Bf 109E/F VS Yak-1/7

Eastern Front 1941–42

DMITRIY KHAZANOV & ALEKSANDER MEDVED

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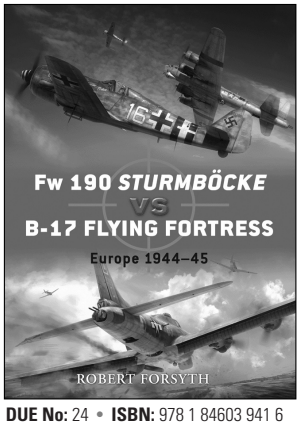

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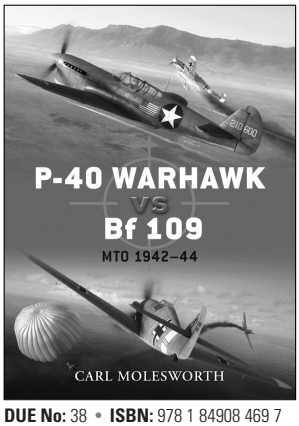

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Yak-1 cover art

32nd IAP (Fighter Aviation Regiment) was the first regiment within the Black Sea Naval Air Force to be retrained on the Yak-1 fighter. Regiment pilot Snr Lt Mikhail Avdeyev, who was destined to become an ace and a Hero of the Soviet Union, accumulated 12 personal and six shared victories with the aeroplane – 13 of these were Bf 109s. One of his first successes in the Yak fighter came during a dogfight on 30 September 1941, as he recalled. 'The engines roared and the aircraft began their takeoff run from where they were parked. Our leader was Ivan Lyubimov, and my fighter was to the right, following him. We went spiralling up. The enemy was very close, at an altitude of no more then 1,500m [4,900ft]. Lyubimov manoeuvred our formation so that we did not cross ahead of the enemy's course, or let them evade us. It was awkward, because the Germans sought to engage us in a dogfight before we had reached their altitude. The enemy wingman was nearer to Lyubimov. Still ascending, Lyubimov opened up his engine, approaching close to the yellow belly of the 'slim one' (as our pilots nicknamed the Bf 109 for its narrow fuselage) and gave a well-aimed burst. Then, finding himself above and behind the enemy fighters, he pursued the flight leader, who was still unaware of any threat and descending slightly. The fighter damaged by Ivan continued to emit smoke. While I stayed unseen behind him, he attempted to pursue my commander's aeroplane, but I fired first. The smoking Messerschmitt burst into flames. At that same moment the flight leader, under attack by Lyubimov, threw his aircraft into a steep dive, probably having been warned of the danger by his wingman. Meanwhile, I approached the burning Bf 109 from the side, waiting for the German pilot to open the canopy and bail out. To my amazement he ejected the canopy, gave his aeroplane a little pitching manoeuvre, then pushed the control column well forward. The fighter dipped sharply, and the tall, slim airman in grey overalls slipped out of the cockpit, opening his parachute at once.' Avdeyev was especially proud of the fact that the whole dogfight had taken place right over his own airfield, and had been observed by most of his comrades. The German airman tried to hide inside a hayrick, but it immediately became a target for Soviet soldiers and he soon began to feel uncomfortable. He emerged from the rick and put his hands in the air, surrendering. An hour later, Gefreiter Johannes Dite of II./JG 77 was in the Soviet air group's HQ, being interrogated by the deputy commander of the Black Sea Naval Force, Maj-Gen V. V. Yeremchenkov. Avdeyev described the enemy pilot as very tall and extremely slim, in brand-new overalls. He had a personal weapon – a pistol given to him for his actions over Crete in May 1941. Afterwards, this pistol was presented to the Naval Museum of Leningrad (St Petersburg), where it is still kept. (Cover artwork by Gareth Hector)

Bf 109F cover art

288th IAD (Fighter Aviation Division) arrived on the banks of the Volga at a time when things were very hard for the Red Army. The vanguard of troops of Germany's 6th Army were rapidly approaching Stalingrad, and the Luftwaffe held sway in the air. From Soviet documents it is known that in a mere month, from the second half of August to the second half of September 1942, of the 100 Yak-7B fighters originally on strength with the Division, 89 were lost to all causes. Not only young and inexperienced pilots were killed during the late summer of 1942. For instance, in 296th IAP, the squadron leader, Snr Lt Vladimir Balashov, was brought down immediately after taking off from an airfield near Zaplavnoye, east of Stalingrad, on the afternoon of 24 August. In action since June 1941, he had flown more than 200 combat sorties and been awarded the orders of the Red Banner and Red Star, which was uncommon for airmen of the early war period. Balashov's Yak had been attacked by a pair of Bf 109s before it had had a chance to gain speed. With his wingman having aborted his takeoff owing to engine problems, Balashov entered the dogfight at a serious disadvantage. The lead German pilot, who was clearly a seasoned aviator and a sound marksman, maintained his advantage. Minutes later the pilots of four Yaks from 296th IAP saw the smouldering wreckage of Balashov's machine as they returned to their airfield from a patrol. As the Yak had struck the ground Balashow's body had been thrown out of the cockpit, thus saving it from incineration in the aircraft. He was later buried near the airfield. His victor that day was almost certainly Ltn Heinrich Graf von Einsiedel, *Gruppen-Adjutant* of III./JG 3, who had claimed his 34th success in the vicinity during the afternoon of 24 August. (Cover artwork by Gareth Hector)

CONTENTS

INTRODUCTION

During the 70 years since the end of World War II there has developed in the West a rather blinkered understanding regarding the course and nature of air combat over the Soviet-German war theatre, influenced to some extent by the subsequent Cold War. It has included such principal notions as the following:

– The Soviet's manifold but obsolete aviation equipment was eliminated by the Luftwaffe during the very first massive strikes, with minimal losses.

– This was mainly due to the totalitarian regime established by Joseph Stalin, and the foolish commissars who lined up the aeroplanes on the airfields, making them easy targets for German pilots.

These five Yak-7 fighters from an unidentified regiment were photographed on Alert No. 1 readiness, with the pilots in their cockpits and the groundcrew on hand, during the summer of 1942.

– Tens of thousands of the most talented Soviet commanders were shot by the tyrant Stalin during the pre-war 'cleansings'.

– Stupid Soviet pilots, bamboozled by communist propaganda, were unable to learn even basic tactics, avoided dogfights after brief manoeuvring and generally appeared to be cowardly.

– The exceptions to this rule were the Guards regiments, most of which were equipped with the aeroplanes supplied by Western allies under Lend-Lease, and manned by specially trained airmen.

– The most important factor that disrupted the plan to eliminate the USSR was the sudden and bitter winter of 1941–42 and, before that, the impassable mud, which prevented regular use of Germany's wonderful military vehicles.

– German aces were cheerful chaps, who regarded the war as a sort of sporting contest, immediately offering a cigarette and a bar of chocolate to any enemy pilot brought down in their vicinity.

These ideas formed the basis of hundreds of aviation publications issued in the West. They present a very simplified and ugly picture, seeking to explain the causes of the initial defeat and completely ignoring the subsequent victories of the Red Army and its air force. While not totally dismissing some of these arguments, the authors of this book have sought to provide a more balanced and reliable analysis of the successes and defeats of the Red Army Air Force (*Voenno-Vozdushniye Sily Krasnoy Armii*, abbreviated to VVS-KA), using as an example two opposing fighter aircraft, their designers and the airmen and commanders of the Soviet and German air forces.

First of all, readers should be reminded that, while many thousands of German, French and British aeroplanes were fighting over the World War I battlefields, Russia's aviation industry was mainly building obsolete French aeroplanes in rather modest quantities. Moreover, there was no domestic aero-engine industry – without foreign input not a single engine could be produced. There were no designers. The revolution of 1918–20 resulted in the almost complete destruction of both aeroplane and engine manufacturing capabilities, and the measures taken during the succeeding decade appeared insufficient to correct this very bad situation.

It was not until the early 1930s, starting from nothing, that the USSR's aviation industry began developing at a rather fast rate. But even then there was no domestic aero-engine manufacturing, which led to the building of Hispano-Suiza, Wright and Gnome-Rhone engines under licence. There was no aluminium production, and there were no cockpit instruments or radios in production locally. The situation was worsened by the lack of well-qualified workers, engineers and designers, and less then a decade was to pass before the outbreak of a new war.

In this period young aircraft designer Aleksander Yakovlev made himself known by creating some experimental aeroplanes, followed by trainers that were built in large quantities. His career has many parallels with that of his direct German counterpart, Willi Messerschmitt, who also started with small aircraft, and trainers in particular. In a short time both designers came close to achieving the power that helped them to attain their ambitious goals. Both established complicated cooperation between the different factories that were producing the vast variety of components required for the aircraft, built in tens of thousands of units. However, the conditions under which they worked were different, and these made their mark upon the general philosophy and

The barrel-like shape of an abandoned I-16 sitting alongside this Bf 109F of II./JG 54 illustrates the yawning chasm in design technology between the Soviet and German fighter arms during the opening phase of Operation *Barbarossa*. This gap would close with the introduction of the Yak-1, MiG-3 and LaGG-3.

design details of the aircraft engineered under the direction of Messerschmitt and Yakovlev.

In creating his first fighter, Yakovlev chose a tried and tested engineering approach by utilizing a simple steel-tube-truss fuselage structure and a joint-free wooden wing, with linen covering applied to the plywood skin, and having all weaponry concentrated in the engine compartment. In his *Notes of an Aircraft Designer* Yakovlev wrote:

> In developing the aeroplane's design, every one of us [i.e. chief designers] thinks not only of its combat qualities and of tactics, but also of technology and economics. One has to be very cautious, choosing the primary materials for the vehicle. On this occasion great wariness was demanded of the designer, as during the war some materials were in extremely short supply. A production and supply base might be knocked out by enemy bombing, or even end up in occupied territory. This particularly occurred during the Great Patriotic War.

As a result of intentional limitation in the choice of materials and technological solutions, the team led by Yakovlev succeeded in creating a fighter that had perfect horizontal manoeuvrability and quite good aerodynamic properties, using only available serially built engines of modest power. It was easy for inexperienced pilots to fly, two to three times cheaper than its German opponent, the Messerschmitt Bf 109, and could be built by poorly qualified workers, including teenagers, ex-peasants and householders. Eventually, the Yak fighters of various versions became the most populous in the VVS-KA, and in May 1945 an aircraft of this particular type dropped the red wreath of victory onto the defeated capital of the Third Reich.

CHRONOLOGY

1934

March Design of the Bf 109 begins in the Messerschmitt factory.

1935

28 May First Bf 109 V1 fighter prototype with Rolls-Royce Kestrel engine makes its maiden flight.

1936

January Maiden flight of the Bf 109 V2 with Junkers Jumo 210 engine.

December First four Bf 109s (third to sixth prototypes) arrive in Spain and join *Legion Condor.*

1938

March Captured Bf 109B is delivered from Spain to the Soviet Union.

December Series production of the Bf 109E-1 with DB 601A engine begins. Some 1,183 examples of this model are built.

1939

27 April Stalin instructs Aleksander Yakovlev to design a high-speed fighter that could be ready by year-end.

27 December I-26 fighter prototype, created by the Yakovlev Design Bureau, is completed.

1940

13 January I-26 prototype (future Yak-1) makes its maiden flight at Central Airfield in Moscow. Two months later, before the conclusion of State tests, construction of the initial batch of 25 aircraft starts.

May Five Bf 109E-3 fighters, purchased in Germany, are delivered to the USSR, where they are examined by the NII VVS (Scientific Test Institute of the Air Force), the LII (Flight Research Institute) of the Aviation Industry People's Commissariat and by the aviation design bureaux.

23 July Maiden flight of two-seat UTI-27 fighter trainer, the future Yak-7UTI.

27 August Defence Committee issues statement about accepting I-26, I-200 and I-301 fighters on strength of VVS-KA.

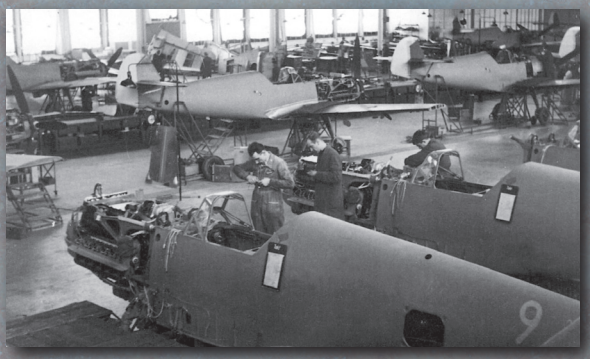
November Start of series production of Bf 109F-1 fighter with DB 601N engine.

December 10,826 aeroplanes are built in Germany in 1940, of which 7,103 are combat aircraft. During that same period in the Soviet Union 10,565 are built, 8,331 of which are combat aircraft.

1941

Spring Mass re-equipping of German fighter squadrons with Bf 109F-2 fighters, intended for participation in Operation *Barbarossa.*

22 June Twenty Bf 109-equipped fighter *gruppen* support the invasion of the USSR, having on strength 858 aircraft,



Bf 109Es are constructed at the Regensburg factory in 1939. Note the three-bladed propellers and the tailplane support struts – the latter would be deleted with the introduction of the Bf 109F from late 1940.

of which two-thirds are Bf 109Fs. By contrast, the air regiments of the VVS-KA's five frontier districts have only 105 Yak-1s available, with others not yet assembled after their arrival from the factory. It is possible that the very first dogfight involving a Yak-1 and a Bf 109 took place on 22 June, but details are lacking. Yak-1s of 11th IAP, 6th IAK (Fighter Aviation Corps) participate in repulsing a night raid of 195 German bombers on Moscow. Capt K. N. Titenkov and Snr Lt N. G. Kukharenko bring down one He 111 each. The Moscow air defence during this period includes 117 Yak-1s.

August Production of the Yak-7 fighter begins at Factory No. 301.

Autumn Bf 109F-4s with DB 601E engines and MG 151 20mm cannon begin to reach Luftwaffe fighter groups.

September Frontline combat units of the VVS-KA have 176 Yak-1s on strength.

November In low temperatures, operation of the Bf 109F becomes difficult. Engines freeze, petrol polymerizes, the undercarriage retraction mechanism malfunctions and the springs in weaponry crack. Intensiveness of Luftwaffe operations on the Soviet-German front tails off as a result.

December During the counteroffensive near Moscow the VVS-KA gains local air superiority for the first time. Nine regiments of Yak-1s and two of Yak-7s fly on skis from snow-covered airfields. On the Eastern Front 15 battle weary Luftwaffe fighter *gruppen* remain in the frontline.

1942

April Factory No. 153 in Novosibirsk begins production of the Yak-7B with the M-105PA engine, armed with ShVAK 20mm cannon and twin 12.7mm UBS machine guns. From July aircraft of this type start to be fitted with the M-105PF.

June On the Eastern Front there are 17 fighter groups with Bf 109Fs, most of them having a full complement of aeroplanes. Re-equipment with Bf 109G-2s begins at this time.

August Especially fierce aerial combat over Stalingrad commences, and fighting is sustained through to October. 16th Air Army includes ten fighter regiments equipped with Yak-7Bs.

September Factory No. 292 in Saratov is tasked with production of Yak-1Bs with M-105PF engines, armed with ShVAK 20mm cannon and single 12.7mm UBS machine guns.

19 November Start of the Soviet counteroffensive at Stalingrad that ends with encirclement of the 6th German Army.

December At ex-German airfields recaptured by the Red Army hundreds of Luftwaffe aeroplanes are lost. More than 300 transport aircraft, which were supplying the 6th Army, are destroyed in the air.

December VVS-KA begins to accept Yak-9s on strength. Total number of Yaks in the frontline exceeds 340.

An assembly-line team completes a Yak-7B. Note the patriotic inscription – 'In excess of the plan – to the front' – on the propeller blades of the nearest fighter. The undercarriage-extended position indicators (striped rods) are visible above the wing uppersurfaces.

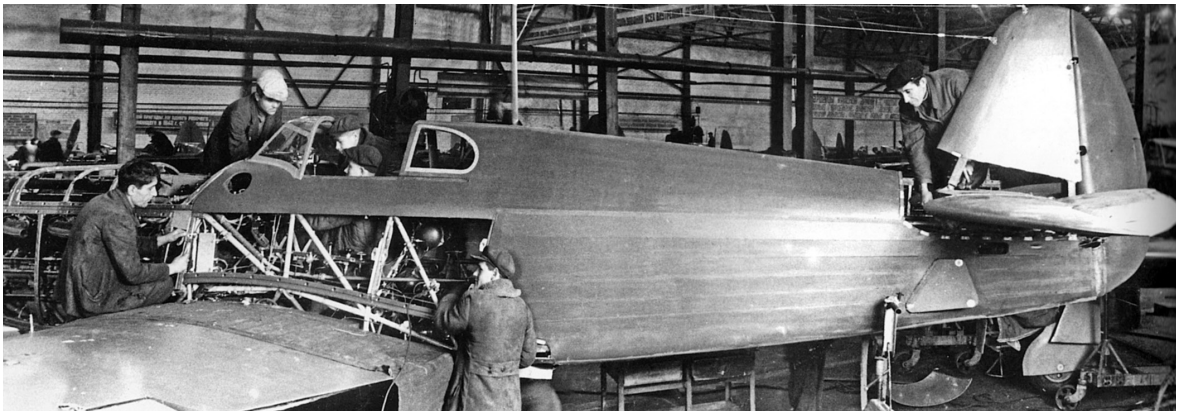
DESIGN AND DEVELOPMENT

Yak-1 and Yak-7

The creation of the I-26 fighter, designated Yak-1 in series production, was the result of a complicated combination of heterogeneous factors. One of the main incentives was the Soviet political and military leaderships' acknowledgement in the late 1930s of the unpleasant fact that the VVS-KA's Polikarpov I-15 and I-16 fighters were inferior in terms of maximum speed and vertical manoeuvrability to the German Messerschmitt Bf 109 then appearing in the Spanish Civil War. The I-28 and I-180, created to replace the I-16, appeared to be failures, but the inevitability of the great war ahead was quite clear to Stalin.

In the spring of 1939 young Soviet designer Aleksander Yakovlev developed his first combat aeroplane, the twin-engined BB-22 reconnaissance and bomber aircraft. The experimental version of this machine had a maximum speed of around 570km/h (355mph), which made it one of the fastest aeroplanes of its type in the world. Stalin immediately became interested in Yakovlev's work, talked to him on occasion, and then proposed that he create, by the end of 1939, a fighter powered by a liquid-cooled engine and armed with a 20mm cannon. A similar task was given to the USSR's other design teams. Yakovlev's design bureau, OKB-115, was subsequently among the winners of this undeclared contest.

Aleksander Yakovlev, deputy people's commissar of the aviation industry and chief designer of all Yak fighters in World War II.



A Yak-1 fighter assembly line at Factory No. 292 in Saratov. The truss-structure fuselage was connected to the one-piece wing by six bolts. The assembled tailplane and elevators had three attachment points.

According to a Soviet government statement dated 29 July 1939, two versions of the I-26 were to be developed. The first was to have the M-106 engine, still under development by Vladimir Klimov's design bureau, and the second the less powerful but already perfectly developed M-105, fitted with a turbo-supercharger. In essence, both engines were uprated and upgraded versions of the Hispano-Suiza 12Ybrs, a production licence for which had been acquired by the USSR in 1932. The M-105's takeoff rating was 1,100hp, it had a two-speed supercharger and weighed a mere 600kg (1,323lb). The more powerful (1,350hp) M-106 with a single-speed supercharger did not enter series production.

All three I-26 prototypes were powered by the M-105P, which allowed the 20mm ShVAK cannon to be installed in the cylinder vee. As projected, the fighter was also to have four 7.62mm ShKAS machine guns, but difficulties with the housing of ammunition forced the designers to arm the second and subsequent aircraft with only two ShKAS weapons over the engine.

The aeroplane was of mixed construction. To save weight the fuselage frame and engine mounting were made as a single steel-tube unit. The engine was covered by detachable aluminium cowling panels, while the fuselage aft of the engine was fabric covered on the sides, and the top and bottom were covered with plywood. The wing was seamless, having two wooden spars and a plywood skin. The empennage was similarly wooden with a plywood skin. The rudders, ailerons and flaps were made of duralumin. The main undercarriage and tailwheel were lowered and retracted pneumatically. Owing to a substantial overweight of 300kg (660lb) compared with estimated figures, Yakovlev and his team kept equipment to a minimum, even omitting the radio.

In accordance with the terms dictated by Stalin, construction of the prototype was completed on 27 December 1939. However, the maiden flight, with test pilot Yulan Piontkowsky at the controls, was not made until 13 January 1940. In April the second prototype flew, but on the 27th of that same month the first prototype crashed, killing Piontkowsky.

On 29 May the second I-26 prototype was handed over to the NII VVS for State tests. Notwithstanding massive design and technical drawbacks, the aircraft was considered very advanced, as its maximum speed at 4,800m (15,750ft) was as high as 585km/h (363mph). All pilots who flew the I-26 noted its perfect flying qualities. In

A UTI-26 two-seater in the course of testing in early spring 1941. Note the main undercarriage legs, which differed from those of the Yak-1, the non-retractable tailwheel, the two-seat canopy and the oil cooler channels now moved to the wing roots.

September 1940, without waiting for the results of the tests of the third reworked airframe, and in accordance with a Soviet government decree, the I-26 was put into series production at two aviation factories. Up to year-end, when the fighter was re-designated the Yak-1, 64 examples were built.

Although it now had a brand new fighter, the VVS-KA lacked a high-speed two-seater to complete the fighter training process. In the mid-1930s the Yakovlev Design Bureau had created some trainer monoplanes that were produced in large numbers, so it was only natural that it was tasked with designing a two-seat fighter trainer. Initially designated UTI-26 (learning and training fighter Type 26), its design differed substantially from that of the initial I-26. In order to accommodate the second cockpit the fuselage changed, and the engine mounting was made detachable. The engine was again the M-105P. The radiator was moved further forward, under the pupil's cockpit, and a higher-capacity oil cooler was installed. The increased takeoff weight demanded the use of larger-diameter main undercarriage wheels, and this in turn required reconfiguration of the entire main undercarriage strut arrangement, as well as modification of the undercarriage wing wells. The weaponry was limited to two ShKAS machine guns.

The UTI-26 was handed over for military testing in July 1940, and in September that year it successfully completed State tests at the NII VVS and was recommended for series production. An important alteration was the modification of the fin and rudder areas, which made the aircraft easier to control and forgiving of the 'yellowbellies" mistakes. In series production the trainer was designated Yak-7UTI, and production was initially set up in Moscow, and then in Novosibirsk.

Soon after the outbreak of World War II, the Yak-7UTI underwent a striking metamorphosis. As a result of a proposal by leading engineer Konstantin Sinelschikov, the trainer was redesigned back into a fighter. This was done because the Yak-7UTI's structure and components differed considerably from those used in the 'old' Yak-1, which was produced in conditions of planned Soviet economics and during the evacuation of associated factories to eastern USSR. A number of technical solutions incorporated in the Yak-7UTI were much more successful than those in the first Yak. The instructor's cockpit, faired over with a non-transparent roof, could accommodate

New Yak-7Bs on the factory airfield at Novosibirsk in the summer of 1942. Armed with a 20mm ShVAK cannon and two 12.7mm UBS machine guns, this fighter had a serious advantage over the three-gun Bf 109F-4 when firing a salvo, as the weight of a one-second burst was 2.72kg (5.99lb) – 1.62 times greater than that of the Bf 109F-4.

a mechanic or small loads when aircraft were being flown to new bases, and the reinforced undercarriage struts and large-diameter wheels permitted an increase in weaponry and equipment. More importantly, by the autumn of 1941, after the industry's evacuation to the east, the Soviet Union seriously lacked fighters, not trainers. This is how the second line of piston-engined Yak fighters evolved. Furthermore, the Yak-1 and Yak-7 also benefited from these successful technical solutions.

