

FIGHTERS COMPARED

Top Gun: 1940

In the first part of a major new *Aeroplane* series, in which we compare five aircraft from specific points in aviation history to establish a clear winner, DONALD NIJBOER analyses five fighters on the front line in mid-1940

SINCE THE END of the Second World War the process of assessing and measuring which weapon system was "the best" has been an ongoing process, with varied results. To say this aircraft or tank or ship was the best often overlooks a series of variables that had a direct effect on the performance of each individual weapon system. Much depends on how and where the weapon was used and how well-trained the people using it were. It is also important to determine whether the weapon in question was being employed in the role for which it was originally designed.

Comparing how World War Two-era fighters matched up against each other is not a simple numbers game. While speed, rate of climb, diving speed, armament and manoeuvrability were vital factors, they do not tell the whole story. In order to gain victory in the air both the Allied and Axis

powers had to use an intelligent combination of design, production, doctrine, training and support. The aircraft without these other factors could not win a war — it was the combination of men and machines that made the difference.

Fighter development

In the two decades between the First and Second World Wars aircraft design and technology had developed rapidly from fabric, wire and wood to metal, glass and a lot more horsepower. By 1940 the latest generation of all-metal aircraft of monocoque construction was capable of very high speeds, and most were fitted with innovations such as hydraulically-operated flaps, retractable undercarriages, efficient radio equipment and heavy armament. Pilots could now fly in a fully enclosed cockpit and had the ability to operate at previously undreamed-of altitudes — 20,000ft and higher.

The technology had changed radically but the rules of the

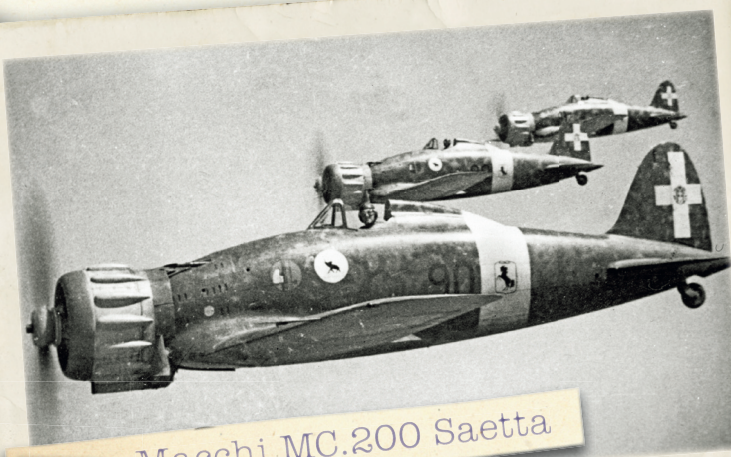
game remained much the same. All the tactics learned and employed in the First World War were brought to bear again in the early days of World War Two. Height was king; seeing the enemy first was vital and diving out of the sun on an unsuspecting enemy often resulted in victory. The surprise "bounce" became the single most effective method of downing an enemy fighter throughout the conflict. Even fighters with modest performance were used to excellent effect provided they stayed within the proven rules of fighter combat.

Over the decades hundreds of books and thousands of articles have stoked the fire of debate over the relative merits of the iconic fighters of World War Two, the first conflict in history in which airpower proved decisive for victory. In the dark early days of the war fighter aircraft and tactics were new and untested. To learn quickly meant survival, and to ignore the reality often meant death.

Hawker Hurricane Mk I



Macchi MC.200 Saetta





Although it is very difficult to determine which fighter was the “best”, or determine an all-round “winner”, we will strive to make the following comparison as meaningful as possible. These fighter aircraft did not operate in a vacuum — each had their individual strengths and weaknesses — but in the end what made a fighter a true champion was a combination of technology, tactics, leadership, pilot training, industrial prowess, serviceability and sound doctrine. Using these variables we hope to present a new perspective on the fighter-versus-fighter contest.

The state of play: 1940

The year 1940 would prove to be one of great defeats — and one inspiring victory — for the Allies. It was also a year in which fighter aircraft from many different nations would meet in combat for the first time. All had roughly the same performance regarding speed, range and armament, but a closer examination of actual combat results shows that, while

in some cases one type was dominant, much depended on the tactics employed and the individual pilot's level of experience when it came to victory or defeat. This comparison will match five types in front-line service in the late summer of 1940 — they are the following:

- Hawker Hurricane Mk I;
- Messerschmitt Bf 109E;
- Curtiss P-36/Hawk 75;
- Macchi MC.200 Saetta;
- Mitsubishi A6M2 Zero.

By 1940 most of the major powers were equipped with single-seat monoplane fighters with engines of 1,000 h.p. or more (Italy and Japan being the exceptions). Many, like the Bf 109E, were of all-metal construction, while the Hurricane combined steel, aluminium, wood and fabric. The Americans were building and exporting the P-36/Hawk 75 in large numbers. The Imperial Japanese Navy Air Force's

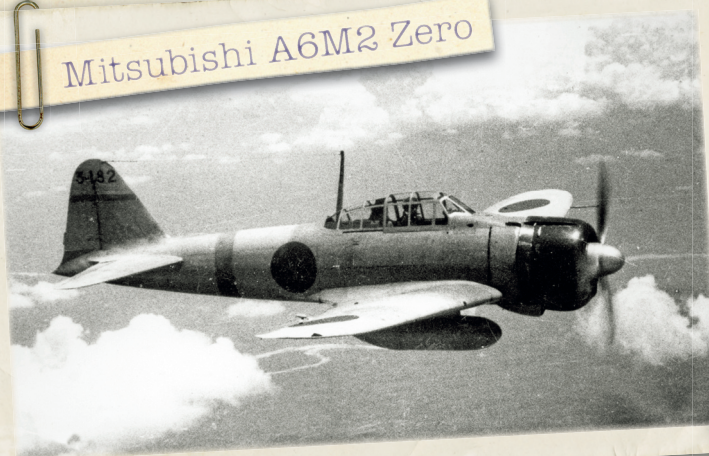
A6M2 represented a revolution in carrierborne fighter design, while Italy had fewer than 150 open-cockpit Macchi MC.200s in service when it entered the war on June 10, 1940. All these aircraft represented a design philosophy influenced by various national and political forces that would affect their overall effectiveness.

This will certainly not end the debate and you, the reader, may not necessarily agree with our conclusions — your thoughts and observations are more than welcome. Check your six! ✎

Curtiss P-36/Hawk 75



Mitsubishi A6M2 Zero



Messerschmitt Bf 109E



FIGHTERS COMPARED HURRICANE Mk I



Hurricane Tough and ready

IN 1940 the Hurricane would be engaged in three major air battles: the Battle of France; the evacuation of Dunkirk and the Battle of Britain. During all three the rugged Hawker fighter proved itself a deadly opponent. The Hurricane's performance was similar to that of the Bf 109, although the latter was quicker, could climb higher faster and could outdive the Hurricane, which was more manoeuvrable. The Hurricane was well-equipped both in terms of armament and armour, and by mid-1940 bullet-proof windshields and additional armour had been fitted, with negligible effect on performance.

