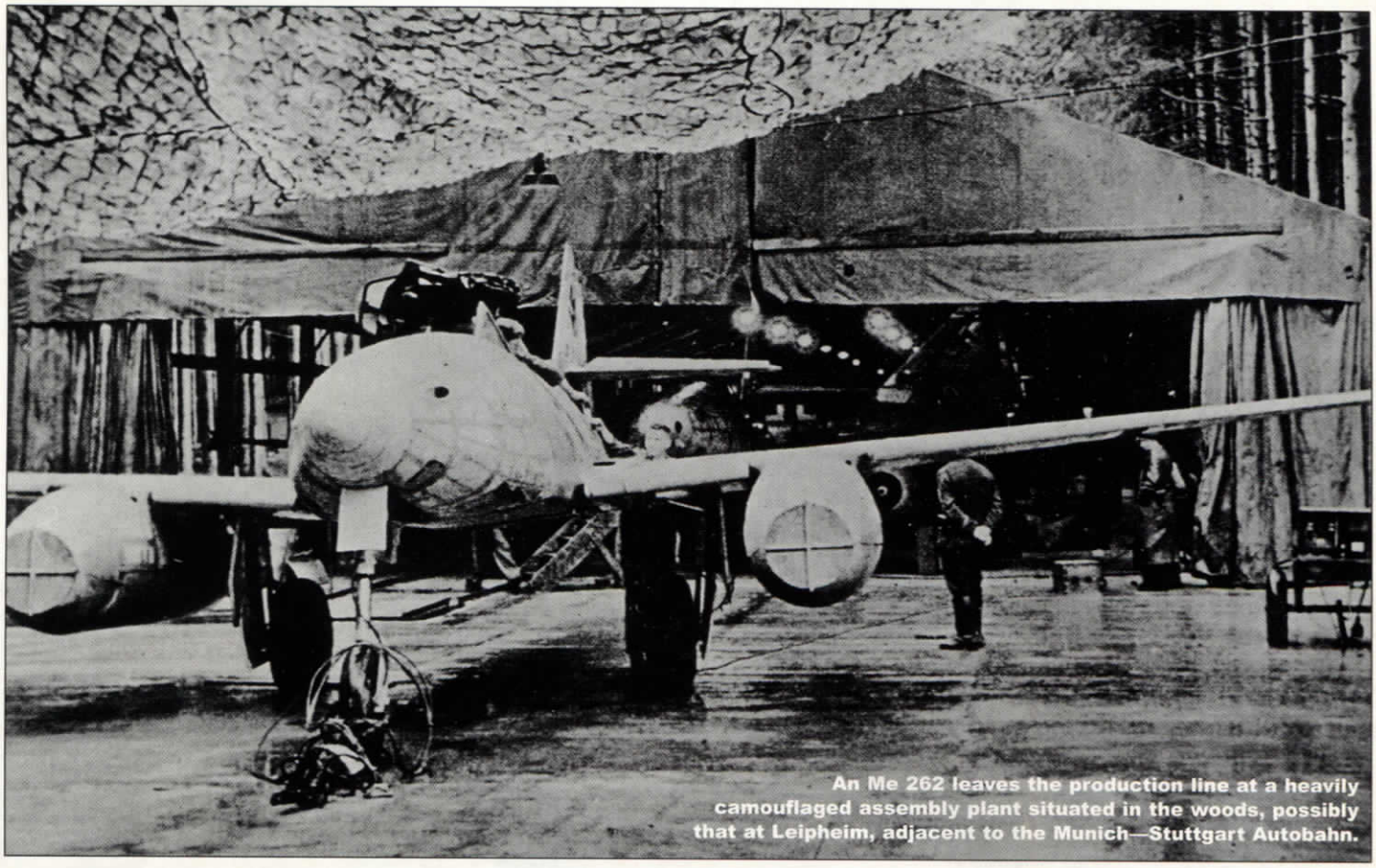


An Me 262 leaves the production line at a heavily camouflaged assembly plant situated in the woods, possibly that at Leipheim, adjacent to the Munich—Stuttgart Autobahn.

The Swallow's Anatomy

The Me 262, unofficially named the *Schwalbe*, or swallow, was optimised for simple and cheap construction. The type's structure is described by Dr ALFRED PRICE

ALTHOUGH THE BASIC structure of the Me 262 airframe was essentially nothing new, the aircraft did introduce a number of innovations in aircraft design, most notably the wing's thickness-to-chord ratio, which was kept low to provide high-speed aerodynamic efficiency. These notes describe a typical Me 262A.

Fuselage

The fuselage was an all-metal semi-monocoque structure of near-triangular section with rounded corners, the wing passing through the base. It was assembled in four sections: the nose cone, which housed the guns and ammunition, the centre-section, which included the cockpit; the rear fuselage, and the tail section.