During the winter of 1941–42 both types were equipped with skis, but these caused a significant loss of speed and were abandoned. That same winter all Yakovlev fighters were fitted with radio receivers, and a third of them (the element commanders' aircraft) had a transmitter.

Unfortunately, the flying characteristics of series production Yak-1s and Yak-7s had significantly worsened by the autumn and winter of 1941–42. This was due to weight growth, the use of substitute non-strategic materials in the fighters' construction and the employment of poorly qualified personnel, including women and teenagers, in aircraft construction. Moreover, extra-long 11-hour working days, combined with cold and constant starvation, did nothing to help the quality of production aircraft.

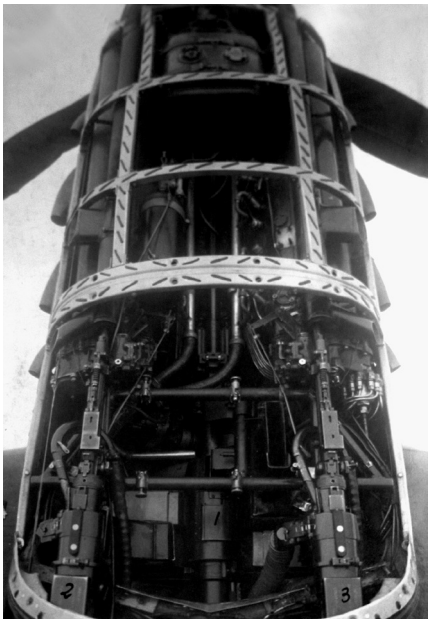
On the other hand, all possible measures were taken to increase the quantity of aeroplanes being built and to improve their flying characteristics. According to the recommendations of the Central Aerohydrodynamics Institute (TsAGI), some structural changes were made to enhance the aerodynamics. By the summer of 1942, when the more powerful but lower-operational-altitude M-105PF engine appeared, the climb rate and maximum speed of Yaks at low to medium altitudes had increased significantly.

The most obvious outward change in the advanced Yak-1B and Yak-7B fighters reaching the frontline in the autumn of 1942 was a lower rear fuselage behind the cockpit, allowing the pilot a better view aft. In addition, the fighters' armament grew heavier during series production. The Yak-1's two 7.62mm ShKAS machine guns were replaced by a single 12.7mm UBS heavy machine gun – two RO-82 rocket launchers were also proposed, but this idea was quickly abandoned. For the Yak-7B the results

OPPOSITE

This Yak-7B was the personal mount of Snr Sgt Pavel Karavai of 897th IAP, who flew it on the Southwest Front between late October 1942 and February 1943. This aircraft was paid for by workers of kolkhoz Vlasenko, a collective farm in the Saratov region of the southwestern USSR. Having risen to the rank of captain by war's end, Karavai was credited with 23 victories (seven of which were shared) during the course of 232 sorties.

Yak-7B



Series production Yak-1s were armed with a single ShVAK cannon (marked 1 in this photograph), with 120 rounds and a firing rate of 800 rounds per minute, and two ShKAS machine guns (marked 2 and 3), with 750 rounds per gun and a firing rate of 1,350 rounds per minute, taking synchronization into account.

were even better. This variant had twin UBS machine guns and a single 20mm ShVAK cannon. In August 1942, 22 Yak-7-37s, armed with the MPSh-37 37mm cannon, were built.

The Yak-7B reconnaissance fighter was also built at this time, fitted with an AFA-IM camera mounting behind the cockpit and camera windows. In the spring of 1942 the simplified Yak-7V (*Vyvoznoy*) trainer was tested. This had a non-retractable undercarriage, a two-seat cockpit and was unarmed. The Yak-7V was built in series production from May 1942, some 600 being completed. It was not only supplied to flying schools and Yak-equipped regiments, but also frontline detachments equipped with other fighter types.

In the summer of 1942 the first Yak-7DI fighter was completed and submitted for State testing. Designated Yak-9 in series production, it differed from its predecessors mainly in having wings of mixed structure, with duralumin spars and wooden ribs. To reduce weight the starboard UBS machine gun was omitted. In terms of speed and manoeuvrability the Yak-9 was the best serial-production Soviet fighter at the end of 1942. The 'DI' in the initial designation stood for *Dalnii Istrebitel* (long-range fighter), as the prototype's endurance with four internal tanks was more than six hours, and it had a range of 1,300km (800 miles). Production aircraft, however, had only two fuel tanks. Series production of the Yak-9 started at the Novosibirsk factory in October 1942, and the type's baptism of fire came in December 1942 in the vicinity of Stalingrad.

Bf 109E and Bf 109F

Development of Messerschmitt's Bf 109 fighter prototype at the Bayerische Flugzeugwerke proceeded under the general leadership of Willi Messerschmitt and leading designer Robert Lusser from March 1934. It was created in response to a Luftwaffe requirement, its principal rival being the Heinkel He 112.

The Bf 109 prototype, wearing the civil registration D-IABI, made its maiden flight on 28 May 1935, with 27-year-old test pilot Hans 'Bubi' Knötsch at the controls. It was powered by a Rolls-Royce Kestrel with a takeoff rating of 695hp that drove a two-blade, fixed-pitch wooden propeller. Upon completion of the manufacturer's tests, in September 1935, Knötsch flew the aircraft, designated Bf 109 V1, to the Luftwaffe test centre at Rechlin. In January 1936 the second prototype (Bf 109 V2), powered by a 610hp Junkers Jumo 210A, started its tests. In the summer of 1936 the Luftwaffe tender committee considered the respective merits of the Heinkel and Messerschmitt products and selected the Bf 109 for production.

Construction of the first batch of Bf 109Bs began in the autumn of 1936. They were powered by Jumo 210Da engines with a takeoff rating of 720hp, and had the same two-blade, fixed-pitch propellers. The oil cooler, which had been mounted in a tunnel under the engine on the prototypes, was repositioned beneath the port wing. Initially, the aircraft were armed with three MG 17 machine guns, one of which fired

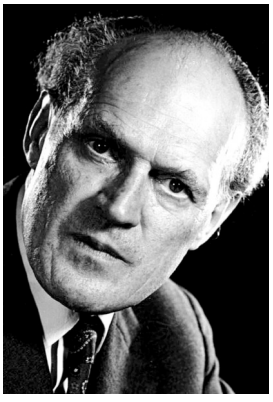
through the hollow propeller shaft, but this weapon proved prone to failure due to overheating in the engine compartment and was removed.

It has been written that the early three-gun aeroplanes, of which some 20 were built, were designated Bf 109A, while the 17 twin-machine gun fighters were designated Bf 109B. These fighters took part in the Spanish Civil War on the side of rebel General Franco, serving with the German *Legion Condor*.

In the spring of 1938 the Bf 109C-1 entered series production. This version had the Jumo 210Ga direct-injection engine and a more powerful armament of four MG 17s. Its maximum speed was 470km/h (290mph) at 4,500m (14,750ft). The Bf 109C-2, with MG/FF cannon between the cylinder banks, and Bf 109C-3, with two MG/FFs in the wings, were tested but did not go into production.

The airframe of the next version, the Bf 109D, was reinforced and therefore heavier. In particular, the spar top and bottom surfaces were thicker. The volume of the fuselage fuel tank, which followed the contours of the pilot's seat, was increased to 400lit (88gal). There was no armour, and armament comprised four MG 17s. The engine mounting, initially intended to carry the Daimler-Benz DB 600, was redesigned. However, technical problems ruled out use of this engine, and series-production 'Doras', which went into production in the autumn of 1938, had the less powerful Jumo 210Da. As a consequence their maximum speed did not exceed 450km/h (280mph).

In late 1938 an initial batch of eight Bf 109E-0 ('Emil') aircraft with DB 601A1 engines with a takeoff rating of 1,050hp were built. The oil cooler was relocated in a tunnel beneath the engine, and radiators were mounted symmetrically under the wings. The first serial production Bf 109E-1 was handed over to the Luftwaffe in January 1939. 'Emils' had three-blade, variable-pitch VDM propellers and FuG 7 radios. Some 400 Bf 109s were built in 1938, followed by another 1,091 in the first eight months of 1939.



Willi Messerschmitt, chief designer and head of Bf 109 development. His brainchild became the most mass-produced single-seat fighter in history.

A pre-production Bf 109E undergoes airflow testing in the full-scale wind tunnel at the *Luftfahrtforschungsanstalt* Hermann Göring Aerial Weapon Establishment, one of the Luftwaffe's leading centres for top-secret develoment located on the outskirts of Braunschweig. The fighter is suspended on cables rather than mounted on the usual rigid posts.

Although Bf 109Fs equipped most Luftwaffe fighter units at the start of Operation *Barbarossa*, a significant number of the 619 single-engined Messerschmitts committed to the offensive were 'Emils'. In the far north *Luftwaffenkommando* Kirkenes included ten Bf 109E-7s of 13./JG 77, which operated at *Jagdstaffel* Kirkenes. Although patrolling the barren shores of the Arctic Ocean, this aeroplane is fitted with a dust filter – it was clearly destined for operations in North Africa prior to being issued to JG 77 on the eve of Barbarossa

The Bf 109E-2 with the DB 601A and an MG/FF central cannon was considered an unnecessary intermediate step and did not enter production. In the autumn of 1939 the Bf 109E-3 replaced the E-1 on the assembly lines. Its maximum speed was 570km/h (355mph), and late-production E-3s had MG/FF cannon with 60 rounds of ammunition per gun in the wings. The firepower of a pair of cannon plus two synchronized machine guns was as high as 2.2kg/sec (4.8lb/sec) – very high for late 1939.

In the late summer of 1940, after the Luftwaffe's experience in the Battle of France, production of the Bf 109E-4 was initiated. The canopy now had a reinforced frame, and the pilot was protected by a backplate of 8mm-thick armour, to which a folding headrest was added a little later. Weaponry comprised two wing-mounted MG/FF cannon plus two MG 17s. To increase range a 300lit (66gal) drop tank was fitted. In parallel with the Bf 109E-4 fighter, a small number of Bf 109E-5 reconnaissance aircraft were built, lacking the MG/FF cannon but with an Rb 21/18 camera installed in the rear fuselage.

In Germany in the summer of 1940 series production of the new DB 601N engine, with maximum power of 1,270hp, began. It was duly fitted to the Bf 109E-4/N fighter, as well as the Bf 109E-5/N and E-6 reconnaissance aircraft. In the early autumn of 1940 the Bf 109E-4/N was replaced on the assembly lines by the Bf 109E-7 with the same DB 601N, although this variant was able to mount a 250kg bomb or 300lit drop tank on an underfuselage carrier. Some of these aircraft had armoured glass cockpit windscreens. In the autumn of 1940 limited quantities of the Bf 109E-8 and E-9 were produced powered by the uprated DB 601E.

In January 1939 Messerschmitt's designers embarked on a general improvement of the Bf 109's aerodynamics. The engine cowling inherited from the earlier variants, the strut-braced tailplane, the radiator tunnels and the non-retractable tailwheel all needed redesigning. The resulting new version, the Bf 109F 'Friedrich', was to have the improved DB 601E, but initially, owing to problems with this engine, the aircraft designers reluctantly had to follow the tried path and use the DB 601N. Nonetheless,

OPPOSITE

Major Hannes Trautloft, *Kommodore* of JG 54, flew this Bf 109F-4 from the advanced airfield at Relbitsy and the captured VVS-KA aerodrome at Siverskaya, near Leningrad, during the winter of 1941–42. It was one of several similarly marked aircraft assigned to him during this period. Note the *Geschwader*'s distinctive green heart emblem beneath the cockpit and the *Kommodore*'s markings, comprising a double chevron and two horizontal bars. A five-victory Spanish Civil War ace, Trautloft would claim an additional 53 kills in World War II, including six Yak-1s.

Bf 109F-4

29ft 3.2in.

8ft 5.3in.

32ft 5.4in.

Rugged up against the cold at Staraya-Russa airfield, an armourer prepares SC 50 bombs for fitting under the wings of a Bf 109E-7 of 5./JG 51, which was the *Jagdgeschwader*'s specialist *Jabo* fighter-bomber *Staffel*, in early 1942. The bombs were fitted with whistles that emitted a piercing wail as the weapon descended. Behind the 'Emil' is a Bf 109F-4, its engine covered with a tarpaulin in an effort to keep the fighter 'thawed out' for its next mission.

even with this less powerful engine, the fighter's maximum speed increased to 600km/h (370mph). Generally, the new model was warmly received by pilots, although they expressed disappointment with its reduced firepower – the Bf 109F-1's initial armament consisted of one central MG FF/M 20mm cannon and two MG 17s.

In September 1940 the Mauser Werke commenced production of the 15mm-calibre MG 151 cannon, which would be fitted in the Bf 109F-2. In many other respects, this new 'Friedrich' variant differed little from its predecessor. The aeroplane also had a new oxygen system, and the 400lit (88gal) fuel tank was made of 10mm rubber fitted inside a plywood box. For some time, production of the Bf 109F-2 ran in parallel with that of the Bf 109F-1. Because of the technical problems with the DB 601N, mass production of the 'Friedrich' did not start until March–April 1941.

Two Bf 109F-2s of 7./JG 51 sit idle between sorties at Bobruisk-South in July 1941. The aeroplane closest to the camera was flown by Feldwebel Werner Bielefeldt, who survived the war with 20 victories to his name.

Armourers clean the barrel of a 20mm MG 151/20 cannon fitted in a Bf 109F-4 of JG 54 '*Grünherz*'. The unit was formed in Thuringen, known as the 'green heart' of Germany, hence the nickname. The 'Friedrich' had a magazine that held 200 rounds of 20mm ammunition.

At that time the flying and fighting characteristics of these aircraft were superior to those of any Allied production fighter.

By mid-summer 1941 Daimler-Benz had finally eliminated the principal problems of the DB 601E. The new engine powered the Bf 109F-3 with MG FF/M cannon and the Bf 109F-4 with the improved 20mm MG 151. It soon became clear that the latter version was much more popular with pilots, and it was the most common variant in the Luftwaffe from autumn 1941 onwards. Thanks to its more powerful engine, the fighter's maximum speed at all altitudes increased to 610–625km/h (380–390mph), and its rate of climb was better. The designers improved the armour protection, and armoured glass was fitted in the cockpit windscreen.

Relatively little is known about the last two models of the 'Friedrich' family, as only a handful were built. According to one source they were both tactical reconnaissance versions, but other sources state that the Bf 109F-5 was a high-altitude fighter with the GM-1 high-altitude supercharger system fitted, and the Bf 109F-6 was a heavily armed version with a single MG 151/20 cannon and four MG 17s. Moreover, it is not completely clear whether the Bf 109F-6 was even built.

TECHNICAL SPECIFICATIONS

Yak-1 and Yak-7

I-26 prototypes

The first prototype was completed at A. S. Yakovlev's design bureau experimental factory at the end of December 1939, and made its maiden flight on 13 January 1940. The new aircraft was 300kg (660lb) heavier than planned owing to incorrect calculations. A principal problem that manifested itself in the early stages of testing was constant overheating of the M-105P engine because of the inadequacy of both the water and oil radiators, which forced test pilots to perform so-called 'platforms' – flying straight and level at low speed to cool the engine. The strength of some wing components was lower than required, but in general, as far as flying characteristics were concerned, the aeroplane was excellent, its speed being as high as 585km/h (363mph). The accident on 27 April 1940 had no effect whatsoever upon the type's future.

The second I-26 was completed in April 1940, and the third followed in September of that year. Many early failings were eliminated during the construction of these aircraft, with armament being developed, better radiators installed and the wing structure strengthened. Consequently, however, the takeoff weight grew substantially. Not wishing to increase it further, A. Yakovlev argued against installing the radio and other equipment, such as larger-diameter wheels that would have required a radical redesign of the whole wing.

UTI-26

This two-seat trainer version of the I-26 was built in the summer of 1940. The engine and principal equipment were the same as for the regular I-26, but to keep the centre-of-gravity in place the wing was moved 100mm (4in.) aft and the water radiator moved forward, beneath the student's cockpit. The armament was two ShKAS machine guns. The tandem two-seat cockpit, with the student in front and the instructor behind, had a single Plexiglas canopy. Because of the anticipated weight increase, the main undercarriage legs were redesigned and fitted with larger-diameter wheels, requiring the wing wheel wells to be enlarged as well. The second UTI-26 prototype also featured a changed ratio of rudder and elevator areas, which appeared to be good for the aircraft's handling. For ease of flying, in particular the facility of recovering from a spin, the aeroplane was much better than its predecessor, the UTI-4, developed from the I-16 fighter.

Yak-1 (early series)

In December 1940 the I-26 fighter was re-designated Yak-1 and put into series production at Factories No. 301 (Moscow) and No. 292 (Saratov).

In design it generally followed the third I-26 prototype, with some shortcomings eliminated. The initial aircraft of the 'Zero' series were built in June 1940, before the prototypes' testing had been completed. They were intended to make a flyover during the air parade in Moscow on 7 November 1940. The Yak-1s were armed with one ShVAK 20mm cannon with 120 rounds and twin synchronized ShKAS machine guns with 750 rounds apiece. All weaponry was situated very close to the engine, which meant that it worked flawlessly at low temperatures.

The weight of series-production aeroplanes grew to 2,844–2,995kg (6,268–6,600lb), some 140–290kg (308–639lb) higher than that of the second prototype I-26. Maximum speed fell to 569km/h (353mph) and time to 5,000m (16,400ft) was 5.7 minutes. Up to the time of the German attack on the Soviet Union, 451 Yak-1s had been built, of which 64 were produced in 1940. In the second half of 1941 another 894 were built.

During the pre-war period Yak-1s came into service with four Frontline Aviation regiments, four PVO (Air Defence) fighter regiments and two Naval Aviation regiments,

An early-series Yak-1 fighter, photographed soon after its manufacture in 1941. Up to the time of the German attack on the Soviet Union, 451 Yak-1s had been built, of which 64 were produced in 1940. In the second half of 1941 another 894 were completed.

An extremely simplified training aircraft based on the Yak-7UTI, the Yak-7V of 1942 had a fixed undercarriage and was unarmed.

but only a small number of pilots had had the chance to master the new fighter by 22 June 1941 – maybe no more than a few dozen.

Yak-7UTI

In series production the UTI-26 combat trainer was dubbed the Yak-7UTI. It was built at Factories No. 301 (Moscow) and No. 153 (Novosibirsk).

The production aircraft had a non-retractable tailwheel, and the engine revolutions were limited to prolong service life. Only the port ShKAS machine gun was retained. Although the pre-war order for Yak-7UTIs was as high as 600 units, only 145 were built owing to preparations to launch the Yak-7 fighter into production from September 1941. However, there was still a need for an advanced trainer specifically designed to enable would-be fighter pilots to master and perfect their skills, and in 1942 production of the essentially similar Yak-7V began.

Yak-1 ('winter version')

Owing to the lack of snow-clearing methods and devices to level snow-covered runways, during the first wartime winter an attempt was made to equip the most modern high-speed new-generation fighters, including the Yak-1, with retractable ski undercarriages. In addition to the skis, the 'winter' aircraft were painted with an easily removed chalk-and-glue mixture, and provided with warming kits for engines, a gasoline system to thin freezing oil and special protective pads, covers and caps for radiators.

Although the skis were designed to cause minimum drag when retracted, the 'winter' Yak-1 was some 70kg (155lb) heavier, and speed at all altitudes was reduced by 30–40km/h (18–25mph). In total, 820 'winter' Yak-1s were built, but in combat the ski-equipped fighters proved significantly inferior to the enemy aircraft, which retained their wheeled undercarriages all year round. The use of ski undercarriages on combat aircraft was later abandoned.

Yak-1 (with M-105PF engine)

From June 1942 series production Yak-1s with the M-105PF engine producing 1,100hp at 4,000m (13,125ft) began to be equipped with the more powerful M-105PF, which developed 1,260 hp at 2,700m (8,860ft). Above that altitude the power fell away, and was the same as that of the M-105P above 4,000m. The

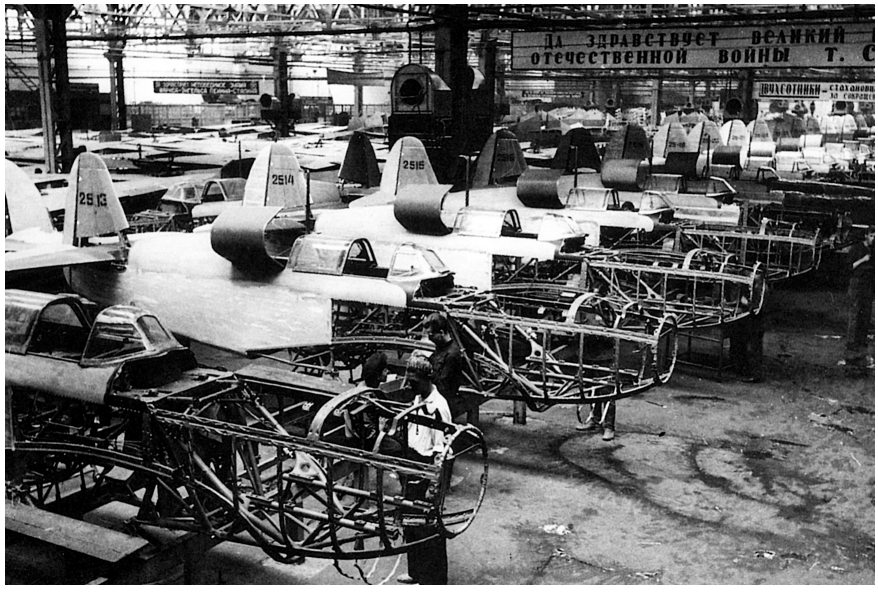
A Yak-1 with a retractable ski undercarriage and RO-82 rocket projectiles underwing. Aircraft thus armed had greater firepower but reduced speed because of the increased drag created by the rockets. Although the skis were designed to cause minimum drag when retracted, the 'winter' Yak-1 was some 70kg (155lb) heavier, and speed at all altitudes was reduced by 30–40km/h (18–25mph). In total, 820 'winter' Yak-1s were built, but in combat the ski-equipped fighters proved significantly inferior to the Bf 109, which retained its wheeled undercarriage all year round.

M-105PF's boost could be used only at low to medium altitudes, and the engine was heavier because of the strengthening required. The oil cooler, though bulky, was of greater capacity. Despite the weight penalty, the Yak-1's performance was appreciably boosted by the M-105PF – the zero-altitude speed increased by 27km/h (17mph), and at altitude its top speed was as high as 575–580km/h (357–360mph). The rate of climb was increased, and the time taken to fly a complete circle reduced.

Yak-1B

In September 1942 the Saratov Factory No. 292 began building the perfected version of the Yak-1, subsequently designated Yak-1B. Initially, this designation was unofficial, but it was applied to the aeroplane in official documents, in parallel with the Yak-7B. The Yak-1B differed from its predecessors in a number of respects. Instead of two ShKAS machine guns, the port weapon was replaced by a high-calibre 0.50-in. (12.7mm) UBS gun, provided with 200 rounds of ammunition. The plywood razorback rear fuselage top-decking was lowered and a Plexiglas bubble canopy fitted, greatly improving the pilot's view aft.

