

## ME-262 78" and 58 " Wingspan (2 and 1.5m) Plan (Other minor plans Included 31" and 43")



Messerschmitt Me 262A at the National Museum of the USAF

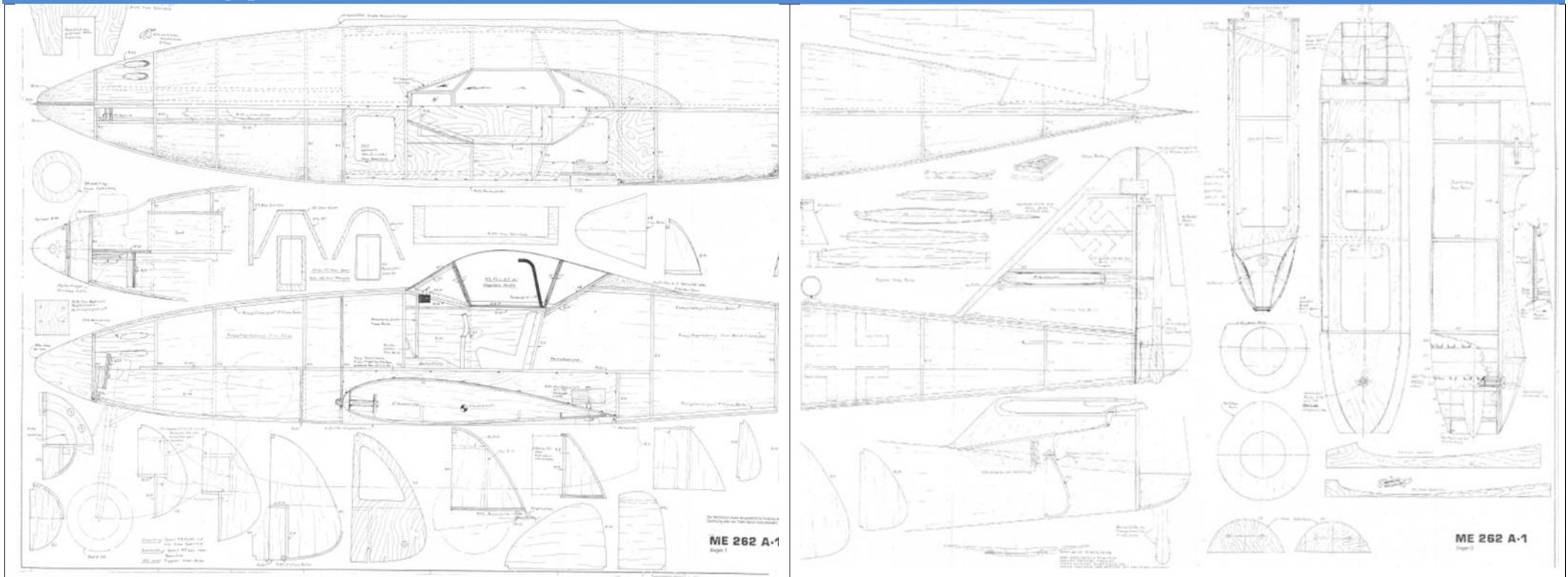
The Messerschmitt Me 262 *Schwalbe* ("[Swallow](#)") was the world's first operational [jet-powered fighter aircraft](#).<sup>[5]</sup> Design work started before [World War II](#) began but engine problems prevented the aircraft from attaining operational status with the [Luftwaffe](#) until mid-1944. Compared with [Allied](#) fighters of its day, including the British jet-powered [Gloster Meteor](#), it was much faster and better armed.<sup>[6]</sup> One of the most advanced [aviation](#) designs in operational use during World War II,<sup>[7]</sup> the Me 262 was used in a variety of roles, including [light bomber](#), [reconnaissance](#) and even experimental [night fighter](#) versions.

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Me 262 pilots claimed a total of 542 Allied kills<sup>[8]</sup> (although higher claims are sometimes made)<sup>[Notes 1]</sup> against the loss of only about 100 Me 262s in the air.<sup>[citation needed]</sup> The Allies countered its potential effectiveness in the air by relentlessly attacking the aircraft on the ground and while they were taking off or landing. Maintenance problems and a lack of fuel during the deteriorating late-war situation also reduced the effectiveness of the aircraft as a fighting force. In the end, the Me 262 had a negligible impact on the course of the war as a result of its late introduction and the consequently small numbers that were deployed in operational service.<sup>[10]</sup> The Me 262 influenced the designs of post-war aircraft such as the [North American F-86 Sabre](#) and [Boeing B-47 Stratojet](#).

