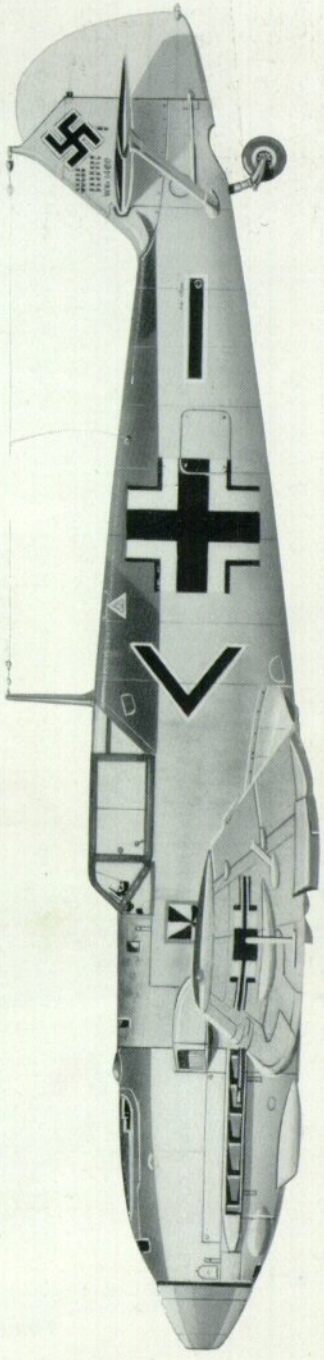
PROFILE
PUBLICATIONS

The Messerschmitt Bf 109E



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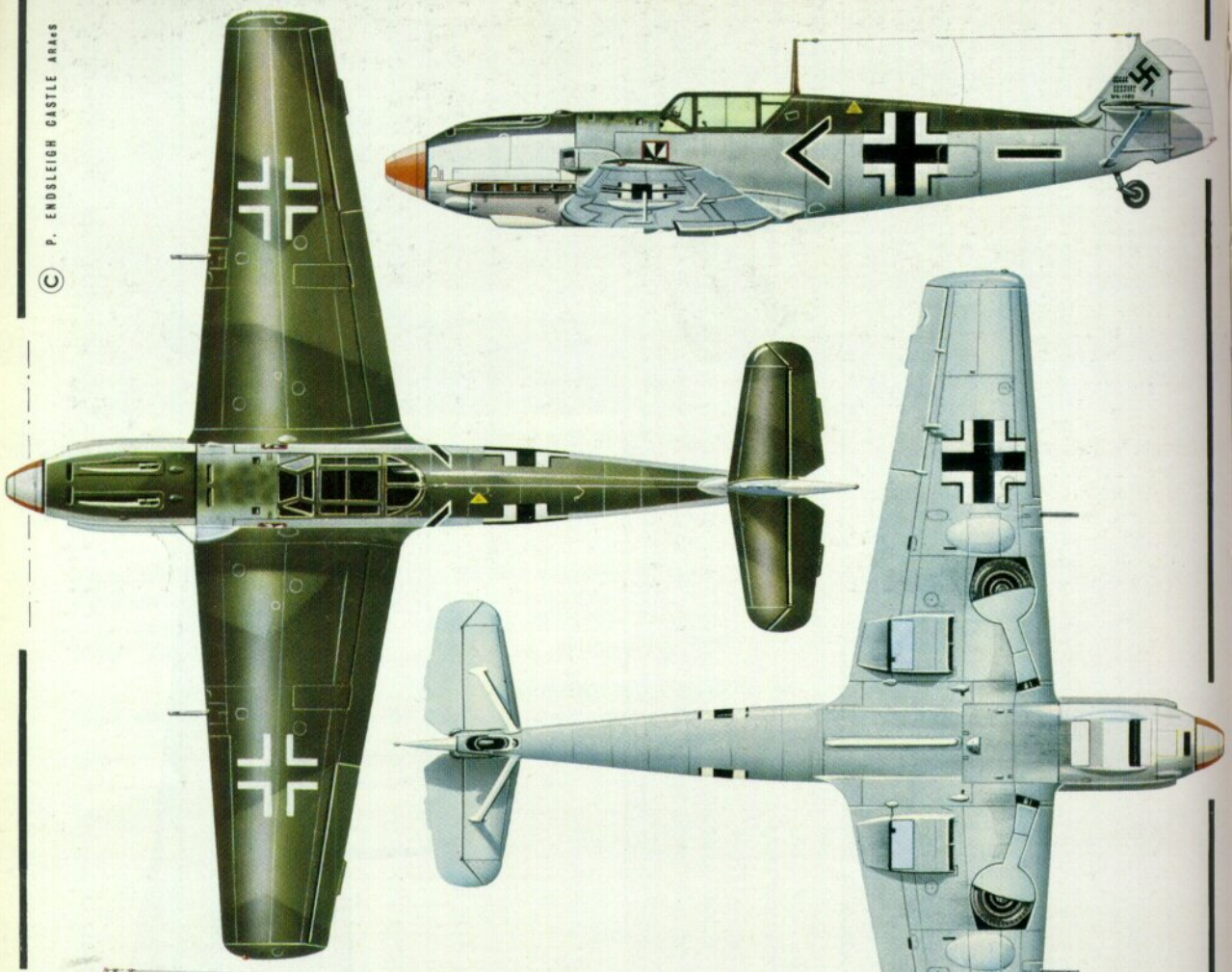
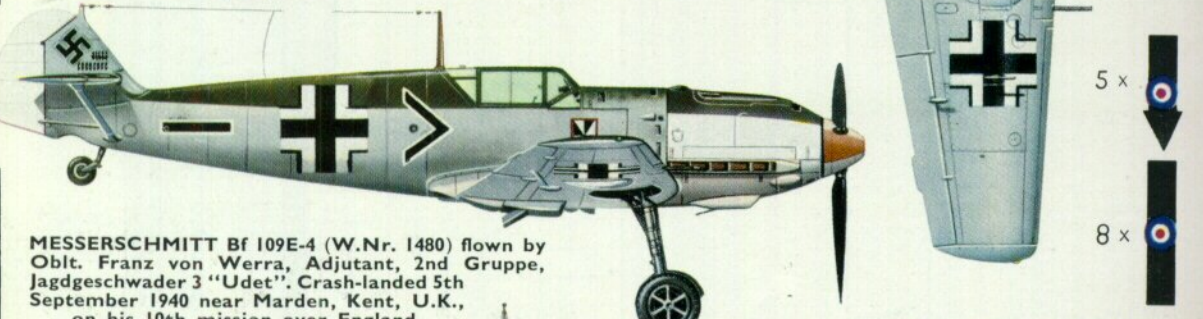
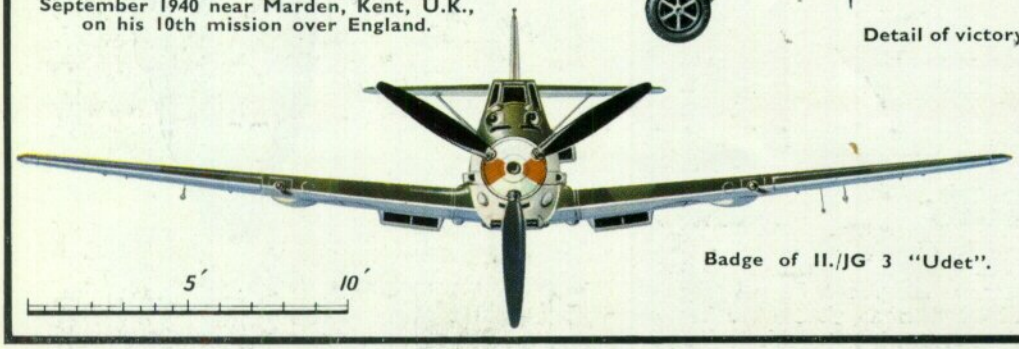