Innovative weight of fire

The Hurricane was a very stable gun platform and, in this respect, probably the best of our five compared fighters. The type's eight 0.303in-calibre machine-guns, each loaded with 334 rounds, provided more than 16sec of fire. The recoil of all eight guns was impressive. Battle of Britain Hurricane ace Dennis David recalled: "The thing you have to remember is, the moment you opened fire, you lost 14 m.p.h. The recoil slowed you down".

The Hurricane was rugged. In combat its robust tubular

construction was able to absorb a terrific amount of damage and still bring the pilot home. Many severely damaged Hurricanes were repaired and returned to active duty by well-trained groundcrews.

The Hurricane was also an easier aircraft to fly when compared to the Spitfire and Bf 109. Its wide-track undercarriage made it easier for pilots to take off and land, especially when operating from rough French airfields — a big plus for fatigued pilots. The view from the cockpit was also good, the Hurricane's nose being shorter than that of the Spitfire.

Good aircraft, poor tactics

From the outset the Hurricane squadrons based in France were always outnumbered, and were committed to the pre-war "vic" formation and a strict adherence to the RAF Manual of Air Tactics, which favoured tight formations, the concentration of formation flying leaving little time for scouring the horizon for the enemy. Hurricane units in France were also hampered by a virtually non-existent early warning system. Forced to fly patrols, they often had to wait for the enemy to come to them.

Hurricane pilots claimed 499 kills and 123 probables during May 10–21, 1940. Contemporary German records attribute 299

Sydney Camm's one-winged biplane

DESIGNED BY Sydney Camm, the prototype Hurricane first flew in the summer of 1936, representing a bridge between past and present aircraft technology; it was a monoplane fighter with an enclosed cockpit and a retractable undercarriage, but in terms of construction it was essentially a monoplane version of Hawker's Fury biplane. It used the latter's warren-girder structure of metal tubes, faired by wooden frames, with fabric covering throughout initially. The first example with all-metal stressed-skin wings were delivered to the RAF on September 29, 1939.

The first Hurricane with armour protection for the pilot was delivered in February 1940, an addition which would prove vital for pilot survival in the coming conflict. Not only did a fighter have to destroy enemy aircraft, it also had to bring its pilot home to fight another day.

By the outbreak of war in September 1939 Hawker had delivered nearly 500 Hurricanes, enough to equip some 18 RAF squadrons. Four of these units were despatched to France as part of the British Expeditionary Force. While some were still fitted with wooden Watts two-bladed propellers and fabric-covered wings, the majority had armour plating, reflector gunsights, all-metal wings and three-bladed constant-speed propellers.

During the Battle of Britain the Hurricane would earn its place in history. While not as elegant or streamlined as its contemporary, Supermarine's superb Spitfire, it was nevertheless a formidable fighter; one that could hold its own against the Luftwaffe's best — the Bf 109E...

aircraft destroyed and 65 seriously damaged to RAF fighters. In total the Luftwaffe lost 1,428 aircraft to all causes during the Battle of France. Hurricane losses amounted to 192; 72 destroyed and 120 damaged or abandoned.

The Hurri's finest hour

The Hurricane really came into its own during the Battle of Britain. Flying from permanent bases on home territory and working with Britain's effective Chain Home radar system, Hurricanes inflicted heavy losses on the Luftwaffe. During the Battle of Britain Hurricane pilots shot down 222 Bf 109s out of a total of 656 German aircraft. Hurricane losses amounted to 497.

Hurricane Mk I N2358 of No 73 Sqn is refuelled at its base in France for another sortie against the Luftwaffe in early 1940.



Hawker Hurricane Mk I

TECHNICAL DATA

Armament

4 x 0.303in Browning machine-guns per wing

Fuel capacity

97 Imp gal in three tanks
Reserve tank 28 Imp gal
Wing tanks 34½ Imp gal per wing

Initial production aircraft had fabric-covered wings. **Mk I production** was standardised with lighter, stronger metal-clad wings and early aircraft, including N2359, were retro-fitted with metal wings during 1940

Fabric-covered ailerons

Wing area 257.6ft²

Length 31ft 5in

Braced steel and alloy-tubing frame structure. Fabric covering over wooden formers and stringers

Fabric-covered tail surfaces

ARTWORK

Wearing its distinctive "Popeye" artwork beneath the cockpit, Hurricane Mk I N2359 of No 17 Sqn operated from the unit's base at Debden during September 1940. All aircraft artworks by JUANITA FRANZI/AERO ILLUSTRATIONS © 2010

Propeller

Rotol (or de Havilland) constant-speed variable-pitch (Initial production aircraft fitted with Watts wooden two-bladed fixed-pitch propeller)

Powerplant

1 x 12-cylinder liquid-cooled Rolls Royce Merlin piston engine

Initial production aircraft Merlin II

Later production Mk I Merlin II or Merlin III

Track 7ft 10in

Span 40ft 0in

Performance



Key

Hawker Hurricane Mk I

Messerschmitt Bf 109E-4

Curtiss P-36/Hawk 75A-2

Macchi MC.200 Saetta

Mitsubishi A6M2 Zero

FIGHTERS COMPARED MESSERSCHMITT Bf 109E



Bf 109E Dogfighter supreme

THE SUPERB Messerschmitt Bf 109E, or “Emil”, was one of the first fighters to embody the three core features that would define the fighter in World War Two and beyond: high speed, high wing-loading and sufficiently robust to allow for aggressive dogfighting manoeuvres. By May 1940 combat in Spain, Poland and Norway had garnered it some limited success, but it was about to take on the best the British, French, Dutch and Belgian air forces had to offer.

Small — but deadly

The Bf 109E was a small interceptor of limited range. Powered by the excellent DB 601A engine with fuel injection, the Bf 109E could easily escape attack by pulling into a steep climb at maximum throttle, or by diving away quickly into a bunt without stalling the engine. Carburettor-fed Hurricanes and Spitfires could do neither. The Bf 109's acceleration was better than that of the Hurricane at all heights, as was its zoom and sustained climb. The Emil also packed a heavy punch, being one of the first single-seat fighters to be armed with two 20mm cannon.

Combat experience gained in the Spanish Civil War provided the German fighter force with a number of combat-tested leaders, and an opportunity to develop extremely effective fighter tactics.

The two-aircraft *Rotte* and four-aircraft *Schwarm* (later adopted by the RAF as the “finger-four” formation), tested in Spain, proved extremely effective. The *Rotte* formation consisted of two fighters flying in-line abreast some 150ft apart, the two pilots being able to watch each other's blind spots behind and below. If one aircraft was attacked from the rear, the pilot could break outwards and away. His companion would then also break in the same direction and place himself on the tail of the attacking fighter. In attack mode, the wingman would drop in behind his leader and cover his back.

Gaining the initiative

Freie Jagd — free-hunting fighter sweeps — also gave Bf 109 pilots the initiative. Using their superior high-altitude performance '109s would dive on unsuspecting aircraft with great success. The Hurricane could out-turn the Emil in a dogfight, but the Germans quickly learned to avoid a horizontal battlefield.

