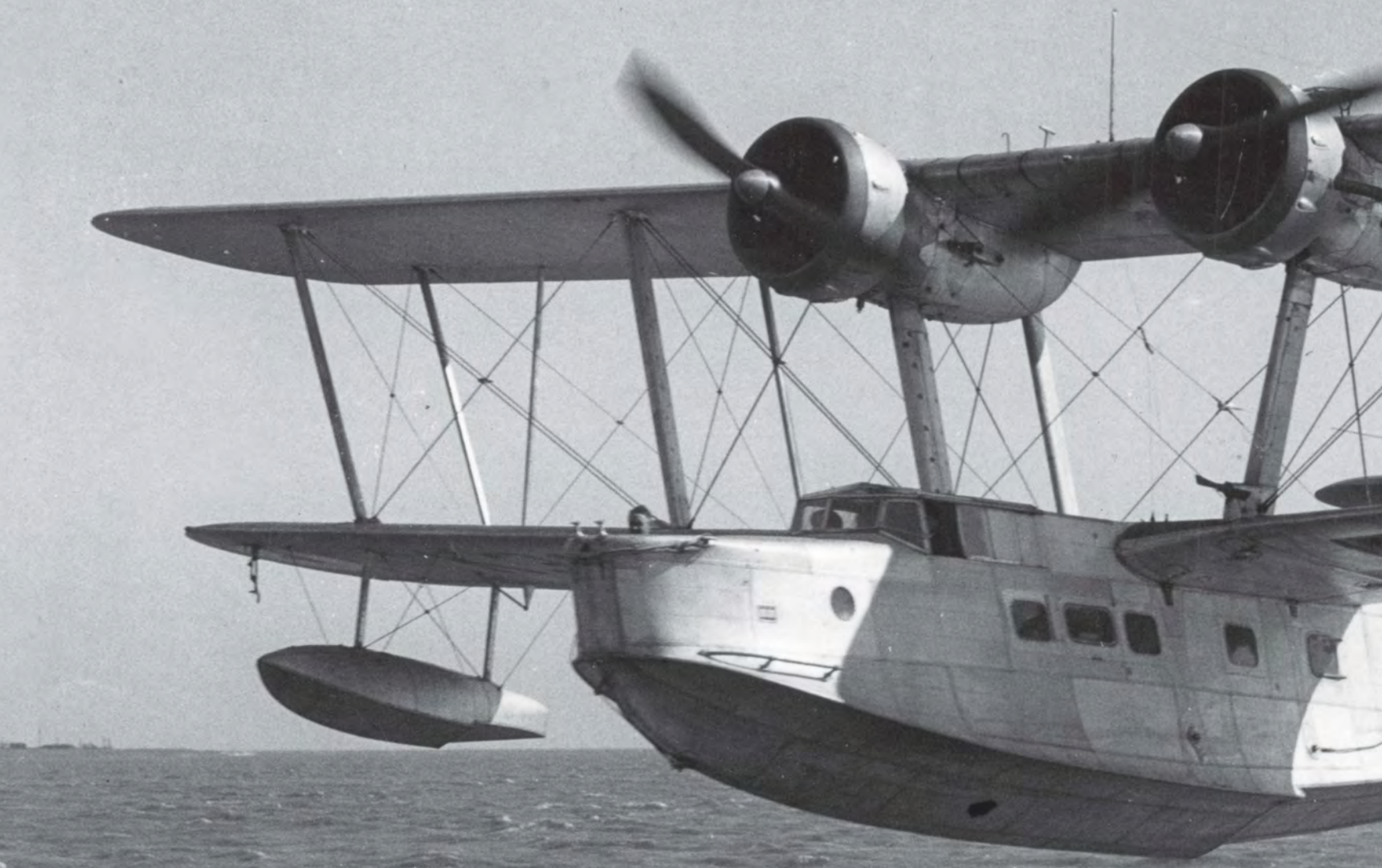


A Sunderland V thunders overhead as it carries out a practice bomb run. The flying boat presented a big target to the concentrated fire of the U-boats in the latter stages of the war.



A Sunderland V in all its majestic glory as it races across the water.

Supermarine Stranraer



Looking at the Stranraer, there is nothing to suggest that its designer would go on to be responsible for the world's most famous aircraft, the immortal Spitfire. Not particularly graceful and with a performance to match, the Stranraer was considered obsolete even before World War 2.

Designed by R. J. Mitchell as a tender to the same Air Ministry specification that spawned the London and Singapore, the Stranraer was the last in a line of biplane flying boats produced by Supermarine and stemming from the Southampton of 1925. In fact, the first prototype was known originally as the Southampton V before it was renamed Stranraer in August 1935. Of all-metal construction with fabric-covered wings, production Stranraers were powered by Pegasus X engines driving three-bladed Fairey-Reed metal airscrews.

Only 17 Stranraers were operated by the RAF between 1937–1941 (primarily by Nos 228, 209 and 240 Squadrons, along with limited numbers at No 4 OTU), however a total of 40 were built in Canada by Canadian Vickers Limited for the RCAAF. In a surprising twist, Canadian Stranraers operated alongside Catalinas and the Canso (Canadian Catalina) from 1943 and were actually considered more seaworthy than the monoplane, hence it remained in service until 1946 demonstrating unexpected longevity. Post-war many were passed into civilian hands to operate passenger flights for fledgling airlines.

SUPERMARINE STRANRAER

Type: General purpose coastal reconnaissance

Crew: 6-7

Length: 54ft 10in

Wingspan: 85ft

Powerplants: 2 x Bristol Pegasus X (920hp)

Loaded weight: 19,000lb

Max speed: 150mph

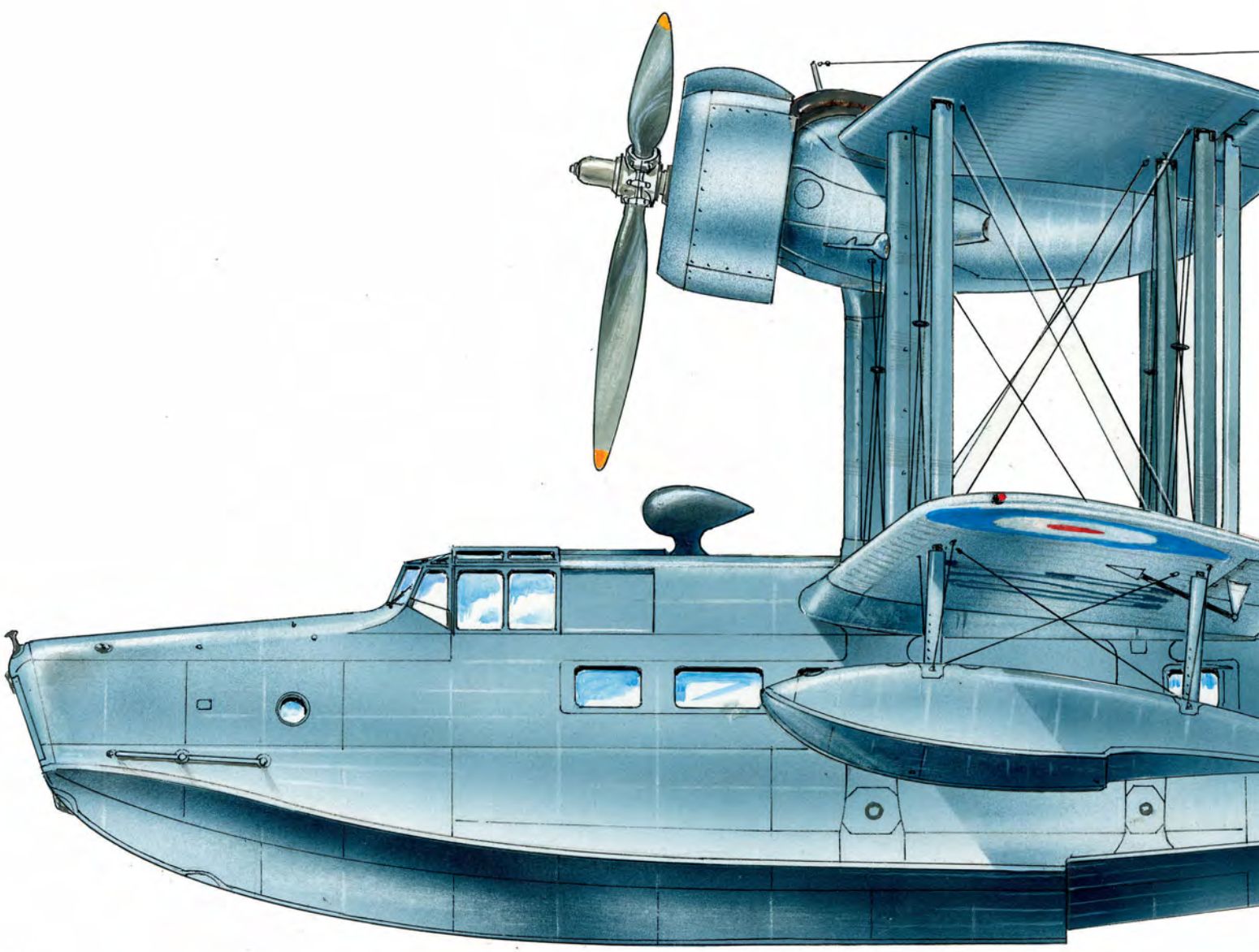
Armament: 3 x swivelling 0.303in Lewis machine guns, plus 1,000lb bombs

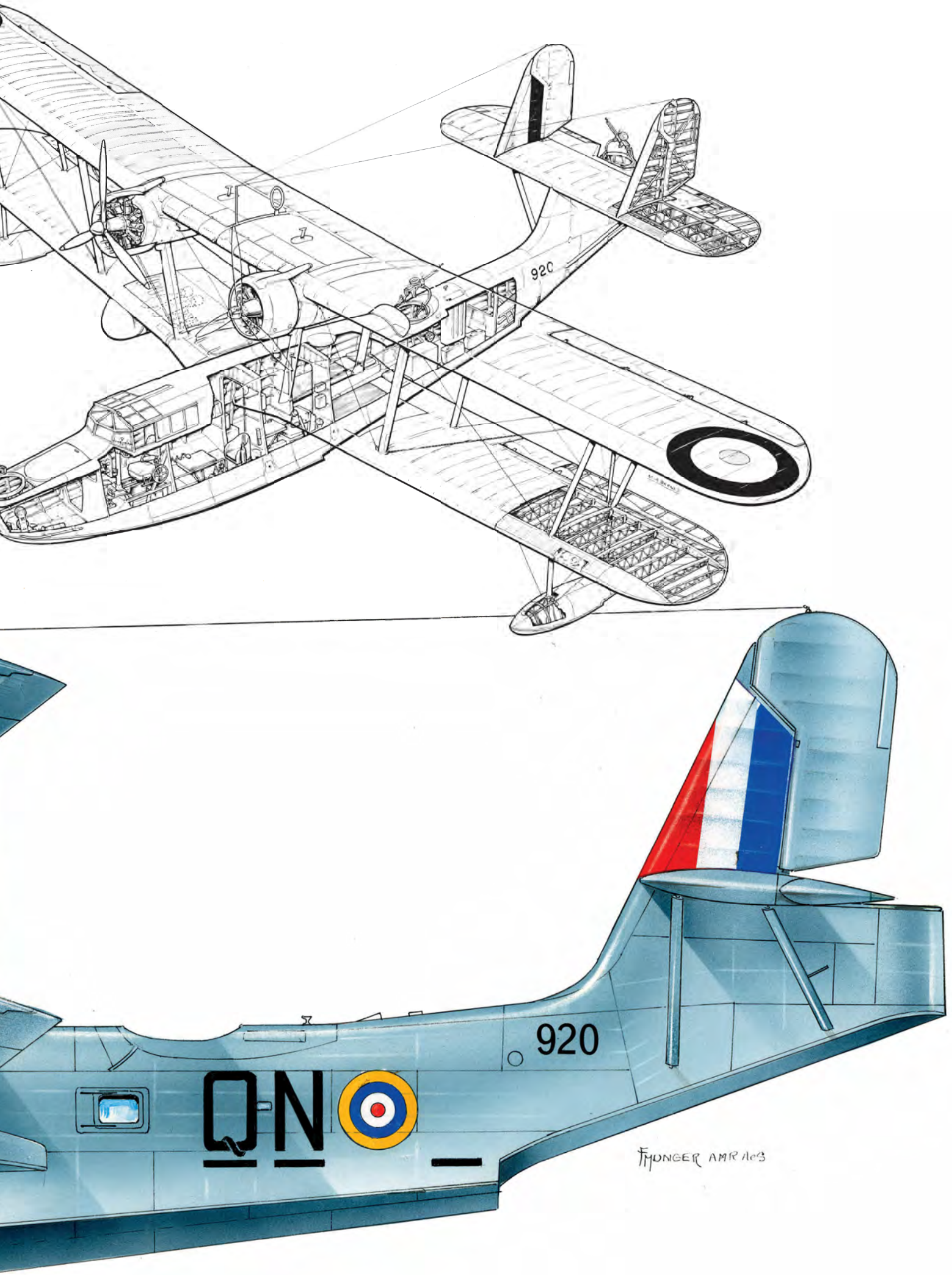
The Stranraer might not have been the most glamorous of R. J. Mitchell's designs, but in its natural element there is no denying that it still had the power to impress. Here the prototype, K3973, poses for the cameraman.

Right:The Stranraer was not generally well-received by its crews as its performance was considered marginal at best. It was of little surprise that it should become the target of many derisive nicknames, the 'Whistling Birdcage' being the least offensive and perhaps the most apposite, as this view attests!

Supermarine Stranraer

Canadian Vickers Stranraer 920 of No 5 Squadron RCAF. Post war, this aircraft found its way onto the Canadian civil register as CF-BXO and was flown by Canadian Pacific Airlines until 1947. It was then passed to Queen Charlotte Airlines, who re-engined it with American Wright 1820s. It continued to operate passenger flights until 1952, flying from Vancouver along the Pacific coast of British Columbia. In 1970, it was bought by the RAF Museum and transported to the UK where it is now on display at Hendon in its original wartime colours.

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A Canadian Vickers-built Stranraer begins its take-off run, casting its reflection in the still water.

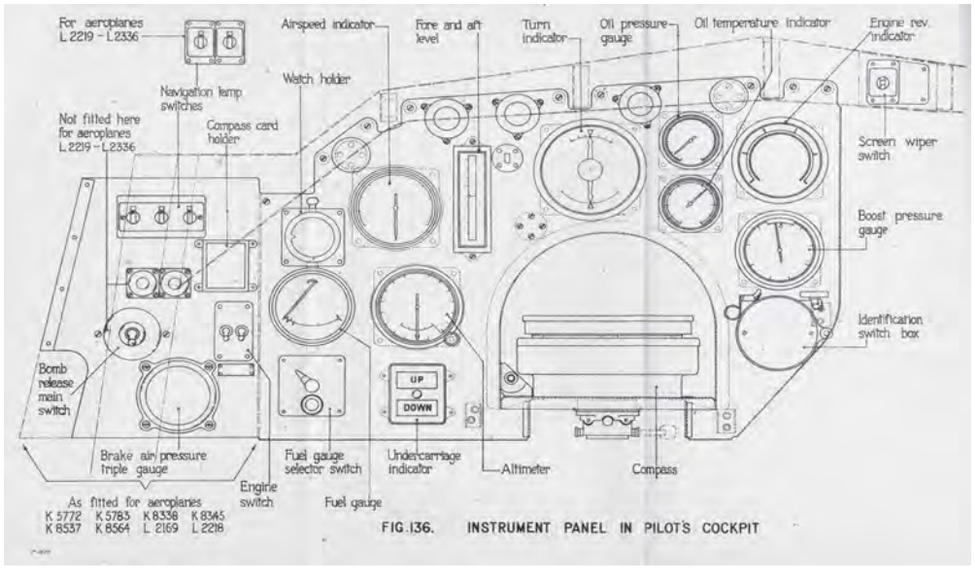
RCAF Stranraers were operated from both the eastern and western coastlines, but saw little enemy action. However, the crew of a No 5 Squadron aircraft was responsible for the capture of an Italian merchant ship in the Gulf of Saint Lawrence, hours after Canada declared war on Italy on 10 June 1940. Note the rarely illustrated long-range fuel tank inboard on the lower wing.

Pre-war image of Walrus K8556 being guided down the slipway at Lee-on Solent. Sadly this aircraft and its crew were later lost when it hit a balloon cable during a practice flight and crashed near Lancing Hill, Southampton.

Supermarine Walrus

The single-engined Walrus began life as the Seagull, a name perhaps more suited to this small amphibian. However, it was bestowed with great inner strength allowing it to be catapulted from warships and it was soon playing a vital role in protecting Allied convoys. As the conflict progressed it developed a second career as an air-sea rescue aircraft, for which it became equally famous. Of the biplane flying boats to see service in World War 2, the Walrus was by far the most successful.

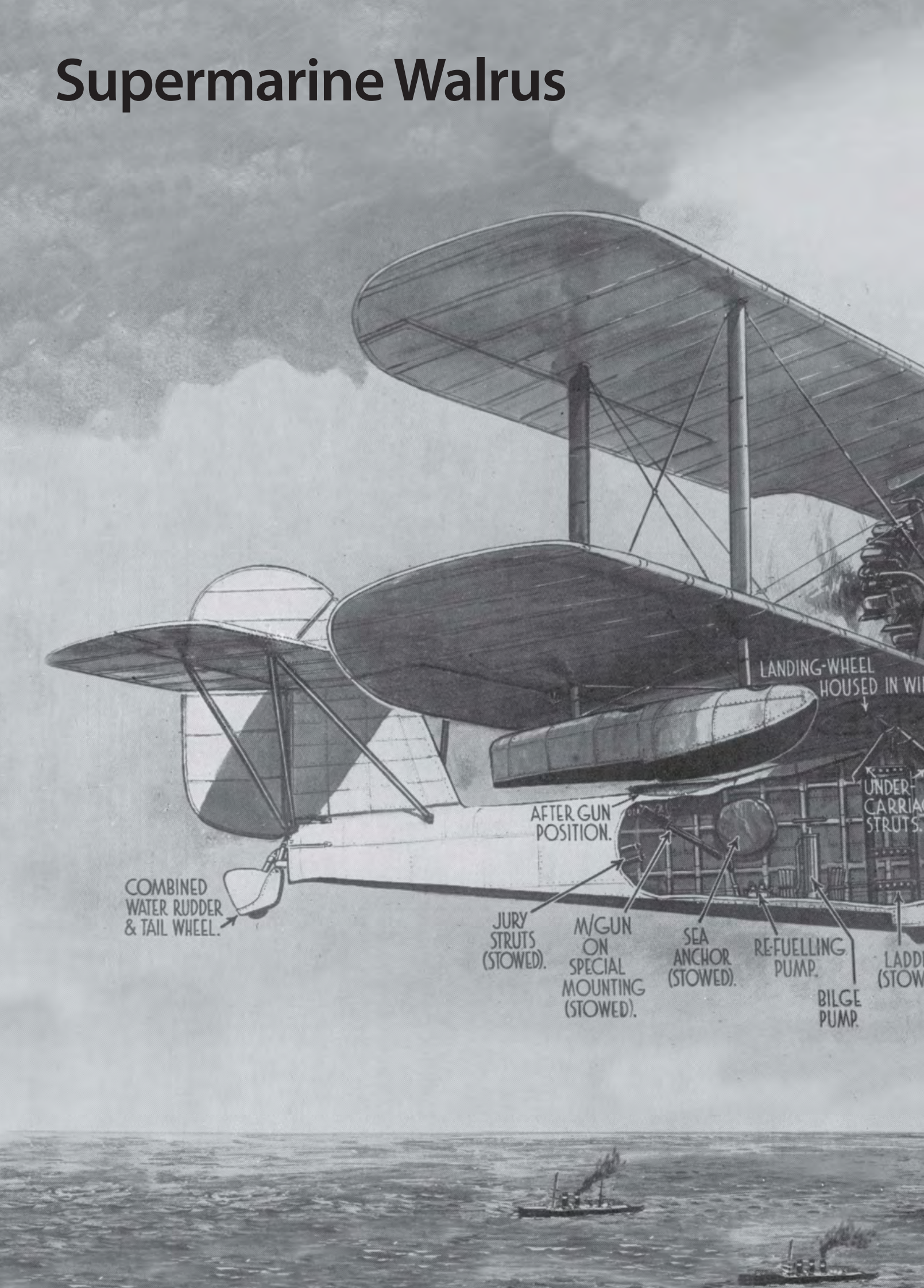
The Walrus amphibian flying boat was developed as a private venture under the name Seagull V and was primarily of metal construction, the flat-sided single-step hull being of aluminium alloy. The wings, which were slightly swept back, had stainless–steel spars and wooden ribs and were covered in fabric. The prototype was first flown by 'Mutt' Summers on 21 June 1933; five days later it made an appearance at the SBAC show at Hendon, where Summers startled the spectators (including its designer R. J. Mitchell) by looping the aircraft. Australia ordered 24 examples of the Seagull V in 1933 and this was followed by the first order for 12 aircraft from the Royal Navy with the initial production aircraft, K5772, flying on 16 March 1936. Now named the Walrus, it entered Fleet Air Arm service in the summer of 1936, operating aboard battleships and cruisers with Nos 700, 701, 711, 712 and 714 Squadrons. The Walrus played a vital role in protecting Allied convoys, tirelessly spotting for enemy surface raiders, submarines and their supply ships. The Walrus was even catapulted off warships to undertake bombing attacks against the Italians in Somaliland.

