Actual for version 3.001

Contents

I-16 type 24

Indicated stall speed in flight configuration: 143..164 km/h

Indicated stall speed in takeoff/landing configuration: 142..163 km/h

Dive speed limit: 620 km/h

Maximum load factor: 12 G

Stall angle of attack in flight configuration: 17.6 °

Stall angle of attack in landing configuration: 15 °

Maximum true air speed at sea level, engine mode - Boosted: 448 km/h

Maximum true air speed at 1800 m, engine mode - Nominal: 460 km/h

Maximum true air speed at 4500 m, engine mode - Nominal: 490 km/h

Service ceiling: 10500 m

Climb rate at sea level: 16.7 m/s

Climb rate at 3000 m: 13.8 m/s

Climb rate at 6000 m: 8.8 m/s

Maximum performance turn at sea level: 19.0 s, at 230 km/h IAS.

Maximum performance turn at 3000 m: 25.3 s, at 230 km/h IAS.

Flight endurance at 3000 m: 0.9 h, at 350 km/h IAS.

Takeoff speed: 145..175 km/h

Glideslope speed: 185..195 km/h

Landing speed: 135..145 km/h

Landing angle: 15.3 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates and turn times are given for Boosted power.

Engine:

Model: M-63

Maximum power in Boosted mode at sea level: 1100 HP

Maximum power in Nominal mode at sea level: 930 HP

Maximum power in Nominal mode at 1800 m: 1000 HP

Maximum power in Nominal mode at 4500 m: 900 HP

Engine modes:

Nominal (unlimited time): 2200 RPM, 915 mm Hg

Boosted power (up to 5 minutes): 2300 RPM, 1065 mm Hg

Oil rated temperature in engine output: 55..90 °C

Oil maximum temperature in engine output: 125 °C

Cylinder head rated temperature: 120..200 °C

Cylinder head maximum temperature: 205 °C

Supercharger gear shift altitude: 3000 m

Empty weight: 1501 kg

Minimum weight (no ammo, 10% fuel): 1633 kg

Standard weight: 1878 kg

Maximum takeoff weight: 2146 kg

Fuel load: 191 kg / 260 l

Useful load: 645 kg

Forward-firing armament:

2 x 7.62mm machine gun "ShKAS", 500 rounds, 1800 rounds per minute, synchronized

2 x 7.62mm machine gun "ShKAS", 900 rounds, 1800 rounds per minute, wing-mounted

2 x 20mm gun "SsVAK", 90 rounds, 800 rounds per minute, wing-mounted (modification)

Bombs:

2 x 50 kg general purpose bombs "FAB-50sv"

2 x 104 kg general purpose bombs "FAB-100M"

Rockets:

Up to 6 x 7 kg rockets "ROS-82", HE payload mass 2.52 kg

Length: 6.04 m

Wingspan: 9 m

Wing surface: 14.54 m^2

Combat debut: June 1941

Additional airplane configurations list:

ShVAK 20mm wing-mounted guns with 90 rounds per each instead of default ShKAS wing-mounted machineguns

Additional mass: 40 kg

Ammunition mass: 22 kg

Guns mass: 98 kg

Estimated speed loss: 3 km/h

2 x 50 kg General Purpose Bombs FAB-50sv / 2 x 104 kg General Purpose Bombs FAB-100M

FAB-50sv:

Additional mass: 120 kg

Ammo mass: 104 kg

Racks mass: 20 kg

Estimated speed loss before drop: 13 km/h

Estimated speed loss after drop: 7 km/h

FAB-100M:

Additional mass: 228 kg

Ammo mass: 208 kg

Racks mass: 20 kg

Estimated speed loss before drop: 18 km/h

Estimated speed loss after drop: 7 km/h

4 x 82mm High Explosive unguided rockets ROS-82

Additional mass: 40 kg

Ammunition mass: 28 kg

Racks mass: 12 kg

Estimated speed loss before launch: 10 km/h

Estimated speed loss after launch: 7 km/h

6 x 82mm High Explosive unguided rockets ROS-82

Additional mass: 60 kg

Ammunition mass: 42 kg

Racks mass: 18 kg

Estimated speed loss before launch: 15 km/h

Estimated speed loss after launch: 10 km/h

One-piece frontal canopy section for better visibility

Additional mass: 0 kg

Estimated speed loss: 0 km/h

Operation features:

- Engine has a boost mode. To set boost mode it is necessary to push the boost lever fully forward and increase the engine to 2300 RPM.

- Engine has a two-stage mechanical supercharger which should be manually shifted at 3000m altitude.

- Engine mixture control is automatic when the mixture lever is set to maximum. It is possible to manually lean the mixture by moving the mixture control to less than maximum. This also reduces fuel consumption during flight.

- Engine RPM has an automatic governor and it is maintained at the required RPM corresponding to the governor control lever position. The governor automatically controls the propeller pitch to maintain the required RPM.

- Oil radiator shutter and air cooling intake shutters control is manual.

- Airplane has no flight-control trimmers. Airplane is equipped with bendable trim tabs that can be set pre-flight by ground personnel.

- Airplane has a manual system for landing flaps and gear, for this reason it is necessary to extend landing flaps and gear before final approach. Landing flaps can be extended to any angle up to 53°.

- Airplane has a tail wheel control mechanism which is linked to rudder pedals. Because of this, it is necessary to avoid of large rudder pedal inputs when moving at high speed on the ground.

- Airplane has independent left and right mechanical wheel brakes. To brake it is necessary to push upper part of the rudder pedal.

- Airplane has a hydrostatic fuel gauge which shows total fuel remaining only when manual sucker lever is pushed in. In game this happens by itself during horizontal flight by every 10 seconds.

- Cockpit has side-doors which should be closed before takeoff to prevent damage.

- When bombs are installed there is a salvo controller, it has two release modes: single drop or drop two in a salvo.

- When rockets are installed there is a salvo controller, it has three launch modes: single fire, fire two in a salvo or fire by four in a salvo.

- The gunsight has a sliding sun-filter. There is also a back-up folding mechanical sight which can be used if main sight is damaged.

MiG-3 series 24

Indicated stall speed in flight configuration: 159..175 km/h

Indicated stall speed in takeoff/landing configuration: 134..147 km/h

Dive speed limit: 750 km/h

Maximum load factor: 12.8 G

Stall angle of attack in flight configuration: 17.3 °

Stall angle of attack in landing configuration: 15.1 °

Maximum true air speed at sea level, engine mode - Boosted: 525 km/h

Maximum true air speed at sea level, engine mode - Nominal: 493 km/h

Maximum true air speed at 7600 m, engine mode - Nominal: 626 km/h

Service ceiling: 11800 m

Climb rate at sea level: 15.9 m/s

Climb rate at 3000 m: 14.0 m/s

Climb rate at 6000 m: 10.2 m/s

Maximum performance turn at sea level: 22.4 s, at 270 km/h IAS.

Maximum performance turn at 3000 m: 28.7 s, at 270 km/h IAS.

Flight endurance at 3000 m: 2.5 h, at 350 km/h IAS.

Takeoff speed: 180..200 km/h

Glideslope speed: 195..205 km/h

Landing speed: 135..145 km/h

Landing angle: 15 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates and turn times are given for Boosted power.

Engine:

Model: AM-35a

Maximum power in Boosted mode at sea level: 1350 HP

Maximum power in Nominal mode at sea level: 1120 HP

Maximum power in Nominal mode at 6000 m: 1200 HP

Engine modes:

Nominal (unlimited time): 2050 RPM, 1040 mm Hg

Boosted power (up to 10 minutes): 2050 RPM, 1240 mm Hg

Water rated temperature in engine output: 80..110 °C

Water maximum temperature in engine output: 120 °C

Oil rated temperature in engine intake: 40..80 °C

Oil maximum temperature in engine intake: 85 °C

Oil rated temperature in engine output: 115 °C

Oil maximum temperature in engine output: 120 °C

Supercharger gear shift altitude: single gear

Empty weight: 2650 kg

Minimum weight (no ammo, 10% fuel): 2831 kg

Standard weight: 3244 kg

Maximum takeoff weight: 3476 kg

Fuel load: 352 kg / 480 l

Useful load: 826 kg

Forward-firing armament:

2 x 7.62mm machine gun "ShKAS", 750 rounds, 1800 rounds per minute, synchronized

12.7mm machine gun "UB", 300 rounds, 1000 rounds per minute, synchronized

2 x 12.7mm machine gun "UB", 145 rounds, 1000 rounds per minute, wing-mounted (modification)

2 x 12.7mm machine gun "UB", 350 rounds, 1000 rounds per minute, synchronized (modification)

2 x 20mm gun "SsVAK", 150 rounds, 800 rounds per minute, synchronized (modification)

Bombs:

2 x 50 kg general purpose bombs "FAB-50sv"

2 x 104 kg general purpose bombs "FAB-100M"

Rockets:

6 x 7 kg rockets "ROS-82", HE payload mass 2.52 kg

Length: 8.255 m

Wingspan: 10.2 m

Wing surface: 17.44 m^2

Combat debut: July 1941

Additional airplane configurations list:

BK 12.7mm machineguns in wing-mounted gun pods with 145 rounds per each

Additional mass: 155 kg

Ammunition mass: 54 kg

Guns mass: 101 kg

Estimated speed loss: 13 km/h

BS 12.7mm nose-mounted machineguns with 350 rounds per each instead of default ShKAS and BS nose-mounted machineguns

Additional mass: 34 kg

Ammunition mass: 131 kg

Guns mass: 62 kg

Estimated speed loss: 0 km/h

ShVAK 20mm nose-mounted guns with 150 rounds per each instead of default ShKAS and BS nose-mounted machineguns

Additional mass: 4 kg

Ammunition mass: 69 kg

Guns mass: 94 kg

Estimated speed loss: 0 km/h

2 x 50 kg General Purpose Bombs FAB-50sv / 2 x 104 kg General Purpose Bombs FAB-100M

FAB-50sv:

Additional mass: 120 kg

Ammunition mass: 104 kg

Racks mass: 20 kg

Estimated speed loss before drop: 20 km/h

Estimated speed loss after drop: 12 km/h

FAB-100M:

Additional mass: 228 kg

Ammunition mass: 208 kg

Racks mass: 20 kg

Estimated speed loss before drop: 27 km/h

Estimated speed loss after drop: 12 km/h

6 x 82mm High Explosive unguided rockets ROS-82

Additional mass: 60 kg

Ammunition mass: 42 kg

Racks mass: 18 kg

Estimated speed loss before launch: 23 km/h

Estimated speed loss after launch: 17 km/h

Operation features:

- Engine has a boost mode which is engaged by setting the mixture control lever to maximum.

- Engine has a single-stage mechanical supercharger which does not require manual control.

- Engine mixture control is automatic when the mixture lever is set to the intermediate (50%) position. It is possible to manually lean the mixture by setting the control to less than 50%. This will reduce fuel consumption during flight.

- Engine RPM has an automatic governor and it is maintained at the required RPM corresponding to the governor control lever position. The governor automatically controls the propeller pitch to maintain the required RPM.

- Water and oil radiator shutter control is manual.

- Airplane has only the pitch and yaw flight-control trimmers.

- Airplane has automatic wing slats. They deploy when the high angle of attack increases which makes pre-stall softer.

- Landing flaps have a limiter for the maximum angle. The flaps have an extended range from 0° to 50°. The landing flaps have pneumatic actuator. Flaps can only be instantly extended to the angle which is set by limiter, gradual extending is impossible. Due to weak force of the actuator the extended landing flaps may retract upward by the airflow when the airspeed is more than 220 km/h. For this reason, it is necessary to remember that flaps will not extend fully in case of high speed. In case of a high-speed landing approach the flaps may extend a few steps right before landing.

- Airplane has a tailwheel control system which is unlocked and made controllable by the rudder if the rudder pedal is pressed more than for 40% of its range. The tailwheel remans locked if pedals are deflected less than 40%. Because of this, it is necessary to avoid large rudder pedal inputs when moving at high speed, or be ready to control the airplane with an unlocked tailwheel should large rudder inputs be made.

- Airplane has differential pneumatic wheel brakes with shared control lever. This means that if the brake lever is held and the rudder pedal the opposite wheel brake is gradually released causing the plane to swing to one side or the other.

- Airplane has a fuel gauge which shows total fuel remaining.

- It is impossible to open or close the canopy at high speed due to strong airflow. The canopy has no emergency release, so bail out requires the speed drop before it.

- When bombs are installed a salvo controller can be used, it has two release modes: single drop or drop two in a salvo.

- When rockets are installed a salvo controller can be used, it has three launch modes: single fire, fire two in a salvo or fire four in a salvo.

Il-2 model of 1941

Indicated stall speed in flight configuration: 136..156 km/h

Indicated stall speed in takeoff/landing configuration: 128..146 km/h

Dive speed limit: 570 km/h

Maximum load factor: 11.5 G

Stall angle of attack in flight configuration: 19.4 °

Stall angle of attack in landing configuration: 17.5 °

Maximum true air speed at sea level, engine mode - Boosted: 430 km/h

Maximum true air speed at sea level, engine mode - Nominal (at 2150 RPM): 421 km/h

Maximum true air speed at 2500 m, engine mode - Nominal (at 2150 RPM): 455 km/h

Service ceiling: 7500 m

Climb rate at sea level: 9.4 m/s

Climb rate at 3000 m: 8.9 m/s

Climb rate at 6000 m: 3.9 m/s

Maximum performance turn at sea level: 23.1 s, at 250 km/h IAS.

Maximum performance turn at 3000 m: 32.6 s, at 250 km/h IAS.

Flight endurance at 3000 m: 1.7 h, at 300 km/h IAS.

Takeoff speed: 150..190 km/h

Glideslope speed: 185..195 km/h

Landing speed: 130..140 km/h

Landing angle: 11.7 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates are given for Nominal power, turn times are given for Boosted power.

Engine:

Model: AM-38

Maximum power in Boosted mode at sea level: 1600 HP

Maximum power in Nominal mode at sea level: 1500 HP

Maximum power in Nominal mode at 1650 m: 1500 HP

Engine modes:

Nominal (unlimited time): 2050 RPM, 1180 mm Hg

Boosted power (up to 10 minutes): 2150 RPM, 1280 mm Hg

Water rated temperature in engine output: 80..110 °C

Water maximum temperature in engine output: 120 °C

Oil rated temperature in engine intake: 40..80 °C

Oil maximum temperature in engine intake: 85 °C

Oil rated temperature in engine output: 115 °C

Oil maximum temperature in engine output: 120 °C

Supercharger gear shift altitude: single gear

Empty weight: 4242 kg

Minimum weight (no ammo, 10% fuel): 4464 kg

Standard weight: 5049 kg

Maximum takeoff weight: 5888 kg

Fuel load: 470 kg / 641 l

Useful load: 1646 kg

Forward-firing armament:

2 x 20mm gun "SsVAK", 210 rounds, 800 rounds per minute, wing-mounted

2 x 7.62mm machine gun "ShKAS", 750 rounds, 1800 rounds per minute, wing-mounted

2 x 23mm gun "VYa-23", 150 rounds, 600 rounds per minute, wing-mounted (modification)

Bombs:

Up to 6 x 50 kg general purpose bombs "FAB-50sv"

Up to 6 x 104 kg general purpose bombs "FAB-100M"

2 x 254 kg general purpose bombs "FAB-250sv"

Rockets:

8 x 7 kg rockets "ROS-82", HE payload mass 2.5 kg

8 x 15 kg rockets "RBS-82", HEAT payload mass 7.2 kg

8 x 42 kg rockets "ROFS-132", HE payload mass 21.3 kg

Length: 11.5 m

Wingspan: 14.6 m

Wing surface: 38.5 m^2

Combat debut: June 1941

Additional airplane configurations list:

2 VYa-23 23mm wing-mounted guns with 150 rounds per each

Additional mass: 110 kg

Ammunition mass: 170 kg

Guns mass: 132 kg

Estimated speed loss: 1 km/h

6 x 50 kg General Purpose Bombs FAB-50sv / 6 x 104 kg General Purpose Bombs FAB-100M

FAB-50sv:

Additional mass: 300 kg

Ammunition mass: 300 kg

Estimated speed loss before drop: 5 km/h

Estimated speed loss after drop: 0 km/h

FAB-100M:

Additional mass: 624 kg

Ammunition mass: 624 kg

Estimated speed loss before drop: 9 km/h

Estimated speed loss after drop: 0 km/h

2 x 254 kg General Purpose Bombs FAB-250sv

Additional mass: 538 kg

Ammunition mass: 508 kg

Racks mass: 30 kg

Estimated speed loss before drop: 19 km/h

Estimated speed loss after drop: 9 km/h

8 x 82mm Armour Piercing unguided rockets RBS-82

Additional mass: 144 kg

Ammunition mass: 120 kg

Racks mass: 24 kg

Estimated speed loss before launch: 13 km/h

Estimated speed loss after launch: 8 km/h

8 x 132mm High Explosive unguided rockets ROFS-132

Additional mass: 376 kg

Ammunition mass: 336 kg

Racks mass: 40 kg

Estimated speed loss before launch: 20 km/h

Estimated speed loss after launch: 12 km/h

Operation features:

- Engine has a boost mode which is engaging by setting mixture control lever to maximum position.

- Engine has a single stage mechanical supercharger which does not require manual control.

- Engine mixture control is automatic when the mixture lever is set to the intermediate (50%) position. It is possible to manually lean the mixture by moving the control lever to less than 50%. This will lower fuel consumption during flight.

- Engine RPM has an automatic governor and it is maintained at the required RPM corresponding to the governor control lever position. The governor automatically controls the propeller pitch to maintain the required RPM.

- Water and oil radiator shutter control is manual. Airplane has armored oil radiator shutters which should to be closed on start of ground attack to reduce possibility of combat damage. After finishing the attack, it is necessary to re-open the shutters to the required position.

- Airplane has only the pitch flight-control trimmer.

- Landing flaps have a pneumatic actuator. Flaps can only be fully extended; gradual extending is impossible. Due to the weak force of the actuator the extended landing flaps may be pressed upwards by the airflow if the airspeed is more than 220 km/h. Remember that the flaps will not extend fully in case of high speed. In case of a high-speed landing approach the flaps may extend a few steps further right before landing.

- Airplane has a manual tail wheel lock. Wheel should be locked when taxiing straight for a long distance and before takeoff and landing.

- Airplane has differential pneumatic wheel brakes with shared control lever. This means that if the brake lever is held and the rudder pedal the opposite wheel brake is gradually released causing the plane to swing to one side or the other.

- Airplane has a fuel gauge which shows the amount of remaining fuel in the front or bottom fuel tank depending on the switch position. In game the fuel indication switch changes by itself during horizontal flight by every 10 seconds. Rear fuel tank level is not indicated.

- Cockpit canopy weight is 50 kg and it has no lock in the open position, for this reason the canopy may to spontaneously close in a deep dive. Also, it is impossible to open or close canopy at high speed due to strong airflow. The canopy has no emergency release, so bail out requires the speed drop before it.

- Airplane is equipped with a joint salvo controller both for bombs and rockets, it has three release/fire modes: single launch, launch two in a salvo or launch four in a salvo.

- The gunsight is installed on a sliding bar which allows the pilot to extend the gunsight towards the pilot allowing fo an increase in the field of view through the gunsight.

Pe-2 series 35

Indicated stall speed in flight configuration: 175..200 km/h

Indicated stall speed in takeoff/landing configuration: 148..169 km/h

Dive speed limit: 790 km/h

Maximum load factor: 11 G

Stall angle of attack in flight configuration: 13.9 °

Stall angle of attack in landing configuration: 9.8 °

Maximum true air speed at sea level, engine mode - Nominal: 434 km/h

Maximum true air speed at 2000 m, engine mode - Nominal: 476 km/h

Maximum true air speed at 5000 m, engine mode - Nominal: 521 km/h

Service ceiling: 9100 m

Climb rate at sea level: 9.3 m/s

Climb rate at 3000 m: 8.4 m/s

Climb rate at 6000 m: 5.6 m/s

Maximum performance turn at sea level: 30.5 s, at 270 km/h IAS.

Maximum performance turn at 3000 m: 39.9 s, at 270 km/h IAS.

Flight endurance at 3000 m: 3.7 h, at 300 km/h IAS.

Takeoff speed: 160..200 km/h

Glideslope speed: 220..240 km/h

Landing speed: 155..165 km/h

Landing angle: 12.5 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates and turn times are given for Nominal power.

Engine:

Model: M-105RA

Maximum power in Nominal mode at sea level: 1020 HP

Maximum power in Nominal mode at 2000 m: 1100 HP

Maximum power in Nominal mode at 4000 m: 1050 HP

Engine modes:

Nominal (unlimited time): 2700 RPM, 910 mm Hg

Water rated temperature in engine output: 70..85 °C

Water maximum temperature in engine output: 100 °C

Oil rated temperature in engine output: 90..100 °C

Oil maximum temperature in engine output: 110 °C

Supercharger gear shift altitude: 2700 m

Empty weight: 6078 kg

Minimum weight (no ammo, 10% fuel): 6640 kg

Standard weight: 7697 kg

Maximum takeoff weight: 8712 kg

Fuel load: 1129 kg / 1505 l

Useful load: 2634 kg

Forward-firing armament:

12.7mm machine gun "UB", 150 rounds, 1000 rounds per minute, nose-mounted

7.62mm machine gun "ShKAS", 450 rounds, 1800 rounds per minute, nose-mounted

Defensive armament:

Top: 7.62mm machine gun "ShKAS", 750 rounds, 1800 rounds per minute

Belly: 12.7mm machine gun "UB", 200 rounds, 1000 rounds per minute

Side: 7.62mm machine gun "ShKAS", 225 rounds, 1800 rounds per minute

Bombs:

Up to 10 x 104 kg general purpose bombs "FAB-100M"

Up to 4 x 254 kg general purpose bombs "FAB-250sv"

Up to 2 x 512 kg general purpose bombs "FAB-500M"

Rockets:

10 x 23 kg rockets "ROS-132", HE payload mass 9.1 kg

Length: 12.69 m

Wingspan: 17.12 m

Wing surface: 40.8 m^2

Combat debut: July 1941

Additional airplane configurations list:

10 x 104 kg General Purpose Bombs FAB-100M

Additional mass: 1040 kg

Ammunition mass: 1040 kg

Estimated speed loss before drop: 23 km/h

Estimated speed loss after drop: 0 km/h

4 x 254 kg General Purpose Bombs FAB-250sv

Additional mass: 1016 kg

Ammunition mass: 1016 kg

Estimated speed loss before drop: 33 km/h

Estimated speed loss after drop: 0 km/h

2 x 512 kg General Purpose Bombs FAB-500M

Additional mass: 1024 kg

Ammunition mass: 1024 kg

Estimated speed loss before drop: 48 km/h

Estimated speed loss after drop: 0 km/h

10 x 132mm High Explosive unguided rockets ROS-132

Additional mass: 280 kg

Ammunition mass: 230 kg

Racks mass: 50 kg

Estimated speed loss before launch: 31 km/h

Estimated speed loss after launch: 20 km/h

RPK-2 fixed loop radio compass for navigation with radio beacons

Additional mass: 20 kg

Estimated speed loss: 2 km/h

Operation features:

- Engine has a two-stage mechanical supercharger which must be manually switched at 2700m altitude.

