

Yakovlev YAK 1

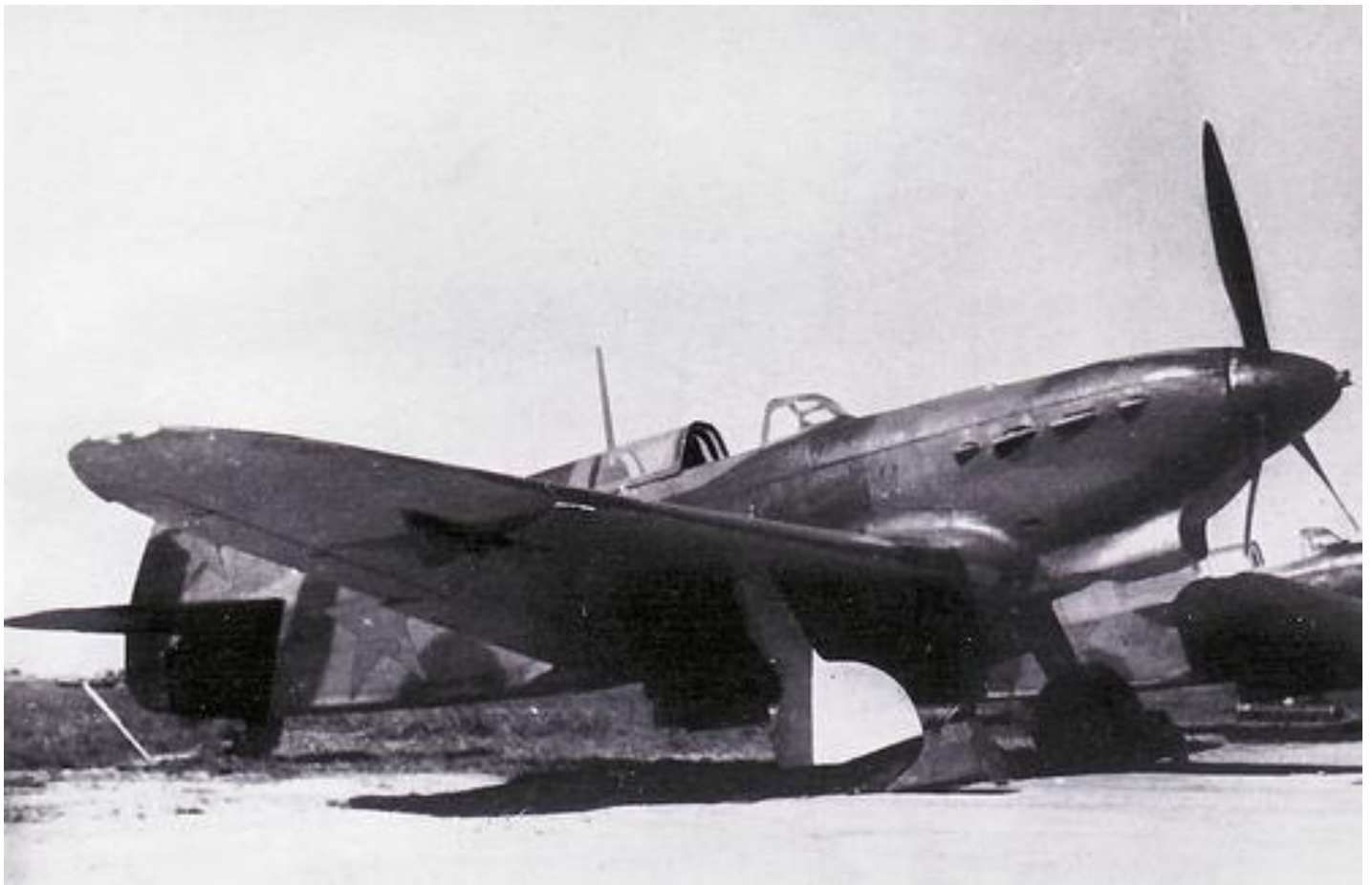


Le Yakovlev Yak-1 est un avion de chasse russe de la Seconde Guerre mondiale. Yakovlev qui n'a produit jusqu'alors que de petits avions, crée en 1939 son premier prototype de chasseur, le Ya-26, pour lequel il reçoit l'« Ordre de Lénine ». Le premier prototype est surnommé « Krasovets » (beauté) par les ouvriers du fait de ses lignes aérodynamiques. Il effectue son premier vol le 13 janvier 1940 aux mains du chef pilote Piontkovsky et s'écrase le 27 avril suivant, à cause d'un défaut de fabrication. Heureusement, le deuxième prototype est déjà prêt avec les modifications qui caractérisent les Yak-1 de série (radiateur d'huile sous le moteur et prises d'air du carburateur noyées à l'implantation des ailes). Malgré quelques problèmes de mise au point du circuit de carburant, verrière et armement, la production est lancée à l'usine GAZ-115 de Moscou et 64 exemplaires livrés avant la fin de l'année. Le manque de visibilité vers l'arrière est résolu en unités de première ligne par le remplacement de la structure arrière supérieure du fuselage par un carénage en plexiglas ; Cette modification est par la suite adoptée en usine sous la désignation : Yak-1B. Parallèlement, Sinelchtchikov, du bureau d'étude Yakovlev, dès octobre 1940 lance une étude pour améliorer les performances par réduction de poids (diminution de 200 kg) et le montage d'un moteur plus puissant, le Klimov Vkh105PF équipé d'une hélice à vitesse constante 105SV. Après deux ans, cette étude donne naissance au Yak-1M qui représente à peu près la moitié de la production de Yak1 et