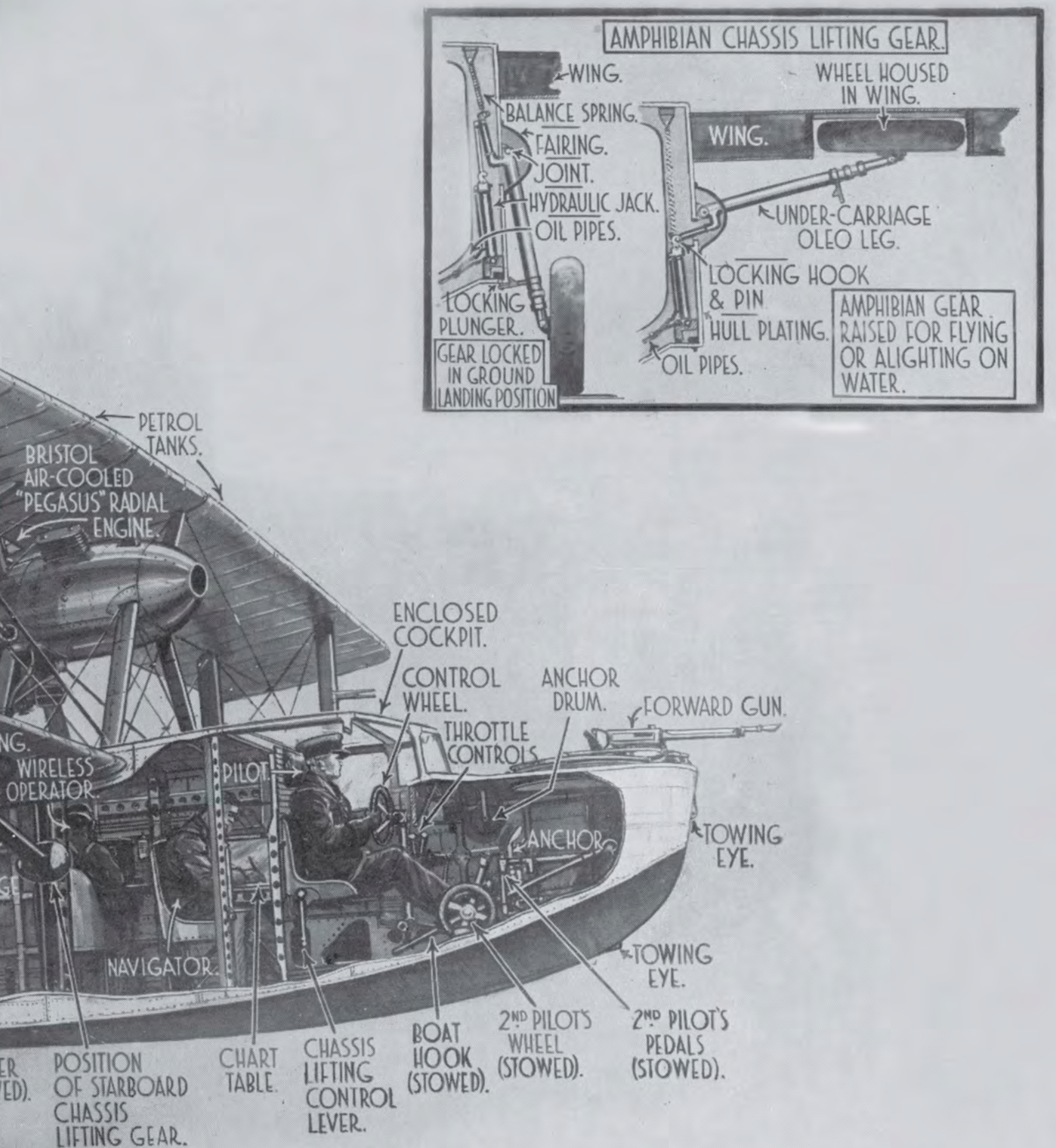


A period schematic of the instrument layout of the Supermarine Walrus.

After the completion of 287 Walrus Is, production was transferred to Sanders-Roe, which built a further 453 machines designated Walrus II. This version differed in having a wooden hull (to save on precious wartime metal stocks), though the extra weight was offset somewhat by installing the more powerful Pegasus VI engine. This was the principal version to serve with the RAF in its legendary air-sea rescue role from 1941 onwards, operating in the North Sea, the Channel and the Mediterranean. From 1944 the Walrus was gradually superseded by the Sea Otter.

Supermarine Walrus

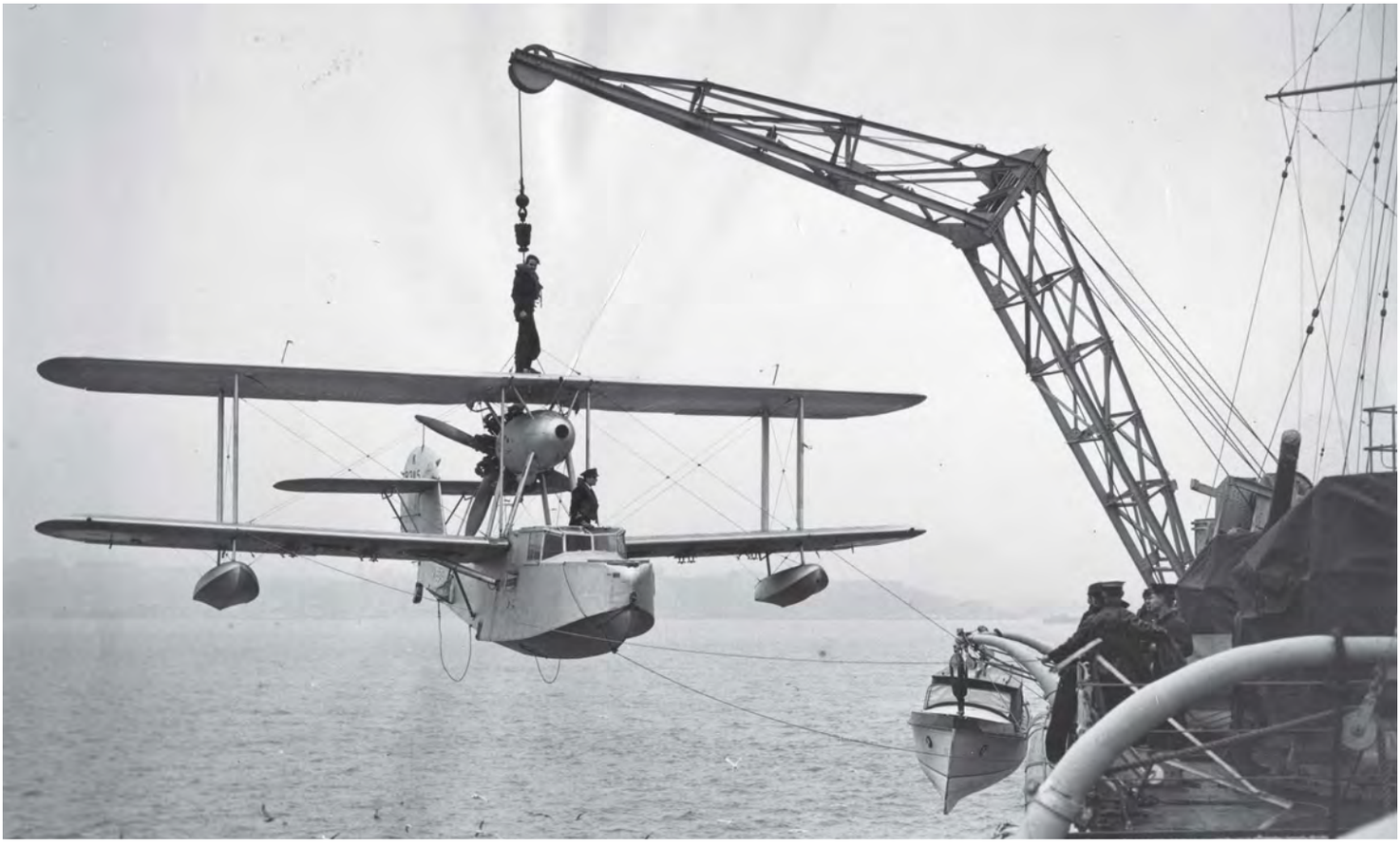



AMPHIBIAN CHASSIS LIFTING GEAR.
WING.
BALANCE SPRING.
FAIRING.
JOINT.
HYDRAULIC JACK.
OIL PIPES.
LOCKING PLUNGER.
GEAR LOCKED IN GROUND LANDING POSITION
WHEEL HOUSED IN WING.
WING.
UNDER-CARRIAGE OLEO LEG.
LOCKING HOOK & PIN
HULL PLATING.
OIL PIPES.
AMPHIBIAN GEAR RAISED FOR FLYING OR ALIGHTING ON WATER.
PETROL TANKS.
BRISTOL AIR-COOLED "PEGASUS" RADIAL ENGINE.
ENCLOSED COCKPIT.
CONTROL WHEEL.
ANCHOR DRUM.
FORWARD GUN.
THROTTLE CONTROLS
WIRELESS OPERATOR.
PILOT
ANCHOR
TOWING EYE.
NAVIGATOR.
TOWING EYE.
POSITION OF STARBOARD CHASSIS LIFTING GEAR.
CHART TABLE.
CHASSIS LIFTING CONTROL LEVER.
BOAT HOOK (STOWED).
2ND PILOT'S WHEEL (STOWED).
2ND PILOT'S PEDALS (STOWED).

Australia acquired 12 Seagull Vs, including A2-18 that was initially delivered to No 5 Squadron and flown from HMAS *Sydney*. Although the aircraft typically flew with one pilot, there were positions for two. The left-hand position was the main one, with the instrument panel and a fixed seat, while the right-hand seat could be folded away to allow access to the nose gun-position via a crawl-way. Behind the cockpit, there was a small cabin with work stations for the navigator and radio operator.

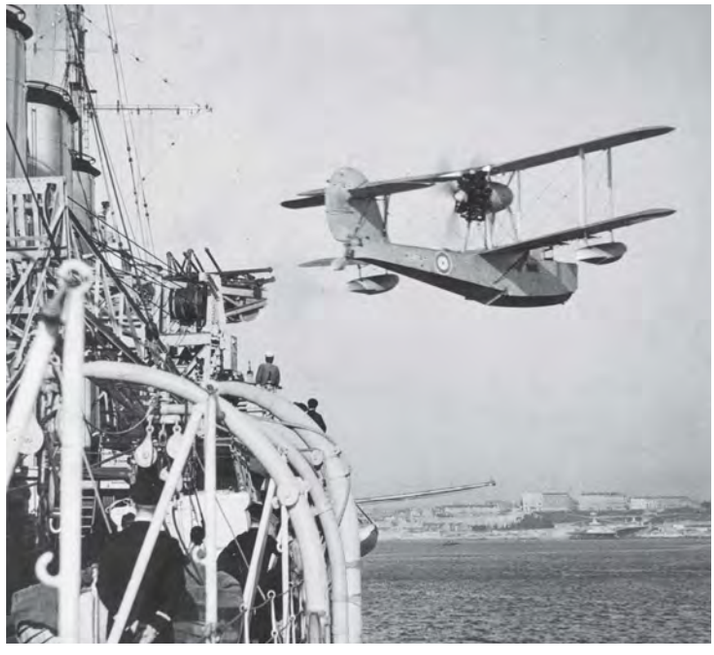
SUPERMARINE WALRUS II

Type: Shipboard Observation and Air-Sea Rescue
Crew: 3-4
Length: 37ft 7in
Wingspan: 45ft 10in
Powerplants: Bristol Pegasus VI (775hp)
Loaded weight: 7,200lb
Max speed: 124mph
Armament: 1 x 0.303in Vickers K machine guns in bow and aft positions, plus underwing bombs or depth charges

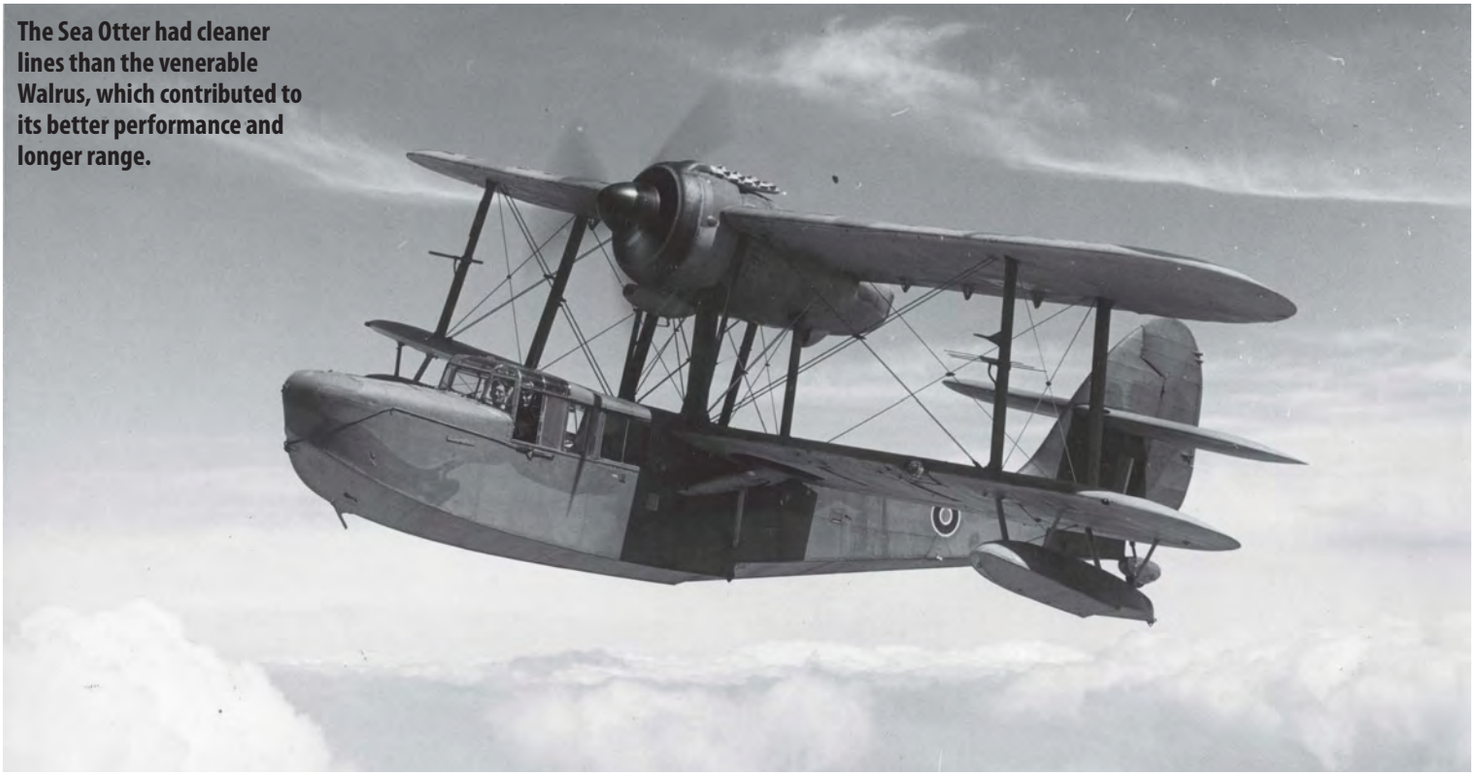


When operating from a warship, the Walrus would be recovered by touching-down alongside, then being lifted from the sea by a ship's crane. The aircraft's lifting-gear was kept in a compartment directly above the engine — one of the Walrus' crew would climb onto the top wing and attach this to the crane hook. Landing and recovery was a straightforward procedure in calm waters, but could be very difficult if the conditions were rough. The usual procedure was for the parent ship to turn through around 20° just before the aircraft touched down, thus creating a 'slick' to the lee side of the ship on which the Walrus could alight, this being followed by a fast taxi up to the ship before the 'slick' dissipated.

The Walrus excelled in its air sea rescue role with the RAF, as illustrated here. Judging from the relaxed nature of the crew and the close proximity of the land, this 'rescue' is presumably being carried out for the benefit of the camera, further credence being supplied by the lowered retractable undercarriage.



Eyes of the fleet. A Walrus being catapulted from a County Class cruiser at the beginning of another long sortie. A successful catapult largely depended on the launching officer, who had to order 'go' at a point when the cruiser itself was at a favourable angle.



The Sea Otter had cleaner lines than the venerable Walrus, which contributed to its better performance and longer range.

Supermarine Sea Otter

Forever in the shadow of its illustrious forebear, the Sea Otter was essentially a longer-range development of the Walrus. It was the last biplane flying boat to be designed by Supermarine and the last to enter service with the RN and the RAF.

Easily distinguishable from the Walrus by its forward-facing (tractor) powerplant, the Sea Otter also had improved aerodynamic and hydrodynamic qualities. Because Supermarine was operating to capacity, the Sea Otter was built by Saunders-Roe.

The Sea Otter I entered service with the Fleet Air Arm in November 1944 aboard the escort carrier HMS *Khedive*, but the bulk of the 292 built were Sea Otter IIs for the RAF for air sea rescue duties.

Eight aircraft were bought for the Royal Danish Air Force, and another eight were supplied to the Dutch Naval Air Arm. The colonial service of France purchased six Sea Otters for use in French Indochina.

SUPERMARINE SEA OTTER II

Type: Air-Sea Rescue
Crew: 3-4
Length: 39ft 7in
Wingspan: 46ft
Powerplants: Bristol Mercury XXX (855hp)
Loaded weight: 9,250lb
Max speed: 150mph
Armament: 1 x 0.303in Vickers K machine guns in bow and aft positions, plus underwing bombs or depth charges

Above: Saunders–Roe built Sea Otters at its Cowes and Weybridge sites, alongside the Walrus. Initially they were designated ABR (Amphibian Boat Reconnaissance) Mk I, but from JN249 the nomenclature ASR MkII was adopted.
Inset: Post war many Sea Otters were converted for civilian use, particularly in Australia where their rugged nature was particularly suited to the harsh bush conditions and extensive coastal regions. Although this ex-RAAF aircraft, JN200, is seen being treated in a less than reverential way, ironically it is the only one to survive (in part) today, its nose section being displayed at Australia's Fleet Air Arm Museum.

CANT Z501

The CANT Z501 Gabbiano (Gull) served with the Italian Regia Aeronautica during World War 2 as a reconnaissance aircraft. It was a record breaker when it made its debut in 1934, but it was hopelessly out dated by the outbreak of war and suffered heavy losses.

Designed by Filippo Zappata, the Gabbiano was produced by Cantieri Riunti dell'Adriatico and was flown for the first time at Monfalcone, Trieste in 1934. It soon established a world record for seaplanes by flying 2,560 miles non-sop to Eritrea, shortly followed by another flight of 3,080 miles to Berbera, Somaliland.