The Bf 109 did have some major faults, however. The cockpit was extremely cramped with very

Augsburg Eagle: setting the standard

WILLY MESSERSCHMITT'S Bf 109 was one of the smallest monoplane fighters of the war, making its maiden flight in May 1935. Lessons learnt from the designer's record-setting Bf 108 light aircraft were incorporated to produce a sophisticated all-metal semi-monocoque airframe for the company's first fighter. Early Bf 109 variants were lightly armed with two fuselage-mounted machine-guns; at the same time the RAF was putting eight machine-guns into the Hurricane and Spitfire. The Bf 109's efficient but thin wings were not suitable for guns, which, in combination with their ammunition, would upset the aircraft's centre of gravity. A solution was found, however, and a new wing was designed for the Bf 109E variant, which could carry an additional cannon in each wing.

One of the Bf 109's most ingenious — and deadly — features was its narrow-track undercarriage. Messerschmitt attached the mainwheels to the fuselage. This proved ideal for speedy factory workflow, and for maintenance, as the wings could be removed and the aircraft remained supported. From the pilot's point of view, however, taking off and landing required great care. During the invasion of France, rough airfield conditions caused many accidents, significantly lowering the type's serviceability rate. The Bf 109 was blooded in the 1936–39 Spanish Civil War, as were many of the Luftwaffe's fighter pilots, and these factors made the type a dangerous threat to its opponents.

restricted visibility, and lacked armour plate for the pilot, which was not fitted until the advent of the Bf 109E-4, which began to equip units in the later stages of the Battle of Britain. As with all fighters with liquid-cooled inline engines, one bullet in the oil tank, radiator or glycol tank could take it out of the fight. In the case of the Bf 109 a single bullet could spell the end of the pilot as well.

At medium speeds the '109 was light on the controls, but above 350 m.p.h. the controls became heavy and in a high-speed dive it required a great deal of strength to bring a target into the gun-sight. While the Bf 109's weight of fire was heavier than that of the Hurricane, it could fire only 34 20mm cannon shells and 74 7.92mm rounds — in a 2sec burst the '109 would use well over a quarter of its 20mm shells.



LEFT State of the art — Bf 109Es of 7./JG52. The unit took part in the Battles of France and Britain, its Emil pilots claiming some 177 aircraft destroyed by the end of 1940.



Messerschmitt Bf 109E

TECHNICAL DATA

Armament

2 x 792mm (0-323in) MG-17 Rheinmetall-Borsig machine-guns in forward fuselage

Bf 109E-3 1 x 20mm MG FF cannon per wing

Bf 109E-1 1 x 792mm (0-323in) MG-17 Rheinmetall-Borsig machine-gun per wing

Automatic leading-edge slats

Fabric-covered ailerons

Fuel capacity

63 Imp gal in one self-sealing fuselage tank

ARTWORK

In June 1940 Messerschmitt Bf 109E-3 "Brown 3" was operating with elite Luftwaffe unit JG26, known as the "Schlageter" squadron. This example bears the *Steinbock* (mountain goat) insignia of 6/JG26 worn throughout the Battle of France

Aluminium stressed-skin construction

Comparative Hurricane outline

Fabric-covered elevators and rudder

Propeller

VDM constant-speed, variable-pitch

Powerplant

1 x 1,175 h.p. 12-cylinder liquid-cooled fuel-injected Daimler-Benz DB 601A piston engine

Track 6ft 7in

Span 32ft 4½in

Length
28ft 4¼in

Wing area 176·5ft²

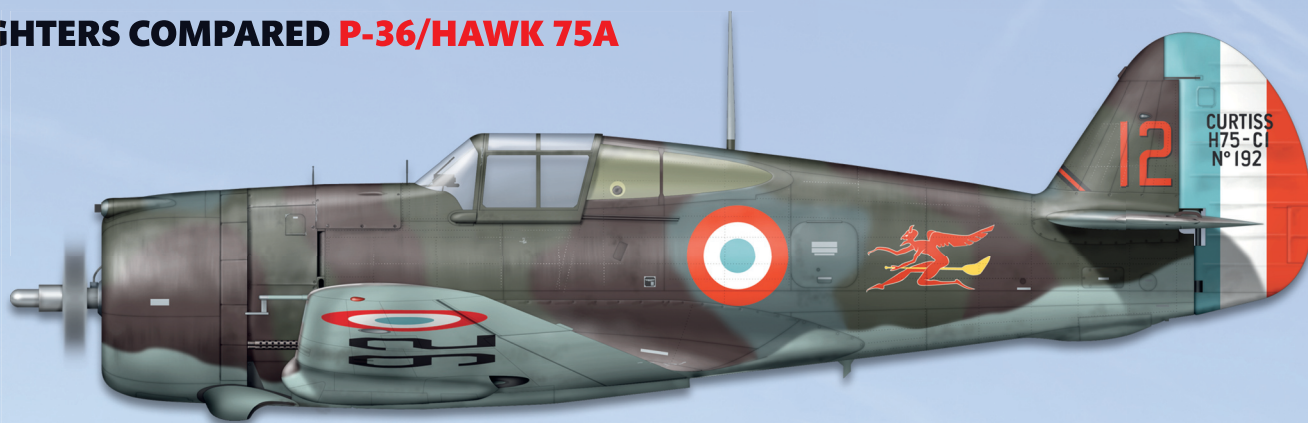
Performance



Key

- Hawker Hurricane Mk I
- Messerschmitt Bf 109E-4
- Curtiss P-36/Hawk 75A-2
- Macchi MC.200 Saetta
- Mitsubishi A6M2 Zero

FIGHTERS COMPARED P-36/HAWK 75A



P-36/Hawk 75 Bird of prey

THE MAJORITY of accounts of the air war over France in the spring of 1940 focus on the fighter-versus-fighter contest. Those in service with both the RAF and France's *Armée de l'Air* gave a good account of themselves between May 10 and June 25 of that year. The fighters mentioned the most in contemporary reports were the Hurricane and the Spitfire, but this is somewhat misleading. Even before the battle had begun French Hawk 75 units had scored most of the 70 confirmed victories for the loss of 28 fighters since September 1939.

Not fast — but very agile

In the first encounters with the Bf 109D and E variants the Hawk 75 proved itself considerably more manoeuvrable, with finger-light controls. Czech ace Frantisek Perina flew the Hawk 75A-3 with GC I/5 during the Battle of France. He recalled the type fondly: "It was not as fast as the Messerschmitt, but it could outmanoeuvre any German aircraft. If [a Bf 109] got on your tail, in one 360° turn you were

behind him". In contrast the Bf 109E was substantially faster in level flight and could outdive and outclimb the Curtiss fighter. However, the Hawk 75 had a robust airframe and could absorb a considerable amount of punishment, despite not being fitted with any armour plate.

While the Hawk 75's armament (initially four and later six 7.5mm machine-guns) seems light compared to the Bf 109, the latter was not armoured and was powered by a vulnerable liquid-cooled inline engine. The Hawk was hindered by a rather poor gunsight, however.

France's ace-maker

Germany began its invasion of France on May 10, 1940, and the ensuing battle would see the *Armée de l'Air* defeated in the air and on the ground. It is remarkable that the Hawk 75 units accomplished what they did, hampered as they were by a poor early warning system and outdated tactics.

By the time the armistice was signed on June 22, the Hawk 75A units had shot down more than 30 German fighters for the loss of three of their own. Most of the French aces with more than ten victories had earned them with the feisty Hawk 75.

Armée de l'Air Curtiss Hawk 75As parked on a French airfield in February 1940, three months before they were called into action against Luftwaffe Bf 109Es.