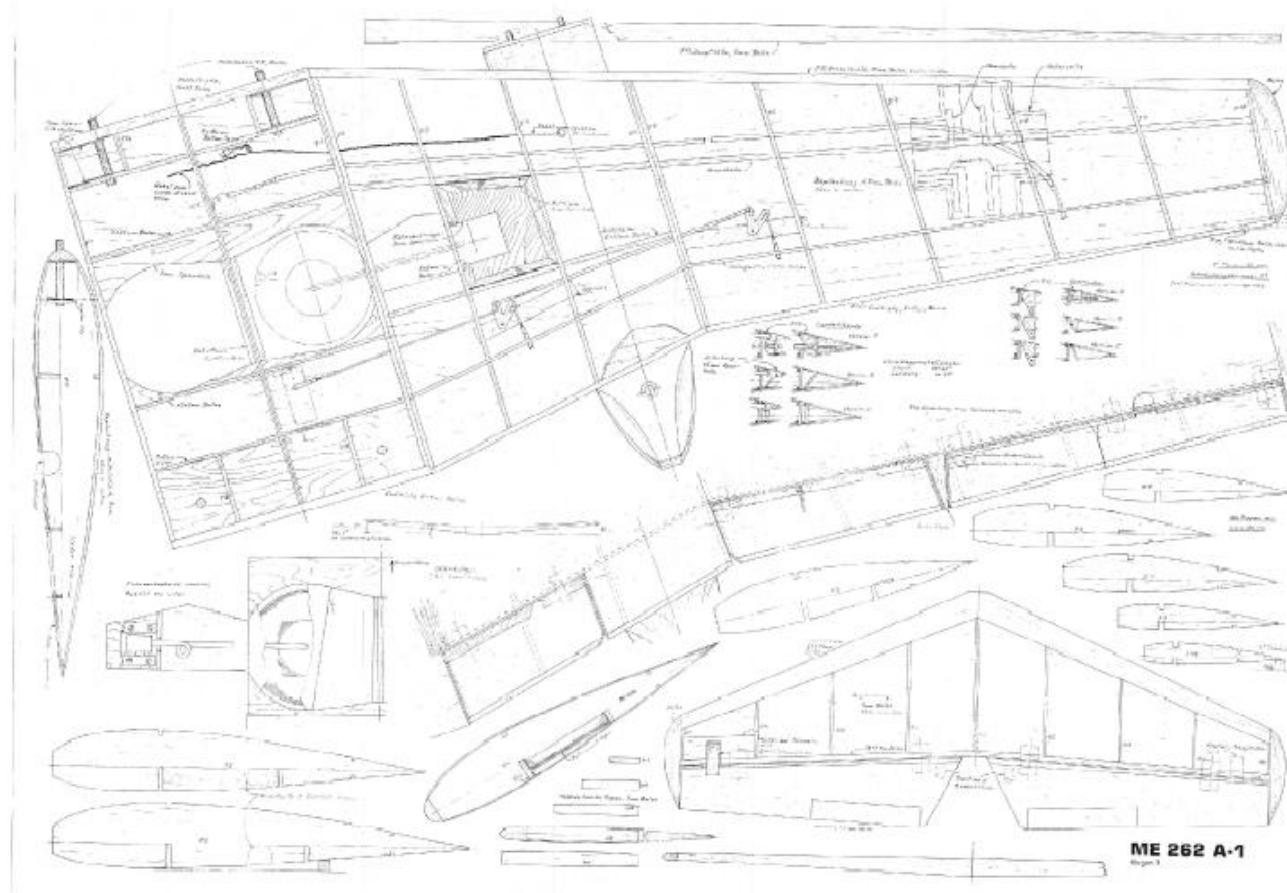
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## Design and development