- Engine mixture control is manual; it is necessary to lean the mixture if altitude is more than 3-4 km for optimal engine operation. Also, leaning the mixture allows a reduction in fuel consumption during flight.

- Engine RPM has an automatic governor and it is maintained at the required RPM corresponding to the governor control lever position. The governor automatically controls the propeller pitch to maintain the required RPM. The governor is electrically actuated and takes a long time to reach the required revolutions, up to 45 seconds when going from minimum to maximum.

- Water and oil radiator shutter control is manual.

- Airplane has trimmers for all flight-controls: pitch, roll, yaw.

- Airplane has fence-type airbrakes which are located under the wing and used to slow the descent during steep dive bombing.

- Landing flaps have electro-hydraulic actuator and they can be extended to any angle up to 50°. When landing and the flaps are fully extended the angle of attack for a stall is less than landing pitch angle. For this reason, it is prohibited to extend flaps to more than to 35° (70%) on landing.

- Airplane has automatically controlled horizontal stabilizer. The automatic control system adjusts the stabilizer angle depending on landing flaps extended angle.

- Airplane tail wheel rotates freely and does not have a lock. For this reason, it is necessary to confidently and accurately operate the rudder pedals during the takeoff and landing.

- Airplane has differential pneumatic wheel brakes with shared control lever. This means that if the brake lever is held and the rudder pedal the opposite wheel brake is gradually released causing the plane to swing to one side or the other.

- Airplane has three fuel gauges which shows the level in the fuselage fuel tank, left wing tanks and right wing tanks.

- Cockpit canopy have an emergency release system for bailouts.

- Airplane is equipped with a bomb salvo controller, it has four release modes: drop single, drop two in a salvo, drop four in a salvo or drop all bombs in salvo. There is also a controller for a drop delay between each bomb in the salvo.

- When rockets are installed a salvo controller can be used, it has three launch modes: single fire, fire two in a salvo or fire four in a salvo. Aircraft has a fire control system that is designed for eight rockets. However, for added punch, ten rockets were typically loaded. In that case, the ninth rocket will fire with the seventh and the tenth will fire with the eighth.

Bf 109 E-7

Indicated stall speed in flight configuration: 152..159 km/h

Indicated stall speed in takeoff/landing configuration: 147..146 km/h

Dive speed limit: 850 km/h

Maximum load factor: 11 G

Stall angle of attack in flight configuration: 20 °

Stall angle of attack in landing configuration: 16.6 °

Maximum true air speed at sea level, engine mode - Emergency: 477 km/h

Maximum true air speed at 2000 m, engine mode - Emergency: 520 km/h

Maximum true air speed at 5000 m, engine mode - Emergency: 564 km/h

Service ceiling: 10500 m

Climb rate at sea level: 14 m/s

Climb rate at 3000 m: 13.3 m/s

Climb rate at 6000 m: 7 m/s

Maximum performance turn at sea level: 20.5 s, at 270 km/h IAS.

Maximum performance turn at 3000 m: 25.5 s, at 270 km/h IAS.

Flight endurance at 3000 m: 2.2 h, at 350 km/h IAS.

Takeoff speed: 140..170 km/h

Glideslope speed: 180..190 km/h

Landing speed: 130..140 km/h

Landing angle: 14.3 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates are given for Combat power, turn times are given for Boosted power.

Engine:

Model: DB-601A

Maximum power in Boosted mode at sea level: 1100 HP

Maximum power in Emergency mode at sea level: 990 HP

Maximum power in Emergency mode at 4500 m: 1020 HP

Maximum power in Combat mode at sea level: 910 HP

Maximum power in Combat mode at 5000 m: 960 HP

Engine modes:

Nominal (unlimited time): 2200 RPM, 1.15 ata

Combat power (up to 30 minutes): 2300 RPM, 1.23 ata

Emergency power (up to 5 minutes): 2400 RPM, 1.3 ata

Boosted power (up to 1 minute): 2400 RPM, 1.4 ata

Water rated temperature in engine output: 94 °C

Water maximum temperature in engine output: 100 °C

Oil rated temperature in engine intake: 30..75 °C

Oil maximum temperature in engine intake: 80 °C

Oil rated temperature in engine output: 95 °C

Oil maximum temperature in engine output: 105 °C

Supercharger gear shift altitude: fluid coupling

Empty weight: 2049 kg

Minimum weight (no ammo, 10% fuel): 2340 kg

Standard weight: 2614 kg

Maximum takeoff weight: 2893 kg

Fuel load: 304 kg / 400 l

Useful load: 844 kg

Forward-firing armament:

2 x 20mm gun "MG FF", 60 rounds, 540 rounds per minute, wing-mounted

2 x 7.92mm machine gun "MG 17", 1000 rounds, 1200 rounds per minute, synchronized

Bombs:

Up to 4 x 55 kg general purpose bombs "SC 50"

249 kg general purpose bomb "SC 250"

Length: 8.8 m

Wingspan: 9.9 m

Wing surface: 16.4 m^2

Combat debut: August 1940

Additional airplane configurations list:

4 x 55 kg General Purpose Bombs SC 50

Additional mass: 260 kg

Ammunition mass: 220 kg

Racks mass: 40 kg

Estimated speed loss before drop: 53 km/h

Estimated speed loss after drop: 13 km/h

249 kg General Purpose Bomb SC 250

Additional mass: 279 kg

Ammunition mass: 249 kg

Racks mass: 30 kg

Estimated speed loss before drop: 34 km/h

Estimated speed loss after drop: 11 km/h

Removed pilot armoured headrest for improved field of view

Weight savings: 8 kg

Estimated speed loss: 0 km/h

Additional pilot protection: armoured triplex wind screen

Additional mass: 20 kg

Estimated speed loss: 1 km/h

Additional protection: armoured plates on bottom of plane

Additional mass: 89 kg

Estimated speed loss: 4 km/h

Operation features:

- Airplane has a wide automatization of the engine systems, in fact, to control speed it is only necessary to use the throttle lever. There is no need to manually set engine revolutions and mixture or supercharger gear in normal flight.

- To reduce swinging during taxiing due to prop-wash the propeller pitch control should be switched to manual mode and pitch should be reduced to minimum.

- Water and oil radiator shutters are controlled manually.

- Airplane has no flight-control trimmers. Airplane is equipped with bendable trim tabs that can be set pre-flight by ground personnel.

- Airplane has a manually controlled horizontal stabilizer. It should be set to +1° before takeoff and to -4°...-5° before landing. Also, it may be used to trim the flight stick during the flight. In a deep dive the stabilizer should be set so that the pilot must push the flight stick forward to maintain the dive angle.

- Airplane has automatic wing slats. They deploy when the high angle of attack increases which makes pre-stall softer.

- Airplane has a manual mechanical system for retracting the landing flaps, for this reason it is necessary to extend landing flaps well before final approach. Markers on the left-wing flap indicate how far the flaps are extended. The flaps can be extended to any angle up to 42°.

- Airplane has a manual tail wheel lock. Wheel should be locked when taxiing straight for a long distance and before takeoff and landing.

- Airplane has independent left and right hydraulic wheel brake controls. To apply either brake push the upper part of the rudder pedal.

- Airplane has a fuel gauge which shows total fuel remaining. Also, it has an emergency fuel warning light (80 liters).

- The design of the cockpit canopy does not allow it to be opened during flight. The canopy should be closed before takeoff to prevent damage. The canopy has an emergency release system for bailouts.

- The control system for the bomb rack only allows for dropping bombs one by one.

- The gunsight has a sliding sun-filter.

Bf 109 F-2

Indicated stall speed in flight configuration: 151..168 km/h

Indicated stall speed in takeoff/landing configuration: 144 km/h..159 km/h

Dive speed limit: 850 km/h

Maximum load factor: 11 G

Stall angle of attack in flight configuration: 19.7 °

Stall angle of attack in landing configuration: 17 °

Maximum true air speed at sea level, engine mode - Emergency: 528 km/h

Maximum true air speed at 2000 m, engine mode - Emergency: 563 km/h

Maximum true air speed at 5000 m, engine mode - Emergency: 606 km/h

Service ceiling: 11500 m

Climb rate at sea level: 16.4 m/s

Climb rate at 3000 m: 14.1 m/s

Climb rate at 6000 m: 10 m/s

Maximum performance turn at sea level: 23.6 s, at 270 km/h IAS.

Maximum performance turn at 3000 m: 29.0 s, at 270 km/h IAS.

Flight endurance at 3000 m: 2.4 h, at 350 km/h IAS.

Takeoff speed: 145..175 km/h

Glideslope speed: 185..195 km/h

Landing speed: 135..145 km/h

Landing angle: 14.8 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates are given for Combat power, turn times are given for Boosted power.

Engine:

Model: DB-601N

Maximum power in Boosted mode at 5500 m: 1220 HP

Maximum power in Emergency mode at sea level: 1175 HP

Maximum power in Emergency mode at 4900 m: 1175 HP

Maximum power in Combat mode at sea level: 1015 HP

Maximum power in Combat mode at 4900 m: 1045 HP

Engine modes:

Nominal (unlimited time): 2300 RPM, 1.15 ata

Combat power (up to 30 minutes): 2400 RPM, 1.25 ata

Emergency power (up to 3 minutes): 2600 RPM, 1.35 ata

Boosted power (up to 1 minute): 2800 RPM, 1.42 ata

Water rated temperature in engine output: 100..102 °C

Water maximum temperature in engine output: 110 °C

Oil rated temperature in engine intake: 70..80 °C

Oil maximum temperature in engine intake: 85 °C

Supercharger gear shift altitude: fluid coupling

Empty weight: 2171 kg

Minimum weight (no ammo, 10% fuel): 2445 kg

Standard weight: 2789 kg

Maximum takeoff weight: 3092 kg

Fuel load: 304 kg / 400 l

Useful load: 921 kg

Forward-firing armament:

15mm gun "MG 151/15", 200 rounds, 700 rounds per minute, nose-mounted

2 x 7.92mm machine gun "MG 17", 500 rounds, 1200 rounds per minute, synchronized

20mm gun "MG 151/20", 200 rounds, 700 rounds per minute, nose-mounted (modification)

Bombs:

Up to 4 x 55 kg general purpose bombs "SC 50"

249 kg general purpose bomb "SC 250"

Length: 8.94 m

Wingspan: 9.97 m

Wing surface: 16.1 m^2

Combat debut: March 1941

Additional airplane configurations list:

MG 151/20 20mm nose-gun with 200 rounds

Additional mass: 4 kg

Ammunition mass: 42 kg

Gun mass: 44 kg

Estimated speed loss: 0 km/h

4 x 55 kg General Purpose Bombs SC 50

Additional mass: 260 kg

Ammunition mass: 220 kg

Racks mass: 40 kg

Estimated speed loss before drop: 51 km/h

Estimated speed loss after drop: 11 km/h

249 kg General Purpose Bomb SC 250

Additional mass: 279 kg

Ammunition mass: 249 kg

Racks mass: 30 kg

Estimated speed loss before drop: 31 km/h

Estimated speed loss after drop: 10 km/h

Removed pilot armoured headrest for improved field of view

Weight savings: 8 kg

Estimated speed loss: 0 km/h

Additional pilot protection: armoured triplex wind screen

Additional mass: 20 kg

Estimated speed loss: 1 km/h

Operation features:

- Airplane has a wide automatization of the engine systems, in fact, to control speed it is only necessary to use the throttle lever. There is no need to manually set engine revolutions and mixture or supercharger gear in normal flight.

- In addition to full-automatic mode there is a special emergency mode for the radiator shutters, which can be used in specific situations. In this mode, the shutters are forced to be fully opened.

- To reduce swinging during taxiing due to prop-wash the propeller pitch control should be switched to manual mode and pitch should be reduced to minimum.

- Airplane has no flight-control trimmers. Airplane is equipped with bendable trim tabs that can be set pre-flight by ground personnel.

- Airplane has a manually controlled horizontal stabilizer. It should be set to +1° before takeoff and to -4°...-5° before landing. Also, it may be used to trim the flight stick during the flight. In a deep dive the stabilizer should be set so that the pilot must push the flight stick forward to maintain the dive angle.

- Airplane has automatic wing slats. They deploy when the high angle of attack increases which makes pre-stall softer.

- Airplane has a manual mechanical system for retracting the landing flaps, for this reason it is necessary to extend landing flaps well before final approach. Markers on the left-wing flap indicate how far the flaps are extended. The flaps can be extended to any angle up to 40°.

- Airplane has a manual tail wheel lock. Wheel should be locked when taxiing straight for a long distance and before takeoff and landing.

- Airplane has independent left and right hydraulic wheel brake controls. To apply either brake push the upper part of the rudder pedal.

- Airplane has a fuel gauge which shows total fuel remaining. Also, it has an emergency fuel warning light (80 liters).

- The design of the cockpit canopy does not allow it to be opened during flight. The canopy should be closed before takeoff to prevent damage. The canopy has an emergency release system for bailouts.

- The control system for the bomb rack only allows for dropping bombs one by one.

- The gunsight has a sliding sun-filter.

Bf 110 E-2

Indicated stall speed in flight configuration: 148..182 km/h

Indicated stall speed in takeoff/landing configuration: 131..162 km/h

Dive speed limit: 740 km/h

Maximum load factor: 11 G

Stall angle of attack in flight configuration: 20.7 °

Stall angle of attack in landing configuration: 17.5 °

Maximum true air speed at sea level, engine mode - Emergency: 456 km/h

Maximum true air speed at 2000 m, engine mode - Emergency: 494 km/h

Maximum true air speed at 5000 m, engine mode - Emergency: 529 km/h

Service ceiling: 9500 m

Climb rate at sea level: 10.3 m/s

Climb rate at 3000 m: 9.6 m/s

Climb rate at 6000 m: 6.1 m/s

Maximum performance turn at sea level: 27.4 s, at 270 km/h IAS.

Maximum performance turn at 3000 m: 35.4 s, at 270 km/h IAS.

Flight endurance at 3000 m: 3.5 h, at 300 km/h IAS.

Takeoff speed: 180..220 km/h

Glideslope speed: 200..220 km/h

Landing speed: 140..160 km/h

Landing angle: 10.6 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates are given for Combat power, turn times are given for Boosted power.

Engine:

Model: DB-601A

Maximum power in Boosted mode at sea level: 1100 HP

Maximum power in Emergency mode at sea level: 990 HP

Maximum power in Emergency mode at 4500 m: 1020 HP

Maximum power in Combat mode at sea level: 910 HP

Maximum power in Combat mode at 5000 m: 960 HP

Engine modes:

Nominal (unlimited time): 2200 RPM, 1.15 ata

Combat power (up to 30 minutes): 2300 RPM, 1.23 ata

Emergency power (up to 5 minutes): 2400 RPM, 1.3 ata

Boosted power (up to 1 minute): 2400 RPM, 1.4 ata

Water rated temperature in engine output: 94 °C

Water maximum temperature in engine output: 100 °C

Oil rated temperature in engine intake: 30..75 °C

Oil maximum temperature in engine intake: 80 °C

Oil rated temperature in engine output: 95 °C

Oil maximum temperature in engine output: 105 °C

Supercharger gear shift altitude: fluid coupling

Empty weight: 5175 kg

Minimum weight (no ammo, 10% fuel): 5597 kg

Standart weight: 6706 kg

Maximum takeoff weight: 8398 kg

Fuel load: 965 kg / 1270 l

Useful load: 3223 kg

Forward-firing armament:

4 x 7.92mm machine gun "MG 17", 1000 rounds, 1200 rounds per minute, nose-mounted

2 x 20mm gun "MG FF", 180 rounds, 540 rounds per minute, nose-mounted

Defensive armament:

Backward: 7.92mm machine gun "MG 15", 825 rounds, 1000 rounds per minute

Bombs:

Up to 12 x 55 kg general purpose bombs "SC 50"

Up to 2 x 249 kg general purpose bombs "SC 250"

Up to 2 x 500 kg general purpose bombs "SC 500"

1090 kg general purpose bomb "SC 1000"

Length: 12.1 m

Wingspan: 16.3 m

Wing surface: 38.4 m^2

Combat debut: October 1940

Additional airplane configurations list:

12 x 55 kg General Purpose Bombs SC 50

Additional mass: 820 kg

Ammunition mass: 660 kg

Racks mass: 160 kg

Estimated speed loss before drop: 80 km/h

Estimated speed loss after drop: 38 km/h

2 x 500 kg General Purpose Bomb SC 500

Additional mass: 1025 kg

Ammunition mass: 1000 kg

Racks mass: 50 kg

Estimated speed loss before drop: 35 km/h

Estimated speed loss after drop: 5 km/h

1090 kg General Purpose Bomb SC 1000

Additional mass: 1140 kg

Ammunition mass: 1090 kg

Racks mass: 50 kg

Estimated speed loss before drop: 33 km/h

Estimated speed loss after drop: 5 km/h

Additional pilot protection: armoured triplex wind screen and armoured headrest

Additional mass: 32 kg

Estimated speed loss: 0 km/h

Additional protection: armoured plates on engines and radiators

Additional mass: 245 kg

Estimated speed loss: 0 km/h

Operation features:

- Airplane has a wide automatization of the engine systems, in fact, to control speed it is only necessary to use the throttle lever. There is no need to manually set engine revolutions and mixture or supercharger gear in normal flight.

- Water and oil radiator shutters are controlled manually. The oil radiator control has five fixed positions. The water radiator control has nine fixed positions.

- Propellers have a feathering system which should be activated in case of engine damage to reduce drag of the propeller in auto-rotation.

- To reduce swinging during taxiing due to prop-wash it is necessary to use asymmetrical engines thrust. It is recommended to give the left engine 20% more power. Also, the propeller pitch control should be switched to manual mode and pitch should be reduced to minimum.

- Airplane has only pitch and yaw flight-control trimmers.

- Airplane has automatic wing slats. They deploy when the high angle of attack increases which makes pre-stall softer.

- Landing flaps have a hydraulic actuator and they can be extended to any angle up to 50°.

- Airplane has a automatically controlled horizontal stabilizer. An automatic control system adjusts the stabilizer angle depending on the extended angle of the landing flaps.

- Airplane tail wheel rotates freely and does not have a lock. For this reason, it is necessary to confidently and accurately operate the rudder pedals during the takeoff and landing.

- Airplane has independent left and right hydraulic wheel brake controls. To apply either brake push the upper part of the rudder pedal.

- Airplane has a fuel gauge which shows the reaming fuel in one of four fuel tanks depending on the switch position. In the game the fuel indicator switch changes by itself during horizontal flight by every 10 seconds. Also, the airplane has a low fuel warning light (50 liters) for each tank.

- The design of the cockpit canopy does not allow it to be opened during flight. The canopy should be closed before takeoff to prevent damage. The canopy has an emergency release system for bailouts.

- Airplane is equipped with an automatic bomb salvo controller, it allows you to choose which bomb-racks to be released (central belly, left and right wing) and to switch the bomb salvo (single release or release all bombs).

- Reloading of both MG-FF guns (forward and rearward) must be performed by the rear gunner. The forward firing MGFF must be reloaded at the pilot's command.

- The gunsight has a sliding sun-filter.

Ju 88 A-4

Indicated stall speed in flight configuration: 188..205 km/h

Indicated stall speed in takeoff/landing configuration: 158..185 km/h

Dive speed limit: 670 km/h

Maximum load factor: 8.0 G

Stall angle of attack in flight configuration: 21.0 °

Stall angle of attack in landing configuration: 16.6 °

Maximum true air speed at sea level, engine mode - Climb: 424 km/h

Maximum true air speed at 2000 m, engine mode - Climb: 462 km/h

Maximum true air speed at 5000 m, engine mode - Climb: 486 km/h

Service ceiling: 7500 m

Climb rate at sea level: 7.0 m/s

Climb rate at 3000 m: 5.1 m/s

Climb rate at 6000 m: 3.4 m/s

Maximum performance turn at sea level: 33.0 s, at 250 km/h IAS.

Maximum performance turn at 3000 m: 50.5 s, at 250 km/h IAS.

Flight endurance at 3000 m: 3.8 h, at 300 km/h IAS.

Takeoff speed: 170..210 km/h

Glideslope speed: 210..220 km/h

Landing speed: 150..160 km/h

Landing angle: 9 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates are given for Climb power, turn times are given for Take-off power.