MESSERSCHMITT Bf 109E-4 (W.Nr. 1480) flown by Oblt. Franz von Werra, Adjutant, 2nd Gruppe, Jagdgeschwader 3 "Udet". Crash-landed 5th September 1940 near Marden, Kent, U.K., on his 10th mission over England.



Detail of victory bars (13) on fin.



Badge of II./JG 3 "Udet".

It will be noted that the cowling panel immediately forward of the cockpit of the aircraft illustrated above is a replacement taken from an aircraft finished in a different camouflage scheme.

The Messerschmitt Bf 109E

by Martin C. Windrow

A Messerschmitt Bf 109E-4/N Trop of 2nd Staffel, JG 27 in flight over the Mediterranean. The tropical filter over the ram-air intake on the port side of the engine cowling is clearly visible. Note also the emblem of JG 27 on the nose and the white belly-band displayed by most Luftwaffe aircraft in North Africa.
(Photo: R. Ward Collection)

The story of Willy Messerschmitt's Bf 109 fighter surely needs but little introduction. The best-known German military aircraft of W.W.II, it has probably monopolised more space in print than any other machine which took part in that great struggle. As the standard equipment of the German fighter force during the epic "Battle of Britain", the exploits of this aggressive little aircraft made its designer's name a household word throughout the civilised world; and it is a much-noised fact that more Bf 109s were built than any other combat aircraft of the war. As one of the two major production series the Bf 109E "Emil" represented the peak of more than four years' development; it was the equal of any contemporary fighter in squadron service anywhere in the world, and vastly superior to most.

The Bf 109 did not have an easy birth. Due to the long-standing feud between Secretary of State for Air General Erhard Milch and Willy Messerschmitt, the *Bayerische Flugzeugwerke* was in a precarious business position when in 1933 Messerschmitt and his joint manager Herr Kokothaki obtained a contract from a Romanian cartel to develop a new transport aircraft, a contract which saved B.F.W. from liquidation. Protests from officials of the *Reichsluftfahrtministerium* against Messerschmitt's acceptance of a foreign contract drew the retort that this step had been forced on B.F.W. by a total lack of home support for the company. Consequently, a fighter development contract was awarded to B.F.W. almost at once; similar contracts were awarded to the Heinkel, Arado and Focke-Wulf concerns and in view of Messerschmitt's lack of experience in high-speed combat design, B.F.W.'s chances in the scheduled competitive trials at Travemünde were extremely dubious.

Design work occupied Messerschmitt's team throughout the summer of 1934. The maximum use was made of features which had proved successful in the Bf 108 *Taifun* touring four-seater, such as leading edge slats, slotted flaps, and a completely enclosed

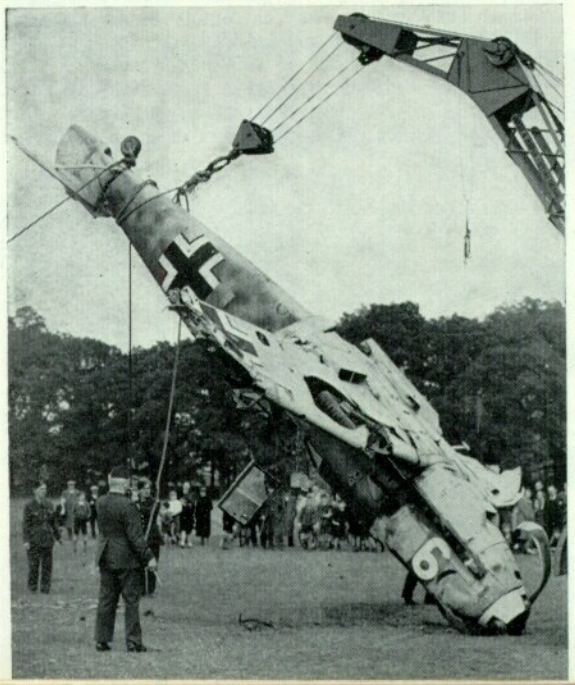
Oberleutnant Franz von Werra, pilot of the Bf 109E-4 depicted on the opposite page, escaped from captivity in Canada and returned to Germany via the U.S.A.; he was the only German officer to succeed in this feat. He is seen here posing by an SB-2 he destroyed on the Russian Front.

Above: *The Bf 109V14, which first flew in mid-1938.* Below: *The initial production variant Bf 109E-1 in factory finish.*
(Photos: G. Heumann/Air Pictorial)

Bf 109E production line at Augsburg.

A pilot of 8/JG 51 (previously 2/JG 20) boards his E-3 in a hurry. The aircraft bears the markings of the late 1939/early 1940 period, with black-green upper surfaces and narrow fuselage crosses.

Above: *J-311, Bf 109E-3 W.Nr.2159, in the colourful fuselage markings of the Swiss Air Force. This machine was written off on 28th December 1949.* (Photo: Werner Gysin, Jr.)
Below: *A Messerschmitt which crash-landed in Windsor Great Park on 30th September 1940 after misjudging an attack on two Avro Anson trainers. The numeral painted on the cowling was a marking not often employed as late as 1940.*



Scottie dog nose emblem on a Bf 109E-3 believed to have flown with JG 2 "Richthofen" in the Battle of Britain. The "Schnauzl" insignia was a personal rather than a unit motif.

cockpit. Despite the resultant poor vision during taxiing, a high ground angle was chosen in order to achieve the highest possible lift coefficient when landing. Messerschmitt was unable to obtain one of the new Junkers Jumo 210A engines of 610 h.p. for his prototype, so when the Bf 109VI was rolled out in September 1935 it was powered by a Rolls-Royce Kestrel V of 695 h.p. After a series of hurried flight tests by test pilot Knoetsch, the Bf 109VI (registration D-IABI, W.Nr. 758) was flown to the Rechlin Experimental Establishment, and suffered a collapsed undercarriage on arrival. Hasty repairs were effected, and the VI flew to Travemünde for the trials in late October. The other competitors were the Heinkel He 112VI, the Arado Ar 80VI and the Focke-Wulf Fw 159VI; and it was with considerable surprise that the German aviation world heard that Messerschmitt, although not the outright winner, had been awarded a contract for ten Bf 109s. (Heinkel obtained a similar contract, but the full story of the ill-fated He 112 would require a *Profile* of its own.) The Augsburg plant of B.F.W. had been working on further prototypes even before the results of the trials had been announced, and three more machines appeared during 1936.

