Hawker Hurricane

Hurricane I (*R4118*), a Hurricane from the 1940 Battle of Britain still flying (as of 2007).

Type	Fighter
Manufacturer	Hawker
Designed by	Sidney Camm
Maiden flight	6 November 1935
Introduced	1937
Primary user	Royal Air Force
Produced	1937-1944
Number built	14,000

The **Hawker Hurricane** was a British single-seat fighter aircraft designed and predominantly built by Hawker Aircraft Ltd. Some production of the Hurricane was carried out in Canada by the Canada Car and Foundry Co Ltd.

The 1930s design evolved through several versions and adaptations, resulting in a series of aircraft which acted as interceptor-fighters, fighter-bombers (also called "Hurribombers"), and ground support aircraft. Further versions known as the **Sea Hurricane** had modifications which enabled operation from ships. The Hurricane was significant in enabling the Royal Air Force (RAF) to win the Battle of Britain of 1940, accounting for the majority of the RAF's air victories. About 14,000 Hurricanes were built by the end of 1944 (including about 1,200 converted to Sea Hurricanes, and about 1,400 that were built in Canada), and served in all the major theatres of the Second World War.

The Hurricane was developed by Hawker Aircraft Ltd in response to the Air Ministry specification F.36/34, (modified by F.5/34) for a fighter aircraft built around the new Rolls-Royce engine, then only known as PV-12, later to become famous as the Merlin. At that time, RAF Fighter Command comprised just 13 squadrons, each equipped with either Hawker Furys, Hawker Hart variants, or Bristol Bulldogs – all biplanes with fixed-pitch wooden propellers and non-retractable undercarriages.[1] The design, started in early 1934, was the work of Sidney Camm.

Sydney Camm's original plans submitted in response to the Air Ministry's specification were rejected (apparently "too orthodox," even for the Air Ministry). Camm tore up the proposal and set about designing a fighter as a Hawker company private venture. With economy in mind, the Hurricane was designed using as many of Hawker's existing tools and jigs as possible (the plane was effectively a monoplane version of the successful Hawker Fury); and it was these factors that were major contributors to the plane's success.

Early design stages of the "Fury Monoplane" incorporated a Rolls-Royce Goshawk engine, but this was replaced shortly after with the Merlin, and featured a retractable undercarriage. The design came to be known as the 'Interceptor Monoplane', and by May 1934, the plans had been completed in detail. To test the new design, a one-tenth scale model of the aircraft was made and sent to the National Physical Laboratory at Teddington. A series of wind tunnel tests confirmed the vital basic aerodynamic qualities of the design were in order, and by December that year, a full size wooden mock-up of the aircraft had been created.[1]

The first prototype, *K5083*, began construction in August 1935 incorporating the PV-12 Merlin engine. The completed sections of the aircraft were taken to the Brooklands racing circuit where Hawkers had an assembly shed, and re-assembled on 23 October 1935. Ground testing and taxi trials took place over the following two weeks, and on 6 November 1935, the prototype took to the air for the first time at the hands of Hawker's chief test pilot, Flight Lieutenant (later Group Captain) P.W.S. Bulman.[2] Flight Lieutenant Bulman was assisted by two other pilots in subsequent flight testing; Philip Lucas flew some of the experimental test flights, while John Hindmarsh conducted the firm's production flight trials.[3]

Even though faster and more advanced than the RAF's current frontline biplane fighters, the Hurricane's design was already outdated when introduced. It employed traditional Hawker construction techniques from previous biplane aircraft, with mechanically fastened, rather than welded joints. It had a Warren girder-type fuselage of high-tensile steel tubes, over which sat frames and longerons that carried the doped linen fabric covering. The Hurricane's traditional construction meant that the airframe was very durable, and proved far more resistant to exploding cannon shells than the metal-skinned Supermarine Spitfire. Initially, the wing structure consisted of two steel spars, and was also fabric-covered. An all-metal, stressed-skin wing of duraluminium (a DERD specification similar to AA2024) was introduced in April 1939 and was used for the all of the later marks.[2] In contrast, the contemporary Spitfire used all-metal monocoque construction and was thus both lighter and stronger, though less tolerant to bullet damage. With its ease of maintenance, widely set landing gear and benign flying characteristics, the Hurricane remained in use in theatres of operations where reliability, easy handling and a good gun platform were more important than performance, typically in roles like ground attack.