A Yak-1B of an unidentified Black Sea Naval Air Force regiment taxies out at the start of a mission. A groundcrewman accompanies the aeroplane, holding its wingtip. Due to the pilot's limited field of view over the nose of the fighter when it was on the ground, he would periodically glance at the man on the wingtip to ensure that he had adequate clearance ahead.



A Yak-7 fuselage assembly line at Factory No. 153 in Novosibirsk. Unlike the Yak-1, this variant had a detachable engine mounting. Note the plywood-covered compartment behind the cockpit – the Yak-7UTI trainer had the instructor's seat in this position.

In addition, the aeroplane's general aerodynamics were enhanced by eliminating various edges and protrusions, and the empennage and wing-to-fuselage fairings were revised. As a result, the speed and, more importantly, vertical and horizontal manoeuvrability were improved.

The weight of a mere 30 aircraft was further reduced by removing the remaining ShKAS machine gun and the radio and fitting the Yak-7's metal empennage. These fighters had a maximum speed of 592km/h (366mph) at 3,800m (12,450ft) and 526km/h (327mph) at ground level, matching the Bf 109F-4 and even the five-gun Bf 109G-2 in this altitude range.

Yak-7

This single-seat fighter was based on the Yak-7UTI trainer, with its engine and armament being the same as those of the Yak-1. The main differences lay in the second cockpit, redesigned undercarriage and slightly modified empennage. From a technological point of view the aircraft was much better designed, as it allowed the installation of more powerful engines thanks to an engine mounting that could be dismantled. In September and October 1941 Factory No. 301 built 51 Yak-7s, and 11 more were manufactured at Factory No. 153 in Novosibirsk. They carried extra weaponry in the form of three RS-82 rocket projectiles under each wing.

Yak-7A

This fighter version was in production in Factory No. 153 from January to May 1942, a total of 277 being built.

It differed from the Yak-7 mainly by having an antenna mast and an RSI-3 'Orel' radio. The aerodynamics were improved by fitting a partly retractable tailwheel and doors to cover the main undercarriage wells. In addition, a system for filling the fuel tank voids with neutral gas was adopted, together with other minor changes. The armament comprised a ShVAK cannon with 120 shells and twin ShKAS machine

Yak-1 ARMAMENT

It was initially intended to arm the I-26 fighter (the future Yak-1) with a 20mm ShVAK cannon firing through the engine driveshaft and four synchronized 7.62mm ShKAS machine guns, two above and slightly behind the M-105 engine, and the second pair underneath, at the level of the engine crankcase. Owing to the poor accessibility of the latter two weapons, which complicated cleaning and replenishment of ammunition, it was decided to remove them. Thus the series production Yak-1 was armed with a single ShVAK cannon (with 120 rounds and a firing rate of 800 rounds per minute) and two ShKAS machine guns (750 rounds per gun and a firing rate of 1,350 rounds per minute, taking synchronization into account)as depicted in this artwork. The weight of a one-second salvo was 1.71kg (3.77lb) and the ammunition was sufficient for nine seconds of cannon fire and 33 seconds of machine-gun fire. Because of this, experienced pilots used the machine guns to find the range of the target and then opened fire with the cannon.

The Yak-7's armament was originally the same as that of the Yak-1, except for the smaller ammunition reserve of the ShKAS machine guns (500 rounds per weapon).

In 1942 the firepower of Yakovlev fighters was increased to take into account the inadequacy of the ShKAS machine gun against the enemy's metal aircraft, which had self-sealing fuel tanks and armour protection for their crews. In place of the ShKAS guns, the Yak-1B was given one (port) 12.7mm UBS machine gun (with 240 rounds) and the Yak-7B two such machine guns, with 140 rounds for the port weapon and 260 rounds for the starboard gun. The UBS's 48g (1.7oz) bullet easily pierced the Bf 109F's rear fuel tank and the pilot's multi-layered armoured backrest.

Pilots from the second squadron of 562nd IAP (which helped defend Moscow during the summer of 1942) pose in front of a Yak-7A fitted with a ski undercarriage. Like the winterized Yak-1s, ski-equipped Yak-7As were supplied to frontline units with warming kits for their engines, a gasoline system to thin freezing oil and special protective pads, covers and caps for radiators.

guns with 500 rounds apiece. Maximum speed at 5,000m (16,400ft) was 571km/h (355mph), and time to reach this altitude was 6.4 minutes.

In the winter of 1941–42 the Yak-7As were flown with ski undercarriages, although this reduced their maximum speed by 30–40km/h (18–25mph).

It was noted that the Yak-7A was exceptionally easy to fly, and this was the key factor in enabling the fighter to be mastered by young pilots. It also had very good survivability, sometimes returning from sorties with significant combat damage – no aileron and only part of the rudder; one wing leading edge completely torn off back to the front spar; or with a broken flap link rod, causing the flap to hang free.

Yak-7B

This version was built at Factory No. 153 from April to June 1942, initially with the M-105PA engine (261 aircraft) and then with the M-105PF.

The most obvious difference from the Yak-7A was the use of twin 0.50in. UBS machine guns with a total of 400 rounds, instead of 0.30in. ShKAS weapons. The ammunition allowance for the ShVAK cannon remained the same at 120 shells. The weight of a one-second burst from the Yak-7B was 2.72kg (5.99lb), 2.87 times higher than that of the Bf 109F-2 and 1.62 times higher than that of the Bf 109F-4 and Bf 109G-2. Six RS-82 rocket projectiles or two 50kg bombs could be carried under the wings. An 80lit (18gal) capacity extra fuel tank was normally installed in the rear cockpit.

From the 22nd series onwards measures were taken to improve aerodynamics and to reduce in-flight weight. The Yak-7B powered by the M-105PF, built from the late summer of 1942, had a maximum speed of 570km/h (355mph) at 3,650m (11,970ft) and 514km/h (320mph) at ground level. A total of 5,120 Yak-7Bs with M-105PF engines were constructed. Starting from November 1942 the Yak-7B version with lowered rear fuselage top-decking was built, giving the pilot a much better field of view in the rear hemisphere.

These Yak-7Bs were built with funds collected by Young Communist League organizations (Komsomol) of different Soviet regions, hence the inscriptions *Novosibirsk Komsomol* and *Kuzbass Komsomol* in Cyrillic on the fuselages of the two nearest aircraft.

Yak-7-37

This fighter version had much heavier armament, comprising a 37mm MPSh-37 cannon with 20 shells and two 0.50in. UBS machine guns with a total of 450 rounds. One hit by an armour-piercing 37mm shell, which could penetrate 50mm armour from a range of 200m (660ft), was normally enough to bring down an enemy fighter. To install the cannon the whole cockpit was moved 400mm (16in.) aft – this experience proved useful in the creation of the Yak-9. The takeoff weight grew substantially, by approximately 200kg (440lb), which worsened the aircraft's handling characteristics. A limited series of 22 Yak-7-37s were built during August 1942.

Bf 109E and Bf 109F

During the war between Nazi Germany and the Soviet Union the earliest version of the Bf 109 used by frontline Luftwaffe units was the E-model.

Bf 109E-1

This was the initial series production version of the Bf 109 fighter, with a 1,050hp DB 601A engine driving a three-bladed variable-pitch VDM propeller. It was built at four factories from late 1938. The 'Emil's' maximum speed was 548km/h (340mph) at an in-flight weight of 2,510kg (5,532lb). Production Bf 109E-1s were armed with four 7.92mm MG 17 machine guns. The two fuselage-mounted MG 17s had 1,000 rounds of ammunition each, while the wing-mounted guns each had 420 rounds. The aircraft was fitted with a FuG 7 transmitter/receiver. There was no armour protection for the pilot and the fuel tanks were not self-sealing, which reduced the fighter's survivability. In 1940 a number of Bf 109E-1s were converted into fighter-bombers, capable of carrying a 250kg bomb, and transferred to the newly formed *Jagdgeschwader*

fighter-bomber detachments. During their rebuilding the E-1s were fitted with more powerful DB 601Ns. Altogether, 1,073 Bf 109E-1s were built, of which 110 were converted into Bf 109E-1/B fighter-bombers.

Bf 109E-3

The Bf 109E-3 replaced the E-1 version on the assembly lines in the autumn of 1939 and had started to reach frontline units by year-end. The major differences from the previous variant were the new powerplant and the more powerful armament. The DB 601Aa engine was rated at 1,175hp on takeoff and 1,020hp at 4,500m (14,760ft). Its design allowed an MG FF cannon to be installed in between the cylinder vee, firing through the propeller hub. Initially, the Bf 109E-3's armament consisted of four machine guns and the central MG FF cannon, but problems with cannon overheating and malfunctioning, and its strong recoil, resulted in the weapon being removed in frontline units immediately after the fighter was taken on strength. Late-build Bf 109E-3s had the wing-mounted machine guns replaced by MG FF cannon with drum-type 60-round magazines, which necessitated a bulged fairing on the wing undersurface.

By the late summer of 1940 German designers, benefiting from pilots' experience gained in aerial combat over France, reinforced the Bf 109E-3's canopy frame and protected the pilot with 8mm armour in the rear, weighing 24kg (53lb). A little later an additional armour plate weighing 13kg (28.5lb) was incorporated into the structure of the hinged canopy, behind the pilot's head. The Bf 109E-3 was the most-produced 'Emil' variant, with 1,163 examples being built for the Luftwaffe and 83 for export.

Bf 109E-4

This version of the 'Emil' differed little from the late Bf 109E-3, with a reinforced canopy frame, armoured backplate and headrest for the pilot. The main difference was in the use of refined MG FF/M 20mm cannon, which could fire fragmentation shells with a higher explosive load. There was a fighter-bomber (E-4/B) version, some were produced in tropical finish (E-4 Trop) and 35 (E-4/N) were powered by the more powerful DB 601N. Production totalled 561 aircraft.

Bf 109E-5 and E-6

These were fighter-reconnaissance aircraft, the first one based on the E-3 and the second on the E-4/N. The weaponry was reduced to twin MG 17s installed over the engine, and the cameras were housed aft of the cockpit. Twenty-nine E-5s and only nine E-6s were built.

Bf 109E-7

This was a development of the small-series Bf 109E-4/N fighter, powered by a DB 601N with a takeoff rating of 1,270hp. It had an underfuselage rack capable of carrying either a 300lit (66gal) additional fuel tank or, in fighter-bomber configuration, a single 250kg or four 50kg bombs. Some of these aircraft were given extra armour protection for the cockpit and radiators. Owing to the increase in takeoff weight, the undercarriage struts were reinforced. The total number of Bf 109E-7s built was 438, including 17 with the GM-1 high-altitude supercharger.

Bf 109F MACHINE GUNS

Designed with air-to-air combat operations in mind, the Bf 109F had all of its weapons grouped in the nose to give their rounds line-of-flight trajectory. This advantage was somewhat offset by the fact that the aircraft carried just three guns. Like the Bf 109E before it, the 'Friedrich' was fitted with a pair of Rheinmetall MG 17 7.92mm machine guns in the nose. Each weapon had a magazine holding 300 rounds mounted just forward of the cockpit. The MG 17s were synchronized with the engine to avoid damaging the propeller when they were fired.

Hauptmann Peter-Paul Steindl, *Gruppen-Adjutant* of II./JG 54, goes in search of a target in his bomb-equipped Bf 109E-7 during the opening phase of *Barbarossa*. Only 438 E-7s were built by Messerschmitt. Austrian Steindl had claimed nine victories by the time he was killed in action on 9 January 1945 serving with *Gruppenstab* I./JG 26.

Bf 109E-8 and E-9

Only nine E-8s and sixteen E-9s were built. The first of them were restored early-model 'Emils' (E-1, E-3 and E-4) that had had their engines replaced by DB 601Ns and plumbing installed to enable them to carry the 300lit (66gal) drop tank. The Bf 109E-9 was a long-range reconnaissance aeroplane based on the Bf 109E-7. Armament was reduced to two MG 17 machine guns, and a camera was installed beneath the cockpit. The 300lit fuel tank on the underfuselage rack was practically standard equipment for the E-9.

Bf 109F-0

This variant had a totally redesigned wing with oval wingtips, a new cowling over the 1,270hp DB 601N engine and a larger spinner. Armament comprised an MG FF/M centrally positioned cannon and two MG 17 machine guns. The tunnels for the oil and water radiators were improved, and a strutless cantilever tailplane was fitted. Thanks to the more powerful engine and aerodynamic refinements, maximum speed increased to 600km/h (375mph). By the autumn of 1940 the initial series of 25 had been completed, some of these subsequently serving as test aircraft.

Bf 109F-1

The F-1 was a series-built version with minor differences from the F-0, the intake for the centrifugal supercharger being made round in section for example. During wartime modifications four reinforcing pieces were riveted externally to the area of the keel framework. A tropical filter-equipped version, the Bf 109F-1 Trop, was produced. From October 1940 to March 1941 just 208 were built.

Bf 109F-2

The principal difference from the previous version was the installation of the 15mm MG 151/15 cannon instead of the MG FF/M. The new weapon had a much higher rate of fire – 900 rounds per minute – and a greater velocity of 870mps (2,850fps), but it was still not powerful enough to bring down bombers and Ilyushin Il-2 ground attack aircraft. Some examples were built as Bf 109F-2/B fighter-bombers, capable of carrying either one 250kg or four 50kg bombs. The 300lit (66gal) underfuselage drop tank could also be carried. During wartime modification armoured glass was installed

This Bf 109F-2, photographed at Sobolevo in late June 1941, was assigned to Leutnant Jürgen Harder of *Gruppenstab* III./JG 53. Serving exclusively with JG 53, Harder was credited with 56 victories prior to his death in combat on 17 February 1945.

in the windscreen. The Bf 109F-2 was built from January to August 1941, with a total of 1,380 being produced.

Bf 109F-3

This comprised a small batch of 15 aircraft built in the autumn of 1940. They were similar to the F-1 but for the engine, having the DB 601E with a takeoff rating of 1,350hp that increased speed by 10–15km/h (6–9mph). However, this was deemed insufficient, so production of the F-3 was limited.

Bf 109F-4

This was the most numerous version of the 'Friedrich', powered by the DB 601E and armed with MG 151/20 20mm cannon. In production from June 1941, it looked quite similar to the F-2, but the external reinforcing elements on the fuselage near the keel were absent. The structure of the fuselage in that area had been strengthened, resulting in an increase in flying weight to 2,930kg (6,458lb). The sub-variants were the F-4/B fighter-bomber, the photo-reconnaissance machine with a camera in the rear fuselage (the radio was removed) and a version with a tropical filter and GM-1 nitrous-oxide injector. During mid-service modification most of these fighters were fitted with armoured glass windscreens. In 1942 240 were delivered with extra underwing MG 151 cannon installations. In total, 1,841 Bf 109F-4s were built.

Bf 109F-4s of II./JG 52 are serviced in the open at a typical *Feldflugplatz* (forward landing ground) near Rostov, in the Caucasus, during the summer of 1942. Ever resourceful, the 'black men' (maintainers) of the *Gruppe* have rolled the main wheels of two of the fighters into shallow trenches and then jacked up their tails, thus making it easier to work on the engines and adjust the armament.

Bf 109F-5 and F-6

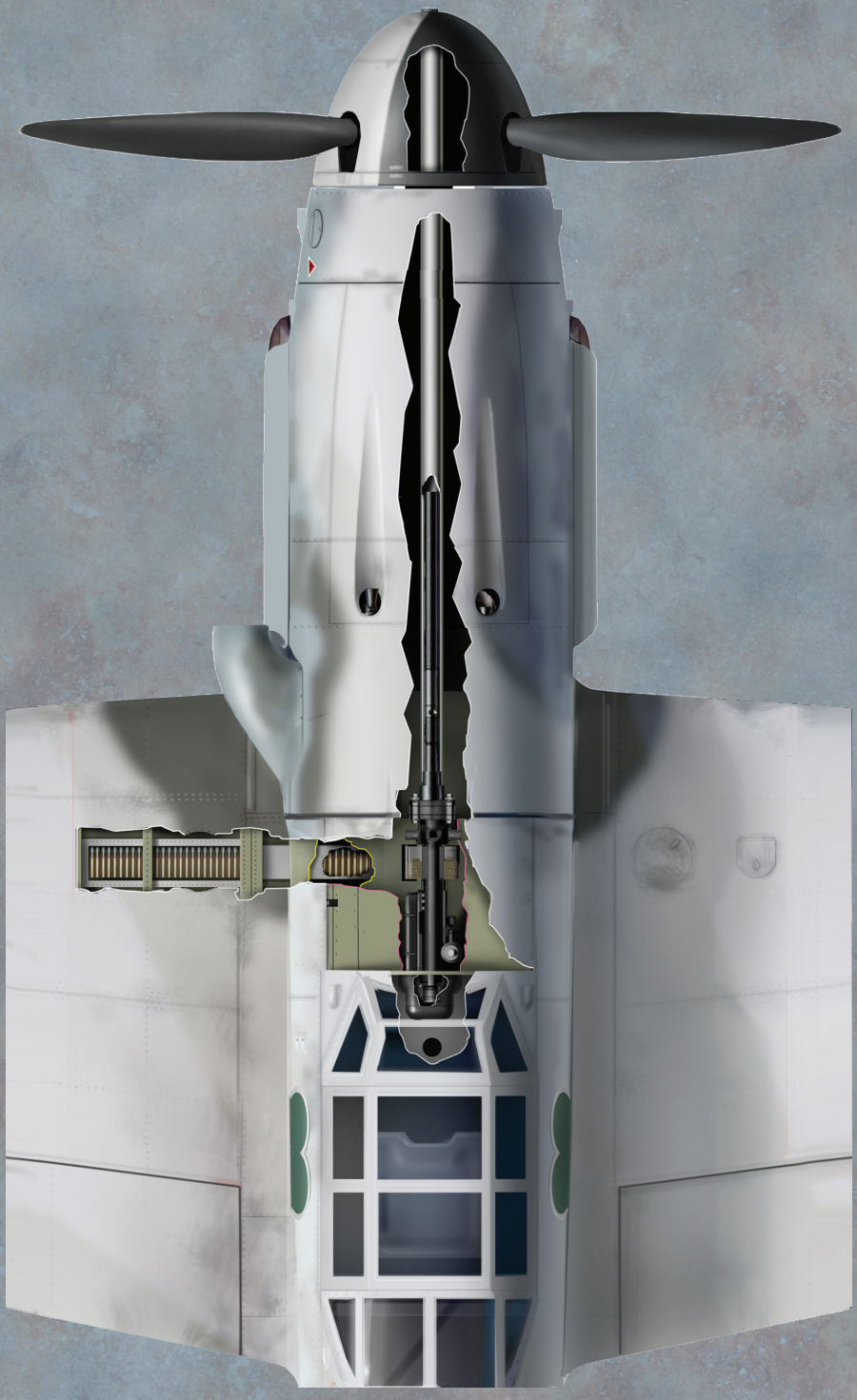
According to some sources the limited-production F-5 was a reconnaissance aircraft, but other historians state that it was a high-altitude fighter with a GM-1 supercharger system. These differences might be explained by rebuilds during repair. As for the F-6, the absence of any data regarding production and combat losses leads one to think that it was never in production.

Yak-1/7 and Bf 109E/F/G Production in 1940–42			
Aircraft type	**1940**	**1941**	**1942**
Yak-1	64	1,333	3,476
Yak-7	–	207	2,431
Bf 109E/F/G	1,667	2,764	2,665

Yak-1, Yak-7, Bf 109F-2 and Bf 109F-4 Comparison Specifications				
	Bf 109F-2	**Yak-1B**	**Bf 109F-4**	**Yak-7B**
Powerplant	1,270hp DB 601N	1,210hp M-105PF	1,350hp DB 601E	1,210hp M-105PF
Dimensions				
Span	9.92m (32.54ft)	10.0m (32.8ft)	9.92m (32.54ft)	10.0m (32.8ft)
Length	8.94m (29.32ft)	8.5m (27.8ft)	8.94m (29.32ft)	8.48m (27.8ft)
Height	2.6m (8.53ft)	2.75m (9.02ft)	2.6m (8.53ft)	2.75m (9.02ft)
Wing area	16.1 sq m (173.3 sq ft)	17.15 sq m (184.6 sq ft)	16.1 sq m (173.3 sq ft)	17.15 sq m (184.6 sq ft)
Weights				
Empty	2,355kg (5,190lb)	2,375kg (5,234lb)	2,392kg (5,272lb)	2,522kg (5,558lb)
Loaded	2,780kg (6,127lb)	2,917kg (6,429lb)	2,832kg (6,242lb)	3,005kg (6,623lb)
Performance				
Max speed	598km/h at 6,100m (371mph at 20,000ft)	571km/h at 3,650m (355mph at 11,970ft)	610km/h at 6,000m (379mph at 19,680ft)	573km/h at 3,650m (356mph at 11,970ft)
Range	580km (360 miles)	650km (400 miles)	560km (350 miles)	640km (395 miles)
Service ceiling	11,000m (36,000ft)	10,000m (32,800ft)	12,000m (39,350ft)	10,000m (32,800ft)
Armament	1 x 15mm MG 151 2 x 7.92mm MG 17	1 x 20mm ShVAK 1 x 12.7mm UBS	1 x 20mm MG 151 2 x 7.92mm MG 17	1 x 20mm ShVAK 2 x 12.7mm UBS

Bf 109F CANNON

The Bf 109F's principal weapon was an engine-mounted automatic cannon – the 20mm MG FF/M in the F-1, the 15mm Mauser MG 151/15 in the F-2 and the 20mm MG 151/20 in the definitive F-4 (depicted here). All three variants had a magazine holding 200 rounds of ammunition. Because the muzzle of the cannon protruded through the centre of the propeller hub, the gun did not require synchronization.



THE STRATEGIC SITUATION

Adolf Hitler ordered the preparation of a war plan against the USSR soon after France was defeated in June 1940 and the British Expeditionary Force had been evacuated from the European continent. He made the final decision to begin the invasion six months later. For various reasons the operation was postponed several times, and although Joseph Stalin was provided with generally reliable information at the time, he lost faith in his intelligence. The penultimate date for the German invasion, provided by Soviet spies, was 15 May 1941, but it did not happen.

The Soviet leadership, not even noticing the provocative flights by German reconnaissance aeroplanes over the USSR, tried by all means to avoid war with Germany, because it was clearly evident that the Soviet Union's army, navy and air force were unprepared. Regarding the VVS-KA, the situation was as follows. During 1939–40 only obsolete aircraft types were in series production. In 1939 4,150 fighters were produced, and in 1940 4,657 fighters, mainly I-16s and I-153s. By late 1940 a mere 200 new fighters had been built, and VVS-KA pilots only started to master them in the spring of 1941.

In the USSR in the winter of 1940–41 the first attempt was made to provide combat aircraft with wheeled undercarriages. Hitherto, ski undercarriages had been fitted. Owing to the lack of snow-clearing equipment and an effective way to harden the snow-covered runways, flying training frequently came to a halt during the winter. Indeed, the average flying time for a single pilot in winter was as low as ten hours. To make matters worse, the spring of 1941 was rainy, causing the airfields to become muddy and halting regular flying training until late April. As a result, even experienced

pilots had not had the chance to master the new aircraft types delivered from the manufacturers before the German invasion.