Wings

The Me 262's wing structure comprised two low one-piece cantilever wings of all-metal structure with single I-section main-spars, with flush-riveted stressed skin fitted into recesses in the underside of the fuselage. The centre portions, between the fuselage and engine nacelles, had a sweptback leading edge and swept-forward trailing edge. The outer portions of the wings were tapered and swept-back, with square-cut tips. The sweepback at the wing leading edge was 18° 32'. The wings had detachable tips and full-span automatic leading-edge slats. Frise-type ailerons were fitted in two sections on each wing. Slotted flaps were mounted inboard of the ailerons and had maximum extension of 60° and a backward movement of 5in.

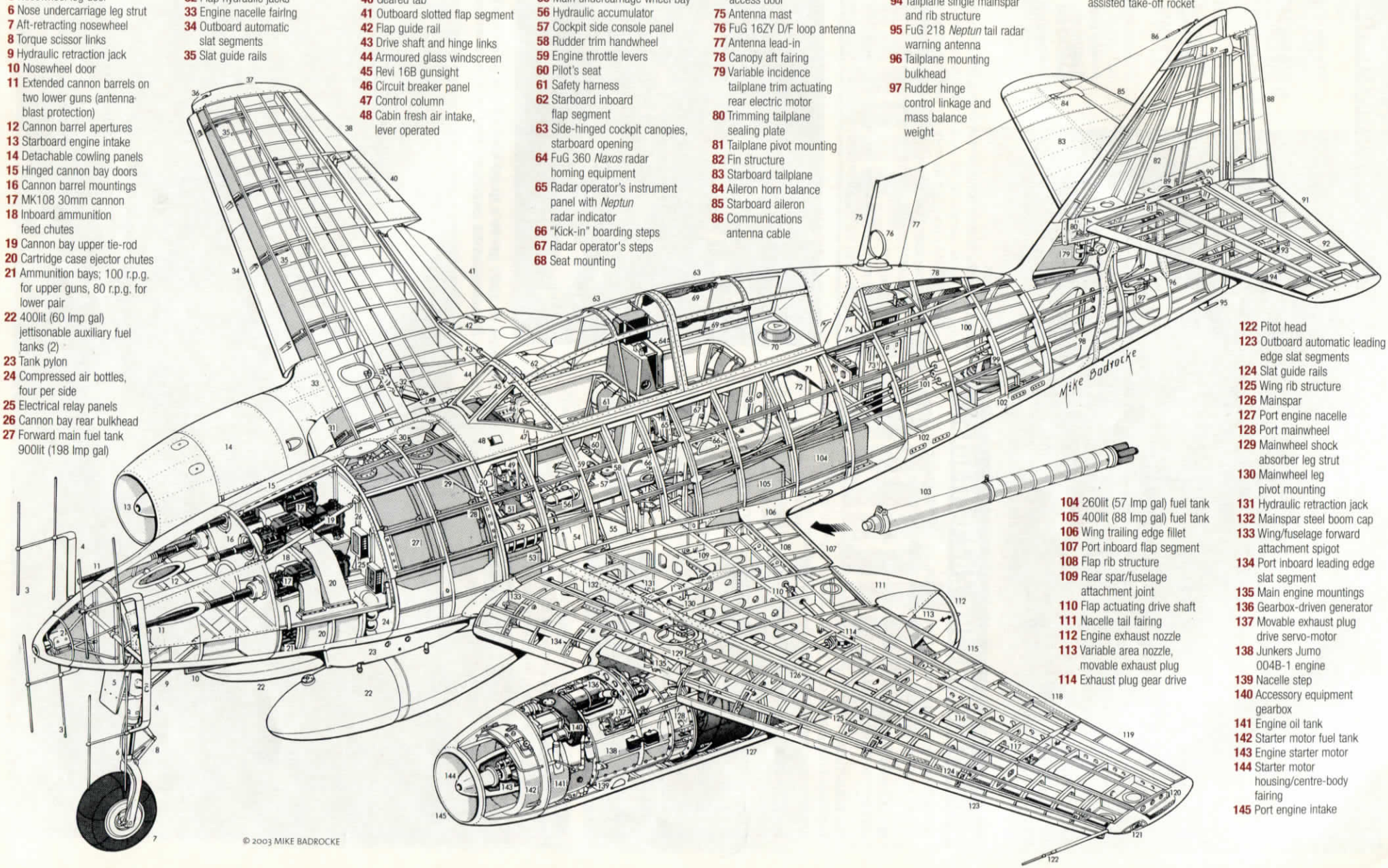
Tail Assembly

The cantilever tailplane was mounted half-way up the fin with mass-balanced rudder and elevators. Trim-tabs were fitted to both elevators and a geared tab fitted to the rudder for trimming.