Curtiss's pugnacious radial fighter

A YEAR AFTER the introduction of the Boeing P-26 Peashooter into United States Army Air Corps (USAAC) service in June 1934, a date was set — May 27, 1935 — for the USA's next Pursuit Aircraft Competition. Curtiss conceded the competition to the Seversky P-35, but all was not lost. Impressed by the Model 75's performance, the USAAC ordered three Y1P-36 prototypes and in 1937, during another competition, its success led to an order for 210 aircraft — the largest order received by an American aircraft company since 1918. The P-36A, as the Model 75 became, was powered by a 1,050 h.p. Pratt & Whitney R-1830 radial engine. The new type's top speed was a respectable 313 m.p.h., but its armament of one 0.50in- and one 0.30in-calibre machine-gun was extremely light. Later versions would be equipped with four 0.30in-calibre machine-guns, two mounted in the nose and firing through the propeller disc and two in the wings (the A-1 variant) and six guns (two nose, two in each wing) for the A-2 version.

Fighters for France

France, chronically short of modern fighter aircraft, ordered 1,000 aircraft in four versions between May 1938 and October 1939. By September 1939, the *Armée de l'Air* had received 100 four-gun Hawk 75A-1s (as the French export P-36 was named) and 100 six-gun A-2s. The Hawk 75A-3 version with an improved 1,200 h.p. R-1830-S1C3G engine would soon follow, with 135 being built, some 60 having reached France, with a number also making it as far as French Morocco, when the French capitulated. France also ordered 795 A-4 variants, fitted with 1,200 h.p. Wright R-1820 Cyclone engines, but of the 284 completed, only six arrived in France, with 23 getting as far as Martinique, where they sat out the war, the majority of the others being taken on by the RAF, which renamed them Mohawks. The French examples were referred to as H75C-1s (C for *chasse* — pursuit — and 1 for single-seater) while in *Armée de l'Air* service.

After the fall of France arrangements were hurriedly made for all the outstanding French contracts for aircraft placed in the USA to be transferred to Britain. Some 227 Hawks would eventually be taken on charge by the RAF as Mohawks, and a number were used by the Vichy French forces against the Allies, particularly in North Africa.

The Curtiss P-36/Hawk 75 has the distinction of being the first American-built fighter to shoot down a German aircraft in World War Two. It is also the first American type to have shot down a Japanese aircraft (during the attack on Pearl Harbor on December 7, 1941).

Curtiss P-36/Hawk 75 *Curtiss*

TECHNICAL DATA

Armament

Hawk 75A-1/A-2/A-3 2 x 7.5mm (0.3in) Browning machine-guns

Hawk 75A-2/A-3 2 x 7.5mm (0.3in) Browning machine-guns per wing

Hawk 75A-1/early production A-2 1 x Browning 7.5mm machine-gun per wing

Fuel capacity

135.3 Imp gal in three non-self-sealing tanks

Forward centre wing tank 34.8 Imp gal

Rear centre wing tank 52.7 Imp gal

Fuselage tank 47.8 Imp gal

ARTWORK

Curtiss Hawk 75A-2 No 192 operated with the Armée de l'Air's 3^e Escadrille, Groupe de Chasse II, Escadre 4 at Xaffevillers in the Lorraine region, circa June 1940

Propeller

Curtiss constant-speed variable-pitch

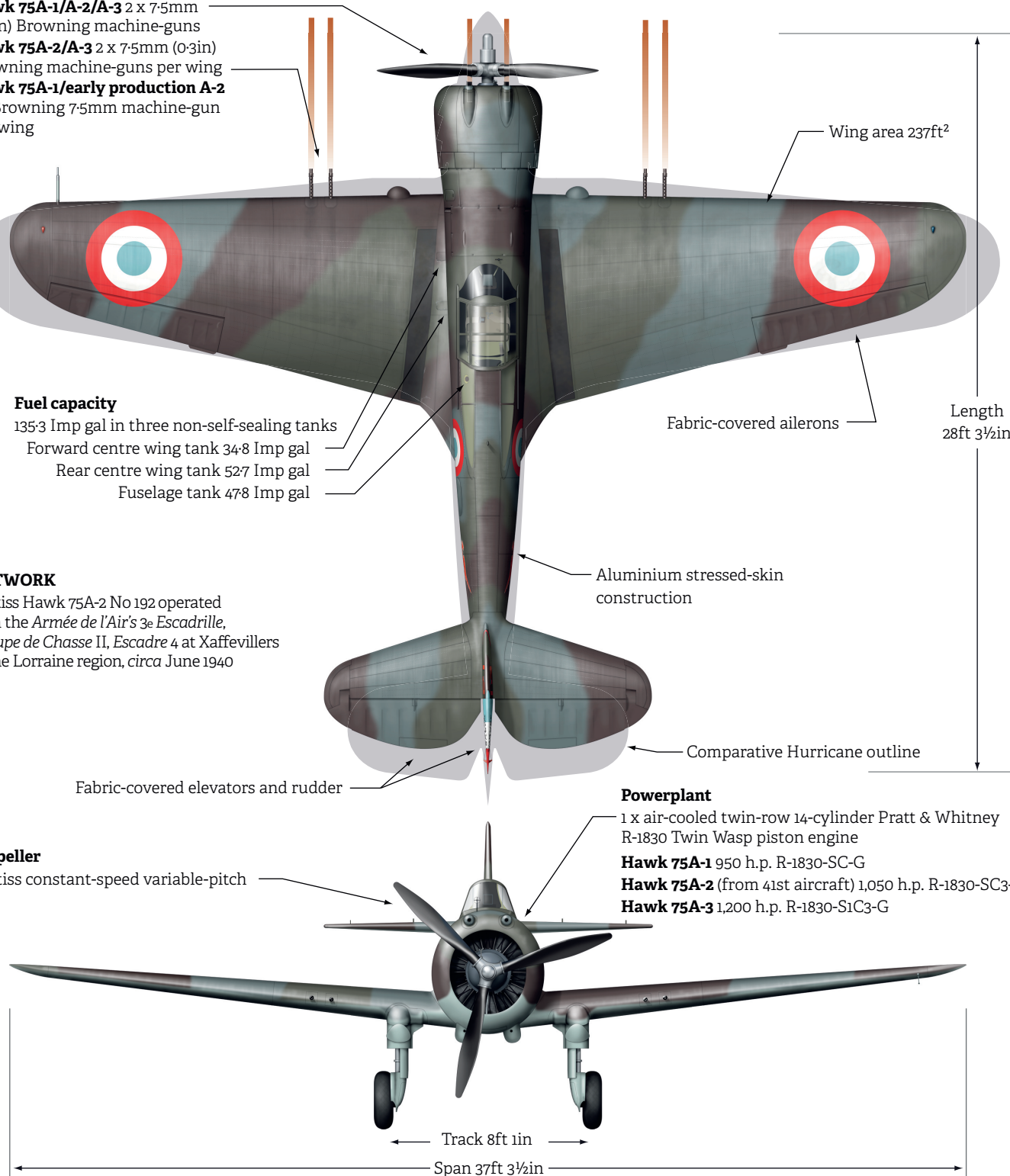
Powerplant

1 x air-cooled twin-row 14-cylinder Pratt & Whitney R-1830 Twin Wasp piston engine