Production

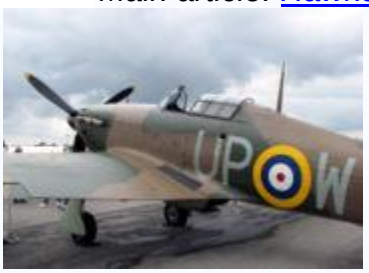
The Hurricane was ordered into production in June 1936, mainly due to its relatively simple construction and ease of manufacture. As the prospect of war was looking more and more likely, and time was of the essence in providing the RAF with an effective fighter aircraft, it was unclear if the much more advanced Spitfire would be able to enter production smoothly, while the Hurricane used well-understood manufacturing techniques. This was true for service squadrons as well, who were experienced in working on and repairing aircraft constructed in a similar fashion to the Hurricane, and the simplicity of its design enabled the improvisation of some remarkable repairs in Squadron workshops.

Powered by a Merlin II engine, the maiden flight of the first production aircraft took place on 12 October 1937. The first four aircraft to enter service with the RAF joined 111 Squadron at RAF Northolt the following December, and by the outbreak of World War II, nearly 500 Hurricanes had been produced, and equipped 18 squadrons.[4]

In all, some 14,000 Hurricanes and Sea Hurricanes were produced. The majority of Hurricanes were built by Hawker (which produced them until 1944) with the Gloster Aircraft Company making most of the rest. The Austin Motor Company built 300. Canada Car and Foundry in Fort William, Ontario, Canada, (where the Chief Engineer, Elsie MacGill, became known as the "Queen of the Hurricanes") was responsible for production of 1400 Hurricanes, known as the Mk X.

Variants

Main article: Hawker Hurricane variants



Hurricane I (R4118)


Hawker Hurricane IIA at the National Museum of the United States Air Force


Hawker Hurricane IIB *Z5140*


Hawker Hurricane IIC *PZ865* (Battle of Britain Memorial Flight), the last Hurricane produced


Hawker Hurricane IV *KZ321* (The Fighter Collection)


Hurricane Mk IV, armed with RP-3 rockets


Canadian-built Hurricane XII painted to represent Hurricane IIB Z5140 of 126 Squadron RAF


Fleet Air Arm Sea Hurricane


Sea Hurricane IB in formation, December 1941

Hurricane I

First production version, with fabric-covered wings, a wooden two-bladed, fixed-pitch propeller, powered by the 1,030-hp (768-kW) Rolls-Royce Merlin Mk II or III engines and armed with eight .303-inch Browning machine guns. Produced between 1937 and 1939.

Hurricane I (revised)

A revised Hurricane I series built with a de Havilland or Rotol constant speed metal propeller, metal-covered wings, armour and other improvements. In 1939, the RAF had taken on about 500 of this later design to form the backbone of the fighter squadrons.

Hurricane IIA Series 1

Hurricane I powered by the improved Merlin XX engine. First flew on 11 June 1940 and went into squadron service in September 1940.

Hurricane IIB (Hurricane IIA Series 2)

Hurricane IIA Series 1 equipped with new and slightly longer propeller spinner and new wing mounting 12 .303-inch Browning machine guns. The first aircraft were built in October 1940 and were renamed **Mark IIB** in April 1941.

Hurricane IIB Trop.

For use in North Africa the Hawker Hurricane IIB (and other variants) were tropicalised. They were given engine dust filters and the pilots were issued a desert survival kit.

Hurricane IIC (Hurricane IIA Series 2)

Hurricane IIA Series 1 equipped with new and slightly longer propeller spinner and new wing mounting four 20-mm Hispano cannons. Hurricane IIA Series 2 became the **Mark IIC** in June 1941, using a slightly modified wing. The new wings also included a hardpoint for a 500 lb or 250 lb bomb, and later in 1941, fuel tanks. By then performance was inferior to the latest German fighters, and the Hurricane changed to the ground-attack role, sometimes referred to as the **Hurribomber**. The mark also served as a night fighter and "intruder."

