

The Pathfinder Museum



Pathfinder Aircraft - Short Stirling



The Stirling was a World War II heavy bomber built by Short Brothers. It was the first British design to use four engines and turned out to be inferior to its rivals. In the end it would be relegated to second-line duties, while four-engine conversions of earlier twin-engine designs took over its role.

Through the 1930's the Royal Air Force was interested primarily in twin engine bombers. These designs put limited demands on engine production and maintenance, both of which were already stretched with the introduction of so many new types into service. However, the limitations in terms of power were so serious that they invested heavily in development of huge engines in the 2,000 horsepower (1500 kW) class in order to improve performance.

Meanwhile the US and USSR were developing bombers with four smaller engines, which proved to have excellent range and fair lifting capacity. So in 1936 the RAF decided to try their hand at the four engine bomber as well. It seems the Air Ministry wasn't entirely clear what it wanted in the new design, and the resulting Specification B.12/36 was an odd mix of features. In addition to a 14,000 lb (6,350 kg) bombload carried to a range of 3,000 miles (4,800 km) (Incredibly demanding for the era), the aircraft should also be able to be used as a troop transport for 24 soldiers. The idea was that it would fly troops to far corners of the British Empire, and then support them with bombing. To help with this task as well as ease production, it needed to be able to be broken down into parts for transport by train. Since it could be operating from limited "backcountry" airfields, it needed to lift off from a 500 ft (150 m) runway and able to clear 50 ft (15 m) trees at the end, a specification most small aircraft would have a problem with today. It is often said that the wingspan was limited to 100 ft (30m) so the aircraft would fit into existing hangars, but this is not the case. The wingspan limit was imposed in an attempt, unsuccessful in the case of the Stirling, to ensure that weights were kept down.

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Shorts was one of eleven designs returned in response to the requirements, but were likely the only company that could have realistically started production in a short time. They were already producing several four-engine flying boat designs of the needed size, and created their S.29 design by removing the lower deck and boat hull of their S.25 Sunderland. Their new S.29 design was largely identical otherwise; the wings and controls were the same, construction was identical, and it even retained the slight upward bend at the rear of the fuselage, originally intended to keep the Sunderland's tail clear of sea spray.

Shorts managed to persuade the RAF to dismiss most of its unrealistic design goals when they saw the S.29 would be an excellent bomber. On one point the RAF stood firm: the S.29 used the Sunderland's 114 ft (35 m) wing, and they demanded it be reduced to less than 100 ft (30 m), the same limit as imposed on the Handley Page Halifax and Avro Manchester. In order to get the needed lift from a shorter span and excess weight, the redesigned wing was thickened and reshaped.



The Short S.31 half-scale replica used for aerodynamic tests of the Stirling design.

Shorts built a half scale version as the S.31, powered by four Pobjoy Niagara engines (Left), which flew in September 1938. Everyone was happy with the design, except the takeoff run was thought to be too long. Fixing this required the angle of the wing to be increased for takeoff, normally meaning the aircraft would be flying nose down while cruising (As in the Whitley). Instead Shorts lengthened the undercarriage struts to tilt the nose up on takeoff, leading to its spindly gear.

The first S.29, now the Stirling, flew on May 14, 1939 with four Bristol Hercules II radial engines. Upon landing one of the brakes locked, causing it to slew off the runway and collapse the landing gear. A redesign added much stronger and heavier struts on the second prototype. On its first mission two months later one of the engines failed on take-off, but the plane landed easily. From then on the record improved and service production started in August 1940 at Shorts' Rochester factory. The area, which included a number of major aviation firms, was heavily bombed in the opening days of the Battle of Britain, including one famous low-level raid by a group of Dornier Do 17's. A number of completed Stirlings were destroyed on the ground and the factories were heavily damaged, setting back production by almost a year. Operational status wasn't reached until January 1941. The first three Stirlings flew a mission on February 10, 1941, over fuel tanks in Rotterdam. From spring of 1942 it started to be used in greater numbers. From May 1943, air raids on Germany started with over one hundred Stirlings.