Several years before World War II, the Germans foresaw the great potential for aircraft of a British invention: the [jet engine](#), invented by [Frank Whittle](#) in 1928. As they were in the middle of a great military build up which would lead to war, they ignored the various patents that Whittle had in effect and simply took the idea and developed it into a very advanced fighter aircraft. As a result, the Me 262 was already being developed as *Projekt 1065* (P.1065) before the start of World War II. Plans were first drawn up in April 1939, and the original design was very similar to the [plane](#) that eventually entered service. The progression of the original design into service was delayed greatly by technical issues involving the new [jet engine](#). Funding for the jet program was also initially lacking as many high-ranking officials thought the war could easily be won with conventional aircraft.<sup>[11]</sup> Among those were: [Hermann Göring](#), head of the *Luftwaffe*, who cut the engine development program to just 35 engineers in February 1940.





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[Willy Messerschmitt](#), who desired to maintain [mass production](#) of the piston-powered [Bf 109](#) and the projected [Me 209](#); and [Major General Adolf Galland](#), who supported Messerschmitt through the early development years, flying the Me 262 himself on 22 April 1943. By that time, problems with engine development had slowed production of the aircraft considerably. One particularly acute problem arose with the lack of an alloy with a melting point high enough to endure the high temperatures involved, a problem that by the end of the war had not been adequately resolved.<sup>[11]</sup>

The project [aerodynamicist](#) on the design of the Me 262 was [Ludwig Bölkow](#), later a prominent figure in the post-World War II development of the German aircraft industry. He initially designed the wing using [NACA airfoils](#) modified with an elliptical nose section.<sup>[12]</sup> Later in the design process, these were changed to AVL derivatives of NACA airfoils, the NACA 00011-0.825-35 being used at the root and the NACA 00009-1.1-40 at the tip.<sup>[13]</sup> The elliptical nose derivatives of the NACA airfoils were used on the horizontal and vertical [tail surfaces](#). Wings were single-spar cantilever construction, with [stressed skins](#), varying from 3 mm (0.12 in) thick at the root to 1 mm (0.039 in) at the tip.<sup>[14]</sup> The wings were fastened to the fuselage at four points, using a pair of 20 mm (0.79 in) and forty-two 8 mm (0.31 in) bolts.<sup>[15]</sup>

In mid-1943, [Adolf Hitler](#) envisioned the Me 262 as an offensive [ground-attack/bomber](#) rather than a defensive interceptor. The configuration of a high-speed, light-payload [Schnellbomber](#) ("Fast Bomber") was intended to penetrate enemy airspace during the expected Allied invasion of France. His edict resulted in the development of (and concentration on) the *Sturmvogel* variant. It is debatable to what extent Hitler's interference extended the delay in bringing the *Schwalbe* into operation.<sup>[16][17]</sup> [Albert Speer](#), then Minister of Armaments and War Production, claimed in [his memoirs](#) that Hitler originally had blocked mass production of the Me 262 before agreeing in early 1944. He rejected arguments that the aircraft would be more effective as a fighter against Allied bombers destroying large parts of Germany, and wanted it as a bomber for revenge attacks. According to Speer, Hitler felt its superior speed compared to other fighters of the era meant it could not be attacked and so preferred it for high altitude straight flying.<sup>[18]</sup>