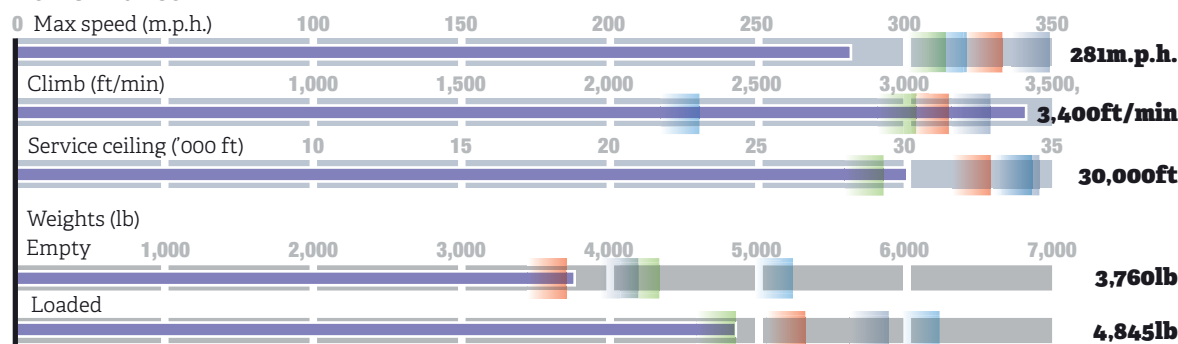
Hawk 75A-1 950 h.p. R-1830-SC-G

Hawk 75A-2 (from 41st aircraft) 1,050 h.p. R-1830-SC3-G

Hawk 75A-3 1,200 h.p. R-1830-S1C3-G



Performance



Key

- Hawker Hurricane Mk I
- Messerschmitt Bf 109E-4
- Curtiss P-36/Hawk 75A-2
- Macchi MC.200 Saetta
- Mitsubishi A6M2 Zero

FIGHTERS COMPARED **MACCHI MC.200 SAETTA**



MC.200 Lightning strikes

LIKE THEIR German and Japanese counterparts, the Italians had experifighter combat before the start of World War Two. The Spanish Civil War which raged between 1936 and 1939 gave the *Regia Aeronautica* and its fighter force a classroom in which to test its equipment and men. It is clear, however, that the Luftwaffe made more of the opportunity to learn from the experience than the Italians. The latter were satisfied with the performance of their Fiat CR.32 biplane fighters against the faster Polikarpov I-15 biplanes and I-16 monoplanes supplied to the Republicans by the Soviet Union. The agile CR.32s were able to extract themselves from sticky situations, leading the Italians to regard manoeuvrability as a cardinal virtue.

One foot in the past

The Italian armed forces were in no way prepared for a modern war in Europe in 1940, and when Italy entered the war in June that year the vast majority of its fighters were biplanes, with comparatively few modern monoplanes, the best of the latter being the Macchi MC.200.

The MC.200 was an attractive, well-proportioned fighter, but was virtually obsolete on its introduction, having no armour or radio equipment.

While the MC.200 was a more modern aircraft in concept than the Hurricane, the latter proved to be the better fighter. The MC.200's armament of just two 12.7mm (0.50in) machine-guns with 370 rounds per gun had the disadvantage of firing through the propeller disc. Synchronised guns by their nature had a slower rate of fire and the Breda-SAFAT gun was not one of the better larger-calibre machine-guns of the war. Compounding this was the fact that gunnery training was almost non-existent and most Italian pilots did not fire their guns until their first combat, resulting in a very inefficient pilot/fighter combination.

On the plus side ...

Visibility from the MC.200's open cockpit was exceptional, and, compared to the Hurricane, it had a better rate of climb and was more agile. The MC.200 was rugged and capable of absorbing heavy punishment. Despite these good points, the Italian predilection for individual fighter tactics based on aerobatic techniques led to an inefficient and poorly-led fighting force.

The MC.200 was too slow, too lightly armed and armoured and was flown by pilots with no grasp of modern fighter tactics, who were thus unable to exploit the type's few positive attributes.

Italy's struggle to go modern

FIGHTER PERFORMANCE depends largely on two things — engine power and aerodynamic design. A clean efficient airframe matched with a powerful engine will provide a fighter of excellent performance. Willy Messerschmitt's Bf 109 and Reginald Mitchell's Supermarine Spitfire are probably the best examples of this — mating the smallest possible airframe to the most powerful engine available. The Italians were able to design good — and in some cases, excellent — airframes, but lacked the capacity to build engines of sufficient power to take advantage of them.

Italian fighter design in the latter stages of the 1930s was rooted in a traditional concept that emphasised agility and pilot visibility. The specification for a fast single-seat bomber-interceptor low-wing monoplane fighter by the *Regia Aeronautica* (Italian Air Force) was not issued until 1936. Two successful designs, the Fiat G.50 and the Macchi MC.200 Saetta (Lightning) were modern all-metal aircraft, but both were handicapped by being fitted with the 840 h.p. Fiat A.74R.C.38 radial engine. Even with this comparatively low power, however, the MC.200 had a respectable top speed of 314 m.p.h. Work on the new Macchi fighter began just as the Spitfire and Hurricane were commencing flight trials.

Compromised by a lack of power

Derived from French Gnome-Rhône designs, Fiat's A.74 engine was considered at the time to be a decent engine, but it was a bulky drag-producing radial. Part of the specification also called for the best possible field of view for the pilot, forcing legendary Italian aircraft designer Mario Castoldi and his team at Macchi to seat the pilot high in the fuselage, giving the MC.200 its distinctive "humped" look. Interestingly the MC.200 prototype was equipped with an enclosed cockpit, standard on all modern monoplane fighters, but it was removed in favour of an open cockpit on production versions.

Flight trials proved that the MC.200 was highly manoeuvrable with exceptionally well-harmonised controls and few vices. Finger-light control under all conditions, matched with a good rate of climb and outstanding diving speed, made the Saetta a tricky opponent. While the MC.200's flight characteristics were very good, its armament of just two Breda-SAFAT 12.7mm (0.50in) machine-guns mounted atop the engine in front of the cockpit was extremely light when compared to its contemporaries.

Underpowered when compared to the Hurricane, Bf 109, Hawk 75 and Mitsubishi A6M2 Zero, the MC.200's clean, modern airframe gave it a competitive top speed. In its favour was its manoeuvrability, which was better than the Hurricane's; it also had a considerably better rate of climb and could outdive the Hurricane with ease.