Although it wasn't as large as the US and Soviet experimental designs, the Stirling had considerably more power and far better payload/range than anything then flying. The massive 14,000 lb (6,340 kg) bomb load put it in a class of its own, double any other bomber. In fact it was larger than the Handley-Page Halifax and comparable to the Avro Lancaster, which would replace it, but both of these were originally designed to have twin engines. The Stirling was the only British bomber designed as four-engined.

The design mounted nose and tail turrets (The latter was notable for the wide angles of fire), and included a retractable ventral ("Dustbin") turret just behind the bomb bay, fired by remote control. This proved almost useless due to the limited visibility through the sighting system, with the added distraction that the turret tended to drop and hit the ground when taxiing over bumps, it was removed almost from the start and replaced by a dorsal turret. This had problems: it had a metal back with an escape hatch in it, which turned out to be almost impossible to use. The later Stirling Mk.III instead used a fully glazed turret (The same FN.50 as in Lancaster) that had more room and an improved view.

The first few Mk Is received the Hercules II engines, but the majority received the 1,500 hp (1100 kW) Hercules XIs. The Mk III, introduced in 1943, was similar with the exception of the new dorsal turret and the improved 1,635 hp (1200 kW) Hercules VI or XVI engines, which improved maximum speed from 255 to 270 mph (410 to 435 km/h).

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The Stirling proved an excellent design and pilots were delighted to discover they could outturn the Ju 88 and Me 110 nightfighters they faced, due to the thick wing. Its handling was much better than that of the Halifax and some preferred it to the Lancaster. Another consequence of the thick wing was a low ceiling and many missions were flown as low as 12,000 ft (4,000 m). This was a disadvantage on many raids, notably if they were attacking Italy and had to fly through (Rather than over) the Alps. When operated with other RAF bombers flying at higher altitudes, the Luftwaffe concentrated on the low-flying Stirlings. Within five months of being introduced, 67 out of the 84 aircraft delivered had been lost to enemy action or written off after crashes.

The Stirling's huge bomb load was only able to be carried short distances of around 590 miles. On typical missions deep into Germany or Italy a smaller 3,500 lb (1,590 kg) load was carried, consisting of seven 500 lb (227 kg) bombs. This was the sort of load being carried by the RAF's medium bombers such as the Vickers Wellington, and by 1944 by the de Havilland Mosquito. Perhaps the biggest problem with the design was that the bomb bay had two structural dividers running down the middle, limiting it to carrying 2000 lb (907 kg) bombs at most. As the RAF started using the 4000 lb (1,815 kg) 'cookies' and even larger 'specials', the Stirling became less useful. The Handley-Page Halifax and especially the Avro Lancaster offered better performance and when they became available in greater numbers from 1943, it was decided to withdraw Stirlings to secondary tasks. (Why Stirlings, with their long legs, were never used for ASW patrol is unclear).

By December 1943, Stirlings were being withdrawn from bombing, seeing more use for dropping mines outside German ports and dropping spies deep behind enemy lines at night (Through the now unused ventral turret ring). At that time, there appeared a need of powerful aircraft to tow heavy transport gliders GAL Hamilcar and Airspeed Horsa and the Stirling fitted this role. In late 1943, 143 MK III bombers were rebuilt to new Mk IV series, without nose and dorsal turrets, for towing gliders and dropping paratroops, and 461 new Mk IVs were produced. They were used in the Battle of Normandy and Operation Market Garden. From late 1944, 160 of the special transport variant Mk V were built, with new openable nose and the tail turret removed, most being completed after the war.

In service with Bomber Command Stirlings flew 14,500 operations, dropping 27,000 tons of bombs, losing 582 in action with 119 written off.

Flight Sergeant Rawdon Hume Middleton of the Royal Australian Air Force earned a posthumous Victoria

Cross for valour during a raid on Turin in November 1942, while piloting a Stirling I of No.149 Squadron RAF.



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