

Supermarine Spitfire (MK V) 70" Wing Span Plan.

(MK-II, MK-VIII, MKXIV and MK-XVI Included)



The **Supermarine Spitfire** is a British single-seat [fighter aircraft](#) that was used by the [Royal Air Force](#) and many other [Allied](#) countries throughout the [Second World War](#). The Spitfire continued to be used as a front line fighter and in secondary roles into the 1950s. It was produced in greater numbers than any other British aircraft and was the only British fighter in continuous production throughout the war.^[5]

The Spitfire was designed as a short-range, high-performance [interceptor aircraft](#)^[6] by [R. J. Mitchell](#), chief designer at [Supermarine Aviation Works](#) (which operated as a subsidiary of [Vickers-Armstrong](#) since 1928). Mitchell continued to refine the design until his death from cancer in 1937, whereupon his colleague [Joseph Smith](#) became chief designer.^[7] The Spitfire's [elliptical wing](#) had a thin cross-section, allowing a higher top speed than several contemporary fighters, including the [Hawker Hurricane](#).^[8] Speed was seen as essential to carry out the mission of home defense against enemy [bombers](#).^[6]

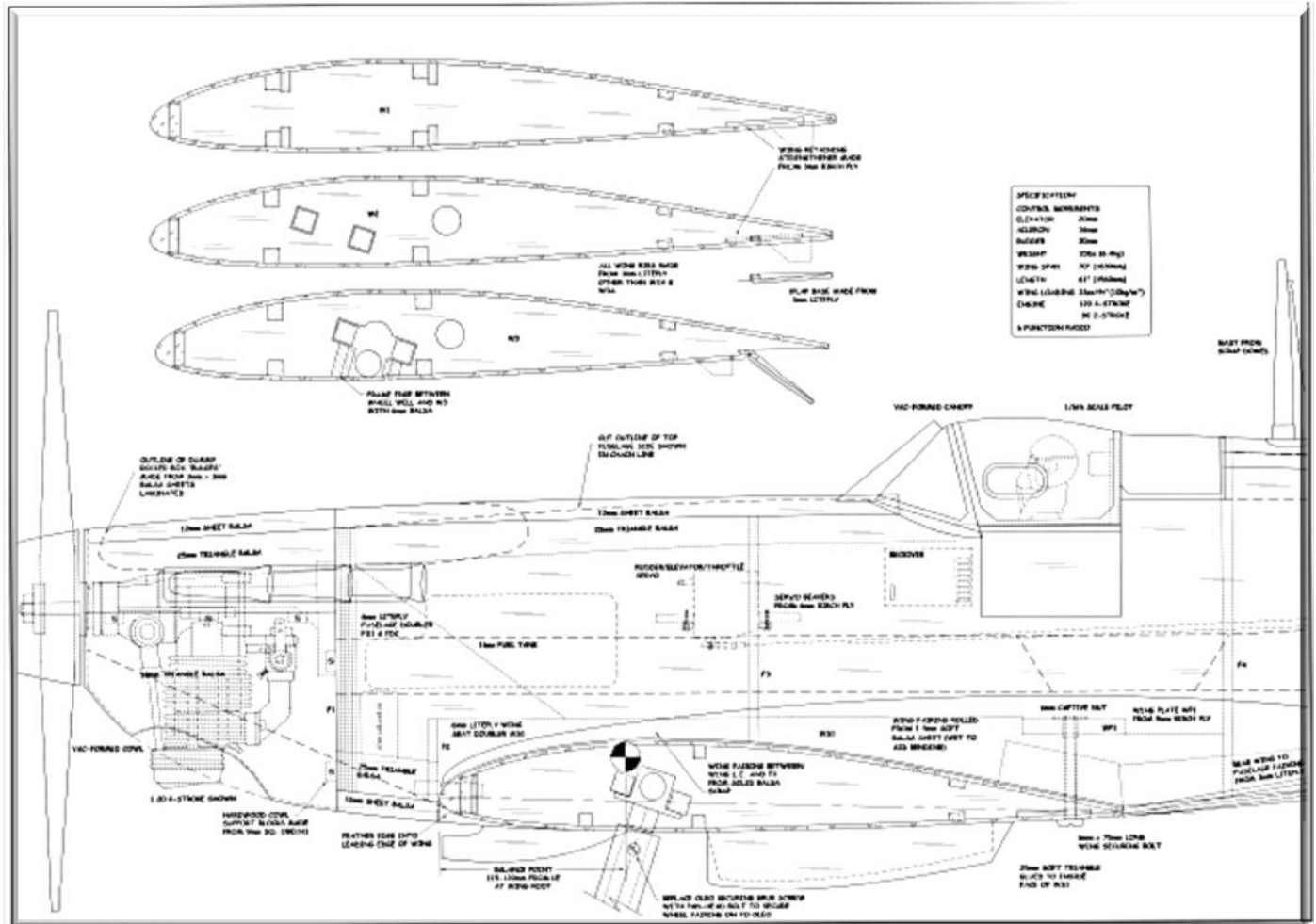
During the [Battle of Britain](#) (July–October 1940), the Spitfire was perceived by the public as *the* RAF fighter of the battle, though the more numerous [Hawker Hurricane](#) shouldered a greater proportion of the burden against the [Luftwaffe](#). The Spitfire units had a lower attrition rate and a higher victory-to-loss ratio than those flying Hurricanes.^[9]

After the Battle of Britain, the Spitfire became the backbone of [RAF Fighter Command](#), and saw action in the [European](#), [Mediterranean](#), [Pacific](#) and the [South-East Asian](#) theatres. Much loved by its pilots, the Spitfire served in several roles, including interceptor, photo-reconnaissance, fighter-bomber, carrier-based fighter, and trainer. It was built in many variants, using several wing configurations.^[10] Although the original airframe was designed to be powered by a [Rolls-Royce Merlin](#) engine producing 1,030 [hp](#) (768 kW), it was adaptable enough

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to use increasingly powerful Merlin and later [Rolls-Royce Griffon](#) engines; the latter was eventually able to produce 2,035 HP (1,520 kW).