The Bf 109V2 (D-IUDE, W.Nr. 809) and V3 (D-IHNY, W.Nr. 810) flew in January and June 1936 respectively, powered by Jumo 210A engines and with provision for two MG 17 machine guns in the upper nose decking; this was the armament envisaged for the production series Bf 109A. The Bf 109A in fact never appeared; international standards of fighter armament were being revised during this period, and in view of the rumoured four-gun armament of the Hawker Hurricane and Supermarine Spitfire it was decided to produce the Bf 109B with a battery of three rifle-calibre machine guns, the third firing through the airscrew spinner and being replaced by a 20-mm. MG FF/M cannon when deliveries of this weapon reached a practicable volume. The Bf 109V4 (D-IOQY, W.Nr. 878), carried three MG 17s initially, the cannon replacing the engine-mounted machine gun later. The V5, V6 and production prototype V7 flew early in 1937, and the first pre-production Bf 109B-0 machines for service testing approached final assembly in the same period.

The history of the Bf 109B, Bf 109C and Bf 109D has no place in the present article; suffice it to say that a steady trend of heavier armament, more powerful engines and more modern equipment can be traced through the successive series. Operational experience of great value was gained in Spain by the pilots and technical observers of the Bf 109B-1, B-2 and C-1 fighters which equipped the three *Staffeln* of *Jagdgruppe 88*, the fighter component of the *Legion Condor*. In their short but triumphant career in Spanish skies the Messerschmitt pilots laid the

Pre-flight briefing for the pilots of a Messerschmitt Staffel in France. The "triple chevron" marking was not a standard insignia and probably indicates that the Staffel was led by the Gruppe Kommandeur in person. (Photo: R. Ward Collection)

foundations for later victories; it was this hard core of veterans, led by men of the calibre of Werner Molders, who two years later came so close to forcing the R.A.F. to its knees.

The Bf 109E series stemmed from the prototype Bf 109V14, which flew for the first time in the summer of 1938. A major advance over previous variants was the installation of the 1,100-h.p. Daimler-Benz DB 601A engine, with direct fuel injection and improved supercharging. Armament comprised two MG 17s in the upper nose decking and two MG FF cannon in the wings. The V15 tested the engine-mounted cannon (which had reached an acceptable service status with the Bf 109D-0) but carried no wing armament; the ten pre-production Bf 109E-0 machines mounted two wing and two nose machine guns when they appeared late in 1938.

PRODUCTION BEGINS

The first Bf 109E-1s left the factory early the following year, and by the most stringent international standards they were formidable fighting machines. With two MG 17s above the nose (1,000 r.p.g.) and either two further machine guns or two MG FF cannon (60 r.p.g.) in the wings, the E-1 had a rate of fire of up to 290 lb. per minute. At 12,300 ft. a speed of 354 m.p.h. was attainable; a climb rate of 3,100 ft./min. and a service ceiling of 36,000 ft. put the first Emils in an altogether higher class than the obsolescent opponents which it would meet in the opening months of the war. The fighter-bomber variant, Bf 109E-1/B, was fitted with racks for four 110-lb. or one 550-lb. bombs; the Carl Zeiss *Revi* gunsight could be employed as a bomb-sight. (Recommended dive speeds for medium and high altitude bombing runs were 373 m.p.h. and 403 m.p.h. respectively.)

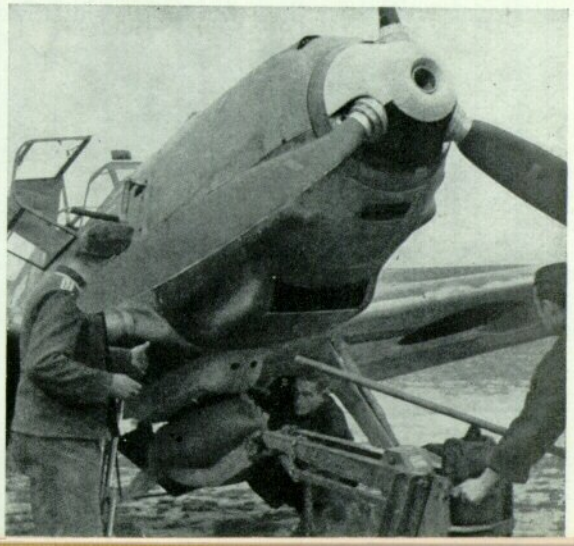
Fifteen Bf 109E-1s were sent to Spain in the late spring of 1939; two examples were coded 6.117 and 6.130. A third E-1 in the Spanish batch led a chequered career which ended only a few years before the time of writing; coded 6.106, Bf 109E-1, W.Nr. 790 was handed over to the Spanish Air Army by the homeward bound *Legion Condor* with only 25 flying hours on the log book. After no less than fifteen years service with various Spanish fighter units and training establishments it was finally handed to the Logrono Apprentice School in 1954 as an instructional airframe. Acquired in 1960 by the *Deutsche Museum* of Munich, the machine was re-conditioned by Hispano Aviacion of Seville and at the time of writing stands in the Munich museum, finished in the colours of JG 26 "*Schlageter*".

Production of the Bf 109 now moved from Augsburg to Regensburg, due to pressure of space brought about by the commencement of Bf 110 production. Massive sub-contract work was undertaken by the plants of Ago (Oschersleben), Arado (Warnemünde), Erla (Leipzig), and W N.F. (Delitzch and Wiener-Neustadt). Of the 1,540 machines delivered in 1939 less than 150 were actually manufactured by the Messerschmitt A.G. (as B.F.W. had been re-christened in July 1938).

When the Third Reich invaded Poland on 1st September 1939 the fighter strength of the *Luftwaffe* consisted of twelve *Gruppen* with a total establishment of 850 Bf 109E-1s and E-1/Bs. A thirteenth unit was equipped with the Arado Ar 68 and some 235 Bf 109D-1s were incorporated into the strength of the *Zerstörergeschwader*. The fighters did not operate in *Jagdgeschwader* at that time, but on paper they were

A Bf 109E-4/B in flight. This sub-type took part in many "hit-and-run" raids over Southern England in the late stages of the Battle of Britain. The aircraft illustrated served with 8/JG 1. (Photo: G. Heumann/Air Pictorial)

A Luftwaffe Oberfeldwebel supervises the loading of an SC 250 bomb on to a Bf 109E-4/B. Points of interest are the engine crank handle and the armour plate in the side-hinging canopy. This style of spinner decoration was known as "Kullerschnauze".



A Bf 109E-4 during flight trials displays standard 1941 colour scheme with radio call-sign codes. Note the flat-topped cockpit canopy, which offered improved armour protection over the earlier style of canopy employed on the E-3 variant.