Hurricane IID

Hurricane IIB conversion armed with two 40-mm AT cannons in a pod under each wing and a single Browning machine gun in each wing loaded with tracers for aiming purposes. The first aircraft flew on 18 September 1941, deliveries started in 1942. Serial built aircraft had additional armour for the pilot, radiator and engine, and were armed with a Rolls-Royce gun with 12 rounds, later changed to the Vickers S 40-mm gun with 15 rounds. The weight of guns and armour protection marginally impacted the aircraft's performance.

Hurricane IIE

Another wing modification was introduced in the **Mk IIE**, but the changes became extensive enough that it was renamed the **Mk IV** after the first 250 had been delivered.

Hurricane T.IIC

Two-seat training version of the Mk. IIC. Only two aircraft were built for the Persian Air Force.

Hurricane III

Version of the Hurricane II powered by a Packard-built Merlin engine, intending to provide supplies of the British-built engines for other designs. By the time production was to have started, Merlin production had increased to the point where the idea was abandoned.

Hurricane IV

The last major change to the Hurricane was to "rationalise" the wing, configuring it with a single design able to mount two bombs, two 40-mm Vickers S guns, or eight "60 pounder" RP-3 rockets. The new design also incorporated the improved Merlin 24 or 27 engines of 1,620-hp (1,208-kW), equipped with dust filters for desert operations.

Hurricane V

Two Hurricane IVs were fitted with a Merlin 32 engine driving a four-bladed propeller for ground attack duties.

Hurricane X

Canadian-built variant. Single-seat fighter and fighter-bomber. Powered by a 1,300-hp (969-kW) Packard Merlin 28. Eight 0.303-inch (7.7-mm) machine guns mounted in the wings. In total, 490 were built.

Hurricane XI

Canadian-built variant. 150 were built.

Hurricane XII

Canadian-built variant. Single-seat fighter and fighter-bomber. Powered by a 1,300-hp (969-kW) Packard Merlin 29. Initially armed with 12 0.303-inch (7.7-mm) machine guns, but this was later changed to four 20-mm cannons.

Hurricane XIIA

Canadian-built variant. Single-seat fighter and fighter-bomber. Powered by a 1,300-hp (969-kW) Packard Merlin 29, armed with eight 0.303-inch (7.7-mm) machine guns.

Sea Hurricane IA

The Sea Hurricane IA was a Hurricane Mk I modified by General Aircraft Limited. They were modified to be carried by CAM ships (catapult armed merchantman). These were cargo ships equipped with a catapult for launching an aircraft, but without facilities to recover them. Thus, if the aircraft were not in range of a land base, pilots were forced to bail out and be picked up by the ship. They were informally known as "Hurricats".
The majority of the aircraft modified had suffered wear-and-tear from serving with frontline squadrons, so much so that at least one example used during trials broke up under the stress of a catapult launching. A total of 50 aircraft were converted from Hurricane Mk Is.

Sea Hurricane IB
Hurricane IIA Series 2 version equipped with catapult spools plus an arrester hook. From October 1941, they were used on Merchant aircraft carrier (MAC ships), which were large cargo vessels with a flight deck enabling aircraft to be launched *and* recovered. A total of 340 aircraft were converted.

Sea Hurricane IC
Hurricane IIB and IIC version equipped with catapult spools, an arrester hook and the four-cannon wing. From February 1942, 400 aircraft were converted.

Sea Hurricane IIC
Hurricane IIC version equipped with naval radio gear; 400 aircraft were converted and used on fleet carriers.

Sea Hurricane XIIA
Canadian-built Hurricane XIIA converted into Sea Hurricanes.