Development and production

[R. J. Mitchell](#)'s 1931 design to meet [Air Ministry specification F7/30](#) for a new and modern fighter capable of 251 mph (404 km/h), the [Supermarine Type 224](#), resulted in an open-cockpit monoplane with bulky gull-wings and a large fixed, spatted [undercarriage](#) powered by the 600 horsepower (450 kW) [evaporative-cooled Rolls-Royce Goshawk](#) engine.^[12] This made its first flight in February 1934.^[13] The Type 224 was a big disappointment to Mitchell and his design team, who immediately embarked on a series of "cleaned-up" designs, using their experience with the [Schneider Trophy](#) seaplanes as a starting point. Of the seven designs tendered to F/30, the [Gloster Gladiator](#) biplane was accepted for service.^[14]

Mitchell had already begun working on a new aircraft, designated Type 300, based on the Type 224, but with a retractable undercarriage and the wingspan reduced by 6 ft (1.8 m). The Type 300 was submitted to the Air Ministry in July 1934, but again was not accepted.^[15] The design then evolved through a number of changes, including incorporating a faired, enclosed cockpit, oxygen-breathing apparatus, smaller and thinner wings, and the newly-developed, more powerful Rolls-Royce [PV-XII V-12](#) engine, later named the "Merlin". In November 1934, Mitchell, with the backing of Supermarine's owner, Vickers-Armstrong, started detailed design work on this refined version of the Type 300^[16] and, on 1 December 1934, the Air Ministry issued a contract AM

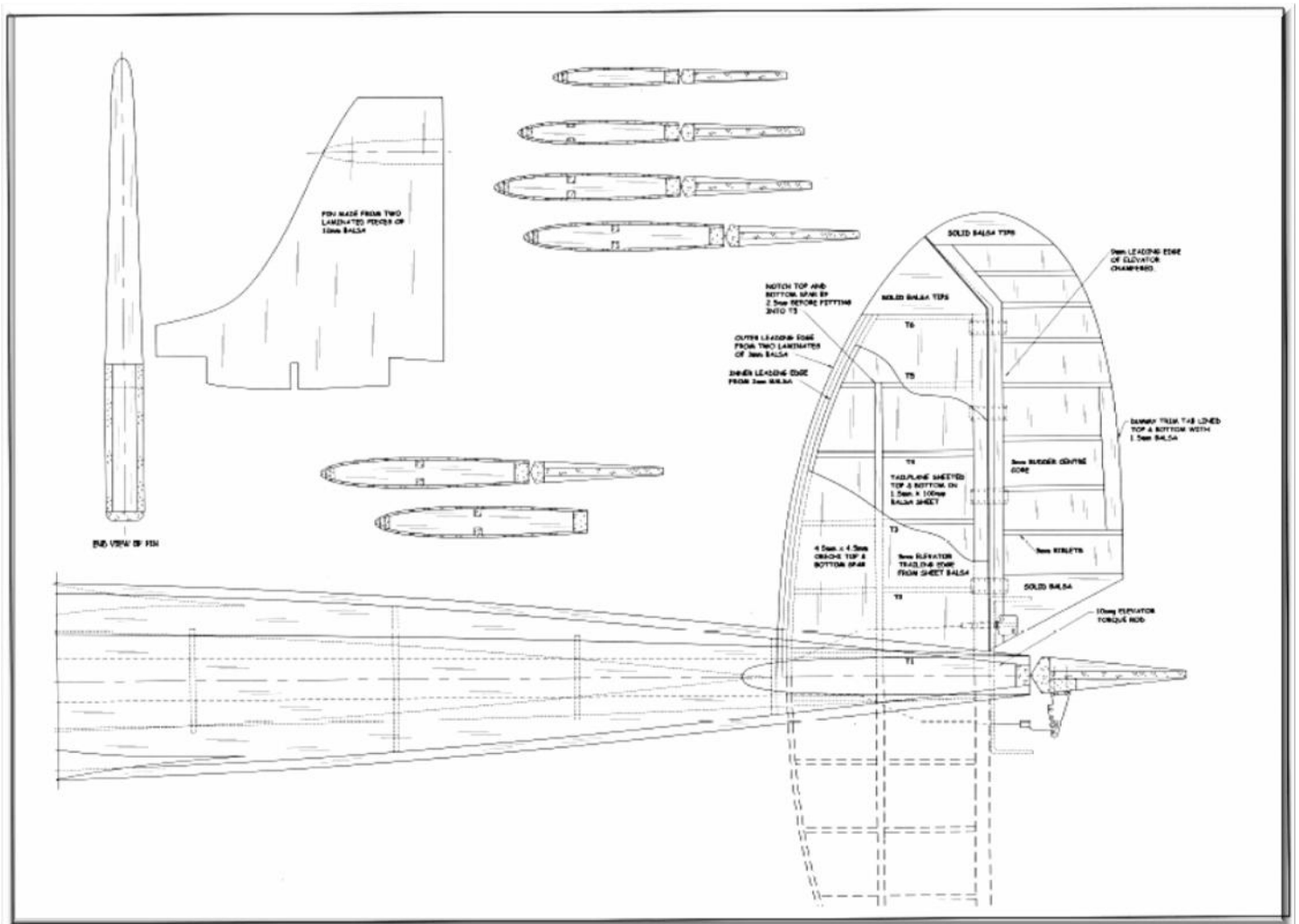
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361140/34, providing £10,000 for the construction of Mitchell's improved F7/30 design.^[17] On 3 January 1935, the Air Ministry formalised the contract and a new Specification F10/35 was written around the aircraft.^[18]

The unpainted Spitfire prototype *K5054* at [Eastleigh](#) airfield, just before the first flight. The angled rudder mass balance, fixed, unfaired main undercarriage and tailskid can be seen. This airframe was written off after a landing accident at the [Royal Aircraft Establishment](#) (R.A.E.) at Farnborough on 4 September 1939.^[19]

In April 1935, the armament was changed from two .303 in (7.7 mm) [Vickers machine guns](#) in each wing to four .303 in (7.7 mm) [Brownings](#),^[20] following a recommendation by Squadron Leader [Ralph Sorley](#) of the Operational Requirements section at the Air Ministry.^[21] On 5 March 1936,^[22] the prototype (*K5054*) took off on its first flight from [Eastleigh Aerodrome](#) (later [Southampton Airport](#)). At the controls was [Captain Joseph "Mutt" Summers](#), chief test pilot for Vickers (Aviation) Ltd., who was reported in the press as saying "Don't touch anything" on landing.^{[23][nb 2]} This eight minute flight^[21] came four months after the maiden flight of the contemporary Hurricane.^[25]