allait donner naissance au Yak-3. Celle-ci fut, du fait de la production sur plusieurs usines (GAZ-115 et GAZ-124 de Moscou, GAZ-286 de Kamenski-Ouralsk et GAZ-153 de Novosibirsk) et des 8 721 exemplaires sortis jusqu'à l'automne 1943, peu standardisée. Plusieurs variantes d'armement et modifications mineures locales (jambes de train allégées, skis, aérodynamisme des prises d'air ...) faisaient qu'il était difficile de trouver deux avions rigoureusement identiques. Peu expérimenté dans la conception de structures et revêtement travaillant en métal, Yakovlev opta pour une conception plus traditionnelle avec fuselage en tubes d'acier soudés entoilés et des ailes en bois. Cependant, certains éléments sont très modernes comme le train à large voie et les volets, tous deux à commande hydraulique, et la tuyauterie d'alimentation en carburant en aluminium. Le moteur Klimov est un dérivé de l'Hispano-Suiza 12Yrs produit sous licence pendant les années 1930. Mais, malgré l'augmentation de puissance, il conserve un rapport poids/puissance nettement insuffisant par rapport aux moteurs allemands et britanniques contemporains. Le Yak-1 est avec les Lavotchkine LaGG-3 et Yakovlev Yak-7, l'épine dorsale de la chasse soviétique jusqu'au milieu de la guerre, où il cède la place à ses variantes améliorées Yak-9 et Yak-3 qui permirent aux Soviétiques d'acquiescer la suprématie aérienne à partir de 1943.

Bien qu'il fût inférieur à ses principaux adversaires, le Bf.109F/G et le Fw-190A, il se comporta honorablement et fut surtout handicapé par le manque de pilotes expérimentés, à cause des pertes terribles de l'été 1941.