[edit] Noted Service

Battle of France

In response to a request from the French government for ten fighter squadrons to provide air support, Air Chief Marshal Sir Hugh Dowding, Commander-in-Chief of RAF Fighter Command, insisted that this number would deplete British defences severely, and so initially only four squadrons of Hurricanes, Nos. 1, 73, 85 and 87, were relocated to France, keeping Spitfires back for "Home" defence. The first to arrive was No.73 Squadron on 10 September 1939, followed shortly by the other three, and a little later Nos. 607 and 615 Squadrons joined them. In May the following year, Nos. 3, 79 and 504 Squadrons reinforced them as Germany's Blitzkrieg gathered momentum, and on 13 May 1940, a further 32 Hurricanes arrived. All ten requested Hurricane squadrons were then operating from French soil and felt the full force of the Nazi offensive. By 17 May, the end of the first week of fighting, only three of the squadrons were near operational strength, but despite their heavy losses the Hurricanes had managed to destroy nearly double the number of German aircraft.

Flying Officer E.J."Cobber" Kain was responsible for No. 73 Squadron's first victory in October 1939, while stationed in France, subsequently he went on to be the RAF's first fighter ace of the war. In June 1940, prior to heading for England at the start of his leave, on leaving his airfield, he crashed during a low-level "victory roll" and lost his life.

On 27 May 1940, 13 aircraft from No. 501 Squadron intercepted 24 Heinkel He 111s escorted by 20 Messerschmitt Bf 110s, and during the ensuing battle, 11 Heinkels were confirmed "kills" and others damaged, with little damage to the Hurricanes.[5]

Battle of Britain

At the end of June 1940, following the fall of France, the majority of the RAF's 36 fighter squadrons were equipped with Hurricanes. The Battle of Britain officially lasted from 1 July until 31 October

1940, but the heaviest fighting took place between 8 August and 21 September 1940. Both Spitfires and Hurricanes are renowned for their part in defending Britain against the Luftwaffe's might – generally the Spitfire would intercept the German fighters leaving Hurricanes to concentrate on destroying the bombers, but despite the undoubted abilities of the "thoroughbred" Spitfire, it was the "workhorse" Hurricane that scored the highest number of RAF victories during this period, accounting for 1,593 out of the 2,739 total claimed.

The only Battle of Britain Victoria Cross was awarded to Flight Lieutenant Eric Nicolson, as a result of an action on 16 August 1940 when he was attacked by three Me 110 fighters. Nicolson was badly wounded, and his Hurricane was damaged and engulfed in flames, but its strong construction held it together. While attempting to leave the cockpit, Nicolson noticed that one of the Me 110s continued to circle his disabled aircraft. He returned to the cockpit which by now was a blazing inferno, sat in the flames, and, while burning, brought the Hurricane out of the dive, engaged the enemy, and shot the Me 110 down.[*citation needed*]

Defence of Malta

The Hurricane played a significant role in the defence of Malta. On 10 June 1940, the day that Italy entered the war, Malta's air defence rested on a few Gloster Gladiators which managed to hold out against vastly superior numbers of the Italian air force during the following three weeks. Four Hurricanes joined them at the end of June, and together they faced attacks throughout July from the 200 enemy aircraft based in Sicily, with the loss of one Gladiator and one Hurricane. Further reinforcements arrived on 2 August in the form of 12 more Hurricanes and two Blackburn Skuas, which prompted the Italians to employ German Junkers Ju 87 dive bombers to try and destroy the airfields. Finally, in an attempt to overcome the stiff resistance put up by these few aircraft, the Luftwaffe took up base on the Sicilian airfields only to find that Malta was not an easy target. After numerous attacks on the island over the following months, and the arrival of an extra 23 Hurricanes at the end of April 1941, and a further delivery a month later, the Luftwaffe left Sicily for the Russian Front in June that year.[6]

As Malta was strategically situated on the increasingly important sea supply route for the North African campaign, the Luftwaffe returned with a vengeance for a second assault on the island at the beginning of 1942. It wasn't until March, when the onslaught was at its highest, that 15 Spitfires flew in from the carrier HMS Eagle to join with the Hurricanes already stationed there and bolster the defence, but many of the new aircraft were lost on the ground and it was again the Hurricane that bore the brunt of the early fighting until further reinforcements arrived. In relation to this second intensive assault on Malta, Wing Commander P.B. "Laddie" Lucas is quoted as saying:[7]

> “ For weeks a handful of Hurricane IIs, aided by Group Captain A.B. Woodhall's masterly controlling, had been meeting, against all the odds, the rising crescendo of Field Marshal Kesselring's relentless attacks on Grand Harbour and the airfields. Outnumbered, usually, by 12 or 14 to one and, later – with the arrival of the Me 109Fs in Sicily – outperformed, the pilots of the few old aircraft which the ground crews struggled valiantly to keep serviceable, went on pressing their attacks, ploughing their way through the German fighter screens, and our flak, to close in with the Ju 87s and 88s as they dived for their targets. ”
>
> —Wing Commander P.B. "Laddie" Lucas D.S.O., D.F.C.