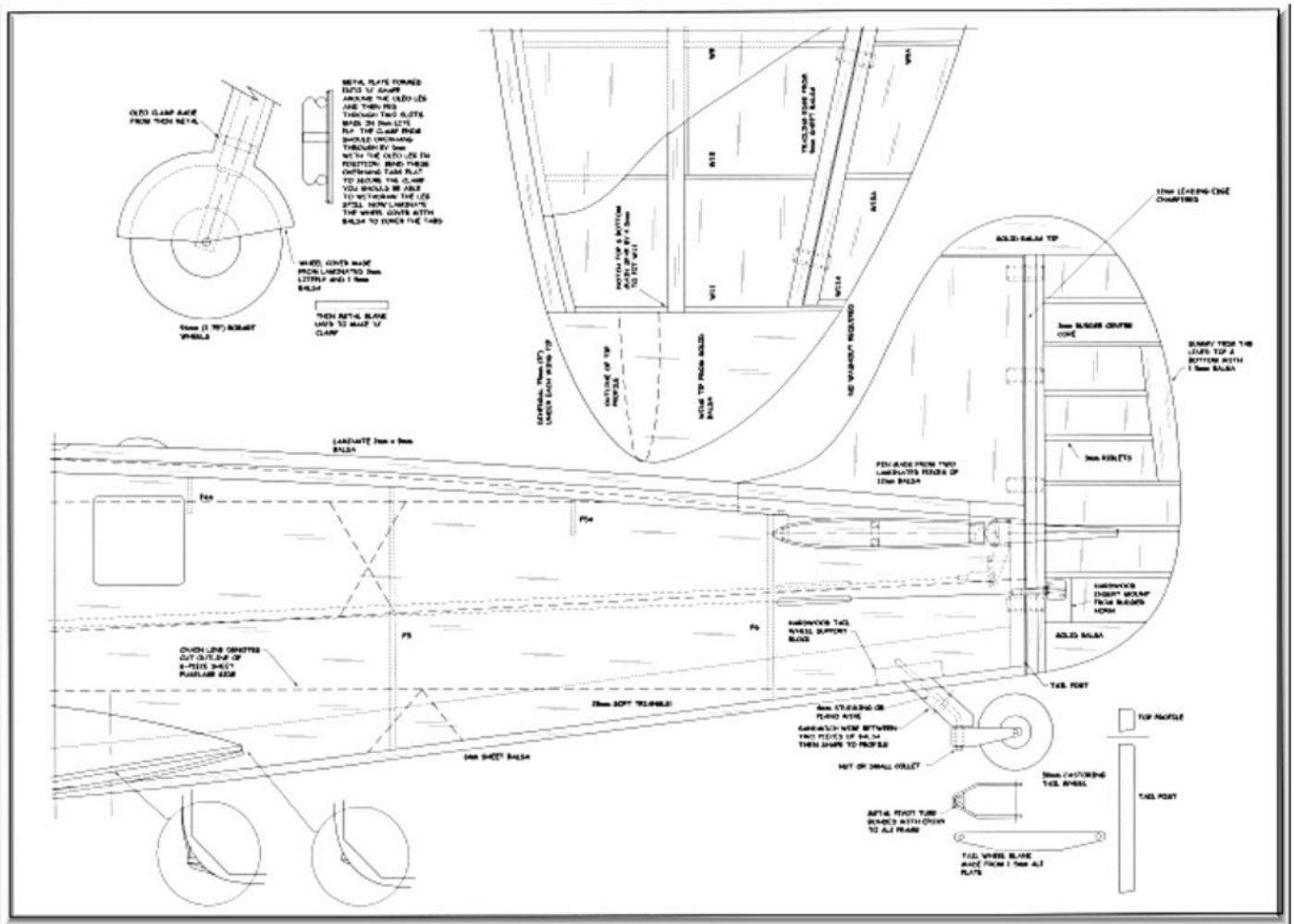


K5054 was fitted with a new propeller, and Summers flew the aircraft on 10 March 1936; during this flight the undercarriage was retracted for the first time.^[26] After the fourth flight, a new engine was fitted, and Summers left the test-flying to his assistants, [Jeffrey Quill](#) and George Pickering. They soon discovered that the Spitfire^{[nb 3][29]} was a very good aircraft, but not perfect. The rudder was over-sensitive and the top speed was just 330 mph (528 km/h), little faster than [Sydney Camm](#)'s new Merlin-powered Hurricane.^[31] A new and better-shaped wooden propeller meant the Spitfire reached 348 mph (557 km/h) in level flight in mid-May, when Summers flew *K5054* to [RAF Martlesham Heath](#) and handed the aircraft over to Squadron Leader Anderson of

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the [Aeroplane & Armament Experimental Establishment](#) (A&AEE). Here, Flight Lieutenant Humphrey Edwardes-Jones took over the prototype for the RAF.^[32] He had been given orders to fly the aircraft and then to make his report to the Air Ministry as he landed. Edwardes-Jones made a positive report; his only request was that the Spitfire be equipped with an undercarriage position indicator.^[33] A week later, on 3 June 1936, the Air Ministry placed an order for 310 Spitfires,^[34] before any formal report had been issued by the A&AEE; interim reports were later issued on a piecemeal basis.