After the failures of the Winter War with Finland in 1939–40, the decision was taken to substantially increase the numbers of VVS-KA combat aircrew. To do this, enrolment to numerous flying schools was increased. Soviet aviation regiments with three-digit numbers beginning with the numerals two and three were formed in 1940–41, manned by 'yellow-bellied' young airmen fresh from flying school. A graduate's intended peacetime experience in fighter aircraft was 35–55 flying hours, but in reality, owing to bad weather and a shortage of fuel, novice aviators entering frontline detachments (which amounted to a third of all pilots) had much less experience, and it had been gained on other, obsolete, fighter types.

The rapid growth in the number of aviation regiments also created a shortage of command staff. Quite frequently the regiments were placed under the command of captains, or even senior lieutenants, who had never led a large unit before, to say nothing of combat experience. The situation was the same at much higher levels, also. For instance, in June 1941 the combat aviation units of the Kiev special military district (approximately 2,000 military aircraft) were under the command of Lt Gen Ivan Kopetz, who in 1939 had been a mere senior lieutenant!

By 1941 the vast majority of frontline aviation airfields still had grass airstrips only, which was a real disadvantage for combat training. However, in the summer of that year at 200 such airfields the process of laying concrete runways began. In many instances this work caused a concentration of large numbers of aeroplanes at rather small airfields. The engineering battalions laying the concrete were busy day and night, and they could not do the same job at secondary 'jump' airfields, intended for the dispersal of VVS-KA aircraft. Such sites were few in number, in any case.

The airfield service battalions were equipped with only 30–50 per cent of the required motor transport. This meant that if an aviation regiment was leaving its airfield for another destination, its refuelling tankers could only take fuel for a mere two or three regiments from the airfield's installed tankage, which normally held sufficient fuel to meet the needs of 30 full regiments. Likewise, 50 full allowances of ammunition for the whole regiment were kept at the armoury, but the regular truck tasked with transporting shells, bullets, bombs, etc. could take only one-and-a-half or two ammunition allowances at a time. When rebasing, groundcrews had to travel on foot or, if they were lucky, hitch-hike. The rail network in the combat area had been a priority target for the Luftwaffe since the first days of the war, so travel by train was virtually impossible.

A sad joke was common throughout the Soviet military during this period – the Red Army is strong, but communication will kill it. At all troop command levels the communications lines were permanent – telephone and telegraph. But these were extremely vulnerable in combat. Radio was not perfect. Moreover, the radio connections between the troop detachments were not properly used.

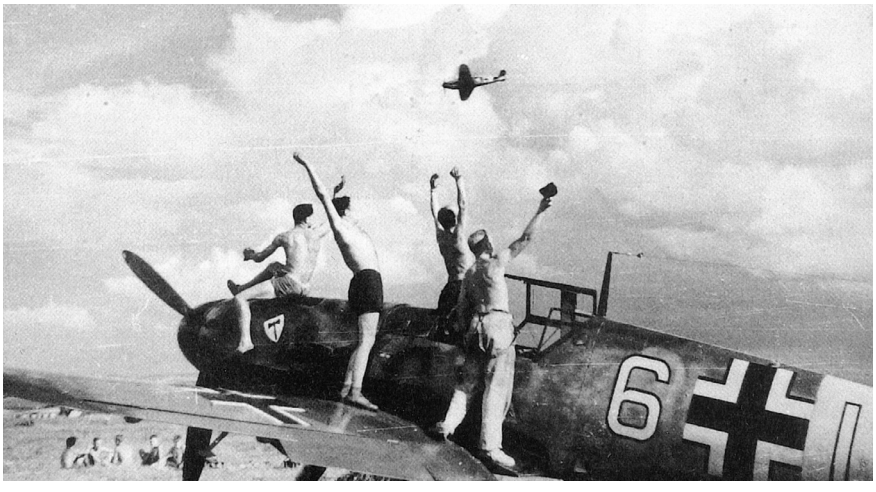
On the other side of the border in June 1941 the best army in the world, comprising perfectly prepared Nazi troops with more than two years of combat experience, was preparing to attack. At rather narrow but decisive points for future breakthroughs the Wehrmacht amassed a manifold superiority in troops and combat vehicles. To cover and work in concert with the attacking Panzer armies, air fleets were also created. At the post-war Nuremberg Trials the ex-head of Luftwaffe Headquarters,

Location of VVS-KA and Luftwaffe units on the eve of Operation *Barbarossa* (22 June 1941).

Generalfeldmarschall Albert Kesselring, described the state of the Luftwaffe before the onslaught on the USSR:

> 'Everything was done to make the German Air Force staff, the combat qualities of its aeroplanes, its anti-aircraft, its air communications, etc., into the most powerful air force in the world.'

The airfield network created in eastern Germany, Poland and partly in Finland and Rumania facilitated the dispersal of units, as well as the manoeuvring and cooperation of the various *Luftflotten* (air fleets). *Luftflotte* 1 (669 aeroplanes, including 203 fighters) was to support the 'North' group of armies, assaulting the Baltic republics and Leningrad. *Luftflotte* 2 (1,468 aeroplanes, including 384 fighters) was to support the 'Centre' group of armies, aiming for Moscow. *Luftflotte* 4, with 969 fighting



Groundcrew of 9./JG 3 stop work on Leutnant Helmut Mertens' 'Yellow 6' to wave up at another Bf 109F-2 as it circles Polonnoye prior to landing on 15 July 1941. Oberfeldwebel Hans Stechmann is at the controls of the latter aircraft, and he has just downed three I-153s to push JG 3's wartime aerial victory tally past the 1,000 mark. Both Mertens (49 victories, including a single Yak-1) and Stechmann (32 victories) survived the war.

aircraft, including 366 fighters, was to support the 'South' group of armies assaulting Kiev and Kharkov. In *Luftflotte* 5, operating mainly from Finnish and Norwegian territory against the USSR, there were 108 German aeroplanes, of which 12 were fighters. The main Luftwaffe HQ also operated the long-range reconnaissance detachments (51 aircraft).

In addition, the Finnish, Rumanian and Hungarian detachments were operating in the regions of the 'Norge' and 'South' groups. Including these, the Axis forces possessed approximately 4,000 combat-ready aeroplanes. Among these were 22 *gruppen* equipped with Bf 109s, seven flying 'Emils', 14 with 'Friedrichs' and one having a mixed force. Including the HQ detachments, the approximate total number of Bf 109s ranged against the USSR on 22 June 1941 can be put at 820.

During the first day of war in the East four VVS-KA detachments took part in combat in the Baltic, Western and Kiev special districts, as well as in the Odessa military districts, along with Black Sea Naval Air Force. In total, the combined VVS-KA force from all these districts had 5,721 combat aircraft but only 4,998 crews. This disparity was caused by the fact that a number of aviation regiments had doubled

Pilots and groundcrew from 63rd SAD's 20th IAP familiarize themselves with a newly arrived Yak-1 fighter. Assigned to the Kiev special district, 20th IAP had 57 I-153s and 56 Yak-1s on strength when Germany invaded the USSR. Critically, none of its pilots had been trained to fly the Yak-1, and the regiment was duly decimated in the first few days of the campaign. 20th IAP later retreated east and was fully equipped with Yak fighters, which it flew in the defence of Moscow.

Peasant women help to camouflage a Yak-1 fighter by adding straw to the masking net. This aircraft has an aerial mast, whereas the one in the background probably did not have a radio. No such effort had been made to camouflage VVS-KA aircraft prior to the German invasion, which meant the Luftwaffe had little difficulty in finding them on the ground during the opening phase of the campaign in the East. According to German claims, on the first day of *Barbarossa* 888 Soviet aircraft were destroyed on their airfields.

their aircraft strengths, as they were still using 'old' aeroplanes that had been taken off strength alongside 'new' ones. As previously mentioned, most of the latter had not even been uncrated following their delivery from the factory. Some of the 'new' aeroplanes were travelling to their frontline units under their own power on 22 June, most of them being located at intermediate airfields when the invasion was launched. This was the situation that befell five Il-2 assault aircraft in Kaunas. Within 48 hours of their arrival there they had become German trophies due to the actions of local collaborators, who prevented their intended crews from ever seeing their aircraft.

As for Yak-1s in the frontline, in the Western Special Military District only 123rd IAP had them on strength (20 Yak-1s were flown alongside 61 I-153s, with a mere 36 pilots of 10th SAD (Composite Aviation Division) trained for Yaks), and in the Kiev special district the fighter had reached 20th IAP of 63rd SAD (57 I-153s and 56 Yak-1s, with no pilots trained on the latter type).

Behind the frontline aviation units were the long-range aviation divisions – four air corps and a separate aviation division. They had on strength 1,088 Ilyushin DB-3 bombers and 980 crews. Finally, the major industrial cities and sites of the Soviet Union such as Moscow, Leningrad and Baku were covered by home air defence (PVO) units, which had been formed as late as June 1941. Neither the long-range aviation divisions nor the home air defence units were subject to Luftwaffe attacks during the first day of the invasion.

At 0200hrs on 22 June 1941, the Luftwaffe's specially prepared night attack crews, flying 637 bombers and 231 fighters, were scrambled to suppress the Soviet aviation units on their airfields. Later, at dawn, a second wave of 400 bombers and a much greater number of fighters struck border airstrips and other major targets. The German high command's intention was to neutralize Soviet aviation, gain absolute air superiority and then switch the Luftwaffe's major force to direct support of the ground forces.

According to German claims, on the first day of Operation *Barbarossa* 888 Soviet aircraft were destroyed on their airfields and a 'mere' 322 were shot down. The assessment that 'more than 1,800 aircraft' were lost on 22 June appeared much later

after calculations had been made of the number of captured aeroplanes, including airworthy and little-damaged ones abandoned on the airfields during the retreat, and Soviet aircraft brought down and subsequently found. This tally was produced by Joseph Goebbels' propaganda department, which did its best to present a most convincing picture.

Although the exact number of Soviet aircraft destroyed on 22 June will never be known, it is an historical fact that the VVS-KA suffered staggering losses that day compared with those it inflicted on the Luftwaffe. Indeed, the Germans lost only 78 aeroplanes to both combat and non-combat causes (plus 11 Rumanian aircraft). A further 89 had to be repaired after suffering battle damage. Some 24 Bf 109s had been destroyed, with an identical number requiring repairs.

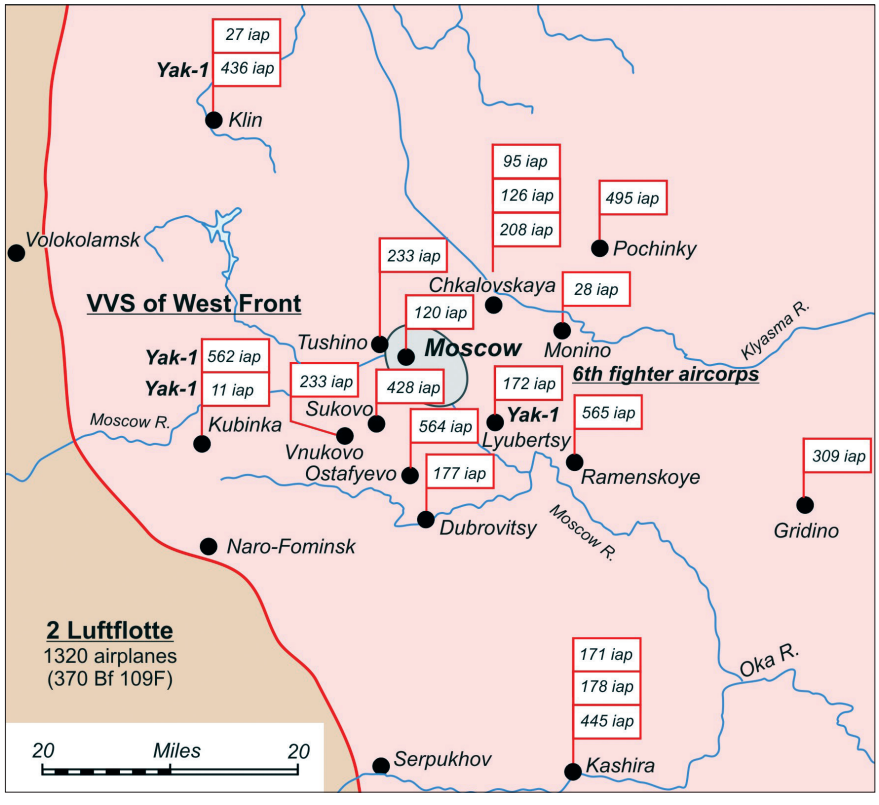
Nevertheless, the 'merry hunt on the Eastern Front' was not to happen. As early as 10 July 1941, the Luftwaffe's *Luftflotte* 4 command was reporting to Generalfeldmarschall Gerd von Rundstedt, the Armies' Group commander:

> In the regions of Berdichev, Shepetovka, Zhitomir and Novgorod-Volynsky the new-type high-speed enemy fighters make the *Luftflotte*'s operations harder. It is the same in the region of Ternopol. Our fighter pilot losses are high, as the Russians fight furiously. Russian bombers in close formations attack our land troops, ignoring the massive anti-aircraft fire. Because of all this the *Luftflotte* is restricted in its actions. From dawn to dusk when attacking the enemy's army columns and airfields, we suffer constantly from the Soviet aviation counterattacks, all day long rebuffing the attacks of their fighters.

In the period from 22 June to 5 July 1941, Luftwaffe losses on the Eastern Front amounted to 807 aircraft (both total losses and machines suffering major damage). From 6 July to 2 August a further 843 aircraft were lost. Soviet losses were a great deal higher. A special report to the Defence Committee stated that, up to 1 August, they were assumed to be as high as 6,500 aeroplanes, including both those brought down and those destroyed on the ground. The Soviet Union's main hopes were pinned on

As the VVS-KA slowly regrouped, and Soviet ground defences became better equipped, so Luftwaffe losses began to steadily climb. This Bf 109F-2 from II./JG 54 was brought down by anti-aircraft fire close to the Baltic coast on 6 August 1941, its pilot, Oberleutnant Reinhard Hein, spending the next eight years in Soviet captivity.

Location of VVS-KA and Luftwaffe units in the Moscow region as of 30 October 1941.



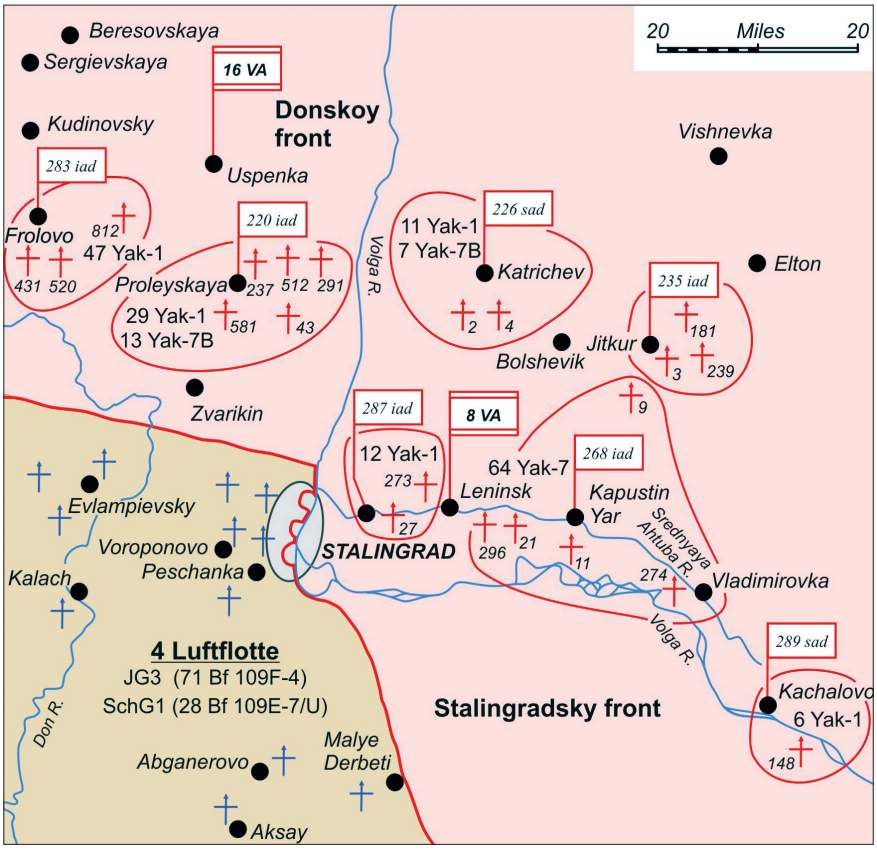
the growing capabilities of the aircraft industry. In August and September 4,500 new aircraft were delivered. It was also hoped that aircrew losses would become lighter, having amounted to around 20 per cent of those manning the aeroplanes that had been destroyed.

After reaching the outskirts of Leningrad and completing the vast encirclement of the Kiev region, it seemed that the Wehrmacht was close to ending the war. In late September the 'Centre' group of armies launched their offensive against the Soviet capital. In this period 1,320 Luftwaffe aeroplanes were concentrated in the Moscow region, including 370 Bf 109Fs and 50 twin-engined Bf 110s. They were confronted by 285 fighters of Soviet Frontline Aviation and 423 fighters of 6th IAK of Moscow Air Defence. In total, there were 84 Yak-1s in VVA-KA service by the end of September 1941.

Counting on the fall of Moscow and a successful end to the campaign in the East, Hitler's high command began preparing for active combat in the West once again. Indeed, just before the Soviet counteroffensive near Moscow, the Luftwaffe relocated *Luftflotte* 2 HQ and part of the forces of *Fliegerkorps* II to the Mediterranean theatre, while *Fliegerkorps* V was moved from Rostov-on-Don to Brussels. However, the changing situation west of Moscow soon forced the German high command not only to stop weakening its aviation component on the Eastern Front, but to strengthen it. For instance, in accordance with a Luftwaffe General HQ order *Fliegerkorps* VIII was strengthened with four bomber *gruppen* and a *gruppe* of nightfighters. From the start of *Barbarossa* to year-end, the Luftwaffe's combat losses on the Soviet–German front amounted to 3,827 aircraft – an average of 650 machines a month.

German soldiers pose for photographs near a lightly damaged Soviet Yak-1 fighter that was captured on 7 October 1941. It has been hastily camouflaged with saplings by the Wehrmacht so as to avoid it being destroyed by VVS-KA aircraft.

Meanwhile, Soviet industry, which suffered greatly during the factories' evacuation to eastern areas of the USSR, continued delivering new-model aircraft to the VVS-KA. In particular, in 1941, 1,233 Yak-1 and 207 Yak-7 fighters were built. In February 1942 the leaders of Germany's aviation industry noted, 'Soviet aeroplanes taken as trophies prove that during the last year a sudden technical breakthrough has happened in the USSR's aviation industry, and in some fields they can compete with the best aeroplanes of Europe and America.'



Location of VVS-KA and Luftwaffe units in the Stalingrad region as of October 1942.

High-scoring ace Oberleutnant Günther Rall (274 victories) is flanked by veteran NCOs Unteroffizier 'Charlie' Gratz (138 victories) and Friedrich Wachowiak (89 victories). All three pilots served with 8./JG 52 at the start of the offensive in the East, and both Rall and Wachowiak claimed early successes against the Yak-1/7. The latter downed seven examples between 25 September 1941 and 2 May 1942, while Rall claimed five between 25 September 1941 and 8 September 1942.

In the spring of 1942 the VVS-KA underwent vast organizational changes. First of all, the strike groups were formed – mobile detachments that could be moved from one front to another to reinforce the aerial strength in any particular direction. Secondly, the frontline air forces were replaced by newly formed Air Armies – massive aviation units that were in some ways analogous to the German *Luftflotten*. Thirdly, the VVS-KA was quickly supplied with new aircraft. For example, by 1 May 1942 there were already 386 Yak fighters serving with frontline detachments.

Unfortunately, simultaneously with the reformation of the VVS-KA, a massive new German assault was launched in the southern sector of the Soviet–German frontline, and this had serious consequences. Although there were no large-scale encirclements as there had been in 1941, the Wehrmacht's 4th and 6th panzer armies managed to reach Stalingrad and the Caucasus, while the 11th Army conquered Sevastopol. By mid-summer 1942 the Bf 109G-2 had also started to come on strength with Luftwaffe fighter units. Its combat capabilities were considerably greater than those of the 'Friedrich', mainly because of its powerful new DB 605A engine. Yaks also received the new M-105PF powerplant, but it was approximately 200hp less powerful than the German engine. Consequently, Soviet fighter pilots again found themselves at a disadvantage in aerial combat against their Luftwaffe counterparts.

The disastrous summer and early autumn of 1942 saw the VVS-KA suffer heavy losses. The reserve of fighter pilots who had begun training in the pre-war years was now exhausted, and young novices entering the combat arena often had only five to ten hours of flying experience in fighters. Under these conditions the scores amassed by German aces practising the 'free hunting' method began to grow. However, according to Generalleutnant der flieger Walter Schwabdissen, commander of the 5th *Jagd Division*:

> Contrary to the events of 1941, when Soviet aviation scarcely avoided catastrophe, and despite the Russian Air Force continuing to suffer heavy losses, the summer of 1942 did not

Four Soviet pilots gather around a map unfolded on the wing of a Yak fighter during a pre-mission briefing on the South Front in the early spring of 1942. Two of these pilots later became aces and twice Heroes of the Soviet Union. Second from left is Grigory Rechkalov (61 victories, the first of which was a Bf 109E shot down on 26 June 1941 whilst flying an I-153), and on the extreme right is Dmitry Glinka (50 victories, including 23 Bf 109s). Both aces scored a number of successes over Bf 109s in the Yak-1 during 1942.

> bring a decisive turn in the balance of power, and the situation for the Russians, at least, did not worsen – a fact witnessed by the growing potential of the Red Army Air Force.

During this period the Luftwaffe also suffered. Between 1 May and 31 August 1942, its total losses amounted to 4,460 aircraft. In May the active *Luftflotte* 4 had 307 Bf 109s on strength, but by September, during the bloody combats overhead Stalingrad, this figure had been reduced to only 213 – one-third less. The total number of German single-engined fighters in the frontline at this time was 554.

On 19 November 1942 Soviet troops launched a surprise counterattack, encircling the 6th Army of General Friedrich von Paulus in the Stalingrad area, together with some elements of the 4th Panzer Army. Up to 300,000 men found themselves encircled. On 19 November there were 366 Yak-1s and 351 Yak-7s on strength in the Air Armies and the Air Corps of the Main HQ reserve. The total number of Yakovlev fighters built in Russia in 1942 was 3,474 Yak-1s, 2,426 Yak-7s and 59 Yak-9s.

During the Soviet counterassault near Stalingrad and the aerial siege of the encircled enemy forces that followed, Soviet aviation units flew 35,929 combat sorties. In the same period the Germans flew only 18,500 sorties, losing 1,416 aeroplanes in the air and on the ground. General Schwabdissen noted:

> The battle for Stalingrad clearly showed the growth of Red Army Air Force power, which turned out to be the principal factor, seriously undermining German air superiority. Even the high skills of German pilots, constantly superior to those of Russian airmen, could not influence this changed situation.

THE COMBATANTS

SOVIET PILOT TRAINING

In the USSR the popularity of M. M. Gromov, V. P. Chkalov, V. K. Kokkinaki and those pilots who participated in the rescue of the crew of the SS *Chelyuskin* in February 1934 – the very first Heroes of the Soviet Union – was comparable with that of movie stars in the West. In the countryside, where many had not even seen a locomotive, any profession involving mechanics was regarded as extremely prestigious, and those who could fly aeroplanes were even more worshipped and respected. Pilots, wearing specially tailored chrome leather high boots, dark blue breeches and blouses, stood out among the common people.