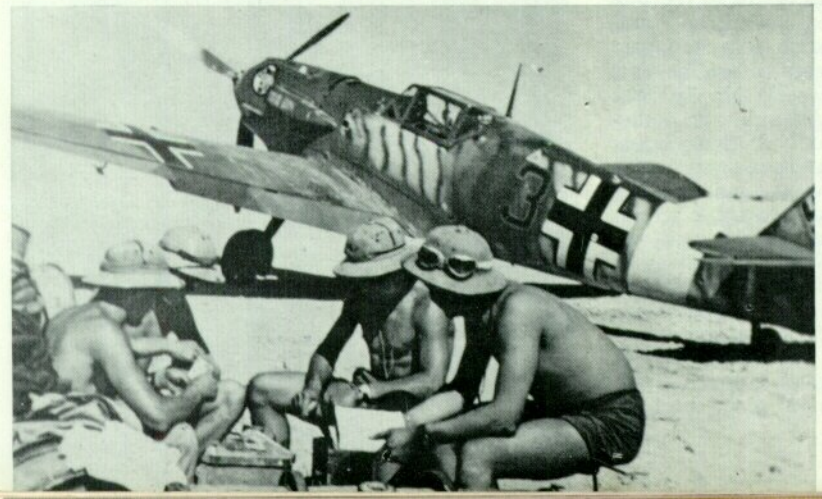
organised into JGs 1, 2, 3, 26, 51, 52 and 53. One fighter *Gruppe* was also on the establishment of *Lehrgeschwader 1*, including a *Staffel* investigating the possibilities of searchlight-collaboration night fighting with the Bf 109E-1. The war in Poland was of such brief duration that the Fighter Arm was unable to gain a clear appreciation of its skill and organisation under combat conditions, the bulk of the operations falling to the light bomber and ground-attack formations.

WAR IN THE WEST

Probably the first occasion on which Bf 109s and Bf 110s exchanged shots with the Royal Air Force was a raid by 24 Wellington bombers of Nos. 9, 37 and 149 (B) Squadrons, R.A.F. on Wilhelmshaven on 18th December 1939. Bf 109Es of III/JG 77 engaged the formation with great success and twelve Wellingtons were shot down for the loss of two Messerschmitts, although several other fighters were severely mauled by the four-gun tail turrets of the British machines; these were the first examples of a realistic rear defence that the *Luftwaffe* encountered. A certain Leutnant Johannes Steinhoff, a *Staffelkapitan* in III/JG 77, shot down two bombers on this occasion; he was to serve near the end of the war as commander of the Me 262 unit *Jagdgeschwader 7*, with a score of 176 confirmed aerial victories.

The machines which participated in this action were Bf 109E-3s, improved sub-types which had reached the *Luftwaffe* late in 1939. With an armament of two MG 17s in the nose, two in the wings and one MG FF/M cannon firing through the spinner*, the E-3 was numerically the most important variant in the series; 1,868 machines were delivered during 1940. A number of export orders were filled; forty machines were supplied to Hungary, five to the U.S.S.R., two to Japan (where Kawasaki's planned licence production was eventually cancelled), seventy-three to Yugoslavia, nineteen to Bulgaria, sixteen to Slovakia, and no less than eighty to Switzerland. This latter batch were operated by *Fliegerkompagnie* 6, 15 and 21 with the Swiss Air Force coding J-311 to J-390. The *Dornier-Werke A.G.* of Altenrhein, Switzerland, also produced nine complete airframes, four pairs of wings and seven fuselage assemblies between April 1944 and March 1946. Swiss-built Bf 109-E-3s, coded J-391 to J-399, were distinguishable by their pointed airscrew spinners.

The next major action in which the Bf 109 played an active part was the *blitzkrieg* in the West; although thirty E-3s of I/JG 77 had taken part in the Norwegian campaign of April 1940, they saw little actual combat. During April and the first week of May 1940 *Luftflotten* 2 and 3, with a fighter strength of some 850 Bf 109E-3s (of JGs 3, 26, 27, 51, 52, 53 and 54) were mustered on the western borders of Germany. The *Armée de l'Air* at this time mustered some 530 fighters equipping twenty-three Groups; eleven Groups operated the Morane-Saulnier 406, four Groups the Curtiss Hawk 75A, and the remaining eight Groups the Dewoitine D.520, the Bloch 151 or the Bloch 152. A large number of these machines were destroyed on the ground during the dawn raids of 10th May, as were many of the Fokker D.XXIs of the Netherlands Air Force and the miscellaneous equipment of the Belgian Air Force. Holland was forced to capitulate on May 15th after a hopeless but gallant struggle; Belgium, thirteen days later. During the rest of May and early June the dwindling French squadrons fought back



Luftwaffe personnel in North Africa kill time with a game of "skat" on an upturned crate. Behind them stands a Bf 109E-4 Trop of 2/JG 27 in an unusual striped camouflage scheme.

(Photo: R. Ward Collection)

** Although fitted, this weapon was ignored by some pilots, who complained of severe vibration when it was fired.*

A wrecked "Emil" of JG 27 abandoned at Daba, Egypt; of interest are the white wing-tips and the unusual marking of the aircraft's individual numeral on the fuselage band.
(Photo: D. F. Harris)

Another photograph of "Black Eight" of 2/JG over the Western Desert. (Photo: R. Ward Collection)

The Bf 109E-7 was essentially an improved E-4/N with shackles for a 66-Imp. gal. drop tank; the variant was widely used in the Middle East. (Photo: G. Heumann/Air Pictorial)

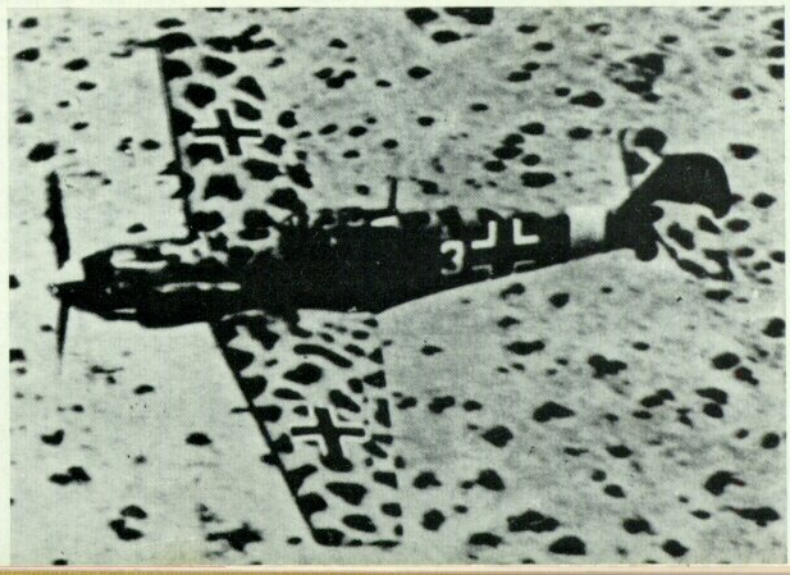
with a bitterness and determination which could not save them from eventual defeat; nevertheless when the instrument of capitulation was signed at Compiègne on June 22nd, some 350 German aircraft had been destroyed. The Bf 109E had stood up creditably to the test of European warfare, acquitting itself well against the obsolescent French fighters and the Hurricanes of the B.E.F. Air Component; approximately 450 of the latter were lost during the campaign. The appearance of Spitfires over Dunkirk had evened the odds somewhat, but on the whole the Fighter Arm had no reason to look forward to the coming battles over the Channel with anything but confidence. One disquieting factor, largely outweighed by the *Luftwaffe's* numerical superiority, had been the number of Emils pinned down by lack of fuel during the rapid "airfield-hopping" advance to the coast. This shortness of range was to be the most serious shortcoming of the Bf 109E throughout its career.