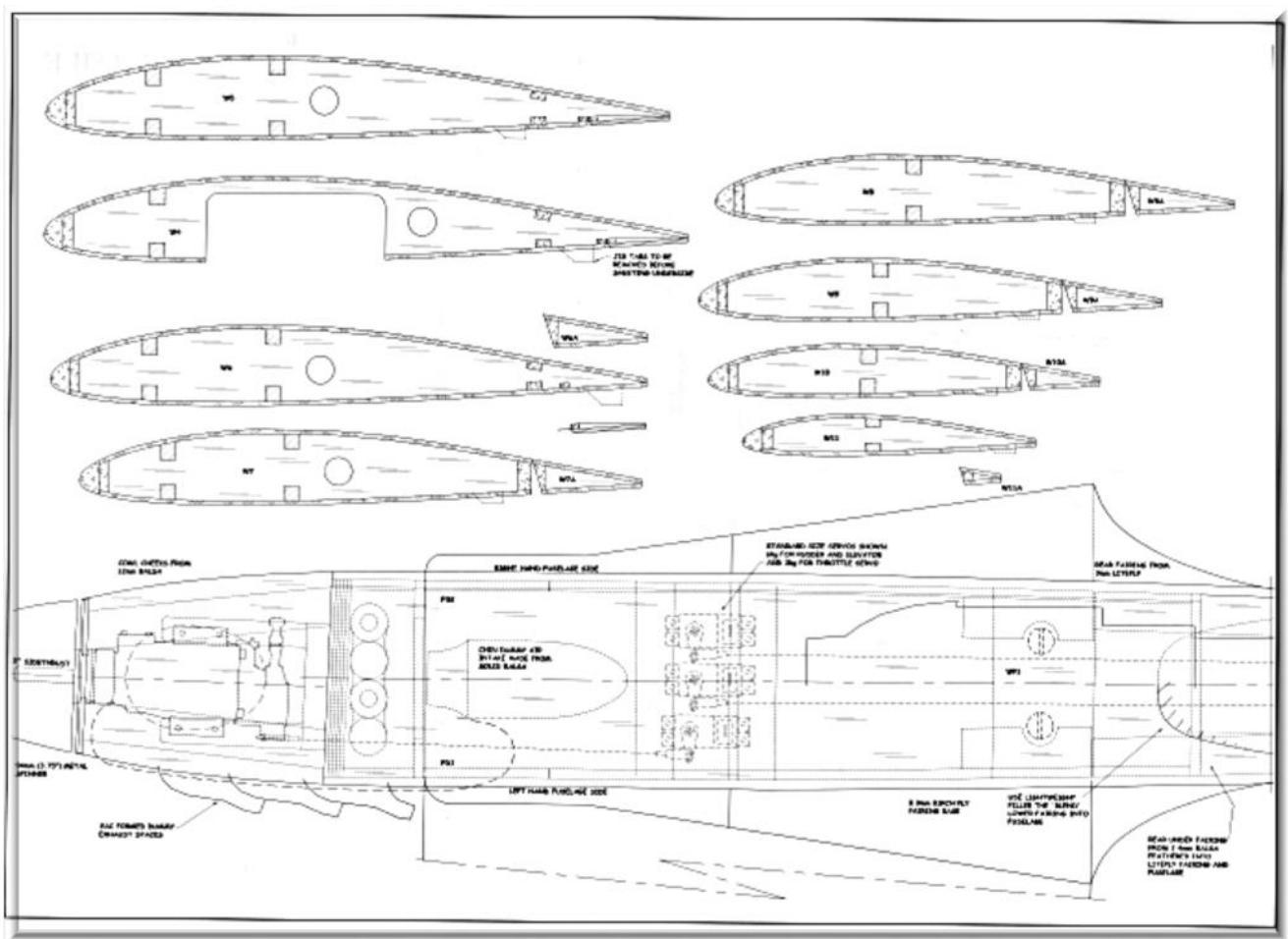
Into production

The British public first saw the Spitfire at the [RAF Hendon](#) air-display on Saturday 27 June 1936. Although full-scale production was supposed to begin immediately, there were numerous problems which could not be overcome for some time and the first production Spitfire, *K9787*, did not roll off the [Woolston](#), Southampton assembly line until mid-1938.^[1] The first and most immediate problem was that the main Supermarine factory at Woolston was already working at full capacity fulfilling orders for [Walrus](#) and [Stranraer](#) flying boats. Although outside contractors were supposed to be involved in manufacturing many important Spitfire components, especially the wings, [Vickers-Armstrong](#) (the parent company) were reluctant to see the Spitfire being manufactured by outside concerns and were slow to release the necessary blueprints and subcomponents. As a result of the delays in getting the Spitfire into full production, the Air Ministry put forward a plan that production of the Spitfire be stopped after the initial order for 310, after which Supermarine would build [Bristol Beaufighters](#). The managements of Supermarine and Vickers were able to persuade the Air Ministry that the problems could be overcome and further orders were placed for 200 Spitfires on 24 March 1938, the two orders covering the K, L and N prefix serial numbers.^[36]

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In February 1936 the director of Vickers-Armstrongs, Sir Robert MacLean, guaranteed production of five aircraft a week, beginning 15 months after an order was placed. On 3 June 1936, the Air Ministry placed an order for 310 aircraft, for a price of £1,395,000.^[37] Full-scale production of the Spitfire began at Supermarine's facility in Woolston, Southampton, but it quickly became clear that the order could not be completed in the 15 months promised. Supermarine was a small company, already busy building the [Walrus](#) and [Stranraer](#), and its parent company, Vickers, was busy building the [Wellington](#). The initial solution was to subcontract the work out.^[37] The first production Spitfire rolled off the assembly line in mid-1938,^[11] and was flown on 15 May 1938, almost 24 months after the initial order.



The final cost of the first 310 aircraft, after delays and increased programme costs, came to £1,870,242 or £1,533 more per aircraft than originally estimated.^[4] Production aircraft cost about £9,500. The most expensive components were the hand-fabricated and finished fuselage at approximately £2,500, then the Rolls-Royce Merlin engine at £2,000, followed by the wings at £1,800 a pair, guns and undercarriage, both at £800 each, and the propeller at £350.

Manufacturing at Castle Bromwich

Spitfire Mk IIA, P7666, EB-Z, "Observer Corps", was built by Castle Bromwich, and delivered to [41 Squadron](#) on 23 November 1940.^[nb 4]

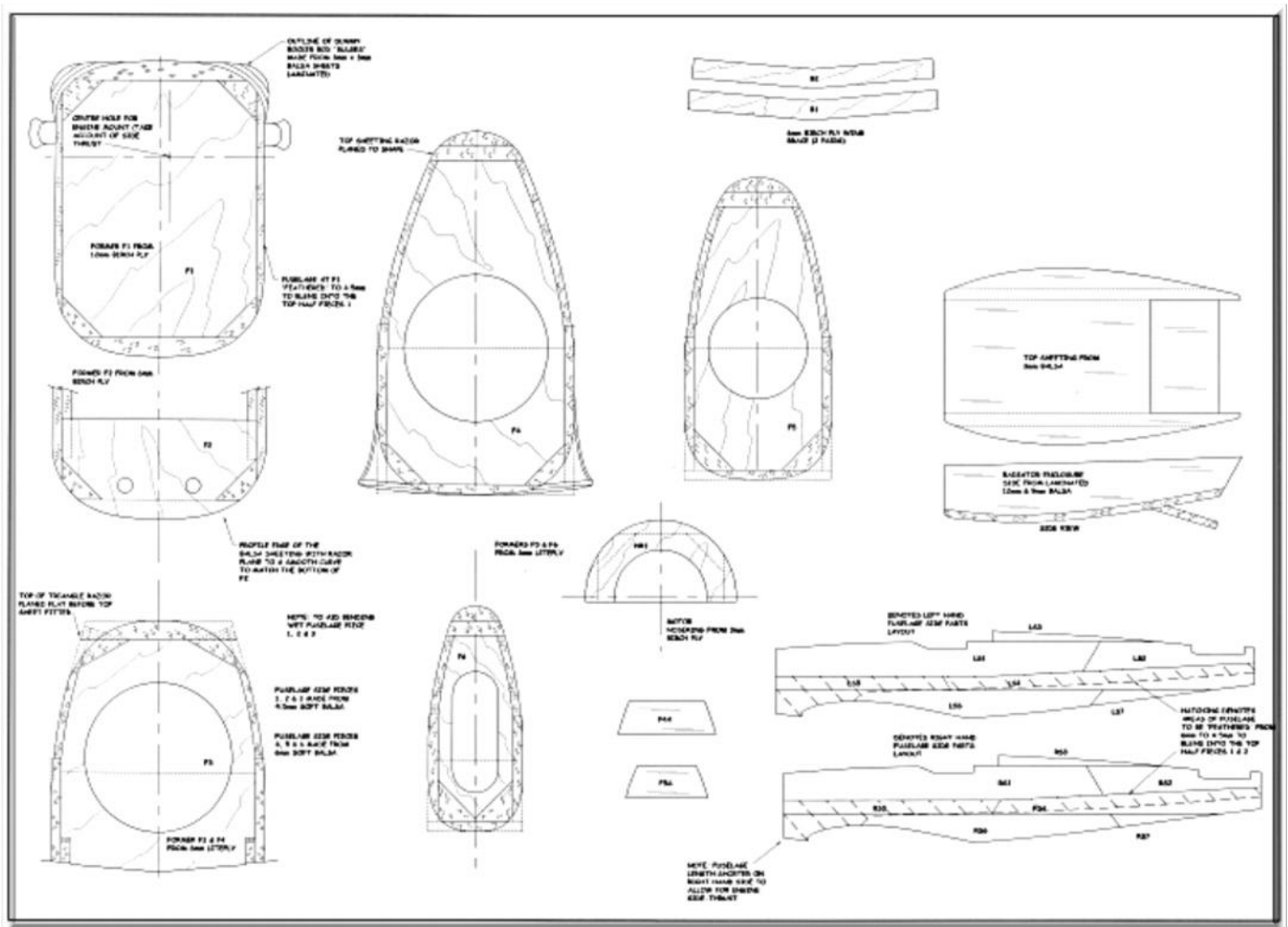
Main article: [Castle Bromwich Assembly](#)

