at the dawn of the jet age at the end of World War II (1945). It was one of the most advanced fighters of the era, including such features as all-metal monocoque construction, a closed canopy, and retractable landing gear. It was powered by a liquid-cooled, inverted V12 aero engine. From the end of 1941, the Bf 109 was steadily being supplemented by the superior Focke-Wulf Fw 190.

It was commonly called the Me 109 most often by Allied aircrew and even amongst German aces themselves even though this was not the official German designation. The "Bf 109" designation was issued by the German ministry of aviation and represents the developing company Bayerische Flugzeugwerke and is a rather arbitrary figure.

It was designed by Willy Messerschmitt (hence Me 109) and Robert Lusser, who worked at Bayerische Flugzeugwerke, during the early to mid-1930s.[2] Originally conceived as an interceptor, later models were developed to fulfill multiple tasks, serving as bomber escort, fighter-bomber, day-, night-, all-weather fighter, ground attack aircraft, and reconnaissance aircraft. It was supplied to and operated by several states during World War II, and served with several countries for many years after the war. The Bf 109 was the most produced fighter aircraft in history, with a total of 33,984 airframes produced from 1936 up to April 1945.[32]

The Bf 109 was flown by the three top-scoring German fighter aces of World War II, who claimed 928 victories among them while flying with Jagdgeschwader 52, mainly on the Eastern Front. The highest scoring fighter ace of all time, Erich Hartmann, flew the Bf 109 and was credited with 352 aerial victories. The aircraft was also flown by Hans-Joachim Marseille, the highest scoring German ace in the North African Campaign who achieved 158 aerial victories. It was also flown by several other aces from Germany's allies, notably Finn Ilmari Juutilainen, the highest scoring non-German ace on the type, and pilots from Italy, Romania, Croatia, Bulgaria and Hungary. Through constant development, the Bf 109 remained competitive with the latest Allied fighter aircraft until the end of the war.[4]

Design and development

Origins

During 1933, the Technisches Amt (T-Amt), the technical department of the Reichsluftfahrtministerium (RLM) ("Reich Aviation Ministry"), concluded a series of research projects into the future of air combat. The result of the studies was four broad outlines for future aircraft:[5]

- Rüstungsmaschine I for a multi-seat medium bomber
- Rüstungsmaschine II for a tactical bomber
- Rüstungsmaschine III for a single-seat fighter
- Rüstungsmaschine IV for a two-seat heavy fighter

The Rüstungsmaschine III was intended to be a short range interceptor, replacing the Heinkel He 64 and Heinkel He 51 batches then in service. In late 1933 the RLM published the tactical requirements for a single-seat fighter in the document L.A. 1432/33.[6]

The fighter needed to have a top speed of 400 km/h (250 mph) at 6,000 m (19,690 ft), to be maintained for 20 minutes, while having a total flight duration of 90 minutes. The critical altitude of 6,000 metres was to be reached in no more than 17 minutes, and the fighter was to have an operational ceiling of 10,000 metres. Power was to be provided by the new Junkers Jumo 210 engine of about 522 kW (700 hp). It was to be armed with either a single 20 mm MG C/30 engine mounted cannon firing through the propeller hub as a Musterkanone, or two engine-cowl mounted 7.92 mm (.312 in) MG 17 machine guns, or one lightweight engine-mounted 20 mm FF cannon with two 7.92 mm MG 17s. The MG C/30 was an airborne adaption of the 2 cm Flak 30 anti-aircraft gun, which fired very powerful "Long Sokolthum" ammunition, but was very heavy and the shot had a low rate of fire. It was also specified that the shot should be kept below 100 kg/m². The performance was to be evaluated based on the fighter's level speed, rate of climb, and manoeuvrability, in that order.[7]

It has been suggested that Bayerische Flugzeugwerke (BFW) was originally not invited to participate in the competition due to personal animosity between Willy Messerschmitt and RLM director Erhard Milch.[8] However, recent research by Willy Radiger and Walter Shick indicates that this may not have been the case, as all three competing companies—Arado, Heinkel and the BFW—received the development contract for the L.A. 1432/33 requirements at the same time in February 1934.[9] A fourth company, Focke-Wulf, received a copy of the development contract only in September 1934.[10] The powerplant was to be the new Junkers Jumo 210, but the proviso was made that it would be interchangeable with the more powerful, but less developed Daimler-Benz DB 600 powerplant.[11] Each was asked to deliver three prototypes for head-to-head testing in late 1934.