Engine:

Model: Jumo-211J

Maximum power in Take-off mode at sea level: 1420 HP

Maximum power in Climb mode at sea level: 1190 HP

Maximum power in Climb mode at 1500 m: 1260 HP

Maximum power in Climb mode at 4900 m: 1180 HP

Engine modes:

Nominal (unlimited time): 2250 RPM, 1.15 ata

Climb power (up to 30 minutes): 2400 RPM, 1.25 ata

Take-off power (up to 1 minute): 2600 RPM, 1.42 ata

Water rated temperature in engine output: 80 °C

Water maximum temperature in engine output: 110 °C

Oil rated temperature in engine output: 100 °C

Oil maximum temperature in engine output: 130 °C

Supercharger gear shift altitude: automatic

Empty weight: 8619 kg

Minimum weight (no ammo, 10% fuel): 9458 kg

Standard weight: 12110 kg

Maximum takeoff weight: 13655 kg

Fuel load: 1277 kg / 1680 l

Useful load: 5036 kg

Defensive armament:

Nose: 7.92mm machine gun "MG 81", 750 rounds, 1600 rounds per minute

Top: 7.92mm machine gun "MG 81", 1000 rounds, 1600 rounds per minute

Belly: 2 x 7.92mm machine gun "MG 81", 950 rounds, 1600 rounds per minute

Bombs:

Up to 44 x 55 kg general purpose bombs "SC 50"

Up to 6 x 249 kg general purpose bombs "SC 250"

Up to 4 x 500 kg general purpose bombs "SC 500"

Up to 2 x 1090 kg general purpose bombs "SC 1000"

1780 kg general purpose bomb "SC 1800"

Length: 14.3 m

Wingspan: 20.02 m

Wing surface: 52.7 m^2

Combat debut: June 1941

Additional airplane configurations list:

44 x 55 kg General Purpose Bombs SC 50

Additional mass: 2640 kg

Ammunition mass: 2420 kg

Racks mass: 220 kg

Estimated speed loss before drop: 97 km/h

Estimated speed loss after drop: 39 km/h

6 x 249 kg General Purpose Bomb SC 250 (+2 on the underwing holders)

Additional mass: 1544 kg

Ammunition mass: 1494 kg

Racks mass: 50 kg

Estimated speed loss before drop: 37 km/h

Estimated speed loss after drop: 4 km/h

4 x 500 kg General Purpose Bomb SC 500

Additional mass: 2000 kg

Ammunition mass: 2000 kg

Estimated speed loss before drop: 34 km/h

Estimated speed loss after drop: 0 km/h

2 x 1090 kg General Purpose Bomb SC 1000

Additional mass: 2180 kg

Ammunition mass: 2180 kg

Estimated speed loss before drop: 26 km/h

Estimated speed loss after drop: 0 km/h

1780 kg General Purpose Bomb SC 1800

Additional mass: 1780 kg

Ammunition mass: 1780 kg

Estimated speed loss before drop: 23 km/h

Estimated speed loss after drop: 0 km/h

Operation features:

- Each engine has a two-stage mechanical supercharger with an automatic switch system that switches gears depending altitude and engine revolutions. It can also be manually switched to first gear.

- Engine mixture control is automatic.

- Engine RPM has an automatic governor and it is maintained at the required RPM corresponding to the governor control lever position. The governor automatically controls the propeller pitch to maintain the required RPM.

- Propellers have a feathering system which should be activated in case of engine damage to reduce drag of the propeller in auto-rotation.

- Water and oil radiators shutters are joint with engine cowl outlet shutters and manually operated. Ground personnel may install additional fixed shutters on the intake of the oil radiators in cold weather to prevent freezing of the oil

- Airplane has trimmers for all flight-controls: pitch, roll, yaw.

- Airplane has fence-type airbrakes which are located under the wing and used to slow the descent during steep dive bombing.

- Airplane has hydraulic-actuated landing flaps with three fixed positions: retracted, takeoff (25°) and landing (50°). Flap indicator lights are located on left panel.

- Airplane has a automatically controlled horizontal stabilizer. An automatic control system adjusts the stabilizer angle depending on the extended angle of the landing flaps. The stabilizer control lamps are located near the flaps indicator lights.

- Airplane is also equipped with differential ailerons which are lowered in synch with the flaps.

- Lowering the landing gear takes a long time, for this reason it is necessary to extend the landing gear well before final landing approach.

- Airplane tail wheel rotates freely and does not have a lock. For this reason, it is necessary to confidently and accurately operate the rudder pedals during the takeoff and landing.

- Airplane has independent left and right hydraulic wheel brake controls. To apply either brake push the upper part of the rudder pedal.

- Airplane has dedicated fuel gauges for left and right fuel tank groups and there is a switch between the internal and external fuel tank group indicator. In game the fuel indicator switch changes by itself during horizontal flight every 10 seconds. Also, the airplane has low fuel warning lights (180 liters) for the internal tanks.

- Airplane is equipped with an automatic bomb salvo controller, it allows the pilot to switch between the bomb racks to be released (internal or external) and to switch between different salvo quantities. There is also a controller for a drop delay between each bomb in the salvo.

LaGG-3 series 29

Indicated stall speed in flight configuration: 163..189 km/h

Indicated stall speed in takeoff/landing configuration: 138..168 km/h

Dive speed limit: 750 km/h

Maximum load factor: 11 G

Stall angle of attack in flight configuration: 18 °

Stall angle of attack in landing configuration: 15 °

Maximum true air speed at sea level, engine mode - Nominal: 505 km/h

Maximum true air speed at 2000 m, engine mode - Nominal: 548 km/h

Maximum true air speed at 4000 m, engine mode - Nominal: 573 km/h

Service ceiling: 10500 m

Climb rate at sea level: 14.9 m/s

Climb rate at 3000 m: 13.3 m/s

Climb rate at 6000 m: 8 m/s

Maximum performance turn at sea level: 22.2 s, at 280 km/h IAS.

Maximum performance turn at 3000 m: 28.9 s, at 270 km/h IAS.

Flight endurance at 3000 m: 2.2 h, at 350 km/h IAS.

Takeoff speed: 165..200 km/h

Glideslope speed: 200..210 km/h

Landing speed: 140..160 km/h

Landing angle: 12.8 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates and turn times are given for Nominal power.

Engine:

Model: M-105PF

Maximum power in Nominal mode at sea level: 1200 HP

Maximum power in Nominal mode at 800 m: 1260 HP

Maximum power in Nominal mode at 2700 m: 1200 HP

Engine modes:

Nominal (unlimited time): 2700 RPM, 1050 mm Hg

Water rated temperature in engine output: 70..85 °C

Water maximum temperature in engine output: 100 °C

Oil rated temperature in engine output: 90..100 °C

Oil maximum temperature in engine output: 115 °C

Supercharger gear shift altitude: 2500 m

Empty weight: 2620 kg

Minimum weight (no ammo, 10% fuel): 2773 kg

Standard weight: 3157 kg

Maximum takeoff weight: 3701 kg

Fuel load: 348 kg / 467 l

Useful load: 1081 kg

Forward-firing armament:

20mm gun "SsVAK", 160 rounds, 800 rounds per minute, nose-mounted

12.7mm machine gun "UB", 200 rounds, 1000 rounds per minute, synchronized

23mm gun "VYa-23", 90 rounds, 600 rounds per minute, nose-mounted (modification)

37mm gun "Sh-37", 20 rounds, 185 rounds per minute, nose-mounted (modification)

Bombs:

2 x 50 kg general purpose bombs "FAB-50sv"

2 x 104 kg general purpose bombs "FAB-100M"

Rockets:

6 x 7 kg rockets "ROS-82", HE payload mass 2.52 kg

Length: 8.84 m

Wingspan: 9.8 m

Wing surface: 17.51 m^2

Combat debut: May 1942

Additional airplane configurations list:

VYa-23 23mm motor-gun with 90 rounds

Additional mass: 35 kg

Ammunition mass: 45 kg

Gun mass: 66 kg

Estimated speed loss: 0 km/h

Sh-37 37mm motor-gun with 20 rounds

Additional mass: 106 kg

Ammunition mass: 25 kg

Gun mass: 169 kg

Estimated speed loss: 2 km/h

2 x 50 kg General Purpose Bombs FAB-50sv

Additional mass: 120 kg

Ammunition mass: 100 kg

Racks mass: 20 kg

Estimated speed loss before drop: 20 km/h

Estimated speed loss after drop: 12 km/h

2 x 104 kg General Purpose Bombs FAB-100M

Additional mass: 228 kg

Ammunition mass: 208 kg

Racks mass: 20 kg

Estimated speed loss before drop: 27 km/h

Estimated speed loss after drop: 12 km/h

6 x 82mm High Explosive unguided rockets ROS-82

Additional mass: 60 kg

Ammunition mass: 42 kg

Racks mass: 18 kg

Estimated speed loss before launch: 23 km/h

Estimated speed loss after launch: 17 km/h

Operation features:

- Engine has a two-stage mechanical supercharger which must be manually switched at 2500m altitude.

- Engine mixture control is manual, it is necessary to lean the mixture if altitude is more than 3-4 km for optimal engine operation. Also, leaning the mixture allows a reduction in fuel consumption during flight.

- Engine RPM has an automatic governor and it is maintained at the required RPM corresponding to the governor control lever position. The governor automatically controls the propeller pitch to maintain the required RPM.

- Water and oil radiator shutters is manually controlled.

- Airplane has trimmers for all flight-controls: pitch, roll, yaw.

- Landing flaps have a hydraulic actuator and they can be extended to any angle up to 60°.

- Airplane tail wheel rotates freely and does not have a lock. For this reason, it is necessary to confidently and accurately operate the rudder pedals during the takeoff and landing.

- Airplane has differential pneumatic wheel brakes with shared control lever. This means that if the brake lever is held and the rudder pedal the opposite wheel brake is gradually released causing the plane to swing to one side or the other.

- Airplane has a fuel gauge which shows total remaining fuel.

- Cockpit canopy has a weak lock when in the opened position, for this reason the canopy may spontaneously close in a deep dive. Also, it is impossible to open or close canopy at high speed due to strong airflow. The canopy has no emergency release, so bail out requires the speed drop before it.

- The control system of wing-mounted bomb racks only allows the dropping of bombs one by one.

- When rockets are installed a salvo controller is used, it has three launch modes: single fire, fire two in a salvo or fire four in a salvo.

Yak-1 series 69

Indicated stall speed in flight configuration: 155..171 km/h

Indicated stall speed in takeoff/landing configuration: 133..146 km/h

Dive speed limit: 720 km/h

Maximum load factor: 10.3 G

Stall angle of attack in flight configuration: 18 °

Stall angle of attack in landing configuration: 15.6 °

Maximum true air speed at sea level, engine mode - Nominal, 2550 RPM: 514 km/h

Maximum true air speed at 2000 m, engine mode - Nominal, 2700 RPM: 549 km/h

Maximum true air speed at 4000 m, engine mode - Nominal, 2700 RPM: 582 km/h

Service ceiling: 10200 m

Climb rate at sea level: 16.9 m/s

Climb rate at 3000 m: 15.0 m/s

Climb rate at 6000 m: 9.4 m/s

Maximum performance turn at sea level: 19.2 s, at 270 km/h IAS.

Maximum performance turn at 3000 m: 24.6 s, at 270 km/h IAS.

Flight endurance at 3000 m: 1.9 h, at 350 km/h IAS.

Takeoff speed: 160..190 km/h

Glideslope speed: 195..205 km/h

Landing speed: 135..145 km/h

Landing angle: 12 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates and turn times are given for Nominal (2700 RPM) power.

Engine:

Model: M-105PF

Maximum power in Nominal mode (2550 RPM) at sea level: 1240 HP

Maximum power in Nominal mode (2700 RPM) at sea level: 1210 HP

Maximum power in Nominal mode (2700 RPM) at 800 m: 1260 HP

Maximum power in Nominal mode (2700 RPM) at 2700 m: 1200 HP

Engine modes:

Nominal (unlimited time): 2550/2700 RPM, 1050 mm Hg

Water rated temperature in engine output: 70..85 °C

Water maximum temperature in engine output: 100 °C

Oil rated temperature in engine output: 90..100 °C

Oil maximum temperature in engine output: 115 °C

Supercharger gear shift altitude: 2300 m

Empty weight: 2365 kg

Minimum weight (no ammo, 10% fuel): 2583 kg

Standard weight: 2932 kg

Maximum takeoff weight: 3170 kg

Fuel load: 304 kg / 408 l

Useful load: 805 kg

Forward-firing armament:

20mm gun "SsVAK", 120 rounds, 800 rounds per minute, nose-mounted

2 x 7.62mm machine gun "ShKAS", 750 rounds, 1800 rounds per minute, synchronized

Bombs:

2 x 50 kg general purpose bombs "FAB-50sv"

2 x 104 kg general purpose bombs "FAB-100M"

Rockets:

Up to 6 x 7 kg rockets "ROS-82", HE payload mass 2.52 kg

Length: 8.5 m

Wingspan: 10 m

Wing surface: 17.15 m^2

Combat debut: May 1942

Additional airplane configurations list:

2 x 50 kg General Purpose Bombs FAB-50sv

Additional mass: 120 kg

Ammunition mass: 100 kg

Racks mass: 20 kg

Estimated speed loss before drop: 20 km/h

Estimated speed loss after drop: 12 km/h

2 x 104 kg General Purpose Bombs FAB-100M

Additional mass: 228 kg

Ammunition mass: 208 kg

Racks mass: 20 kg

Estimated speed loss before drop: 27 km/h

Estimated speed loss after drop: 12 km/h

2 x 82mm High Explosive unguided rockets ROS-82

Additional mass: 60 kg

Ammunition mass: 42 kg

Racks mass: 18 kg

Estimated speed loss before launch: 8 km/h

Estimated speed loss after launch: 6 km/h

6 x 82mm High Explosive unguided rockets ROS-82

Additional mass: 60 kg

Ammunition mass: 42 kg

Racks mass: 18 kg

Estimated speed loss before launch: 23 km/h

Estimated speed loss after launch: 17 km/h

RPK-10 fixed loop radio compass for navigation with radio beacons

Additional mass: 10 kg

Estimated speed loss: 0 km/h

Operation features:

- Engine has a two-stage mechanical supercharger which must be manually switched at 2300m altitude.

- Engine mixture control is manual; it is necessary to lean the mixture if altitude is more than 3-4 km for optimal engine operation. Also, leaning the mixture allows a reduction in fuel consumption during flight.

- Engine RPM has an automatic governor and it is maintained at the required RPM corresponding to the governor control lever position. The governor automatically controls the propeller pitch to maintain the required RPM.

- Water and oil radiator shutter control is manual.

- Airplane has only a flight-control trimmer on the pitch.

- Landing flaps have a pneumatic actuator. Flaps can only be fully extended; gradual extending is impossible. Due to the weak force of the actuator the extended landing flaps may be pressed upwards by the airflow if the airspeed is more than 220 km/h. Remember that the flaps will not extend fully in case of high speed. In case of a high-speed landing approach the flaps may extend a few steps further right before landing.

- Airplane has a manual control for the tailwheel lock. The unlocked tailwheel has a 90° turn limit. The tailwheel should be locked when taxiing straight for a long distance and before takeoff and landing.

- Airplane has differential pneumatic wheel brakes with shared control lever. This means that if the brake lever is held and the rudder pedal the opposite wheel brake is gradually released causing the plane to swing to one side or the other.

- Fuel gauges are installed on left and right wing fuel tanks, outside of the cockpit. They show remaining fuel level only when there is less than 80 liters of fuel left in the tank.

- It is impossible to open or close the canopy at high speed due to strong airflow. The canopy has no emergency release, so bail out requires the speed drop before it.

- The control system for the wing-mounted bomb racks only allows releasing of both bombs together.

- When rockets are installed a salvo controller can be used, it has three launch modes: single fire, fire two in a salvo or fire four in a salvo.

Il-2 model of 1942

Indicated stall speed in flight configuration: 138..158 km/h

Indicated stall speed in takeoff/landing configuration: 130..148 km/h

Dive speed limit: 570 km/h

Maximum load factor: 10.5 G

Stall angle of attack in flight configuration: 19.4 °

Stall angle of attack in landing configuration: 17.5 °

Maximum true air speed at sea level, engine mode - Boosted: 400 km/h

Maximum true air speed at sea level, engine mode - Nominal: 380 km/h

Maximum true air speed at 2500 m, engine mode - Nominal: 414 km/h

Service ceiling: 6000 m

Climb rate at sea level: 7.1 m/s

Climb rate at 3000 m: 5.6 m/s

Climb rate at 6000 m:m/s

Maximum performance turn at sea level: 25.7 s, at 250 km/h IAS.

Maximum performance turn at 3000 m: 37.3 s, at 250 km/h IAS.

Flight endurance at 3000 m: 1.7 h, at 300 km/h IAS.

Takeoff speed: 150..190 km/h

Glideslope speed: 185..195 km/h

Landing speed: 135..145 km/h

Landing angle: 11.7 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates are given for Nominal power, turn times are given for Boosted power.

Engine:

Model: AM-38

Maximum power in Boosted mode at sea level: 1600 HP

Maximum power in Nominal mode at sea level: 1500 HP

Maximum power in Nominal mode at 1650 m: 1500 HP

Engine modes:

Nominal (unlimited time): 2050 RPM, 1180 mm Hg

Boosted power (up to 10 minutes): 2150 RPM, 1280 mm Hg

Water rated temperature in engine output: 80..110 °C

Water maximum temperature in engine output: 120 °C

Oil rated temperature in engine intake: 40..80 °C

Oil maximum temperature in engine intake: 85 °C

Oil rated temperature in engine output: 115 °C

Oil maximum temperature in engine output: 120 °C

Supercharger gear shift altitude: single gear

Empty weight: 4462 kg

Minimum weight (no ammo, 10% fuel): 4651 kg

Standard weight: 5294 kg

Maximum takeoff weight: 6127 kg

Fuel load: 535 kg / 730 l

Useful load: 1665 kg

Forward-firing armament:

2 x 20mm gun "SsVAK", 250 rounds, 800 rounds per minute, wing-mounted

2 x 7.62mm machine gun "ShKAS", 750 rounds, 1800 rounds per minute, wing-mounted

2 x 23mm gun "VYa-23", 150 rounds, 600 rounds per minute, wing-mounted (modification)

2 x 37mm gun "Sh-37", 40 rounds, 185 rounds per minute, wing-mounted (modification)

Defensive armament:

Backward: 7.62mm machine gun "ShKAS", 500 rounds, 1800 rounds per minute (modification)

Bombs:

Up to 6 x 50 kg general purpose bombs "FAB-50sv"

Up to 6 x 104 kg general purpose bombs "FAB-100M"

2 x 254 kg general purpose bombs "FAB-250sv"

Rockets:

8 x 7 kg rockets "ROS-82", HE payload mass 2.5 kg

8 x 15 kg rockets "RBS-82", HEAT payload mass 7.2 kg

8 x 42 kg rockets "ROFS-132", HE payload mass 21.3 kg

Length: 11.5 m

Wingspan: 14.6 m

Wing surface: 38.5 m^2

Combat debut: June 1942

Additional airplane configurations list:

2 VYa-23 23mm wing-mounted guns with 150 rounds per each

Additional mass: 91 kg

Ammunition mass: 170 kg

Guns mass: 132 kg

Estimated speed loss: 1 km/h

2 gun pods with Sh-37 37mm guns with 40 rounds per each

Additional mass: 495 kg

Ammunition mass: 101 kg

Guns mass: 605 kg

Estimated speed loss: 19 km/h

2 x 254 kg General Purpose Bombs FAB-250sv

Additional mass: 538 kg

Ammunition mass: 508 kg

Racks mass: 30 kg

Estimated speed loss before drop: 18 km/h

Estimated speed loss after drop: 7 km/h

8 x 82mm Armour Piercing unguided rockets RBS-82 or 8 x 132mm High Explosive unguided rockets ROFS-132

RBS-82:

Additional mass: 144 kg

Ammunition mass: 120 kg

Racks mass: 24 kg

Estimated speed loss before launch: 10 km/h

Estimated speed loss after launch: 7 km/h

ROFS-132:

Additional mass: 376 kg

Ammunition mass: 336 kg

Racks mass: 40 kg

Estimated speed loss before launch: 18 km/h

Estimated speed loss after launch: 9 km/h

Rear turret with ShKAS 7.62mm machinegun with 500 rounds

Additional mass: 130 kg

Estimated speed loss: 40 km/h

Operation features:

- Engine has a boost mode which is engaging by setting mixture control lever to maximum position.

- Engine has a single stage mechanical supercharger which does not require manual control.

- Engine mixture control is automatic when the mixture lever is set to the intermediate (50%) position. It is possible to manually lean the mixture by moving the control lever to less than 50%. This will lower fuel consumption during flight.

- Engine RPM has an automatic governor and it is maintained at the required RPM corresponding to the governor control lever position. The governor automatically controls the propeller pitch to maintain the required RPM.

- Water and oil radiator shutter control is manual. Airplane has armored oil radiator shutters which should to be closed on start of ground attack to reduce possibility of combat damage. After finishing the attack, it is necessary to re-open the shutters to the required position.

- Airplane has only the pitch flight-control trimmer.

- Landing flaps have a pneumatic actuator. Flaps can only be fully extended; gradual extending is impossible. Due to the weak force of the actuator the extended landing flaps may be pressed upwards by the airflow if the airspeed is more than 220 km/h. Remember that the flaps will not extend fully in case of high speed. In case of a high-speed landing approach the flaps may extend a few steps further right before landing.

- Airplane has a manual tail wheel lock. Wheel should be locked when taxiing straight for a long distance and before takeoff and landing.

- Airplane has differential pneumatic wheel brakes with shared control lever. This means that if the brake lever is held and the rudder pedal the opposite wheel brake is gradually released causing the plane to swing to one side or the other.

- Airplane has a fuel gauge which shows the amount of remaining fuel in the front or bottom fuel tank depending on the switch position. In game the fuel indication switch changes by itself during horizontal flight by every 10 seconds. Rear fuel tank level is not indicated.

- Cockpit canopy weight is 50 kg and it has no lock in the open position, for this reason the canopy may to spontaneously close in a deep dive. Also, it is impossible to open or close canopy at high speed due to strong airflow. The canopy has no emergency release, so bail out requires the speed drop before it.

- Airplane is equipped with a bomb salvo controller, it has three release modes: single drop, drop two in a salvo or drop four in a salvo.

- Airplane is equipped with a rockets salvo controller, it has three launch modes: single fire, fire two in a salvo or fire four in a salvo.

- The gunsight is installed on a sliding bar which allows the pilot to extend the gunsight towards the pilot allowing fo an increase in the field of view through the gunsight.

Pe-2 series 87

Indicated stall speed in flight configuration: 175..200 km/h

Indicated stall speed in takeoff/landing configuration: 148..169 km/h

Dive speed limit: 790 km/h

Maximum load factor: 11 G

Stall angle of attack in flight configuration: 13.9 °

Stall angle of attack in landing configuration: 9.8 °

Maximum true air speed at sea level, engine mode - Nominal: 446 km/h

Maximum true air speed at 2000 m, engine mode - Nominal: 476 km/h

Maximum true air speed at 5000 m, engine mode - Nominal: 498 km/h

Service ceiling: 8000 m

Climb rate at sea level: 10.4 m/s

Climb rate at 3000 m: 7.8 m/s

Climb rate at 6000 m: 3.0 m/s

Maximum performance turn at sea level: 29.9 s, at 270 km/h IAS.

Maximum performance turn at 3000 m: 40.3 s, at 270 km/h IAS.