ABOVE **The Rheinmetall-Borsig MK108 30mm cannon. A technician holds one of the 330g (11oz) high-explosive rounds.**
BELOW **An Me 262A-1a of JG7 with 12 R4M 55mm folding-fin rockets mounted on a wooden rack under the starboard wing.**

Messerschmitt Me 262B-1a/U1

1 Camera aperture
2 Gun camera
3 FuG 218 *Neptun* dipole radar antennae
4 Antenna mast
5 Nosewheel leg door
6 Nose undercarriage leg strut
7 Aft-retracting nosewheel
8 Torque scissor links
9 Hydraulic retraction jack
10 Nosewheel door
11 Extended cannon barrels on two lower guns (antenna-blast protection)
12 Cannon barrel apertures
13 Starboard engine intake
14 Detachable cowling panels
15 Hinged cannon bay doors
16 Cannon barrel mountings
17 MK108 30mm cannon
18 Inboard ammunition feed chutes
19 Cannon bay upper tie-rod
20 Cartridge case ejector chutes
21 Ammunition bays; 100 r.p.g. for upper guns, 80 r.p.g. for lower pair
22 400lit (60 Imp gal) jettisonable auxiliary fuel tanks (2)
23 Tank pylon
24 Compressed air bottles, four per side
25 Electrical relay panels
26 Cannon bay rear bulkhead
27 Forward main fuel tank 900lit (198 Imp gal)
28 Fuel tank mountings
29 Fuel feed pipe
30 Tank filler access
31 Starboard inboard leading edge slat
32 Flap hydraulic jacks
33 Engine nacelle fairing
34 Outboard automatic slat segments
35 Slat guide rails
36 Starboard navigation light
37 Wing tip fairing
38 Starboard linked "Frise-type" aileron panels
39 Aileron hinge control linkage
40 Geared tab
41 Outboard slotted flap segment
42 Flap guide rail
43 Drive shaft and hinge links
44 Armoured glass windscreen
45 Revi 16B gunsight
46 Circuit breaker panel
47 Control column
48 Cabin fresh air intake, lever operated
49 Pilot's instrument panel
50 Cockpit front pressure bulkhead
51 Rudder pedals
52 Hydraulic reservoir
53 170lit (37 Imp gal) forward auxiliary fuel tank
54 Mainwheel door
55 Main undercarriage wheel bay
56 Hydraulic accumulator
57 Cockpit side console panel
58 Rudder trim handwheel
59 Engine throttle levers
60 Pilot's seat
61 Safety harness
62 Starboard inboard flap segment
63 Side-hinged cockpit canopies, starboard opening
64 FuG 360 *Naxos* radar homing equipment
65 Radar operator's instrument panel with *Neptun* radar indicator
66 "Kick-in" boarding steps
67 Radar operator's steps
68 Seat mounting
69 Roll-down window blinds
70 Rear fuel tank filler
71 Cylindrical cockpit pressure shell
72 Cockpit rear pressure bulkhead
73 Electronic equipment racks
74 Starboard side equipment access door
75 Antenna mast
76 FuG 16ZY D/F loop antenna
77 Antenna lead-in
78 Canopy aft fairing
79 Variable incidence tailplane trim actuating rear electric motor
80 Trimming tailplane sealing plate
81 Tailplane pivot mounting
82 Fin structure
83 Starboard tailplane
84 Aileron horn balance
85 Starboard aileron
86 Communications antenna cable
87 Rudder horn balance
88 Rudder trim tab
89 Elevator mass balance weight
90 Hinge control
91 Elevator geared tab
92 Port elevator rib construction
93 Rudder-mounted tail navigation light
94 Tailplane single mainspar and rib structure
95 FuG 218 *Neptun* tail radar warning antenna
96 Tailplane mounting bulkhead
97 Rudder hinge control linkage and mass balance weight
98 Fin spar attachment sloping bulkhead
99 Master compass transmitter
100 Rear fuselage frame and stringer structure
101 Tailplane control rods
102 Signal cartridge launchers
103 1,000kg-thrust (2,205lb) assisted take-off rocket
104 260lit (57 Imp gal) fuel tank
105 400lit (88 Imp gal) fuel tank
106 Wing trailing edge fillet
107 Port inboard flap segment
108 Flap rib structure
109 Rear spar/fuselage attachment joint
110 Flap actuating drive shaft
111 Nacelle tail fairing
112 Engine exhaust nozzle
113 Variable area nozzle, movable exhaust plug
114 Exhaust plug gear drive
115 Port outboard flap segment
116 Wing detachable bottom skin panels
117 Aileron control rod
118 Aileron geared tab
119 Port aileron rib structure
120 Wing tip fairing
121 Port navigation light
122 Pitot head
123 Outboard automatic leading edge slat segments
124 Slat guide rails
125 Wing rib structure
126 Mainspar
127 Port engine nacelle
128 Port mainwheel
129 Mainwheel shock absorber leg strut
130 Mainwheel leg pivot mounting
131 Hydraulic retraction jack
132 Mainspar steel boom cap
133 Wing/fuselage forward attachment spigot
134 Port inboard leading edge slat segment
135 Main engine mountings
136 Gearbox-driven generator
137 Movable exhaust plug drive servo-motor
138 Junkers Jumo 004B-1 engine
139 Nacelle step
140 Accessory equipment gearbox
141 Engine oil tank
142 Starter motor fuel tank
143 Engine starter motor
144 Starter motor housing/centre-body fairing
145 Port engine intake