Yakovlev Yak-1 :

- Klimov M105P puis M105P V12
- 1100 Ch
- 600 Km/h
- 1 Canons 20 mm 2 Mitrailleuses 7,62 mm
- 2847 Kg en charge
- 10000 m de plafond pratique
- 850 Km en distance franchissable
- 1 pilote





Source : <http://les-avions-de-legende.e-monsite.com/pages/les-chasseurs/les-chasseurs-sovietiques/yakovlev-yak1.html>

The **Yakovlev Yak-1** (Russian: Яковлев Як-1) was a [Soviet fighter aircraft](#) of [World War II](#). The Yak-1 was a single-seat monoplane with a composite structure and wooden wings; production began in early 1940.^[1] The Yak-1 was a maneuverable, fast and competitive fighter aircraft.^{[1][2]} The composite-wooden structure made it easy to maintain and the engine proved to be reliable.^[3] It formed the basis for subsequent developments from the Yakovlev bureau and was the founder of a family of aircraft, with some 43,000 being built.^{[4][5]} As a reward, designer [Alexander Yakovlev](#) was awarded the [Order of Lenin](#) (Russian: Орден Ленина, Orden Lenina) (the highest civilian [decoration](#) bestowed by the [Soviet Union](#)), a 100,000 [ruble](#) prize, and a [ZIS](#) motor car.^{[6][1][7]}

Design and development

Before the war, [Yakovlev](#) was best known for building light sports aircraft. His [Yak-4](#) light [bomber](#) impressed the Soviet government enough to order the [OKB](#) to design a new fighter with a [Klimov M-106](#) V-12 liquid-cooled [engine](#). Formal specifications, which were released on 29 July 1939, called for two prototypes – **I-26-1** with a top speed of 620 km/h (390 mph) at 6,000 m (20,000 ft), combat range of 600 km (370 mi), a climb to 10,000 m (33,000 ft) of under 11 minutes, armed with 2 × 7.62 mm (0.300 in) [ShKAS machine guns](#) and 1 × 12.7 mm (0.50 in) [Berezin BS](#) heavy machine gun. **I-26-2** had a [turbocharged](#) M-106 engine with a top speed of 650 km/h (400 mph) at 10,000 m (33,000 ft) and armament of 2 × 7.62 mm (0.300 in) ShKAS machine guns. The design took full advantage of Yakovlev OKB's experience with sports aircraft and promised agility as well as high top speed. Since the M-106 was delayed, the design was changed to incorporate the [Klimov M-105P](#) V-12 engine, with a 20 mm (0.787 in) [ShVAK](#) cannon in the "vee" of the engine block, in a *motornaya pushka* mount. I-26-I first flew on 13 January 1940 and suffered from oil overheating which was never completely resolved, resulting in 15 emergency landings during early testing. On 27 April 1940, I-26-1 crashed, killing its test pilot [Yu.I. Piontkovskiy](#). The investigation of the crash found that the pilot had performed two consecutive barrel rolls at low altitude, which was in violation of the test flight plan. It was believed that during the first roll, the [main landing gear](#) became unlocked, causing it to crash through the wing during the second roll. It has been speculated that Piontkovskiy's deviation from the flight plan was caused by frustration that his aircraft was being used for engine testing while I-26-2, built with the lessons of I-26-1 in mind, was already performing [aerobatics](#). Technical problems with sub-assemblies provided by different suppliers raised the I-26-2's weight 400 kg (880 lb) above projected figures, which restricted the airframe to only 4.4 G, while oil overheating continued to occur. The many defects caused I-26-2 to fail government testing in 1940. Fortunately for Yakovlev, its competitors, I-200 (future [Mikoyan-Gurevich MiG-3](#)) and I-301 (future [LaGG-3](#)), also failed testing. Requested improvements were incorporated into I-26-3, which was delivered for testing on 13 October 1940. Although it passed on 9 December 1940, the aircraft was still very much unfinished, its engine problems still unresolved. Troublesome and slow testing and development concerned Soviet officials, since I-26 was ordered into production under the name "Yak-1" on 19 February 1940, a mere month after I-26-1 made its maiden flight. The gamble was intended to reduce the time between the prototype and the beginning of production of service aircraft; the I-200 and I-301 were also ordered into production. The Yak-1 was slower than the I-200 and less heavily armed than the I-301, it enjoyed the advantage of having been started earlier, which gave it a consistent lead in testing and development over its competitors. Due to [Operation Barbarossa](#) the Axis invasion of the Soviet Union on 22 June 1941, development of promising designs, like the [Polikarpov I-185](#), proved unfeasible. Yakovlev might have been [Joseph Stalin](#)'s favorite, which may have been in the Yak-1's favor. Simultaneous manufacturing and testing of a design that required as many improvements as I-26 caused much disruption of production. Almost 8,000 changes were made to the blueprints by 1941, with an additional 7,000 implemented the following year and 5,000 more in 1942. Production was further slowed by shortages of engines, [propellers](#), [radiators](#), wheels and cannons. Shortages of quality materials resulted in [plywood](#) being shed from the wings of several aircraft. Factory No.292, the main manufacturer of Yak-1s was bombed on 23 June 1941 and burned to the ground; production resumed amid the ruins on 29 June. Due to loose tolerances, each aircraft was unique, with workers performing the final assembly having to mate dissimilar components. The left and right main landing gear could be of different lengths and different angles relative to the aircraft, which required adjusting their attachments to ensure an even stance for the aircraft and parts were often not interchangeable. Production of the Yak-1 ended in July 1944, with somewhere around 8,700 built.