Flight endurance at 3000 m: 2.8 h, at 300 km/h IAS.

Takeoff speed: 160..200 km/h

Glideslope speed: 220..240 km/h

Landing speed: 155..165 km/h

Landing angle: 12.5 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates and turn times are given for Nominal power.

Engine:

Model: M-105RF

Maximum power in Nominal mode at sea level: 1200 HP

Maximum power in Nominal mode at 800 m: 1260 HP

Maximum power in Nominal mode at 2700 m: 1200 HP

Engine modes:

Nominal (unlimited time): 2700 RPM, 1050 mm Hg

Water rated temperature in engine output: 70..85 °C

Water maximum temperature in engine output: 100 °C

Oil rated temperature in engine output: 90..100 °C

Oil maximum temperature in engine output: 115 °C

Supercharger gear shift altitude: 2300 m

Empty weight: 6089 kg

Minimum weight (no ammo, 10% fuel): 6643 kg

Standard weight: 7685 kg

Maximum takeoff weight: 8701 kg

Fuel load: 1113 kg / 1484 l

Useful load: 2612 kg

Forward-firing armament:

12.7mm machine gun "UB", 150 rounds, 1000 rounds per minute, nose-mounted

7.62mm machine gun "ShKAS", 450 rounds, 1800 rounds per minute, nose-mounted

Defensive armament:

Top: 12.7mm machine gun "UB", 200 rounds, 1000 rounds per minute

Belly: 12.7mm machine gun "UB", 200 rounds, 1000 rounds per minute

Side: 7.62mm machine gun "ShKAS", 225 rounds, 1800 rounds per minute

Top turret: 12.7mm machine gun "UB", 200 rounds, 1000 rounds per minute (modification "series 110")

Bombs:

Up to 10 x 104 kg general purpose bombs "FAB-100M"

Up to 4 x 254 kg general purpose bombs "FAB-250sv"

Up to 2 x 512 kg general purpose bombs "FAB-500M"

Rockets:

10 x 23 kg rockets "ROS-132", HE payload mass 9.1 kg

Length: 12.69 m

Wingspan: 17.12 m

Wing surface: 40.8 m^2

Combat debut: May 1942

Additional airplane configurations list:

10 x 104 kg General Purpose Bombs FAB-100M

Additional mass: 1040 kg

Ammunition mass: 1040 kg

Estimated speed loss before drop: 23 km/h

Estimated speed loss after drop: 0 km/h

4 x 254 kg General Purpose Bombs FAB-250sv

Additional mass: 1016 kg

Ammunition mass: 1016 kg

Estimated speed loss before drop: 33 km/h

Estimated speed loss after drop: 0 km/h

2 x 512 kg General Purpose Bombs FAB-500M

Additional mass: 1024 kg

Ammunition mass: 1024 kg

Estimated speed loss before drop: 48 km/h

Estimated speed loss after drop: 0 km/h

10 x 132mm High Explosive unguided rockets ROS-132

Additional mass: 280 kg

Ammunition mass: 230 kg

Racks mass: 50 kg

Estimated speed loss before launch: 31 km/h

Estimated speed loss after launch: 20 km/h

VUB-1 rear wide-angle turret with UBT 12.7mm machinegun with 200 rounds

Additional mass: 0 kg

Estimated speed loss: 5 km/h

Operation features:

- Engine has a two-stage mechanical supercharger which must be manually switched at 2300m altitude.

- Engine mixture control is manual; it is necessary to lean the mixture if altitude is more than 3-4 km for optimal engine operation. Also, leaning the mixture allows a reduction in fuel consumption during flight.

- Engine RPM has an automatic governor and it is maintained at the required RPM corresponding to the governor control lever position. The governor automatically controls the propeller pitch to maintain the required RPM.

- Water radiator shutter control is manual. Oil radiator shutters are fixed.

- Airplane has trimmers for all flight-controls: pitch, roll, yaw.

- Airplane has fence-type airbrakes which are located under the wing and used to slow the descent during steep dive bombing.

- Landing flaps have electro-hydraulic actuator and they can be extended to any angle up to 50°. When landing and the flaps are fully extended the angle of attack for a stall is less than landing pitch angle. For this reason, it is prohibited to extend flaps to more than to 35° (70%) on landing.

- Airplane has automatically controlled horizontal stabilizer. The automatic control system adjusts the stabilizer angle depending on landing flaps extended angle.

- Airplane tail wheel rotates freely and does not have a lock. For this reason, it is necessary to confidently and accurately operate the rudder pedals during the takeoff and landing.

- Airplane has differential pneumatic wheel brakes with shared control lever. This means that if the brake lever is held and the rudder pedal the opposite wheel brake is gradually released causing the plane to swing to one side or the other.

- Airplane has a fuel gauge which shows total fuel remaining.

- Cockpit canopy have an emergency release system for bailouts.

- Airplane is equipped with a bomb salvo controller, it has four release modes: drop single, drop two in a salvo, drop four in a salvo or drop all bombs in salvo. There is also a controller for a drop delay between each bomb in the salvo.

- When rockets are installed a salvo controller can be used, it has three launch modes: single fire, fire two in a salvo or fire four in a salvo. Aircraft has a fire control system that is designed for eight rockets. However, for added punch, ten rockets were typically loaded. In that case, the ninth rocket will fire with the seventh and the tenth will fire with the eighth.

Bf 109 F-4

Indicated stall speed in flight configuration: 154..171 km/h

Indicated stall speed in takeoff/landing configuration: 148..161 km/h

Dive speed limit: 850 km/h

Maximum load factor: 11 G

Stall angle of attack in flight configuration: 19.9 °

Stall angle of attack in landing configuration: 17 °

Maximum true air speed at sea level, engine mode - Combat: 522 km/h

Maximum true air speed at 2000 m, engine mode - Combat: 570 km/h

Maximum true air speed at 6000 m, engine mode - Combat: 635 km/h

Service ceiling: 11600 m

Climb rate at sea level: 19.5 m/s

Climb rate at 3000 m: 18.8 m/s

Climb rate at 6000 m: 14.9 m/s

Maximum performance turn at sea level: 20.3 s, at 270 km/h IAS.

Maximum performance turn at 3000 m: 26.1 s, at 270 km/h IAS.

Flight endurance at 3000 m: 2.6 h, at 350 km/h IAS.

Takeoff speed: 150..180 km/h

Glideslope speed: 190..200 km/h

Landing speed: 145..155 km/h

Landing angle: 14.8 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates are given for Combat power, turn times are given for Emergency power.

Engine:

Model: DB-601E

Maximum power in Emergency mode at sea level: 1350 HP

Maximum power in Emergency mode at 4800 m: 1320 HP

Maximum power in Combat mode at sea level: 1200 HP

Maximum power in Combat mode at 4900 m: 1200 HP

Engine modes:

Nominal (unlimited time): 2300 RPM, 1.15 ata

Combat power (up to 30 minutes): 2500 RPM, 1.3 ata

Emergency power (up to 1 minute): 2700 RPM, 1.42 ata

Water rated temperature in engine output: 100..102 °C

Water maximum temperature in engine output: 115 °C

Oil rated temperature in engine intake: 70..80 °C

Oil maximum temperature in engine intake: 85 °C

Supercharger gear shift altitude: fluid coupling

Empty weight: 2382 kg

Minimum weight (no ammo, 10% fuel): 2545 kg

Standard weight: 2890 kg

Maximum takeoff weight: 3189 kg

Fuel load: 304 kg / 400 l

Useful load: 807 kg

Forward-firing armament:

20mm gun "MG 151/20", 200 rounds, 700 rounds per minute, nose-mounted

2 x 7.92mm machine gun "MG 17", 500 rounds, 1200 rounds per minute, synchronized

2 x 15mm gun "MG 151/15", 135 rounds, 700 rounds per minute, wing-mounted (modification)

2 x 20mm gun "MG 151/20", 135 rounds, 700 rounds per minute, wing-mounted (modification)

Bombs:

Up to 4 x 55 kg general purpose bombs "SC 50"

249 kg general purpose bomb "SC 250"

Length: 8.94 m

Wingspan: 9.97 m

Wing surface: 16.1 m^2

Combat debut: June 1941

Additional airplane configurations list:

MG 151/15 15mm guns in wing-mounted gun pods with 135 rounds per each

Additional mass: 193 kg

Ammunition mass: 47 kg

Guns mass: 146 kg

Estimated speed loss: 11 km/h

MG 151/20 20mm guns in wing-mounted gun pods with 135 rounds per each

Additional mass: 212 kg

Ammunition mass: 55 kg

Guns mass: 157 kg

Estimated speed loss: 12 km/h

4 x 55 kg General Purpose Bombs SC 50

Additional mass: 260 kg

Ammunition mass: 220 kg

Racks mass: 40 kg

Estimated speed loss before drop: 51 km/h

Estimated speed loss after drop: 11 km/h

249 kg General Purpose Bomb SC 250

Additional mass: 279 kg

Ammunition mass: 249 kg

Racks mass: 30 kg

Estimated speed loss before drop: 31 km/h

Estimated speed loss after drop: 10 km/h

Removed pilot armoured headrest for improved field of view

Weight savings: 8 kg

Estimated speed loss: 0 km/h

Additional pilot protection: armoured triplex wind screen

Additional mass: 20 kg

Estimated speed loss: 1 km/h

Operation features:

- Airplane has a wide automatization of the engine systems, in fact, to control speed it is only necessary to use the throttle lever. There is no need to manually set engine revolutions and mixture or supercharger gear in normal flight.

- In addition to full-automatic mode there is a special manual control mode for the radiator shutters, which can be used in specific situations.

- To reduce swinging during taxiing due to prop-wash the propeller pitch control should be switched to manual mode and pitch should be reduced to minimum.

- Airplane has no flight-control trimmers. Airplane is equipped with bendable trim tabs that can be set pre-flight by ground personnel.

- Airplane has a manually controlled horizontal stabilizer. It should be set to +1° before takeoff and to -4°...-5° before landing. Also, it may be used to trim the flight stick during the flight. In a deep dive the stabilizer should be set so that the pilot must push the flight stick forward to maintain the dive angle.

- Airplane has automatic wing slats. They deploy when the high angle of attack increases which makes pre-stall softer.

- Airplane has a manual mechanical system for retracting the landing flaps, for this reason it is necessary to extend landing flaps well before final approach. Markers on the left-wing flap indicate how far the flaps are extended. The flaps can be extended to any angle up to 40°.

- Airplane has a manual tail wheel lock. Wheel should be locked when taxiing straight for a long distance and before takeoff and landing.

- Airplane has independent left and right hydraulic wheel brake controls. To apply either brake push the upper part of the rudder pedal.

- Airplane has a fuel gauge which shows total fuel remaining. Also, it has an emergency fuel warning light (80 liters).

- The design of the cockpit canopy does not allow it to be opened during flight. The canopy should be closed before takeoff to prevent damage. The canopy has an emergency release system for bailouts.

- The control system for the bomb rack only allows for dropping bombs one by one.

- The gunsight has a sliding sun-filter.

Bf 109 G-2

Indicated stall speed in flight configuration: 158..174 km/h

Indicated stall speed in takeoff/landing configuration: 153..164 km/h

Dive speed limit: 850 km/h

Maximum load factor: 10.5 G

Stall angle of attack in flight configuration: 19.8 °

Stall angle of attack in landing configuration: 17 °

Maximum true air speed at sea level, engine mode - Combat: 530 km/h

Maximum true air speed at 2000 m, engine mode - Combat: 577 km/h

Maximum true air speed at 7000 m, engine mode - Combat: 656 km/h

Service ceiling: 12100 m

Climb rate at sea level: 21.0 m/s

Climb rate at 3000 m: 19.5 m/s

Climb rate at 6000 m: 16.5 m/s

Maximum performance turn at sea level: 22.2 s, at 270 km/h IAS.

Maximum performance turn at 3000 m: 28.3 s, at 270 km/h IAS.

Flight endurance at 3000 m: 2.4 h, at 350 km/h IAS.

Takeoff speed: 155..180 km/h

Glideslope speed: 195..205 km/h

Landing speed: 150..155 km/h

Landing angle: 14.8 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates and turn times are given for Combat power.

Engine:

Model: DB-605A

Maximum power in Combat mode at sea level: 1310 HP

Maximum power in Combat mode at 5800 m: 1250 HP

Engine modes:

Nominal (unlimited time): 2300 RPM, 1.15 ata

Combat power (up to 30 minutes): 2600 RPM, 1.3 ata

Water rated temperature in engine output: 100..102 °C

Water maximum temperature in engine output: 115 °C

Oil rated temperature in engine intake: 70..80 °C

Oil maximum temperature in engine intake: 85 °C

Supercharger gear shift altitude: fluid coupling

Empty weight: 2486 kg

Minimum weight (no ammo, 10% fuel): 2649 kg

Standard weight: 2994 kg

Maximum takeoff weight: 3283 kg

Fuel load: 304 kg / 400 l

Useful load: 797 kg

Forward-firing armament:

20mm gun "MG 151/20", 200 rounds, 700 rounds per minute, nose-mounted

2 x 7.92mm machine gun "MG 17", 500 rounds, 1200 rounds per minute, synchronized

2 x 20mm gun "MG 151/20", 135 rounds, 700 rounds per minute, wing-mounted (modification)

Bombs:

Up to 4 x 55 kg general purpose bombs "SC 50"

249 kg general purpose bomb "SC 250"

Length: 8.94 m

Wingspan: 9.97 m

Wing surface: 16.1 m^2

Combat debut: May 1942

Additional airplane configurations list:

MG 151/20 20mm guns in wing-mounted gun pods with 135 rounds per each

Additional mass: 212 kg

Ammunition mass: 55 kg

Guns mass: 157 kg

Estimated speed loss: 12 km/h

4 x 55 kg General Purpose Bombs SC 50

Additional mass: 260 kg

Ammunition mass: 220 kg

Racks mass: 40 kg

Estimated speed loss before drop: 51 km/h

Estimated speed loss after drop: 11 km/h

249 kg General Purpose Bomb SC 250

Additional mass: 279 kg

Ammunition mass: 249 kg

Racks mass: 30 kg

Estimated speed loss before drop: 31 km/h

Estimated speed loss after drop: 10 km/h

Alternative pilot protection: armoured transparent triplex head rest for better visibility

Additional mass: 10 kg

Estimated speed loss: 0 km/h

Removed pilot armoured headrest for improved field of view

Weight savings: 8 kg

Estimated speed loss: 0 km/h

Operation features:

- Airplane has a wide automatization of the engine systems, in fact, to control speed it is only necessary to use the throttle lever. There is no need to manually set engine revolutions and mixture or supercharger gear in normal flight.

- In addition to full-automatic mode there is a special manual control mode for the radiator shutters, which can be used in specific situations.

- To reduce swinging during taxiing due to prop-wash the propeller pitch control should be switched to manual mode and pitch should be reduced to minimum.

- Airplane has no flight-control trimmers. Airplane is equipped with bendable trim tabs that can be set pre-flight by ground personnel.

- Airplane has a manually controlled horizontal stabilizer. It should be set to +1° before takeoff and to -4°...-5° before landing. Also, it may be used to trim the flight stick during the flight. In a deep dive the stabilizer should be set so that the pilot must push the flight stick forward to maintain the dive angle.

- Airplane has automatic wing slats. They deploy when the high angle of attack increases which makes pre-stall softer.

- Airplane has a manual mechanical system for retracting the landing flaps, for this reason it is necessary to extend landing flaps well before final approach. Markers on the left-wing flap indicate how far the flaps are extended. The flaps can be extended to any angle up to 40°.

- Airplane has a manual tail wheel lock. Wheel should be locked when taxiing straight for a long distance and before takeoff and landing.

- Airplane has independent left and right hydraulic wheel brake controls. To apply either brake push the upper part of the rudder pedal.

- Airplane has a fuel gauge which shows total fuel remaining. Also, it has an emergency fuel warning light (80 liters).

- The design of the cockpit canopy does not allow it to be opened during flight. The canopy should be closed before takeoff to prevent damage. The canopy has an emergency release system for bailouts.

- The control system for the bomb rack only allows for dropping bombs one by one.

- The gunsight has a sliding sun-filter.

Ju 87 D-3

Indicated stall speed in flight configuration: 137..176 km/h

Indicated stall speed in takeoff/landing configuration: 123..155 km/h

Dive speed limit: 650 km/h

Maximum load factor: 9 G

Stall angle of attack in flight configuration: 19.9 °

Stall angle of attack in landing configuration: 18 °

Maximum true air speed at sea level, engine mode - Climb: 367 km/h

Maximum true air speed at 2000 m, engine mode - Climb: 389 km/h

Maximum true air speed at 6000 m, engine mode - Climb: 422 km/h

Service ceiling: 7000 m

Climb rate at sea level: 8 m/s

Climb rate at 3000 m: 7 m/s

Climb rate at 6000 m: 2.5 m/s

Maximum performance turn at sea level: 22.2 s, at 230 km/h IAS.

Maximum performance turn at 3000 m: 31.3 s, at 230 km/h IAS.

Flight endurance at 3000 m: 3.4 h, at 300 km/h IAS.

Takeoff speed: 140..170 km/h

Glideslope speed: 180..195 km/h

Landing speed: 125..145 km/h

Landing angle: 11 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates are given for Climb power, turn times are given for Take-off power.

Engine:

Model: Jumo-211J

Maximum power in Take-off mode at sea level: 1420 HP

Maximum power in Climb mode at sea level: 1190 HP

Maximum power in Climb mode at 1500 m: 1260 HP

Maximum power in Climb mode at 4900 m: 1180 HP

Engine modes:

Nominal (unlimited time): 2250 RPM, 1.15 ata

Climb power (up to 30 minutes): 2400 RPM, 1.25 ata

Take-off power (up to 1 minute): 2600 RPM, 1.42 ata

Water rated temperature in engine output: 80 °C

Water maximum temperature in engine output: 110 °C

Oil rated temperature in engine output: 90 °C

Oil maximum temperature in engine output: 105 °C

Supercharger gear shift altitude: automatic

Empty weight: 3930 kg

Minimum weight (no ammo, 10% fuel): 4250 kg

Standard weight: 4835 kg

Maximum takeoff weight: 6684 kg

Fuel load: 626 kg / 840 l

Useful load: 2754 kg

Forward-firing armament:

2 x 7.92mm machine gun "MG 17", 1000 rounds, 1200 rounds per minute, nose-mounted

12 x 7.92mm machine gun "MG 81", 250 rounds, 1600 rounds per minute, wing-mounted (modification)

2 x 37mm gun "BK 37", 12 rounds, 160 rounds per minute, wing-mounted (modification)

Defensive armament:

Backward: 2 x 7.92mm machine gun "MG 81", 500 rounds, 1600 rounds per minute

Bombs:

Up to 4 x 70 kg general purpose bomb "SD 70"

Up to 3 x 249 kg general purpose bombs "SC 250"

500 kg general purpose bomb "SC 500"

1090 kg general purpose bomb "SC 1000"

1780 kg general purpose bomb "SC 1800"

Length: 11 m

Wingspan: 13.8 m

Wing surface: 31.9 m^2

Combat debut: March 1942

Additional airplane configurations list:

2 gun pods with 3 twin 7.92mm MG-81Z machineguns and 1500 rounds per each pod

Additional mass: 369 kg

Ammunition mass: 89 kg

Guns mass: 280 kg

Estimated speed loss: 31 km/h

2 gun pods with 37mm autocannons 3.7cm BK with 12 rounds per each

Additional mass: 793 kg

Ammunition mass: 31 kg

Guns mass: 840 kg

Estimated speed loss: 33 km/h

1780 kg General Purpose Bomb SC 1800

Additional mass: 1780 kg

Ammunition mass: 1780 kg

Estimated speed loss before drop: 28 km/h

Estimated speed loss after drop: 0 km/h

Special impeller-actuated siren for demoralizing enemies in dive attacks

Additional mass: 9 kg

Estimated speed loss: 12 km/h

Additional pilot protection: armoured plates on side of cockpit and canopy

Additional mass: 60 kg

Estimated speed loss: 0 km/h

Operation features:

- The engine has a two-stage mechanical supercharger with an automatic switch system that switches gears depending altitude and engine revolutions. It can also be manually switched to first gear.

- Engine mixture control is automatic.

- Engine RPM has an automatic governor and it is maintained at the required RPM corresponding to the governor control lever position. The governor automatically controls the propeller pitch to maintain the required RPM.

- Water and oil radiators shutters control is manual.

- Airplane has only the pitch and roll flight-control trimmers.

- Airplane has fence-type airbrakes which are located under the wing and used to slow the descent during steep dive bombing.

- Airplane has hydraulic-actuated landing flaps with three fixed positions: retracted, takeoff (25°) and landing (40°). Flap indicator lights are located on left panel near the throttle.

- Airplane is also equipped with differential ailerons which are lowered in synch with the flaps.

- Airplane has a automatically controlled horizontal stabilizer. An automatic control system adjusts the stabilizer angle depending on the extended angle of the landing flaps. The stabilizer control lamps are located near the throttle lever.

- Airplane has a manual tail wheel lock. Wheel should be locked when taxiing straight for a long distance and before takeoff and landing.

- Airplane has independent left and right hydraulic wheel brake controls. To apply either brake push the upper part of the rudder pedal.

- Airplane have a fuel gauge which shows remaining fuel in left and right fuel tanks depending on switch position. In game the fuel indicator switch changes by itself during horizontal flight by every 10 seconds. Also, the airplane has indicator lights for full internal tanks and a low fuel warning light (160 liters) for each tank.

- It is impossible to open or close canopy at high speed due to strong airflow. When the canopy is open, it is impossible to use rear gun because it is linked to canopy. The canopy has an emergency release system for bailouts.

- Airplane has a window in the cockpit floor which can be opened by the bomb bay door command.

- Airplane is equipped with a salvo controller, it allows the pilot to choose which bomb racks to use (central, left and right wing) and to switch the bomb salvo (single drop or all bombs on the rack).

- The gunsight has a sliding sun-filter.

He 111 H-6

Indicated stall speed in flight configuration: 150..184 km/h

Indicated stall speed in takeoff/landing configuration: 123..151 km/h

Dive speed limit: 560 km/h

Maximum load factor: 4.5 G

Stall angle of attack in flight configuration: 20 °

Stall angle of attack in landing configuration: 17 °

Maximum true air speed at sea level, engine mode - Climb: 369 km/h

Maximum true air speed at 2000 m, engine mode - Climb: 398 km/h

Maximum true air speed at 5000 m, engine mode - Climb: 405 km/h

Service ceiling: 6300 m

Climb rate at sea level: 4.5 m/s

Climb rate at 3000 m: 3.6 m/s

Climb rate at 6000 m: 1.8 m/s

Maximum performance turn at sea level: 30.8 s, at 250 km/h IAS.