Undercarriage

This was of tricycle type with hydraulic retraction. Hydraulic brakes were used on all wheels. The mainwheels retracted inwards into the underside of the wing centre section, and the nosewheel retracted rearwards into the fuselage.

Engines

The most significant part of the Me 262's construction concerned the two Junkers Jumo 004 B-1 or B-4 eight-stage axial-flow gas turbine units, each developing 1,980lb thrust, mounted in a nacelle slung under each wing. The engines were started by means of a Riedel two-cylinder two-stroke starter motor built into the nose cone of each jet unit.

Both the main engines and their starter motors ran on J-2 fuel, 87-octane petrol mixed with 5 per cent diesel oil. The Me 262A-1a fighter carried four fuel tanks in the fuselage, two of 196 Imp gal, one of 38 gal and one of 132 gal capacity. There was also provision to carry two drop tanks under the forward fuselage, with a total capacity of 132 Imp gal.

Accommodation

The pilot's cockpit was mounted over the wing trailing edge, and was protected by 15mm armour plates in front of and behind the pilot, and by a 90mm toughened glass windscreen. Access was gained via a sideways-hinged canopy.

Messerschmitt Me 262 variants

Me 262A-0 Pre-production fighter version, 13 aircraft built during March and April 1944. Most sent to test establishments

Me 262A-1a First production fighter version, armament four 30mm cannon. More than 1,000 built

Me 262A-1a/U3 Tactical reconnaissance version of the A-1 fighter. Armament reduced to one 30mm cannon, carried two Rb 50/30 aerial cameras in a vertical split pair. Built in small numbers

Me 262A-2a Fighter-bomber version of the A-1a fighter. Armour removed, and additional fuel tanks mounted in the rear fuselage. Racks for two 250kg or one 500kg bomb mounted under the nose. More than 100 built

Me 262B-1a Two-seat conversion trainer, fitted with dual controls. Second seat fitted to the rear of the first, in place of the rear fuselage fuel tank. Produced in small numbers

Me 262B-1a/U1 Two-seater modified for the nightfighter role. Fitted with SN-2 *Liechtenstein*, later *Neptun*, airborne interception radar. Also carried the *Naxos* equipment for homing on emissions from the British H_2S radar. Produced in small numbers

Me 262 B-2a Definitive nightfighter variant. As the B-1a/U1, but with length increased by just under 4ft to accommodate a fuel tank in the rear fuselage. Produced in small numbers

Me 262A-1a fighter data

Dimensions

Span	41ft 0½in (12·5m)
Length	34ft 9½in (10·6m)
Height	11ft 6¾in (3·5m)
Wing area	233·58ft² (21·72m)
Wing loading at normal loaded weight	60·4lb/ft²

Weights

Empty, equipped	9,742lb (4,420kg)
Normal loaded (no external stores)	14,101lb (6,396kg)

Performance

Max speed (clean)	513 m.p.h. at sea level, 541 m.p.h. at 19,500ft, limiting safe Mach No 0·83
Max initial rate of climb	3,940ft/min
Time to 19,500ft	6min 48sec
Range	Normal fighter internal tankage, 300 miles at s/l, 650 miles at 29,500ft