Operational history

At the time of Operation Barbarossa on 22 June 1941, 425 Yak-1s had been built, although many were en route or still incomplete. 92 machines were fully operational in the Western Military Districts but most were lost in the first days.^[8] The Yak-1 was built as an escort fighter for [Il-2](#) tactical bombers and combats took place below 4,000 m (13,000 ft), where the Yak-1 performed the best. The Yak-1 proved to have a significant advantage over its Soviet competitors. A full circle turn took just 17 seconds in the Yak-1M. The MiG-3, which had the best high-altitude performance, did poorly at low and medium altitudes and its light armament made it unsuitable for ground attack. The LaGG-3 experienced a significant degradation in performance (as much as 100 km/h (62 mph) on some aircraft) compared to its prototypes due to the manufacturer's inexperience with its special wooden construction, which suffered from warping and rotting when exposed to the elements. The Yak-1's plywood covering also suffered from the weather, but the steel frame kept the aircraft largely intact. Early aircraft suffered from fuel leaks, spot-welded fuel tanks failing from vibration. The [canopy](#) could not be opened under certain conditions in earlier models and some pilots had the sliding portion of the canopy removed. The first 1,000 Yak-1s had no radios; wireless equipment became common by spring 1942 and obligatory by August 1942 but Soviet radios were notoriously unreliable and short-ranged, so they were frequently removed to save weight.^[8] The M-105 could not tolerate negative G forces which starved it of fuel and suffered from breakdowns of magnetos, speed governors and emitted oil from the reduction shaft.^[9] The Yak-1 was better than the Bf 109E but inferior to the Bf 109F – its main opponent – in rate of climb at all altitudes, although it could complete a circle at the same speed (20–21 seconds at 1,000 m (3,300 ft)).^{[10][11]} The Bf 109, with its automatic wing slats, had a lower stall speed and was more stable in sharp turns and vertical aerobatic figures.^[8] A simulated combat between a Yak (with M-105PF engine) and a Bf 109F revealed that the Messerschmitt had only marginally superior maneuverability at 1,000 m (3,300 ft), though the German fighter could gain substantial advantage over the Yak-1 within four or five nose-to-tail turns. At 3,000 m (9,800 ft), the capabilities of the two fighters were nearly equal, as combat was essentially reduced to head-on attacks. At altitudes over 5,000 m (16,000 ft), the Yak was more manoeuvrable. The engine's nominal speed at low altitudes was lowered to 2,550 rpm, and the superiority of the Bf 109F at these altitudes was reduced.