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In 1935, the Air Ministry approached [Morris Motors Limited](#) to ask how quickly their [Cowley plant](#) could be turned to aircraft production. This informal asking of major manufacturing facilities was turned into a formal plan to boost British aircraft production capacity in 1936, as the [Shadow factory plan](#), under the leadership of [Herbert Austin](#). Austin was briefed to build nine new factories, and further supplement the existing British car manufacturing industry, by either adding to its overall capacity or capability to reorganise to produce aircraft and their engines.

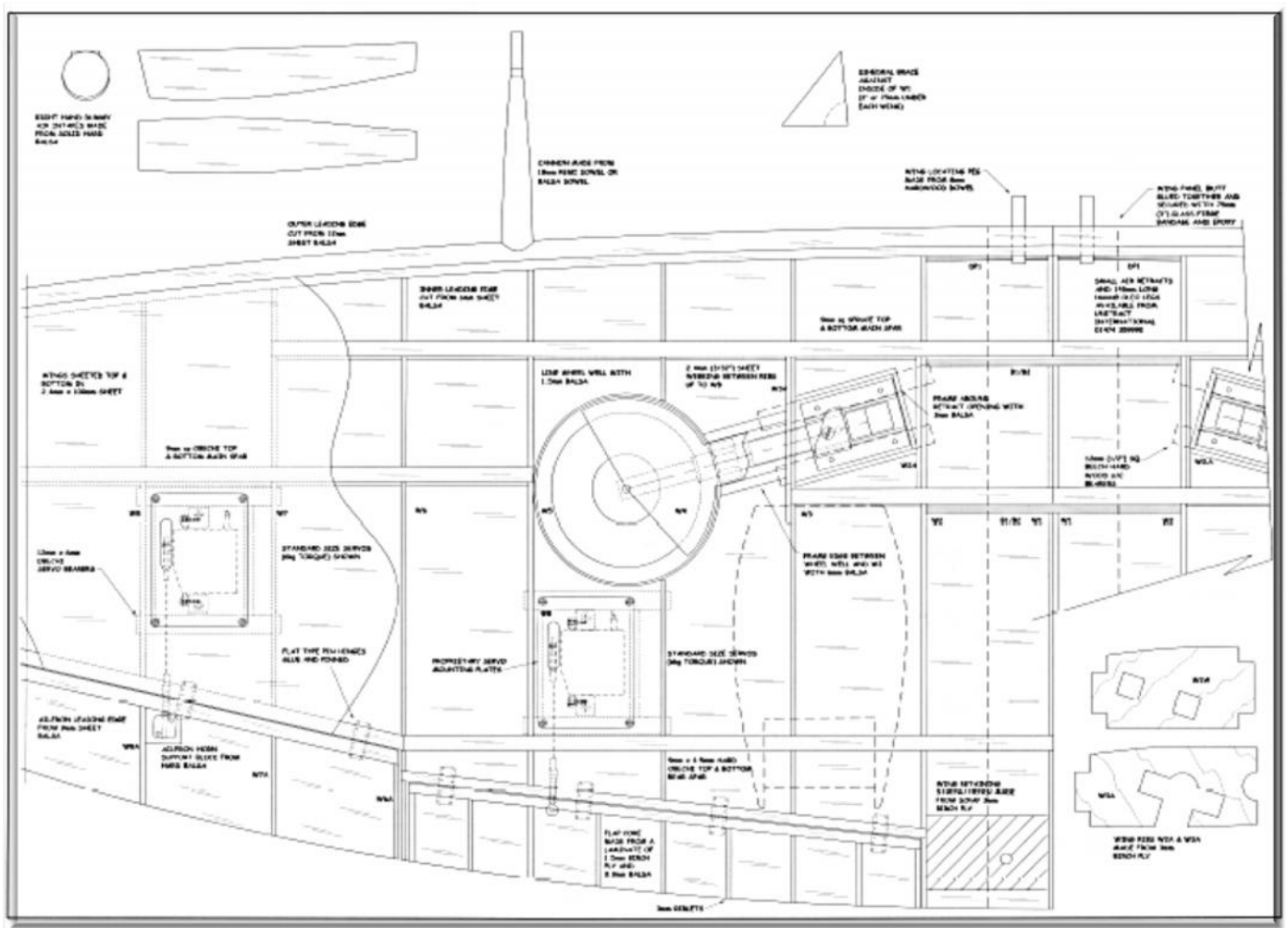
Under the plan, on 12 July 1938, the Air Ministry bought a site consisting of farm fields and a [sewage works](#) next to [Castle Bromwich Aerodrome](#) in [Birmingham](#). This [shadow factory](#) would supplement Supermarine's original factories in Southampton in building the Spitfire. The [Castle Bromwich Aircraft Factory](#) ordered the most modern [machine tools](#) then available, which were being installed two months after work started on the site.^[4] Although Morris Motors under [Lord Nuffield](#) (an expert in mass motor-vehicle construction) at first managed and equipped the factory, it was funded by government money. When the project was first mooted it was estimated that the factory would be built for £2,000,000, however, by the beginning of 1939 this cost had doubled to over £4,000,000.^[40] The Spitfire's stressed-skin construction required precision engineering skills and techniques outside the experience of the local labour force, which took some time to train. However, even as the first Spitfires were being built in June 1940 the factory was still incomplete, and there were numerous problems with the factory management, which ignored tooling and drawings provided by Supermarine in favour of tools and drawings of its own designs,^[41] and with the workforce which, while not completely stopping production, continually threatened [strikes](#) or "slow downs" until their demands for higher than average pay rates were met.^[42]