Prototypes

Design work on Messerschmitt Project Number P.1034 began in March 1934, just three weeks after the development contract was awarded. The basic mock-up was completed by May, and a more detailed design mock-up was ready by January 1935. The RLM designated the design as type "Bf 109," the next available from a block of numbers assigned to BFV.[12]

The first prototype (Versuchsmaschine V or V1), with civilian registration D-IABI, was completed by May 1935, but the new German engines were not yet ready. In order to get the "Bf 109" into the air, the RLM acquired four Rolls-Royce Kestrel VI engines by trading Rolls-Royce a Heinkel He 70 Blitz for use as an engine test-bed.[12] Messerschmitt received two of these engines and adapted the engine mounts of V1 to take the V-12 engine uptight. V1 made its maiden flight at the end of May 1935 at the airfield located in the southwestern Augsburg neighborhood of Haunstetten, piloted by Hans-Dietrich "Bubi" Knetsch. After four months of flight testing, the aircraft was delivered in September to the Luftwaffe's central test centre at the Erprobungsstelle Rechlin to take part in the design competition.

In 1935, the first Jumo engines became available so V2 was completed in October using the 449 kW (600 hp) Jumo 210A engine. V3 followed, the first to be mounted with guns, but it did not fly until May 1936 due to a delay in procuring another Jumo 210 engine.

Design competition

After Luftwaffe acceptance trials were completed at their headquarters Erprobungsstelle (E-Stelle) military aviation test and development facility at Rechlin, the prototypes were moved to the subordinated E-Stelle Baltic seacoast facility at Travemünde for the head-to-head portion of the competition. The aircraft participating in the trials were the Arado Ar 80 V3, the Focke-Wulf Fw 159 V3, the Heinkel He 112 V4 and the Bf 109 V2. The He 112 arrived first, in early February 1936, followed by the rest of the prototypes by the end of the month.
Initially, the Bf 109 was regarded with disfavour by E-Stelle test pilots because of its steep ground angle, which resulted in poor forward visibility when spectators and ground personnel would only guarantee safety of the two favourites, proved to be completely outdated. The Arado Ar 80, with its gull wing (replaced with a straight, tapered wing on the V3) and fixed, spatted undercarriage was overweight and underpowered, and the design was abandoned after three prototypes had been built. The parastrayed winged Fw 190, potentially inspired by the same firm's earlier Focke-Wulf Fw 56, was consistently outperformed by the E-Stelle Travemünde facility's staff to be a compromise between a biplane and an aerodynamically more efficient, low-wing monoplane. Although it had some advanced features, it used a novel, complex retractable main undercarriage which proved to be unreliable.[10]

Because most fighter pilots of the Luftwaffe were used to planes with open cockpits, low wing loading, light forces and easy handling like the Heinkel He 51, they were very critical of the Bf 109 at first. However, it soon became one of the front runners in the contest, as the Arado and Focke-Wulf entries, which were intended as "back-ups", were regarded as "bargains", Messerschmitt felt this was unreasonable. With a low wing loading and the engines available, a fighter would end up being slower than the bombers it was tasked with catching.

Because of its smaller, lighter airframe, the Bf 109 was 30 km/h (20 mph) faster than the He 112 in level flight, and superior in climbing and diving. The Commission ultimately ruled in favour of the Bf 109 because of the Messerschmitt test pilot's demonstration of the He 112's capabilities during a series of spins, dives, flick rolls and tight turns, throughout which the pilot was in complete control of the aircraft.[11]

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Armament and gondola cannons

Reflecting Messerschmitt's belief in low-weight, low-drag, simple monoplanes, the armament was placed in the fuselage. This kept the wings very thin and light. Two synchronized machine guns were mounted in the cowling, firing over the top of the engine and through the propeller arc. An alternative arrangement was also designed, consisting of a single cannon firing through a blast tube between the cylinder banks of the engine, known as a Motorkanone mount in German.[30][31] This was also the choice of armament layout on some contemporary monoplane fighters, such as the French Dewoitine D.520, or the American Bell P.39 Airacobra, and dated back to World War I's small run of SPAD S.XII moteur-canon, 37 mm calibre cannon-armed fighters in France.

When it was discovered in 1937 that the RLM was planning eight gun-batteries for its new Hawker Hurricane and Supermarine Spitfire fighters, it was decided that the Bf 109 should be more heavily armed. The problem was that the only place available to mount additional guns was in the wings. There was only one spot available in each wing, between the wheel well and slats, and there was room for only one gun, either a 7.92 mm MG 17 machine gun, or a 20 mm MG FF or MG FF/M cannon.[29]

The first variant of the 109B to have wing guns was the C-1, which had one MG 17 in each wing. To avoid redesigning the wing to accommodate large ammunition boxes and access hatches, an unusual ammunition feed was fixed to the wing with a continuous belt holding 500 rounds. This was fed along chutes out to the wing tip, around a roller and then back along the wing. In July 1937, not long after the public debut of the new fighter, three Bf 109Bs took part in the Flugmeeting airshow in Zürich, under the command of Major Seidemann. They won in several categories: First prize in a speed race over a 202 km (125 miles) course and first prize in the class A category at the international Alpenrundflug competition.[15] The aircraft was often nicknamed Die Beule ("the hump"), by its operators and opponents alike; the name was not only an abbreviation of the manufacturer, but also the German word for "knife". In Finland, the Bf 109 was known as Merihaki, by its operators and opponents alike; the name was not only an abbreviation of the manufacturer, but also the Finnish nickname for "knife", with the separate Flugkapitän prefix also used on the leading edge of the port wing. JG 2, France, late 1943.