THE GREAT TEST

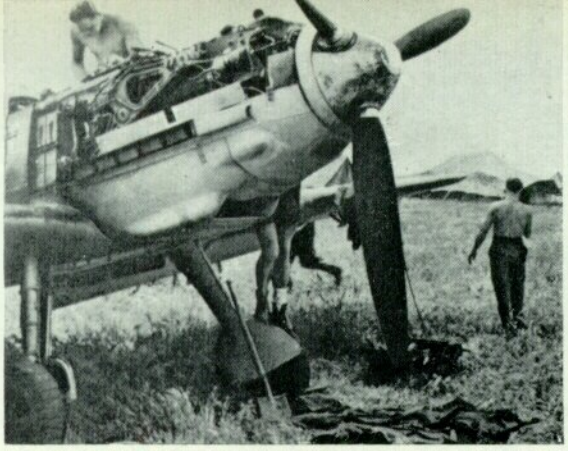
Much has been written about the various "phases" of the Battle of Britain, and this mass of material based on conflicting interpretations of the same events has led to some confusion. Broadly, the pattern was as follows: attacks on shipping and coastal targets, followed by attacks on airfields and industrial targets, superseded by a daylight bombing campaign against London. In September 1940 the emphasis of the bombing switched to night raids, while the fighters undertook hit-and-run fighter-bomber sorties. The chronology of these stages of the campaign is open to a certain amount of dispute; but the attacks on Channel shipping by formations of about 50 aircraft occupied the month of July. R.A.F. Fighter Command was unable to extract the full benefit of the radar chain in these actions, but they provided both sides with a month's rehearsal for the later, more massive assaults.

Adler Tag (Eagle Day) was postponed several times and finally dawned on 13th August. The first large raid on the coast five days previously and the opening of attacks on the radar stations on 11th August had "stolen the thunder" of the Eagle Attack to some extent; but two days later the heaviest fighting of the Battle took place, seventy-five German aircraft and thirty-four British were lost, and 15th August is significant in that it saw the massacre of the once-dreaded Junkers Ju 87 Stukas, and of an unescorted bomber force from Norwegian-based *Luftwaffe* units. For the next three weeks the *Luftwaffe* was engaged in heavy raids on Fighter Command stations and in drawing the Spitfires and Hurricanes into battles of attrition; one of the main objects of the whole campaign was, after all, simply the total destruction of Fighter Command. Several airfields were severely damaged, particularly Manston and Biggin Hill, and when the assault was switched to London on 7th September the *Luftwaffe* had come nearer than they realised to forcing the withdrawal of the South Coast squadrons to stations north of London, out of range of the Bf 109 escort fighters.

The attacks on London were mounted for several reasons; false German intelligence gave highly optimistic figures for the number of R.A.F. fighters already destroyed; it was thought that the remaining squadrons "resting" in the North would be drawn into the campaign if the capital was threatened; the recent bombing of Berlin demanded revenge raids; and the simple fact that London, as the nation's largest port and administrative centre, was an excellent military target. In fact the continuation of attacks on fighter bases would have reaped a better reward,



A Messerschmitt of 1/JG 27 demonstrates the almost uncanny effectiveness of its camouflage when flying low over the scrub-covered desert.
(Photo: R. Ward Collection)



Luftwaffe mechanics at work on the DB 601N powerplant of a machine of III/JG 27 during that Gruppe's service in the Balkans. (Photo: R. Ward Collection)

although the first four or five days of the attacks on London were reasonably successful in terms of loss/victory figures. However, in the carefully planned attacks of 15th September the *Luftwaffe* lost 60 machines out of 1,790 as compared to 26 R.A.F. aircraft destroyed, and from this point on the size of German raids diminished; there were no longer large enough fighter formations available to protect the bombers to an acceptable ratio.

The Messerschmitt pilots fought with a skill, determination and courage throughout the Battle which can never be overshadowed by the distasteful necessities of propaganda. Sometimes frustrated by their rôle of nursemaids to the bomber formations, sometimes distracted by the necessity to protect the vulnerable Bf 110s and Ju 87s, and always handicapped by short range, the *Jagdgeschwader* came nearer than is generally appreciated to accomplishing the almost impossible task they had been set. The Bf 109Es were constantly in action during these months, flying several sorties each day in either the escort or the "free chase" rôle. The pilots were unjustly blamed for the heavy bomber losses; and their machines were abused in September when each *Jagdgeschwader* was instructed to fit one *Staffel* with bomb racks. It is hardly surprising that the fighter pilots did not achieve significant results on these missions; many were only too anxious to get rid of their "eggs" on the first target which offered and reduce the dangerous handicap to their manœuvrability in unfriendly skies.

The Hurricane, usually committed to bomber-interception rather than fighter-versus-fighter combats, was in many respects inferior to the Bf 109E-3; but it gained many victories by virtue of its firepower, its extremely rugged construction, and the excellent gun-platform it offered. The Spitfire was committed to combat with escort formations of Emils on numerous occasions, and Mitchell's tight-turning thoroughbred soon earned the profound respect of the Messerschmitt pilots. The technical advantages and disadvantages largely cancelled each other out when the Bf 109E was pitted against the Spitfire; the outcome of any dog-fight depended to a great extent on the skill and determination of the pilots, but the *Luftwaffe* aircrew were constantly handicapped by the fact that fuel consumption allowed for only twenty minutes actual combat over Britain. The Battle of Britain cost both the British and German fighter squadrons their hard core of professional fliers; in the months and years to come the loss of men like Wick of JG 2 and Rhodes-Moorhouse of 601 Squadron R.A.F. was to be keenly felt.

LUFTWAFFE FIGHTER UNITS WESTERN FRONT, 1st AUGUST 1940

Luftflotte 2 (North France and Low Countries)	All units equipped with the Bf 109E-3.
JG 3 "Udet" — *Three Gruppen*	"Paper" strength 1,171 a/c. 1,118 pilots.
JG 26 "Schlageter" — *Three Gruppen*	Combat strength 878 a/c. 869 pilots.
JG 51 — *Four Gruppen*	At this time Royal Air Force Fighter Command strength totalled 29 Hurricane squadrons with 527 a/c and 19 Spitfire squadrons with 321 a/c.
JG 52 — *Two Gruppen*	
JG 54 "Grunherz" — *Three Gruppen*	
LG2 — *One Gruppe*	
Luftflotte 3 (France)	
JG 2 "Richthofen" — *Three Gruppen*	
JG 27 — *One Gruppe*	
JG 53 "Pik As" — *Three Gruppen*	