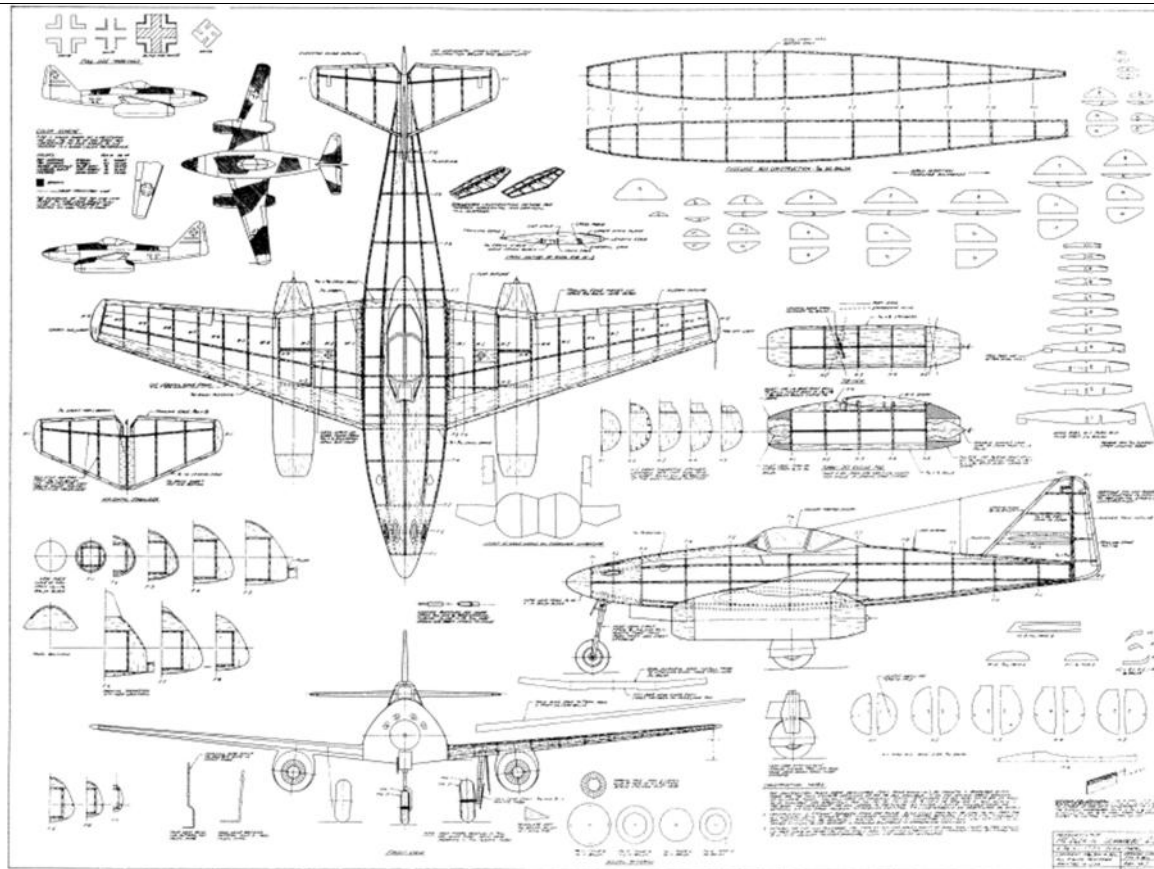


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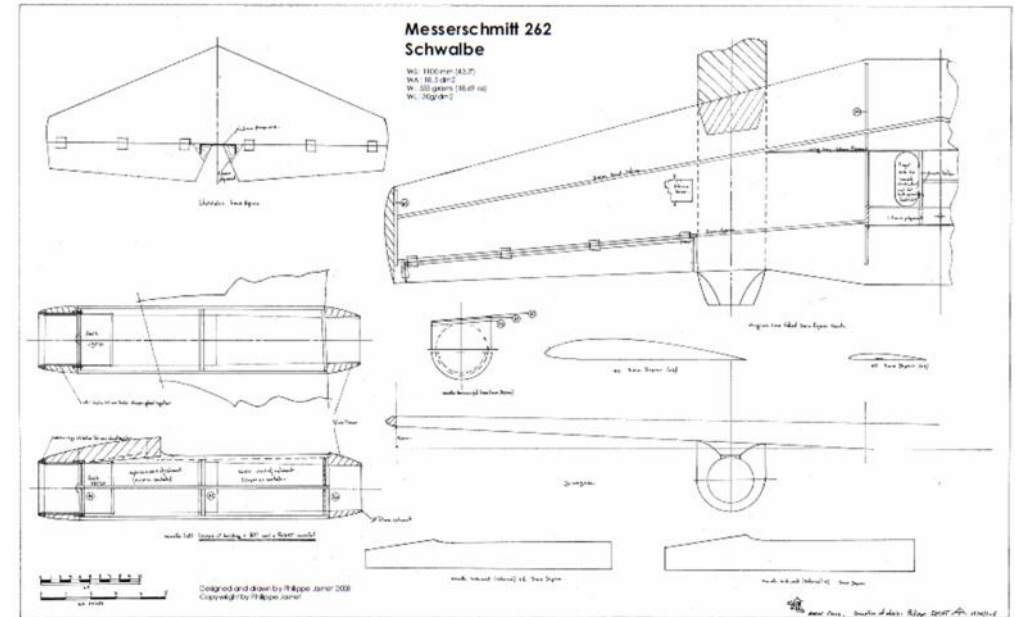
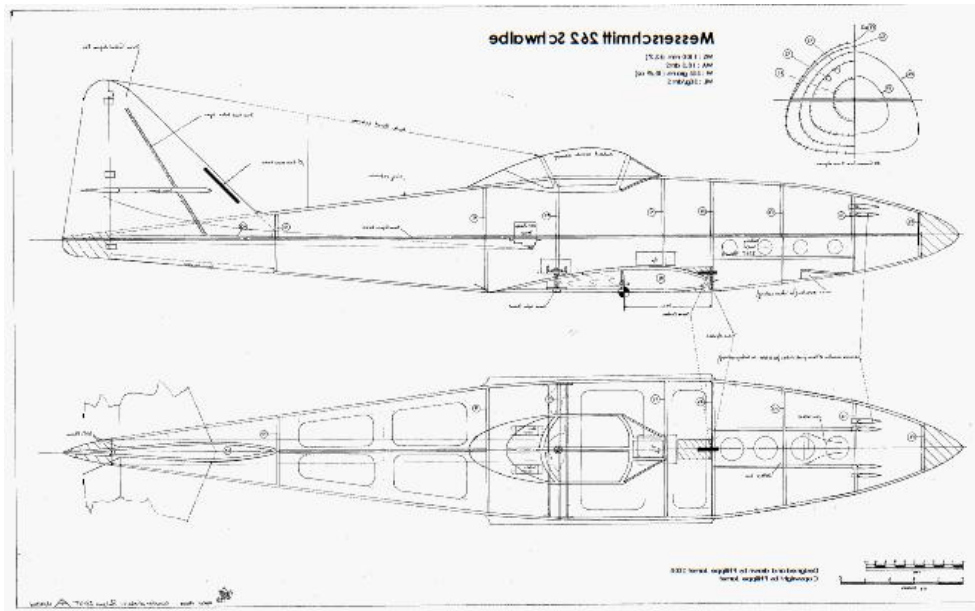
Although the Me 262 is often referred to as a "[swept wing](#)" design, the production Me 262 had a [leading edge](#) sweep of only 18.5°, too slight to achieve any significant advantage in increasing the [critical Mach number](#).<sup>[19]</sup> Sweep was added after the initial design of the aircraft, when the engines proved to be heavier than originally expected, primarily to position the center of lift properly relative to the centre of mass. On 1 March 1940, instead of moving the wing backward on its mount, the outer wing was repositioned slightly aft; the trailing edge of the midsection of the wing remained unswept.<sup>[20]</sup> Based on data from the AVA [Göttingen](#) and [wind tunnel](#) results, the middle section's leading edge was later swept to the same angle as the outer panels.<sup>[21]</sup>

## 31" Plan



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## 43" Plan



## Test flights

The first test flights began on 18 April 1941, with the Me 262 V1 example, bearing its *Stammkennzeichen* radio code letters of PC+UA, but since its intended [BMW 003 turbojets](#) were not ready for fitting, a conventional [Junkers Jumo 210](#) engine was mounted in the V1 prototype's nose, driving a propeller, to test the Me 262 V1 airframe. When the BMW 003 engines were finally installed, the Jumo was retained for safety, which proved wise as both 003s failed during the first flight and the pilot had to land using the nose-mounted engine alone.