Maximum performance turn at 3000 m: 45.2 s, at 250 km/h IAS.

Flight endurance at 3000 m: 8.5 h, at 300 km/h IAS.

Takeoff speed: 170..210 km/h

Glideslope speed: 180..200 km/h

Landing speed: 125..150 km/h

Landing angle: 9 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates are given for Climb power, turn times are given for Take-off power.

Engine:

Model: Jumo-211F

Maximum power in Take-off mode at sea level: 1420 HP

Maximum power in Climb mode at sea level: 1190 HP

Maximum power in Climb mode at 1500 m: 1260 HP

Maximum power in Climb mode at 4900 m: 1180 HP

Engine modes:

Nominal (unlimited time): 2250 RPM, 1.15 ata

Climb power (up to 30 minutes): 2400 RPM, 1.25 ata

Take-off power (up to 1 minute): 2600 RPM, 1.42 ata

Water rated temperature in engine output: 80 °C

Water maximum temperature in engine output: 110 °C

Oil rated temperature in engine output: 90 °C

Oil maximum temperature in engine output: 105 °C

Supercharger gear shift altitude: automatic

Empty weight: 8963 kg

Minimum weight (no ammo, 10% fuel): 9946 kg

Standard weight: 13727 kg

Maximum takeoff weight: 15239 kg

Fuel load: 3214 kg / 4285 l

Useful load: 6276 kg

Defensive armament:

Nose: 7.92mm machine gun "MG 15", 600 rounds, 1000 rounds per minute

Top: 7.92mm machine gun "MG 15", 1125 rounds, 1000 rounds per minute

Belly-backward: 7.92mm machine gun "MG 15", 1200 rounds, 1000 rounds per minute

Belly-forward: 7.92mm machine gun "MG 15", 675 rounds, 1000 rounds per minute

Left: 7.92mm machine gun "MG 15", 450 rounds, 1000 rounds per minute

Right: 7.92mm machine gun "MG 15", 450 rounds, 1000 rounds per minute

Nose: 20mm gun "MG FF", 240 rounds, 540 rounds per minute (modification)

Belly-forward: 20mm gun "MG FF", 330 rounds, 540 rounds per minute (modification)

Bombs:

Up to 16 x 55 kg general purpose bombs "SC 50"

Up to 4 x 249 kg general purpose bombs "SC 250"

500 kg general purpose bomb "SC 500"

Up to 2 x 1090 kg general purpose bombs "SC 1000"

Up to 2 x 1780 kg general purpose bombs "SC 1800"

2400 kg general purpose bomb "SC 2500"

Length: 16.38 m

Wingspan: 22.5 m

Wing surface: 79.5 m^2

Combat debut: June 1941

Additional airplane configurations list:

2 x 1090 kg General Purpose Bomb SC 1000

Additional mass: 2180 kg

Ammunition mass: 2180 kg

Estimated speed loss before drop: 23 km/h

Estimated speed loss after drop: 0 km/h

2 x 1780 kg General Purpose Bomb SC 1800

Additional mass: 3560 kg

Ammunition mass: 3560 kg

Estimated speed loss before drop: 32 km/h

Estimated speed loss after drop: 0 km/h

2400 kg General Purpose Bomb SC 2500

Additional mass: 2400 kg

Ammunition mass: 2400 kg

Estimated speed loss before drop: 17 km/h

Estimated speed loss after drop: 0 km/h

Nose turret with 20mm MG FF gun with 240 rounds

Additional mass: 46 kg

Estimated speed loss: 0 km/h

Belly forward-looking turret with 20mm MG FF gun with 300 rounds

Additional mass: 147 kg

Estimated speed loss: 0 km/h

Operation features:

- Each engine has a two-stage mechanical supercharger with an automatic switch system that switches gears depending altitude and engine revolutions. It can also be manually switched to first gear.

- Engine mixture control is automatic.

- Engine RPM has an automatic governor and it is maintained at the required RPM corresponding to the governor control lever position. The governor automatically controls the propeller pitch to maintain the required RPM.

- Propellers have a feathering system which should be activated in case of engine damage to reduce drag of the propeller in auto-rotation.

- Water and oil radiator shutter controls are manual. The oil radiator control has five fixed positions.

- Airplane has trimmers for all flight-controls: pitch, roll and yaw.

- Landing flaps have a hydraulic actuator and they can be extended to any angle up to 60°.

- Airplane tail wheel rotates freely and does not have a lock. For this reason, it is necessary to confidently and accurately operate the rudder pedals during the takeoff and landing.

- Airplane has independent left and right hydraulic wheel brake controls. To apply either brake push the upper part of the rudder pedal.

- Airplane has dedicated fuel gauges for left and right fuel tank groups and there is a switch between the internal and external fuel tank group indicator. In game the fuel indicator switch changes by itself during horizontal flight every 10 seconds. Also, there is dedicated fuel gauge for the fuselage fuel tank. Also, the airplane has low fuel warning lights (200 liters) for left and right fuel tank groups.

- Airplane is equipped with an automatic bomb salvo controller, it allows you to switch between the bomb racks to be released (internal or external) and to switch between different salvo quantities. There is also a controller for a drop delay between each bomb in the salvo.

Yak-7B series 36

Indicated stall speed in flight configuration: 155..172 km/h

Indicated stall speed in takeoff/landing configuration: 139..154 km/h

Dive speed limit: 740 km/h

Maximum load factor: 11.5 G

Stall angle of attack in flight configuration: 20°

Stall angle of attack in landing configuration: 19°

Maximum true air speed at sea level, engine mode - Nominal, 2700 RPM: 526 km/h

Maximum true air speed at 2000 m, engine mode - Nominal, 2700 RPM: 565 km/h

Maximum true air speed at 4000 m, engine mode - Nominal, 2700 RPM: 586 km/h

Service ceiling: 10660 m

Climb rate at sea level: 16.9 m/s

Climb rate at 3000 m: 14.3 m/s

Climb rate at 6000 m: 8.6 m/s

Maximum performance turn at sea level: 19..20 s, at 310 km/h IAS.

Maximum performance turn at 3000 m: 24..25 s, at 310 km/h IAS.

Flight endurance at 3000 m: 1.9 h, at 350 km/h IAS.

Takeoff speed: 170..175 km/h

Glideslope speed: 200 km/h

Landing speed: 145..165 km/h

Landing angle: 11.5°

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates and turn times are given for Nominal (2700 RPM) power.

Engine:

Model: M-105PF

Maximum power in Nominal mode (2700 RPM) at sea level: 1210 HP

Maximum power in Nominal mode (2700 RPM) at 700 m: 1260 HP

Maximum power in Nominal mode (2700 RPM) at 2700 m: 1180 HP

Engine modes:

Nominal (unlimited time): 2600/2700 RPM, 1050 mm Hg

Water rated temperature in engine output: 70..85 °C

Water maximum temperature in engine output: 100 °C

Oil rated temperature in engine output: 90..100 °C

Oil maximum temperature in engine output: 115 °C

Supercharger gear shift altitude: 2000 m

Empty weight: 2302 kg

Minimum weight (no ammo, 10% fuel): 2630 kg

Standard weight: 3002 kg

Maximum takeoff weight: 3229 kg

Fuel load: 305 kg / 420 l

Useful load: 927 kg

Forward-firing armament:

20mm gun "SsVAK", 120 rounds, 800 rounds per minute, nose-mounted

2 x 12.7 mm machine gun "UBS", 400 rounds, 900 rounds per minute, synchronized

Bombs:

2 x 50 kg general purpose bombs "FAB-50sv"

2 x 104 kg general purpose bombs "FAB-100M"

Length: 8.5 m

Wingspan: 10 m

Wing surface: 17.15 m^2

Combat debut: May 1942

Additional airplane configurations list:

2 x 50 kg General Purpose Bombs FAB-50sv

Additional mass: 120 kg

Ammunition mass: 100 kg

Racks mass: 20 kg

Estimated speed loss before drop: 20 km/h

Estimated speed loss after drop: 12 km/h

2 x 104 kg General Purpose Bombs FAB-100M

Additional mass: 228 kg

Ammunition mass: 208 kg

Racks mass: 20 kg

Estimated speed loss before drop: 27 km/h

Estimated speed loss after drop: 12 km/h

2 x 82mm High Explosive unguided rockets ROS-82

Additional mass: 60 kg

Ammunition mass: 42 kg

Racks mass: 18 kg

Estimated speed loss before launch: 8 km/h

Estimated speed loss after launch: 6 km/h

6 x 82mm High Explosive unguided rockets ROS-82

Additional mass: 60 kg

Ammunition mass: 42 kg

Racks mass: 18 kg

Estimated speed loss before launch: 23 km/h

Estimated speed loss after launch: 17 km/h

RPK-10 fixed loop radio compass for navigation with radio beacons

Additional mass: 10 kg

Estimated speed loss: 0 km/h

Operation features:

- Engine has a two-stage mechanical supercharger which must be manually switched at 2000 m altitude.

- Engine mixture control is manual; it is necessary to lean the mixture if altitude is more than 3-4 km for optimal engine operation. Also, leaning the mixture allows a reduction in fuel consumption during flight.

- Engine RPM has an automatic governor and it is maintained at the required RPM corresponding to the governor control lever position. The governor automatically controls the propeller pitch to maintain the required RPM.

- Water and oil radiator shutters are controlled manually.

- Airplane has only the pitch flight-control trimmer.

- Landing flaps have a pneumatic actuator. Flaps can only be fully extended; gradual extending is impossible. Due to the weak force of the actuator the extended landing flaps may be pressed upwards by the airflow if the airspeed is more than 250 km/h. Remember that the flaps will not extend fully in case of high speed. In case of a high-speed landing approach the flaps may extend a few steps further right before landing.

- Airplane has a manual control for the tailwheel lock. The unlocked tailwheel has a 90° turn limit. The tailwheel should be locked when taxiing straight for a long distance and before takeoff and landing.

- Airplane has differential pneumatic wheel brakes with shared control lever. This means that if the brake lever is held and the rudder pedal the opposite wheel brake is gradually released causing the plane to swing to one side or the other.

- Fuel gauges are installed on left and right wing fuel tanks, outside of the cockpit. They show remaining fuel level only when there is less than 130 liters of fuel left in the tank.

- It is impossible to open or close the canopy at high speed due to strong airflow. The canopy has no emergency release, so bail out requires the speed drop before it.

- The control system for the wing-mounted bomb racks only allows releasing of both bombs together.

P-39L-1

Indicated stall speed in flight configuration: 160..172 km/h

Indicated stall speed in takeoff/landing configuration: 140..151 km/h

Dive speed limit: 841 km/h

Maximum load factor: 13.0 G

Stall angle of attack in flight configuration: 18.3 °

Stall angle of attack in landing configuration: 16.3 °

Maximum true air speed at sea level, engine mode - Take-off: 539 km/h

Maximum true air speed at 2850 m, engine mode - Take-off: 600 km/h

Maximum true air speed at 4600 m, engine mode - Military: 596 km/h

Service ceiling: 9300 m

Climb rate at sea level: 16.7 m/s

Climb rate at 3000 m: 13.5 m/s

Climb rate at 6000 m: 7.2 m/s

Maximum performance turn at sea level: 21.5 s, at 270 km/h IAS.

Maximum performance turn at 3000 m: 30.3 s, at 270 km/h IAS.

Flight endurance at 3000 m: 1.6 h, at 350 km/h IAS.

Takeoff speed: 150..180 km/h

Glideslope speed: 180..210 km/h

Landing speed: 155..160 km/h

Landing angle: 17.0 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates and turn times are given for Take-off power.

Engine:

Model: V-1710-63

Maximum power in War Emergency power mode at sea level: 1550 HP

Maximum power in Take-off mode at sea level: 1325 HP

Maximum power in Military mode at 12000 feet: 1150 HP

Maximum power in Nominal mode at 10800 feet: 1000 HP

Engine modes:

Nominal (unlimited time): 2600 RPM, 37.2 inch Hg

Military power (up to 15 minutes): 3000 RPM, 42 inch Hg

Take-off power (up to 5 minutes): 3000 RPM, 51 inch Hg

Maximum Possible power (up to 2 minutes): 3000 RPM, 60 inch Hg

Water rated temperature in engine output: 105..115 °C

Water maximum temperature in engine output: 125 °C

Oil rated temperature in engine intake: 70..85 °C

Oil maximum temperature in engine intake: 90 °C

Supercharger gear shift altitude: single gear

Empty weight: 2929 kg

Minimum weight (no ammo, 10% fuel): 3331 kg

Standart weight: 3508 kg

Maximum takeoff weight: 3868 kg

Fuel load: 326,9 kg / 454 l

Useful load: 939 kg

Forward-firing armament:

37 мм cannon "M4", 30 rounds, 150 rounds per minute, nose-mounted

2 x 12,7мм machine gun "M2.50", 200 rounds, 850 rounds per minute, synchronized

4 x 7,62мм machine gun "M2.30", 300 or 1000 rounds, 1350 rounds per minute, wing-mounted

Bombs:

104 kg general purpose bomb "FAB-100M"

254 kg general purpose bomb "FAB-250sv"

Length: 9.2 m

Wingspan: 10.4 m

Wing surface: 29.82 m^2

Combat debut: late 1942

Additional airplane configurations list:

Special 37mm Gun Ammo Load

Additional loadout variant for M4 37mm gun: armour piercing (AP) (Lend-Leasing of this type of rounds was limited)

1000 rounds per ammo load for wing-mounted .30 machine guns

Additional mass: 83 kg

Estimated speed loss: 0 km/h

Removal of 4 wing-mounted .30 cal machine guns and rear armour plate to reduce total weight

Removed mass: 192 kg

Removed ammunition mass: 158 kg

Removed guns mass: 20 kg

Estimated speed gain: 3 km/h

104 kg General Purpose Bomb FAB-100M

Additional mass: 114 kg

Ammunition mass: 104 kg

Rack mass: 10 kg

Estimated speed loss before drop: 18 km/h

Estimated speed loss after drop: 3 km/h

254 kg General Purpose Bomb FAB-250tsk

Additional mass: 264 kg

Ammunition mass: 254 kg

Rack mass: 10 kg

Estimated speed loss before drop: 19 km/h

Estimated speed loss after drop: 7 km/h

Bendix MN-28Y fixed loop radio compass for navigation with radio beacons

Additional mass: 20 kg

Estimated speed loss: 2 km/h

Operation features:

- There is War Emergency power mode. To engage it, move the throttle to max forward position and set the mxiture control to Full Rich (move it 90% forward to engage the Take-Off mode).

- Engine has a single stage mechanical supercharger which does not require manual control.

- Engine is equipped with an automatic fuel mixture control which maintains optimal mixture if mixture lever is set to Auto Rich (66%) position. To use automatic mixture leaning to reduce fuel consumption during flight it is necessary to set mixture lever to Auto Lean (33%) position. To stop the engine mixture lever should be set to the Cut Off (0%) position. Full Rich positon is used during take-off, in case of emergency or automatic mixture system malfunction.

- Engine RPM has an automatic governor and it is maintained at the required RPM corresponding to the governor control lever position. The governor automatically controls the propeller pitch to maintain the required RPM. Also it is possible to turn off the governor and control propeller pitch manually.

- Water and oil temperatures are controlled manually by adjusting the outlet engine radiator shutters.

- Airplane has trimmers for all flight-controls: pitch, roll and yaw.

- Airplane has electrically-actuated landing flaps and they can be extended to any angle up to 43°.

- The nose gear orients by itself, doesn't have brakes and can't be controlled. Its maximum turn angle is 60° left or right.

- Airplane has independent left and right hydraulic wheel brake controls. To apply either brake push the upper part of the rudder pedal.

- Airplane is equipped with a parking brake system.

- Airplane has two fuel gauges which shows the level in each group of fuel tank.

- Although there are two cockpit doors equipped with window lifters, usually only the right one is used. They can't be opened during flight, but can be jettisoned to bail out.

- Airplane is equipped with mechanical releasing system for a single bomb.

- The gunsight has a sliding sun-filter. There is also a back-up mechanical sight which can be used if main sight is damaged.

Il-2 model of 1943

Indicated stall speed in flight configuration: 144..159 km/h

Indicated stall speed in takeoff/landing configuration: 135..152 km/h

Dive speed limit: 570 km/h

Maximum load factor: 10.5 G

Stall angle of attack in flight configuration: 19.4 °

Stall angle of attack in landing configuration: 17.5 °

Maximum true air speed at sea level, engine mode - Boosted: 407 km/h

Maximum true air speed at sea level, engine mode - Nominal: 389 km/h

Maximum true air speed at 1200 m, engine mode - Nominal: 400 km/h

Service ceiling: 5600 m

Climb rate at sea level: 7.5 m/s

Climb rate at 3000 m: 4.2 m/s

Maximum performance turn at sea level: 26.6 s, at 250 km/h IAS.

Maximum performance turn at 3000 m: 39.3 s, at 250 km/h IAS.

Flight endurance at 3000 m: 1.4 h, at 300 km/h IAS.

Takeoff speed: 160..200 km/h

Glideslope speed: 195..205 km/h

Landing speed: 145..155 km/h

Landing angle: 11.7 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates are given for Nominal power, turn times are given for Boosted power.

Engine:

Model: AM-38F

Maximum power in Boosted mode at sea level: 1720 HP

Maximum power in Nominal mode at sea level: 1500 HP

Maximum power in Nominal mode at 750 m: 1500 HP

Engine modes:

Nominal (unlimited time): 2050 RPM, 1200 mm Hg

Boosted power (up to 5 minutes): 2350 RPM, 1360 mm Hg

Water rated temperature in engine output: 80..110 °C

Water maximum temperature in engine output: 120 °C

Oil rated temperature in engine intake: 40..80 °C

Oil maximum temperature in engine intake: 85 °C

Oil rated temperature in engine output: 115 °C

Oil maximum temperature in engine output: 120 °C

Supercharger gear shift altitude: single gear

Empty weight: 4715 kg

Minimum weight (no ammo, 10% fuel): 5014 kg

Standard weight: 5681 kg

Maximum takeoff weight: 6375 kg

Fuel load: 535 kg / 730 l

Useful load: 1660 kg

Forward-firing armament:

2 x 20mm gun "SsVAK", 250 rounds, 800 rounds per minute, wing-mounted

2 x 7.62mm machine gun "ShKAS", 750 rounds, 1800 rounds per minute, wing-mounted

2 x 23mm gun "VYa-23", 150 rounds, 600 rounds per minute, wing-mounted (modification)

2 x 37mm gun "NS-37", 50 rounds, 250 rounds per minute, wing-mounted (modification)

Defensive armament:

Backward: 12.7 mm machine gun "UBT", 150 rounds, 1000 rounds per minute (modification)

Bombs:

Up to 240 x 1.5 kg HEAT bomblets "PTAB-2,5-1,5"

Up to 6 x 50 kg general purpose bombs "FAB-50sv"

Up to 6 x 104 kg general purpose bombs "FAB-100M"

2 x 254 kg general purpose bombs "FAB-250sv"

Rockets:

4 x 7 kg rockets "ROS-82", HE payload mass 2.5 kg

4 x 15 kg rockets "RBS-82", HEAT payload mass 7.2 kg

4 x 42 kg rockets "ROFS-132", HE payload mass 21.3 kg

Length: 11.5 m

Wingspan: 14.6 m

Wing surface: 38.5 m^2

Combat debut: early 1943

Additional airplane configurations list:

2 VYa-23 23mm wing-mounted guns with 150 rounds per each

Additional mass: 91 kg

Ammunition mass: 170 kg

Guns mass: 132 kg

Estimated speed loss: 1 km/h

Two NS-37 37mm gun pods with 50 rounds per each

Additional mass: 260 kg

Ammunition mass: 90 kg

Guns mass: 340 kg

Estimated speed loss: 15 km/h

2 x 254 kg General Purpose Bombs FAB-250sv

Additional mass: 538 kg

Ammunition mass: 508 kg

Racks mass: 30 kg

Estimated speed loss before drop: 18 km/h

Estimated speed loss after drop: 7 km/h

4 x 82mm Armour Piercing unguided rockets RBS-82 or 4 x 132mm High Explosive unguided rockets ROFS-132

RBS-82:

Additional mass: 72 kg

Ammunition mass: 60 kg

Racks mass: 24 kg

Estimated speed loss before launch: 5 km/h

Estimated speed loss after launch: 4 km/h

ROFS-132:

Additional mass: 188 kg

Ammunition mass: 168 kg

Racks mass: 20 kg

Estimated speed loss before launch: 9 km/h

Estimated speed loss after launch: 5 km/h

192(240) x 1.5 kg HEAT (anti-tank) bomblets PTAB-2.5-1.5

Additional mass: 308(380) kg

Ammunition mass: 288(360) kg

Racks mass: 20 kg

Estimated speed loss before drop: 5 km/h

Estimated speed loss after drop: 0 km/h

Operation features:

- Engine has a boost mode which is engaged by setting mixture control lever to maximum position.

- Engine has a single stage mechanical supercharger which does not require manual control.

- Engine mixture control is automatic when the mixture lever is set to the intermediate (50%) position. It is possible to manually lean the mixture by moving the control lever to less than 50%. This will lower fuel consumption during flight.

- Engine RPM has an automatic governor and it is maintained at the required RPM corresponding to the governor control lever position. The governor automatically controls the propeller pitch to maintain the required RPM.

- Water and oil radiator shutter control is manual. Airplane has armored oil radiator shutters which should be closed at the beginning of ground attack to reduce a possibility of combat damage. After finishing the attack, it is necessary to re-open the shutters to the required position.

- Airplane has only the pitch flight-control trimmer.

- Landing flaps have a pneumatic actuator. Flaps can be extended fully or to takeoff position - 17°, gradual extending is impossible. Due to the weak force of the actuator the extended landing flaps may be pressed upwards by the airflow if the airspeed is more than 220 km/h. Remember that the flaps will not extend fully in case of high speed. In case of a high-speed landing approach the flaps may extend a few steps further right before the landing which will cause the aircraft to shoot upwards.