^[9] The Yak-1's armament would be considered too light by Western standards but was typical of Soviet aircraft, pilots preferring a few guns grouped on the centerline to improve accuracy and reduce weight. Wing guns were rarely used on Soviet fighters and when they were supplied, they were often removed (as they were from US-supplied [Bell P-39 Airacobras](#)). Avoiding wing guns reduced weight and demonstrably improved roll rates (the same was true of the Bf 109F). The US and Britain considered heavy armament and high performance necessary, even at the cost of inferior maneuverability, while the Soviets relied on the marksmanship of their pilots coupled with agile aircraft. Even with the Yak-1's light armament, to reduce weight, modifications were made on the front line and on about thirty production aircraft: the 7.62 mm ShKAS machine-guns were removed, retaining only the single ShVAK cannon. Nevertheless, these lighter aircraft were popular with experienced pilots, for whom the reduction in armament was acceptable and combat experience in November 1942 showed a much improved kill-to-loss ratio. In the autumn of 1942, the Yak-1B appeared, with the more powerful M-105P engine and a single 12.7 mm UBS machine gun instead of the two ShKAS. Although this did not increase the total weight of fire much, the UBS machine-gun was much more effective than the two 7.62 mm ShKAS. The simple VV ring sight replaced the PBP gun-sight because of the very poor quality of the latter's lenses.^[10] The Yak-1 had a light tail, and it was easy to tip over and to hit the ground with the propeller. Often, technicians had to keep the tail down, which could lead to accidents, with aircraft taking off with technicians still on the rear fuselage.^[12] The Yak-1 was well liked by its pilots; Nikolai G. Golodnikov considered that the Yak-1B, flown by experienced pilots, could meet the Bf 109F-4 and G-2 on equal terms.^{[13][14]} The French [Normandie-Niemen](#) squadron selected the primitive model Yak-1M (that had a cut-down fuselage to allow all-round vision) when it was formed, in March 1943.^[15] Twenty-four of these aircraft were sent to the all-female [586th Fighter Aviation Regiment](#), whose pilots included the world's only female [aces](#): [Katya Budanova](#), with 5, and [Lydia Litvyak](#) (claims range between 5 and 12, plus two shared). Litvyak flew Yak-1 "Yellow 44", with an aerial mast, at first in 296th Fighter Aviation Regiment and then with 73rd Guards Fighter Aviation Regiment, until her death in combat on 1 August 1943.^[16] Another ace who flew the Yak-1 was [Mikhail Baranov](#), who scored all his 24 victories with it, including five in a day (four Bf 109s and a Ju 87, on 6 August 1942).^[17]

The Yak-1 was also the first type operated by the [1 Pułk Lotnictwa Myśliwskiego "Warszawa"](#) (1st Polish Fighter Regiment "Warsaw"). Soviet naming conventions obscure the fact that the Yak-1 and its successors – the Yak-7, Yak-9 and Yak-3 – are essentially the same design, comparable to the numerous Spitfire or Bf 109 variants. Were the Yaks considered as one type, the 37,000 built would constitute the most produced fighter in history.^{[4][5]} That total would also make the Yak one of the most prolific aircraft in history, roughly equal to the best known Soviet ground attack type of World War II, the [IL-2 Shturmovik](#). Losses were the highest of all fighter types in service in the USSR: from 1941 to 1945, VVS KA lost 3,336 Yak-1s: 325 in 1941, 1,301 the following year, 1,056 in 1943, 575 in 1944 and 79 in 1945.^[18]