<sup>[1]</sup> The BMW 003s were discovered to be subject to catastrophic failure due to the [propwash](#) entering the intakes during operation and they were permanently removed from the program in favor of the relatively reliable [Junkers Jumo 004](#).

The V3 third prototype [airframe](#), with the code PC+UC, became a true "jet" when it flew on 18 July 1942 in [Leipheim](#) near [Günzburg](#), Germany, piloted by [Fritz Wendel](#).<sup>[24]</sup> This was almost nine months ahead of the British [Gloster Meteor](#)'s first flight on 5 March 1943. The [conventional gear](#) — producing a pronounced tail-



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down attitude on the ground — of the Me 262 V3 caused its jet exhaust to deflect off the runway, with the wing's turbulence negating the effects of the [elevators](#), and the first takeoff attempt was cut short.<sup>[25]</sup>

On the second attempt, Wendel solved the problem by tapping the aircraft's brakes at takeoff speed, lifting the horizontal tail out of the wing's turbulence.<sup>[25]</sup> The first four [prototypes](#) (V1-V4) were built with this configuration. Changing to a [tricycle](#) arrangement<sup>[26]</sup> (initially a fixed undercarriage on the fifth prototype (V5), with fully retractable on V6 (with *Stammkennzeichen* code VI+AA) and subsequent aircraft) corrected this problem.