Macchi MC.200 Saetta

TECHNICAL DATA

Armament

2 x 12.7mm (0.50in) Breda-SAFAT machine-guns

Wing area 180.2ft²

Fuel capacity

68.9 Imp gal in two self-sealing tanks

Front tank 52.4 Imp gal

Rear tank 16.5 Imp gal

ARTWORK

Macchi MC.200 Saetta Serie I 88-10 was based at Catania, Sicily, while serving with 88^a Squadriglia, 6^o Gruppo Autonomo, 1^o Stormo of the Regia Aeronautica in June 1940

Oil radiator built into NACA cowling

Fabric-covered ailerons

Serie I had a fully-enclosed cockpit but pilot preferences and problems with the clarity of the canopy resulted in later models having a partly open canopy design

Aluminium stressed-skin construction

Fabric-covered elevators and rudder

Comparative Hurricane outline

Length 27ft 1in

Propeller

Piaggio P.1001

Constant-speed variable-pitch

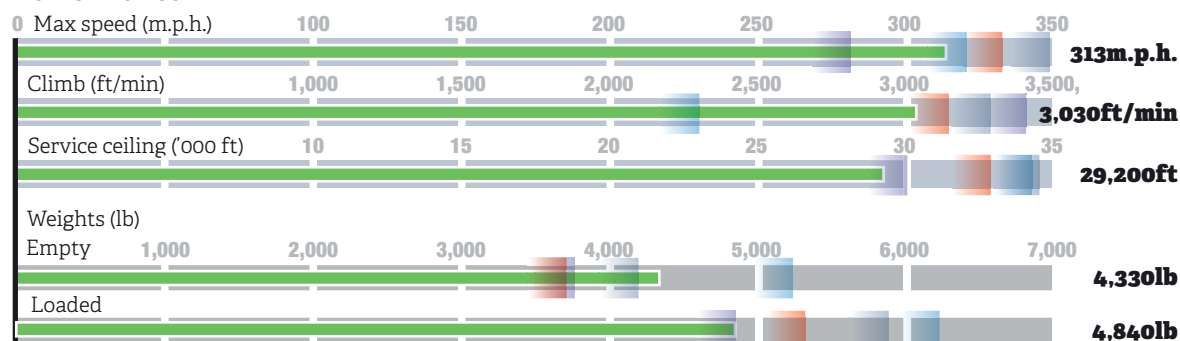
Powerplant

1 x 870 h.p. air-cooled twin-row 14-cylinder Fiat A.74R.C.38 piston engine

Track 9ft 7in

Span 34ft 8in

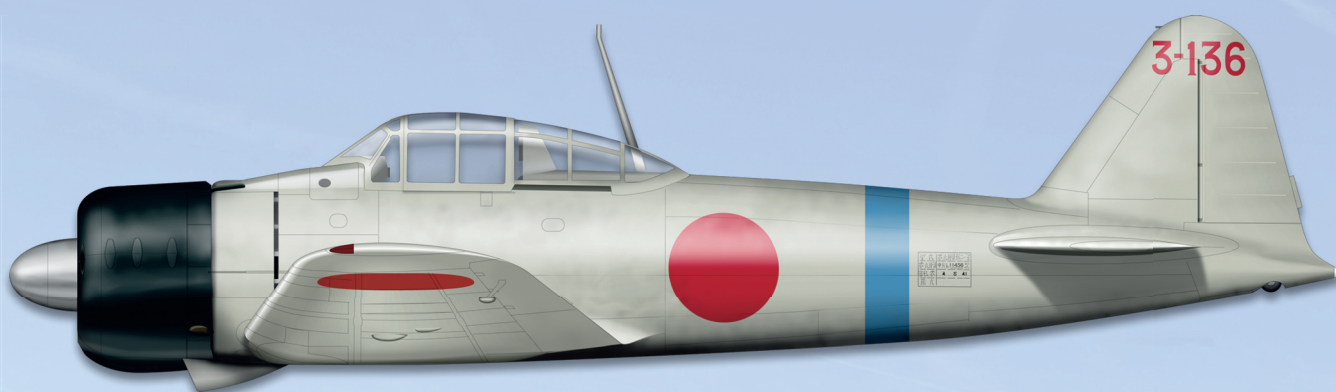
Performance



Key

- Hawker Hurricane Mk I
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- Mitsubishi A6M2 Zero

FIGHTERS COMPARED **A6M2 ZERO**



A6M2 Mitsubishi's hero

THE MITSUBISHI Zero was born out of a false ideal. It was also one of the most lethal fighters in the early years of the war. Air combat in China and the success of Mitsubishi's nimble A5M (later given the Allied codename *Claude*) led the Japanese to believe that a highly manoeuvrable fighter designed for tight-turning dogfighting was the way forward. The Japanese also wanted a fighter capable of intercepting and destroying enemy bombers and to serve as a long-range escort fighter. It was a tall order, and one the Zero was able to accomplish, but at a price.

Eastern promise

The Zero's low weight and high lift made it one of the most agile fighters of World War Two. At low speeds it could turn inside any Allied fighter, and it was here that the Zero departed from the European and American design ethos. The Zero was at its best as a low-speed fighter; its preferred fighting speed was 180 m.p.h. or less. The Japanese chose manoeuvrability over speed as the key requirement for its front-line naval fighter, with the intention of slowing the battle

down and drawing the enemy into a turning fight.

In the early months of the Pacific War many Allied pilots lost their lives trying to turn with the Zero. The lesson was a hard one to learn, but the mantra for Allied pilots in the Pacific quickly became "Never dogfight with a Zero". Both the speed and rate of climb of the A6M2 were very good; a top speed of 330 m.p.h. at 14,000ft and an initial rate of climb of more than 4,000ft/min.

Like the Bf 109E the Zero was armed with two licence-built Oerlikon cannon and two Type 97 7.7mm machine-guns. The rifle-calibre guns were of questionable value (most if not all Allied fighters were armoured against such small-calibre rounds), and, like the Bf 109, the cannon were slow-firing. The cannon had only 60 rounds per gun, giving it only 7sec of fire.

The Zero was neither armoured nor equipped with self-sealing fuel tanks. A short burst of rifle-calibre or 20mm cannon fire was more than enough to smash the light airframe to pieces or cause it to explode into flames.

Built to go to sea

The Zero was by far the best carrier fighter of the war until the advent of Grumman's F6F Hellcat in late 1943. During the first year

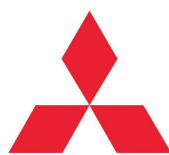
Nothing better: Jiro's masterpiece

DESIGNER JIRO HORIKOSHI'S superb A6M *Rei Shiki Sentoki* (Zero Type Fighter — commonly abbreviated to *Rei-sen* or *Zero*) for Mitsubishi was one of the finest fighters of World War Two, the simple reason being that it was the first shipborne carrier fighter that could match — and in some cases exceed — the performance of land-based fighters. It was an extraordinary achievement given the fact that it was powered by an engine of less than 1,000 h.p.

Like the Italians, the Japanese were only producing powerplants in the 800–1,000 h.p. range in the late 1930s. Horikoshi, faced with the problem of using an engine of just 950 h.p. at best, was forced to cut the weight of his new fighter. The Imperial Japanese Navy Air Force wanted a carrier fighter that was capable of intercepting and destroying enemy bombers, but also serve as long-range escort fighter — two requirements that would seem to be impossible to incorporate into one airframe. As a result the new Zero was made as light as possible and stripped of excess weight including armour plate, self-sealing fuel tanks and even radio equipment.

In July 1940, as the Battle of Britain was gathering pace, the Zero entered front-line service. The type's first combat occurred in September 1940 when 13 fighters escorted a small force of bombers assigned to attack the city of Chungking in China.

Aerodynamically the Zero was extremely efficient, which, when combined with its low weight and high-lift wing, made it one of the most manoeuvrable fighters of the war. Where the Zero really excelled, however, was in its phenomenal range, which could be up to 1,100 miles. Had it been available to Germany at that time, it could have made a world of difference to the Battle of Britain...