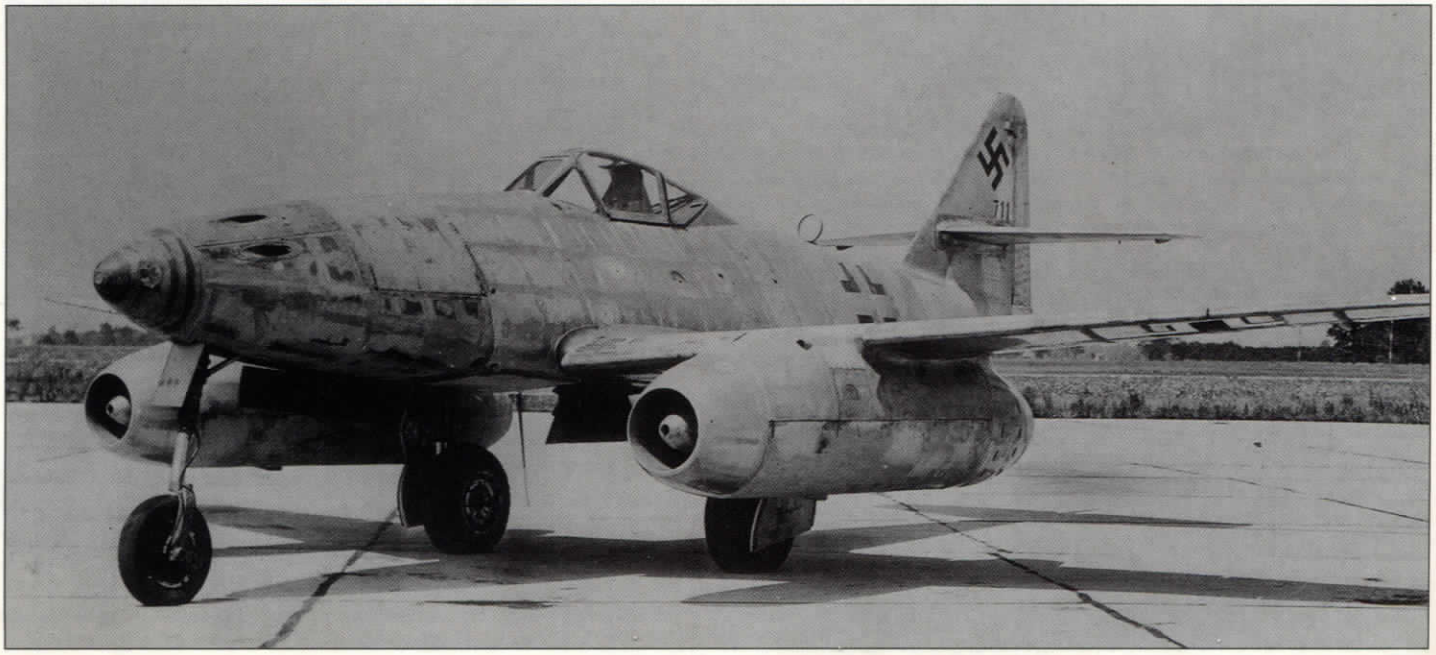
Armament

Fighter Four 30mm Rheinmetall-Borsig MK108 cannon, 100 r.p.g. for the two upper weapons, 80 r.p.g. for the two lower. Later modified to carry 24 R4M unguided rockets on wing-mounted wooden racks

Fighter-bomber Two 30mm MK108 cannon with 80 r.p.g. Two 250kg (550lb) or one 500kg (1,100lb) bombs carried externally under the nose

Tactical reconnaissance version One 30mm cannon in the extreme nose. Two Rb 50/30 automatic cameras in vertical split pair

ABOVE RIGHT **This Jumo 004 being moved into the Deutsches Museum in 1957 gives a good idea of the primitive jet's dimensions.**
BELOW **Me 262A-1a WNr 111711 was used for research work by the Messerschmitt company, and was later moved to America.**



The radical new Jumo 004 jet engines gave the Me 262 outstanding performance – provided they worked properly. Dr ALFRED PRICE explains how difficulties with production greatly limited its potential capability

Engine Troubles

AT THE END OF THE 1930s it was realised that the laws of physics dictated the maximum speed propeller-driven fighters could attain — somewhere around 500 m.p.h. The problem centred on the inefficiency of the propeller as a means of converting the rotational power from a piston engine into propulsive thrust. As an aircraft neared that speed, propeller efficiency fell drastically.

For high-speed flight, the gas turbine was more efficient than the piston engine. The Junkers Jumo 004 gas turbine, the unit which powered the Me 262 after spring 1942, developed 1,850lb of thrust and weighed 1,590lb. Like their counterparts in Great Britain, German engineers working on the early gas turbine engines for aircraft were beguiled by their simplicity. There were no propeller conversion losses, no reciprocating parts, and thrust was more or less constant throughout the speed range.

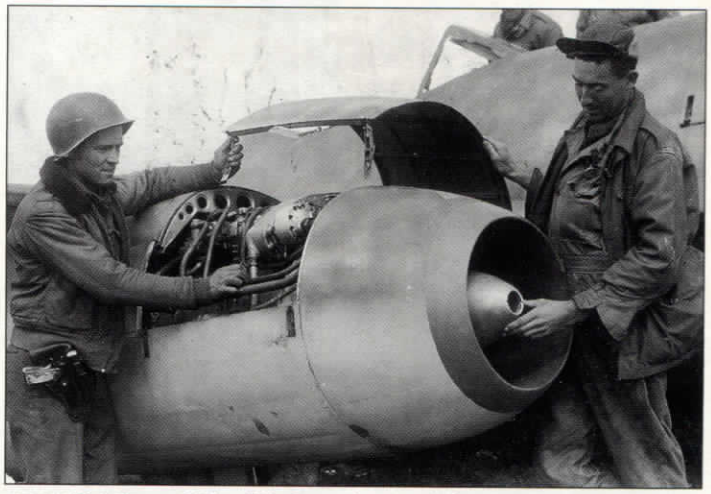
On the down side, however, the gas turbine ran at far higher temperatures, much greater rotational speeds, and proved considerably more difficult to control than previous types of aircraft engine. Designers of the early gas turbines faced a host of new problems which, in many cases, they had to resolve from first principles.