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By May 1940, Castle Bromwich had not yet built its first Spitfire, in spite of promises that the factory would be producing 60 per week starting in April.^[40] On 17 May [Lord Beaverbrook](#), Minister of Aircraft Production, telephoned Lord Nuffield and manoeuvred him into handing over control of the Castle Bromwich plant to Beaverbrook's Ministry.^[43] Beaverbrook immediately sent in experienced management staff and experienced workers from Supermarine and gave over control of the factory to Vickers-Armstrong. Although it would take some time to resolve the problems, in June 1940, 10 [Mk IIs](#) were built,^[44] 23 rolled out in July, 37 in August, and 56 in September.^[45] By the time production ended at Castle Bromwich in June 1945, a total of 12,129 Spitfires (921 Mk IIs,^[46] 4,489 Mk Vs,^[47] 5,665 Mk IXs,^[47] and 1,054 Mk XVIs^[46]) had been built. CBAF went on to become the largest and most successful plant of its type during the 1939-45 conflict. As the largest Spitfire factory in the UK, by producing a maximum of 320 aircraft per month, it built over half of the approximately 20,000 aircraft of this type.



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Other Models / Scales:

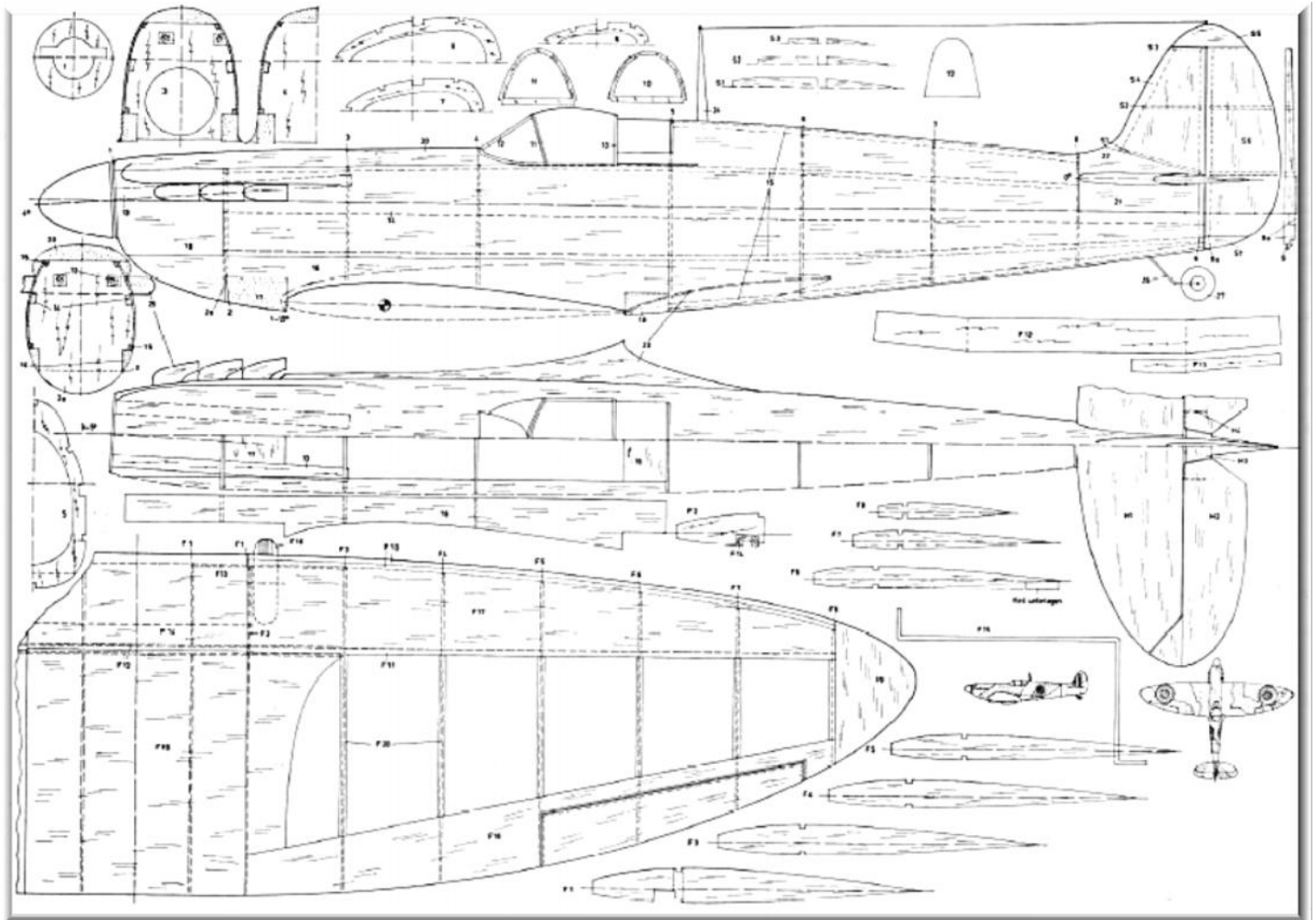
MK-IIA 35" Wing Span Plan.



MK-II

Spitfire Mk IIA, P7666, EB-Z, "Observer Corps", was built by Castle Bromwich, and delivered to 41 Squadron on 23 November 1940.

Spitfire Mk IIA P7350 of the BBMF is the only existing airworthy Spitfire that fought in the Battle of Britain.