- Airplane has a manual tail wheel lock. Wheel should be locked when taxiing straight for a long distance and before takeoff and landing.

- Airplane has differential pneumatic wheel brakes with shared control lever. This means that if the brake lever is held and the rudder pedal the opposite wheel brake is gradually released causing the plane to swing to one side or the other.

- Airplane has a fuel gauge which shows the amount of remaining fuel in the front or bottom fuel tank depending on switch position. In game the fuel indicator switch changes by itself during horizontal flight by every 10 seconds. Rear fuel tank level is not indicated.

- Cockpit canopy weight is 50 kg and it has no lock in the open position, for this reason the canopy may to spontaneously close in a deep dive. Also, it is impossible to open or close canopy at high speed due to strong airflow. The canopy has no emergency release, so bail out requires the speed drop before it.

- Airplane is equipped with a joint salvo controller both for bombs and rockets, it has three release/fire modes: single launch, launch two in a salvo or launch four in a salvo.

- The mechanical gun sight "Visier Vladimirova" allows aiming rockets and guns at ground and air targets and horizontal bombing at certain speeds and altitudes.

A-20B

Indicated stall speed in flight configuration: 161..193 km/h (100..120 mph)

Indicated stall speed in takeoff/landing configuration: 139..166 km/h (86..103 mph)

Dive speed limit: 665 km/h (412 mph)

Maximum load factor: 6.5 G

Stall angle of attack in flight configuration: 19.1 °

Stall angle of attack in landing configuration: 17.1 °

Maximum true air speed at sea level, engine mode - Combat: 505 km/h (314 mph)

Maximum true air speed at 1000 m, engine mode - Combat: 524 km/h (326 mph)

Maximum true air speed at 5000 m, engine mode - Combat: 544 km/h (338 mph)

Maximum true air speed at sea level, engine mode - Nominal: 467 km/h (290 mph)

Maximum true air speed at 2000 m, engine mode - Nominal: 500 km/h (311 mph)

Maximum true air speed at 5000 m, engine mode - Nominal: 525 km/h (326 mph)

Service ceiling: 8700 m (28540 ft)

Climb rate at sea level: 10.0 m/s (1969 ft/min)

Climb rate at 3000 m: 8.2 m/s (1614 ft/min)

Climb rate at 6000 m: 5.0 m/s (984 ft/min)

Maximum performance turn at sea level: 24.5 s, at 270 km/h IAS.

Maximum performance turn at 3000 m: 34.1 s, at 270 km/h IAS.

Flight endurance at 3000 m: 3.4 h, at 350 km/h IAS. Engine mode - Cruise, 1st supercharger stage

Takeoff speed: 170..195 km/h (105..120 mph)

Glideslope speed: 185..225 km/h (115..140 mph)

Landing speed: 150..170 km/h (95..105 mph)

Landing angle: 3.4 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for aircraft mass with 8 FAB-100 bombs.

Note 4: climb rates and turn times are given for Nominal power.

Engine:

Model: Wright R-2600-11

Maximum power in Cruise mode at 5500 ft: 810 HP

Maximum power in Cruise mode at 12000 ft: 765 HP

Maximum power in Nominal mode at 5500 ft: 1350 HP

Maximum power in Nominal mode at 12000 ft: 1275 HP

Maximum power in Combat mode at sea level: 1600 HP

Maximum power in Combat mode at 11500 ft: 1400 HP

Engine modes:

(boost value is listed for 1st and 2nd supercharger gears)

Cruise (unlimited time): 1705 RPM, 27,5 / 30,0 inch Hg, mixture "Auto Lean"

Nominal (unlimited time): 2300 RPM, 36,0 / 40,0 inch Hg, mixture "Auto Rich"

Combat (5 min limit): 2400 RPM, 43,0 / 41,0 inch Hg, mixture "Auto Rich"

Oil rated temperature in engine output: 80..95 °C

Oil maximum temperature in engine output: 105 °C

Cylinder head rated temperature: 140..240 °C

Cylinder head maximum temperature: 260 °C

Supercharger gear shift altitude: 2900 m (9500 ft)

Empty weight: 6781 kg

Minimum weight (no ammo, 10% fuel): 7359 kg

Standard weight: 8366 kg

Maximum takeoff weight: 10466 kg

Fuel load: 1057 kg / 1468 l / 388 gal

Useful load: 3665 kg

Forward-firing armament:

12.7mm machine gun ANM2 .50, 200 rounds, 850 rounds per minute, nose-mounted

Defensive armament:

Top: 12.7mm machine gun ANM2 .50, 390 rounds, 850 rounds per minute

Belly: 7.92mm machine gun ANM2 .30, 600 rounds, 1150 rounds per minute

Bombs:

Up to 20 x 104 kg general purpose bombs FAB-100M

Up to 4 x 254 kg general purpose bombs FAB-250ck

Length: 14.54 m

Wingspan: 18.69 m

Wing surface: 43.18 m^2

Combat debut: spring 1942

Additional airplane configurations list:

20 x 104 kg General Purpose Bombs FAB-100M

Additional mass: 2080 kg

Ammunition mass: 2080 kg

Estimated speed loss before drop: 39 km/h

Estimated speed loss after drop: 16 km/h

4 x 254 kg General Purpose Bombs FAB-250tsk

Additional mass: 1016 kg

Ammunition mass: 1016 kg

Estimated speed loss before drop: 39 km/h

Estimated speed loss after drop: 16 km/h

Bendix MN-28Y fixed loop radio compass for navigation with radio beacons

Additional mass: 20 kg

Estimated speed loss: 0 km/h

Operation features:

- Engine has no manifold pressure automatic governor. For this reason, manifold pressure not only depends on throttle position, but also from RPM and altitude. This requires additional checking of manifold pressure to not cause engine damage.

- Engine is equipped with an automatic fuel mixture control which maintains optimal mixture if mixture lever is set to Auto Rich (66%) position. To use automatic mixture leaning to reduce fuel consumption during flight it is necessary to set mixture lever to Auto Lean (33%) position. In the case of mulfunction of the automatic mixture control the mixture lever should be set to Full Rich (100%) position. To stop the engine mixture lever should be set to the Cut Off (0%) position.

- Engine RPM has an automatic governor and it is maintained at the required RPM corresponding to the governor control lever position. The governor automatically controls the propeller pitch to maintain the required RPM.

- Oil radiators shutters are joint with engine cowl outlet shutters and manually operated.

- Airplane has trimmers for all flight-controls: pitch, roll and yaw.

- Landing flaps have a hydraulic actuator and they can be extended to any angle up to 50°.

- Airplane has independent left and right hydraulic wheel brake controls. To apply either brake push the upper part of the rudder pedal.

- Airplane is equipped with a parking brake system.

- Airplane is equipped with a siren that warns a pilot if the throttle is set to low position with landing gear retracted.

- Airplane is equipped with upper formation lights.

- Engine has a two-stage mechanical supercharger which must be manually switched at 2900m (9500 ft) altitude.

- Airplane have a fuel gauge which shows remaining fuel in left and right fuel tanks depending on switch position. In game the fuel indicator switch changes by itself during horizontal flight by every 15 seconds.

- The aircraft is equipped with an electromechanical safety system that blocks the hydraulic landing gear actuator while the aircraft is on the ground.

- The nose gear orients by itself, doesn't have brakes and can't be controlled.

- It is forbidden to open the upper cowl flaps during flight, so they should be closed before taking off.

- The upper cowl flaps are controlled simultaneously using a shared hydraulic actuator.

- There are white and red signal lamps in the tail: the white one is lit while bomb doors are open and the red one lights up for 5 seconds when bombs are released.

- The upper cockpit door can't be opened during flight, but there is an emergency jettison handle.

- Airplane is equipped with a bomb salvo controller that has four release modes: drop single, drop two in a salvo, drop four in a salvo or drop all bombs in salvo. There is also a controller for a drop delay between each bomb in the salvo.

Bf 109 G-4

Indicated stall speed in flight configuration: 165..175 km/h

Indicated stall speed in takeoff/landing configuration: 154..167 km/h

Dive speed limit: 850 km/h

Maximum load factor: 10.5 G

Stall angle of attack in flight configuration: 19.8 °

Stall angle of attack in landing configuration: 17 °

Maximum true air speed at sea level, engine mode - Emergency: 540 km/h

Maximum true air speed at sea level, engine mode - Combat: 517 km/h

Maximum true air speed at 2000 m, engine mode - Combat: 564 km/h

Maximum true air speed at 7000 m, engine mode - Combat: 640 km/h

Service ceiling: 11800 m

Climb rate at sea level: 20.1 m/s

Climb rate at 3000 m: 18.9 m/s

Climb rate at 6000 m: 15.4 m/s

Maximum performance turn at sea level: 21.2 s, at 270 km/h IAS.

Maximum performance turn at 3000 m: 27.2 s, at 270 km/h IAS.

Flight endurance at 3000 m: 2.4 h, at 350 km/h IAS.

Takeoff speed: 155..180 km/h

Glideslope speed: 195..205 km/h

Landing speed: 150..155 km/h

Landing angle: 13.7 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates and turn times are given for Combat power.

Engine:

Model: DB-605A

Maximum power in Emergency mode at sea level: 1480 HP

Maximum power in Emergency mode at 5600 m: 1360 HP

Maximum power in Combat mode at sea level: 1310 HP

Maximum power in Combat mode at 5800 m: 1250 HP

Engine modes:

Nominal (unlimited time): 2300 RPM, 1.15 ata

Combat power (up to 30 minutes): 2600 RPM, 1.3 ata

Emergency power (up to 1 minute): 2800 RPM, 1.42 ata

Water rated temperature in engine output: 100..102 °C

Water maximum temperature in engine output: 115 °C

Oil rated temperature in engine intake: 70..80 °C

Oil maximum temperature in engine intake: 85 °C

Supercharger gear shift altitude: fluid coupling

Empty weight: 2506 kg

Minimum weight (no ammo, 10% fuel): 2669 kg

Standard weight: 3014 kg

Maximum takeoff weight: 3303 kg

Fuel load: 304 kg / 400 l

Useful load: 797 kg

Forward-firing armament:

20mm gun "MG 151/20", 200 rounds, 700 rounds per minute, nose-mounted

2 x 7.92mm machine gun "MG 17", 500 rounds, 1200 rounds per minute, synchronized

2 x 20mm gun "MG 151/20", 135 rounds, 700 rounds per minute, wing-mounted (modification)

Bombs:

Up to 4 x 55 kg general purpose bombs "SC 50"

249 kg general purpose bomb "SC 250"

Length: 8.94 m

Wingspan: 9.97 m

Wing surface: 16.1 m^2

Combat debut: spring 1943

Additional airplane configurations list:

MG 151/20 20mm guns in wing-mounted gun pods with 135 rounds per each

Additional mass: 212 kg

Ammunition mass: 55 kg

Guns mass: 157 kg

Estimated speed loss: 12 km/h

4 x 55 kg General Purpose Bombs SC 50

Additional mass: 260 kg

Ammunition mass: 220 kg

Racks mass: 40 kg

Estimated speed loss before drop: 51 km/h

Estimated speed loss after drop: 11 km/h

249 kg General Purpose Bomb SC 250

Additional mass: 279 kg

Ammunition mass: 249 kg

Racks mass: 30 kg

Estimated speed loss before drop: 31 km/h

Estimated speed loss after drop: 10 km/h

Alternative pilot protection: armoured transparent triplex head rest for better visibility

Additional mass: 10 kg

Estimated speed loss: 0 km/h

Removed pilot armoured headrest for improved field of view

Weight savings: 8 kg

Estimated speed loss: 0 km/h

Operation features:

- Airplane has a wide automatization of the engine systems, in fact, to control speed it is only necessary to use the throttle lever. There is no need to manually set engine revolutions and mixture or supercharger gear in normal flight.

- In addition to full-automatic mode there is a special manual control mode for the radiator shutters, which can be used in specific situations.

- To reduce swinging during taxiing due to prop-wash the propeller pitch control should be switched to manual mode and pitch should be reduced to minimum.

- Airplane has no flight-control trimmers. Airplane is equipped with bendable trim tabs that can be set pre-flight by ground personnel.

- Airplane has a manually controlled horizontal stabilizer. It should be set to +1° before takeoff and to -4°...-5° before landing. Also, it may be used to trim the flight stick during the flight. In a deep dive the stabilizer should be set so that the pilot must push the flight stick forward to maintain the dive angle.

- Airplane has automatic wing slats. They deploy when the high angle of attack increases which makes pre-stall softer.

- Airplane has a manual mechanical system for retracting the landing flaps, for this reason it is necessary to extend landing flaps well before final approach. Markers on the left-wing flap indicate how far the flaps are extended. The flaps can be extended to any angle up to 40°.

- Airplane has a manual tail wheel lock. Wheel should be locked when taxiing straight for a long distance and before takeoff and landing.

- Airplane has independent left and right hydraulic wheel brake controls. To apply either brake push the upper part of the rudder pedal.

- Airplane has a fuel gauge which shows total fuel remaining. Also, it has an emergency fuel warning light (80 liters).

- The design of the cockpit canopy does not allow it to be opened during flight. The canopy should be closed before takeoff to prevent damage. The canopy has an emergency release system for bailouts.

- The control system for the bomb rack only allows to drop bombs one by one.

- The gunsight has a sliding sun-filter.

Fw 190 A-5

Indicated stall speed in flight configuration: 169..195 km/h

Indicated stall speed in takeoff/landing configuration: 160..175 km/h

Dive speed limit: 850 km/h

Maximum load factor: 11 G

Stall angle of attack in flight configuration: 19.5°

Stall angle of attack in landing configuration: 18.1°

Maximum true air speed at sea level, engine mode - Emergency: 558 km/h

Maximum true air speed at 3000 m, engine mode - Emergency: 578 km/h

Maximum true air speed at 6400 m, engine mode - Emergency: 658 km/h

Maximum true air speed at sea level, engine mode - Combat: 533 km/h

Maximum true air speed at 3000 m, engine mode - Combat: 558 km/h

Maximum true air speed at 6000 m, engine mode - Combat: 622 km/h

Service ceiling: 10600 m

Climb rate at sea level: 15.4 m/s

Climb rate at 3000 m: 11.9 m/s

Climb rate at 6000 m: 9.7 m/s

Maximum performance turn at sea level: 23.5 s, at 280 km/h IAS.

Maximum performance turn at 3000 m: 35.5 s, at 280 km/h IAS.

Flight endurance at 3000 m: 3.0 h, at 350 km/h IAS.

Takeoff speed: 170..210 km/h

Glideslope speed: 205..215 km/h

Landing speed: 160..170 km/h

Landing angle: 12.5°

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates are given for Combat power, turn times are given for Emergency power.

Engine:

Model: BMW-801D

Maximum power in Emergency mode at sea level: 1700 HP

Maximum power in Emergency mode at 5700 m: 1440 HP

Maximum power in Combat mode at 700 m: 1520 HP

Maximum power in Combat mode at 5300 m: 1320 HP

Engine modes:

Nominal (unlimited time): 2300 RPM, 1.2 ata

Combat power (up to 30 minutes): 2400 RPM, 1.32 ata

Emergency power (up to 3 minutes): 2700 RPM, 1.42 ata

Oil rated temperature in engine intake: 60..70 °C

Oil maximum temperature in engine intake: 85 °C

Oil rated temperature in engine output: 105 °C

Oil maximum temperature in engine output: 120 °C

Cylinder head rated temperature: 180 °C

Cylinder head maximum temperature: 220 °C

Supercharger gear shift altitude: automatic

Empty weight: 3219 kg

Minimum weight (no ammo, 10% fuel): 3401 kg

Standard weight: 3926 kg

Maximum takeoff weight: 4648 kg

Fuel load: 409 kg / 524 l

Useful load: 1429 kg

Forward-firing armament:

2 x 20mm gun "MG 151/20", 250 rounds, 700 rounds per minute, synchronized

2 x 7.92mm machine gun "MG 17", 900 rounds, 1200 rounds per minute, synchronized

2 x 20mm gun "MG FF", 90 rounds, 540 rounds per minute, wing-mounted (modification)

4 x 20mm gun "MG 151/20", 500 rounds, 700 rounds per minute, wing-mounted (modification)

Bombs:

Up to 8 x 55 kg general purpose bombs "SC 50"

249 kg general purpose bomb "SC 250"

500 kg general purpose bomb "SC 500"

Length: 8.85 m

Wingspan: 10.51 m

Wing surface: 18.3 m^2

Combat debut: Spring of 1943

Additional airplane configurations list:

MG 151/20 20mm guns in wing-mounted gun pods with 125 rounds per each

Additional mass: 247 kg

Ammunition mass: 105 kg

Guns mass: 142 kg

Estimated speed loss: 39 km/h

MG FF/M 20mm additional wing-mounted guns with 90 rounds per each

Additional mass: 131 kg

Ammunition mass: 37 kg

Guns mass: 94 kg

Estimated speed loss: 6 km/h

Fw 190 A5/U17 strike modification includes 1.65 ATA modified engine, additional fuselage bottom and engine armor and SC 50 underwing bomb holders

Additional mass: 218 kg

Estimated speed loss: 14 km/h (with C3 system disengaged)

4 x 55 kg General Purpose Bombs SC 50

Additional mass: 282 kg

Ammunition mass: 222 kg

Racks mass: 60 kg

Estimated speed loss before drop: 83 km/h

Estimated speed loss after drop: 39 km/h

249 kg General Purpose Bomb SC 250

Additional mass: 279 kg

Ammunition mass: 249 kg

Racks mass: 30 kg

Estimated speed loss before drop: 37 km/h

Estimated speed loss after drop: 13 km/h

500 kg General Purpose Bomb SC 500

Additional mass: 530 kg

Ammunition mass: 500 kg

Racks mass: 30 kg

Estimated speed loss before drop: 41 km/h

Estimated speed loss after drop: 13 km/h

Operation features:

- Airplane has a wide automatization of the engine systems, in fact, to control speed it is only necessary to use the throttle lever. There is no need to manually set engine revolutions and mixture or supercharger gear in normal flight. The engine supercharger has an automatic switch system which depends on altitude and engine revolutions.

- U17 strike modification includes C3 additional fuel injection system. When engaged, it increases pressure to 1.65 ATA (10 minutes time limit). This system can be turned on by engine boost command only at 100% throttle, with automatic propeller pitch control enabled and at altitudes lower than 1 km.

- Outlet cowl shutters are operated manually.

- To reduce swinging during taxiing due to prop-wash the propeller pitch control should be switched to manual mode and pitch should be reduced to minimum.

- When the angle of attack increases to critical levels the wing may stall suddenly and unexpectedly. There is almost no pre-stall buffet before the stalling. To avoid this the pilot must pay additional attention when performing extreme maneuvering.

- Airplane has no flight-control trimmers. Airplane is equipped with bendable trim tabs that can be set pre-flight by ground personnel.

- Airplane has a manually controlled horizontal stabilizer which is electrically-actuated. It should be set to +1.5° before takeoff and landing. Also, it may be used to trim the flight stick during the flight. In a deep dive the stabilizer should be set so that the pilot must push the flight stick forward to maintain the dive angle.

- Airplane has electrically-actuated landing flaps with three fixed positions: retracted, takeoff (13°) and landing (58°). Flaps control buttons and indicator lights are located on left panel near the throttle. The flap angle may also be checked by indicators on the left and right wing outside the cockpit.

- Airplane has a tail wheel lock system which locks the tail wheel if the flight-stick is pulled backward. The tailwheel should be locked when taxiing straight for a long distance, before takeoff and after touchdown upon landing.

- Airplane has independent left and right hydraulic wheel brake controls. To apply either brake push the upper part of the rudder pedal.

- Airplane has a fuel gauge which shows the amount of remaining fuel in the front or rear fuel tank depending on switch position. In game the fuel indicator switch changes by itself during horizontal flight by every 10 seconds. Also, the airplane has an emergency fuel warning light (100 liters).

- It is impossible to open or close the canopy at high speed due to strong airflow. The canopy has an emergency release system for bailouts.

- The control system for the bomb rack only allows for dropping bombs one by one.

- The gunsight has a sliding sun-filter.

Bf 110 G-2

Indicated stall speed in flight configuration: 160..190 km/h

Indicated stall speed in takeoff/landing configuration: 141..168 km/h

Dive speed limit: 740 km/h

Maximum load factor: 11 G

Stall angle of attack in flight configuration: 20.3 °

Stall angle of attack in landing configuration: 17.4 °

Maximum true air speed at sea level, engine mode - Combat: 489 km/h

Maximum true air speed at 2000 m, engine mode - Combat: 533 km/h

Maximum true air speed at 6500 m, engine mode - Combat: 581 km/h

Service ceiling: 10800 m

Climb rate at sea level: 15.6 m/s

Climb rate at 3000 m: 14.1 m/s

Climb rate at 6000 m: 10.7 m/s

Maximum performance turn at sea level: 23.5 s, at 270 km/h IAS.

Maximum performance turn at 3000 m: 31.2 s, at 270 km/h IAS.

Flight endurance at 3000 m: 4.0 h, at 300 km/h IAS.

Takeoff speed: 190..230 km/h

Glideslope speed: 210..230 km/h

Landing speed: 150..170 km/h

Landing angle: 10.7 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates are given for Combat power, turn times are given for Emergency power.