Additional armament was added over time. Fuel tanks were fitted on the fuselage underside. A small hatch was incorporated in the bulge to allow access for changing the drum. The entire weapon could be removed for servicing by removing a leading edge panel.

From the 109F-series onwards, guns were no longer carried inside the wings. Instead the Bf 109F had a 20 mm gun firing through the propeller shaft. The change was disliked by leading fighter pilots such as Adolf Galland and Walter Oesau, but others such as Werner Mölders considered the single nose-mounted gun to compensate well for the loss of the 2 machine guns.[32] Galland had his Bf 109 F-2 field-modified with a 20 mm MG FF/M cannon installed internally in each wing.[33][34]

In place of internal wing armament, additional firepower was provided through a pair of 20 mm MG 151/20 cannons installed in conformal gun pods under the wings. The conformal gun pods, exclusive of ammunition, weighed 135 kg (299 lb).[35] Installation of the under-wing gun pods was a simple task that could be quickly performed by the unit's armourers, and the gun pods imposed a reduction of speed of only 8 km/h (5 mph).[36] By comparison, the installed weight of a similar armament of two 20 mm MG 151/20 cannon inside the wings of the FW 190A-4/U8 was 130 kg (287 lb), without armament.[37]

Although the additional armament increased the fighter's potency as a bomber destroyer, it had an adverse effect on the handling qualities, reducing its performance in fighter-versus-fighter combat and accentuating the tendency of the fighter to swing pendulum-fashion in flight.

Some of the project 109K-series models, such as the K-6, were designed to carry 30 mm (1.18 in) MK 108 cannons in the wings.[38]

Designation and nicknames

Originally the aircraft was designated as Bf 109 by the RLM, since the design was submitted by the Bayerische Flugzeugwerke (literally "Bavarian Aircraft Works"), meaning "Bavarian Aircraft Factory"; sometimes abbreviated B.F.W.[39] to BMW) during 1935. The company was renamed Messerschmitt AG after 11 July 1938 when Erhard Milch finally allowed Willy Messerschmitt to acquire the company. All Messerschmitt aircraft that originated after that date, such as the Me 210, were to carry the "Me" designation. Despite regulations by the RLM, wartime documents from Messerschmitt AG, RLM and Luftwaffe loss and strength reports continued to use both designations, sometimes even on the same page.[40]

All extant aircraft bear the official[41] "Bf 109" designation on their identification plates, including the final K-4 models.[42] The aircraft was often referred to by this "Me 109" folk designation, partly inspired by the Allied use.

The aircraft was often nicknamed Messer; by its operators and opponents alike; the name was not only an abbreviation of the manufacturer, but also the German word for "knife". In Finland, the Bf 109 was known as Mersu, although this was originally the Finnish nickname for Mercedes-Benz cars.

Soviet aviators nicknamed the Bf 109 "the skinny one" ("xyzolit"; "khudot"), for its sleek appearance compared, for example, to the more robust Fw 190.

The names "Anton", "Beata", "Casar", "Dora", "Emil", "Friedrich", "Gustav" and "Kurfürst" were derived from the variant's official letter designation (e.g. Bf 109K-0 "--Gustav"), based on the German spelling alphabet of World War II, a practice that was also used for other German aircraft designs.[43][44] The Bf 109 G variant was nicknamed Luftwaffe personnel as Die Beute ("the bumph/bullet") because of the cowling's characteristic, bulging covers for the breaches of the 13 mm (0.51 in) MG 131 machine guns, with the separate Beute covers eliminated by the time of the G-10 model's introduction of a subtly reshaped upper cowling.