MK-IIA 35" Wing Span Plan

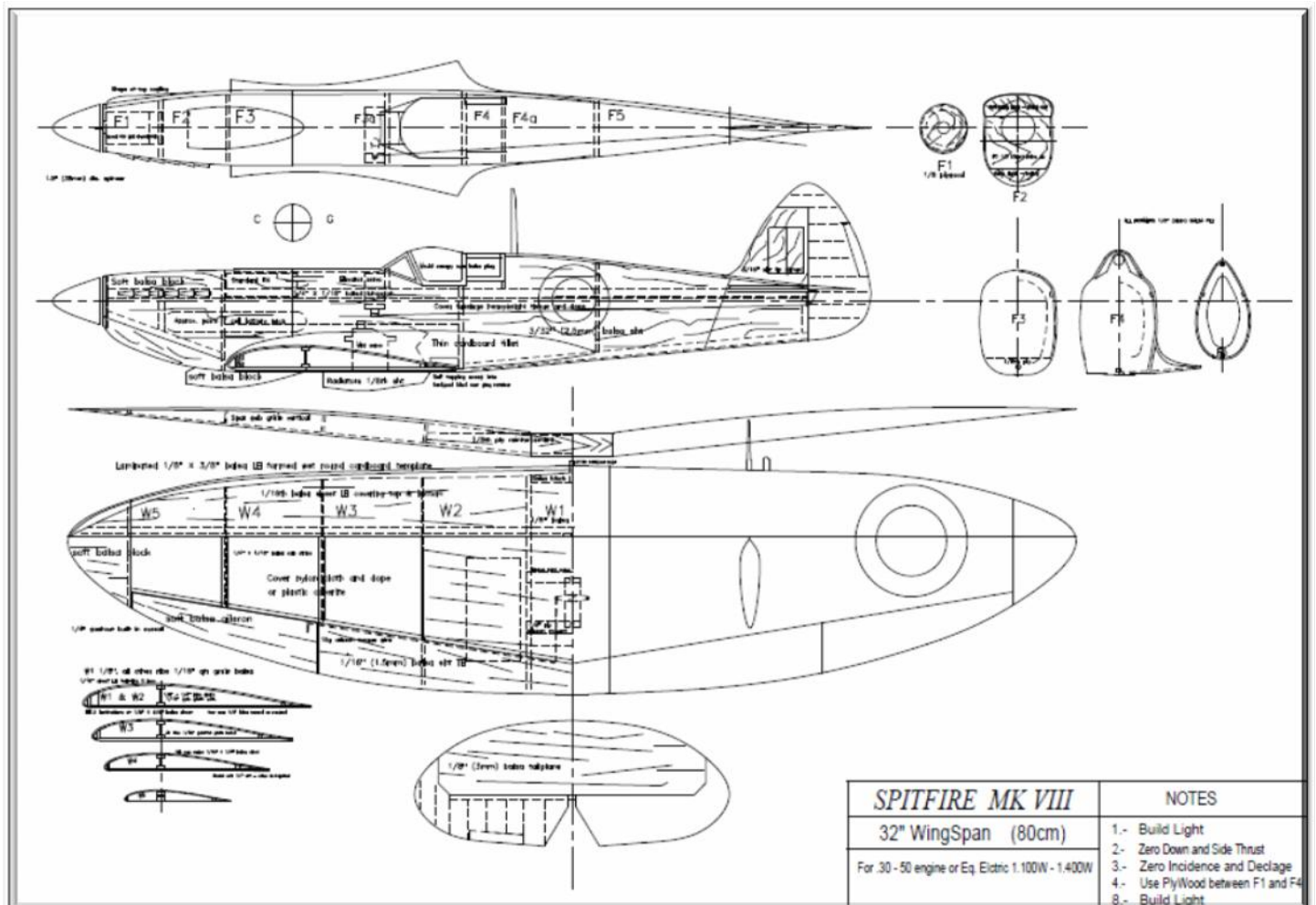
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MK-VIII 32" Wing Span Plan.



Supermarine developed a two-seat variant known as the T Mk VIII to be used for training, but none were ordered, and only one example was ever constructed (identified as N32/G-AIDN by Supermarine).^[129] In the absence of an official two-seater variant, a number of airframes were crudely converted in the field. These included a 4 Squadron SAAF Mk VB in North Africa, where a second seat was fitted instead of the upper fuel tank in front of the cockpit, although it was not a dual-control aircraft and is thought to have been used as the squadron "run-about."^[130] The only unofficial two-seat conversions that were fitted with dual-controls were a small number of Russian lend/lease Mk IX aircraft. These were referred to as Mk IX UTI and differed from the Supermarine proposals by using an inline "greenhouse" style double canopy rather than the raised "bubble" type of the T Mk VIII.



MK-VIII 32" Wing Span Plan

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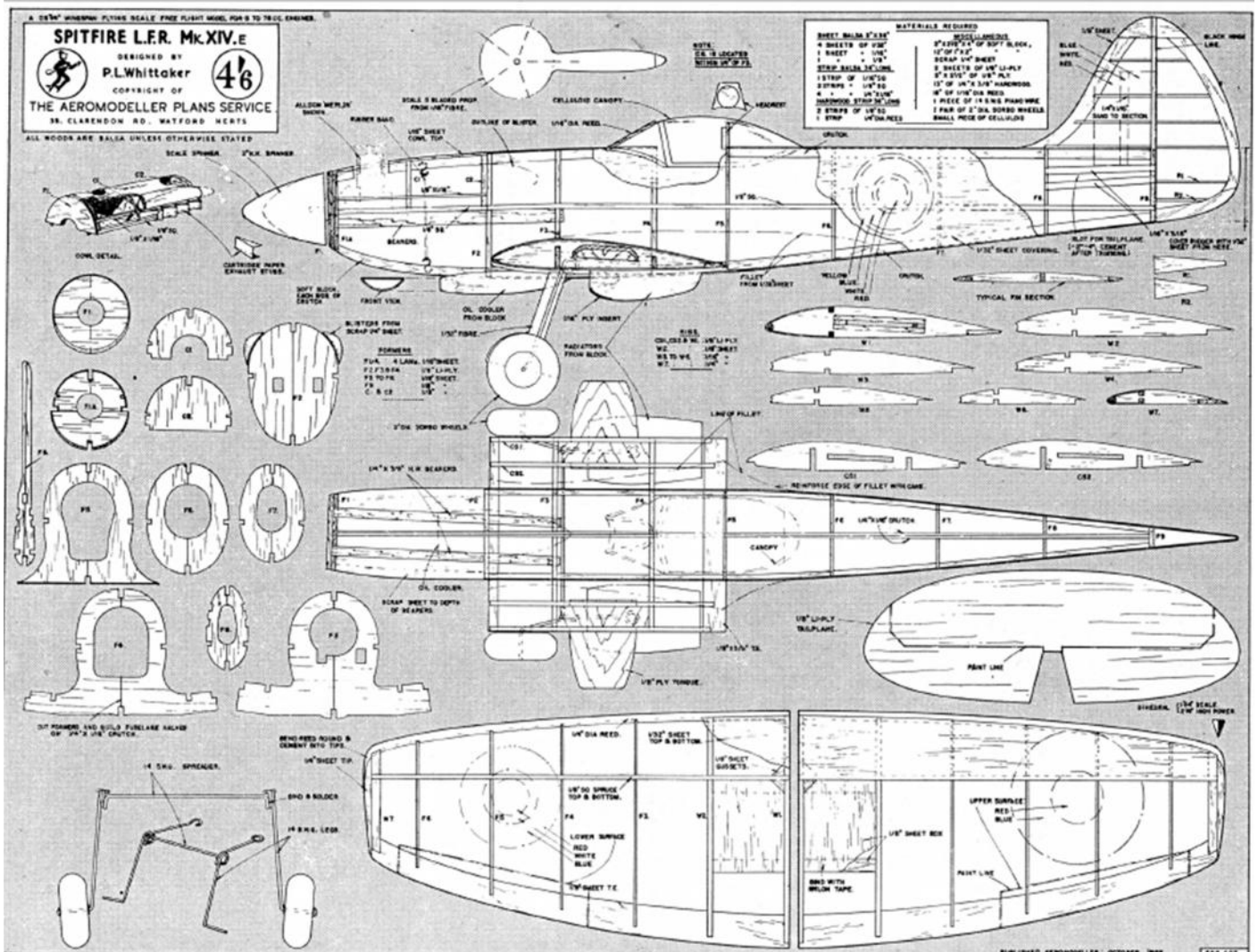
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MK-XIV 36.6" Wing Span Plan.