LATER DEVELOPMENTS

Although the Battle of Britain was the Emil's greatest struggle, the stub-winged fighter saw action in several other theatres of operations before its replacement by the Bf 109F. During the Battle of Britain the E-4 variant reached the front line; with various improvements in the fields of armour protection and pilot vision, the E-4 differed from its predecessor mainly in armament. The engine-mounted cannon was discarded, and two MG FFs replaced the wing machine guns. The fighter-bomber E-4/B carried the bomb-rack layout pioneered on the E-1/B. The Bf 109E-4/N, powered by a DB 601N engine with improved fuel injection and supercharger coupling, was widely used in its tropical configuration in the Western Desert. This sub-type will always be closely associated with the exploits of JG 27 and JG 53, the two *Geschwader* which bore the brunt of the air war in North Africa. The next variants in the series were the E-5 and E-6, short-range reconnaissance fighters with no wing armament and a camera installed behind the pilot's seat; they differed only in powerplant, the E-5 having the DB 601A and the E-6 the 1,200-h.p. DB 601N. The campaigns in the Mediterranean and the Balkans provided an introduction to combat for the E-7 sub-type, essentially an E-4 with a jettisonable 66-Imp. gal. belly tank. This model was operated over Malta, and by III/JG 77 in Greece and the Balkans. (An ironic feature of the Balkan campaign were the

The Bf 109E was employed by at least two Luftwaffe units in the opening phases of the Russian campaign. Two examples of Russian-based Messerschmitts are illustrated here. (Photos: R. Ward Collection)

combats which took place between German forces and Yugoslav pilots flying Bf 109E-3s of the original export batch.) The Bf 109E-7/U2 was a ground-attack variant extensively employed in North Africa, with additional armour protection for the engine and coolant radiators, and the E-7/Z was equipped with GM 1 boost, nitrous oxide being injected into the supercharger to provide additional oxygen and to act as an anti-detonant. The Bf 109E-8 was a variant which incorporated all the general modifications to previous models; and in the spring of 1941 the final production variant Bf 109E-9 appeared, a reconnaissance machine with no wing armament, an external 66-Imp. gal. tank, an Rb 50/30 camera, and powered, as was the E-8, by a 1,200-h.p. DB 601E engine.

The Bf 109E was being phased out of service when Germany invaded Russia in June 1941; but although some records indicate that the seven *Jagdgeschwader* which took part in Operation Barbarossa (JGs 1, 3, 51, 52, 53, 54 and 77) were equipped entirely with the Bf 109F-1 or F-2, there is evidence that the Emil was in fact used in Russia for several months. Two units known to have operated the Bf 109E in this theatre are JG 54 and SG 1.

The Bf 109F was born of Bf 109E, W.Nr. 5604, a test airframe fitted with a DB 601N engine in a new, streamlined cowling. The hybrid machine carried the codes V K+A B during a series of trials which opened on 10th July 1940 at Haunsletten. Many prominent *Luftwaffe* pilots felt that the reduced armament of the Bf 109F, which initially carried no wing armament, represented an extraordinary backward step in design. Major Walter Oesau's attitude may be regarded as typical of the distrust felt by many German veterans for the new type; the C.O. of JG 2 "*Richthofen*" after the death of Helmut Wick on 28th November 1940, Oesau refused to fly a Bf 109F while spares were available to keep his E-4 flying. Another pilot who found the cut-back in armament inexplicable was Major Adolph Galland, who commanded III/JG 26 "*Schlageter*" at Caffiers during the Battle of Britain and later became *Geschwader Kommodore* of this élite unit. A General at the age of 30, Galland rose to be Inspector-General of the Fighter Arm.

Another offspring of the Emil was the Bf 109T. The resumption of work on the projected German aircraft carrier *Graf Zeppelin* in July 1940 led to an order to Fieseler, the Messerschmitt sub-contractors, for ten "navalised" E-3 airframes, to be designated Bf 109T

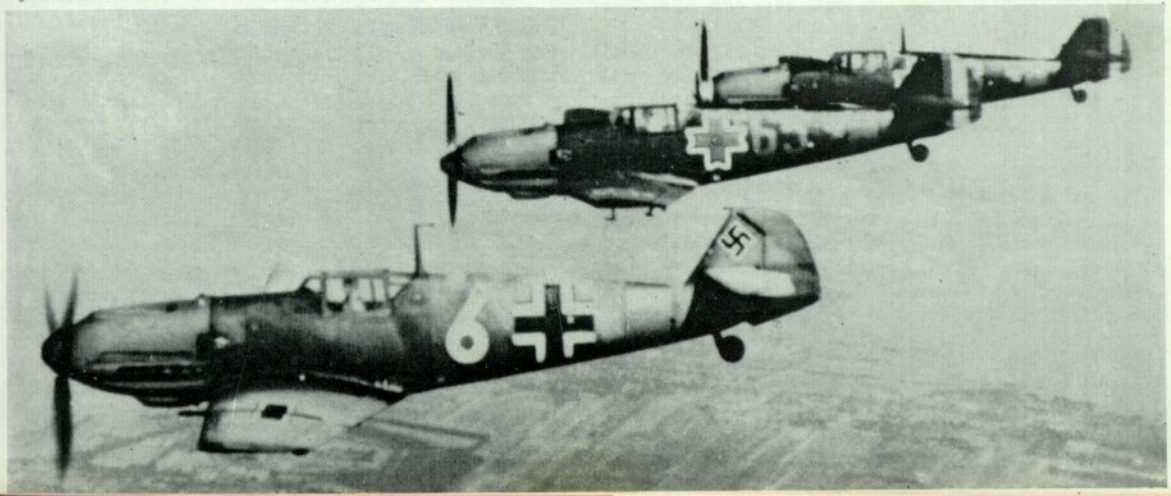
A fitter wires up the firing button of a Bf 109E-4. The gun-sight head with reflector has not yet been installed, although the selector box can be seen at the top of the instrument panel.

(Träger = Carrier). The modifications comprised increasing the span of the manually-folding wings, the installation of catapult spools and arrester hooks, and the fitting of spoilers to the upper wing surfaces to steepen the glide and shorten the landing run. When work on the carrier was once more suspended, some fifty production T-1 airframes had been modified; and rather than re-convert the aircraft they were handed over to I/JG 77 after the actual deck equipment had been removed by Fieseler. This *Gruppe* operated from short Norwegian airstrips with frequent vicious cross-winds, and the locking tailwheel and increased span of the Bf 109T-1 was much appreciated by Lt.-Col. Seegert and his pilots. The machines were eventually handed over to a test unit based on Trondheim.

FLYING THE EMIL

Perhaps the principal feature governing the performance of the Bf 109E was the high wing loading of 32 lb. To compensate for the high loading, the result of Messerschmitt's deliberate marrying of the smallest practicable airframe with the most powerful engine

Bf 109E-4s of the Rumanian Air Force, with a Luftwaffe machine in the foreground. It is probable that the latter belonged to either JG 77 or I/JG 4, the last-mentioned unit being based at Mizil, Rumania, for much of the war as fighter defence for the Ploesti oil refineries. (Photo: R. Ward Collection)



A captured E-4 under test by the R.A.F. Radiator flaps and balance horns are clearly visible. (Photo: Imperial War Museum)

available, various high-lift devices were incorporated. The long leading-edge slats, slotted flaps and ailerons demanded their own penalty in weight and drag, but on the whole the Bf 109E had an excellent aerodynamic finish.