Record-setting flights

In July 1937, not long after the public debut of the new fighter, three Bf 109Bs took part in the Fiume meeting airshow at Biarritz under the command of Major Seidemann. They won in several categories: First prize in a speed race over a 202 km course, first prize in the class A category in the international Alpenrundflug for military aircraft, and victory in the international Patrouillenflug category.[43] On 11 November 1937, the Bf 109 V13, D-PKYY flown by Messerschmitt's chief pilot Dr. Hermann Wurster, powered by a 1,230 kW (1,650 hp) DB 601R racing engine, set a new world air speed record, with a speed of 610.95 km/h (379.62 mph), winning the title for Germany for the first time. Converted from a Bf 109D, the V13 was fitted with a special racing DB 601R engine that could deliver 1,230 kW (1,650 hp) for short periods.[44][45]

Heinkel, having had the He 112 rejected in the design competition of 1936, designed and built the He 100. On 6 June 1938, the He 100 B-0 set the world's speed record with a speed of 634.74 km/h (394.4 mph). In March 1939, test pilot Hans Dieterle surpassed that record, reaching 746.61 km/h (463.9 mph) with the He 100 V8. Messerschmitt, however, soon regained the lead when, on 26 April 1939, Flugkapitän Fritz Wendel, flying the Me 209 V1, set a new record of 755.14 km/h (469.82 mph). For propaganda purposes, the machine was named the Bf 109R, suggesting it was another variant of the standard fighter, but in fact it was a racing aircraft having little in common with the Bf 109. It was powered by the DB 601AFU, producing 1,156 kW (1,550 hp), but capable of reaching 1,715 km/h (2,300 mph). This world record for a piston-engined aircraft was to stand until 1969.

When Darryl Greenamyer's modified Grumman F6F-5 Bearcat, Conquest I broke it with a 777 km/h (484 mph) record speed. [46]
When the Bf 109 was designed in 1934, by a team led by Willy Messerschmitt and Robert Lusser,[44] its primary role was that of a high-speed, short range interceptor.[45] It utilized the most advanced aerodynamics of the time and embodied advanced structural design which was ahead of its contemporaries.[46] In the years of the Blitzkrieg, the Bf 109 was the only single-engined fighter operated by the Luftwaffe, until the appearance of the Fw 190.

The 109 remained in production from 1937 through 1945 in many different variants and sub-variants. The primary engines used were the Daimler-Benz DB 601 and DB 605, though the Junkers Ju 288 210D was most of the pre-war production. The most-produced Bf 109 model was the 109G series (more than a third of all 109s built were the G-6 series, 12,000 units being manufactured from March 1943 until the end of the war).[47]

The initial production models of the A, B, C and D series were powered by the relatively low-powered, 670-700 PS (660-690 HP) Junkers Jumo 210 series engines. A handful of prototypes of these early aircraft were converted to use the more powerful DB 600.[48]

The first major redesign came with the E series, including the naval variant, the Bf 109T (T standing for Träger, or carrier). The Bf 109E, or "Emil", introduced structural changes in order to accommodate the heavier, but significantly more powerful, 1,100 PS (1,085 HP) Daimler-Benz DB 601 engine, heavier armament and increased fuel capacity. Later variants of the EIs introduced a fuselage bomb rack or provision for a long-range, standardized 500 kg (1,100 lb) drop-tank, and used the DB 601N engine of higher power output.[49] The 109E first saw service with the "Condor Legion" during the last phase of the Spanish Civil War and was the main variant from the beginning of World War II until mid-1941 when the 109F replaced it in the pure fighter role.[50] (Eight 109Es were assembled in Switzerland in 1940 by the Dornier-Werke, using licence built airframes; a ninth airframe was assembled using spare parts.[51]

The second major redesign during 1939–40 gave birth to the F series. The "Friedrich" saw a complete redesign of the wings, the cooling system and fuselage aerodynamics, and was powered by the 1,175 PS (1,159 HP) DB 601N (F-1, F-2) or the 1,350 PS (1,332 HP) DB 601E (F-3, F-4). Considered by many as the high-water mark of Bf 109 development, the F series abandoned the wing cannon and concentrated all armament in the forward fuselage with a pair of synchronized machine guns above and a single 15 or 20 mm Motorkanone-mount cannon behind the engine, the latter firing between the cylinder banks and through the propeller hub. This configuration was used by all subsequent variants. A handful of Bf 109Fs were used late in the Battle of Britain in 1940, but the variant only came into wide use in the first half of 1942.[52]

The G series, or "Gustav", was introduced in mid-1942. Its initial variants (G-1 through G-4) differed only in minor details from the Bf 109F, most notably in the more powerful 1,455 HP (1,439 HP) DB 605 engine. Odd numbered variants were built as high-altitude fighters with a pressurized cockpit and GM-1 boost, while even numbered variants were non-pressurized, air superiority fighters and fighter-bombers. Long range photo-reconnaissance variants also existed. The later G series (G-5 through G-14) were produced in a multitude of variants, with uprated armament and provision for kits of pre-packaged, generally factory-installed parts known as Umrüst-Bausätze (usually contracted to Umbau) and adding a "U" suffix to the aircraft designation when installed.