LEFT An A6M2 of 3 *Kokutai* at Rabaul, New Britain in 1942. When fighting in China in 1940, the Zero proved itself untouchable against Soviet Polikarpov I-16s.

of the Pacific War, the Zero was as fast or faster than most Allied fighters, and more manoeuvrable. Allied fighters, in contrast, were better-armed and -armoured, had greater diving speeds and were more robust. The Allies' dive-and-zoom tactics lost the Zero most of its advantages.

The Zero's early success was largely a result of good Japanese pilot training rather than the aircraft itself. By the time Japan entered the war in December 1941 most IJNAF pilots averaged 800 flying hours and many had combat experience in China.



Mitsubishi A6M2 Zero

TECHNICAL DATA

Armament

2 x 77mm (0303in) Type 97 machine-guns
1 x 20mm Type 99 cannon per wing

Fuel capacity

116 Imp gal in three non-self-sealing fuel tanks
Fuselage tank: 32 Imp gal
Wing tanks: 42 Imp gal per wing

Fabric-covered ailerons

Wing area 241.5ft²

Length
29ft 8¾in

ARTWORK

Mitsubishi A6M2 Model 11 (with non-folding wingtips) 3-136 of 12 Kokutai is seen here in the colours it wore while serving in China in late 1940

Aluminium stressed-skin construction.
Mainspar machined from high-tensile-strength aluminium alloy

Fabric-covered elevators and rudder

Comparative Hurricane outline

Propeller

Constant-speed variable-pitch

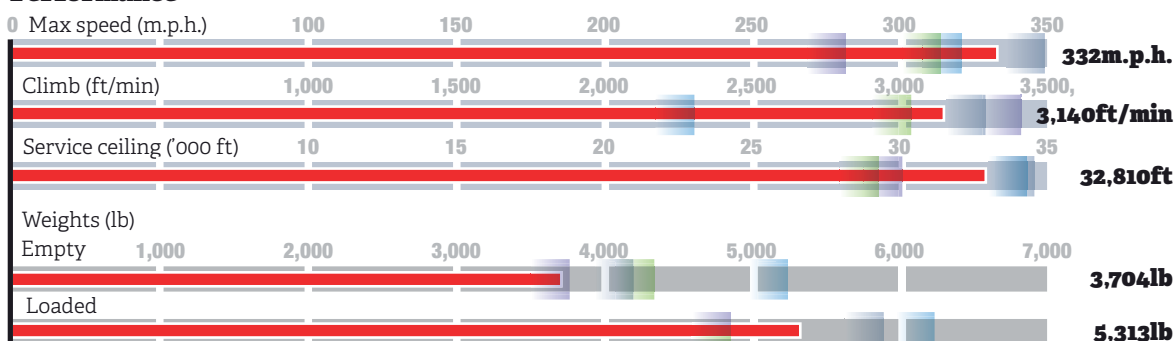
Powerplant

1 x 940 h.p. air-cooled twin row 14-cylinder Nakajima NK1C Sakae (Prosperity) 12 piston engine

Track 11ft 3in

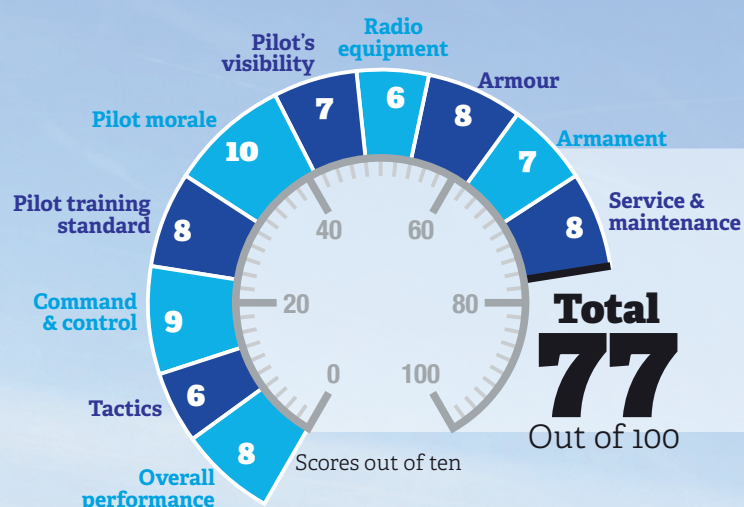
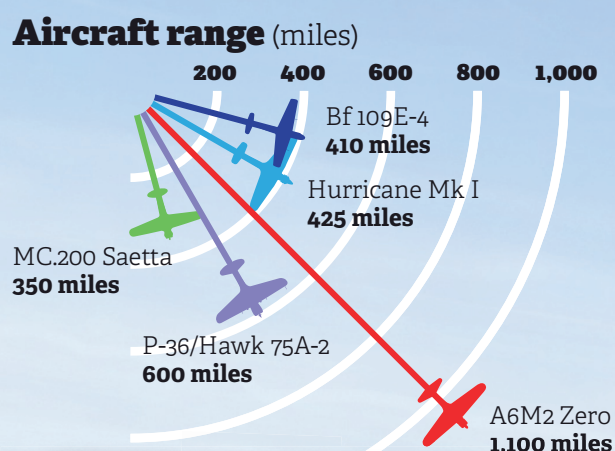
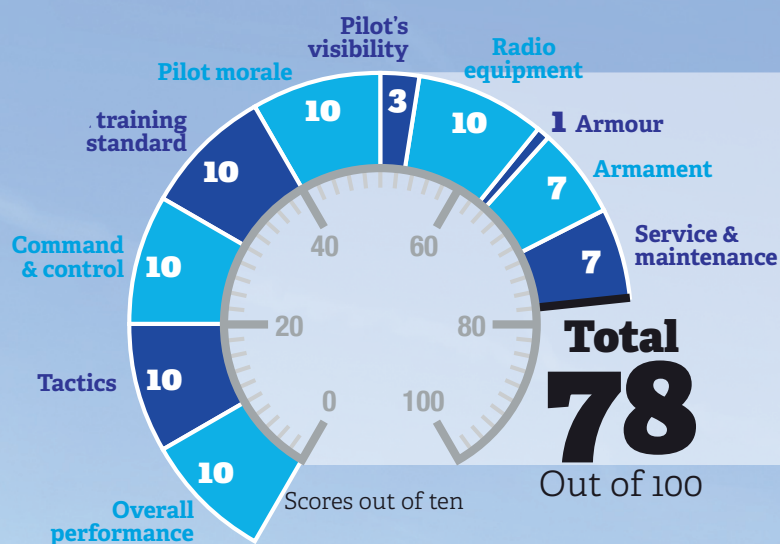
Span 39ft 4½in

Performance



Key

Hawker Hurricane Mk I
Messerschmitt Bf 109E-4
Curtiss P-36/Hawk 75A-2
Macchi MC.200 Saetta
Mitsubishi A6M2 Zero



The Final Assessment

PERFORMANCE NUMBERS like speed and rate of climb, as related in detail over these last pages, cannot alone decide which was the finest fighter in 1940. Ultimately, pilot ability was the most important factor in deciding the outcome of fighter-on-fighter combat — if the man in the cockpit could not fly his machine to its limits, the excellent qualities of his aircraft would be wasted. It is also necessary to assess how the fighter was employed and whether it was up to its set task.