Test flights continued over the next year, but engine problems continued to plague the project, the Jumo 004 being only marginally more reliable than the BMW 003. Airframe modifications were complete by 1942 but, hampered by the lack of engines, serial production did not begin until 1944, and deliveries were low, with 28 Me 262s in June, 59 in July, but only 20 in August.<sup>[7]</sup> This delay in engine availability was in part due to the shortage of strategic materials, especially metals and alloys able to handle the extreme temperatures produced by the jet engine.

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Even when the engines were completed, they had an expected operational lifetime of approximately 50 continuous flight hours; most 004s lasted just 12 hours, even with adequate maintenance. A pilot familiar with the Me 262 and its engines could expect approximately 20–25 hours of life from the 004s. Changing a 004 engine was intended to require three hours, but this typically took eight to nine due to poorly made parts and inadequate training of ground crews.

Due to their low compression ratios, early turbojet engines developed less thrust at low speed than [propellers](#), and as a result, low-speed acceleration was relatively poor. This was particularly noticeable in the Me 262, since early jet engines (before the invention of [afterburners](#)) also responded slowly to throttle changes. The introduction of a primitive [autothrottle](#) late in the war helped only slightly. Conversely, the superior power of jet engines at higher speeds meant the Me 262 enjoyed a much greater [rate of climb](#). Used tactically, this gave the jet fighter an even larger speed advantage in climb than in level flight at top speed.

With one engine out, the Me 262 still flew well, with speeds of 450–500 [km/h](#) (280–310 [mph](#); 240–270 [kn](#)), but pilots were warned never to fly slower than 300 km/h (190 mph; 160 kn) on one engine, as the asymmetrical thrust would cause serious problems.

Operationally, carrying 2,000 l (440 imp gal; 530 US gal) of fuel in two 900 l (200 imp gal; 240 US gal) tanks, one each fore and aft the cockpit, and a 200 l (44 imp gal; 53 US gal) tank beneath,<sup>[27]</sup> the Me 262 had an [endurance](#) of 60 to 90 minutes. Fuel was usually brown [coal-derived](#) J2, with the option of [diesel](#) oil or a mixture of oil and high [octane](#) B4 [aviation petrol](#).<sup>[28]</sup> Consumption was double the usual for a twin-engine *Luftwaffe* aircraft, so a low-fuel warning came on when levels fell below 250 l (55 imp gal; 66 US gal).<sup>[28]</sup>

Unit cost for an Me 262 airframe, less engines, armament, and electronics, was [RM](#)87,400.<sup>[29]</sup> (By comparison, a new [Volkswagen Type 1](#) was priced at [RM](#)990.)<sup>[30]</sup> To build one airframe took around 6,400 man-hours.<sup>[29]</sup>

## Operational history

On 19 April 1944, [Erprobungskommando](#) 262 was formed at [Lechfeld](#) just south of [Augsburg](#), [Bavaria](#) as a test unit (*Jäger Erprobungskommando Thierfelder*, commanded by [Hauptmann Werner Thierfelder](#))<sup>[31]</sup> to introduce the 262 into service and train a core of pilots to fly it. On 26 July 1944, [Leutnant Alfred Schreiber](#) with the 262 A-1a W.Nr. 130 017 damaged a [Mosquito](#) reconnaissance aircraft of [No. 540 Squadron RAF](#) PR Squadron, which was allegedly lost in a crash upon landing at an air base in Italy.<sup>[32]</sup> Other sources state the aircraft was damaged during evasive manoeuvres and escaped.<sup>[33]</sup>