The aircraft had a very slim fuselage, a high parasol wing and a single wing-mounted engine nacelle. The aerodynamic low-drag design was typical of Zappata-designed aircraft, as was the wooden construction. In the prototype a 750hp inline Isotta-Fraschini Asso-750.RC engine was fitted, with an annular (circular) radiator that made the installation resemble a radial engine, although it was actually a liquid-cooled inline. The engine nacelle was extended to carry a rear-facing machine gun, while other guns were mounted in the centre fuselage and nose. Later, the bow cockpit for the observer was enclosed and the nose gun removed.

By the time Italy entered World War 2 on 10 June 1940, 202 Gabbianos were in service with 15 squadrons, mainly used for search and rescue and anti-submarine patrols. The Z501 operated in all theatres of conflict, but it was slow and vulnerable and easy prey for roving fighters and by the end of 1942 only 40 remained operational. The situation was not helped either by problems with the durability of the wooden fuselage, particularly the aircraft built during the war. Its seafaring qualities were poor and it was susceptible to bad weather conditions.

Following Italy's surrender in 1943, a few of these flying boats continued to operate with both the Axis Aeronautica Nazionale Repubblicana and the Allied Italian Co-Belligerent Air Force, but only 10 were left by May 1945.

CANT Z501

Type: Light reconnaissance and bomber

Crew: 4-5

Length: 46ft11in

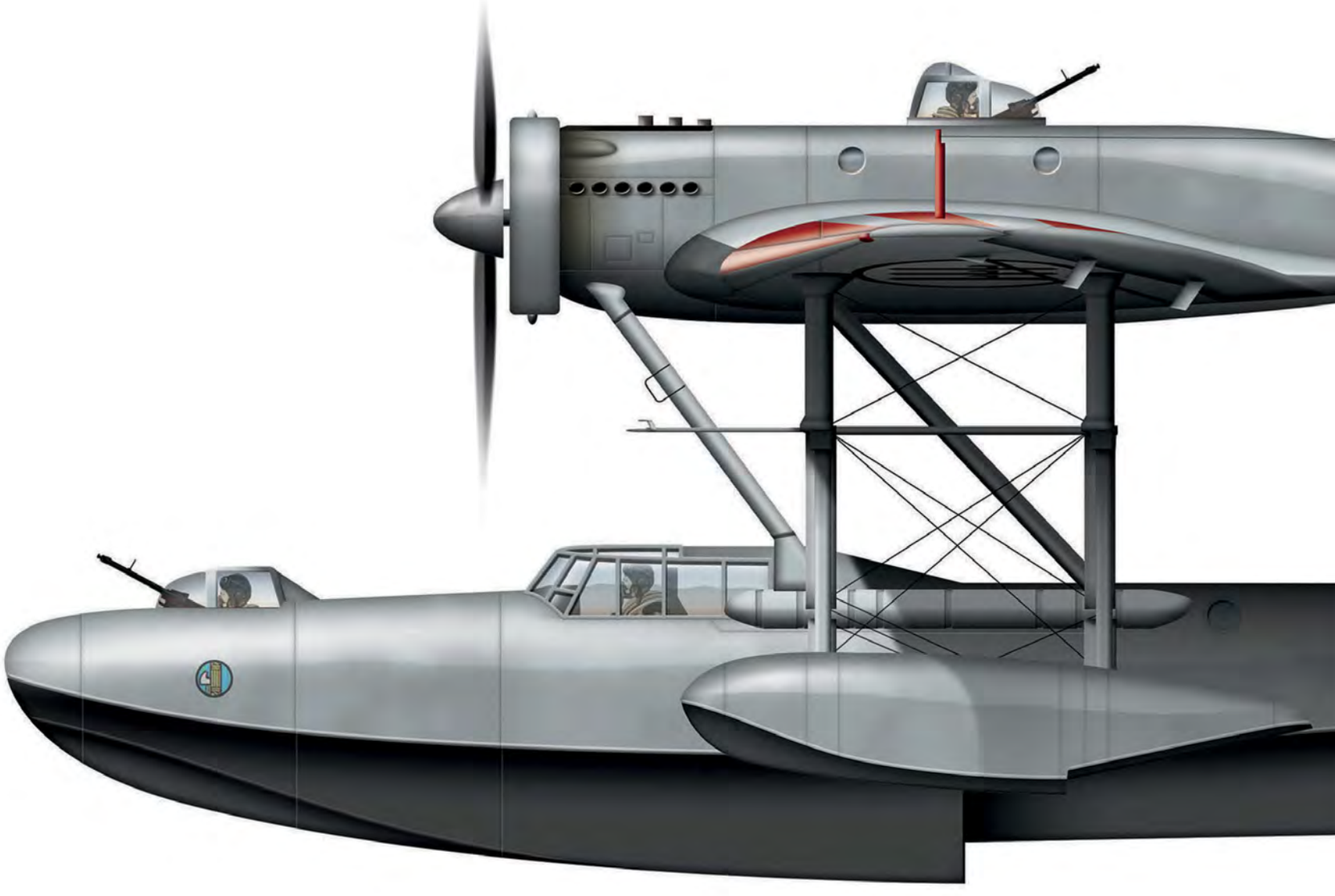
Wingspan: 73ft 10in

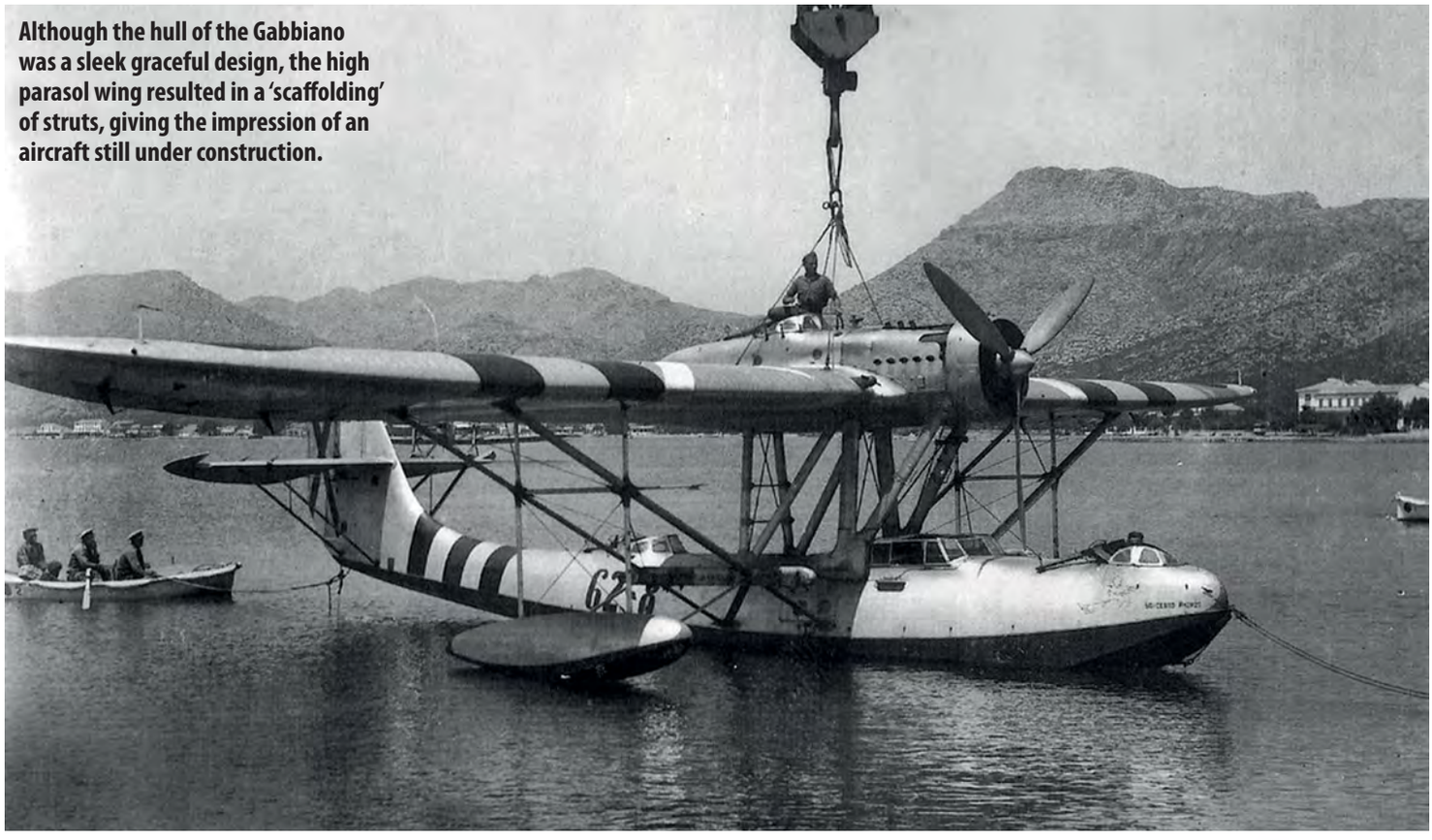
Powerplants: 1 x Isotta Fraschini Asso X1R2 (900hp)

Loaded weight: 13,117lb

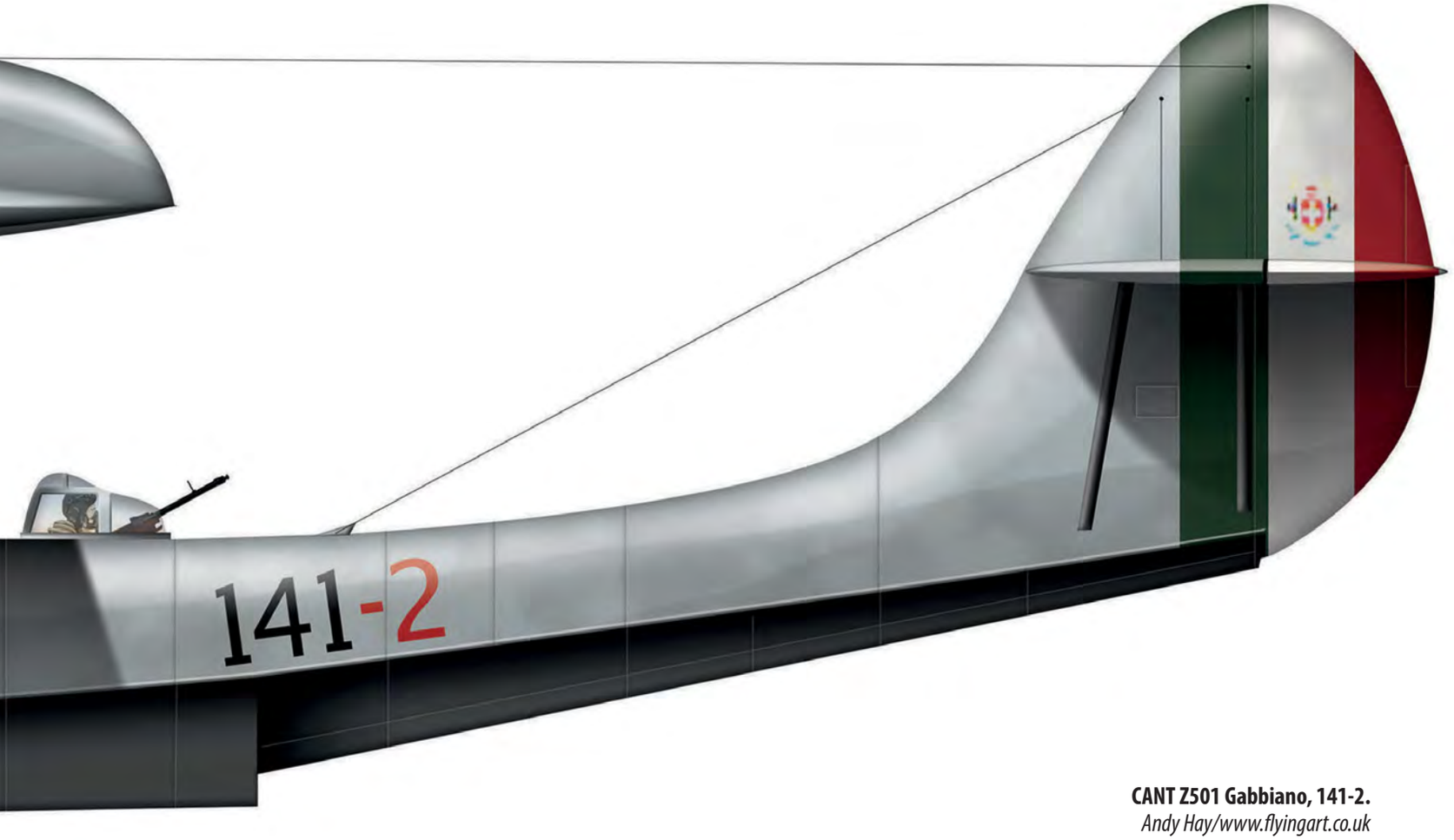
Max speed: 171mph

Armament: 2 x or 3 x 7.7 Breda-SAFAT machine guns and bomb load of 1,404lb





Although the hull of the Gabbiano was a sleek graceful design, the high parasol wing resulted in a 'scaffolding' of struts, giving the impression of an aircraft still under construction.



CANT Z501 Gabbiano, 141-2.
Andy Hay/www.flyingart.co.uk

Kawanishi H6K 'Mavis'

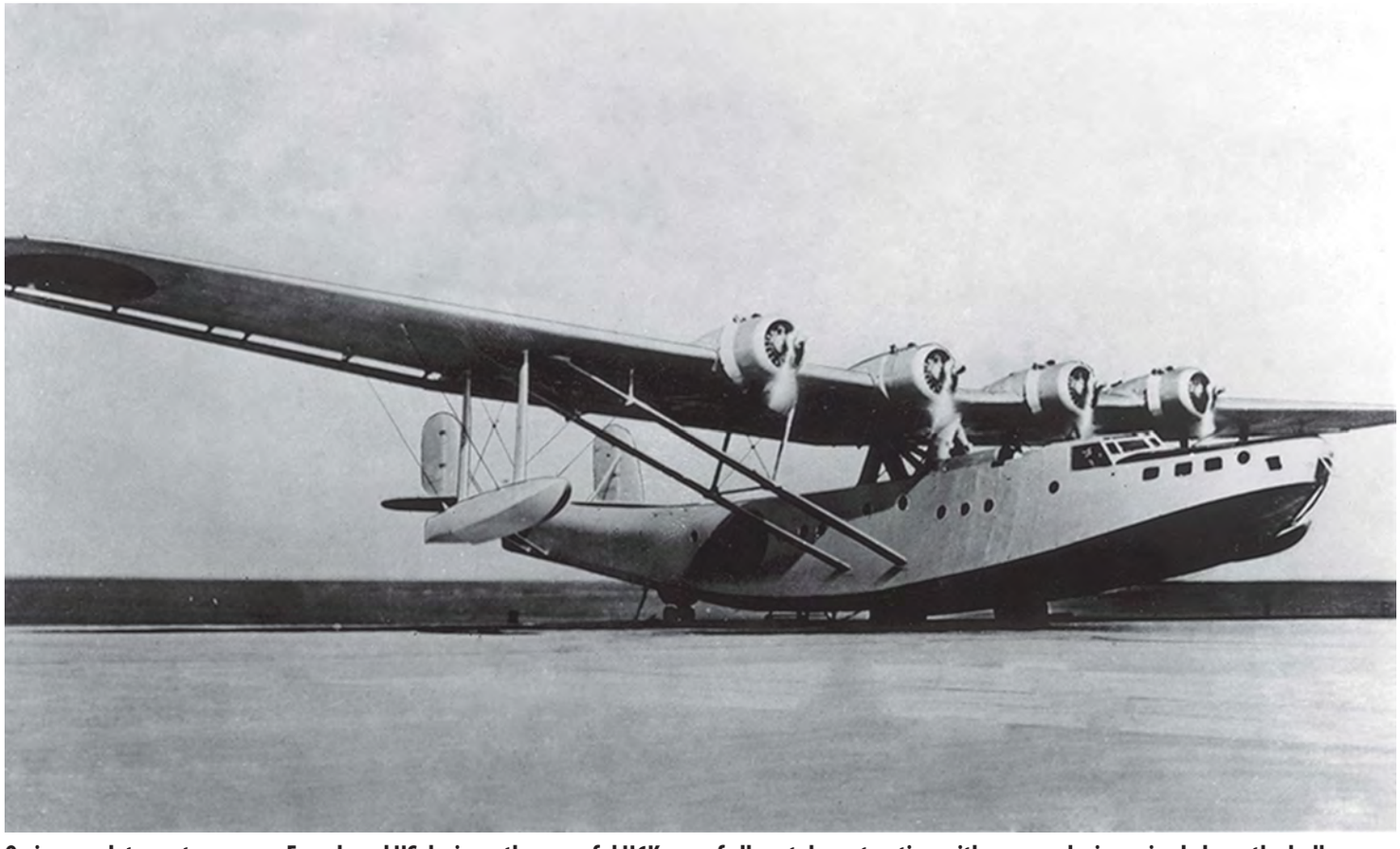
When Japanese forces launched the Pacific War, only one type of long-range maritime reconnaissance flying boat was in front-line service with the Imperial Japanese Navy — the Kawanishi H6K. Heavily influenced by Western designs, 217 were produced between 1936-1943, during which time five variants were built.

The H6K evolved from a specification for a Navy Experimental Large Flying Boat and was designed by a Kawanishi team led by Dr Shizuo Kikuhara. The high-wing strut-braced parasol monoplane H6K (later given the Allied reporting name 'Mavis' during the Pacific War), made its first flight in July 1936, entered full-scale production shortly thereafter and entered IJNAF service in January 1938. Although the H6K was hardly cutting-edge by contemporary standards, it was a great leap forward in terms of indigenous Japanese aircraft design.

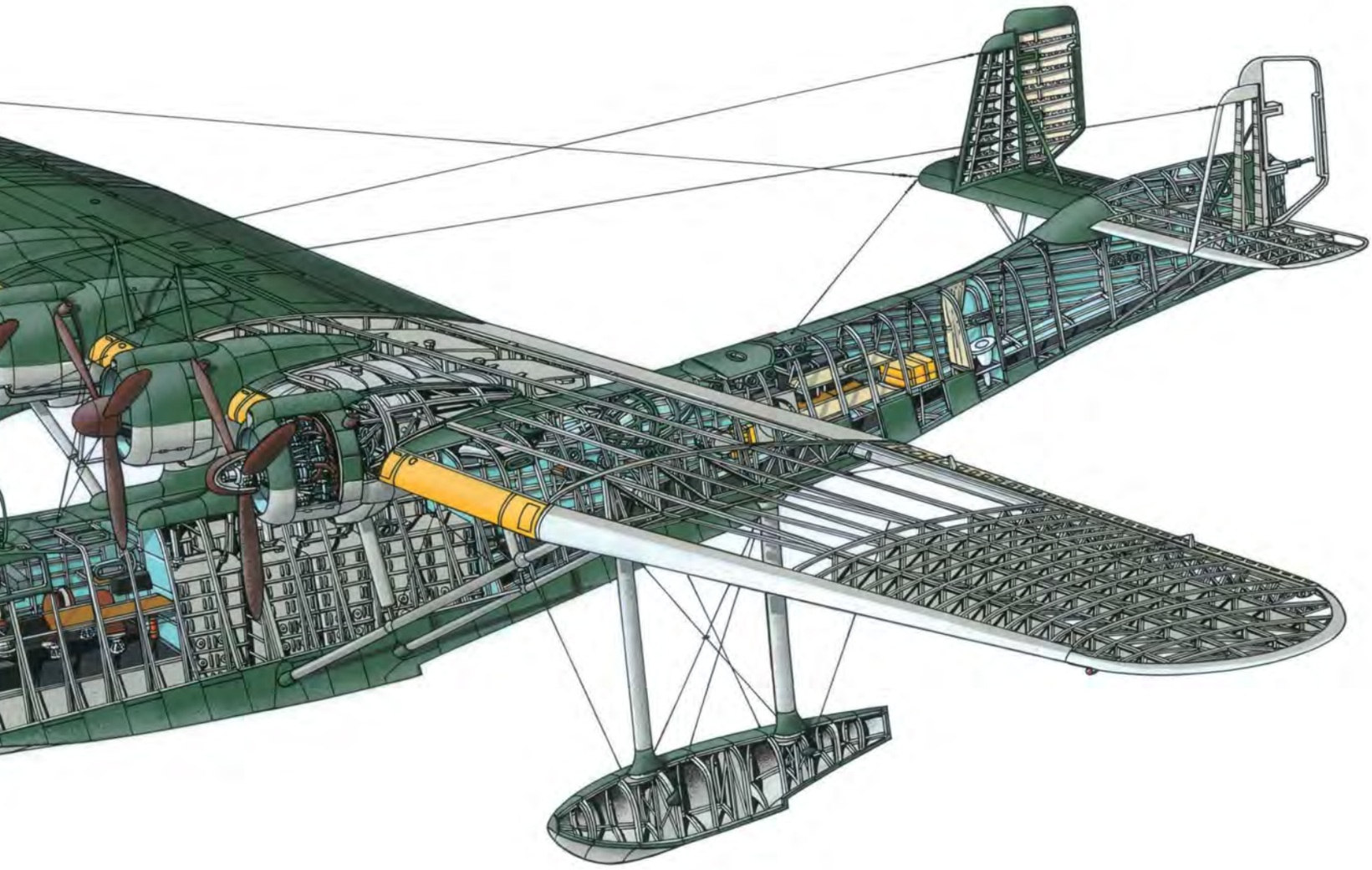
H6Ks were deployed from 1938 onwards, first seeing service in the Sino-Japanese War and were in widespread use by the time the Pacific War full-scale erupted, in 1942. At that time, four Kōkūtai (Air Groups) operated a total of 66 H6K4s. H6Ks had excellent endurance, being able to undertake 24-hour patrols, and were often used for long-range reconnaissance and bombing missions. From bases in the Dutch East Indies, they were able to undertake missions over a large portion of Australia. However it was extremely vulnerable to fighter attack, forcing its gradual retirement from daylight operations as the war progressed.