Although they were small in number in the USSR pre-war, pilots had had good flying training. Together with tank crews, airmen were frequently decorated in the 1930s, which was very rare in those days. They received these awards for participation in multiple pre-war conflicts in which the USSR was either openly or clandestinely involved. Moreover, airmen received very high salaries and were well provisioned and fed.

One such individual was naval pilot I. P. Lukyanov, who flew 94 combat sorties during the war, some of which were in the Yak-1, and who recently celebrated his 100th birthday. Joining the Red Army in the summer of 1934, he initially drilled as an infantryman. However, from January 1935 Lukyanov attended the J. V. Stalin naval pilots' and air observers' school in Yeysk, where, as well as learning theory in the classroom, he also flew the Polikarpov U-2 biplane trainer. He made 113 flights with the instructor, followed by ten check flights with veteran pilots of different ranks, one

The venerable Polikarpov U-2 (re-designated the Po-2 in 1944) served as the VVS-KA's elementary trainer throughout World War II, some 13,500 examples having been built by June 1941. Praised for its positive longitudinal stability and reluctance to spin, the pedestrian U-2 was the ideal tool for the hundreds of flying clubs charged with training pilots for frontline units.

of whom was the Chief of the VVS-KA, Army Commander second rank Ya. I. Alksnis – he had arrived at Yeysk unannounced in order to carry out an inspection.

Lukyanov's total flying time in U-2s during his first year of training was 42 hours, with 188 landings. Flying practice in Polikarpov R-5 reconnaissance biplanes followed, and his total flying time at the school in all types was 97 hours, with 425 landings. After graduation Lukyanov was recommended for service in naval fighter aviation. Having mastered the Polikarpov I-5 single-seat biplane fighter, Polikarpov UTI-4 two-seat *Rata* trainer and the I-16, and having flown some night sorties, Lukyanov felt confident in a fighter cockpit.

But things changed significantly when, in the late 1930s, the USSR started to increase the size of its armed forces in readiness for the future 'great war'. These changes affected the VVS-KA also. As before, primary training took place in flying clubs, with the slogan of the time being 'We must give ten thousand airmen to our Motherland!' The flying clubs began to receive State support and, together with those volunteers who dreamt of becoming pilots, many others entered flying schools who were sent there as so-called 'special conscriptions'. This programme was established with the sole aim of getting Young Communist League members into aviation. Many of them became brilliant pilots, but for the majority it was a waste of time. In this the VVS-KA was unique, as conscription of flying crew was not practised anywhere else in the world.

After exams in the flying club, the graduates who had passed the selection process were sent for secondary training in the flying schools. In the mid-1930s the cycle of pilot training lasted about two-and-a-half years, but in the spring of 1941, because of the efforts to enlarge the VVS-KA, it was shortened as much as possible to one-and-a-half years. To expedite the tuition of pilots, primary training schools that ran courses lasting just four months were created, together with secondary training schools that undertook ten-month terms. The primary schools were intended for trainees who had graduated from the flying clubs. The shortening of flying training by a full year immediately lowered the professional skills of pilots reaching the frontline. In addition to courses being truncated, training was much simplified and aerobatics were eliminated in an effort to reduce accidents.

Students from a VVS-KA flying school pose alongside a UT-2M trainer designed under Aleksander Yakovlev's leadership. No fewer than 7,243 examples of the aeroplane were built in five factories between 1937 and 1946, with the M (modernized) version being introduced in 1941 in an attempt to improve the UT-2's handling and stability.

It would be a mistake to say that all Soviet fighter pilots in the summer of 1941 were inadequately trained conscripts. There were of course combat-seasoned aviators who had fought in the Spanish, Khalhin-Gol and Winter wars, but their number was insignificant in relation to the total numbers of aircrew recruited during that pre-war year. In 1938 the VVS-KA consisted of 194,900 personnel. Two years later the total was 291,200, and in the summer of 1941 this figure had reached 530,000 – a three-fold growth factor.

As the size of the VVS-KA grew, pilots were dealt a terrible blow to their prestige with the issuing of an order by People's Commissar S. K. Timoshenko on 22 December 1940. Titled 'About the changes in the order of progression in the military service for junior and middle-rank commanding staff of the Red Army Air Force', it stated that from then on graduates of flying schools were to be assigned the rank of sergeant, rather than lieutenant or senior lieutenant as had previously been the case. Airmen whose term of service was less than four years were obliged to live in barracks, and their supplies and salary were reduced accordingly. This had an adverse effect on the fighting spirit of aircrew within the VVS-KA, who, just sixth months after the issuing of this decree, would find themselves locked in an uneven struggle for survival with the Luftwaffe as they attempted to defend the USSR from invasion.

GERMAN PILOT TRAINING

In Germany, special attention was paid to the training of aircrew. When Hitler came to power in 1933 the nation had nearly 2,000 airmen that had combat experience from World War I. Now, youths aged from 12 to 16 were attracted to service in the re-born Luftwaffe via the aeromodelling schools, where they learnt elementary gliding and basic flying theory. The National Socialist Flying Corps was duly created to cater for their needs. At the age of 18 young men entered the aviation training regiments,

Fw 44 biplane trainers sit on the flightline at a Luftwaffe training base. Known as the Stieglitz ('Goldfinch'), the Fw 44 was produced by Focke-Wulf as a pilot-training and sport-flying aircraft from 1932.

where for two to three months they were drilled and given basic ground training. There were normally up to 1,000 trainees in each regiment.

After graduation the trainees were sent to the Airmen Candidates' schools (A/B schools), where, for six to nine months, they were trained in the basics of aviation and completed 100–140 hours of flying training. Permission to fly solo was granted after 50–60 landings and a minimum of five flying hours' practice with an instructor. Experienced instructors trained up to 12 students simultaneously, and every school was passing out 350 airmen a year.

After graduation from A/B school the trainees were granted a military airman's certificate, on which all subsequent examinations passed by the pilot were recorded. The airmen were then distributed according to their assigned speciality. Future single-engined fighter pilots were transferred to the fighter schools, which normally had three detachments of 60 trainees each. The first such school was organized in Schleichsheim, near Munich, and housed in the oldest aviation workshops on the airfield. These had been erected by the Royal Bayerische Air Corps, founded there in 1912. The school was equipped with Arado Ar 68s, Heinkel He 51s and Bücker Bü 131s, as well as other aircraft types, and some Bf 108s and Bf 109Bs were subsequently added. Later, another school was created in the small town of Vehrnhoyn, in the east of the country.

Many students, along with their main training, studied blind flying and navigation. Some air combat schools, the first of which was established in Dresden, honed the special skills needed to destroy enemy aircraft. The network of different schools covered the whole Reich territory by the time Germany invaded Poland in September 1939. As a result, at the outbreak of war the Luftwaffe had up to 25,000 well-prepared aircrew, of whom approximately 12,000 were pilots.

Primary training of recruits conscripted to serve in the Luftwaffe was carried out in 23 air force training regiments and two naval aviation battalions. Those young men who decided to become pilots, and whose health, education and other qualities were deemed suitable, were sent to flying schools. For advanced aircrew training the Luftwaffe had 21 pilot schools, ten combat schools and two aircraft technician schools.

MIKHAIL DMITRIEVICH BARANOV

With 13 Bf 109s destroyed to his name, Mikhail Baranov was one of the most successful early Yak aces. Born in Gorki, near Leningrad, on 21 October 1921, he had learned to fly with his local aero club and then joined the Red Army in 1938. Graduating from the Chuguyevsk Military Aviation School two years later, Baranov eventually joined 183rd IAP in early September 1941 when the unit formed in the Odessa Military District. Initially lacking aircraft, the regiment withdrew to the Volga, where it received both MiG-3s and Yak-1s, before returning to the front in mid September.

There is some confusion as to which type of fighter Baranov flew into action during his first few months in combat, with some sources stating that he downed six enemy aircraft in the MiG-3 prior to swapping to the Yak-1 in January 1942. Baranov's first success (probably in a MiG-3) came on 22 September when he destroyed a Bf 109 and a Henschel Hs 126 artillery spotting aircraft. A few days later it was his turn to be shot down, taking to his parachute after being wounded in the leg. Baranov landed behind enemy lines, and he spent the next two weeks evading capture (he even shot a German soldier) until he could escape into friendly territory.

On 8 November Baranov was returning from a ground-strafing mission when he saw another Hs 126. Initially gaining altitude, he then dived at the Henschel and shot it down before escorting fighters were alerted to his presence. As he recovered from his attack, Baranov spotted a flight of four Bf 109s nearby. Feeling it was his lucky day, he decided to take a chance. If he could take them by surprise, he might be able to steal up on one, shoot it down and dive away before the others could react. He was not able to escape so easily, however, for after shooting down the first Bf 109 Baranov's fighter was damaged before he could break off and return home.

He was forced to take to his parachute once again on 24 December when his aeroplane was set on fire during yet another dogfight.

183rd IAP had replaced all of its surviving MiG-3s with Yak-1s by January 1942, and it was in this type that Baranov was to score the bulk of his 24 aerial victories. Having been made a flight commander at around the same time, Baranov was a 20-victory ace (he had also destroyed six enemy aircraft on the ground) when 183rd IAP was committed to the bitter fighting on the Stalingrad front in mid-July 1942.

On 6 August, while escorting Il-2s from 226th ShAD over Kotel'nikovo, Baranov led his section of four Yak-1s in an attack on a formation of 25 Bf 109s and Ju 87s. He attacked and shot down the fighter leader, and then found a second Messerschmitt on his tail. Turning inside his pursuer and diving away, Baranov then saw seven Stukas attempting to bomb Soviet troops positions, and he quickly shot one of them down. On the return flight, he spotted a gaggle of five Bf 109s stalking a battle-damaged Ilyushin that had dropped out of formation. Baranov attacked, shooting down one of the German fighters before running out of ammunition. Giving little thought to his own safety, Baranov struck the tailplane of the fighter with his starboard wing. The Messerschmitt turned belly-up and spun into the ground. Baranov bailed out moments later, seriously injuring his leg in the process. According to Soviet records, on that day, in the vicinity of Abganerovo railway station, the airmen of 183rd IAP downed four Bf 109s and one Ju 87 for the loss of two Yak-1s. As a reward for his bravery during this mission Baranov was made a Hero of the Soviet Union on 12 August and promoted to captain.

In October 1942 he became deputy CO of 9th GIAP, despite suffering continuing medical problems following his August ramming attack. In mid November he almost crashed as a result of in-flight leg cramps, and he was sent to hospital for treatment and recuperation. Baranov did not return until 15 January 1943, and 48 hours later he attempted to demonstrate his fitness for combat by performing a series of aerobatic manoeuvres in a Yak-1. The aircraft soon fell into a spin, however, and exploded when it hit the ground, killing Baranov. His final score was 24 individual victories achieved in 285 missions and 85 combats. He also destroyed six aircraft on the ground.

HERMANN GRAF

Typical of the high-scoring *experte* who inflicted mind-boggling losses on the VVS-KA in 1941–42, Hermann Graf was credited with the destruction of no fewer than 35 Yak-1/7s between 13 September 1941 and 26 September 1942 (the latter represented the 202nd victory in his tally of 206 kills).

Born on 24 October 1912 in Engen, in the Grand Duchy of Baden near the German–Swiss border, Graf was the son of an artillery soldier who had been awarded an Iron Cross in World War I. Fascinated by football and flying as a youth, Graf flew a homemade glider with the Engen Glider Club prior to being accepted into the newly created Luftwaffe in mid 1936. Although initially deemed to be too old for fighters, Graf was fortunate enough to be posted to I./JG 51 in May 1939 because of a chronic shortage of officers in the Jagdwaffe at that time. Unsurprisingly, having received no fighter training (Graf had been selected for transports because of his age), the future ace crashed his Bf 109E at the end of his first flight in the aeroplane.

Despite completing 21 combat sorties during the early months of the Phoney War, he was still considered to be an unreliable pilot by senior officers in I./JG 51. Graf was duly transferred to the *Ergänzungs-Jagdgruppe Merseburg* (a supplementary training unit stationed at Merseburg) in January 1940, where he provided newly trained fighter pilots from the fighter pilot schools with combat experience as an instructor. He eventually succeeded in securing a posting to III./JG 52 in October 1940 after his former CO at the *Ergänzungs-Jagdgruppe Merseburg*, Major Gotthard Handrick, joined the unit as its new *Gruppenkommandeur*.

Accompanying III./JG 52 to the Eastern Front, via Rumania and Greece, Graf finally claimed his first victory on 4 August 1941 near Kiev – his first Yak kill came nine days later. Within little over a year he had scored so many aerial victories that he was wearing the Diamonds to the Knights Cross (awarded on 16 September 1942 for 172 aircraft destroyed). Graf was one of only seven day-fighter pilots so honoured, having become the first aviator in the world to score 200 aerial victories. By now a national hero, the one-time apprentice blacksmith was able to indulge his life-long passion for football. Graf formed his own team, 'The Red Hunters', and whenever he was posted to a new unit he ensured that his star players accompanied him!

In 1943 Graf served another spell in training command, before heading specialist units JG(r) 50 and JG 11 in Defence of the Reich duties. This netted him ten heavy bombers before he returned to JG 52 in the East in October 1944, this time as *Geschwader Kommodore*. By war's end Graf had amassed a total of 206 aerial victories.

It was during the immediate post-war years of Soviet captivity that the pragmatic Graf's actions contributed to his downfall – despite ending the conflict as CO of the world's most successful fighter unit in terms of aerial victories, Graf's name is little known to all but a few. Unlike others, such as the redoubtable Erich Hartmann, Graf cooperated – some say collaborated – with his captors. After his release in 1950 and return to West Germany, Graf was ostracized by most of his former comrades. Although many subsequently mellowed in their old age, Hermann Graf was fated to remain something of a 'non-person' in Luftwaffe history. He died in his home town of Engen in November 1988, aged 76.

Luftwaffe student pilots practise formation flying in Arado Ar 96A trainers. Used for advanced, night and instrument flying training, the Ar 96 was a single-engine, low-wing monoplane of all-metal construction.

Their numbers grew constantly during the war. During the early years of the conflict the flying capabilities and personal qualities of the trainees dictated whether they would fly fighters, bombers, reconnaissance or transport aircraft. Further training at the schools would follow according to their specializations. Potential officers were selected from the best *oberfendrichs* (trainees), such individuals being educated in four special air force schools and two academies, namely air force and technical.

For operational and tactical aircrew training, the Luftwaffe had both combat training schools and combat training fleet groups. The latter had special detachments for fighter pilot training that were designed to bring the novice aviators up to operational level. In late January 1942 the fighter combat training detachments were concentrated in Krakow, where they were part of the East replacement fighter group (*Ergänzungsjagdgeschwader*). At different times this organization was led by aces Hauptmann Hubertus von Bonin and Majors Hermann Graf, Victor Bauer and Werner Andres. Special attention was paid to tactics and the techniques employed by the VVS-KA, as the East group specialised in the preparation of pilots particularly intended for combat on the Soviet–German front.

The concentration of all fighter training in a single *Ergänzungsjagdgeschwader* was a significant departure from the training regime that had been in place since the 1930s. Previously, a pilot, upon the successful completion of his formal training programme, would be posted to the subordinate *Ergänzungsgruppe* (replacement wing) of the particular frontline unit he was scheduled to join. Instead of each *Jagdgeschwaderen* operating what was, in effect, its own personal operational training unit to prepare its newly assigned pilots for frontline combat, henceforth this task would be taken over by the official *Ergänzungsjagdgeschwader*, a unit intended to supply the entire fighter arm with combat-ready pilots.

This new EJG was divided into two *Gruppen*, 'East' and 'West', and these in turn were composed of a number of *Staffeln*, each of which was responsible for supplying the requirements of a particular *Jagdgeschwader*. Frontline pilots from these *Jagdgeschwader* were rotated back to their specific *Ergänzungsstaffel* to help prepare the trainees for the conditions they would face when posted forward to their operational unit.

Although the basic training programmes were gradually curtailed as the war progressed (a result of the growing demand for quick replacements, allied to declining fuel stocks), the *Ergänzungs* system continued. The frontline pilots did what they could with the ever more youthful and sketchily trained material passing through their hands, but the outcome was predictable. In the face of overwhelming enemy strength, many young pilots, however eager and willing, failed to return from their first mission.

Comparative analysis shows that between 1939 and early 1942 (when the new *Ergänzungsjagdgeschwader* was introduced) German aircrew training was superior to

that in both Great Britain and the USSR. The average flying time accrued by a German pilot was around 230 hours during this period, of which approximately 80 hours were spent in a fighter cockpit and 30 to 40 hours flying training aircraft at the fighter aviation school. In the training programmes the combat experience accumulated by pilots in the Spanish Civil War and during the course of the conflict in Western Europe was analysed and considered.

After allocation to a combat unit a pilot did not go into battle at once, but was kept in the reserve group, where, under the supervision of instructors with good dogfighting experience, he continued to perfect his skills in air fighting and aerial gunnery. Only after this was a decision made regarding his combat readiness. It should be stressed that, by this time, the Germans did not consider it necessary to put a specialized two-seat combat trainer model of the Bf 109 into production, as the basic aircraft was rather simple to master and the average trainee was well prepared before he climbed into the cockpit of the frontline fighter.

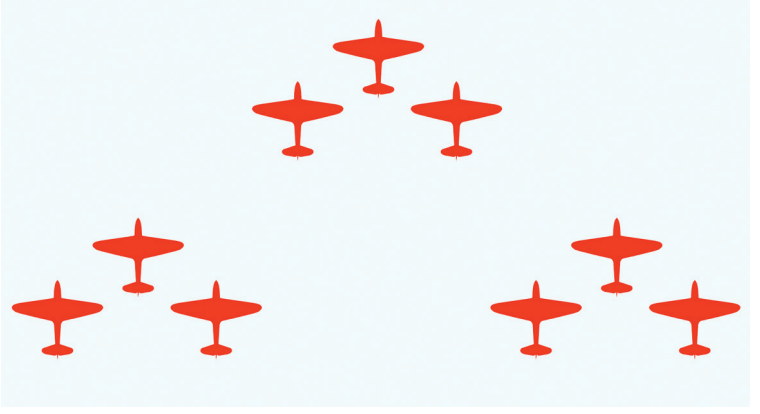
Continual and intense fighting on the Eastern Front, as well as on the other fronts, caused a considerable growth in the number of losses suffered by the Luftwaffe's fighter force. The intelligence section of the VVS-KA HQ assumed that, at their flying schools' normal output rate, the Germans would not be able to replace them. Thinking wishfully, a document they produced on the eve of the 1941 invasion stressed:

> In order to replace the losses [following the invasion of Western Europe and the Battle of Britain] quickly, the German command was forced to disregard the training syllabus and the methods of training aircrew. Belgians, Frenchmen, Czechs, Croats and men of other nationalities who previously were not allowed into the air force began to be inducted. Aircrew candidates did not become NSDAP or *Hitlerjugend* members, and the training periods were shortened dramatically. However, although this increased the monthly output from the air force schools to 1,200 pilots and 2,600 technicians, combat units started to be replenished with inexperienced, badly prepared pilots.

In contrast to Soviet aviators, by the summer of 1941 all of the Luftwaffe pilots were carefully selected volunteers. When a young pilot arrived at his combat unit he had amassed 230 flying hours and, moreover, had mastered the skills of solo and formation aerobatics, instrument flying, etc. The young airmen were also trained to handle aircraft in emergency situations and forced landings. Much attention was paid to solo and group dogfighting skills, as well as shooting at ground targets. Up to early 1942 the German pilot training system was one of the best in the world.

COMBAT TACTICS AND ORGANIZATIONAL STRUCTURE

The Luftwaffe was also superior to the VVS-KA with regard to tactics, which German units had developed after thorough analysis of combat experience in Spain. Fighters operated in free formations of pairs and fours, and these became the principal tactical fighter formations used globally throughout World War II. The previous vee formation,



VVS-KA close vee fighter wing formation.

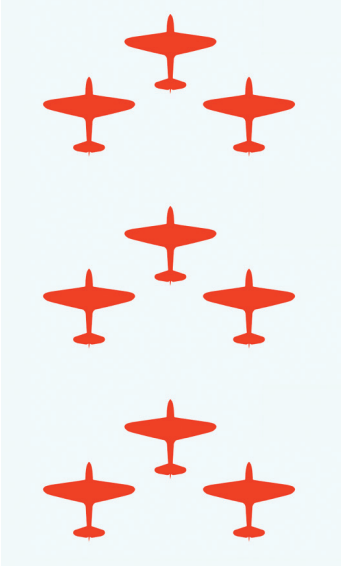
or vic, of three aircraft, which made combat manoeuvring difficult, was dropped, and the new formations gave German pilots the flexibility to exploit the superiority in speed that their aircraft possessed.

Contrary to this, Soviet fighter pilots in 1941 were flying in tight three-aircraft formations. This added a solid tactical advantage to the superiority already possessed by the German pilots thanks to the better technical characteristics of their aeroplanes.

The Soviet fighter pilots flew in close formations because most of their aircraft lacked radios. Consequently, the leader had to direct his formation in a dogfight by using his aircraft (rocking its wings), or by hand signals. To see this clearly the wingmen had to fly as close to the leader as they could, thus losing the ability to manoeuvre freely. Moreover, in the Luftwaffe, the independence and initiative of commanders at all levels was cultivated and stimulated. The German pilot was free in his choice of methods to fulfil a task. Soviet pilots could only envy their opponents. Before a sortie they were not only limited to a strict area of action, but they were even told the speed and altitude at which they would fly. Under such conditions they could not react rapidly in a quickly changing situation.

It should also be remembered that, during the first half of the war, Soviet aviation units were in most cases directly subordinate to the commanders of land troops. Most army HQ officers had little understanding of the specifics of air combat. On many occasions groups of fighters covering the men on the ground were ordered to fly low and slow for the longest possible time, 'so that our soldiers can constantly see our aviation overhead and feel more self-assured', and this increased losses. Flying under such conditions made Soviet aeroplanes very vulnerable to marauding German fighters, who attacked from higher altitude at high speed.

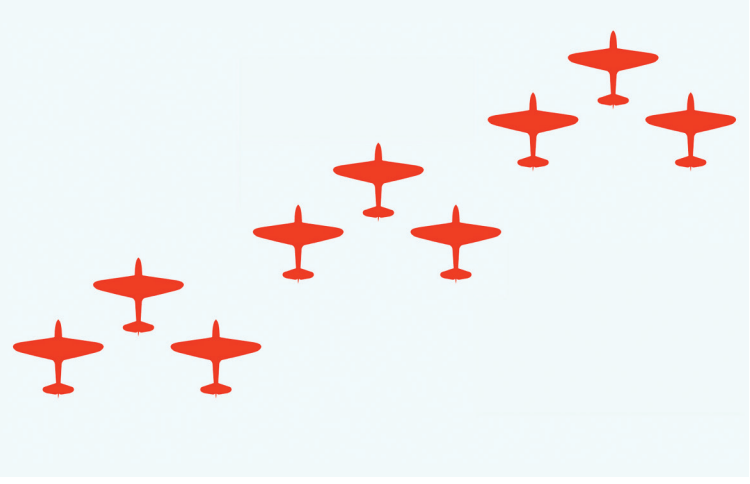
VVS-KA column fighter wing formation.