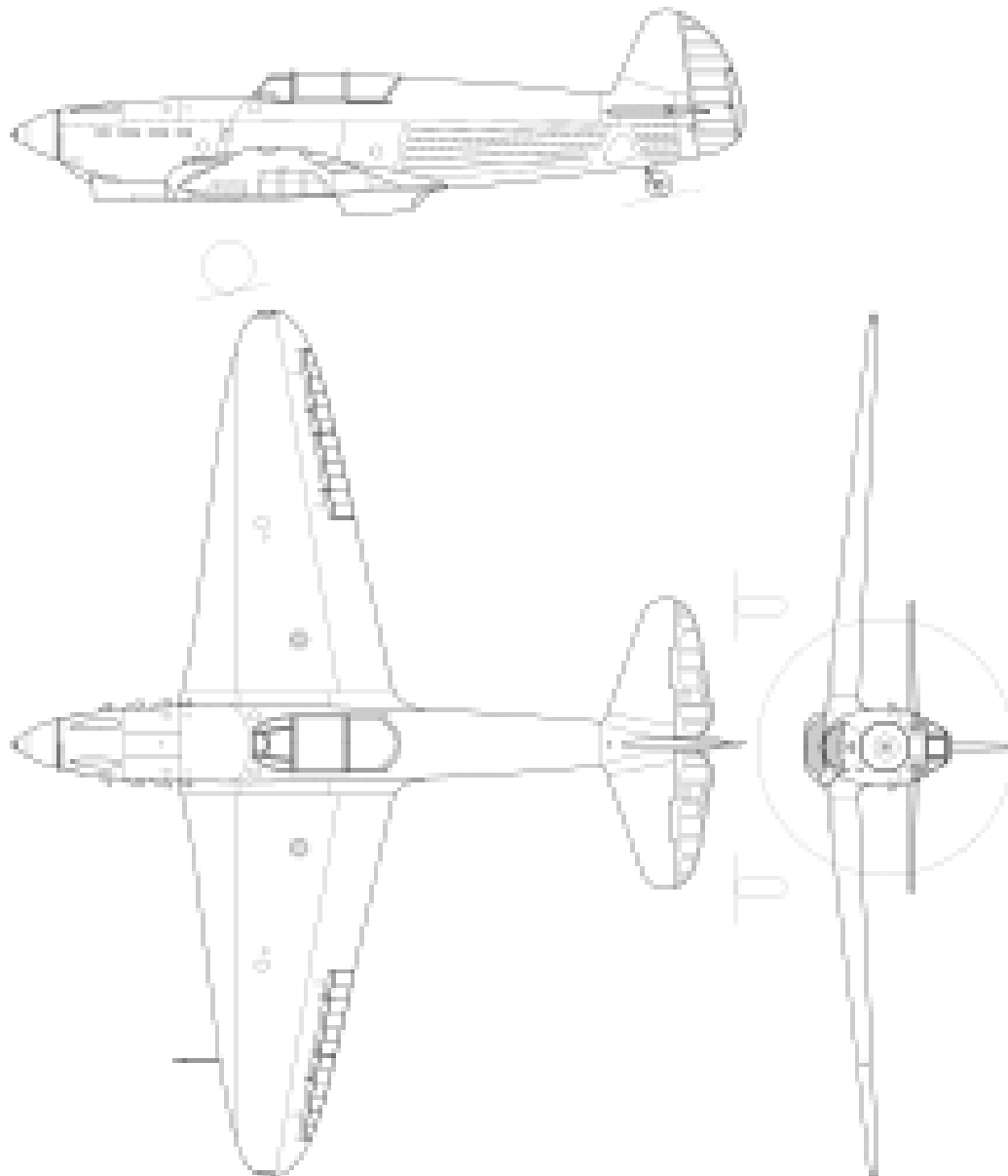
Variants



- Side-view silhouettes of the Yakovlev I-26 Krasavec and an early production Yak-1. **I-26** (also known as Ya-26^[19]) – The first prototype of the Yak-1 and progenitor of all Yakovlev's piston-engined fighters of World War II. Of mixed steel tube and wood construction the lightweight I-26 displayed promising performance and was produced as the Yak-1.
- **UTI-26** – The third and fourth I-26s were completed as dual control trainers, produced as a fighter as the [Yak-7](#).
- **I-28** (^[20]) – High-altitude interceptor prototype with [Klimov M-105PD](#) engine developed from I-26-2. Differed from I-26 in having an all-metal fuselage and tail and automatic, leading-edge slats on slightly smaller and reshaped wings. One aircraft was built, first flying on 1 December 1940. It did not enter production due to many deficiencies of the engine but served as the basis for high-altitude versions of [Yak-7](#) and [Yak-9](#).
- **I-30 (Yak-3)** – Development of I-26 with an all-metal wing with leading-edge slats, weight and space savings were used for additional armament and greater fuel capacity. Two prototypes built – I-30-1 armed with 3 × 20 mm (0.79 in) [ShVAK](#) cannons and 2 × 7.62 mm (0.300 in) [ShKAS](#) machine guns, and I-30-2 with two additional ShKAS. It did not enter production. The name Yak-3 was re-used for a different fighter. See [Yakovlev Yak-3](#).

- **Yak-1** – Single-seat fighter aircraft. Initial production version.
- **Yak-1b** – ("b" was an unofficial designation; after October 1942, all Yak-1s were built to this standard). New [bubble canopy](#) with lowered rear fuselage, increased armor, ShKAS machine guns replaced with a single 12.7 mm (0.50 in) [Berezin UBS](#), electrical and pneumatic firing of the weapons instead of the mechanical system, new control stick based on the [Messerschmitt Bf 109](#) design, new gunsight, airtight fuselage, retractable tailwheel, improved engine cooling, [Klimov M-105](#)PF engine with better low-altitude performance. The first flight (aircraft No.3560) took place in June 1942, with aircraft entering production in August. A total of 4,188 were built.