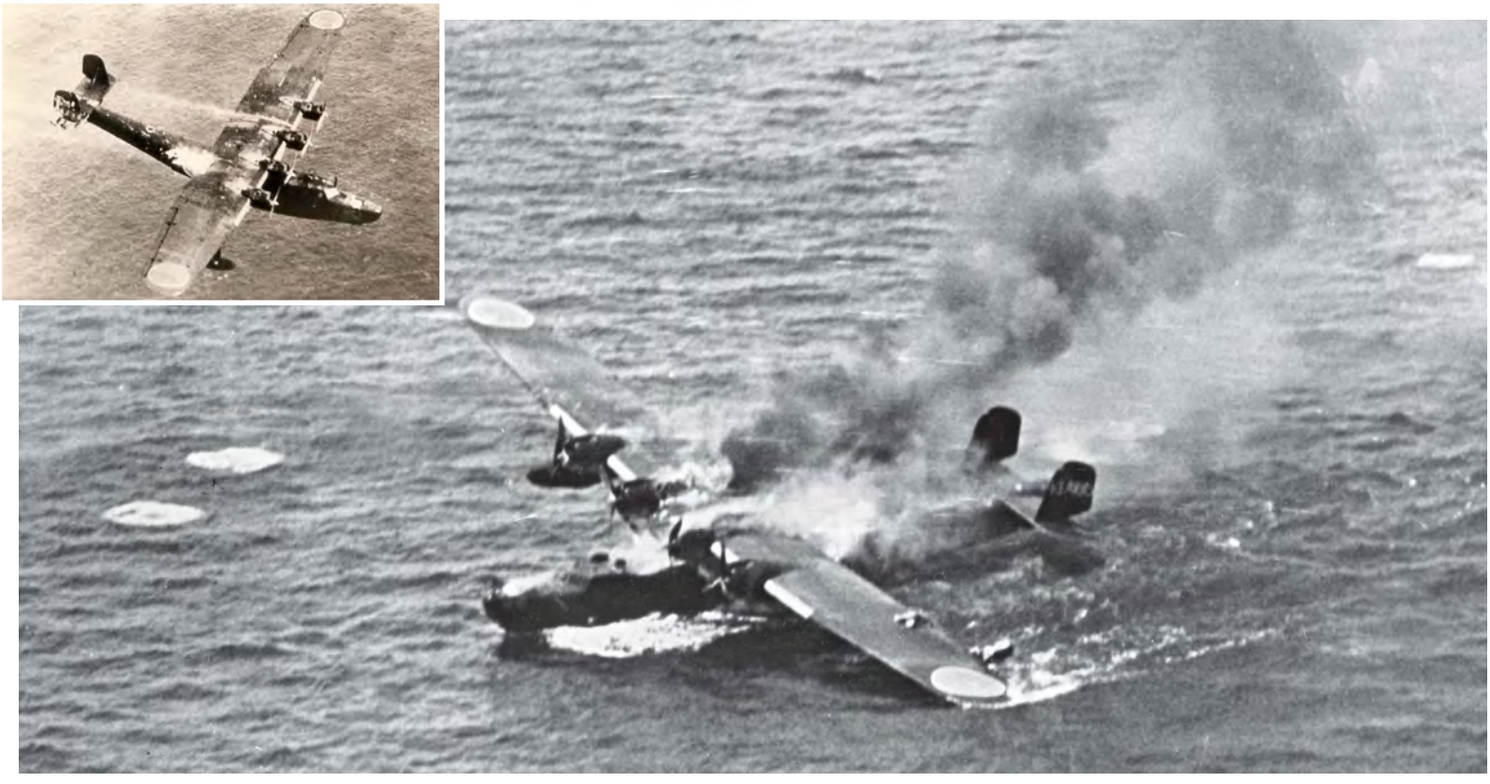
KAWANISHI H6K5

Type: Long-range maritime reconnaissance
Crew: 9
Length: 84ft
Wingspan: 131ft
Powerplants: 4 x 14-cylinder Mitsubishi Kinsei 53s (1,300hp)
Loaded weight: 38,580lb
Max speed: 239mph
Armament: 4 x 7.7mm machine guns in forward and aft dorsal turrets and 1 x 20mm cannon in tail turret, plus 4 x 1,00lb bombs or 2 x 1,764lb torpedoes

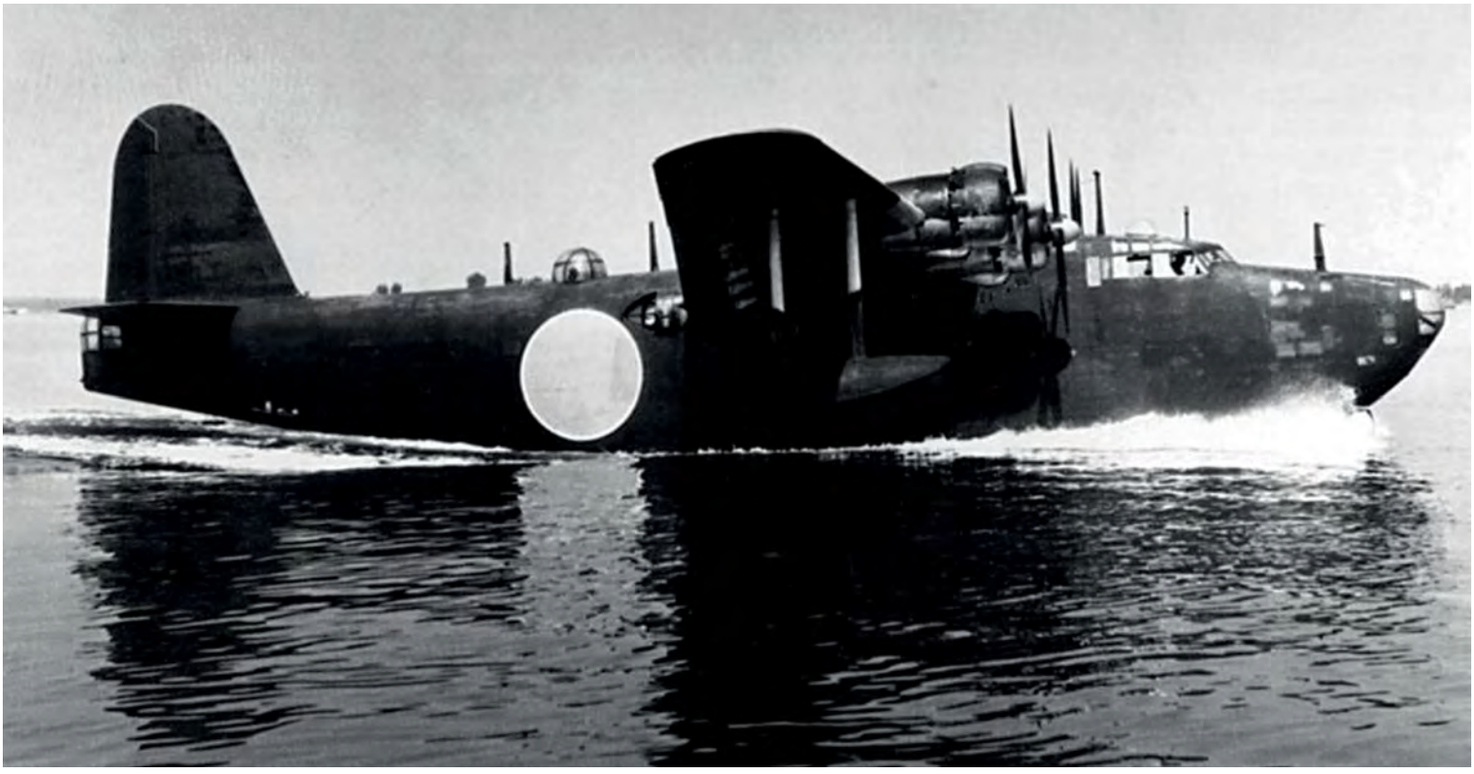


Owing much to contemporary French and US designs, the graceful H6K was of all-metal construction with a parasol wing raised above the hull on inverted tee struts.





Although the H6K 'Mavis' bristled with machine guns, it lacked armour for the crew and engines, nor was it equipped with self-sealing fuel tanks. Thus if encountered, it was easy prey for Allied fighter pilots, as these dramatic images illustrate.



A captured Japanese Kawanishi H8K 'Emily' under evaluation at the US Naval Air Test Center at Patuxent River, Maryland, in 1946-47. The Mitsubishi Kasei two-row 14-cylinder air-cooled supercharged radial engine was one of the most important and dependable Japanese engines of the Pacific War.

Kawanishi H8K 'Emily'

Of all the long-range maritime-patrol flying-boats used during World War 2, arguably none was better than the Imperial Japanese Navy Air Force's four-engined Kawanishi H8K, code-named 'Emily' by the Allies. The H8K saw action as a bomber, transport and reconnaissance machine, and in the early days of the Pacific War was selected to undertake the longest bombing mission in history up to that point.

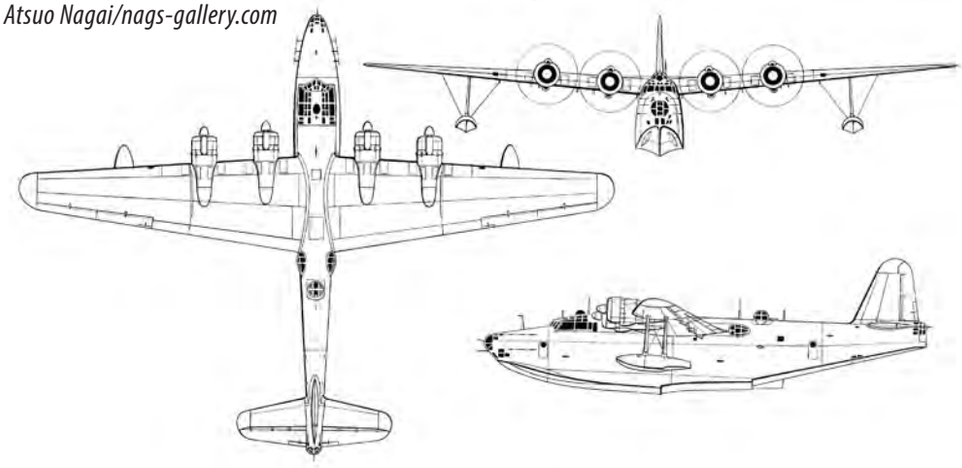
After the success of the Kawanishi H6K, the IJNAF was encouraged to develop an even more ambitious flying boat design, this time under the 13-Shi Specification, which called for a machine with superior performance to Britain's Short Sunderland. It was a tough assignment, but on the last day of 1940 the prototype was rolled out of the Kawanishi factory at Naruo. It was soon joined by two pre-production aircraft, which incorporated the fruits of the prototype's extensive test programme, and the aircraft was accepted for service with the IJNAF as the H8K1. From aircraft 17 onwards it was fitted with Kasei 22s powerplants, the more powerful aircraft being designated H8K2, which became the definitive production version with 112 being built. By mid-1942 the Allies had introduced its reporting name system, and the H8K2 was given the name 'Emily'. A transport version was also produced that could accommodate up to 64 fully-armed troops and 36 of this version were built as H8K2-Ls.

The 'Emily' proved itself to be a dependable workhorse for the IJNAF during the Pacific War and was to be found in the thick of the action wherever it was deployed. While not the most manoeuvrable of aircraft, it was certainly one of the prickliest customers an enemy fighter pilot could face, being armed to the teeth and well protected by armour. The H8K2 carried its offensive ordnance on wing-mounted racks, on which could be fitted two 800kg (1,765lb) torpedoes or 800kg bombs per wing, or eight 250kg (550lb) or 16 x 60kg (130lb) bombs.

As Japan's defensive perimeter began to shrink rapidly in the last year of the war, so the movements of the IJNAF's flying boat units were much restricted. Allied air superiority and a lack of spares severely compromised the H8K's excellent qualities, and by the end of the conflict only a handful of the mighty flying boats remained to be surrendered.

A Japanese Kawanishi H8K 'Emily' of the 851st Kokutai in flight in July 1944. Seconds later it was shot down by a US Navy Consolidated PB4Y-1 Liberator of VB-115, from which this photo was taken.

Kawanishi H8K2 Type 2 flying boat model 12 (Allied code-name 'Emily'), s/n 426, 5th Naval Air Wing (Kikusui Force) at Takuma Air Group on April 1945. This H8K2 was captured by the US Navy and postwar sent to Patuxent River for testing. Today it is preserved at JMSDF Kanoya.
Atsuo Nagai/nags-gallery.com



KAWANISH H8K2 'EMILY'

Type: Long range maritime reconnaissance

Crew: 10

Length: 92ft 4in

Wingspan: 124ft 8in

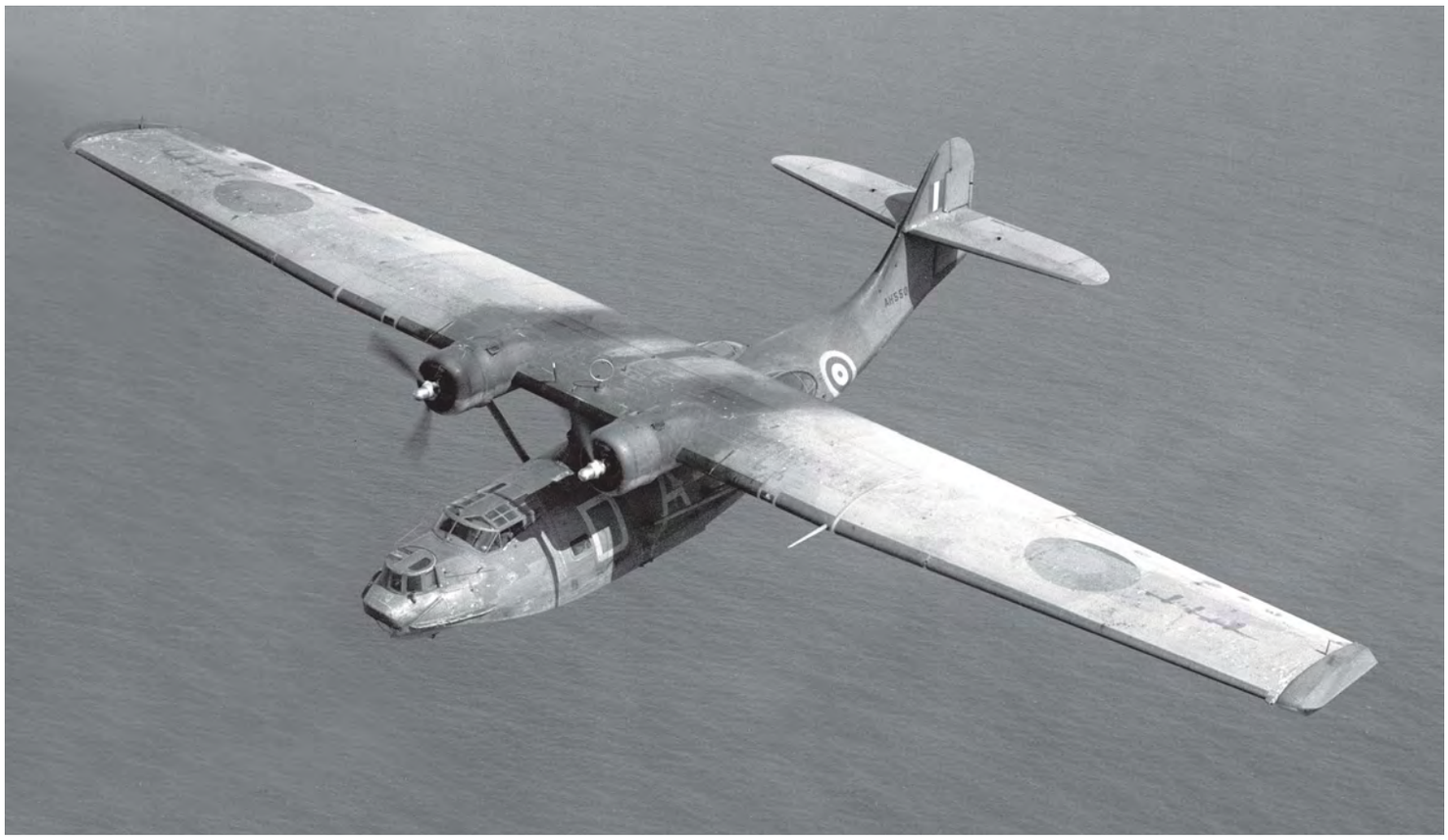
Powerplants: 4 x 14-cyinder Mitsubishi Kasei 22s (1,850hp)

Loaded weight: 54,013lb

Max speed: 290mph

Armament: 1 x 20mm cannon in bow, dorsal and tail turrets and two beam blister and four hand-held 7.7mm machine guns, plus 8 x 550lb bombs or 2 x 1,764lb torpedoes

US Army troops pause for a look at a wrecked H8K seaplane during the battle of Makin. The aircraft was under repair in the lagoon when the invasion started. The Japanese used it as a machine gun nest until American fliers took care of it.



RAF Catalina Mk I DA-L AH550 of No 210 Squadron, one of the first to be delivered to the service in 1941. The Catalina saw its first true action with the RAF's Coastal Command when, on 26 May 1941, a No 209 Squadron machine captained by Plt Off Dennis Briggs located in mid-Atlantic the German battleship *Bismarck*.

Consolidated PBY Catalina

The appearance of the Consolidated Catalina is such as to make it one of the most recognisable aircraft of all time, at once somehow graceful and ungainly, yet in every sense also highly functional. The product of an innovative manufacturer, this patrol flying boat was of great importance to Allied victory in World War 2 and performed superbly in every theatre to which it was assigned.

The Catalina stemmed from the XP3Y-1, which had been ordered by the US Navy in 1933. Such was the performance of the aircraft when it commenced flying trials in March 1935, that the US Navy broadened its requirement from that of a patrol to a patrol-bomber flying boat. So confident was the US Navy in the design that before the first production PBY-1 emerged in September 1936, it placed an order for 50 of the slightly-modified PBY-2 variant. Service entry of the PBY-1 followed soon after. The PBY-3 and PBY-4 introduced more powerful Twin Wasp engines while the last few examples of the latter housed the waist guns in characteristic glazed fuselage-side blisters rather than behind hatches. These aircraft, of course, were still pure flying boats, but a single-aircraft contract signed in April 1939 changed that. The Navy requested that a single PBY-4 be completed as an amphibian, thus becoming the prototype XPBY-5A. 1940 saw a first export deal, one of great significance — Britain's Royal Air Force wanted 30 PBY-5s, to which it gave the designation Catalina I. The name, that of an island off the Californian coast, stuck, and the Americans adopted it too.