Another major contribution to the superiority of the Luftwaffe fighters over their Soviet opponents in the initial stages of the war was the considerable amount of experience accumulated by German pilots and commanders during two years of hard aerial combat, mainly against France and Great Britain. In the USSR, experience gained in pre-war conflicts was mainly ignored. The main fighter types, the I-16 and I-153, were substantially inferior to their Messerschmitt counterparts in speed and vertical manoeuvre, which put even well prepared Soviet pilots at a disadvantage. These and other factors were the cause of severe defeats and the high loss rate suffered by the VVS-KA in the initial war period.

At the time the war against the USSR began, the German high command treated the air force as an independent armed force. The highest homogenous tactical fighter unit was the *Luftflotte*. As a rule, every *Luftflotte* consisted of three combat *geschwader*, the *Luftflotte* HQ, a HQ detachment and a

Communication Company. The reserve (training) units included in the *Luftflotte* were based at rear airfields away from the frontline. A single *geschwader* consisted of three *gruppen*, the HQ element and a Technical Company (manned by specialists who carried out minor repairs and servicing of aircraft, engines, instruments and weaponry). The standard number of fighters in a *gruppe* was 39.

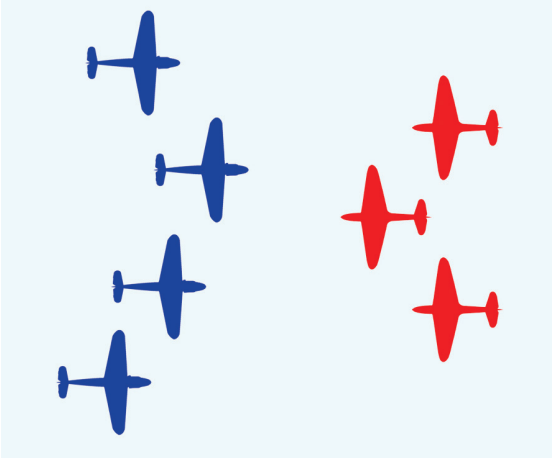


VVS-KA echelon fighter wing formation.

In the late 1930s the Soviet leadership had embarked upon a massive expansion of aircraft construction, envisaging in 1938–42 a growth in the number of aeroplanes delivered, the building of new training centres and an enhancement of the aviation forces' destructive power and tactical mobility. On the eve of war with Germany the decision was taken, based upon combat experience from Spain and China in 1938, to introduce a regimental structure to the VVS-KA. In the fighter aviation organization a regiment consisted of four squadrons and a command element – 63 aeroplanes in total. An air regiment was intended to solve combat tasks both on its own and in cooperation with other units (initially within an Air Brigade and then within an Air Division). This improved the interaction between different kinds of aviation units and between aviation and land forces.

The battles with the Luftwaffe from 22 June 1941 were bloody and cruel from the outset. The VVS-KA suffered severe losses, with large number of aircraft in the vicinity of the border being destroyed on the ground, having had no chance to take off. It was clear that the organizational structure of the air force had to be changed. The pre-war regiments were considered too cumbersome, and the commanders, who were mostly young, were too inexperienced to manage them in combat manoeuvres. With the aim of simplifying the organizational structure, a change to 20-aircraft regiments was made. High aircraft losses and an insufficient number of new fighters coming from the aviation industry led to a great shortage of aircraft in the units.

Typical formations adopted by VVS-KA Yak-1/7 and Luftwaffe Bf 109 units when entering a dogfight.



There was also an urgent need to speed up the retraining of aircrew to operate new aircraft types because production of obsolete fighters had been terminated. Therefore, in accordance with a State Defence Committee decision, the creation of auxiliary air regiments (ZAPs) was begun in order to better prepare pilots for combat. Unfortunately, the pilots' mastering of the new Yak fighter took longer than desired. It was planned to retrain 468 pilots onto the Yak-1 in the first half of 1941, but only 156 had completed the task up to

296th IAP squadron leader and future 23-victory ace Capt Boris Yeremin became famous in the VVS-KA after a successful air combat on 9 March 1942 that saw him lead six Yak-1 fighters against 27 enemy aircraft – seven German aircraft were reportedly shot down. Yeremin is seen here strapped into the cockpit of a Yak-1B paid for by collective farmer and beekeeper Fedor Golovaty in late 1942. The inscription on the fighter states, 'To the pilot of the Stalingrad Front, Guards Maj Yeremin, from the collective farmer of the "Stakhanovets" collective farm, comrade Golovaty'.

20 June. In comparison, 686 pilots had been retrained for the MiG-3 – 4.4 times as many. Moreover, of the ten initial ZAPs deployed at airfields deep in the rear, only one, 8th ZAP at Bagay-Baranovka, to the southeast of Saratov, was training pilots and technicians for Yak-1s. Conversion to Yaks was also underway in the Moscow suburbs of Kubinka, Monino and Chkalovskaya, and at the airfield of Plant No. 292 at Sennaya, near Saratov. In August 1941 the large 13th ZAP was formed at Kuznetsk. Initially specializing in converting pilots onto the Yak-1, it later became a centre for studying the Yak-7 and Yak-9.

The creation of the Yak-7 fighter trainer, which possessed similar flying characteristics to the Yak-1, as well as the simplicity of flying the latter (especially when compared with the I-153 and I-16, which had neutral stability), enabled experienced pilots to master the new Yakovlev fighter very quickly. This meant that some regiments retrained on the new machine in the frontline, as was the case with 296th IAP on the Southwestern Front. Stressing that he liked the new fighter for its good balance of speed, manoeuvrability and weaponry, regiment squadron leader and future 23-victory ace Boris Yeremin wrote:

> For retraining we were given the sole Yak. It was in the hangar on the airfield, and the hangar was, in fact, our classroom. Neither posters nor drawings were ready yet. The classes were taught by engineers. Before being admitted to a training flight, every pilot had to pass a test near the grounded aircraft. The test was agreed by regiment commander N. I. Baranov, who insisted that the examiners pampered no one. The retraining concluded with every pilot making a solo sortie in the Yak-1. We flew around the 'box', making three turns and then landing. There were not enough aeroplanes for retraining, so we had no chance to do any aerobatics. Therefore, I could not get as familiar with the aircraft as I would have liked. We continued to master the aeroplane during the flight to the frontline, where we went directly into combat. Engine life had to be conserved en route for future fighting at the front.

Massive pilot losses forced the Soviet command to speed up sending the young replacements to the front. The pilots' training now consisted primarily of elementary takeoffs and landings, which were refined until these actions were automatic – all other elements were considered secondary. As a result, young pilots with eight to ten hours of flying time in a combat aircraft, sometimes in a completely different type (Yaks were not supplied to training units until late 1942), were sent to units in the frontline regiments. They were often literally taught only how to hold the control column. They were not capable of performing aerobatics, had no dogfighting skills and knew nothing about flying in adverse weather. Their aerial gunnery training was

also virtually non-existent. Most flying school graduates had only shot at a towed drogue two or three times, and they could not use a gunsight properly.

In some spots on the Soviet–German frontline during 1942, where the most severe battles raged, Luftwaffe aces inflicted great damage on the VVS-KA regiments. On each sortie Bf 109 *experten* often destroyed multiple Yak-1s, MiG-3s and LaGG-3s, which formed the backbone of the Soviet fighter force by the summer and autumn of 1942. Messerschmitt pilots loitered in the vicinity of Soviet airfields, bringing down the aircraft when they were taking off or landing. They also accompanied the groups as they returned home, waiting for the formation to disperse for landing and shooting down the Soviet fighters in sudden attacks out of the blinding sun. Their victims were usually poorly trained pilots fresh in the frontline.

During the early months of the campaign in the East Bf 109 pilots were given the freedom and flexibility to exploit the superiority in speed that their aircraft possessed. However, by the spring of 1942 the VVS-KA had grown in strength to such an extent that German bomber formations now needed close escort when targeting enemy positions, thus reducing the effectiveness of the fighter force. This Bf 109F of I./JG 51 has been tasked with protecting a Ju 87D of *Stukageschwader* 2 during the late summer of 1942 on the Vyazma Front.

From the previous testimony of Boris Yeremin, it can be seen that the conditions under which novice fighter pilots were initiated into to the VVS-KA in 1942 were far worse than those experienced by the enemy's tyros. He continued:

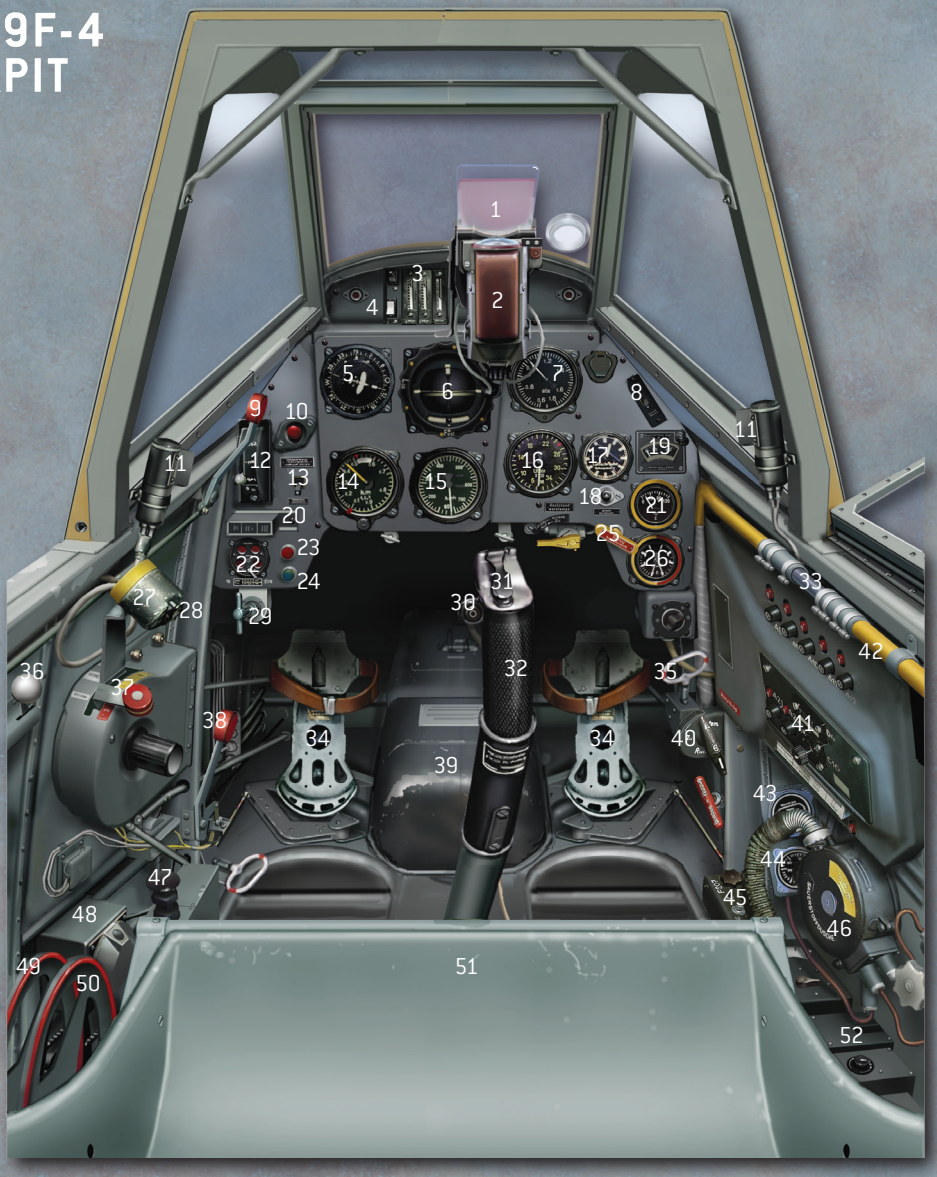
> The most tragic fate befell the young replenishment pilots who found themselves near Stalingrad in the summer and autumn of 1942. In 1941 our numbers were replenished mainly by a 'golden fund' in the form of instructor pilots from flying schools and numerous flying clubs. In terms of flying ability, they were very well prepared. Many of them had brilliant piloting skills. They quickly gained combat experience and would become perfect fighter pilots. There were many such pilots among the veterans, but this 'golden fund' rapidly faded away. In 1943 we were also replenished with young men. But by then they were much better trained, and the situation was quite different. We had the opportunity to give these young airmen some additional preparation before including them in the combat groups, bearing in mind the individual training level of every novice. Near Stalingrad there was no such opportunity. The only thing the commander could do was to give them some extra sorties to improve their piloting skills, but it was far from enough.

These circumstances serve to explain why the ratio of victories to losses was so bad for the VVS-KA, and they apply to any type of Soviet fighter of that period, including both the Yak-1 and Yak-7B. Nonetheless, until the Lavochkin La-5 fighter appeared in frontline service, a Yak fighter flown by a pilot with good flying skills and tactical training was a serious opponent to the formidable Messerschmitt. Such merits of the Yak-1 and Yak-7B as simplicity, reliability, easy and prompt exit from an unpremeditated spin and powerful cannon and machine gun armament were prime factors in making these aircraft effective challengers of Willi Messerschmitt's celebrated Bf 109.

Yak-1B COCKPIT

1. Control column
2. Seat vertical position adjustment handle
3. Pilot's seat
4. Armoured windscreen
5. Tailwheel locking system
6. Electrical system control panel
7. PBP-1A gunsight
8. Cabin ventilation control lever
9. Elevator trimming handwheel
10. Fuel flow valve
11. Exhaust gases valve handwheel
12. Rudder pedals
13. Airscrew pitch control handwheel
14. Cannon manual rearming cable
15. Oil cooler shutter control handwheel
16. Cabin ventilation
17. Emergency oxygen bottle valve
18. Exhaust valve
19. Throttle
20. Engine power boost control lever
21. Bomb release lever
22. Engine supercharging lever
23. Undercarriage Up/Down light
24. On/Off switch for undercarriage Up/Down light
25. Undercarriage emergency extension handwheel
26. Gun-firing levers (UBS machine guns (top) and ShVAK cannon (bottom))
27. Emergency locking lever for undercarriage (when extended)
28. Water cooler shutter control handwheel
29. Engine oil injection system handle
30. KPA-3bis oxygen system
31. Pump for KPA-3bis oxygen system
32. Main electrical switch
33. Signal flares in rack
34. Three-parameter instrument (oil temperature, oil pressure and fuel gauge)
35. Angle-of-bank indicator
36. Volt amp meter
37. Undercarriage position control lever
38. Locking lever for undercarriage
39. Spark plug activation/test switch
40. Manual rearming handle for UBS machine guns
41. Compressed air pressure gauge
42. US-800 airspeed indicator
43. Altimeter
44. Gunsight lighting adjustment control
45. KI-10 compass
46. Weapon arming system pressure gauge
47. Tachometer
48. Takeoff/landing instructions data plate
49. Clock
50. High-pressure gauge
51. Undercarriage extended/retracted lights
52. Engine temperature gauge

Bf 109F-4 COCKPIT



1. Revi C12D reflector gunsight
2. Gunsight pad
3. Ammunition counters
4. Armament switch
5. Repeater compass
6. Artificial horizon/turn-and-bank indicator
7. Manifold pressure gauge
8. Tumbler switch
9. Canopy jettison lever
10. Main light switch
11. Instrument panel lights
12. Ignition switch
13. Start plug cleansing switch
14. Altimeter
15. Airspeed indicator
16. Tachometer
17. Propeller pitch position indicator
18. Fuel warning lamp
19. Combined coolant exit and oil intake temperature indicator
20. Starter switch
21. Fuel gauge
22. Undercarriage position indicator
23. Undercarriage retraction switch
24. Undercarriage extension switch
25. Undercarriage emergency release lever
26. Oil and fuel content gauge
27. Throttle
28. Propeller pitch control
29. Dust filter handgrip
30. Bomb release button
31. Gun firing trigger
32. Control column with KG12A grip
33. Drop tank flow control tube
34. Rudder pedals
35. Radiator cutoff handle
36. Ventilation control lever
37. Oil cooler flap control
38. Fuel cock lever
39. MG 151/20 cannon breech cover
40. Radiator shutter control lever
41. FuG 16ZY radio control panel
42. Drop tank pipe
43. Oxygen supply indicator
44. Oxygen pressure gauge
45. Radio controls
46. Oxygen supply
47. Fuel injection primer pump
48. Tailplane incidence indicator
49. Undercarriage emergency lowering handwheel
50. Tailplane trim adjustment handwheel
51. Seat
52. Radio tuner panel

COMBAT

Capt Mikhail Avdeyev, squadron commander of 32nd IAP of the Black Sea Naval Air Force, in the cockpit of a Yak-1. On 30 September 1941 he shot down the Bf 109E-7 flown by Unteroffizier Julius Dite over the Crimean peninsula, and he brought down another Bf 109 two days later. Made a Hero of the Soviet Union on 14 June 1942, Avdeyev would survive the war with 18 victories to his name, nine of them being Bf 109s that he destroyed whilst flying the Yak-1/7.

The tactics employed by the Soviet fighter forces were defined by the Combined Arms command. The primary combat activities of the VVS-KA were the support of ground troops and the protection of potential targets in the rear. Pilots of frontline fighters spent approximately two-thirds of their time fulfilling these tasks. Several types of coverage were provided for ground troops; the most widely used in 1941–42 (more than 90 per cent of all sorties) was patrolling. The command reasoned that the reliability of coverage depended, first of all, upon the number of patrolling aircraft involved.

Normally, the orders for the day were sent to the regiment from the higher HQs, and after that the schedule of sorties for every combat-ready crew was worked out. The assigned patrolling area was broken down into rectangular sub-zones of 10 x 20km (6 x 12 miles), and a patrol was sent to every sub-zone. The composition of the patrol depended upon the Soviet forces present, and on the enemy's supposed actions. It usually consisted of pairs or elements, but sometimes a whole squadron – the main tactical unit of fighter aviation – went on a patrol. During this period the fighters patrolled in close formations, which restricted manoeuvring and made it harder for the

flight leader to direct a dogfight. He had to devote all of his attention to leading his group, rather than searching for the enemy. When they engaged the enemy the combat formation was broken up after the very first attack, and the fighters' subsequent actions usually became disorganized.

In the initial stages of the war the VVS-KA's inability to direct the flights from the ground, coupled with the lack of on-board radios in the majority of fighters, made it harder to control the groups once they were in the air. In addition, the delay in conveying information from the ground observation posts regarding the arrival of enemy aircraft gave the groups little chance to prepare for dogfights. The desire of ground force commanders and higher command to have the patrols constantly in sight deprived flight leaders of the ability to use their initiative and control manoeuvres. Moreover, it was a long time before forces could be increased during a dogfight, and as a result the Soviet patrols were obliged to engage in air combat despite invariably being outnumbered.

Completely different tactics were employed by the enemy. The Luftwaffe provided patrols of Bf 109s at different altitudes overhead advancing Wehrmacht forces, but this coverage was supplementary. Much more frequently, German fighter pilots set off well ahead of ground troops to intercept Soviet aircraft as they scrambled from their airfields. They would also routinely ambush VVS-KA formations as the latter attempted to reach the frontline to support Red Army units under attack by the Wehrmacht. Bf 109 pilots were also free to seek out the enemy. The latter method worked well throughout the war, but was most widely used in 1942 when supporting intensive ground operations. These 'hunters' inflicted heavy losses on the VVS-KA, and their presence created a sense of uncertainty, of the hopelessness of the situation, and of the total superiority of the enemy's aircraft, especially among young and poorly trained pilots.

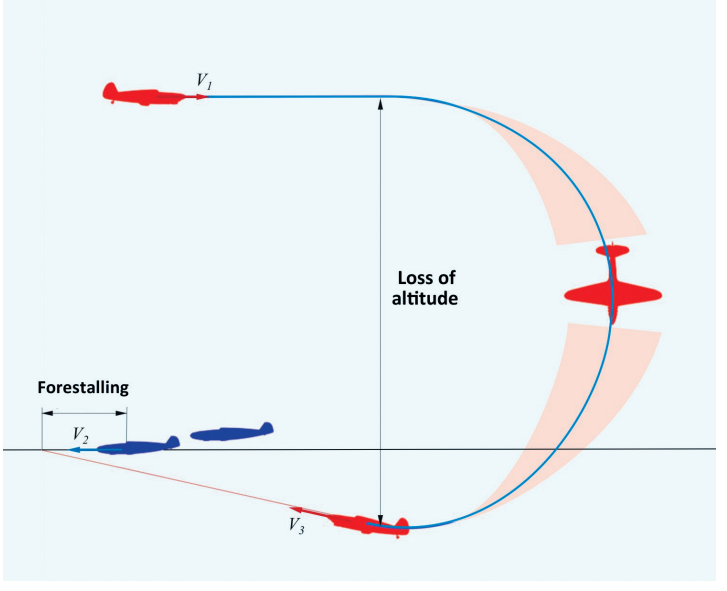
Just as important as the protection of ground troops was the provision of other combat activities. Apart from the initial and especially difficult months of the war, Soviet fighters regularly escorted bombers and assault aircraft en route to and over their targets. This was a demanding and dangerous job, as enemy aircraft could suddenly attack the covering fighters, who would leave the bombers unprotected while they engaged their German counterparts. Additional enemy aircraft then targeted the bombers with relative impunity. This was a frequent occurrence in the early war period, when the enemy had numerical superiority. As they gained combat experience the pilots flying the protecting fighters divided their formation up into a group providing close coverage and a separate strike group flying much higher. The adoption of such a tactic increased the chances of preventing Bf 109s from reaching the bombers.

As the number of Yaks in frontline units grew, they began to be involved in such missions with increasing frequency. As a rule, the escort group was of squadron size or less; otherwise it became hard to control. The commander insisted that every pilot strictly kept his place in the escort, and, in the event of an enemy attack, did not stray far from the group or lose visual contact with his fellow pilots. At the group's speed of 350–400km/h (215–250mph), a complete turn took up to 25 seconds, and in this time a stray pilot could easily lose sight of his group.

German fighter pilots also escorted their own bombers and dive-bombers to targets, but they often passed the task of close defence to the air gunners of the He 111s, Ju 88s,

Seen here as an oberfeldwebel, Heinrich Füllgrabe was one of the acknowledged *Experten* of JG 52's famous 9. *Staffel* on the Eastern Front before his transfer back to the Reich. Having claimed 63 victories (including 14 Yak-1s) between 10 August 1941 and 10 February 1944, he was killed in action on 30 January 1945.

Major Hubertus von Bonin (right), 65-victory ace and *Gruppenkommandeur* of III./JG 52, presents the Knight's Cross 'in the field' to Feldwebel Alfred Grislawski, who finished the war with 127 victories to his name (including seven Yak-1s).



Typical VVS-KA fighter attack tactic when engaging enemy Bf 109 formation with the element of surprise.

Do 17s and Ju 87s while they endeavoured to engage the attacking Yaks in combat prior to them reaching the bombers. In addition, special 'fighter sweep' flights were sent to the target area beforehand to watch nearby airfields and prevent Soviet fighters from scrambling. These tactics proved effective, and the work performed by forward ground observers in reporting activity by VVS-KA units to Bf 109 pilots who were already on patrol usually helped the Germans avoid unpleasant surprises.