Engine:

Model: DB-605B

Maximum power in Emergency mode at sea level: 1480 HP

Maximum power in Emergency mode at 5600 m: 1360 HP

Maximum power in Combat mode at sea level: 1310 HP

Maximum power in Combat mode at 5800 m: 1250 HP

Engine modes:

Nominal (unlimited time): 2300 RPM, 1.15 ata

Combat power (up to 30 minutes): 2600 RPM, 1.3 ata

Emergency power (up to 1 minute): 2800 RPM, 1.42 ata

Water rated temperature in engine output: 100..102 °C

Water maximum temperature in engine output: 115 °C

Oil rated temperature in engine intake: 70..80 °C

Oil maximum temperature in engine intake: 85 °C

Supercharger gear shift altitude: fluid coupling

Empty weight: 5905 kg

Minimum weight (no ammo, 10% fuel): 6335 kg

Standart weight: 7514 kg

Maximum takeoff weight: 8928 kg

Fuel load: 1003 kg / 1270 l

Useful load: 3023 kg

Forward-firing armament:

4 x 7.92mm machine gun "MG 17", 1000 rounds, 1200 rounds per minute, nose-mounted

20mm gun "MG 151/20", 400 rounds, 700 rounds per minute, nose-mounted left

20mm gun "MG 151/20", 350 rounds, 700 rounds per minute, nose-mounted right

2 x 20mm gun "MG 151/20", 200 rounds, 700 rounds per minute, nose-mounted (modification)

37mm gun "BK37", 66 rounds, 160 rounds per minute, nose-mounted (modification)

Defensive armament:

Backward: 2 x 7.92mm machine guns "MG 81", 750 rounds, 1600 rounds per minute

Bombs:

Up to 12 x 55 kg general purpose bombs "SC 50"

Up to 2 x 249 kg general purpose bombs "SC 250"

Up to 2 x 500 kg general purpose bombs "SC 500"

1090 kg general purpose bomb "SC 1000"

Length: 12.1 m

Wingspan: 16.3 m

Wing surface: 38.4 m^2

Combat debut: Autumn 1942

Additional airplane configurations list:

Removed pilot armoured headrest for improved field of view

Removed mass: 8 kg

Estimated speed gain: 0 km/h

12 x 55 kg General Purpose Bombs SC 50

Additional mass: 820 kg

Ammunition mass: 660 kg

Racks mass: 160 kg

Estimated speed loss before drop: 80 km/h

Estimated speed loss after drop: 38 km/h

2 x 500 kg General Purpose Bomb SC 500

Additional mass: 1025 kg

Ammunition mass: 1000 kg

Racks mass: 50 kg

Estimated speed loss before drop: 35 km/h

Estimated speed loss after drop: 5 km/h

1090 kg General Purpose Bomb SC 1000

Additional mass: 1140 kg

Ammunition mass: 1090 kg

Racks mass: 50 kg

Estimated speed loss before drop: 33 km/h

Estimated speed loss after drop: 5 km/h

Two MG 151/20 20mm guns in fuselage mounted gun pod with 200 rounds per each

Additional mass: 274 kg

Ammunition mass: 84 kg

Guns mass: 190 kg

Estimated speed loss: 40 km/h

37mm 3.7cm BK autocannon gun pod with 66 rounds (11 clips with 6 rounds in each)

Additional mass: 251 kg

Ammunition mass: 95 kg

Guns mass: 419 kg

Estimated speed loss: 54 km/h

Operation features:

- Airplane has a wide automatization of the engine systems, in fact, to control speed it is only necessary to use the throttle lever. There is no need to manually set engine revolutions and mixture or supercharger gear in normal flight.

- Water and oil radiator shutters are controlled manually. The oil radiator control has five fixed positions. The water radiator control has nine fixed positions.

- Propellers have a feathering system which should be activated in case of engine damage to reduce drag of the propeller in auto-rotation.

- To reduce swinging during taxiing due to prop-wash it is necessary to use asymmetrical engines thrust. It is recommended to give the left engine 20% more power. Also, the propeller pitch control should be switched to manual mode and pitch should be reduced to minimum.

- Airplane has only pitch and yaw flight-control trimmers.

- Airplane has automatic wing slats. They deploy when the high angle of attack increases which makes pre-stall softer.

- Landing flaps have a hydraulic actuator and they can be extended to any angle up to 50°.

- Airplane has an automatically controlled horizontal stabilizer. An automatic control system adjusts the stabilizer angle depending on the extended angle of the landing flaps.

- Airplane tail wheel rotates freely and does not have a lock. For this reason, it is necessary to confidently and accurately operate the rudder pedals during the takeoff and landing.

- Airplane has independent left and right hydraulic wheel brake controls. To apply either brake push the upper part of the rudder pedal.

- Airplane has a fuel gauge which shows the remaining fuel in one of four fuel tanks depending on the switch position. In the game the fuel indicator switch changes by itself during horizontal flight by every 10 seconds. Also, the airplane has a low fuel warning light (50 liters) for each tank.

- The design of the cockpit canopy does not allow it to be opened during flight. The canopy should be closed before takeoff to prevent damage. The canopy has an emergency release system for bailouts.

- Airplane is equipped with an automatic bomb salvo controller, it allows you to choose which bomb-racks to be released (central belly, left and right wing) and to switch the bomb salvo (single release or release all bombs).

- Reloading of BK37 gun is performed by the rear gunner at the pilot`s command.

- The gunsight has a sliding sun-filter.

He 111 H-16

Indicated stall speed in flight configuration: 150..194 km/h

Indicated stall speed in takeoff/landing configuration: 123..156 km/h

Dive speed limit: 560 km/h

Maximum load factor: 4.5 G

Stall angle of attack in flight configuration: 20 °

Stall angle of attack in landing configuration: 17 °

Maximum true air speed at sea level, engine mode - Climb: 370 km/h

Maximum true air speed at 2000 m, engine mode - Climb: 399 km/h

Maximum true air speed at 5000 m, engine mode - Climb: 410 km/h

Service ceiling: 6850 m

Climb rate at sea level: 5.3 m/s

Climb rate at 3000 m: 4.1 m/s

Climb rate at 6000 m: 2.3 m/s

Maximum performance turn at sea level: 30.8 s, at 250 km/h IAS.

Maximum performance turn at 3000 m: 45.2 s, at 250 km/h IAS.

Flight endurance at 3000 m: 6.7 h, at 300 km/h IAS.

Takeoff speed: 170..210 km/h

Glideslope speed: 180..200 km/h

Landing speed: 125..150 km/h

Landing angle: 9 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates are given for Climb power, turn times are given for Take-off power.

Engine:

Model: Jumo-211F

Maximum power in Take-off mode at sea level: 1340 HP

Maximum power in Climb mode at sea level: 1120 HP

Maximum power in Climb mode at 1900 m: 1210 HP

Maximum power in Climb mode at 5300 m: 1060 HP

Engine modes:

Nominal (unlimited time): 2250 RPM, 1.15 ata

Climb power (up to 30 minutes): 2400 RPM, 1.25 ata

Take-off power (up to 1 minute): 2600 RPM, 1.40 ata

Water rated temperature in engine output: 80 °C

Water maximum temperature in engine output: 110 °C

Oil rated temperature in engine output: 90 °C

Oil maximum temperature in engine output: 105 °C

Supercharger gear shift altitude: automatic

Empty weight: 8698 kg

Minimum weight (no ammo, 10% fuel): 9831 kg

Standard weight: 13017 kg

Maximum takeoff weight: 15689 kg

Fuel load: 2553 kg / 3450 l

Useful load: 6991 kg

Defensive armament:

Nose: 20mm gun "MG FF", 240 rounds, 540 rounds per minute

Top: 13mm machine gun "MG 131", 1000 rounds, 900 rounds per minute

Belly-backward: 2 x 7.92mm machine guns "MG 81", 850 rounds, 1600 rounds per minute

Left: 7.92mm machine gun "MG 81", 500 rounds, 1600 rounds per minute

Right: 7.92mm machine gun "MG 81", 500 rounds, 1600 rounds per minute

Bombs:

Up to 16 x 55 kg general purpose bombs "SC 50"

Up to 4 x 249 kg general purpose bombs "SC 250"

Up to 2 x 500 kg general purpose bombs "SC 500"

Up to 2 x 1090 kg general purpose bombs "SC 1000"

Up to 2 x 1780 kg general purpose bombs "SC 1800"

2400 kg general purpose bomb "SC 2500"

Length: 16.38 m

Wingspan: 22.5 m

Wing surface: 79.5 m^2

Combat debut: Winter of 1943

Additional airplane configurations list:

2 x 1090 kg General Purpose Bomb SC 1000

Additional mass: 2180 kg

Ammunition mass: 2180 kg

Estimated speed loss before drop: 23 km/h

Estimated speed loss after drop: 0 km/h

2 x 1780 kg General Purpose Bomb SC 1800

Additional mass: 3560 kg

Ammunition mass: 3560 kg

Estimated speed loss before drop: 32 km/h

Estimated speed loss after drop: 0 km/h

2400 kg General Purpose Bomb SC 2500

Additional mass: 2400 kg

Ammunition mass: 2400 kg

Estimated speed loss before drop: 17 km/h

Estimated speed loss after drop: 0 km/h

Operation features:

- Each engine has a two-stage mechanical supercharger with an automatic switch system that switches gears depending altitude and engine revolutions. It can also be manually switched to first gear.

- Engine mixture control is automatic.

- Engine RPM has an automatic governor and it is maintained at the required RPM corresponding to the governor control lever position. The governor automatically controls the propeller pitch to maintain the required RPM.

- Propellers have a feathering system which should be activated in case of engine damage to reduce drag of the propeller in auto-rotation.

- Water and oil radiator shutter controls are manual. The oil radiator control has five fixed positions.

- Airplane has trimmers for all flight-controls: pitch, roll and yaw.

- Landing flaps have a hydraulic actuator and they can be extended to any angle up to 60°.

- Airplane tail wheel rotates freely and does not have a lock. For this reason, it is necessary to confidently and accurately operate the rudder pedals during the takeoff and landing.

- Airplane has independent left and right hydraulic wheel brake controls. To apply either brake push the upper part of the rudder pedal.

- Airplane has dedicated fuel gauges for left and right fuel tank groups and there is a switch between the internal and external fuel tank group indicator. In game the fuel indicator switch changes by itself during horizontal flight every 10 seconds. Also, the airplane has low fuel warning lights (200 liters) for left and right fuel tank groups.

- Airplane is equipped with an automatic bomb salvo controller, it allows you to switch between the bomb racks to be released (internal or external) and to switch between different salvo quantities. There is also a controller for a drop delay between each bomb in the salvo.

La-5 series 8

Indicated stall speed in flight configuration: 165..183 km/h

Indicated stall speed in takeoff/landing configuration: 147..162 km/h

Dive speed limit: 720 km/h

Maximum load factor: 10 G

Stall angle of attack in flight configuration: 22.7 °

Stall angle of attack in landing configuration: 15.1 °

Maximum true air speed at sea level, engine mode - Boosted: 544 km/h

Maximum true air speed at 3000 m, engine mode - Nominal: 571 km/h

Maximum true air speed at 6500 m, engine mode - Nominal: 603 km/h

Service ceiling: 9500 m

Climb rate at sea level: 18 m/s

Climb rate at 3000 m: 13.3 m/s

Climb rate at 6000 m: 8.2 m/s

Maximum performance turn at sea level: 23.4 s, at 270 km/h IAS.

Maximum performance turn at 3000 m: 35.3 s, at 270 km/h IAS.

Flight endurance at 3000 m: 1.9 h, at 350 km/h IAS.

Takeoff speed: 170..200 km/h

Glideslope speed: 200..210 km/h

Landing speed: 150..160 km/h

Landing angle: 13 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates and turn times are given for Boosted power.

Engine:

Model: M-82

Maximum power in Boosted mode at sea level: 1700 HP

Maximum power in Nominal mode at sea level: 1400 HP

Maximum power in Nominal mode at 2100 m: 1550 HP

Maximum power in Nominal mode at 5300 m: 1335 HP

Engine modes:

Nominal (unlimited time): 2400 RPM, 950 mm Hg

Boosted power (up to 5 minutes): 2400 RPM, 1140 mm Hg

Oil rated temperature in engine output: 55..90 °C

Oil maximum temperature in engine output: 125 °C

Cylinder head rated temperature: 140..210 °C

Cylinder head maximum temperature: 215 °C

Supercharger gear shift altitude: 3500 m

Empty weight: 2648 kg

Minimum weight (no ammo, 10% fuel): 2928 kg

Standard weight: 3353 kg

Maximum takeoff weight: 3593 kg

Fuel load: 370 kg / 521 l

Useful load: 945 kg

Forward-firing armament:

2 x 20mm gun "SsVAK", 170 rounds, 800 rounds per minute, synchronized

Bombs:

2 x 50 kg general purpose bombs "FAB-50sv"

2 x 104 kg general purpose bombs "FAB-100M"

Length: 8.672 m

Wingspan: 9.8 m

Wing surface: 17.51 m^2

Combat debut: September 1942

Additional airplane configurations list:

Loadout variants: armour piercing (AP) or high-explosive (HE) rounds only

2 x 50 kg General Purpose Bombs FAB-50sv

Additional mass: 120 kg

Ammunition mass: 100 kg

Racks mass: 20 kg

Estimated speed loss before drop: 20 km/h

Estimated speed loss after drop: 12 km/h

2 x 104 kg General Purpose Bombs FAB-100M

Additional mass: 228 kg

Ammunition mass: 208 kg

Racks mass: 20 kg

Estimated speed loss before drop: 27 km/h

Estimated speed loss after drop: 12 km/h

Flat frontal section for better visibility

Additional mass: 2 kg

Estimated speed loss: 2 km/h

RPK-10 fixed loop radio compass for navigation with radio beacons

Additional mass: 10 kg

Estimated speed loss: 0 km/h

Late M-82F engine modification with unlimited boosted mode duration. Performance wise, early La-5 aircraft upgraded with this engine are similar to La-5F model.

Additional mass: 0 kg

Estimated speed loss: 0 km/h

Operation features:

- Engine has a boost mode. To set boost mode it is necessary to push the boost knob and increase manifold pressure to 1140 mm Hg.

- Engine has a two-stage mechanical supercharger which must be manually switched at 3500m altitude.

- Engine mixture control is automatic when the mixture lever is set to maximum. It is possible to manually lean the mixture by moving the mixture control to less than maximum. This also reduces fuel consumption during flight.

- Engine RPM has an automatic governor and it is maintained at the required RPM corresponding to the governor control lever position. The governor automatically controls the propeller pitch to maintain the required RPM.

- Oil radiator, air cooling intake and outlet shutters is manually controlled.

- Air cooling intake shutters should always be open. They should only be closed when there is a possibility of engine overcooling, for example in a dive with idle throttle.

- Airplane has trimmers for all flight-controls: pitch, roll, yaw.

- Airplane has automatic wing slats. They deploy when the high angle of attack increases which makes pre-stall softer.

- Landing flaps have a hydraulic actuator and they can be extended to any angle up to 60°.

- Airplane tail wheel rotates freely and does not have a lock. For this reason, it is necessary to confidently and accurately operate the rudder pedals during the takeoff and landing.

- Airplane has differential pneumatic wheel brakes with shared control lever. This means that if the brake lever is held and the rudder pedal the opposite wheel brake is gradually released causing the plane to swing to one side or the other.

- Airplane has a fuel gauge which shows total remaining fuel.

- Cockpit canopy has a weak lock when in the opened position, for this reason the canopy may spontaneously close in a deep dive. Also, it is impossible to open or close canopy at high speed due to strong airflow. The canopy has no emergency release, so bail out requires the speed drop before it.

- The control system of wing-mounted bomb racks only allows the dropping of bombs one by one.

La-5FN series 2

Indicated stall speed in flight configuration: 168..185 km/h

Indicated stall speed in takeoff/landing configuration: 147..159 km/h

Dive speed limit: 720 km/h

Maximum load factor: 10 G

Stall angle of attack in flight configuration: 22.2 °

Stall angle of attack in landing configuration: 15.0 °

Maximum true air speed at sea level, engine mode - Boosted: 552 km/h

Maximum true air speed at sea level, engine mode - Nominal: 583 km/h

Maximum true air speed at 2500 m, engine mode - Nominal: 605 km/h

Maximum true air speed at 6000 m, engine mode - Nominal: 646 km/h

Service ceiling: 10500 m

Climb rate at sea level: 20 m/s

Climb rate at 3000 m: 16.7 m/s

Climb rate at 6000 m: 12.5 m/s

Maximum performance turn at sea level: 21.0 s, at 320 km/h IAS.

Maximum performance turn at 3000 m: 28.0 s, at 340 km/h IAS.

Flight endurance at 3000 m: 2.0 h, at 350 km/h IAS.

Takeoff speed: 175..195 km/h

Glideslope speed: 200..210 km/h

Landing speed: 150..160 km/h

Landing angle: 13 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates and turn times are given for Boosted power.

Engine:

Model: M-82FN

Maximum power in Boosted mode at sea level: 1850 HP

Maximum power in Nominal mode at sea level: 1560 HP

Maximum power in Nominal mode at 1550 m: 1630 HP

Maximum power in Nominal mode at 4800 m: 1460 HP

Engine modes:

Nominal (unlimited time): 2400 RPM, 1000 mm Hg

Boosted power (up to 10 minutes): 2500 RPM, 1180 mm Hg

Oil rated temperature in engine intake: 65..75 °C

Oil maximum temperature in engine intake: 85 °C

Cylinder head rated temperature: 180..215 °C

Cylinder head maximum temperature: 250 °C

Supercharger gear shift altitude: 3500 m

Empty weight: 2655 kg

Minimum weight (no ammo, 10% fuel): 2929 kg

Standard weight: 3305 kg

Maximum takeoff weight: 3544 kg

Fuel load: 334 kg / 464 l

Useful load: 896 kg

Forward-firing armament:

2 x 20mm gun "SsVAK", 170 rounds, 800 rounds per minute, synchronized

Bombs:

2 x 50 kg general purpose bombs "FAB-50sv"

2 x 104 kg general purpose bombs "FAB-100M"

Length: 8.672 m

Wingspan: 9.8 m

Wing surface: 17.51 m^2

Combat debut: June 1943

Additional airplane configurations list:

Loadout variants: armour piercing (AP) or high-explosive (HE) rounds only

2 x 50 kg General Purpose Bombs FAB-50sv

Additional mass: 120 kg

Ammunition mass: 100 kg

Racks mass: 20 kg

Estimated speed loss before drop: 20 km/h

Estimated speed loss after drop: 12 km/h

2 x 104 kg General Purpose Bombs FAB-100M

Additional mass: 228 kg

Ammunition mass: 208 kg

Racks mass: 20 kg

Estimated speed loss before drop: 27 km/h

Estimated speed loss after drop: 12 km/h

Landing light for night flights

Additional mass: 2 kg

Estimated speed loss: 0 km/h

RPK-10 fixed loop radio compass for navigation with radio beacons

Additional mass: 10 kg

Estimated speed loss: 0 km/h

Rear view mirror

Additional mass: 1 kg

Estimated speed loss: 0 km/h

Operation features:

- The engine has a boost mode. To engage it, increase the manifold pressure to 1180 mm Hg. Boost only works on 1st supercharger gear.

- Engine has a two-stage mechanical supercharger which must be manually switched at 3500m altitude.

- Engine RPM has an automatic governor and it is maintained at the required RPM corresponding to the governor control lever position. The governor automatically controls the propeller pitch to maintain the required RPM.

- Oil radiator, air cooling intake and outlet shutters are manually controlled.

- Air cooling intake shutters should always be open. They should only be closed when there is a possibility of engine overcooling, for example in a dive with idle throttle.

- Aircraft is equipped with elevator and rudder trimmers.

- Airplane has automatic wing slats. They deploy when the high angle of attack increases which makes pre-stall softer.

- Landing flaps have a hydraulic actuator and they can be extended to any angle up to 60°.

- Airplane tail wheel rotates freely and does not have a lock. For this reason, it is necessary to confidently and accurately operate the rudder pedals during the takeoff and landing.

- Airplane has differential pneumatic wheel brakes with shared control lever. This means that if the brake lever is held and the rudder pedal the opposite wheel brake is gradually released causing the plane to swing to one side or the other.

- Airplane has a fuel gauge which shows total remaining fuel.

- Also, it is impossible to open or close canopy at high speed due to strong airflow. The canopy has no emergency release, so bail out requires the speed drop before it.

- The control system for the bomb rack only allows to drop bombs one by one.

Yak-1(b) series 127

Indicated stall speed in flight configuration: 153..169 km/h

Indicated stall speed in takeoff/landing configuration: 132..145 km/h

Dive speed limit: 720 km/h

Maximum load factor: 10.3 G

Stall angle of attack in flight configuration: 18 °

Stall angle of attack in landing configuration: 15.6 °

Maximum true air speed at sea level, engine mode - Nominal, 2550 RPM: 530 km/h

Maximum true air speed at 2000 m, engine mode - Nominal, 2700 RPM: 567 km/h

Maximum true air speed at 4500 m, engine mode - Nominal, 2700 RPM: 600 km/h

Service ceiling: 10600 m

Climb rate at sea level: 17.0 m/s

Climb rate at 3000 m: 15.0 m/s

Climb rate at 6000 m: 9.5 m/s

Maximum performance turn at sea level: 19.0 s, at 270 km/h IAS.

Maximum performance turn at 3000 m: 24.1 s, at 270 km/h IAS.

Flight endurance at 3000 m: 2.0 h, at 350 km/h IAS.

Takeoff speed: 160..190 km/h

Glideslope speed: 195..205 km/h

Landing speed: 135..145 km/h

Landing angle: 12 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates and turn times are given for Nominal (2700 RPM) power.

Engine:

Model: M-105PF

Maximum power in Nominal mode (2550 RPM) at sea level: 1240 HP

Maximum power in Nominal mode (2700 RPM) at sea level: 1210 HP

Maximum power in Nominal mode (2700 RPM) at 800 m: 1260 HP

Maximum power in Nominal mode (2700 RPM) at 2700 m: 1200 HP

Engine modes:

Nominal (unlimited time): 2550/2700 RPM, 1050 mm Hg

Water rated temperature in engine output: 70..85 °C

Water maximum temperature in engine output: 100 °C

Oil rated temperature in engine output: 90..100 °C

Oil maximum temperature in engine output: 115 °C

Supercharger gear shift altitude: 2300 m

Empty weight: 2322 kg

Minimum weight (no ammo, 10% fuel): 2543 kg

Standard weight: 2887 kg

Maximum takeoff weight: 3117 kg

Fuel load: 304 kg / 408 l

Useful load: 795 kg

Forward-firing armament:

20mm gun "SsVAK", 140 rounds, 800 rounds per minute, nose-mounted

12.7mm machine gun "UB", 220 rounds, 1000 rounds per minute, synchronized

Bombs:

2 x 50 kg general purpose bombs "FAB-50sv"

2 x 104 kg general purpose bombs "FAB-100M"

Length: 8.5 m

Wingspan: 10 m

Wing surface: 17.15 m^2

Combat debut: April 1943

Additional airplane configurations list:

2 x 50 kg General Purpose Bombs FAB-50sv

Additional mass: 120 kg

Ammunition mass: 100 kg

Racks mass: 20 kg

Estimated speed loss before drop: 23 km/h

Estimated speed loss after drop: 13 km/h

2 x 104 kg General Purpose Bombs FAB-100M

Additional mass: 228 kg

Ammunition mass: 208 kg

Racks mass: 20 kg

Estimated speed loss before drop: 31 km/h

Estimated speed loss after drop: 13 km/h

Landing light for night flights

Additional mass: 2 kg

Estimated speed loss: 0 km/h

RPK-10 fixed loop radio compass for navigation with radio beacons

Additional mass: 10 kg

Estimated speed loss: 0 km/h

Mirror for view to rear hemisphere

Additional mass: 1 kg

Estimated speed loss: 0 km/h

Operation features:

- Engine has a two-stage mechanical supercharger which must be manually switched at 2300m altitude.