War, especially when US engagement began following the Japanese attack on Pearl Harbor, spurred ever more production contracts. Yet, with the odd exception, the PBY design changed little, testament to its essential 'rightness'.

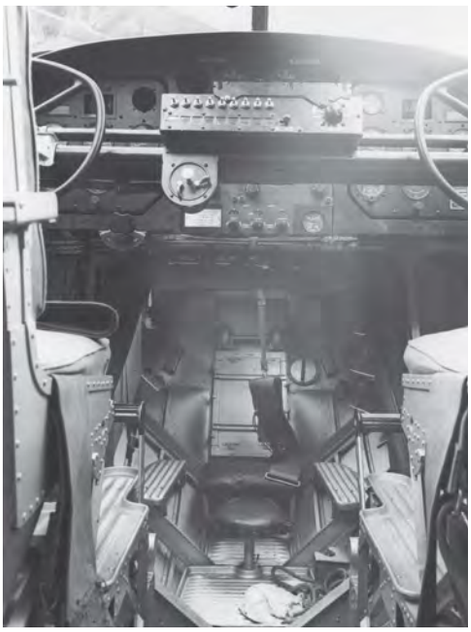
It is impossible here to do justice to the full range of the PBY's wartime exploits across all theatres —from the Atlantic to the Indian Ocean and the Pacific, from air-sea rescue duties to night-time nuisance raids, from the heat of North Africa to the cold of the Eastern Front. Its great range was a boon; crucial, indeed, in allowing Catalinas to roam where other Allied aircraft simply could not go. As an anti-submarine warfare weapon the PBY bore a considerable load, and unquestionably did much to defeat the U-boat menace. By the end of the war, more Catalinas had been built than all other flying boats combined, making it a true world-beater.

CONSOLIDATED PBY-5A CATALINA

Type: Long-range maritime reconnaissance
Crew: 7-9
Length: 63ft 10in
Wingspan: 104ft
Powerplants: 2 x 14-cylinder Pratt & Whitney R-1830-92 Twin Wasps (1,200hp)
Loaded weight: 32,414lb
Max speed: 169mph
Armament: 2 x 0.303in machine guns in bow, 1 x 0.303in machine gun in ventral tunnel, 1 x 0.5in gun in each beam blister, plus 4 x 1,000lb bombs, or two Mk13-2 torpedoes, or depth charges.

An unidentified PBY gets 'up on the step' during its take-off run. The PBY's wing was mounted high up on a streamlined pylon, keeping the twin engines on the leading edge well away from the water. The outboard floats folded up to form the wingtips.

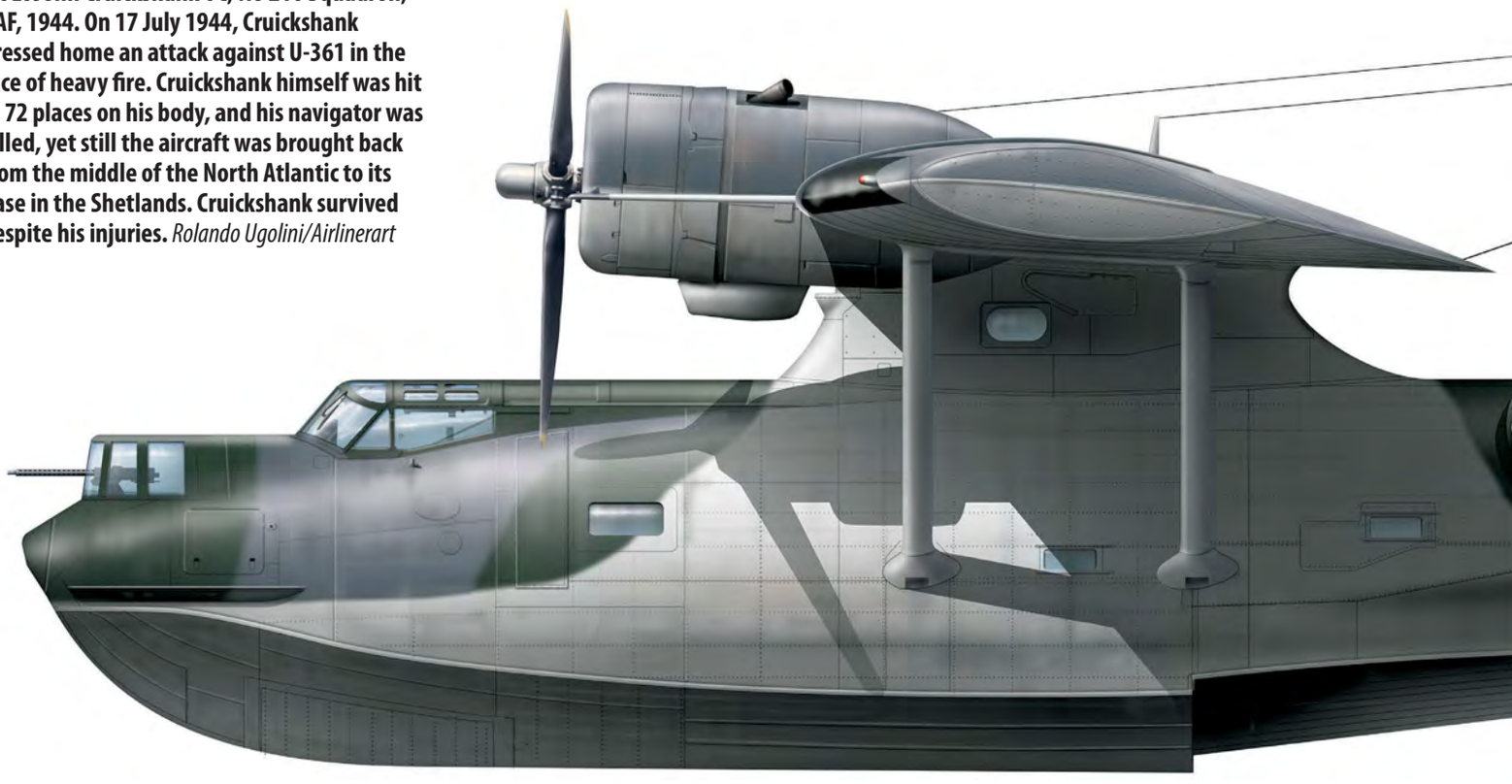
Still in pre-war markings, this impressive line-up of PBYs was captured during 1941 at NAS Corpus Christi, Texas.



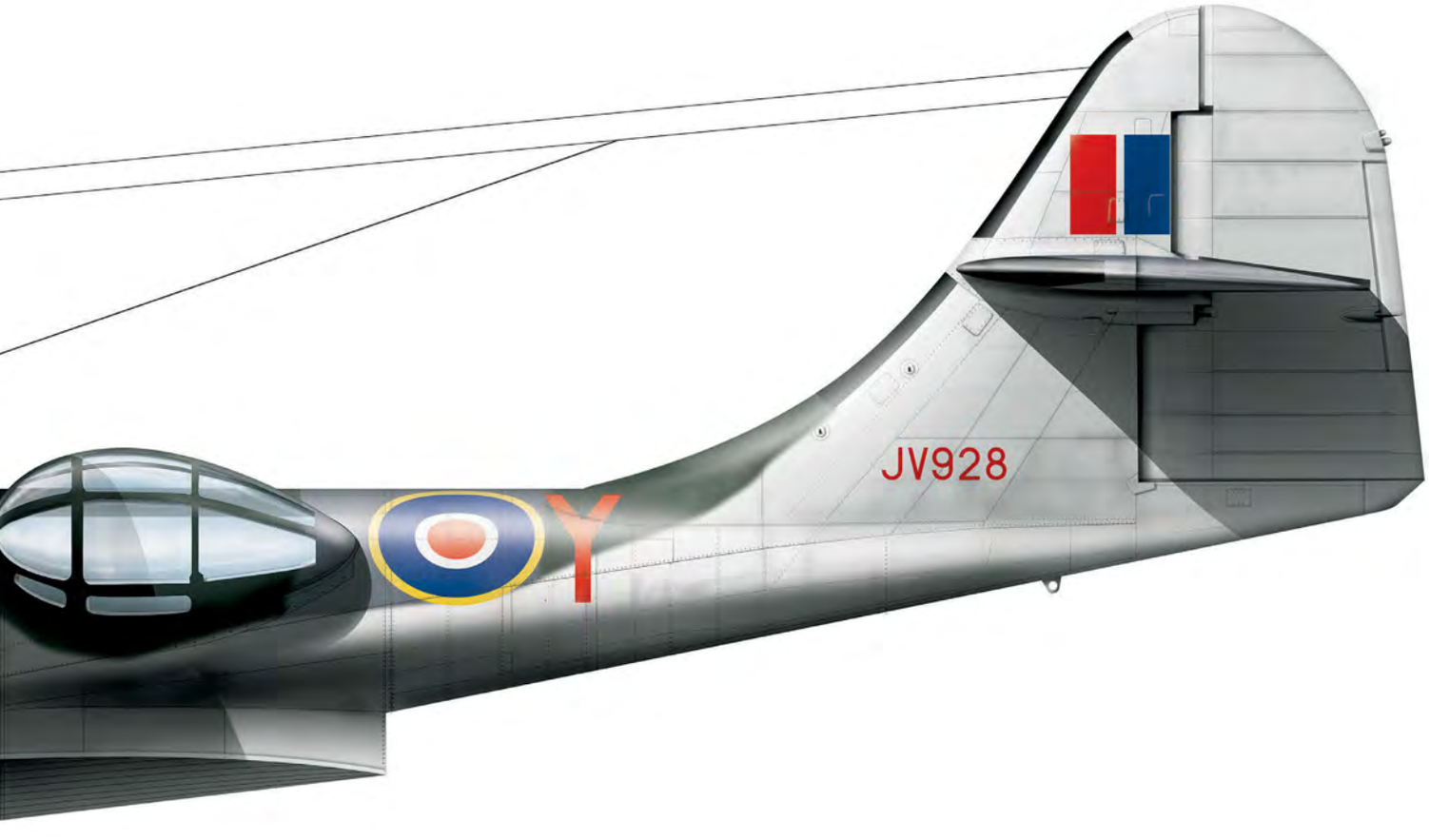
The front office of the Catalina, looking forward and down into the bow compartment and the forward mooring door. The fuselage was divided up by four bulkheads into five compartments. Furthest forward, the bomber's compartment was in the nose, with the two-man pilot's compartment aft of that; behind, one found the radio/radar operator's and navigator's compartment, while the engineer's station was in the superstructure supporting the wing. Further aft came the crew quarters and lastly the two gun blisters and the tail compartment.

Bite of the Cat. US Navy aviation ordnance mate Jesse Rhodes Waller poses with a .30-calibre Browning machine gun on a PBY-5A at NAS Corpus Christi, Texas, in 1942.

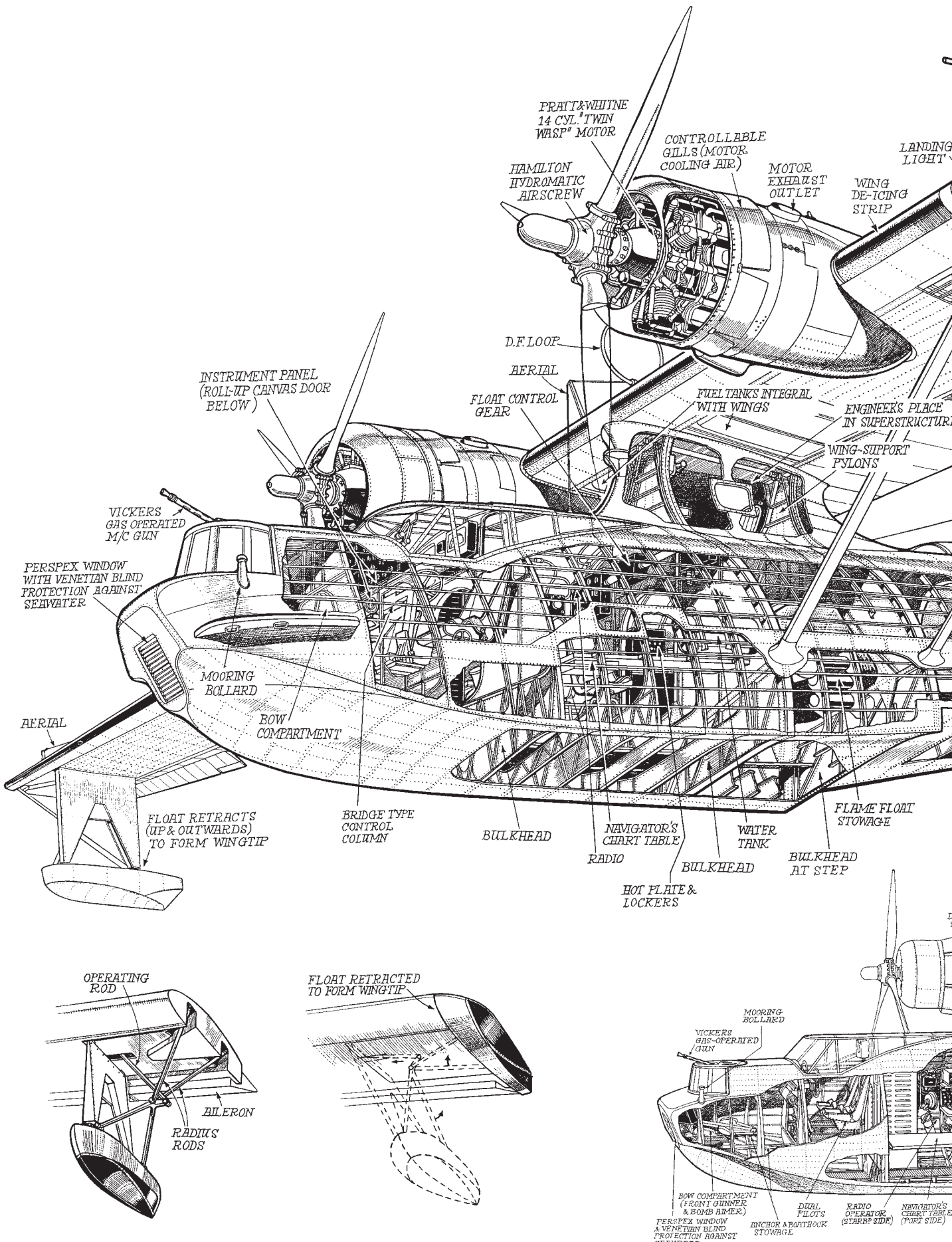
Consolidated Catalina IVa, JV928/Y flown by Flt Lt John Cruickshank VC, No 210 Squadron, RAF, 1944. On 17 July 1944, Cruickshank pressed home an attack against U-361 in the face of heavy fire. Cruickshank himself was hit in 72 places on his body, and his navigator was killed, yet still the aircraft was brought back from the middle of the North Atlantic to its base in the Shetlands. Cruickshank survived despite his injuries. *Rolando Ugolini/Airlinerart*

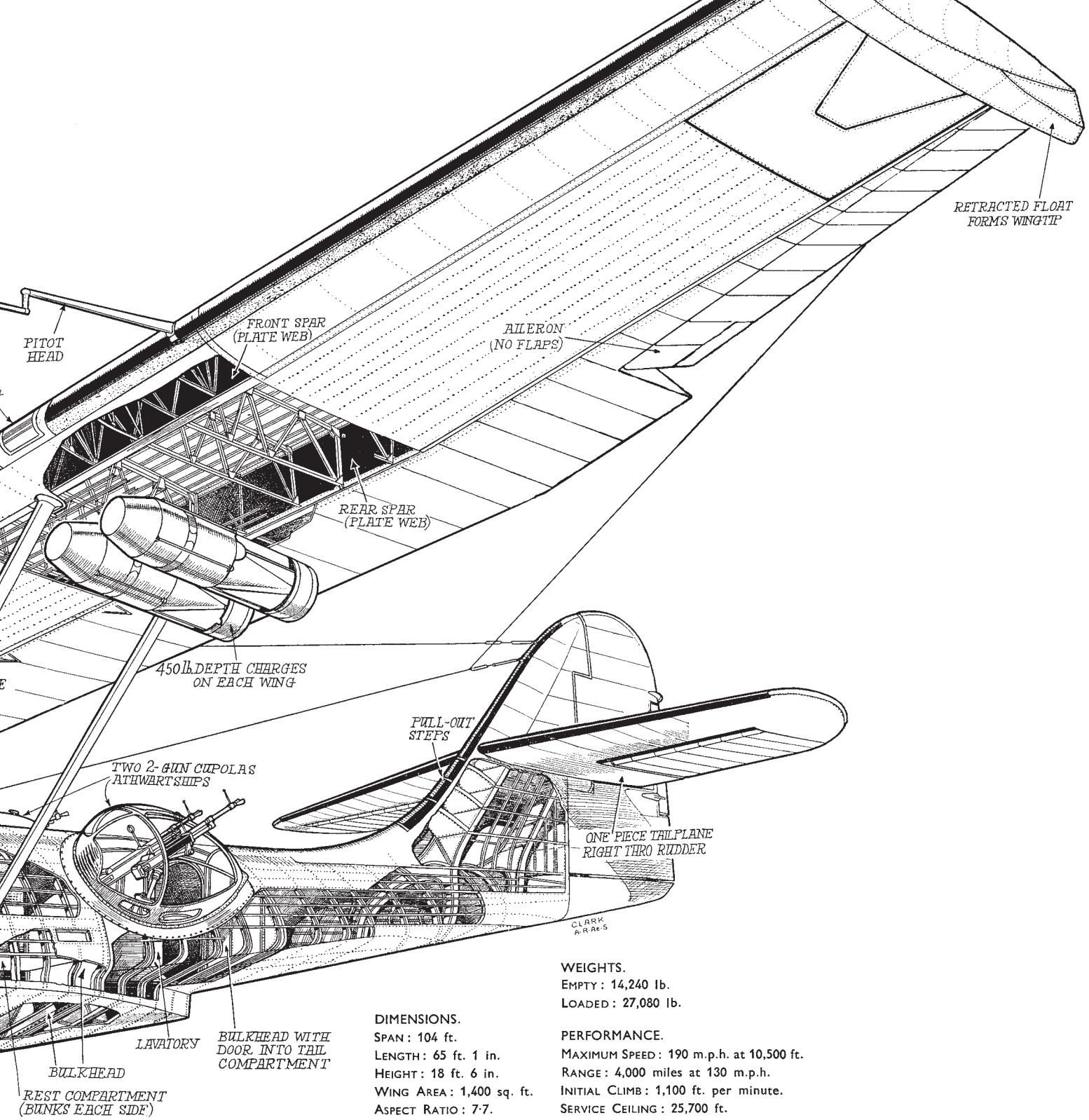


Catalinas flew in every theatre of conflict during World War 2, often operating under extreme conditions. Here US Navy personnel free a PBY-5A from frozen waters at Kodiak Bay, Alaska, some time in 1942-43.



Consolidated PBY Catalina





DIMENSIONS.