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It was the first victory for a turbojet fighter aircraft in aviation history.<sup>[34]</sup> [Major Walter Nowotny](#) was assigned as commander after the death of Thierfelder in July 1944, and the unit redesignated [Kommando Nowotny](#). Essentially a trials and development unit, it holds the distinction of having mounted the world's first jet fighter operations. Trials continued slowly, with initial operational missions against the Allies in August 1944 allegedly downing 19 Allied aircraft for six Me 262s lost, although these claims have never been verified by cross-checking with [USAAF](#) records. The RAF Museum holds no intelligence reports of RAF aircraft engaging in combat with Me 262s in August, although there is a report of an unarmed encounter between an Me 262 and a Mosquito.<sup>[35]</sup>

Despite orders to stay grounded, Nowotny chose to fly a mission against an enemy bomber formation flying some 30,000 feet above, on 8 November 1944. He claimed two P-51Ds destroyed before suffering engine failure at high altitude.<sup>[36]</sup> Then, while diving and trying desperately to restart his engines, he was attacked, by other Mustangs, and forced to bail out. Some<sup>[who?]</sup> U.S. historians proposed Nowotny's victor was P-51D pilot Lt. Robert W. Stevens of the 364th Fighter Group.<sup>[37]</sup> According to other sources, he was shot down and killed by [First Lieutenant](#) Edward "Buddy" Haydon of the [357th Fighter Group](#) and [Captain](#) Ernest "Feeb" Fiebelkorn of the 20th Fighter Group, both USAAF.<sup>[citation needed]</sup> The exact circumstances surrounding the death of Walter Nowotny remain uncertain to this day. It is also possible he was hit by "friendly" flak.<sup>[37][38]</sup> The *Kommando* was then withdrawn for further [training](#) and a revision of combat tactics to optimise the 262's strengths.



By January 1945, [Jagdgeschwader 7](#) (JG 7) had been formed as a pure jet fighter wing, although it would be several weeks before it was operational. In the meantime, a bomber unit – I Gruppe, [Kampfgeschwader 54](#) (KG 54) – had re-equipped with the Me 262 A-2a fighter-bomber for use in a ground-attack role. However, the unit lost 12 jets in action in two weeks for minimal returns.

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[Jagdverband 44](#) (JV 44) was another Me 262 fighter unit, of *Staffel* (squadron) size given the low numbers of available personnel, formed in February 1945 by [Lieutenant General Adolf Galland](#), who had recently been dismissed as [Inspector of Fighters](#). Galland was able to draw into the unit many of the most experienced and decorated *Luftwaffe* fighter pilots from other units grounded by lack of fuel.

During March, Me 262 fighter units were able, for the first time, to mount large scale attacks on Allied bomber formations. On 18 March 1945, 37 Me 262s of JG 7 intercepted a force of 1,221 bombers and 632 escorting fighters. They shot down 12 bombers and one fighter for the loss of three Me 262s. Although a 4:1 ratio was exactly what the *Luftwaffe* would have needed to make an impact on the war, the absolute scale of their success was minor, as it represented only one per cent of the attacking force. In 1943 and early 1944, the USAAF had been able to keep up offensive operations despite loss ratios of 5% and more, and the few available Me 262s could not inflict sufficient losses to hamper their operations.

Side view of a Me 262B-1a/U1 night fighter, Wrknr. 110306, with [Neptun radar](#) antenna on the nose and second seat for a radar operator. This airframe was surrendered to the RAF at Schleswig in May 1945.<sup>[22]</sup>

Several two-seat [trainer](#) variants of the Me 262, the Me 262 B-1a, had been adapted through the *Umrüst-Bausatz 1* factory refit package as [night fighters](#), complete with on-board [FuG 218 Neptun](#) high-VHF band radar, using *Hirschgeweih* ("stag's antlers") antennae with a set of shorter dipole elements than the [Lichtenstein SN-2](#) had used, as the B-1a/U1 version. Serving with 10 *Staffel*, [Nachtjagdgeschwader 11](#), near Berlin, these few aircraft (alongside several single-seat examples) accounted for most of the 13 Mosquitoes lost over Berlin in the first three months of 1945. However, actual intercepts were generally or entirely made using [Wilde Sau](#) methods, rather than AI radar-controlled interception. As the two-seat trainer was largely unavailable, many pilots had to make their first flight in a jet in a single-seater without an instructor.