Field kits known as Alataustre were also available for the general public but those did not change the aircraft designation. By early 1944, 1944, tactical requirements resulted in the addition of MW-50 water injection boost and high-performance superchargers, boosting engine output to 1,800–2,000 PS (1,775-1,973 HP). From early 1944 some G-2s, G-3s, G-4s and G-6s were converted to two seat trainers, known as the G-12. An instructor's cockpit was added behind the original cockpit and both were covered by an elongated, glazed canopy.[53] The so covered by an elongated, glazed canopy. Modifications kit and Umrüst-Bausätze conversion kits were part of a system promulgated by the RLM as a whole, throughout the German military aviation industry, with each airframe type number having its own set of "R" and/or "U" numbered designations for such upgrade packages.

The final production version of the Bf 109 was the "H" series, or "Kurfürst", introduced in late 1944, powered by the DB 606 engine with up to 2,000 PS (1,973 HP). Though externally akin to the late production Bf 109G series, a large number of internal changes and aerodynamic improvements were incorporated that improved its effectiveness and remedied existing flaws, keeping it competitive with the latest Allied and Soviet fighters.[54] The Bf 109G-14 was the last production variant of the Bf 109. All major Allied airfields were equipped with it, and it remained in production until the end of the war in 1945.

Total Bf 109 production was 33,984 units[7] Wartime production (September 1939 to May 1945) was 30,573 units. Fighter production totalled 47% of all German aircraft production, and the Bf 109 accounted for all of 57% of all German fighter types produced.[55] A total of 2,193 Bf 109 A-E were built, from 1936 to August 1939. Some 865 Bf 109G derivatives were manufactured postwar under licence in Czechoslovakia, as the Avia S-99 and S-199 and in Spain as the Hispano Aviación Ha 1109 and Ha 1112.[56]

Variants

Main article: Messerschmitt Bf 109 variants

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New production Messerschmitt Bf 109 fighters, 1936–45[56]

<table>
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<tr>
<th>Factory, location</th>
<th>Up to 1939</th>
<th>1939</th>
<th>1940</th>
<th>1941</th>
<th>1942</th>
<th>1943</th>
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<td>1,287</td>
<td>2,203</td>
<td>3,061</td>
<td>541</td>
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<td>Gyr, Villing &amp; Giepl, Gym</td>
<td>39</td>
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<td>AGO, Checmany</td>
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<tr>
<td>Totals</td>
<td>1,880</td>
<td>1,948</td>
<td>2,828</td>
<td>2,638</td>
<td>6,418</td>
<td>14,152</td>
<td>2,800</td>
<td>33,094</td>
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* Production up to end of March 1945 only.

Operational history

Main article: Messerschmitt Bf 109 operational history

The first Bf 109As saw service in the Spanish Civil War. By September 1939, the Bf 109 had become the main fighter of the Luftwaffe, replacing the biplane fighters, and was instrumental in gaining air superiority for the Wehrmacht during the Blitzkrieg. During the Battle of Britain, it was pressed into the role of escort fighter, a role for which it was not originally designed, and it was widely employed as a fighter-bomber as well as a photo-reconnaissance platform. Despite mixed results over Britain, with the introduction of the improved Bf 109F in early 1941, the type again proved to be an effective fighter during the Invasion of Yugoslavia (where it was used by both sides), the Battle of Crete, Operation Barbarossa, the invasion of the USSR and the Siege of Malta.

In 1942, it began to be partially replaced in Western Europe by a new German fighter, the Focke Wulf Fw 190, but it continued to serve in a multitude of roles on the Eastern Front and in the Defense of the Reich, as well as in the Mediterranean Theatre of Operations and with Erwin Rommel's Afrikakorps. It was also supplied to several of Germany's allies, including Finland, Hungary, Romania, Bulgaria, Croatia, and Slovakia.

More aerial kills were made with the Bf 109 than any other aircraft of World War II.[57] Many of the aerial victories were accomplished against poorly trained and badly organized Soviet forces in 1941 during Operation Barbarossa. The Soviets lost 21,200 aircraft at this time, about half to combat.[58] If shot down, the Luftwaffe pilots might land or parachute to friendly territory and return to fight again. Later in the War, when Allied victories began to bring the fight closer, and then to German
territory, bombing raids supplied plenty of targets for the Luftwaffe. This unique combination of events led to the highest-ever individual pilot victory scores.[81] One hundred and five Bf 109 pilots were each credited with the destruction of 100 or more enemy aircraft.[81][82] Thirteen of these men scored more than 200 kills, while two scored more than 300. Altogether, this group of pilots were credited with a total of nearly 15,000 kills.[83] Though there was no official "ace" status in the Luftwaffe (unofficially, the term Experte (expert) was used for an experienced pilot irrespective of his number of kills), using the Allied definition of pilots who scored five or more kills, there were more than 2,500 Luftwaffe fighter aces in World War II.[84] Against the Soviets, Finnish flown Bf 109Gs claimed a victory ratio of 25:1.[85] Bf 109s remained in foreign service for many years after World War II. The Swiss used their Bf 109Gs well into the 1950s. The Finnish Air Force did not retire their Bf 109Gs until March 1954. Romania used its Bf 109s until 1955. The Spanish Hispanics flew even longer. Some were still in service in the late 1960s. They appeared in films (notably Battle of Britain) playing the role of Bf 109Es. Some Hispanic airframes were sold to museums, which rebuilt them as Bf 109s.