German engineers working in this field faced further constraints. By the mid-war period chromium and nickel, the steel-hardening elements usually considered necessary for high-temperature steel alloys, were in desperately short supply in Germany. The munitions industry's needs exceeded supply, and stockpiles of these materials depleted with each month. There was little to spare for the jet engine programme. Those working on jet engines endeavoured to design around the problem, and performance came secondary to building engines that could be mass-produced using available materials.

In the case of the Jumo 004, Junkers engineers used substitute materials which were often not up to the job. The engine's combustion chambers, for example, were fashioned from mild steel with a spray-coating of aluminium baked on to prevent oxidisation. During running, these gradually became distorted, thus limiting the life of the engine.

Early production Jumo 004 B-1 engines had a running life of only 10–12 hours. Pilots had to be very careful in handling the throttles if they were to avoid the risk of engine failures, flameouts or engine fires. One of the most difficult problems concerned getting the correct fuel flow to the engine throughout the Me 262's performance envelope. Too much fuel and the turbine blades would burn out, too little and the engine would flame out. At altitudes above 13,000ft the engine became increasingly temperamental, and if it suffered a flameout it was necessary to descend below that altitude before attempting a relight. The short running life, along with many other problems, meant the B-1 engine contained too many failings to allow mass production to begin.

ABOVE **An engineless Me 262 sits among the trees next to a stretch of road pressed into service as a makeshift airstrip in 1945.**
ABOVE **Flame spurts from a Jumo 004 after start-up. Note the ignited spillage on the concrete below.**



ABOVE **Soldiers of the 7th Army inspect the compressor and Riedel starter motor on a captured Me 262 at Giebelstadt.**

After much hard work to eliminate weaknesses in the design, the Jumo 004 B-4 emerged, with a nominal life of 10 running hours before it needed an overhaul, and a total life of 25 running hours. The new variant was less sensitive to throttle handling than its predecessors and generally less temperamental. Some control problems remained, but the Luftwaffe could wait no longer. The design of the 004 B-4 was frozen in June 1944 to allow for mass production. In September 1944, production reached significant levels and during that month 90 Me 262s were delivered to the Luftwaffe.

Hitler's Edict

In May 1944, Adolf Hitler ordered that the Me 262 was initially to go into action only in the high-speed bomber role. Despite wide condemnation, there were sound reasons for adopting such a course. Dr ALFRED PRICE examines the motives for the order, and its effect

UNTIL THE AUTUMN OF 1943 the Me 262 had been considered solely for the bomber-destroyer role. By then it was clear that the Allies were assembling forces for a major invasion operation in the following year, to be launched against a point in north-west Europe. When the blow fell, the fight to secure the beachhead would decide the outcome of the war. If the invasion succeeded, the German Army would be squeezed inexorably between the Eastern and Western fronts. If, on the other hand, the invasion was defeated, Allied losses would probably be so great as to preclude a further attempt for some time. During that time the German Army could concentrate its forces on the Eastern Front, and try to secure a major victory there.

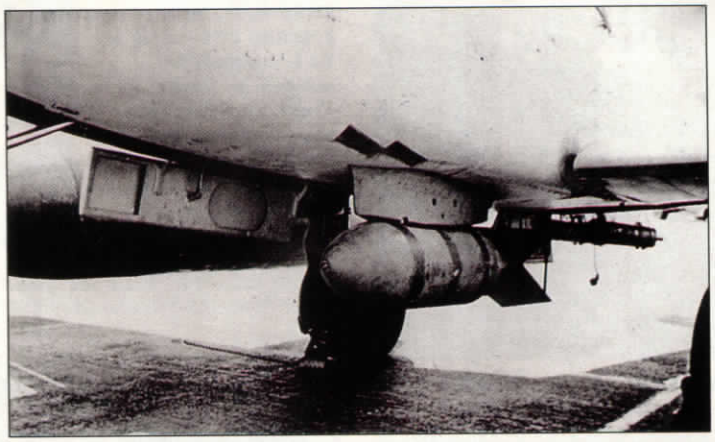
The critical initial hours of a landing operation would be fraught with difficulty and confusion. How much more difficult would the invaders' task be, if the Luftwaffe sent 50 or 100 high-speed bombers to bomb and strafe the troops coming ashore? Just a few hours delay in securing the beachhead might be decisive, if German armoured units reached the scene first and drove the invaders into the sea. In the event, the landings on *Omaha* beach on D-Day ran into severe difficulties, and had there been additional harassment from scores of high-speed bombers strafing the troops as they came ashore, the landing could have failed disastrously.