Despite its deficiencies, the Me 262 clearly signaled the beginning of the end of piston-engined aircraft as effective fighting machines. Once airborne, it could accelerate to speeds over 850 km/h (530 mph), about 150 km/h (93 mph) faster than any Allied fighter operational in the European Theater of Operations.

The Me 262's top [ace](#)<sup>[Notes 2]</sup> was probably *Hauptmann* [Franz Schall](#) with 17 kills which included six four-engine bombers and 10 [P-51 Mustang](#) fighters, although night fighter ace *Oberleutnant* [Kurt Welter](#) claimed 25 Mosquitos and two four-engine bombers shot down by night and two further Mosquitos by day flying the Me 262. Most of Welter's claimed night kills were achieved in standard radar-less aircraft, even though Welter had tested a prototype Me 262 fitted with [FuG 218 Neptun radar](#). Another candidate for top ace on the aircraft was *Oberstleutnant* [Heinrich Bär](#), who claimed 16 enemy aircraft while flying the Me 262.

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## Anti-bomber tactics

The Me 262 was so fast that new tactics had to be devised to attack American bombers. In the head-on attack, the closing speed, of about 350 yd per second (320 m), was too high for accurate shooting. Even from astern, the closing speed was too great for the short-ranged 30 mm cannon to be used to maximum effect. Therefore, a roller-coaster attack was devised. The 262s approached from astern and about 6,000 ft higher (1,800 m) than the bombers. From about 3 mi behind (4.8 km), they went into a shallow dive that took them through the escort fighters with little risk of interception. When they were about 1 mi astern (1.6 km) and 1,500 feet (460 m) below the bombers, they pulled up sharply to reduce their excess speed. On levelling off, they were 1,000 yd astern (0.91 km) and overtaking the bombers at about 100 mph (160 km/h), well placed to attack them.<sup>[39]</sup>

Since 30 mm cannon were not accurate beyond 650 yd (590 m), and it was necessary to break off at 200 yd (180 m) to avoid colliding with the target, Me 262 pilots would normally commence firing at 550 yd (500 m).<sup>[40]</sup> Allied bomber gunners found their electric gun turrets had problems tracking the jets. Target acquisition was difficult because the jets closed into firing range quickly and remained in firing position only briefly, using their standard attack profile which proved to be more effective.

Captain [Eric Brown](#), Chief Naval Test Pilot and C.O. Captured Enemy Aircraft Flight [Royal Aircraft Establishment](#), who tested the Me 262 noted: "This was a [Blitzkrieg](#) aircraft. You whack in at your bomber. It was never meant to be a dogfighter, it was meant to be a destroyer of bombers... The great problem with it was it did not have [dive brakes](#). For example, if you want to fight and destroy a B-17, you come in on a dive. The 30mm cannon were not so accurate beyond 650 yards. So you normally came in at 600 yards and would open fire on your B-17. And your closing speed was still high and since you had to break away at 200 yards to avoid a collision, you only had two seconds firing time. Now, in two seconds, you can't sight. You can fire randomly and hope for the best. If you want to sight and fire, you need to double that time to four seconds. And with dive brakes, you could have done that."<sup>[40]</sup>

Eventually, new combat tactics were developed to counter the Allied bombers' defences. Me 262s, equipped with [R4M rockets](#), would approach from the side of a bomber formation, where their silhouettes were widest, and while still out of range of the bombers machine guns, fire a [salvo](#) of rockets. The [Hexogen](#) filled warhead of only one or two of these rockets was capable of downing even the famously rugged [B-17 Flying Fortress](#); a strike on an enemy aircraft meant its total annihilation.<sup>[41]</sup>

Although this tactic was effective, it came too late to have a real effect on the war, and only small numbers of Me 262s were actually equipped with the rocket packs.<sup>[42]</sup> Most of those so equipped were Me 262A-1as, members of [Jagdgeschwader 7](#).<sup>[43]</sup> This method of attacking bombers became the standard until the invention and mass deployment of guided missiles. Some nicknamed this tactic the "[Luftwaffe's Wolf Pack](#)", as the fighters would often make runs in groups of two or three, fire their rockets, then return to base.

On 1 September 1944, USAAF [General Carl Spaatz](#) expressed the fear that if greater numbers of German jets appeared, they could inflict losses heavy enough to force cancellation of the [Allied bombing offensive](#) by daylight.