Operators

Note, this list includes operators who used Bf 109s for active service or combat. It does not include the United States, the United Kingdom and the Soviet Union, who all operated small numbers of captured aircraft for testing and evaluation (see: Messerschmitt Bf 109 operational history#Alled Bf 109s).

- **Bulgaria**
  - Bulgarian Air Force operated 19 E-3s and 145 G-2/-6/-10s.

- **NDH**
  - Zrnlomlošavljezovne Dražave Hrvatske operated over 50 Bf 109s, including E-4, F-2, G-2/-6/-10 and Ks.

- **Czechoslovakia**
  - Czechoslovak Air Force operated captured aircraft and continued building Messerschmitt Bf 109Gs after the war under the Avia S-99 name, but soon ran out of the 109's Daimler-Benz DB 605 engine after many were destroyed during an explosion at a warehouse in Krásné Březno.

- **Finland**
  - Finnish Air Force ordered 162 aircraft (48 G-2s, 111 G-6s and three G-8s) from Germany, but 3 were destroyed during transit, leaving the FAF with 159 Bf 109s.

- **Nazi Germany**
  - Luftwaffe was the main operator of the Bf 109.

- **Hungary**
  - Royal Hungarian Air Force operated 3 D-1s, 50 E-3/-4/-6, 66 F-4s and -G-2/-4/-6/8/-10/-14s.

- **Israel**
  - Israeli Air Force operated the Avia S-199 derivative, bought from Czechoslovakia. Despite the type's shortcomings the Israeli scored 8 victories. Egypt and Syria claimed 4 S-199 kills, and 1 probable.[54]

- **Italy**
  - Regia Aeronautica operated several tens of Bf 109s in the first half of 1943.[63]

- **Italian Social Republic**
  - Aeronautica Nazionale Repubblicana operated 300 G-6/-10/-14s and two G-12s; three K-4s were also received.

- **Japan**
  - Imperial Japanese Army Air Force purchased 5 E-7s in 1941. The aircraft were used for tests and trials.[62]

- **Romania**
  - Royal Romanian Air Force operated 50 E-3/-4/-6, 19 E-7s, 2 F-2s, 5 F-4s and at least 235+ G-2/G-4/G-6/-8s plus 75 IAR built 109G-6a.
  - Romanian Air Force – Postwar.

- **Slovak Republic**
  - Slovenské vzdušné zbrane operated 16 E-3s, 14 E-7s and 30 G-6s.
  - Slovak Insurgent Air Force operated 3 G-6s.

- **Spanish State**
  - Spanish Air Force operated some D-1s, E-3s and 15 F-4s, and may have received several older B-types. Volunteers of Escuadrilla Azul on the Eastern Front operated E-4, E-7, E-7/B, F-2, F-4 (belonged in JG-27 under the command of Luftflotte 2 until April 1943) among G-4 and G-6 (detached in JG-51 under the command of Luftflotte 4, until June 1944). A variant under license by the name Hispano Aviación HA-1112 was produced until 1958.

- **Switzerland**
  - Swiss Air Force operated 10 D-1s, 89 E-3a variants, 2 F-4s and 14 G-6s.

- **Yugoslavia**
  - Royal Yugoslav Air Force operated 73 E-3a variants.
  - SFR Yugoslav Air Force operated several ex-NDH and Bulgarian Bf 109Gs.

Surviving aircraft

Main article: List of surviving Messerschmitt Bf 109s

Approximately twenty surviving Bf 109 airframes in the 21st century are known to have, at one time or another, served with the most northerly-based World War II German fighter wing, Jagdgeschwader 5 in Scandinavia. More surviving Axis aircraft in modern aviation museums once served with the Luftwaffe’s JG 5 fighter wing than with any other Axis Powers military aviation unit.

- **Australia**
  - A Bf 109 G-6, Australian War Memorial, Canberra. It is the last example to retain its original wartime camouflage and markings.