In November 1943 Hitler had watched an impressive demonstration of high-speed flight by the Me 262 V6. Willi Messerschmitt was in attendance, and afterwards the Führer asked whether the aircraft could carry bombs. Messerschmitt assured him it could, either one 1,000kg (2,200lb) or two 500kg (1,100lb) bombs. That was the answer Hitler wanted to hear. This was the "Blitzbomber" he sought, an aircraft with the speed to punch through the Allied fighter screens and plant its bombs on the invaders.

From then on, the Me 262 fighter-bomber featured prominently in Hitler's counter-invasion plans. Yet he failed to communicate the strength of his feelings to those responsible for preparing the aircraft for that role. Significantly, in the months that followed, the Messerschmitt company did not initiate detailed design work on a fighter-bomber version of the Me 262, and senior Luftwaffe officers did not press it to do so. For his part Generalfeldmarschall Erhard Milch, in charge of aircraft production for the Luftwaffe, acknowledged the usefulness of aircraft as a fighter-bomber. But he considered that it would do better initially as a bomber-destroyer, and he concentrated the work on readying the Me 262 for service in that role. That divergence, between Hitler's wishes and the course of the aircraft's development, set in motion a train of events that threatened to shake the Me 262 programme to its very foundations.

Matters came to a head on May 23, 1944, when Hitler ordered a top level conference at his Berghof residence to discuss the latest Luftwaffe production programmes. Among those present were *Reichsmarschall* Hermann Goering, Erhard Milch, Luftwaffe Chief of Staff General Günther Korten, Inspector of Fighters Generalmajor Adolf Galland and other senior staff officers, as well as Albert Speer and officials from his armament ministry.

Hitler listened without great interest to details of the new fighter production programmes, until the Me 262 was mentioned. He asked how the Blitzbomber was progressing, how many had yet been built? Milch replied that no Me 262s had yet been built as bombers, the aircraft was being manufactured exclusively as a fighter. There was an awkward silence, then Hitler lost his composure and the meeting developed into a blazing if rather one-sided row. The Allies might launch their invasion of Northern Europe any day, and the aircraft he needed to defeat the landings did not exist. He was particularly angry at the



ABOVE The key players in the development of the Me 262 meet at Berchtesgaden in 1943. Shaking Hitler's hand is Generalmajor Adolf Galland, with Generalfeldmarschall Erhard Milch just visible behind the Führer. Nearest the camera is Generalmajor Hans Jeschonnek, Chief of Staff of the Luftwaffe.

LEFT A close-up of the streamlined bomb rack under the fuselage of an Me 262A-2a, carrying an SC 250 general-purpose bomb.

way he had been misled on the Me 262's ability to carry bombs.

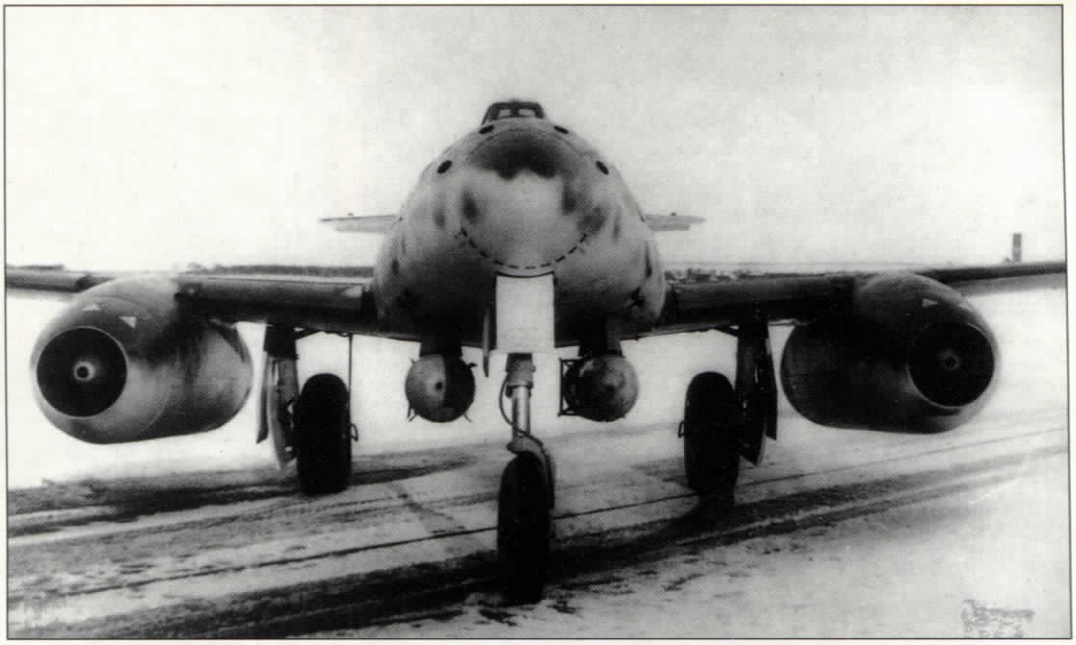
Hitler then dismissed everyone except Goering, and delivered a blistering attack on the latter for his incompetence in mishandling the matter. At the end of the audience, the Führer declared that he now held Goering personally responsible for seeing the Me 262 into service as a Blitzbomber as rapidly as possible. New aircraft coming off the production lines were to be delivered only to bomber units.