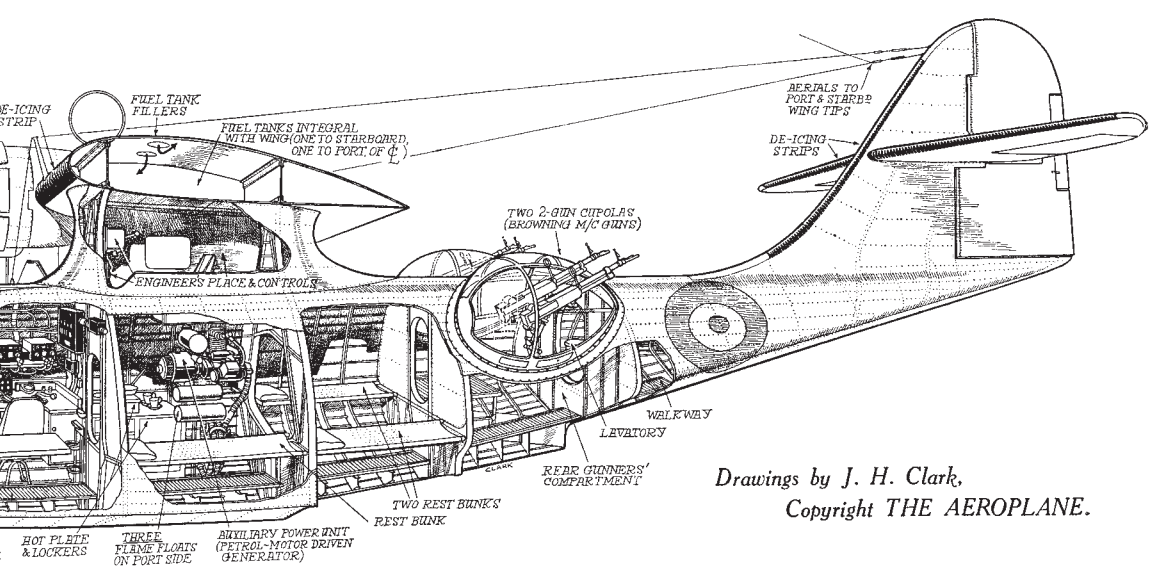
SPAN : 104 ft.
LENGTH : 65 ft. 1 in.
HEIGHT : 18 ft. 6 in.
WING AREA : 1,400 sq. ft.
ASPECT RATIO : 7·7.

WEIGHTS.

EMPTY : 14,240 lb.
LOADED : 27,080 lb.

PERFORMANCE.

MAXIMUM SPEED : 190 m.p.h. at 10,500 ft.
RANGE : 4,000 miles at 130 m.p.h.
INITIAL CLIMB : 1,100 ft. per minute.
SERVICE CEILING : 25,700 ft.



Drawings by J. H. Clark,

Faded and patched, war-weary PBYs dominate the deck of the escort carrier USS *Thetis Bay* in July 1944 as it transports its cargo, also including F6F Hellcats and a J2F Duck, from Hawaii to Alameda for repairs.

One of the most distinctive and best-loved shapes in aviation, the Consolidated Catalina. This version is a Naval Aircraft Factory-built PBN-1 Nomad, a variant derived from the PBY-5 but featuring a sharper bow, extended aft hull step and redesigned taller tail.

Some of the most famous PBY exploits of the war were those by the so-called 'Black Cats', black-painted Catalinas that carried out night missions in the Pacific theatre. US Navy examples in the South-west Pacific were hugely successful on night interdiction sorties against Japanese shipping.

Baptism of fire. Desperate efforts to save a burning PBY at NAS Kaneohe, Hawaii, after the Japanese attack of 7 December 1941. PBYs were sitting ducks when the Japanese attacked Hawaii on 7 December 1941. After the first striking wave, just 10 of 61 Catalinas stationed on the island of Oahu remained available — seven had been airborne, while two survived at Kaneohe and one at Wake Island.

The XPB2Y-1 prototype Coronado in its third modification fitted with a redesigned twin tail section to improve lateral stability. The tail fins on this vertion were practically circular, whereas production models featured a more oblong design, similar to those of the B-24 Liberator.

Consolidated PB2Y Coronado

The big-brother of the Consolidated Catalina, the Coronado was meant to build on the success of its famous predecessor. However, its performance never fulfilled its promise and by the end of the war the Coronado was already outmoded, both as a bomber and a transport.

Within months of the first Consolidated PBY Catalina prototype taking to the skies, the US Navy instructed its manufacturer to produce a prototype of a larger flying-boat. First flown on 17 December 1937, Consolidated's aircraft was designated the XPB2Y-1 by the US Navy and was an all metal flying boat featuring retractable wingtip stabilising floats, a single tail fin and internal wing bays for its bomb load. Powered by Pratt & Whitney Twin Wasps, trials revealed serious lateral instability, resulting in the complete re-design of the tail assembly into a configuration similar to the Mariner. Production aircraft emerged with the characteristic deep hull and development continued throughout the war. The PB2Y-3, featuring self-sealing fuel tanks and additional armour, entered service just after the attack on Pearl Harbor and formed most of the early-war Coronado fleet.

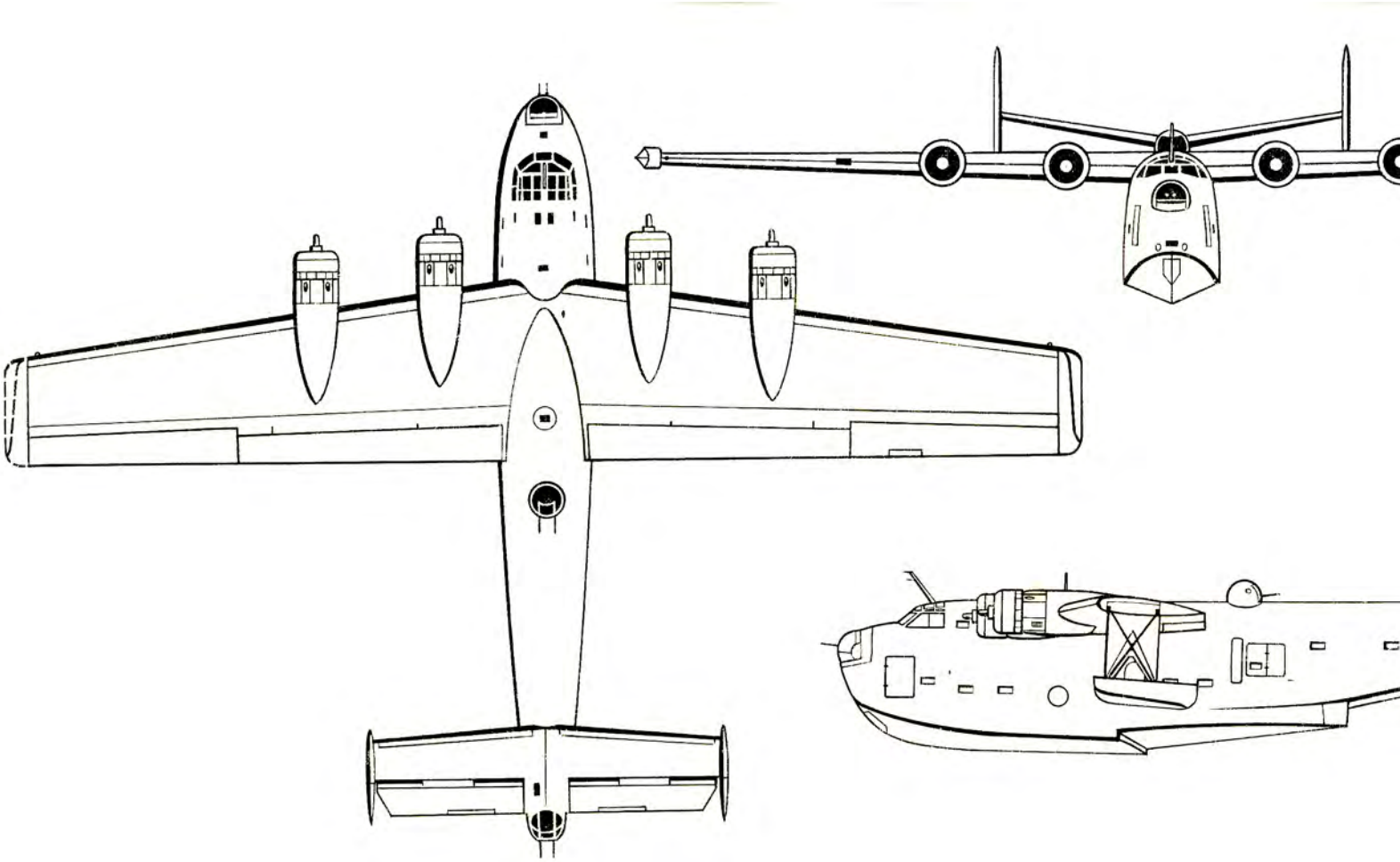
RAF Coastal Command had hoped to use the Coronado as a maritime patrol bomber. However, the range of the big flying boat (1,070 miles) compared poorly with the Catalina (2,520 miles) and the Short Sunderland (1,780 miles). Consequently, the 10 Coronados supplied to the RAF under Lend-Lease were outfitted purely as transports, serving with RAF Transport Command's No 231 Squadron on freight services across the North Atlantic and between Africa and the West Indies. After the war ended five of the RAF aircraft were scrapped, one had already been lost in a collision with a PBM Mariner and the last four were scuttled off the coast of Bermuda in 1946.

Meanwhile, Coronados continued to serve as a major component in the US Naval Air Transport Service (NATS) in the Pacific theatre. Although most had originally been acquired as combat patrol aircraft, again its poor performance in relation to other comparable types quickly relegated them to transport service. By the end of the conflict, the Coronado had become obsolete and virtually all of the 210 aircraft built were quickly scrapped.

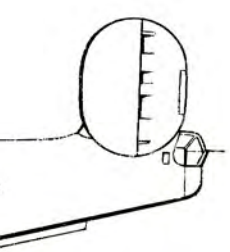
CONSOLIDATED PB2Y-3 CORONADO

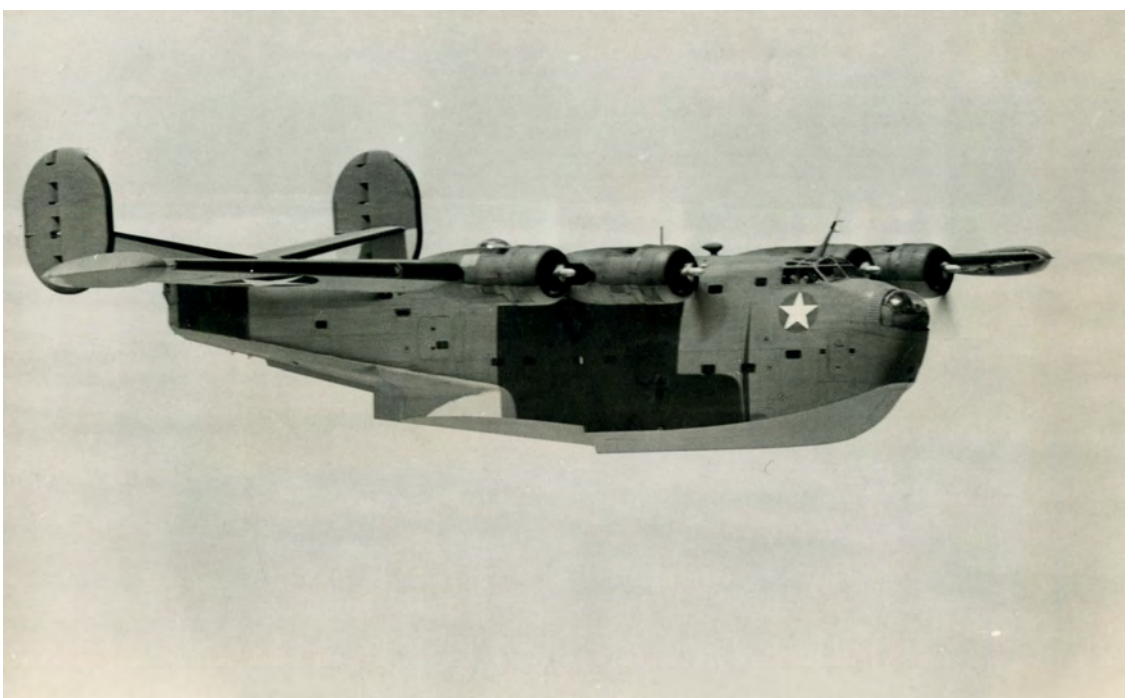
Type: Long-range maritime reconnaissance/patrol bomber
Crew: 10
Length: 79ft 3in
Wingspan: 115ft
Powerplants: 4 x Pratt & Whitney R-1830-88 Twin Wasp (1,200hp)
Loaded weight: 68,000lb
Max speed: 199mph
Armament: 2 x 0.5in machine guns in nose, dorsal and tail turrets and 1 x 0.5in in each of two beam positions, plus eight 1,000lb bombs internally (or equivalent) and four 1,000lb externally, or depth charges or torpedoes

Consolidated PB2Y Coronado

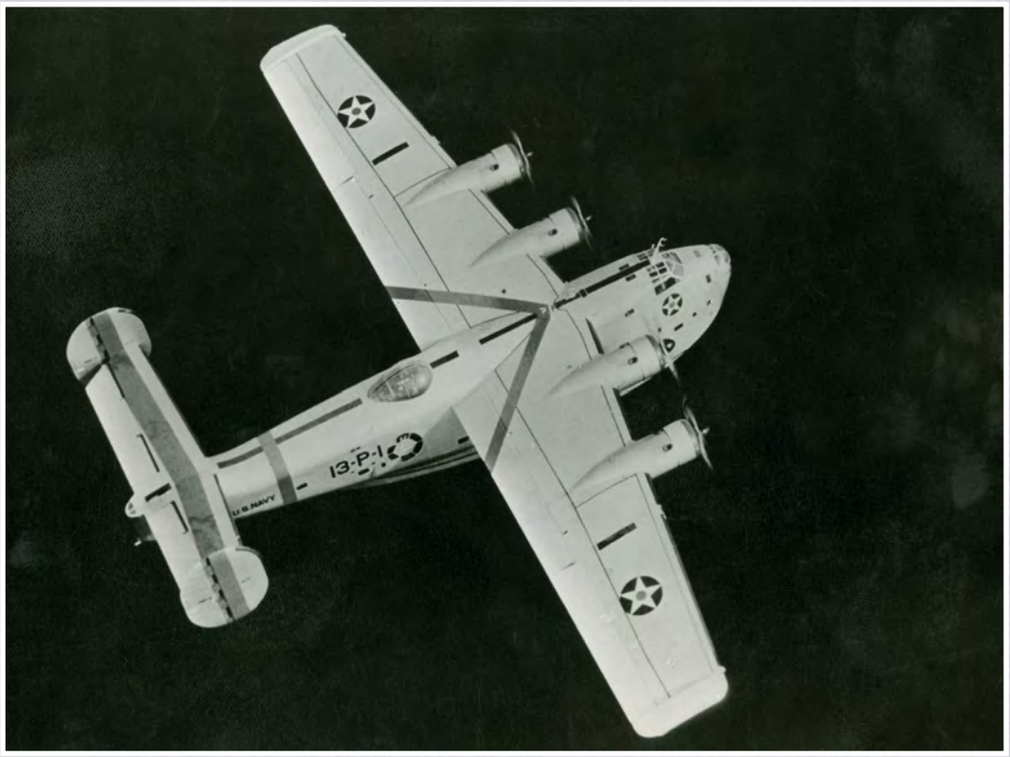


Consolidated PB2Y Coronado long-range maritime reconnaissance/ patrol bomber.
Andy Hay/www.flyingart.co.uk





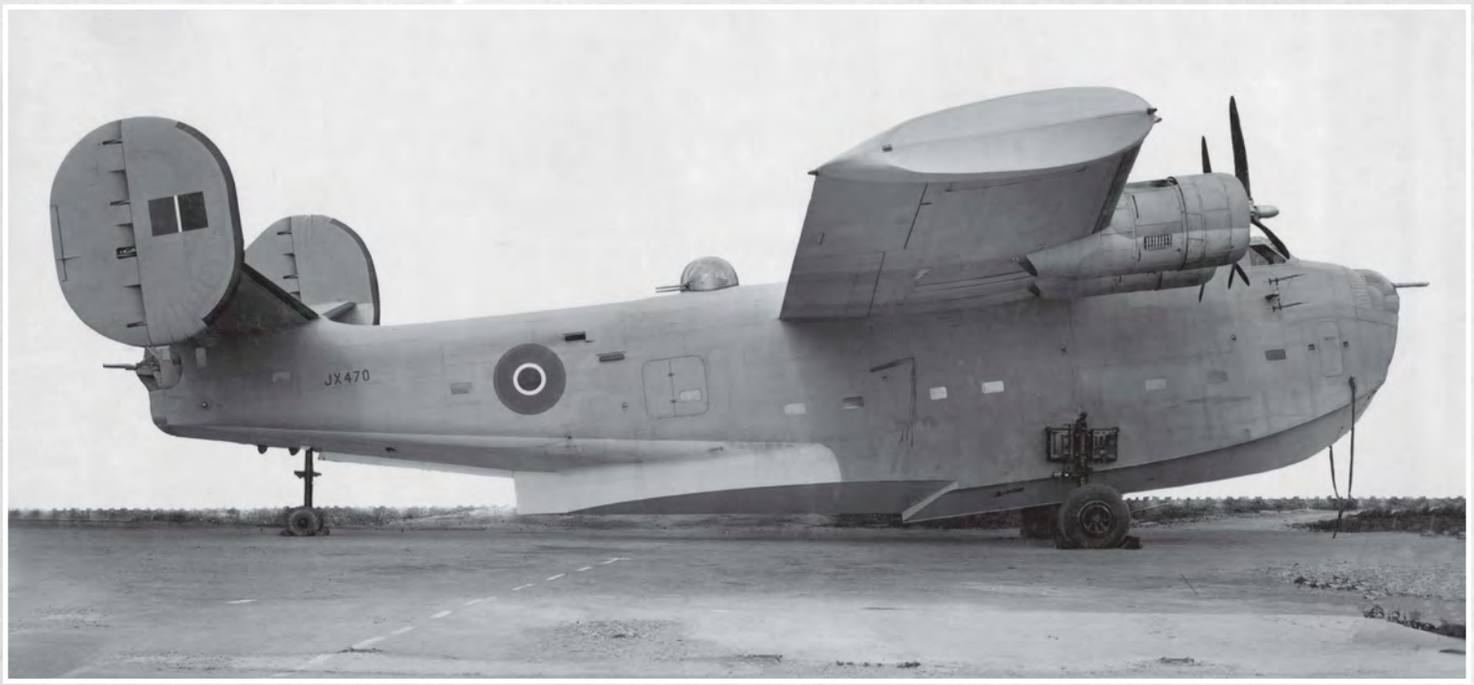
The Coronado was big in every sense of the word, but sadly its performance did not match up to its appearance. Designed for long-range maritime patrol, it was soon relegated to transport duties.