Although Soviet fighter units were hit hard during the early stages of the invasion, by late 1941 Yak-1s began to reach the frontline in increasing numbers. One high-scoring German ace to notice the difference in the aircraft he was now encountering was then Feldwebel Alfred Grislawski of III./JG 52, who would survive the war with 127 victories to his name (including seven Yak-1s):

> In the beginning the Russians were easy opponents as their biplanes were obsolete and their pilots often appeared frightened when they saw a German fighter approaching. But soon MiG, Yak and LaGG fighters flown by well-motivated pilots began to appear, and things gradually became more and more dangerous for us. They had very good aircraft that were lighter than ours and easier to handle.

Fellow III./JG 52 *experte* Leutnant Hermann Graf enjoyed great success against the Yak-1, although the first examples he encountered during the summer and autumn of 1941 proved to be worthy opponents. Indeed, on 14 October, he and his wingman, future 62-victory ace Unteroffizier Heinrich Füllgrabe (who downed 14 Yak-1s), fought an exhausting 30-minute action that almost cost them their lives. Attacking four Yak-1s head-on, Graf and Füllgrabe managed to quickly down two of them, only to then find that the Soviet flight leader was hell bent on avenging his fallen comrades:

> Füllgrabe is in deep trouble. The Russian flight leader proves to be most skilful. I rush to my wingman's assistance. The second Russian has had enough and disengages. I order Heinrich to get out of my way. And then the nicest and most dangerous air combat I have ever encountered starts. We wrung all that was possible out of both ourselves and our machines, flying wide loops with a radius of more than 3,000m [9,800ft] followed by sharp 180-degree turns, time after time. My body is soaked with sweat. My adversary is at least as good as I am. It's amazing how he repeatedly tries to outwit me. One sharp turn follows another. Over and over again, we meet nose-to-nose. Both fire our guns. He jumps over me at the last moment, and then he comes after me again. On one occasion we almost rammed each other.
>
> Suddenly, the second Russian fighter reappears. I have a few free seconds to fend off his attack. The Soviet wingman tries to escape in a dive. A quick glance backward tells

me that my main enemy is sitting on my tail, although at a distance of more than 400m [1,300ft]. So I open fire against his wingman. The Russian fighter is thrown upward, then it starts falling – and doesn't stop until it hits the ground. I must have hit him in the head. Füllgrabe informs me of this over the radio, as I have no time to watch.

Seeking revenge, the expert is clinging on to me. In the meantime, he has approached to a distance of 200m [650ft]. I dive to the deck. I quickly glance at the speedometer: 600km/h [370mph]. That's enough. Now, 'rise with the Daimler-Benz', and I reach an altitude of 1,200m [3,900ft]. Behind me, the Russian is at 1,000m [3,280ft]. It's a climbing race! We reach 3,000m [9,800ft]. Then we start circling again.

Wearing his Oak Leaves with Swords, awarded on 19 May 1942 for 106 victories, Oberleutnant Hermann Graf (second from right) relaxes in the company of three of his 9./JG 52 Knight's Cross NCO *Experten*. They are, from left to right, Oberfeldwebel Ernst Süss (65 victories, including 12 Yak-1s), Feldwebel Hans Dammers (103 victories, including 12 Yak-1s) and Oberfeldwebel Josef 'Jupp' Zwernemann (123 victories, including 16 Yak-1s). Only Graf survived the war.

Another ten minutes have passed. Each attack made by the enemy fills me with respect. This has to be their top ace. Fortunately, I have practised this kind of flying for years. Had it not been for this, I would already have been dead.

Heinrich Füllgrabe reports that he must leave. His aircraft is running out of fuel. Another five minutes, then my red warning lamp starts twinkling. That means I've got no more than 20 minutes' flight time left, and we are 50 kilometres [31 miles] behind the frontline. I ought to disengage, but my pride doesn't permit me to do so. That would give my adversary at least a symbolic victory. And, anyway, he is still on my tail, hunting me towards our own lines.

We start turning on each other again and come rushing head-on. During one of these nose-to-nose encounters, I try to turn past him instead of climbing above. By coincidence, he undertakes the same manoeuvre. We pass by each other with only a few metres left between us. Now what will he do? Will he let me pass by, and then turn around and give me the final hit? I never let him out of my sight. Then the incredible occurs. He continues flying to the east – and I to the west. I return literally on the last drops of fuel. During the landing my propeller stops.

My whole body is shivering as I climb out of the cockpit. What an enemy! I am hardly aware of the congratulations for my two victories. My head is filled with thoughts of the Russian fighter pilot. I would like to sit down and chat with him. He must be a nice fellow. I wonder what he might be thinking of me?

The Baltic Sea Fleet Air Force, operating in the defence of Leningrad alongside the VVS-KA, also began to receive Yak-1s and LaGG-3s in place of its I-16s towards the end of 1941. An early recipient of both types was 5th IAP-KBF (Red Banner Baltic Fleet), and amongst its pilots was future 28-victory ace Igor Kaberov. Although he initially flew the LaGG-3 exclusively, he switched to the Yak-1 in early 1942 when his fighter was damaged by another pilot. Kaberov's first flight in the aircraft was almost his last, as he was bounced by Bf 109s. Incredibly, he had been sent aloft to escort attack aircraft while still conducting his first cockpit check of the fighter on the ground! He hastily took off with fellow ace Capt Semyon Lvov (flying a LaGG-3) and

A Yak-1 of an unidentified Baltic Sea Naval Air Force regiment is refuelled during the defence of Leningrad. Flying alongside VVS-KA units in this theatre, the naval regiments began to receive Yak-1s and LaGG-3s in place of their I-16s towards the end of 1941. An early recipient of both types was 5th IAP-KBF (Red Banner Baltic Fleet).

headed for the ice highway over frozen Lake Ladoga – a critical supply route to Leningrad used by the Red Army: Kaberov recounts his experience:

'Let's go down', said Lvov and he rolled away. I intended to follow him, but on looking round noticed shadows in the blinding rays of the sun. I turned my head sharply to the side and now saw more clearly four Me 109s diving on me. Lvov had gone. He was already beside the group. I couldn't summon him for help. Of course, the enemy pilots would immediately discover the attack aircraft and pursue them. No, I must delay this group of Messerschmitts and, meanwhile, our aircraft would carry out the mission before them.

The sun prevented me from observing and aiming, and the enemy fighters were coming at me. There could be no doubt that they were about to open fire. It was impossible to get away; I couldn't dodge all four. Without thinking – when was there time to think? – I performed a barrel-roll. The Yak easily turned over. Surprised by the unexpected move, the Fascists swept over me.

Now this was what I had to do. With the sun clearly behind me, I now occupied an advantageous position and could see clearly. The enemy fighters divided into two groups. One pair came straight at me and the other circled to the side in order to attack from behind. Knowing that our group, having hit the target, would return this way, I tried to draw the Fascists away. This unequal battle lasted 20 minutes. At a suitable moment I attacked. One Messerschmitt started to smoke and fell away to one side. The three remaining were bedevilled by their lack of success. I had heard a little about the manoeuvrability of the Yak and I tried to conduct the fight flying vertically, as my friends had usually done. What a light machine this Yak was! My CO [Maj Aleksander Myasnikov] was right: it's not an aircraft – it's a dream!

From vertical flight (in which the Yak is an invincible machine), the Messerschmitts caught me on the turn. I pulled the stick towards me and the aircraft shuddered and shook all over as if in mortal danger of pulling out of the spin. Never fear, my friend, if that's the case, we'll die together! But there was a Fascist on my tail. Closer and closer he came. Crash! It felt as if a mallet had smashed into the rudder. The control column was torn from my hands. The aircraft turned over and went into a spin. From a height of 3,000m [9,800ft] it was swept earthwards and turned at such a speed that it seemed that my head would be torn from my shoulders.

Having failed to bring the aircraft out of its spin, I unbuttoned my harness and tried to throw myself out of the cockpit, but some kind of devilish power pressed me to the armoured seat. I was half out of the cockpit but I hadn't the strength to tear myself free. It seemed that my end had come, but at this moment, quite unexpectedly, the aircraft stopped spinning and changed to a gentle spiral.

Despite the rudder being broken clean off, half the port elevator missing and 20 per cent of the starboard elevator damaged, Kaberov managed to land the fighter on the snow airfield from which 5th IAP-KBF was operating. The broken tail unit was duly replaced and the Yak-1 returned to frontline service.

One of the first offensives supported by Yak fighters in significant numbers took place in the Staritsa-Rzhev area when the Red Army launched a counterassault in late December 1941 in an effort to relieve the pressure on Moscow. 31st SAD found itself in the thick of the action, the division being periodically reinforced with fresh units. One such regiment posted in on 10 January 1942 was 237th IAP, which arrived with 19 Yak-1s under the command of Hero of the Soviet Union Col A. B. Yumashev, widely known in the USSR for his participation in a record-breaking pre-war flight to the USA by an Antonov ANT-25, together with M. M. Gromov and S. A. Danilin. Under his command, the regiment entered combat for the second time with Yak-1s (it had been decimated in the weeks after *Barbarossa* flying in the Ukraine) and began patrolling over Soviet troops.

Future 28-victory ace Igor Kaberov of 5th IAP-KBF flew several different fighter types during the defence of Leningrad, including the I-16, LaGG-3, Yak-1 and La-5. Kaberov's first flight in the Yak-1 was almost his last, as he was bounced by Bf 109s. Incredibly, he had been sent aloft to escort attack aircraft while still conducting his first cockpit check of the fighter on the ground.

Following a handful of small-scale actions with Luftwaffe fighters, the regiment fought a series of fierce clashes with Bf 109s in early February when the enemy's aviation activities in the region increased. Keen to match the operational tempo of their German counterparts, Yak pilots undertook a vast amount of combat flying. On 10 February the man of the day was the leader of four Yaks, Spanish Civil War ace Capt Vladimir Bobrov, who engaged a Bf 109 in a close combat and hit the enemy fighter's wing with an unguided rocket projectile – an extremely rare occurrence. He then broke away from the dogfight and attacked a formation of Ju 88 bombers. Bobrov would end the war with 30 victories to his name to add to the 13 he claimed in Spain.

That same day, success was achieved during a longer battle (lasting up to 20 minutes) between six Yak-1s of neighbouring 521st IAP, under the command of ace Maj Ivan Kleschev, and a mixed enemy formation including nine bomb-equipped Bf 109s, 18 Ju 87s and four Hs 123s. The Yak pilots duly claimed four victories without loss, although the Germans only conceded that two of their aircraft had been shot down.

Luftwaffe activity increased even more in late spring and early summer, but the Soviet command was prepared for it. The creation of new types of Air Armies and Divisions had by then begun, and their regiments were predominantly equipped with new aircraft types. For instance, 201st IAD, led by Lt Col A. P. Zhukov, comprised five regiments, of which 20th, 32nd and 236th IAPs received Yak-1s. When the division joined the struggle for air superiority, its opponent was JG 51 – one of the Luftwaffe's most effective units, which had a combat victory tally of more than 3,000 aeroplanes. Although the *Jagdgeschwader's* leading pilots from 1941

Regiment commissar V. G. Stelmashchuk leads a political gathering with the pilots of 434th IAP, commanded by Maj Kleshchev. Note the Yak-7 fighter in the background bearing ten victory markings and the inscription 'Death for death'.


1

PREVIOUS PAGES
In August 1942, during the bitter fighting near Stalingrad, Snr Lt Mikhail Baranov of 183rd IAP was flying three or four combat sorties a day, attacking German aircraft and enemy forces crossing the River Don, protecting friendly troop locations and performing reconnaissance missions. Perhaps the most famous action in which the 24-victory ace was involved took place on 6 August while he was leading six Yak-1s as escorts for Il-2s from 226th ShAD (Ground Attack Aviation Division). Four Bf 109s attempted to intercept the Ilyushins but Baranov attacked them first, sending one down smoking – its pilot was seen to bail out. Baranov then spotted seven Ju 87s targeting Soviet troop positions under the cover of five Bf 109s. Before the German fighter pilots had the chance to fend off his attack, he forced one of the Stukas down in Soviet territory. By then five Bf 109s were attempting to bring down a damaged Il-2 that had dropped out of the formation. Coming to its aid, Baranov destroyed another Messerschmitt with an accurate burst of fire. He then went after a third Bf 109, but his guns failed to respond when he pressed the trigger – his ammunition was spent. Giving little thought to his own safety, Baranov struck the tailplane of the German fighter with his starboard wing. The Messerschmitt turned belly-up and spun into the ground. Baranov bailed out moments later, seriously injuring his leg in the process. According to Soviet records, on that day in the vicinity of Abganerovo railway station the airmen of 268th IAD downed four Bf 109s and one Ju 87 for the loss of two Yak-1s.

(Werner Mölders, Hermann-Friedrich Joppien and Heinrich Hoffmann) had perished, they had been replaced by a younger generation of aces (including Anton Hafner, Ernst Weismann and Franz-Josef Beerenbrock).

According to German records, on 5 July aircraft from II./JG 51 shot down 46 Soviet aircraft for the loss of only two Bf 109Fs, and in nine days of combat over the southern sector of the Western Front 161 aircraft bearing red stars were destroyed. From 4 to 14 July, according to Soviet records, 201st IAD flew 1,396 combat sorties and claimed 58 enemy aircraft destroyed for the loss of 27 Yak-1s. Both sides considerably exaggerated their opponent's losses in their combat reports, but the fact is that in combat over the Belev-Bolkhov-Zhizdra area the VVS-KA lost considerably more aircraft than the Luftwaffe. In many instances Yak pilots made forced landings with their fuselages riddled with bullets and shell fragments, having been shot up by either German fighters or deadly ground fire.

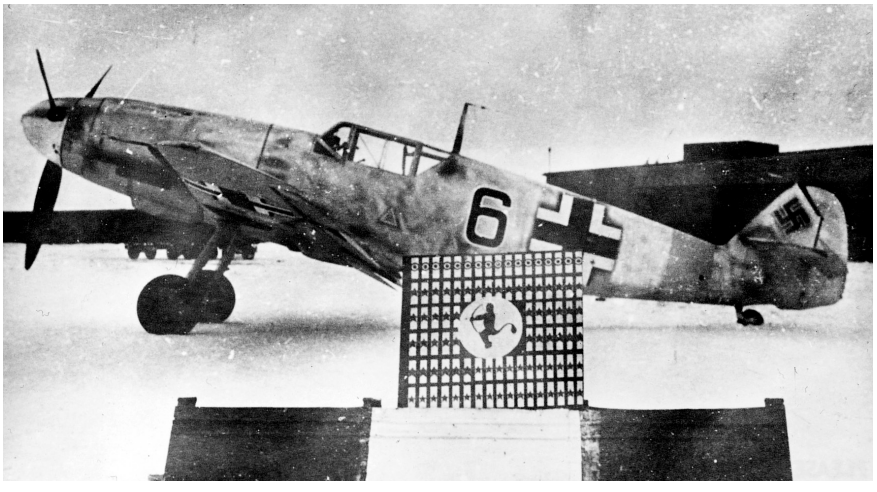
In the wake of these heavy losses, the VVS-KA took certain measures to turn the tide. The problems of controlling the fighters in the air began to be eliminated as pilots learned to use brief radio communications. At the same time the number of radio-equipped Yak-1s was increasing, while the efficiency of forward ground observers continued to improve. Regiments also started to switch from flying in close formation, as recommended in pre-war years, to groups that separated at altitude, dividing into a strike group and a close escort group. It was also recommended that defensive combat formations be abandoned, transferring the initiative in a dogfight from the enemy to the offensive aircraft. The experienced Yak pilots began to make greater use of covert attacks on the enemy, firing at close range, using vertical manoeuvring in combat, and so on.

One of the first pilots to embrace more aggressive tactics in the Yak-1 was future 23-victory ace Capt Boris Yeryomin of 296th IAP, fighting around Kharkov in the early spring of 1942. His regiment had finally swapped its I-16s for Yak-1s in early March, and on the 9th of that month seven examples had spotted two enemy formations below them – six Ju 87s escorted by Bf 109s from I./JG 77 and, nearby, 12 Bf 109 fighter-bombers. Seizing the initiative, 296th IAP launched a head-on attack on the German aircraft, firing RS-82 rocket projectiles on their first pass. Yeryomin was leading the Soviet formation:

> We attacked the bombers and ripped their formation apart, and then I made a head-on attack on the Messerschmitts. I managed to hit one of the fighters during my first pass. It fell to the ground like a flaming torch. Almost simultaneously, Lt Aleksey Solomatin set a second Messerschmitt burning – it went down not far from the first – and Lt Aleksander Martynov shot down a third, while a fourth was set on fire by Sgt Dimitry Korol. During the 15-minute combat, our *Eskadrilya* destroyed one enemy bomber and four fighters without loss. The engagement began at an altitude of 6,000ft [1,820m] and finished at 150ft [45m]. This combat taught us much. It convinced us that a fighter pilot's only sound tactic is to go on the offensive.

296th IAP would achieve numerous successes with the Yak-1 in the Ukraine, over Stalingrad and on the South Front, with several high-scoring aces serving in its ranks.

Despite the victories claimed by units such as 296th IAP, the summer and early autumn of 1942 proved to be a time of trial under fire for the VVS-KA, and the most



Standing on a snow-covered apron in early December 1941, 5./JG 52's winter-camouflaged Bf 109F-4 'Black 6' provides the backdrop for a commemorative photograph of the *Staffel*'s collective scoreboard. No fewer than 73 Soviet kills are recorded here, with the last success (a U-2) being credited to *Staffelkapitän* Oberleutnant Siegfried Simsch (who was eventually credited with 54 victories) on 30 November during the push on Moscow.

troublesome area was near Stalingrad. To correct the situation the Higher Command sent in most of its aviation reserves. One such regiment was 520th IAP with 20 Yak-1s, which arrived at Volga on 5 September. Soon after the unit's first combat, its commander, Maj S. N. Chirva, observed:

> Enemy bombers fly in groups of 10–30 aircraft, and in rare cases they are covered by two or three Me 109s. They approach their target in close vee formation at 1,500–2,000m [4,900–6,500ft] altitude and then break formation, form a circle and release their bombs from a slanting dive. When our fighters arrive they return to the close vee formation and then flee to their territory. The Messerschmitts patrol in pairs, spaced at an altitude of 1,500–3,500m [4,900–11,000ft], often attacking abruptly. They open fire from the rear hemisphere, firing accurately from 50–100m [160–325ft]. Multiple observations show that the enemy fighters persistently chase ours to their very airfields, sometimes attacking even though they are short of fuel.

Another pilot to enjoy success against the Yak-1 was Feldwebel Gerhard Köppen of III./JG 52, who claimed seven destroyed between 9 November 1941 and 22 February 1942. By the time he was posted missing on 5 May 1942 he had been credited with 85 victories.

The dogfights with enemy aircraft over Stalingrad were desperate, and the VVS-KA suffered great losses, especially in August and September. The reasons for this were the still-inferior flying characteristics of the Yak-1 against the Bf 109F-4 and the new Bf 109G-2, and the high vulnerability of the Soviet fighter, which quickly caught fire when explosive rounds hit the fuel tanks or cockpit area. Compared with the all-metal enemy aircraft, the Yak-1 had little protection for its large wing fuel tanks. And because of the poor view from the cockpit, and the risk of the windscreen being sprayed with oil,

Oberleutnant Max-Hellmuth Ostermann, *Staffelkapitän* of 8./JG 54, was photographed at Siverskaya with his Bf 109F-2 in May 1942. Although diminutive in stature, Ostermann was a deadly ace once in the air. Having claimed 102 victories, including 17 Yak-1/7s, he was killed in action dogfighting with LaGG-3s on 9 August 1942.

Jnr Lt Lilya Litvyak became both an ace and a posthumous Hero of the Soviet Union flying Yak-1Bs with 586th IAP. On 13 September 1942, in the vicinity of Stalingrad, she shot down her first Bf 109. Litvyak, who succumbed to wounds suffered in aerial combat on 1 August 1943, may have claimed as many as 16 victories (nine of them Bf 109s).

pilots preferred to have the canopy open during combat sorties.

The primary reason why the VVS-KA suffered such horrendous losses, however, was the inadequate training given to replacement pilots. With frontline units struggling to make good losses, flying schools were told to cut the minimum number of hours required to train replacement pilots. Most of these particularly badly trained sergeants and junior lieutenants fell victim to experienced Luftwaffe aces during their very first combat sorties. At Stalingrad in the late summer/early autumn of 1942 the young aviators flying Yak-1/7s were usually brought down on their fifth to eighth sortie. Pilots arriving at the front felt very unsure of their own abilities, and as they tried their best not to lose their flight leaders, they could not monitor the situation in the air. Most novice pilots, therefore, only became aware of a Bf 109 'on their tail' when their fighter was struck by an often deadly burst of machine gun and cannon fire.

And regiments such as 520th IAP were not only losing their young novice pilots. The hero of its first battles, Lt B. M. Gomolko, who had rammed a He 111 while flying to the front, was shot down and killed, and the courageous and skilful Capt G. V. Kryukov, who, in 16 combat sorties from 5 to 13 September had brought down two Bf 109s, was mortally wounded.

One particular fighter unit formed to fly the Yak-1 in 1941 must be mentioned, namely female-manned regiment 586th IAP. It is widely known that in October 1941 Hero of the Soviet Union Marina Raskova gained permission to form 'Unit 122', which included three female aviation regiments – 586th IAP with Yak-1s, 587th Bomber AP with Petlyakov Pe-2s and 588th Night Bomber AP with Polikarpov U-2s. Training of these new detachments took place at Engels, near Saratov, with Yak-7V fighter trainers being supplied on which to train the female pilots of 586th IAP. After graduation, many of the female fighter pilots joined the regular (male) fighter regiments and entered combat. 586th IAP was considered combat ready by the spring of 1942. Under the command of Maj T. A. Kazarinova, it defended the skies over Saratov, and Lt Valeria Khomyakova opened its combat tally, bringing down a Ju 88A-4 of III./KG 76 on the night of 24/25 September.

The regiment was sent to Stalingrad shortly thereafter, where it endured great trials. According to VVS-KA records, two of its women pilots, Ekaterina Budanova and Lilya Litvyak, destroyed five German aeroplanes at Stalingrad, and 12 in total up to August 1943 – Litvyak may have claimed as many as 16 victories, nine of them Bf 109s. Both were posthumously awarded the Soviet Union's highest orders after being killed in action. The combat record of the regiment, which in 1943 converted from Yak-1s to Yak-9s, records 4,419 sorties, and 38 enemy aircraft destroyed in 125 aerial combats. After taking part in the aerial defence of Voronezh, Kursk, Kiev and other important sites, 586th IAP was in Vienna on VE Day. All of the regiment's personnel were awarded orders and medals.

STATISTICS AND ANALYSIS

Soviet ace Mikhail Baranov of 183rd IAP in the cockpit of his Yak-1. In the autumn of 1942 his tally of enemy aircraft reached 24, the highest for a Yak fighter pilot during this period of fierce combat. At least 13 of his victories were Bf 109s. Made a Hero of the Soviet Union on 12 August 1942 after he had claimed four victories (including three Bf 109s) in a single mission six days earlier, Baranov was killed on 17 January 1943 whilst undertaking a training flight.

During the first six months of the war in the East, the Luftwaffe encountered Yak-1s on fewer occasions that any other Soviet fighter type in frontline service. Up to the autumn of 1941 they were rarely mentioned in German aces' victory claims. This started to change with the launching of Operation *Typhoon* on 2 October by units of *Luftflotte* 2. Although the first day was successful for the Germans, they subsequently suffered substantial losses – no fewer than 20 aeroplanes were written off, including four Bf 109s. Soviet fighters met the enemy head-on, claiming 31 victories.