The cockpit was cramped, with poor rear vision, and the awkward sideways-hinging canopy made open-cockpit take-offs impossible. On the other hand, the hinged panel in the forward left-hand side of the hood gave excellent foul-weather forward vision without draught. The dished seat was low and imposed a semi-reclining posture on the pilot; the instrument layout was good, flap wheel and throttle coming easily to hand. The steep ground angle drastically cut forward vision during taxiing; the heavy tailplane gave stability but turning took time and power. The throttle response was quick and clean, acceleration brisk, and the take-off short and steep. Skill was needed, however, to counteract the "heavy" port wing at the moment of unstick. (The weak, narrow undercarriage coupled with this incipient swing on take-off and landing caused the "write-off" of nearly five per cent of the Bf 109's total production of some 33,000.)

Once airborne and the aircraft cleaned-up, the two main characteristics of the Emil were immediately apparent; the first, perhaps disconcerting to an unfamiliar pilot, was the lack of trim available from within the cockpit. The other was the heaviness of control. Being unequipped with rudder trim control (save for a "ground-bent" metal tab on the rudder) heavy leg loads were needed at low speeds, these reversing when accelerating to high I.A.S. Longitudinal trim, however, was so effective that considerable strength was required in such actions as dive recovery, and this coupled with high natural stick loads demanded more pilot stamina than in, say, the Spitfire I and II.

As a fighter, flying in the medium-to-high speed regimes, the Emil flew accurately and steadily once the out-of-trim tendencies had been mastered. In combat the fighter was extremely stable and could be reefed round in high-g turns, only the banging-out of the leading-edge slats as the high-speed stall was approached perhaps causing gun aiming to be upset. Some Emil pilots, when attacked from a rear quarter, would resort to pushing the nose sharply down—by all text books disastrous in air combat—yet the Messerschmitt could at medium altitude out-dive most enemy contemporaries, and the direct fuel injection would enable the engine to continue running without falter (unlike the carburettor-equipped Merlins of the Spitfire and Hurricane).

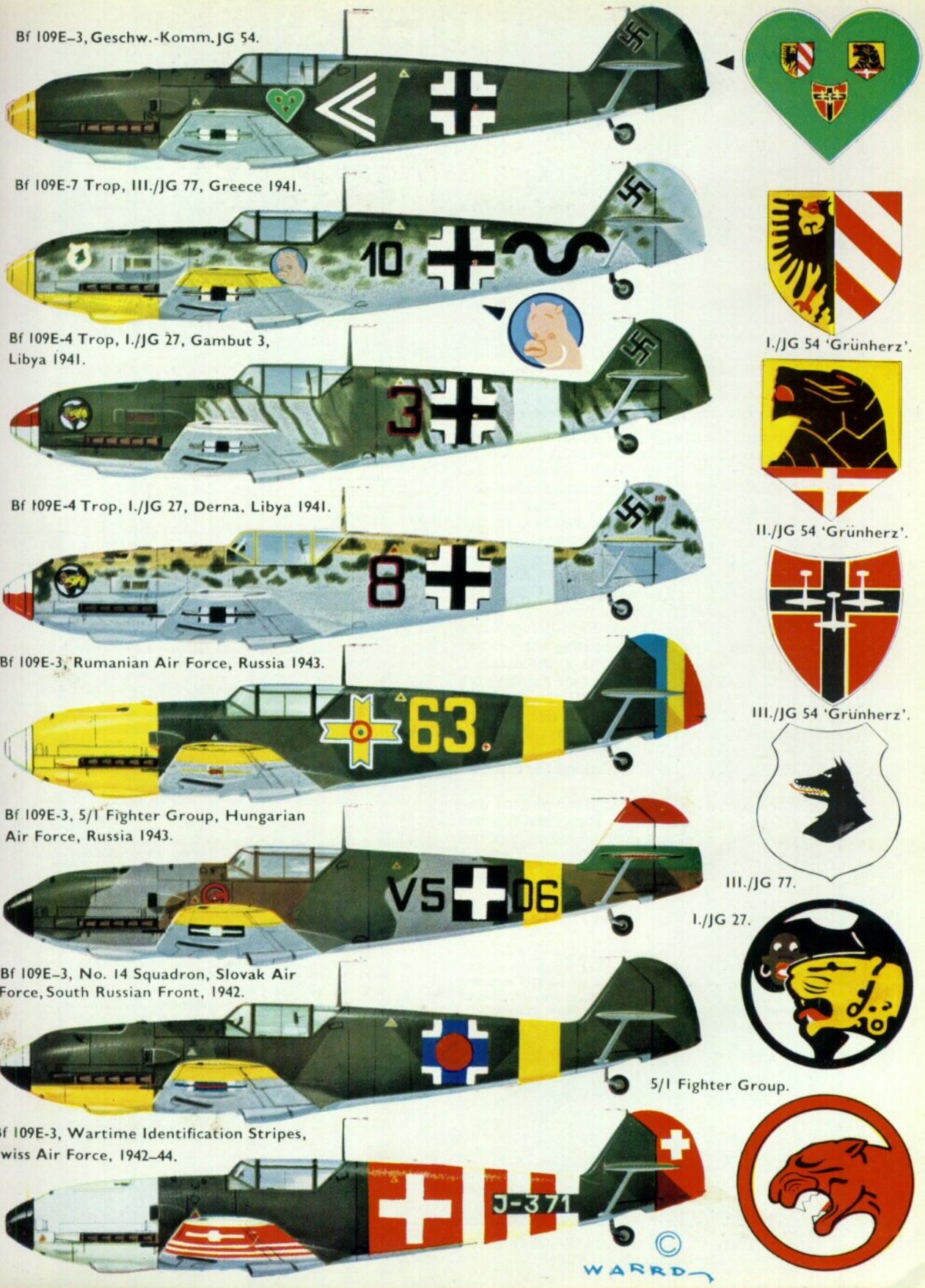
At the other end of the speed range, the Emil was kind to the pilot. As the stall was approached the aircraft was entirely stable until, at about 105 m.p.h. indicated airspeed, slight lateral unsteadiness was manifest and course use of rudder and aileron was necessary to maintain a level altitude. With wheels and flaps up, the stall occurred at about 95 I.A.S., and at about 12–15 m.p.h. less in the landing configuration with flap selected. Undoubtedly the wing slots contributed to this remarkable low speed stability. On the approach to land, forward visibility was poorer even than the Spitfire and Hurricane—the outcome of the pilot's semi-reclining posture and the high broad engine cowling. "Wheelers" were more customarily performed for this reason, and also for the fact that if speed *was* misjudged, complete airflow breakdown behind the slats invariably caused one wing, usually the port, to drop sharply.