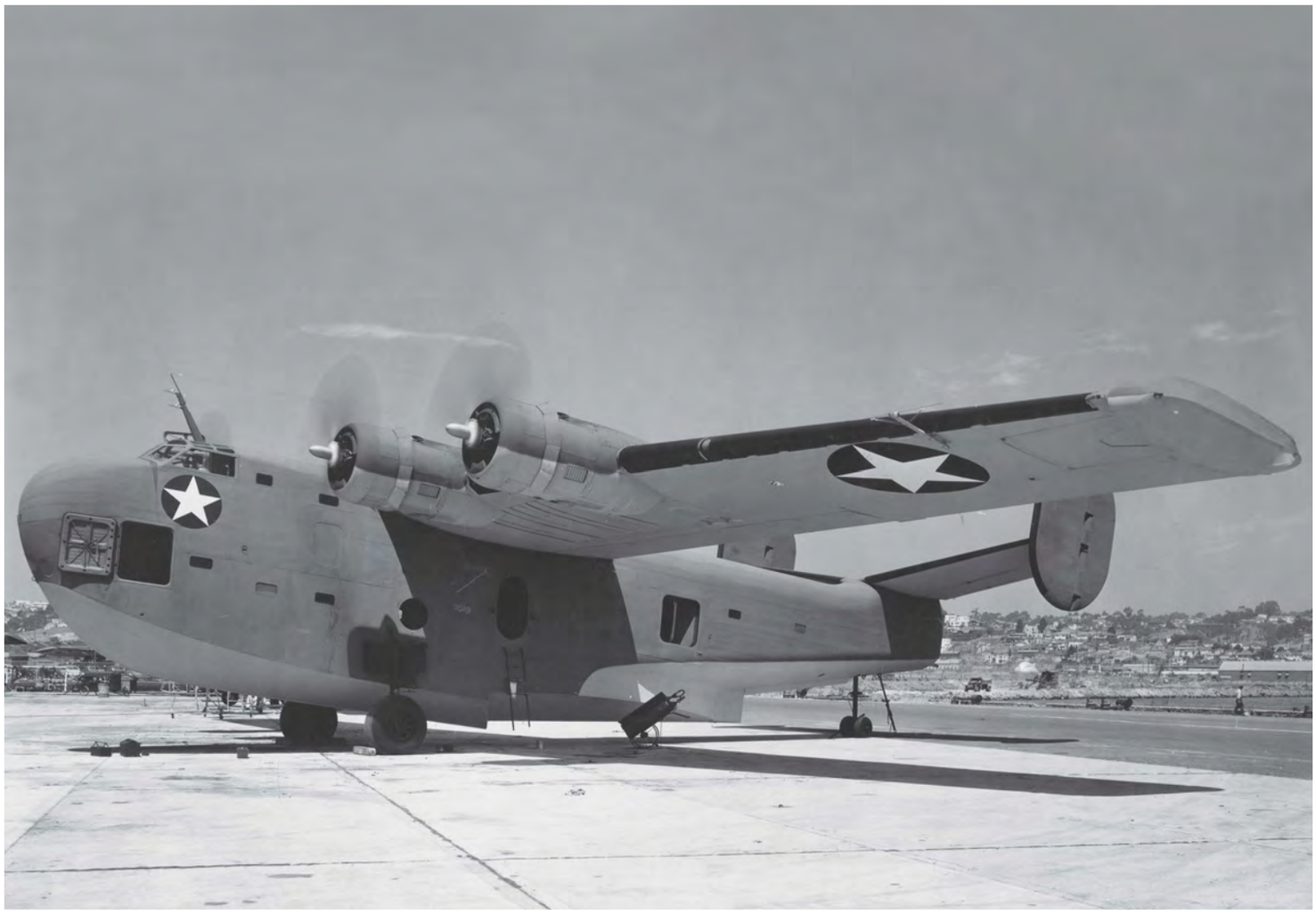


Left: One of the six PB2Y-2 flying boats delivered to US Navy Squadron VP-13 at a price of $300,000 each — roughly three times the cost of a PBY Catalina. These Coronados were employed mostly for experimental purposes, lacking self-sealing fuel tanks and armour protection for the crew.

Right: The Coronado's career with the RAF did not follow the path that was originally intended. Instead of operating as a maritime bomber, its 10 Coronado GR1s (including JX470) were assigned to RAF Transport Command's No 231 Squadron on freight services across the North Atlantic and between Africa and the West Indies.

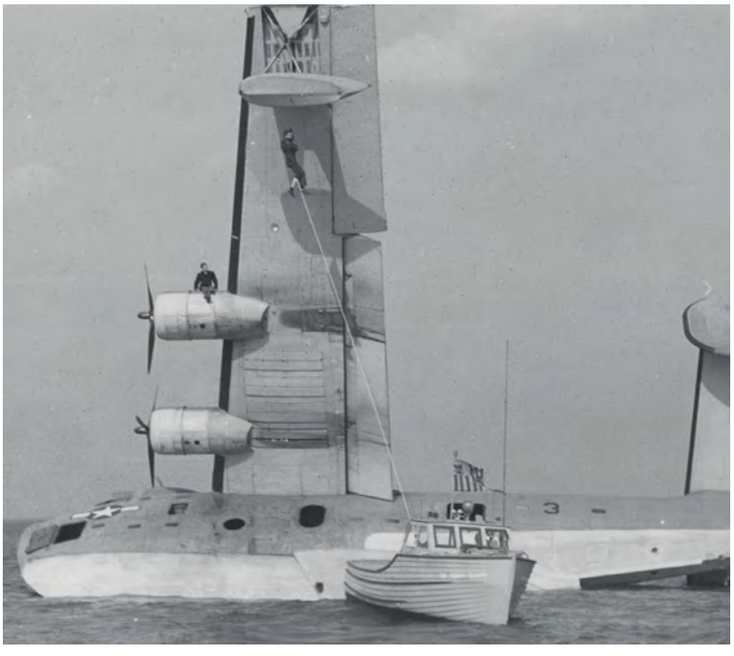
Up on the step. This Coronado was one of 31 converted to PBY2Y-3R transport standard, with faired over nose and tail turret positions. It could carry a crew of five and 44 passengers, or a 16,000lb cargo load.


JX470



Despite the Coronado's short-comings in action, it performed a valuable service in the transport/hospital evacuation role in the Pacific. A handful of PB2Y-5Rs were also configured to act as flagships and staff 'barges'.

Fourteen PB2Y-5 Coronados of VP-13 and VP-102 anchored in the submarine basin at Sand Island, Midway Atoll, on 29 January 1944. These aircraft carried out four bombing raids on Wake Island between 30 January and 9 February 1944.



A Coast Guard vessel pictured during salvage operations with a PB2Y Coronado that lost a wing tip float on 29 October 1943, presumably during a heavy landing. Well shown are the doors to the internal wing bomb bays.

The performance of the Coronado PB2Y-5H was enhanced by JATO, jet assisted take-off rockets.

A Coronado 'sails off into the distance'. Following VJ Day, all surviving Coronados were rapidly retired and scrapped, the last having gone by the summer of 1946. In the Pacific Theatre many were scuttled or used for target practice by strafing Mustangs.

Grumman G-21 Goose

The compact little Grumman G-21A was not designed for military service, but when war broke out its versatility to operate just about anywhere was quickly recognised and put to good use.

Envisioned as a private 'flying yacht' for Manhattan millionaires, the Grumman Model G-21 was designed as a light amphibian transport. Grumman's typically rugged engineering produced a high-wing monoplane of almost all-metal construction powered by two Pratt & Whitney R-985 Wasp Junior nine-cylinder, air-cooled, radial engines mounted on the leading edges of the wings. The deep fuselage served also as a hull and was equipped with hand-cranked retractable landing gear. The first flight of the prototype took place in June 1937.

The first military adaptation of the amphibian was ordered by the US Army Air Corps, which placed a contract for 26 machines in 1938, these being intended for the utility role, initially under the designation OA-9. The US Navy was also quick to embrace the flexible nature of G-21 operations and the ensuing JRF series (1-6) were the most numerous of the military variants, flying a variety of roles such as: eight-seat utility transport; target towing; photography; air-sea-rescue; anti-submarine patrol; and navigation trainer. The RCAF and RAF also received the little amphibian in whose service it was designated 'Goose', a name that quickly stuck.

A total of 345 were built and after the war many enjoyed continued commercial use around the world, from the cold wilderness of Alaska to the heat of the Caribbean.

This Grumman JRF-5 was assigned to NAS Jacksonville, Florida, in 1941 and remained on the station throughout World War 2. IT was used for utility purposes, including photography.

GRUMMAN G-21 GOOSE

Type: Utility/trainer and coastal control amphibian

Crew: 1-3

Length: 38ft 4in

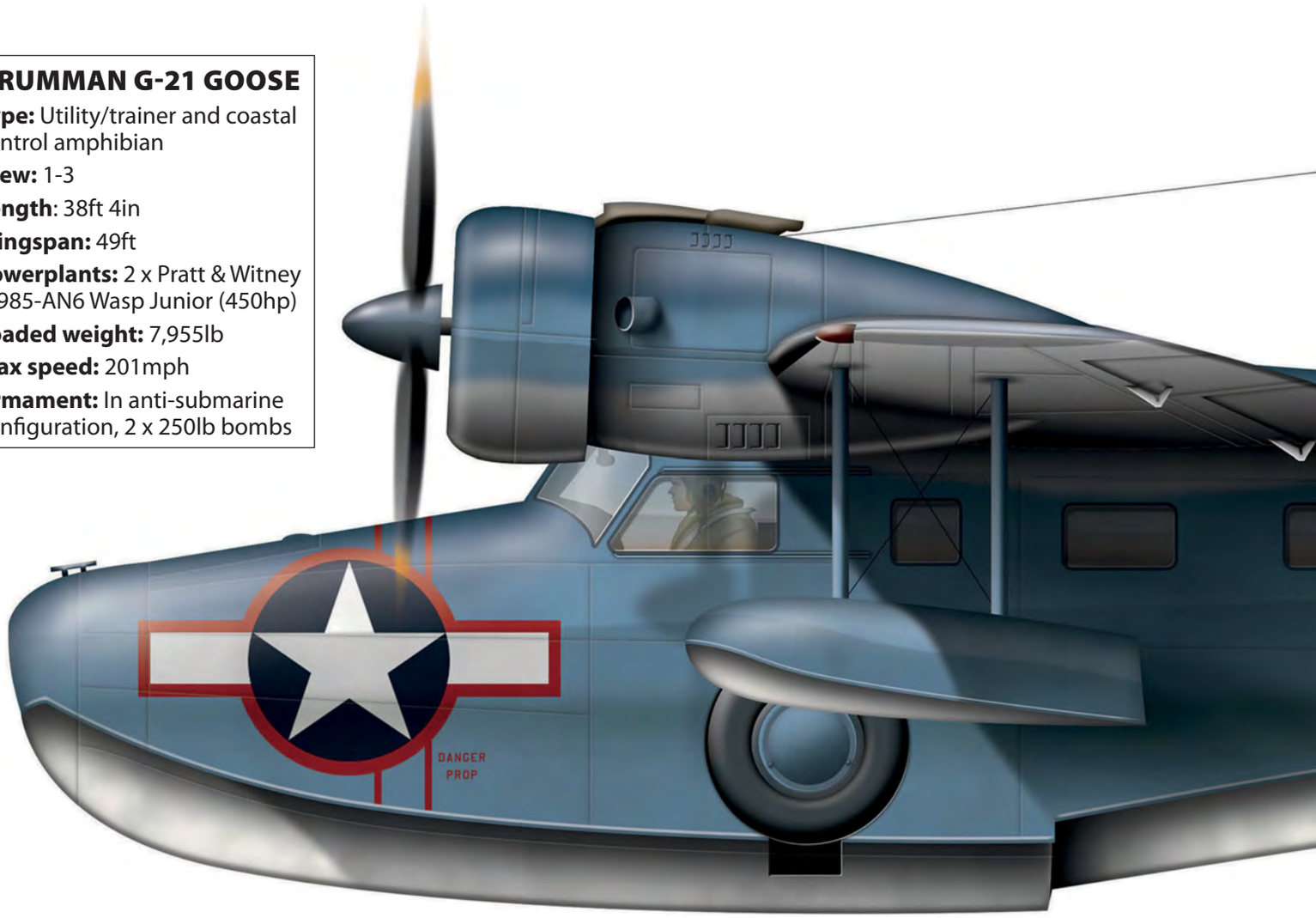
Wingspan: 49ft

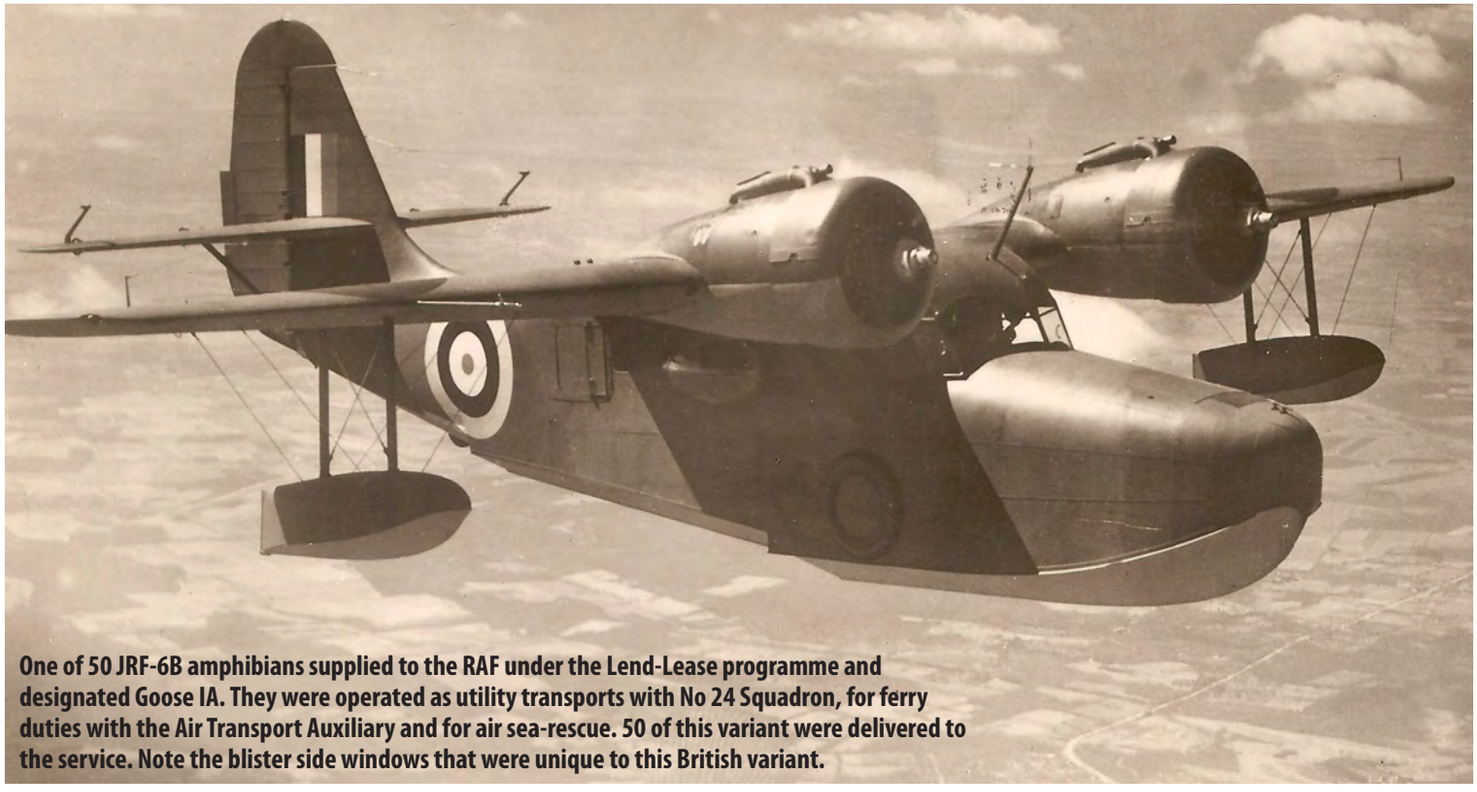
Powerplants: 2 x Pratt & Witney R-985-AN6 Wasp Junior (450hp)

Loaded weight: 7,955lb

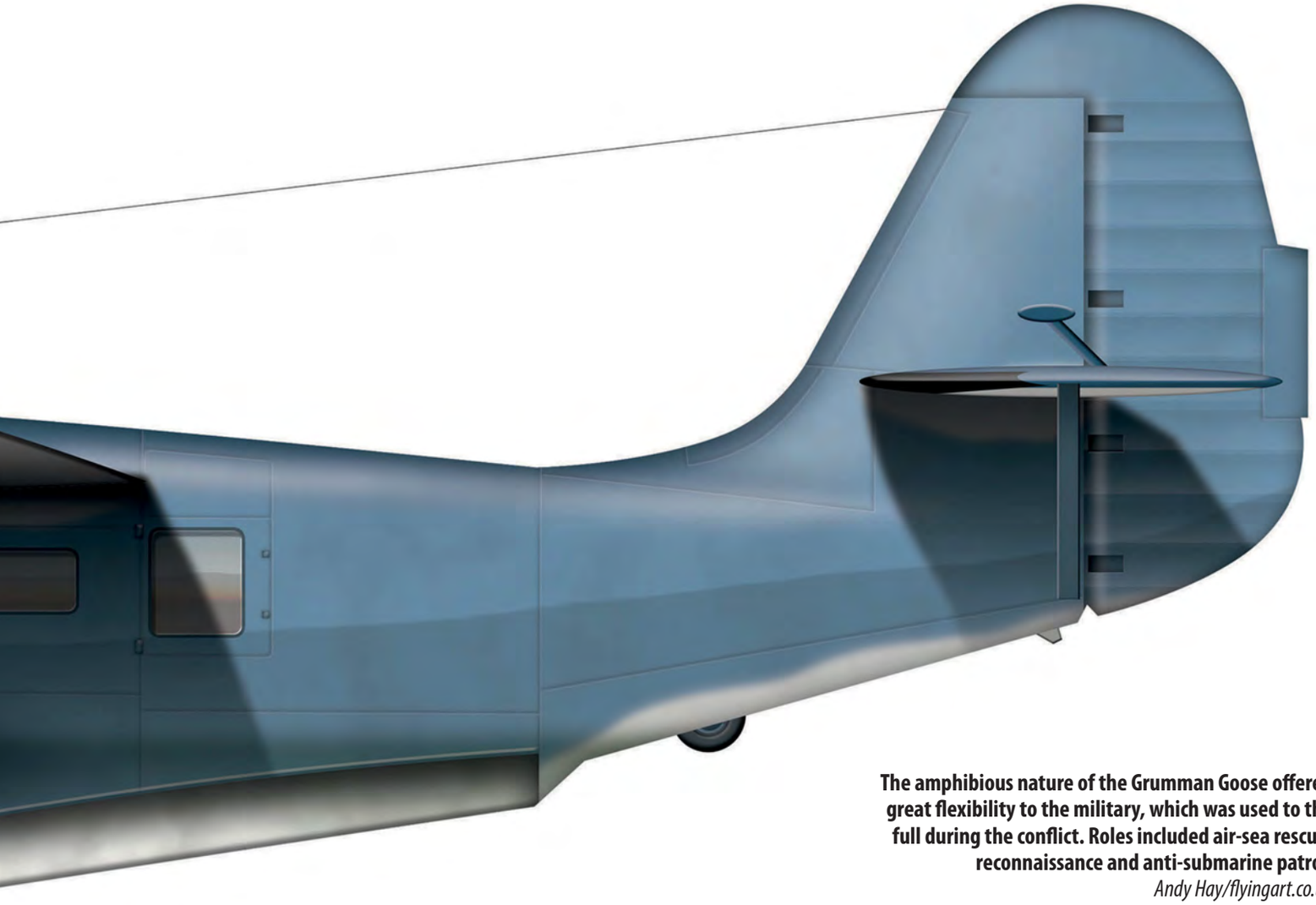
Max speed: 201mph

Armament: In anti-submarine configuration, 2 x 250lb bombs





One of 50 JRF-6B amphibians supplied to the RAF under the Lend-Lease programme and designated Goose IA. They were operated as utility transports with No 24 Squadron, for ferry duties with the Air Transport Auxiliary and for air sea-rescue. 50 of this variant were delivered to the service. Note the blister side windows that were unique to this British variant.