The VVS-KA's most combat-capable unit opposing *Typhoon* was 43rd SAD, which had 13 Yak-1s on strength among other types. A successful action was fought by future 14-victory ace Lt S. G. Shvarev of 236th IAP, who shot down a Bf 109 during an intense dogfight between five Yaks and 12 Messerschmitts over Yartsevo.

11th IAP's part in defending Moscow against Luftwaffe raids, and the struggle against the enemy reconnaissance aircraft, has already been described. From early October 1941 to late August 1942, when 11th IAP was sent to the Stalingrad Front, the unit destroyed 38 enemy aircraft (a number of which were Bf 109s).

45th IAP, based in Transcaucasia, received its first Yak-1s in early 1941, and had sufficient time and opportunity to prepare for combat. Its pilots included many graduates of the military academy at the North Caucasus School of Highland Peoples, one of them being the

Hauptmann Heinrich Setz, *Staffelkapitän* of 4./JG 77, enjoyed great success over Sevastapol during the summer of 1942, claiming five Yak-1s destroyed between 11 June and 12 July 1942, including three on 10 July. By the time he was killed in action on 13 March 1943 Setz had been credited with 133 victories (16 of which were Yak-1s).

regiment's commander, Ibragim M. Dzusov, who was Ossetian by nationality. The regiment went into combat on 20 January 1942 on the Caucasus Front, soon renamed the Crimean Front. The unit's 1,000th combat sortie was flown on 7 May that same year while the Red Army was advancing to Kerch.

The regiment's records provide a full picture of the tasks undertaken – 49 sorties were flown against enemy ground troops; 22 against airfields; 120 for reconnaissance (of which six were weather reconnaissance sorties); and 277 to escort strike aircraft (protecting Il-2s on 18 occasions and bombers in all other instances). Another 201 sorties protected ports and transport vessels at sea and 178 provided cover for ground troops, important objects and airfields. The purpose of the rest of the sorties is not specified. In 140 dogfights 28 enemy aeroplanes were destroyed, of which five were Bf 109s. There are no details regarding losses of aeroplanes and pilots.

45th IAP had scarcely had time to recover from its losses before a new battle started, the enemy launching a determined assault against Sevastopol. The Luftwaffe's *Fliegerkorps* VIII had substantial superiority over the VVS-KA, whose losses could not be made good by the forces of the Black Sea Naval Air Force. So to assist the defenders of Sevastopol Marshal S. M. Budyonny ordered land-based 45th IAP, equipped with Yak-1s, to be sent there. Two-thirds of this regiment, which was commanded by 19-victory ace K. D. Denisov, managed to fly from the Caucasus to Crimea. 45th IAP thus became the last reinforcement sent to the Sevastopol air group from the USSR. According to Soviet records, on 11 July the regiment accounted for eight Bf 109s, losing a single Yak-1 from which the pilot successfully bailed out.

One of the Luftwaffe aces involved in these actions over Sevastopol was Oberleutnant Heinrich Setz of II./JG 77 (whose tally of 133 victories included 16 Yak-1s), who wrote in his diary:

> Although the dogfights over Sevastopol are quite rare, they are desperate. The enemy has brand new 'birds' and the pilots fly them well, so we must use all our skills. Yesterday I was in a dogfight twice. On the first occasion I was shooting badly and had to run at top speed. The second time I saw the enemy group landing. I gave a good battering to an armoured Il-2, but it didn't go down. Then, all of a sudden, I noticed one of the newest Russian fighters overhead. I managed to outturn it, then climb above my opponent and attack out of the sun. Another Me 109 was already engaging him in an unsuccessful dogfight, but I assessed the situation and began my attack. This time I was cautious, and the crosshairs of my gunsight lay right on the [enemy aeroplane's] engine. Nothing could save him. My wingman began to pursue another one, and then I saw two escaping aircraft 1,000m [3,300ft] above. I chased them, but almost at once it became clear that they were friendly.

Setz claimed five Yak-1s destroyed between 11 June and 12 July 1942, including three on 10 July.

One of the largest dogfights involving Yaks during the third Sevastopol assault period took place on 13 June, and it lasted from takeoff to landing. Lts Aleksander Filatov and future ace Ivan Shmatko destroyed a Bf 109 apiece. 45th IAP lost three

Yak-1s, with Shmatko and Sgt S. G. Vazyan bailing out successfully. Five-victory ace Lt P. A. Ushakov perished, however. Two Yak-1s of 6th GIAP of the Black Sea Navy, flown by pilots Kamyshan and Leschenko, were also shot down. Aside from the five Yaks, Bf 109 pilots also managed to destroy an Il-2 and a reconnaissance Pe-2. These seven destroyed aircraft turned into 14 victory claims when submitted by II./JG 77's pilots!

A number of the unit's high-scoring aces were credited with multiple victories, Oberleutnant Anton Hackl correctly identifying one of his two victims as a Yak-1 (which was his 54th of 180 victories – he claimed five Yak-1/7s overall). Oberleutnant Siegfried Freytag claimed four successes, one of which was a Yak-1 and another a LaGG-3 – the latter was almost certainly another Yak. These took his tally to 39 kills, and he would survive the war with 89 victories to his name. Finally, Feldwebel Ernst-Wilhelm Reinert also destroyed two fighters (his 52nd and 53rd victories), which he claimed were a LaGG-3 and a MiG-1 despite them being Yak-1s. He too survived the war with 168 kills (12 of which were identified as Yak-1s) to his name.

Official VVS-KA documentation from 25 May to 1 July 1942 recorded that 3rd IAD, which was defending Sevastopol, lost 53 aircraft in air combat, 28 of which were Yak-1s. Another 16 aeroplanes were listed as missing in action. Among the causes of the generally unfavourable outcome of this battle as far as the Soviets were concerned, it should especially be noted that there were a high proportion of aces serving with JG 77 in this theatre at the time. In addition to those mentioned previously, others included Gordon Gollob (146 victories, including eight Yak-1/7s), Kurt Ubben (93 victories, including six Yak-1/7s) and Emil Omert (55 victories, including one Yak-1. By contrast, the most successful Yak-1 pilots of the Black Sea Naval Air Force had between seven and ten victories.

Furthermore, the Bf 109Fs encountered by the VVS-KA fighter regiments were of superior quality, as was stressed in the following extract from a report compiled by 62nd IAB (Fighter Air Brigade) of the Black Sea Naval Air Force:

> At medium altitudes our fighters fall behind the Bf 109 in terms of speed, especially in the vertical plane, making it rather hard to wage a dogfight, and this results in extra losses. Combat, almost in every case, takes place in the horizontal plane, and looks more like a defensive circle. The Yak-1 possesses much better flying characteristics, but it also lags behind the Me 109F.

The aerial combatants' actions and losses in the first half of 1942 may be summed by examining the Kharkov operation in the southwest, which took place in May. Amassing a powerful ground force for the offensive, the Red Army sought to protect its troops by providing them with substantial air cover. More than 900 Soviet aeroplanes participated in the operation, including six Yak-1s from 296th IAP (from 6th IAK), seven Yak-1s from 146th IAP (from 3rd SAD), 16 Yak-1s from 273rd IAP (from 4th RAG), 18 Yak-1s from 6th IAP and 18 Yak-1s from 186th IAP. The Luftwaffe had just 150 combat aircraft in this section of the frontline with *Luftflotte* 4 at the time, although an additional 360 were quickly transferred in.

In the initial days of the advance things went favourably for the VVS-KA. However, the Luftwaffe high command expeditiously strengthened its forces, which allowed *Luftflotte* 4 to sortie more fighters. As a result the assault against Kharkov stalled, the

Leutnant Adolf Dickfeld (holding the map) of 7./JG 52 was another high-scoring ace who developed a liking for the Yak-1. Credited with 132 victories by war's end, he claimed at least 15 Yak-1/7s destroyed.

strike force was cut off from Soviet lines at its rear and 239,000 soldiers and officers were taken prisoner. Despite this reversal on the ground, according to reports from the various headquarters, up to 250 enemy aircraft were destroyed for the loss of 76 Soviet machines. Indeed, many VVS-KA units, such as 273rd IAP, received praise for their efforts by the Soviet high command. It was noted that, after accepting this regiment just before the battle, 'Maj I. T. Koshevoy, in the shortest period, managed to turn it into a well-knit combat unit, which from 11–15 May flew 129 combat sorties and destroyed ten enemy aircraft in the air and 19 more on the ground. In assault strikes it destroyed 46 tanks, 26 cars and many other vehicles.' The unit itself lost seven Yaks.

The HQ *Luftflotte* 4 released its own assessment of the campaign, which averred that between 12 and 29 May 596 Soviet aeroplanes were brought down and 19 destroyed on the ground, 229 tanks were damaged, 3,038 cars and 22 railway trains destroyed and other damage was caused. Its own aircraft losses were put at 49, including 19 Bf 109s. Many German aces subsequently increased their combat scores during the assault on Kharkov, with Leutnant Adolf Dickfeld of III./JG 52 shooting down 11 aircraft on one day, boosting his tally to 73 victories – the identity of these aeroplanes is unknown. Claiming 132 kills by war's end, he downed at least 15 Yak-1s. Leutnant Hermann Graf of the same unit was also a prolific scorer at this time, although none of his victories were identified as Yak-1s.

Despite the tragic results of the whole Kharkov operation, surviving Soviet pilots used the experience to improve their abilities in combat. Two such individuals were Snr Lt Alexei Reshetov and Lt Fotii Morozov, who subsequently became high-scoring aces following their transfer to 273rd from 6th IAP in the wake of the Kharkov disaster. During the summer of 1942 their new regiment began to specialize in flying reconnaissance missions close behind the enemy's frontline. Pilots normally conducted such sorties in pairs, and it was reasoned that Yak-1s had a greater chance of evading attacks by Bf 109s than traditional reconnaissance types. Should a dogfight become inevitable, the Yak pilots could engage their German opponents on an equal footing.

Luftwaffe groundcrew from an unidentified unit take photographs alongside a captured, near new, Yak-1B whose pilot lost his bearings and landed at an enemy fighter airfield on the Stalingrad Front in the autumn of 1942.

ENGAGING THE ENEMY

Almost all Soviet fighters of 1941–42 were equipped with the PBP-1A gunsight, which was used when firing machine guns and cannon armament. It also aided the accurate delivery of bombs in a dive. The PBP-1A was a collimator-type sight, projecting two rings of light and a central 'crosshair' on an inclined glass with the aid of a lamp and optical lenses. The diameter of the rings could be adjusted by rotating a knob on the lower left side of the gunsight. By getting a target of known dimensions (such as its wingspan) into the ring, the pilot was able to work out the distance to the target and to define more precisely the lead (deflection) and lowering of the gun's tracers. However, collimator sights of this type (similar ones were used on German fighters) provided the pilot with relatively effective gunfire only at limited distances (up to 200–300m (220–330yd)) and at small angles to the target (almost directly in the rear). If the target had an aspect angle of more than 2/4 at a distance of 200m (i.e. its heading differed from the heading of the attacking fighter by more than 45 degrees) and its airspeed exceeded 540km/h (335mph), the required lead angle exceeded seven degrees, and at the moment of opening fire the target would be outside of the area covered by the gunsight's glass.

During the course of a dogfight, when both adversaries were manoeuvring, the collimator gunsight was of no importance at all, as aiming was done by the tracer shells, and aces who had accumulated huge experience of aerial combat judged the deflection by intuition.

In some cases, when a target's movement was predictable, the attacker would open fire in such a way that the enemy aeroplane would fly into the gunfire. Most commonly, however, aces would make a surprise attack when the targeted pilot did not suspect that his last seconds had come. According to different assessments, 50 to 70 per cent of all aircraft shot down were hit during surprise attacks, when the attacker opened fire at a range of about 50–70m (55–77yd), which effectively ruled out any possibility of missing the target.

In an emergency wheels-up landing, when the aircraft was decelerating sharply, the presence of the gunsight in front of the pilot's face posed a considerable risk of injury. Soviet pilots had an ironic joke, interpreting the PBP-1A gunsight designation as standing for 'gunsight beating the pilot once and painfully'. Some pilots removed the gunsight, painted rings directly on the windscreen and installed a primitive foresight on the engine cowling. Designers of the gunsight also tried to eliminate the danger by installing a soft cushion over its attachment point.

As the best reconnaissance pilot in his unit, Reshetov once fulfilled a personal task for the unit's commander, Gen T. T. Khryukin, who asked him to find an encircled Soviet ground unit and drop them an ensign. At the end of the war both Reshetov and Morozov, who frequently flew sorties together, were awarded the title of Hero of the Soviet Union. Their results were impressive. Reshetov had flown 821 combat sorties and destroyed 35 aircraft on his own and eight more with another pilot. Morozov, whose tally of 857 sorties was the highest number achieved by a Soviet fighter pilot, brought down 16 enemy aircraft on his own and shared five more with another pilot. Apart from the summer months of 1941, both heroes had flown Yaks throughout the war.

From what has been stated previously it can be concluded that both sides massively exaggerated their opponent's losses over Kharkov – this was a problem in all theatres during World War II. This is especially apparent in the reports made by one of the best Soviet regiments, 434th IAP, which came under the command of Hero of the Soviet Union and 49-victory ace Maj I. I. Kleschev in May 1942. The regiment contained the very best pilots, they flew much more frequently than those of other units and they fought the enemy courageously, initially in the Valuiki-Kupyansk area. However, their combat claims seem massively exaggerated. For example, before the Germans' 'general' assault in the south the pilots reported that, while attacking a group of Ju 88s protected by Bf 109s, they had gained six victories. On 2 July the Yaks again engaged Messerschmitts, and victories were claimed by Capt A. I. Yakimov and Snr Lts F. S. Kayuk, I. I. Izbinsky and future 36-victory ace Andrei Baklan.

Following an order by VVS-KA HQ, 434th IAP was sent to the rear for rest and to receive new aircraft. It was subsequently moved to the rear on two more occasions. Its last tour of duty to the northwest of Stalingrad, from 14 September to 3 October 1942, was not only fruitful (according to the combat reports, 83 enemy aircraft were brought down in 652 combat sorties), but also the bloodiest – 16 pilots died, including 12-victory ace and Hero of the Soviet Union Snr Lt Nikolai Karnachenko on 22 September.

On the German side, the claims of I./JG 53 display very similar distortions. From 1 to 23 September 1942, the '*Pik-As*' pilots claimed 344 victories in 1,100 combat sorties for the loss of 18 of their own Bf 109G-2s and eight aces.

During the culmination of the Battle of Stalingrad both sides brought their best units and their most advanced fighters to the combat arena. However, the VVS-KA still relied on I-16- and I-153-equipped units as well, and they suffered terribly at the hands of the Luftwaffe *experten*.

In the Northern Caucasus, in 5th SAD, the very best aircrew were 17-victory ace Maj Dmitrii Kalarash, a navigator of 236th IAD, and 17-victory ace Capt Sergei Schirov, a squadron leader in 518th IAP. During the autumn they routinely flew as a pair in a Yak-7B and a Yak-1, respectively, in the Tuapse region, covering the actions of less skilled pilots. Despite their best efforts the Yak units still took a hammering, culminating in the loss of nine of the 15 aircraft that took part in a large dogfight on 29 October 1942 that had seen 518th IAP credited with 11 victories. Six pilots were killed, including Maj Kalarash, who was bounced from above by Oberleutnant Gerhard Barkhorn of II./JG 52. Posthumously made a Hero of the Soviet Union, Kalarash was Barkhorn's 75th of 300 victories (19 of which were Yak-1s claimed in Bf 109Fs). Sergei Schirov, who also perished in this action, received the same honour.

Propaganda in action. The caption for this photograph states that the Red Army soldiers are encircling a German pilot of I./JG 53 who intentionally flew to a Soviet airfield in Ukraine in the early summer of 1942 in order to surrender. However, the bent propeller blades show that the aeroplane had clearly experienced a belly landing and then been put on its wheels for the staged photo session. The identity and final fate of the pilot remain unknown.

The statistics, taken from official Soviet and German reports, allow several conclusions to be drawn. Without having information from both sides about the same event it is hard to reach impartial conclusions because exaggerations were common. In the main, the failures of Yak pilots were due not to the technical shortcomings of their aeroplanes, but to other causes. These included the inadequate level of training for VVS-KA aircrew, poor control of fighter groups from the ground and in the air, faulty structural organization before the changeover to Air Armies, when a few forces were split between different commanding officers, and obsolete combat tactics. Flying the same Yak-1 fighters in 1943–44, Soviet pilots achieved much better results in their tussles with Bf 109s as most of these problems had by then been eliminated.

Leading Yak-1/7 Bf 109 killers 1941–42

Ace	Bf 109 kills	Final Score	Unit(s)
Snr Lt A. V. Martynov	14+2sh	17+15sh	296th IAP
Capt M. D. Baranov	13	24	183rd IAP
Snr Lt G. N. Zhidov	9+8sh	16+13sh	123rd IAP
Lt A. F. Solomatin	9+3sh	13+16sh	296th IAP
Lt Sultan Amet-Khan	7+14sh	33+19sh	4th and 9th GIAPs
Snr Lt S. S. Schirov	7	17+3sh	518th IAP
Maj I. I. Kleschev	6+3sh	16+15sh	521st and 434th IAPs
Snr Lt K. S. Alekseyev	6+3sh	15+7sh	9th and 8th IAP-KBF
Capt M. N. Avdeyev	6+3sh	12+6sh	32nd and 8th IAP-KBF
Capt B. N. Yeremin	5+4sh	8+15sh	296th IAP

AFTERMATH

Bf 109G-2s began to replace F-model fighters in the East from the late summer of 1942, the new aircraft featuring the more powerful 1,475hp DB 605 engine. Early 'Gustavs', such as these G-2s assigned to II./JG 52 near Rostov, were just as lightly armed as the Bf 109Fs they replaced. This would quickly change, however, with the availability of underwing MG 151/20 20mm cannon pods.

During his long life (1898–1978), the famous aircraft designer Willi Messerschmitt created many outstanding designs, including the world's first jet fighter, but his Bf 109 became truly iconic and symbolic of the Luftwaffe. No fewer than 33,000 production aircraft were built, placing it second only to the Soviet Il-2 as one of the world's most mass-produced aircraft.

Multi-talented, brilliantly educated and obsessed by the idea of flight, Messerschmitt devoted all of his life to aviation. He became fond of flying when he was 11, and this eventually led to him designing and building gliders and lightweight aeroplanes. One of his assets was an ability to find highly positioned sponsors in all situations, which helped him to beat his competitors. In this respect, Messerschmitt and Soviet designer Aleksander S. Yakovlev (1906–89) have much in common.

The Yak-9 was an improved version of the Yak-7 that benefited from lessons learned with the Yakovlev fighter in the early years of the war in the East. Eventually featuring 37mm cannon, a Duralumin airframe in place of the wooden structure of the Yak-1/7 and increased fuel capacity, the first examples of the Yak-9 entered service with 42nd IAP in the defence of Stalingrad in December 1942. The Yak-9Ds in this photograph were from 6th GIAP of the Black Sea Naval Air Force, with the closest fighter being assigned to 17-victory ace Mikhail Grib. He had claimed ten of these kills flying Yak-1s over Crimea in 1942.

Twice Hero of Socialist Labour, Yakovlev had a key acquaintance in Stalin's cabinet in the form of A. I. Shakhurin, who was appointed People's Commissar of the Aviation Industry in early 1940. Shakhurin had noted Yakovlev's self-discipline and restraint, and saw that he demanded the highest standards from himself and his subordinates. After becoming a deputy commissar in experimental aircraft design, Yakovlev began to combine his creative work as a designer with administrative activities, making wide use of the support of leading persons of the State, including Stalin himself. This gave him greater opportunities to develop his ideas.

Like Messerschmitt, Yakovlev had also been fond of aviation from his youth, having created gliders and light aircraft. But it was his Bf 109 equivalent, the Yak-1, that brought him glory and the highest State awards. With this aircraft, which proved to be the best Soviet fighter in the initial stage of the Great Patriotic War, he developed the technical solutions and new technologies that formed the basis of a whole generation of Yak fighters. The young design bureau led by Yakovlev managed to resolve the prototype's design faults in short order and, in concert with series-production Factory No. 292, many construction problems were eliminated. Of the latter there were dozens, and sometimes even hundreds, but the process of eliminating the Yak-1's defects continued while the aeroplane was on the strength of the VVS-KA.

Series production of the Yak-1 and its delivery to frontline units was delayed by problems at the manufacturing factories. During 1941 the type's flying characteristics did not improve, but it became more reliable and safe, and required less time to be prepared for a combat sortie. Changing from the M-105P engine to the M-105PA, with a float-free carburettor, allowed experienced pilots to perform aerobatic manoeuvres such as inverted flight and diving with negative-g loads, and this in turn enabled the Yak to vie with the Bf 109 in combat.

During all of the period covered within this volume, the Yak-1 was superior in performance to both the MiG-3 and LaGG-3 fighters created at the same time, especially at medium-to-low altitudes, where most air combats on the Soviet–German front took place. But it was lagging behind its main opponents, the Bf 109F-2 and F-4, and especially the further developed Bf 109G-2, which reached the frontline from July 1942. The German fighters had an advantage in maximum speed and vertical manoeuvrability, although the Yak-1 was slightly better in horizontal manoeuvres.

A prototype Yak-3 is put through its paces by Yakovlev test pilot W. L. Rastorguyev in late 1943. Developed from the Yak-1M, the new machine had a smaller wing area, a more powerful Klimov VK-105PF-2 engine and a 20mm ShVAK cannon and two 12.7mm UBS machine guns. The first production examples reached 91st IAP at the very end of June 1944.

Foreseeing this situation, chief designer Yakovlev made the Yak-1 suitable for pilots with lower than average qualifications. It was very simple to fly, easy to take off from grass airfields, and stable in horizontal flight while climbing and gliding.

The Yak-7 fighter and its developments proved to be even better, as having the centre of gravity further forward increased stability and simplified landing, especially on rough airfields. Another merit of the Yaks was cheapness of production, in part due to the absence of scarce materials in their structure and the minimal use of aluminium. It is hard to imagine how the Soviet aircraft industry would have managed to work during the evacuation of many factories to the east had it not been for the almost unlimited stock of raw materials for fighter production, such as wood, veneer and linen, in Siberia, over the Urals, where the principal aircraft factories were concentrated.

Even the poorly qualified workers employed in the factories after the war began, such as teenagers and housewives, could build Yaks. The number of Yak-1s produced – a 'mere' 8,721 units according to the Commissariat's reports – was much lower than the total number of Bf 109s built. But this is explained by the fact that, in 1944, Yak-1s were replaced on the assembly lines by the more sophisticated Yak-3, and Yak-7s and their development, the Yak-9s, were built in parallel. During 1942 (an especially hard year for the Soviet Union), 9,918 fighters were built, compared with 5,565 in Germany. The Soviet factories rolled out 3,474 Yak-1s and 2,430 Yak-7s, compared with 2,657 Bf 109s. Constant replacement of losses enabled the Soviet command to start creating strategic aviation reserves in the second half of the year, and this turned the tide in favour of the VVS-KA in the battle with the Luftwaffe for air supremacy on the Soviet–German Front.

Although they were inferior to the enemy in terms of the sophistication of their aircraft and quality of training, the Soviet fighter pilots confronted the Germans with one great asset – courage. This quality enabled them to survive the most difficult period of the war and, subsequently, to turn the situation in the Red Army's favour.

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