MK-XIV

Supermarine developed a new laminar flow wing based on new aerofoil profiles developed by NACA in the United States, with the objective of reducing drag and improving performance. These laminar flow airfoils were the Supermarine 371-I used at the root and the 371-II used at the tip.^[97] Supermarine estimated that the new wing could give an increase in speed of 55 mph (89 km/h) over the Spitfire Mk 21.^[98] The new wing was initially fitted to a Spitfire Mk XIV; later a new fuselage was designed, with the new fighter becoming the Supermarine Spitful.



MK-XIV 36.61" Wing Span Plan

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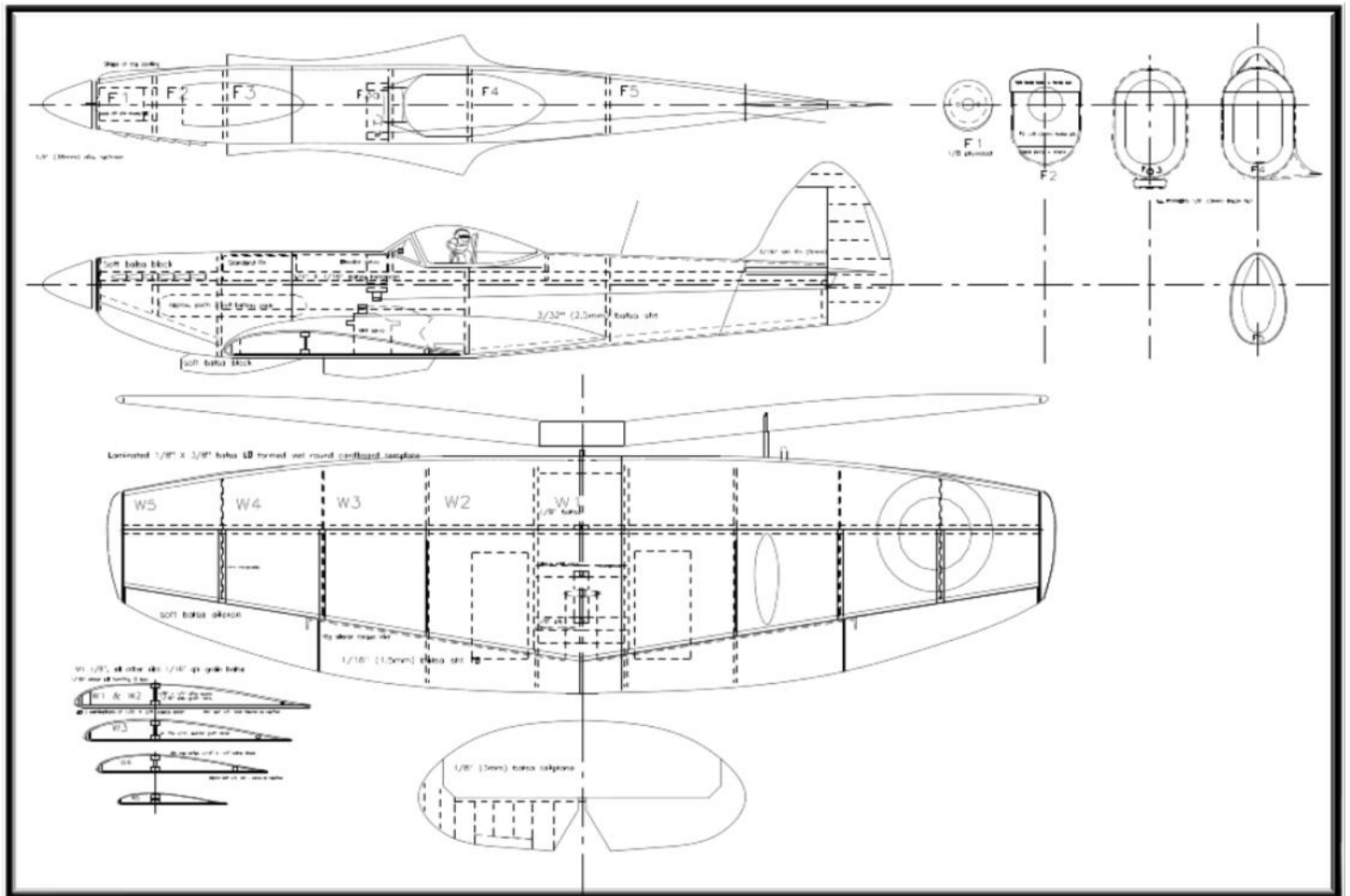
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MK-XVI 37" Wing Span Plan.



Built at Vickers Armstrong's Castle Bromwich "shadow factory", near Birmingham, in late 1944.

The aircraft's first action was on 24 March (wearing squadron code FU-P) when, laden with two 250lb bombs and a long range belly tank, the aircraft headed a flight of four Spitfires for an armed reconnaissance; briefed to bomb rail targets in the Utrecht/Hague/Leiden area. TB863's cannons were fired in anger for the first time during a strafing attack on a large railway coach by the four, claimed as probably destroyed, before returning to altitude. The aircraft continued with these sorties flying twelve missions during its six weeks on operations; 23 hours 55 minutes in total.



MK-XVI 37" Wing Span Plan.