Air Defence in Russia

Mk II Hurricanes played an important air defence role in 1941 when the Soviet Union found itself under threat from the German Army approaching on a broad front stretching from Leningrad, Moscow, and to the oil fields in the south. Britain's decision to aid the Soviets meant sending supplies by sea to the far northern ports, and as the convoys would need to sail within range of enemy air attack from the Luftwaffe based in neighbouring Finland. It was decided to deliver a number of Hurricane Mk IIBs, flying with Nos. 81 and 134 Squadrons, to provide protection. Twenty-four were transported on the carrier HMS Argus arriving just off Murmansk 28 August 1941, and another 15 crated aircraft on board merchant vessels. In addition to their convoy protection duties, the aircraft also acted as escorts to Russian bombers. Enemy attention to the area declined in October, at which point the RAF pilots trained their Soviet counterparts to operate the Hurricanes themselves and, by the end of the year, the RAF's role had ended, but the aircraft remained behind and were just the first of thousands of Allied aircraft that would be accepted by the Soviet Union.[8]

North Africa

During and following the five-day El Alamein artillery barrage commencing the night of 23 October 1942, six squadrons of fighter-bomber Hurricanes claimed to have destroyed 39 tanks, 212 lorries and armoured troop-carriers, 26 bowsers, 42 guns, 200 various other vehicles and four small fuel and ammunition dumps, flying 842 sorties with the loss of 11 pilots. Whilst performing in a ground support role, Hurricanes based at RAF Castel Benito, Tripoli, knocked out six tanks, 13 armoured vehicles, ten lorries, five half-tracks, a gun and trailer, and a wireless van on 10 March 1943, with no losses to themselves.[9]

Hurricanes in non-British service

Hawker Hurricane Mk IVRP with Yugoslav Air Force markings, Museum of Aviation in Belgrade, Belgrade, Serbia

The Hawker Hurricane, due to its rugged construction and ease of maintenance, enjoyed a long operational life in all theatres of war, flown by both the Axis and Allies. It served in the air forces of many countries, some "involuntarily" as in the case of Hurricanes which either landed accidentally or force-landed in neutral Ireland. There, the Hurricanes were immediately impounded by the authorities, followed by their entry into service with the Irish Air Corps at Baldonnel. (The Irish would turn a "blind eye" as the pilot *escaped* across the border into Northern Ireland).

Squadrons from other British Commonwealth air forces — and individual pilots from them — serving with RAF formations also used the type. These included No. 486 Squadron, Royal New Zealand Air Force and No. 488 Squadron RNZAF. Following the fall of Singapore, 488 Squadron's Hurricanes were transferred to New Zealand home service, where some ended their days as airfield decoys. Several Royal Canadian Air Force squadrons were equipped with Hurricanes, including No. 1

Squadron RCAF, which flew in the Battle of Britain. The South African Air Force also operated several squadrons of Hurricanes as part of the Desert Air Force, including 40 Squadron.

Hurricanes also joined the ranks of the *Forces Aériennes Françaises Libres* (FAFL), the Free French Air Force, fighting in North Africa between June 1940 and May 1943 . The Hurricanes, like all FAFL aircraft, sported the Cross of Lorraine on the fuselage, instead of the roundel in order to distinguish them from those aircraft flying for the Vichy French air force. These squadrons were generally formed within the RAF, so that *Groupe de Chasse Alsace* was known in British circles as No. 341 Squadron RAF.