On balance, pilots who flew Emils in comparison with contemporary Hurricanes and Spitfires considered that in terms of manœuvrability there was little to choose between the Bf 109E and the Spitfire I and II at altitudes between 12,000 and 17,000 ft., and that although one aircraft possessed some slight advantage in one regime, the other could outperform its adversary in another manœuvre. There can be little doubt, however, that above 20,000 ft. the Emil was the better machine. In comparison with the Bf 109E and the Spitfire, the Hurricane was at a disadvantage in that drag was higher than with either of its contemporaries, and the resulting lack of acceleration left the pilot in the Emil's sights too long for safety. In combat with the Bf 109E, the Hurricane was often called upon to display its magnificent robustness of structure to the full.

LUFTWAFFE UNITS AND MARKINGS

The basic *Luftwaffe* tactical unit was the *Geschwader*. The fighter *Geschwader* (*Jagdgeschwader or* JG) consisted of three or four *Gruppen*, each of which was in turn made up of three *Staffeln*. The sub-units were numbered independently; thus III/JG 77 (the third *Gruppe* of JG 77) was made up of 7/JG 77 (the seventh *Staffel* of JG/77), 8/JG 77 and 9/JG 77. Similarly, 1/JG 77, 2/JG 77 and 3/JG 77 together made up the strength of I/JG 77, and so on throughout the *Geschwader*. The operational strengths of these units varied considerably but an average *Staffel* mustered ten to sixteen aircraft, thus giving a *Geschwader* an establishment of between 90 and 150 machines—on paper. The "serviceable" figure was often much lower.

Jagdgeschwader and some *Schlachtgeschwader* (Ground-Attack Wings) employed the following identification markings. Each aircraft carried a large


Bf 109E–3, Geschw.-Komm. JG 54.
Bf 109E-7 Trop, III./JG 77, Greece 1941.
10
Bf 109E-4 Trop, I./JG 27, Gambut 3, Libya 1941.
3
Bf 109E-4 Trop, I./JG 27, Derna, Libya 1941.
8
Bf 109E-3, Rumanian Air Force, Russia 1943.
63
Bf 109E-3, 5/1 Fighter Group, Hungarian Air Force, Russia 1943.
V5 06
Bf 109E–3, No. 14 Squadron, Slovak Air Force, South Russian Front, 1942.
Bf 109E-3, Wartime Identification Stripes, Swiss Air Force, 1942–44.
J-371
© WARRD
I./JG 54 'Grünherz'.
II./JG 54 'Grünherz'.
III./JG 54 'Grünherz'.
III./JG 77.
I./JG 27.
5/1 Fighter Group.

An unusual modification to a Bf 109E. Considerable research was carried out in Germany into the possibility of mounting over-wing slipper fuel tanks to Bf 109s and Fw 190s; this in turn led to the "para-capsule" project illustrated here. The upper forward section of the fuel tank was replaced by a transparency, and it was intended that a parachutist with full equipment should be accommodated in the housing. The operational potential was presumably fast low-level dropping of agents, or, conceivably, the evacuation of casualties.

numeral between one and sixteen (higher numerals usually indicated training establishments) painted in the *Staffel* colour (see table right) forward of the national marking on the fuselage sides. During the first 18 months of the war, "No. 1" was almost invariably the machine of the *Staffelkapitan*. In the case of Staff aircraft, a system of chevron-and-bar symbols replaced the numerals; for instance, a single forward-facing chevron indicated a *Gruppe* Adjutant (see painting on Page 2 of this *Profile*) and a double chevron, a *Gruppe Kommandeur*.

Behind the national marking on the fuselage sides appeared a system of symbols indicating the *Gruppe* within the *Geschwader*. No marking indicated I *Gruppe*; a horizontal bar, II *Gruppe* (see painting on Page 2 of this *Profile*); a wavy line, III *Gruppe* prior to the spring of 1941; a vertical bar, III *Gruppe* from this period until the end of the war. Where there was a fourth *Gruppe*, as in JG 51 "*Mölders*", the aircraft carried a small cross or solid circle behind the fuselage marking.

Considerable variation from this basic pattern was observed throughout the war. The identification markings were to some extent the responsibility of the individual unit or commander, and personal whims were sometimes indulged.

The final stage of the Starr-Schlepp (rigid glider tug) research programme, forerunner of the Beethoven-Gerät composite weapon project, was the series of tests involving a Bf 109E-3 mounted on a DFS 230 troop glider; this combination was capable of independent performance throughout the flight pattern.

STRUCTURE OF THE GESCHWADER

Staffel Colour	I Gruppe	II Gr.	III Gr.	IV Gr.
White, black trim	1 Stfl.	4 Stfl.	7 Stfl.	10 Stfl.
Red, white trim	2 Stfl.	5 Stfl.	8 Stfl.	11 Stfl.
Yellow, black or white trim	3 Stfl.	6 Stfl.	9 Stfl.	12 Stfl.

SPECIFICATION

Messerschmitt Bf 109E-4 Single-seat Day Fighter

Dimensions: Span 32 ft. 4½ in.; length 28 ft. 8 in.; height 11 ft. 2 in. (tail down, measurement from airscrew tip to ground line); wing area 174 sq. ft.

Powerplant: One Daimler-Benz DB 601Aa twelve-cylinder inverted-Vee liquid-cooled engine rated at 1,150 h.p. at 2,400 r.p.m. for take-off; V.D.M. electrically-operated controllable-pitch fully-feathering three-blade metal airscrew.

Armament: Two 7·9 mm. MG 17 machine guns with 1,000 r.p.g. mounted on engine crankcase, with muzzles protruding into blast troughs in upper nose decking, firing through airscrew arc. Two 20-mm. MG FF cannon with 60 r.p.g. mounted in wings and firing outside airscrew arc.

Weights: Empty 4,440 lb. Gross loaded 5,520 lb.

Fuel Tankage: 88 Imp. gal. in fuselage tank contoured behind and under pilot's seat.

Performance: Maximum speed 357 m.p.h. at 12,300 ft.; cruising speed 298 m.p.h. at 62·5 per cent rated power; stalling speed 75 m.p.h. in landing configuration with flaps down. Range, 412 miles at 62·5 per cent rated power at 16,400 ft. Initial climb rate 3,100 ft./min. Service ceiling 36,000 ft.

STRUCTURE

Fuselage: Oval section light metal monocoque, manufactured in two halves and joined longitudinally top and bottom. Each half constructed of longitudinal stringers and vertical panels; alternative panels had flanged edges to form Z-frames, holed to allow passage of stringers. Metal flush-riveted stressed skin covering.

Wings: Low wing cantilever monoplane. All-metal single-spar structure with metal flush-riveted stressed skin covering. Three fuselage attachment points on each wing, two on spar flanges, the third at the leading edge. Entire trailing edges were hinged, slotted ailerons outboard and slotted flaps inboard. Handley Page-type auto-slats on outboard leading edges. External mass balance horns on ailerons.

Tail Unit: Tailplane mounted on cantilever fin and braced to fuselage by a single strut on each side. Tailplane adjustable by hand wheel in cockpit. Balanced rudder and elevators. Metal frame; metal covering on fixed surfaces, fabric covering on movable surfaces.

Undercarriage: Retractable upward and outward by hydraulic jacks, with auxiliary hand-raising gear. Fixed tail wheel.

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