- **Brazil**
  - A Bf 109 G-2, at the Museu TAM near São Carlos, 250 km northwest of São Paulo City in the State of São Paulo, Brazil. It was recovered from the bottom of a lake in Norway. It’s painted in wrong colours, depicting the plane of the German ace Hans-Joachim Marseille. It also received a filter to resemble a Trop series aircraft.

- **Canada**
  - A Bf 109 F-4 trop at the Canada Aviation and Space Museum in Ottawa, Ontario.

- **Finland**
  - A Bf 109 G 6 "MT-452", at the Finnish Aviation Museum, Vantaa, Finland.
  - A Bf 109 G 6 "MT-507", at the Aviation Museum of Central Finland, Tikkakoski.

- **Germany**
  - A Bf 109 G-4 of JG 52 salvaged from Black Sea, at the Technikmuseum Speyer.
  - A Bf 109 G-6, at the Sinsheim Auto & Technik Museum.
A Bf 109 E, at the Deutsches Museum, Munich, Germany.

Poland

Russia
- A Bf 109 G-6 (Wnr. 411768) (restored), at the Zadornychy Technical Museum, Moscow.

South Africa
- A preserved Bf 109 F-2, at the South African National Museum of Military History in Johannesburg. This museum also has on display a Bf 109 E which crashed during the Battle of Britain.

United Kingdom
- Bf 109 E-3 (WNr. 4101): originally 6./JG 52; made an emergency landing at RAF Manston in 1940.
- Bf 109 G-2 trop (WNr. 10639): originally PG + QJ, RIC; crashed, repaired and operated by No. 3 Squadron RAAF at Gambut, Libya in 1942; later transferred to No. 1426 Flight RAF.

United States
- A Bf 109, at the National World War Two Museum in New Orleans, LA.
- A preserved Bf 109 G-6, at the Mighty Eighth Air Force Museum outside of Savannah Georgia.
- A preserved Bf 109 F-2, at the National Air and Space Museum in Washington DC.
- A Bf 109 E-3 ex-6./JG 52 "Black 2", ex-USAAF FE-124, T2-124, "Blue 4"; captured, repaired and operated by No. 3 Squadron RAAF at Gambut, Libya in 1942; later transferred to No. 1426 Flight RAF.
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Specifications (Bf 109 G-6)

- **General characteristics**
  - **Crew:** One
  - **Length:** 8.95 m (29 ft 7 in)
  - **Wingspan:** 9.925 m (32 ft 6 in)
  - **Height:** 2.60 m (8 ft 2 in)
  - **Wing area:** 16.05 m² (173.3 ft²)
  - **Empty weight:** 2,247 kg (5,893 lb)
  - **Loaded weight:** 3,148 kg (6,940 lb)
  - **Max. takeoff weight:** 3,400 kg (7,495 lb)
  - **Powerplant:** 1 × Daimler-Benz DB 605 A-1 liquid-cooled inverted V12, 1,475 PS (1,455 hp, 1,085 kW)
  - **Propellers:** VDM 9-12087 three-bladed light-alloy propeller
  - **Propeller diameter:** 3 m (9 ft 10 in)

- **Performance**
  - **Maximum speed:** 640 km/h (398 mph) at 6,300m (20,669 ft)
  - **Cruise speed:** 590 km/h (365 mph) at 6,000m (19,680 ft)
  - **Range:** 850 km (528 mi) with droptank
  - **Service ceiling:** 12,000 m (39,370 ft)
  - **Rate of climb:** 17.0 m/s (3,345 ft/min)
  - **Power/mass:** 344 W/kg (0.21 hp/lb)

- **Armament**
  - **Guns:**
    - 2 × 13 mm (.51 in) synchronized MG 131 machine guns with 300 rounds per gun
    - 1 × 20 mm (.78 in) MG 151/20 cannon as centerline Motorkanone with 200 rpg.
  - **Rockets:** 2 × 21 cm (8 in) Wfr. Gr. 21 rocket pods with 135 rpg (optional kit—Rüstsatz VI)
  - **Bombs:** 1 × 250 kg (551 lb) bomb or 4 × 50 kg (110 lb) bombs or 1 × 300-litre (79 US gal) drop tank

- **Avionics**
  - FuG 16Z radio

See also
- List of surviving Messerschmitt Bf 109s
- Sonderkommando Elbe
- Aircraft of comparable role, configuration and era
  - A6M Zero
  - Bell P-39
  - Curtiss P-40
  - Fw 190
  - Dewoitine D.520
  - Fiat G.55 Centauro
  - Focke Wulf Fw 190
  - Hawker Hurricane
  - Heinkel He 112

Specifications (Bf 109 G-6)