Looking at the performance data it is easy to conclude that one type was indeed faster, had a better rate of climb or better armament and was therefore the better fighter. This to miss the point, however. It was not just about speed and firepower. Tactics, leadership, command and control, pilot training, morale, ease of maintenance, production, armour plating and radio communications all played a crucial role in the effectiveness of each type to do its deadly work.

Our final analysis here takes the established numbers for overall performance, as related over the previous

pages, and adds the supplementary criteria mentioned above to the equation.

By the autumn of 1940 all five of our chosen fighters were in front-line service, and most of them had already seen combat. Despite the ultra-modern design of these aircraft it is important to remember that the rules for aerial combat were the same for all pilots — altitude, surprise and concentration of force gave the attacker a distinct advantage. Attacking out of the sun was still a vital tactic and seeing the enemy first was probably the single most important factor in air-to-air combat. Height was supreme, and could be traded for speed, which in the world of fighter combat, often meant the difference between living to fight another day and certain death.

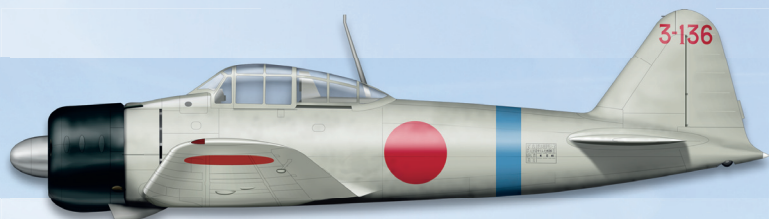
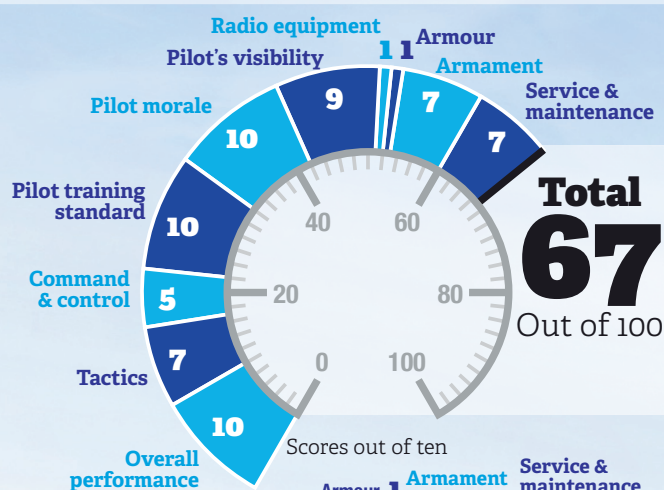
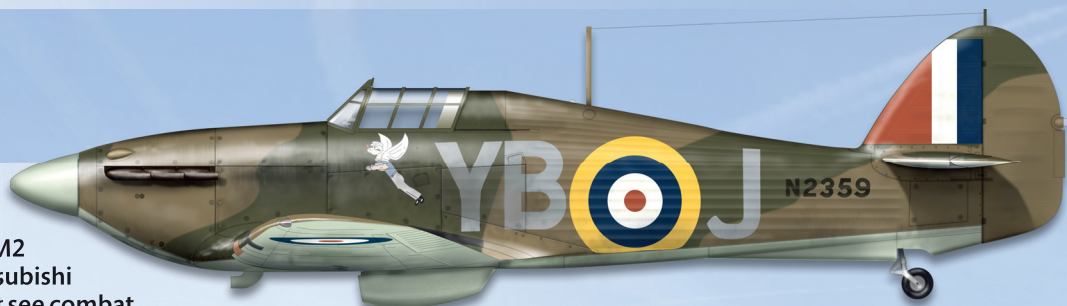
In the final assessment, Willy Messerschmitt's superb Bf 109E, in combination with the effective tactics developed by well-trained Luftwaffe pilots in Spain, proves, on paper, to be the best fighter aircraft available in the summer of 1940. Bearing this in mind makes the supreme sacrifice and extraordinary achievements of the RAF's "Few", the majority of which were equipped with "second-best" Hurricane Is, all the more remarkable.

Bf 109E



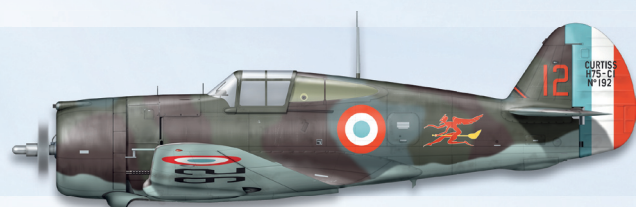
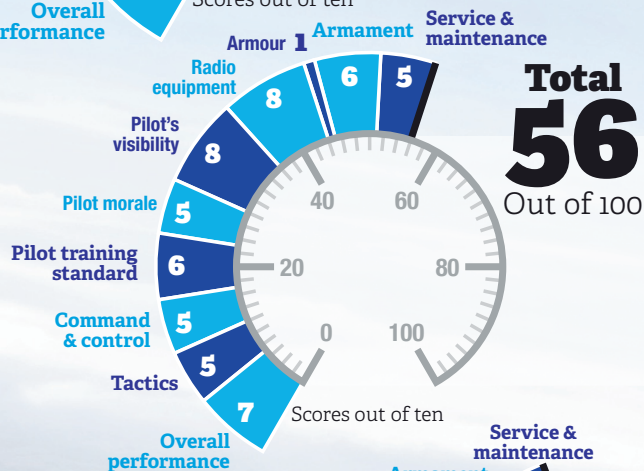
Hawker Hurricane Mk I

THE HURRICANE scores well against both the Bf 109E and A6M2 Zero and ranks ahead of the Mitsubishi fighter because the latter did not see combat against comparable types until late 1941. The Hurricane fought two significant battles in 1940; in the Battle of France it was somewhat handicapped, but during the Battle of Britain its best qualities were put to excellent use



Mitsubishi A6M2 Zero

IN THIRD PLACE is the A6M2 Zero. While the Zero was an excellent fighter it had many faults and its early successes in the Pacific had more to do with the extremely well-trained pilots who flew it than the machine itself. One of the type's best attributes was its phenomenal range, surprising Allied commanders and throwing them off balance



Curtiss P-36/Hawk 75

A ROBUST FIGHTER with similar performance to the Hurricane, the P-36/Hawk 75's rugged construction allowed it to absorb a great deal of damage and still return home. It lacked good armament, however, and well-conceived French tactics that would maximise its positive attributes. Nevertheless, the French flew it well and with some success



Macchi MC.200 Saetta

BRINGING UP the rear is the MC.200, described in a World War Two recognition manual as "a somewhat unsightly contraption". Harsh words perhaps, and while Macchi's Lightning could outdive and outturn the Hurricane, it was much too lightly armed and the pilots who flew it were poorly trained

Special thanks to...

...the three artists without whom this feature would have been impossible. The graphic information is by **Ian Bott** (www.ianbottillustration.com), the aircraft artworks by **Juanita Franzi** (www.aeroillustrations.com) and the backgrounds are by **Gareth Hector** (whose work may be seen on <http://aviation-arthouse.com>)