The conversion for the new role involved removing much of the armour plate, installing extra fuel tanks and fitting streamlined bomb pylons under the fuselage. While these were not major modifications, they could not easily be incorporated in aircraft already built. Instead, aircraft in the early stages of assembly were selected for modification.

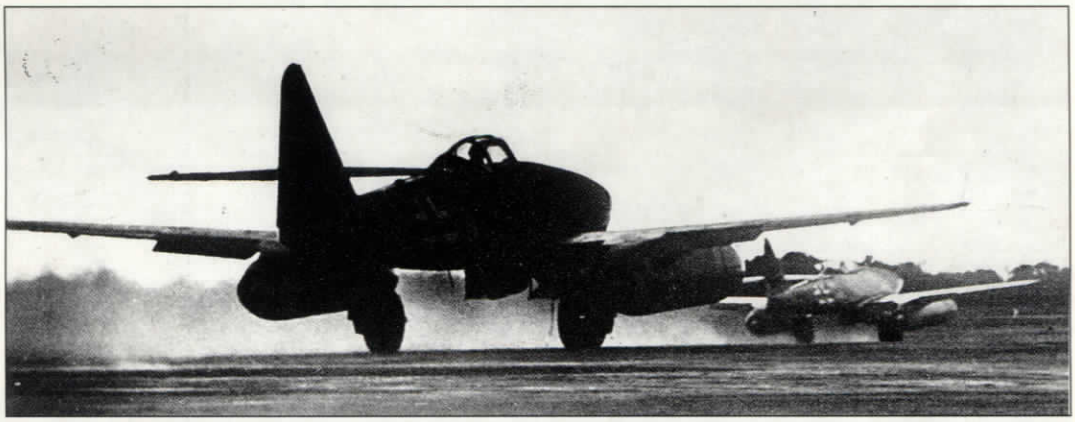
The first casualty of the row was Erhard Milch, for Hitler had lost confidence in the man he blamed for misleading him. In the weeks that followed, Milch was stripped of his various offices. In retrospect, it is surprising that the Führer did no more than that.

On June 6, 1944, ten days after the tempestuous conference at Berchtesgaden, Allied troops blasted their way ashore in Normandy. By mid-morning, all four of their beachheads were secure and no power at Adolf Hitler's command could dislodge them. The opportunity for the Me 262 to play a decisive role against that operation, if it ever existed, had passed.

By D-Day fewer than 30 pre-production and production Me 262s had been delivered to the Luftwaffe, all with temperamental engines. Clearly the aircraft was not yet ready for action. Regardless of what Hitler, Milch, Goering or Messerschmitt had or had not done, the factor limiting production of the Me 262 in any role was the failure to bring the Jumo 004 gas turbine to the point where it was ready for mass production.



ABOVE An ominous head-on view of an Me 262A-2a fighter-bomber of *Kampfgeschwader 51* carrying a pair of SC 250 bombs, highlighting the aircraft's shark-like appearance.



BELOW Two Me 262A-2as of KG51 take off for an operational mission. To offset the forward weight of the ordnance, the bombers were fitted with an additional fuel tank towards the rear.

Only in June 1944 was the Jumo 004 running well enough to allow the design to be frozen so mass production could begin. It was September before production engines started to emerge from the factories in large numbers.

Also in September, Hitler rescinded his order that new Me 262s were to be delivered only to Blitzbomber units. By then there were scores of Me 262 fighter airframes finished or almost finished, but lacking engines. These aircraft were now completed rapidly. Within a few days the first Me 262 fighter unit, *Kommando Nowotny*, received 23 new-build fighters, all with production Jumo 004 engines. At the end of the month the unit was declared ready for operations.

The greatest effect of "the Blitz-bomber row" was that it shook the Luftwaffe leadership to its core, leaving it demoralised and cowed. Never again would any Luftwaffe officer attempt to stand his ground with Hitler on any issue. Set against that, the edict itself had remarkably little effect. The delay in fielding the first operational Me 262 fighter *Gruppe*, with aircraft fitted with production engines, was probably only about three weeks. In the months to follow, the Me 262 would encounter several problems which prevented its mass deployment in the fighter role.

An Me 262 fighter-bomber of KG51 prepares for a mission at Rheine in eastern Germany in the autumn of 1944.