Belgium bought 20 Hurricanes and a licence to build 80 more, of which only two were completed, with most of the aircraft being lost during the German invasion when they were bombed at the military airfield at Schaffen near Diest on 10 May 1940.

Hurricanes were licence-built in Yugoslavia along with 24 examples delivered from Britain. A large number (2,952 aircraft) of Hurricanes of several makers were sent to the Soviet Union where they served on all fronts. One Hurricane Mk IIB was captured from the Soviets during the war and flown by the Finnish Air Force.

Finland bought 12 Mk I Hurricanes at the end of the Winter War, but lost two during the transit flight. The aircraft did not have much success (only 5½ kills). When hostilities began again on 25 June 1941, their use was quite limited, partially because they were worn out due to the scarcity of replacement parts available during the Interim Peace (13 March 1940- 25 June 1941) and subsequent combat flying.

Turkey and Romania bought Hurricanes in 1939 while other significant operators included Australia, Greece, Egypt, India, Persia, Portugal and Yugoslavia.

The Luftwaffe operated some captured Hurricanes for training and education purposes,[*citation needed*] while the Japanese captured two.[*citation needed*]

Operators

- Australia
- Belgium
- Canada
- Egypt
- France
- Finland
  - Finnish Air Force
  - No. 10 Squadron, Finnish Air Force
  - No. 22 Squadron, Finnish Air Force
  - No. 26 Squadron, Finnish Air Force
  - No. 28 Squadron, Finnish Air Force
  - No. 30 Squadron, Finnish Air Force
  - No. 32 Squadron, Finnish Air Force
  - No. 34 Squadron, Finnish Air Force
- Germany
  - Luftwaffe
- Greece
- British India

India
Iran
Ireland
Italy
Japan
Netherlands (Dutch East Indies)
New Zealand
Norway
Poland
Portugal
Romania
South Africa
Soviet Union
Turkey
United Kingdom
Kingdom of Yugoslavia
Yugoslavia

Specifications (Hurricane IIC)

A National Air and Space Museum Hawker Hurricane of the Smithsonian Institution
Data from Jane's Fighting Aircraft of World War II[10]

General characteristics

- **Crew:** One
- **Length:** 32 ft 3 in (9.84 m)
- **Wingspan:** 40 ft 0 in (12.19 m)
- **Height:** 13 ft 1½ in (4.0 m)
- **Wing area:** 257.5 ft² (23.92 m²)
- **Empty weight:** 5,745 lb (2,605 kg)
- **Loaded weight:** 7,670 lb (3,480 kg)
- **Max takeoff weight:** 8,710 lb (3,950 kg)
- **Powerplant:** 1× Rolls-Royce Merlin XX liquid-cooled V-12, 1,185 hp at 21,000 ft (883 kW at 6,400 m)

Performance

- **Maximum speed:** 340 mph (547 km/h) at 21,000 ft (6,400 m)[11] (320 mph (514 km/h) at 19,700 ft (6,004 m) with two 250 lb bombs[12])
- **Range:** 600 mi (965 km)
- **Service ceiling:** 36,000 ft (10,970 m)
- **Rate of climb:** 2,780 ft/min (14.1 m/s)
- **Wing loading:** 29.8 lb/ft² (kg/m²)
- **Power/mass:** 6.47 lb/hp (kg/kW)

Armament

- **Guns:**
  - **IIA**: 8× 0.303 in (7.7 mm) Browning machine guns
  - **IIB**: 12× 0.303 in (7.7 mm) Browning machine guns
  - **IIC**: 4× 20 mm Hispano Mk II cannon
  - **IID**: 2× 40 mm Vickers Type S cannon, 2× 0.303 in (7.7 mm) Browning machine guns
- **Bombs (IIC & IID):**
  - 2× 250 lb *or* 500 lb bombs

Comparable aircraft

- Arado Ar 80
- Curtiss P-36
- Curtiss P-40
- Focke Wulf Fw 190
- Heinkel He 112
- Messerschmitt Bf 109
- Miles M.20
- Morane-Saulnier M.S.406
- Polikarpov I-16
- Supermarine Spitfire
- Yakovlev Yak-1

Designation sequence

Nimrod - Hart - **Hurricane** - Henley - Typhoon