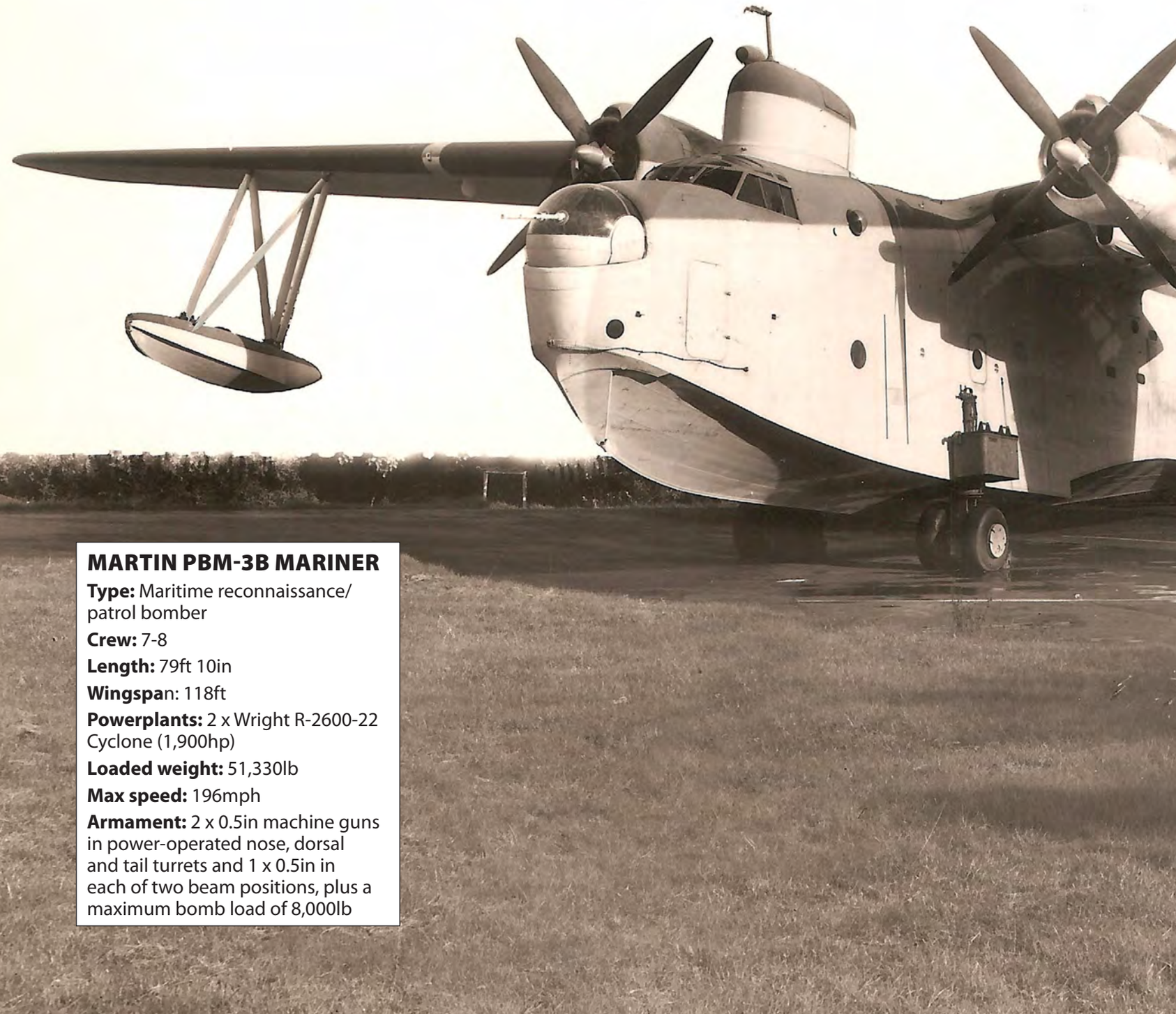
The amphibious nature of the Grumman Goose offered great flexibility to the military, which was used to the full during the conflict. Roles included air-sea rescue, reconnaissance and anti-submarine patrol.
Andy Hay/flyingart.co.uk

Martin PBM Mariner

With its distinctive gull-wing and canted twin tail fins, the Martin Mariner was one of the most recognisable of the twin-engined flying boats of World War 2. Designed to complement the Consolidated PBY Catalina in service, an impressive 1,366 were built. Testament to the success of the design, examples were still operational 20 years after it first flew.

The Glenn L. Martin Co began the design of the Model 162 medium-range maritime reconnaissance bomber flying boat in 1937 and the resulting XPBM-1 made its maiden flight on 18 February 1939. Following orders from the US Navy the type entered production as the Mariner. Seven crew members were carried and defensive armament included power-operated turrets in the nose, dorsal and, in later models, tail positions. Bombs were carried in a bay in each engine nacelle. Apart from more powerful engines, later versions differed from the PBM-1 in having enlarged non-retractable floats and a surface search radar installed in a large housing immediately aft of the flight deck. Other machines were completed as transports with armament removed.

The first PBM-1s entered service with Patrol Squadron Fifty-Five (VP-55) of the US Navy on 1 September 1940. Following Japan's attack on Pearl Harbor, PBMs were used on anti-submarine patrols, sinking their first German U-boat, U-158, on 30 June 1942. PBMs were responsible, wholly or in part, for sinking a total of 10 U-boats during the conflict. PBMs were also heavily used in the Pacific War, operating from bases at Saipan, Okinawa, Iwo Jima and the South West Pacific. Mariners continued in service with the US Navy following the end of World War 2, flying long patrol missions during the Korean War.



MARTIN PBM-3B MARINER

Type: Maritime reconnaissance/ patrol bomber

Crew: 7-8

Length: 79ft 10in

Wingspan: 118ft

Powerplants: 2 x Wright R-2600-22 Cyclone (1,900hp)

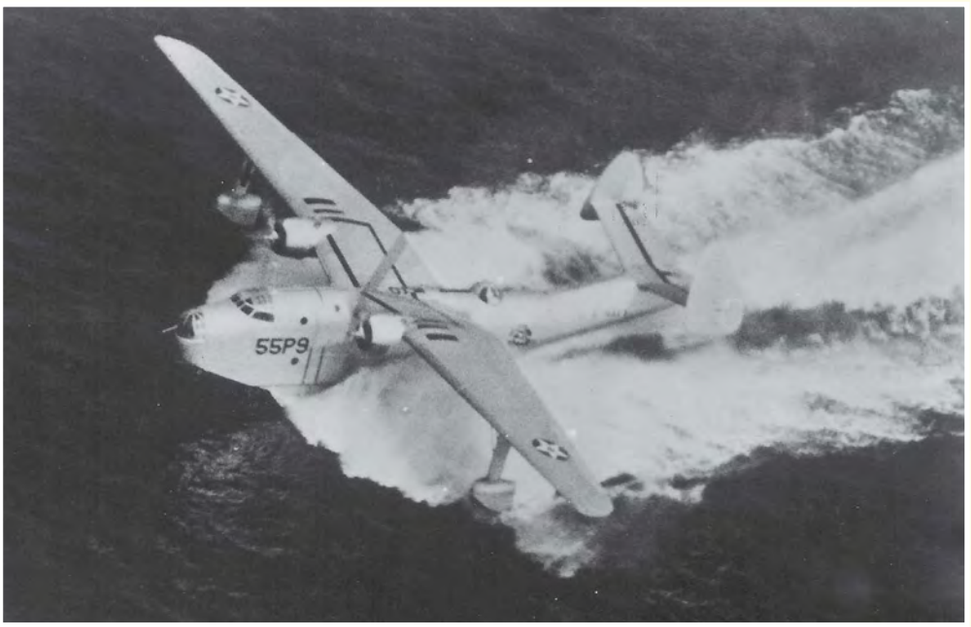
Loaded weight: 51,330lb

Max speed: 196mph

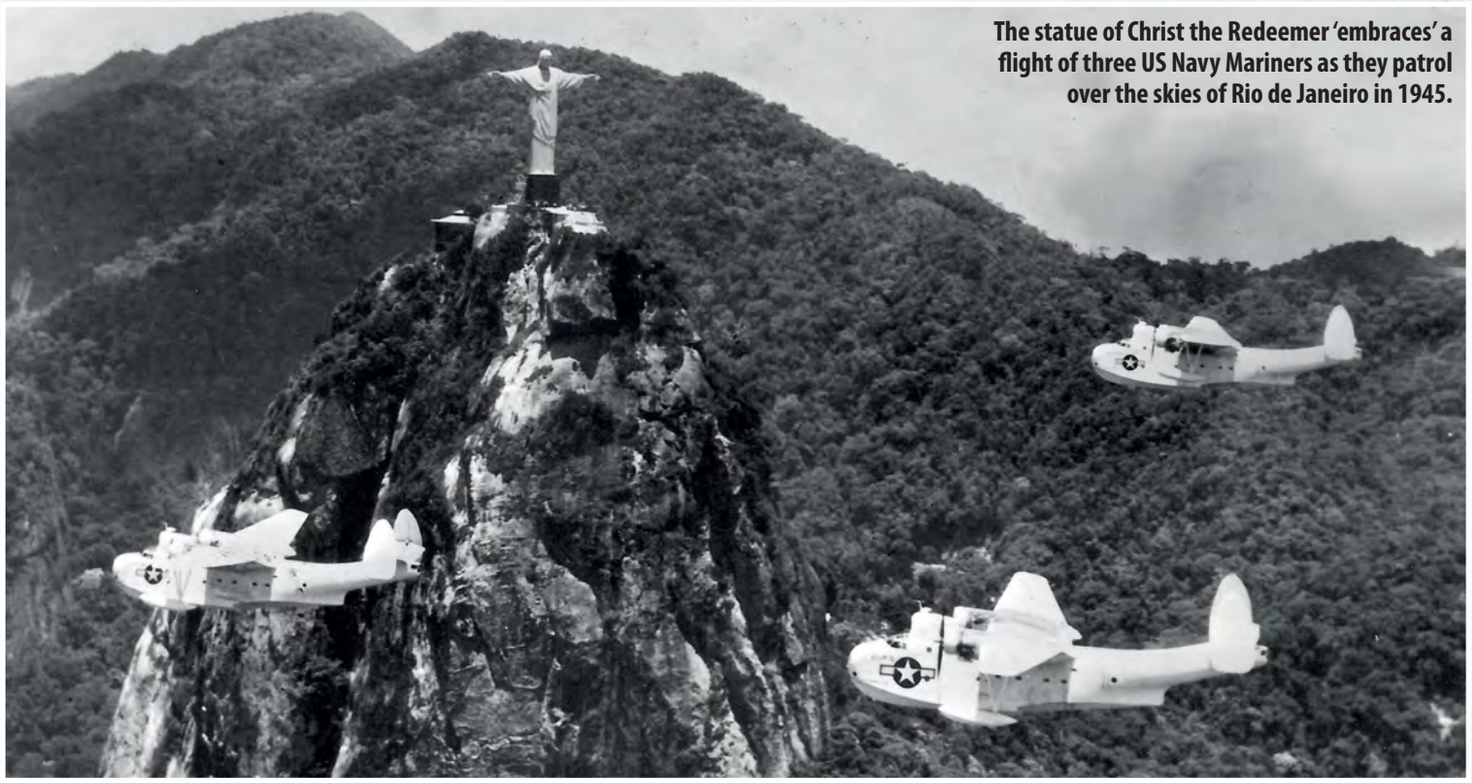
Armament: 2 x 0.5in machine guns in power-operated nose, dorsal and tail turrets and 1 x 0.5in in each of two beam positions, plus a maximum bomb load of 8,000lb

Right: The design of the Mariner was defined by its gull-wing that kept the propellers out of the sea spray on taxi, take-off and landings. This early PBM-1 featured retractable floats.

Main: The RAF was supplied with 25 PBM-3Bs under Lend–Lease, these going to No 524 Squadron at Oban on 20 October 1943. However, the type was never used operationally by the RAF and the squadron was disbanded six weeks later with the Mariners being subsequently returned to the US.



The Martin PBM-3C model of the Mariner began to appear in September 1942 and was the first version to be built in substantial numbers (272). It was powered by Wright R-2600-12 Cyclones.



The statue of Christ the Redeemer 'embraces' a flight of three US Navy Mariners as they patrol over the skies of Rio de Janeiro in 1945.

The PBM-5 was the final wartime production version of the Mariner and 589 were delivered. Jet-assisted take-offs were employed on the PBM to reduce take-off runs and permit heavier loads to be carried.

A Mariner meets its watery grave. In 1944 this aircraft was on a test flight when it suffered an engine fire and the pilot was forced to make an emergency landing. It hit the water so hard that both engines were ripped off, but the integrity of the strong PBM hull remained. The crew evacuated the aircraft safely and the stricken machine continued to float for an hour and a half before finally succumbing to its inevitable fate.

Martin Mars

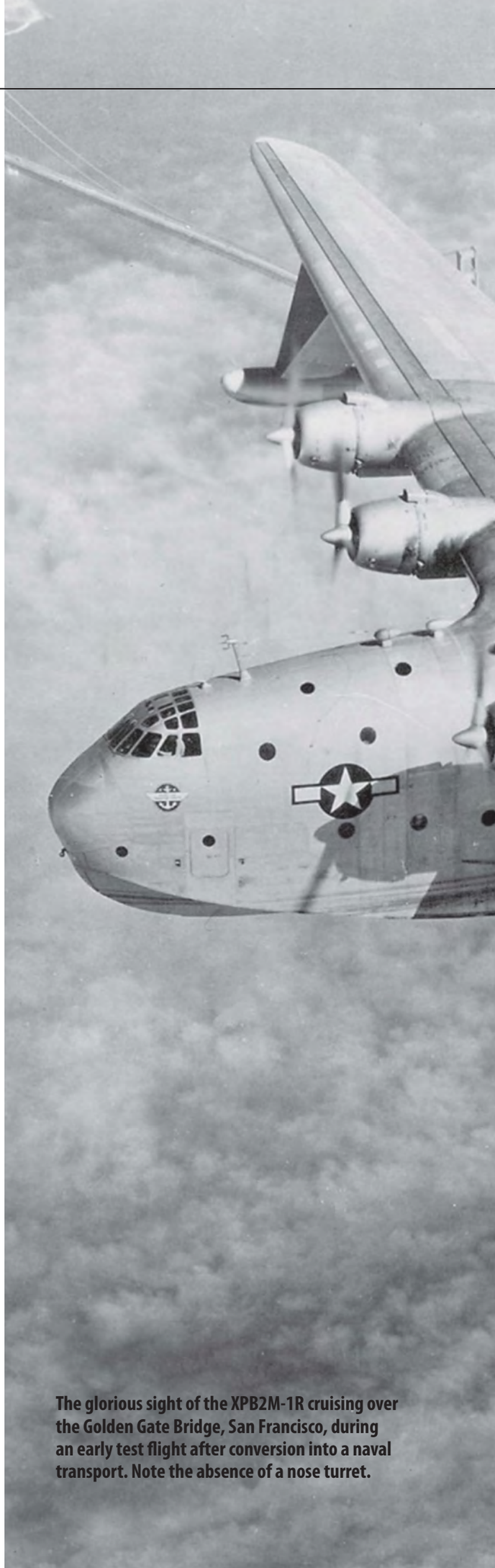
The largest flying boat of its time, the Martin Mars was launched on 8 November 1941. The original caption to this shot reveals the role for which this hulking aircraft was designed: 'The aerial battleship is capable of carrying a bomb load to Europe and back, non-stop'.

It is perhaps appropriate that the mighty Martin Mars should bring this publication to a close. The largest flying boat ever to be put into production and flown operationally, the Mars not only flew in World War 2, but was also reincarnated as a firefighter.

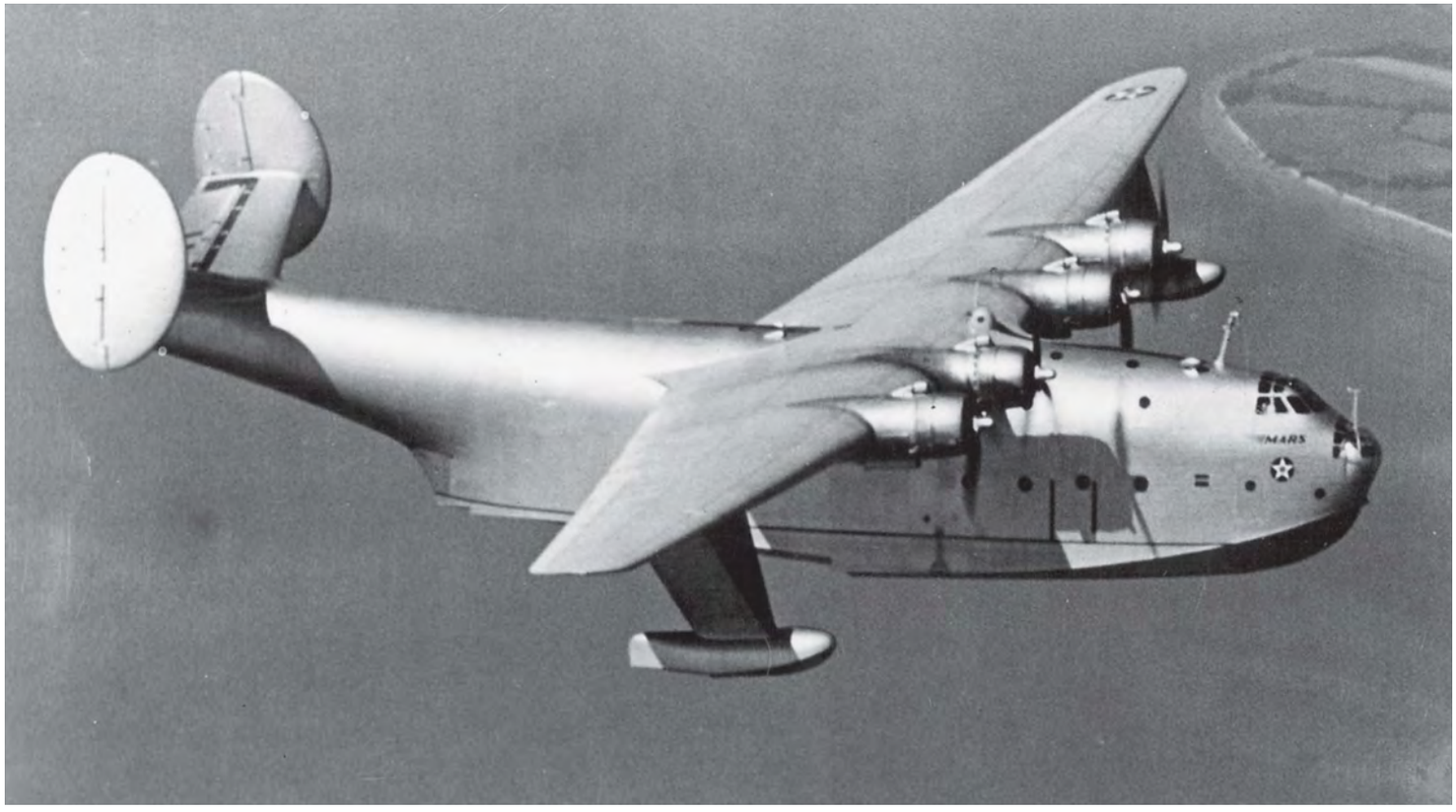
Ordered as a long-range maritime reconnaissance bomber, the Mars made its first flight on 3 July 1942. Although provision was made for power-operated gun turrets in the bow and extreme tail, the production aircraft were redesigned and classified for long-range general transport because of the heavy-lift capability demonstrated by the prototype. The gun turrets were faired over, the floors reinforced, larger hatches and loading equipment provided and the Mars became the XPB2M-1R transport aircraft. In December 1943 the Mars made its first flight as a naval transport carrying a 13,000lb load non-stop between NAS Patuxent River and Natal, Brazil, a distance of 4,375 miles. The success of the Mars in the airlift role prompted an order from the US Navy for 20 examples, as the modified JRM-1 Mars. The first, named *Hawaii Mars*, was delivered in June 1945, but with the end of World War 2 the US Navy scaled back its order, buying only the five aircraft that were then on the production line. Though the original *Hawaii Mars* was lost in an accident in Chesapeake Bay a few weeks after it first flew, the other five Mars were completed and the last delivered in 1947. They remained in service until 1956 and thereafter established a second career as water-bombers, a role for which they became renowned.

MARTIN XPB2M-1 MARS

Type: Long-range maritime patrol bomber/transport
Crew: 11
Length: 117ft 3in
Wingspan: 200ft
Powerplants: 2 x Wright R-3350-18 Duplex Cyclone (2,200hp)
Loaded weight: 144,000lb
Max speed: 221mph
Armament: None



The glorious sight of the XPB2M-1R cruising over the Golden Gate Bridge, San Francisco, during an early test flight after conversion into a naval transport. Note the absence of a nose turret.



The US Navy Martin Mars first flew as a patrol bomber prototype (XPB2M-1) on 3 July 1942 and was converted to a transport (XPB2M-1R) in December 1943. It was nicknamed *Old Lady* and was finally beached at Alameda, California (USA), in mid-1945, before being subsequently scrapped.

Post-war the Martin Mars established flying boat airlift and endurance records which remain valid today. In 1949, all the men in this picture (and more) boarded *Marshall Mars* for a new world record for total people flown at one time (308) on a single aircraft of any type.

This post-war image of the Martin Mars JRM-1 is worthy of inclusion if only to see four of the mighty flying boats in formation.

In its XPB2M-1R guise, the Martin Mars saw operational service during World War 2, including a 4,700-mile round trip to Hawaii in 27 hours 26 minutes, delivering a 20,500lb cargo load.

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