Data from The Great Book of Fighters and the Finnish Air Force Bf 109 Manual

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- FuG 16Z radio

See also
- List of surviving Messerschmitt Bf 109s
- Sonderkommando Elbe
Citations

- IAR 80
- Kawasaki Ki-61 Hien
- Lavochkin La-7
- Macchi C.205 Folgore
- Macchi C.205 Velasco
- North American P-51 Mustang
- Supermarine Spitfire
- Yakovlev Yak-1
- Yakovlev Yak-9

Related lists

- List of military aircraft of Germany
- List of aircraft of World War II
- List of aircraft of Germany in World War II

References

- In 1929 Milch, then managing director of Deutsche Luft Hansa, cancelled an order for 10 Messerschmitt M20b light transport aircraft after Hans Hackman, a close friend of Milch, was killed testing the prototype.\[31\]
- This aircraft was instrumental in testing the Rolls-Royce PV-12, later to become the Rolls-Royce Merlin engine.\[323\]
- The engine's mass helped buffer the recoil. British reports on captured DB 601 series engines describe "a double walled cannon tube housing" as part of the crankcase. Few if any Bf 109s used weapons firing through the propeller hub before the F-series, which mounted 15 mm (.59 in) and 20 mm weapons.\[323\]
- Galland also flew another F-2/U1 which the MG 17s above the engine were replaced by 13 mm MG 131s.\[323\]
- World speed records and other aeronautical records were and still are set by the Fédération Aéronautique Internationale (FAI). A record attempt must be made on a recognized course at a set altitude to be considered. The Bf 109 and 209s came under the category "CLASS C, GROUP 1d".\[323\]
- Some sources state one hundred and nine pilots were credited with more than 100 enemy aircraft.\[323\]

Notes

1. 1 2 3 U.S. Strategic Bombing Survey, Aircraft Division Industry Report, Exhibit I – German Airplane Programs vs Actual Production.
2. 1 2 3 4 5 6 Nowara, 1993, pp. 189.
3. 1 2 Green 1980, pp. 15, 14.
5. 1 2 Zobel and Matthmann 1995, p. 3.
7. 1 2 Kobal and Matthmann 1997, p. 3.
8. 1 2 Green 1980, pp. 11–12.
10. 1 2 Nowara 1993, pp. 18–21.
12. 1 2 Caidin 1968
15. 1 2 Nowara 1993, p. 190.
18. 1 2 Hann Valtosen — Messerschmitt Bf 109 je saalese sotatalus
20. 1 2 Radinger and Otto 1999, p. 36.
23. 1 2 virtualpilotis.de. Retrieved 1 April 2015.
27. 1 2 Drabkin 2007, p. 74.
28. 1 2 Cross and Scarborough 1976, pp. 74.
29. 1 2 Cross and Scarborough 1976, pp. 15.
30. 1 2 Deighton 1977, p. 281.
32. 1 2 Hahn 1963, pp. 35.
33. 1 2 Nowara 1993, p. 88.
34. 1 2 Prien and Rodeika 1996, p. 177.
35. 1 2 Flight (Oct 5, 1939).\[28\]
Bibliography


To improve on the performance afforded by the rather small 447-522 kW (600-700 hp) Jumo, the larger Daimler-Benz DB 601A engine was used, yielding an extra 223 kW (300 hp) at the cost of an.

The Luftwaffe and other foreign air forces, numerous variants were produced over the eight years of service with the Luftwaffe and even more were produced by its foreign users. In late 1938, the Bf 109 "Emil"-serie entered production. Due to the Messerschmitt Bf 109's versatility and time in service with both Germany the upper hand in the early stages of the war while also taking part in every front until the very end of the conflict in Europe. The Bf 109 was the main fighter of the Luftwaffe, later complemented by the Focke Wulf Fw 190. The Spanish Civil War was the Bf 109 saw its first combat action. Almost doomed by the bureaucracy of the RLM prior to its maiden flight, the Messerschmitt Bf 109 went on to become the most numerously produced German fighter of the war. Its design was simple; a compact slender airframe with plenty of power and a heavy gun package. The Bf 109 combat lineage began with the Spanish Civil war when in October 1936 a handful of early Bf 109 prototypes were hastily sent as reinforcement to the embattled Nationalist air force. All in all some 140 Bf 109s of different Due to the Messerschmitt Bf 109's versatility and time in service with both the Luftwaffe and other foreign air forces, numerous variants were produced over the eight years of service with the Luftwaffe and even more were produced by its foreign users. In late 1938, the Bf 109 "Emil"-serie entered production. To improve on the performance afforded by the rather small 447-522 kW (600-700 hp) Jumo, the larger Daimler-Benz DB 601A engine was used, yielding an extra 223 kW (300 hp) at the cost of an.