- **Yak-1M** – [Yak-3](#) prototype with a smaller wing, revised cooling intakes, reduced overall weight and upgraded engine. Two were built.
- [Yak-7UTI](#) – Initial production version of the UTI-26.
- [Yak-7](#) – Conversions of Yak-7UTI and new production of fighter version of Yak-7UTI.
- Several other Yak-1 variants did not receive special designations. These include prototypes with [Klimov VK-106](#) and [Klimov VK-107](#) engines, production aircraft capable of carrying external fuel tanks, production aircraft with the ability to carry 6 × [RS-82](#) rockets or 2 × 100 kg (220 lb) bombs, and lightened versions for air defense.

Specifications (Yak-1b)



Yakovlev Yak-1 fighter.

General characteristics

- **Crew:** 1
- **Length:** 8.48 m (27 ft 10 in)
- **Wingspan:** 10.0 m (32 ft 10 in)
- **Height:** 2.64 m (8 ft 8 in)
- **Wing area:** 17.15 m² (184.6 sq ft)
- **Airfoil:** root: [Clark YH](#) (14%); tip: Clark YH (10%)^[24]
- **Empty weight:** 2,316 kg (5,106 lb)
- **Max takeoff weight:** 2,884 kg (6,358 lb)
- **Powerplant:** 1 × [Klimov M-105PF](#) V-12 liquid-cooled piston engine, 940 kW (1,260 hp) at 700 m (2,300 ft)
- **Propellers:** 3-bladed constant-speed propeller

Performance

- **Maximum speed:** 592 km/h (368 mph, 320 kn) at 4,900 m (16,100 ft)
- **Range:** 700 km (430 mi, 380 nmi)
- **Service ceiling:** 10,050 m (32,970 ft)
- **Time to altitude:** 5.4 min to 5,000 m (16,000 ft)
- **Wing loading:** 150 kg/m² (31 lb/sq ft)
- **Take-off run:** 340 m (1,120 ft)
- **Landing run:** 560 m (1,840 ft)

Armament

- **Guns:** 1 × 20 mm (0.79 in) [ShVAK](#) cannon and 1 × 12.7 mm (0.50 in) [Berezin UBS](#) machine gun.