- Engine mixture control is manual; it is necessary to lean the mixture if altitude is more than 3-4 km for optimal engine operation. Also, leaning the mixture allows a reduction in fuel consumption during flight.

- Engine RPM has an automatic governor and it is maintained at the required RPM corresponding to the governor control lever position. The governor automatically controls the propeller pitch to maintain the required RPM.

- Water and oil radiator shutter control is manual.

- Airplane has only a flight-control trimmer on the pitch.

- Landing flaps have a pneumatic actuator. Flaps can only be fully extended; gradual extending is impossible. Due to the weak force of the actuator the extended landing flaps may be pressed upwards by the airflow if the airspeed is more than 220 km/h. Remember that the flaps will not extend fully in case of high speed. In case of a high-speed landing approach the flaps may extend a few steps further right before landing.

- Airplane has a tailwheel control system which is unlocked by the rudder if the rudder pedal is pressed more than 75% of its range. The tailwheel remains locked if pedals are deflected less than 75%. Because of this, it is necessary to avoid large rudder pedal inputs when moving at high speed.

- Airplane has differential pneumatic wheel brakes with shared control lever. This means that if the brake lever is held and the rudder pedal the opposite wheel brake is gradually released causing the plane to swing to one side or the other.

- Fuel gauges are installed on left and right wing fuel tanks, outside of the cockpit. They show remaining fuel level only when there is less than 80 liters of fuel left in the tank.

- It is impossible to open or close the canopy at high speed due to strong airflow. The canopy has no emergency release, so bail out requires the speed drop before it.

- The control system for the wing-mounted bomb racks only allows releasing of both bombs together.

P-40E-1

Indicated stall speed in flight configuration: 153..176 km/h

Indicated stall speed in takeoff/landing configuration: 141..164 km/h

Dive speed limit: 860 km/h

Maximum load factor: 12.2 G

Stall angle of attack in flight configuration: 14 °

Stall angle of attack in landing configuration: 12.6 °

Maximum true air speed at sea level, engine mode - Take-off: 494 km/h

Maximum true air speed at 5000 m, engine mode - Take-off: 601 km/h

Service ceiling: 9200 m

Climb rate at sea level: 12.5 m/s

Climb rate at 3000 m: 10 m/s

Climb rate at 6000 m: 3.7 m/s

Maximum performance turn at sea level: 24.3 s, at 270 km/h IAS.

Maximum performance turn at 3000 m: 36.1 s, at 270 km/h IAS.

Flight endurance at 3000 m: 2.8 h, at 350 km/h IAS.

Takeoff speed: 160..190 km/h

Glideslope speed: 210..220 km/h

Landing speed: 140..145 km/h

Landing angle: 13.9 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates are given for Take-off power, turn times are given for Maximum possible power.

Engine:

Model: V-1710-39

Maximum power in Maximum Possible power mode at sea level: 1470 HP

Maximum power in Take-off mode at sea level: 1150 HP

Maximum power in Nominal mode at sea level: 900 HP

Maximum power in Combat mode at 12000 feet: 1150 HP

Maximum power in Nominal mode at 10800 feet: 1000 HP

Engine modes:

Nominal (unlimited time): 2600 RPM, 37.2 inch Hg

Combat power (up to 5 minutes): 3000 RPM, 42 inch Hg

Take-off power (up to 2 minutes): 3000 RPM, 45.5 inch Hg

Maximum Possible power (prohibited by flight manual): 3000 RPM, 56.0 inch Hg

Water rated temperature in engine output: 105..115 °C

Water maximum temperature in engine output: 125 °C

Oil rated temperature in engine intake: 70..85 °C

Oil maximum temperature in engine intake: 90 °C

Supercharger gear shift altitude: single gear

Empty weight: 3073 kg

Minimum weight (no ammo, 10% fuel): 3264.2 kg

Standart weight: 3819.1 kg

Maximum takeoff weight: 4414 kg

Fuel load: 404 kg / 561 l

Useful load: 1341 kg

Forward-firing armament:

6 x 12.7mm machine gun "M2.50", 235 rounds, 850 rounds per minute, wing-mounted

Bombs:

254 kg general purpose bomb "FAB-250sv"

512 kg general purpose bomb "FAB-500M"

Rockets:

4 x 7 kg rockets "ROS-82", HE payload mass 2.52 kg

Length: 9.05 m

Wingspan: 11.4 m

Wing surface: 21.92 m^2

Combat debut: December 1941

Additional airplane configurations list:

Removal of 2 external wing-mounted machine guns to reduce total weight

Weight savings: 156 kg

Removed ammunition mass: 64 kg

Removed guns mass: 92 kg

Estimated additional speed: 3 km/h

Additional ammo for machine guns: 312 for internal ones, 291 for middle ones, 240 for external ones (instead of 235 per each) or 615 per each for 4x MG.

6 machineguns:

Additional mass: 38 kg

Estimated speed loss: 0 km/h

4 machineguns:

Additional mass: 207 kg

Estimated speed loss: 2 km/h

254 kg General Purpose Bomb FAB-250sv

Additional mass: 264 kg

Ammunition mass: 254 kg

Rack mass: 10 kg

Estimated speed loss before drop: 19 km/h

Estimated speed loss after drop: 7 km/h

254 kg General Purpose Bomb FAB-500M

Additional mass: 522 kg

Ammunition mass: 512 kg

Rack mass: 10 kg

Estimated speed loss before drop: 36 km/h

Estimated speed loss after drop: 7 km/h

4 x 82mm High Explosive unguided rockets ROS-82

Additional mass: 40 kg

Ammunition mass: 28 kg

Racks mass: 12 kg

Estimated speed loss before launch: 13 km/h

Estimated speed loss after launch: 10 km/h

Mirror for view to rear hemisphere

Additional mass: 1 kg

Estimated speed loss: 2 km/h

Operation features:

- Engine has no manifold pressure automatic governor. For this reason, manifold pressure not only depends on throttle position, but also from RPM and altitude. This requires additional checking of manifold pressure to not cause engine damage.

- Engine has a single-stage mechanical supercharger which does not require manual control.

- Engine is equipped with an automatic fuel mixture control which maintains optimal mixture if mixture lever is set to Auto Rich (66%) position. To use automatic mixture leaning to reduce fuel consumption during flight it is necessary to set mixture lever to Auto Lean (33%) position. In the case of mulfunction of the automatic mixture control the mixture lever should be set to Full Rich (100%) position. To stop the engine mixture lever should be set to the Cut Off (0%) position.

- Engine RPM has an automatic governor and it is maintained at the required RPM corresponding to the governor control lever position. The governor automatically controls the propeller pitch to maintain the required RPM. Also it is possible to turn off the governor and control propeller pitch manually.

- Water and oil radiators shutters are joint with engine cowl outlet shutters and manually operated.

- Airplane has a very small stability margin in yaw. When angle of side slip is more than 12° plane becomes unstable in yaw and starts to increase the side slip angle by itself. Because of this, it is necessary to accurately operate the rudder pedals and pay attention to the side slip indicator.

- Airplane has trimmers for all flight-controls: pitch, roll, yaw.

- Landing flaps have a hydraulic actuator and they can be extended to any angle up to 45°.

- Airplane has a tailwheel control system which is unlocked by the rudder if the rudder pedal is pressed more than half of its range. The tailwheel remains locked if pedals are deflected less than half way. Because of this, it is necessary to avoid large rudder pedal inputs when moving at high speed.

- Airplane has independent left and right hydraulic wheel brakes. To brake it is necessary to push upper part of the rudder pedal.

- Airplane is equipped with a parking brake system.

- Airplane has three fuel gauges which shows the level in each fuel tank.

- It is impossible to open or close canopy at high speed due to strong airflow. The canopy has an emergency release system for bail out.

- Airplane is equipped with mechanical releasing system for a single bomb.

- When rockets are installed a salvo controller can be used, it has three launch modes: single fire, fire two in a salvo or fire four in a salvo.

- The gunsight has a sliding sun-filter. There is also a back-up mechanical sight which can be used if main sight is damaged.

Supermarine Spitfire Mk.VB

Indicated stall speed in flight configuration: 137..144 km/h

Indicated stall speed in takeoff/landing configuration: 129..135 km/h

Dive speed limit: 725 km/h

Maximum load factor: 12.5 G

Stall angle of attack in flight configuration: 18.8 °

Stall angle of attack in landing configuration: 16.0 °

Merlin 46 engine:

Maximum true air speed at sea level, 3000 RPM, boost +9: 457 km/h

Maximum true air speed at sea level, 3000 RPM, boost +16: 515 km/h

Maximum true air speed at 7400 m, 3000 RPM, boost +9: 597 km/h

Maximum true air speed at 5000 m, 3000 RPM, boost +16: 604 km/h

Service ceiling: 12000 m

Climb rate at sea level: 12.9 m/s

Climb rate at 3000 m: 13.1 m/s

Climb rate at 6000 m: 12.0 m/s

Maximum performance turn at sea level: 25 s, at 270 km/h IAS.

Maximum performance turn at 3000 m: 30 s, at 260 km/h IAS.

Merlin 45 engine:

Maximum true air speed at sea level, 3000 RPM, boost +9: 480 km/h

Maximum true air speed at sea level, 3000 RPM, boost +16: 535 km/h

Maximum true air speed at 6000 m, 3000 RPM, boost +9: 590 km/h

Maximum true air speed at 3500 m, 3000 RPM, boost +16: 596 km/h

Service ceiling: 11200 m

Climb rate at sea level: 14.5 m/s

Climb rate at 3000 m: 14.7 m/s

Climb rate at 6000 m: 11.4 m/s

Maximum performance turn at sea level: 22 s, at 270 km/h IAS.

Maximum performance turn at 3000 m: 28.2 s, at 260 km/h IAS.

Flight endurance at 3000 m: 1 h 45 m, at 350 km/h IAS.

Takeoff speed: 160..170 km/h

Glideslope speed: 145..160 km/h

Landing speed: 130..135 km/h

Landing angle: 12.5 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates are given for 2850 RPM and boost +9, turn times are given for 3000 RPM and boost +9.

Engine:

Model: Merlin 46

Maximum power in Take-off mode (3000 RPM, boost +12) at sea level: 1100 HP

Maximum power in Emergency Max All Out mode (3000 RPM, boost +16) at 14000 feet: 1400 HP

Maximum power in International power mode (2850 RPM, boost +9) at 19000 feet: 1115 HP

Model: Merlin 45

Maximum power in Take-off mode (3000 RPM, boost +12) at sea level: 1185 HP

Maximum power in Emergency Max All Out mode (3000 RPM, boost +16) at 9000 feet: 1455 HP

Maximum power in International power mode (2850 RPM, boost +9) at 14200 feet: 1170 HP

Engine modes:

Max Cruising power (unlimited time): 2650 RPM, boost +7

International power (up to 30 minutes): 2850 RPM, boost +9

Emergency Max All Out power (up to 5 minutes): 3000 RPM, boost +16

Water rated temperature in engine output: 105..115 °C

Water maximum temperature in engine output: 125 °C

Oil rated temperature in engine intake: 70..85 °C

Oil maximum temperature in engine intake: 105 °C

Supercharger gear shift altitude: single gear

Empty weight: 2415 kg

Minimum weight (no ammo, 10%25 fuel): 2732 kg

Standard weight: 2979 kg

Fuel load: 274 kg / 386 l / 85 gallons

Useful load: 564 kg

Forward-firing armament:

2 x 20mm guns "Hispano Mk.II", 60 rounds per gun, 650 rounds per minute, wing-mounted

4 x 7.92mm machine gun "Browning .303", 350 rounds per gun, 1150 rounds per minute, wing-mounted

Length: 9.2 m

Wingspan: 11.21 m

Wing surface: 22.48 m^2

Combat debut: Winter 1941 (In Battle of Kuban - at Spring 1943)

Additional airplane configurations list:

Merlin 45 engine

Additional mass: 0 kg

Estimated speed loss: 0 km/h

Mirror for view to rear hemisphere

Additional mass: 1 kg

Estimated speed loss: 2 km/h

Operation features:

- Engine is equipped with the automatic governor of the manifold pressure that works when the throttle is set to 1/3 position or above. It is neccessary to turn the automatic governor off to set the boost value to +16.

- Engine has a single stage mechanical supercharger which does not require manual control.

- Engine is equipped with an automatic fuel mixture control which maintains optimal mixture if mixture lever is set to the forward position. To use automatic mixture leaning to reduce fuel consumption during flight move the mixture lever to backward position.

- Engine RPM has an automatic governor that controls the propeller pitch to maintain the required RPM.

- The water radiator is operated manually, while the oil radiator is unadjustable.

- Aircraft has a neutral static stability. The elevator effectiveness is high, so the aircraft should be controlled carefully, not giving too much flight stick input.

- Aircraft becomes unstable with extended landing flaps.

- Aircraft is equipped with elevator and rudder trimmers.

- Landing flaps have a pneumatic actuator so they can be extended to maximum position only. Speed with extended landing flaps is limited to 150 mph.

- Airplane tail wheel rotates freely and does not have a lock. Since the landing gear wheels are relatively close to each other, it is necessary to confidently and accurately operate the rudder pedals during the takeoff and landing.

- Airplane has differential pneumatic wheel brakes with shared control lever. This means that if the brake lever is held and the rudder pedal the opposite wheel brake is gradually released causing the plane to swing to one side or the other.

- Airplane is equipped with a siren that warns a pilot if the throttle is set to low position with landing gear retracted.

- It is impossible to open or close the canopy at high speed due to strong airflow. The canopy has an emergency release system for bailouts.

- Airplane is equipped with upper and bottom formation lights which can be turned on simultaneously or independently.

- The gunsight is adjustable: both the target distance and target base can be set.

- The gunsight has a sliding sun-filter.

Bf 109 G-6

Indicated stall speed in flight configuration: 160..177 km/h

Indicated stall speed in takeoff/landing configuration: 153..169 km/h

Dive speed limit: 850 km/h

Maximum load factor: 10.5 G

Stall angle of attack in flight configuration: 19.8 °

Stall angle of attack in landing configuration: 17 °

Maximum true air speed at sea level, engine mode - Emergency: 529 km/h

Maximum true air speed at sea level, engine mode - Combat: 505 km/h

Maximum true air speed at 2000 m, engine mode - Combat: 547 km/h

Maximum true air speed at 7000 m, engine mode - Combat: 632 km/h

Service ceiling: 11800 m

Climb rate at sea level: 20.1 m/s

Climb rate at 3000 m: 18.8 m/s

Climb rate at 6000 m: 15.2 m/s

Maximum performance turn at sea level: 21.5 s, at 270 km/h IAS.

Maximum performance turn at 3000 m: 28.0 s, at 270 km/h IAS.

Flight endurance at 3000 m: 2.2 h, at 350 km/h IAS.

Takeoff speed: 155..180 km/h

Glideslope speed: 195..205 km/h

Landing speed: 150..155 km/h

Landing angle: 13.7 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates and turn times are given for Combat power.

Engine:

Model: DB-605A

Maximum power in Emergency mode at sea level: 1480 HP

Maximum power in Emergency mode at 5600 m: 1360 HP

Maximum power in Combat mode at sea level: 1310 HP

Maximum power in Combat mode at 5800 m: 1250 HP

Engine modes:

Nominal (unlimited time): 2300 RPM, 1.15 ata

Combat power (up to 30 minutes): 2600 RPM, 1.3 ata

Emergency power (up to 1 minute): 2800 RPM, 1.42 ata

Water rated temperature in engine output: 100..102 °C

Water maximum temperature in engine output: 115 °C

Oil rated temperature in engine intake: 70..80 °C

Oil maximum temperature in engine intake: 85 °C

Supercharger gear shift altitude: fluid coupling

Empty weight: 2583 kg

Minimum weight (no ammo, 10% fuel): 2734 kg

Standard weight: 3100 kg

Maximum takeoff weight: 3400 kg

Fuel load: 304 kg / 400 l

Useful load: 817 kg

Forward-firing armament:

20mm gun "MG 151/20", 200 rounds, 700 rounds per minute, nose-mounted

2 x 13mm machine gun "MG 131", 300 rounds, 900 rounds per minute, synchronized

2 x 20mm gun "MG 151/20", 135 rounds, 700 rounds per minute, wing-mounted (modification)

30mm gun "MK 108", 65 rounds, 650 rounds per minute, nose-mounted (modification)

Bombs:

Up to 4 x 55 kg general purpose bombs "SC 50"

249 kg general purpose bomb "SC 250"

Length: 8.94 m

Wingspan: 9.97 m

Wing surface: 16.1 m^2

Combat debut: february 1943

Additional airplane configurations list:

MG 151/20 20mm guns in wing-mounted gun pods with 135 rounds per each

Additional mass: 212 kg

Ammunition mass: 55 kg

Guns mass: 157 kg

Estimated speed loss: 12 km/h

MK 108 30mm nose-gun with 65 rounds

Removed mass: 6 kg

Ammunition mass: 28 kg

Gun mass: 58 kg

Estimated speed loss: 0 km/h

4 x 55 kg General Purpose Bombs SC 50

Additional mass: 260 kg

Ammunition mass: 220 kg

Racks mass: 40 kg

Estimated speed loss before drop: 51 km/h

Estimated speed loss after drop: 11 km/h

249 kg General Purpose Bomb SC 250

Additional mass: 279 kg

Ammunition mass: 249 kg

Racks mass: 30 kg

Estimated speed loss before drop: 31 km/h

Estimated speed loss after drop: 10 km/h

Alternative pilot protection: armoured transparent triplex head rest for better visibility

Additional mass: 10 kg

Estimated speed loss: 0 km/h

Removed pilot armoured headrest for improved field of view

Weight savings: 8 kg

Estimated speed loss: 0 km/h

Fixed loop radio compass for navigation with radio beacons Peilrahmen PR 16

Additional mass: 10 kg

Estimated speed loss: 0 km/h

Operation features:

- Airplane has a wide automatization of the engine systems, in fact, to control speed it is only necessary to use the throttle lever. There is no need to manually set engine revolutions and mixture or supercharger gear in normal flight.

- In addition to full-automatic mode there is a special manual control mode for the radiator shutters, which can be used in specific situations.

- To reduce swinging during taxiing due to prop-wash the propeller pitch control should be switched to manual mode and pitch should be reduced to minimum.

- Airplane has no flight-control trimmers. Airplane is equipped with bendable trim tabs that can be set pre-flight by ground personnel.

- Airplane has a manually controlled horizontal stabilizer. It should be set to +1° before takeoff and to -4°...-5° before landing. Also, it may be used to trim the flight stick during the flight. In a deep dive the stabilizer should be set so that the pilot must push the flight stick forward to maintain the dive angle.

- Airplane has automatic wing slats. They deploy when the high angle of attack increases which makes pre-stall softer.

- Airplane has a manual mechanical system for retracting the landing flaps, for this reason it is necessary to extend landing flaps well before final approach. Markers on the left-wing flap indicate how far the flaps are extended. The flaps can be extended to any angle up to 40°.

- Airplane has a manual tail wheel lock. Wheel should be locked when taxiing straight for a long distance and before takeoff and landing.

- Airplane has independent left and right hydraulic wheel brake controls. To apply either brake push the upper part of the rudder pedal.

- Airplane has a fuel gauge which shows total fuel remaining. Also, it has an emergency fuel warning light (80 liters).

- The design of the cockpit canopy does not allow it to be opened during flight. The canopy should be closed before takeoff to prevent damage. The canopy has an emergency release system for bailouts.

- The control system for the bomb rack only allows to drop bombs one by one.

- The gunsight has a sliding sun-filter.

Fw 190 A-3

Indicated stall speed in flight configuration: 166..189 km/h

Indicated stall speed in takeoff/landing configuration: 166..172 km/h

Dive speed limit: 850 km/h

Maximum load factor: 11 G

Stall angle of attack in flight configuration: 19.5°

Stall angle of attack in landing configuration: 18.1°

Maximum true air speed at sea level, engine mode - Emergency: 560 km/h

Maximum true air speed at 3000 m, engine mode - Emergency: 581 km/h

Maximum true air speed at 6400 m, engine mode - Emergency: 662 km/h

Maximum true air speed at sea level, engine mode - Combat: 535 km/h

Maximum true air speed at 3000 m, engine mode - Combat: 562 km/h

Maximum true air speed at 6000 m, engine mode - Combat: 626 km/h

Service ceiling: 10800 m

Climb rate at sea level: 16.0 m/s

Climb rate at 3000 m: 12.7 m/s

Climb rate at 6000 m: 10.3 m/s

Maximum performance turn at sea level: 23.0 s, at 280 km/h IAS.

Maximum performance turn at 3000 m: 28.0 s, at 280 km/h IAS.

Flight endurance at 3000 m: 3.2 h, at 350 km/h IAS.

Takeoff speed: 170..210 km/h

Glideslope speed: 205..215 km/h

Landing speed: 160..170 km/h

Landing angle: 12.5°

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates are given for Combat power, turn times are given for Emergency power.

Engine:

Model: BMW-801D

Maximum power in Emergency mode at sea level: 1700 HP

Maximum power in Emergency mode at 5700 m: 1440 HP

Maximum power in Combat mode at 700 m: 1520 HP

Maximum power in Combat mode at 5300 m: 1320 HP

Engine modes:

Nominal (unlimited time): 2300 RPM, 1.2 ata

Combat power (up to 30 minutes): 2400 RPM, 1.32 ata

Emergency power (up to 3 minutes): 2700 RPM, 1.42 ata

Oil rated temperature in engine intake: 60..70 °C

Oil maximum temperature in engine intake: 85 °C

Oil rated temperature in engine output: 105 °C

Oil maximum temperature in engine output: 120 °C

Cylinder head rated temperature: 180 °C

Cylinder head maximum temperature: 220 °C

Supercharger gear shift altitude: automatic

Empty weight: 3148 kg

Minimum weight (no ammo, 10% fuel): 3330 kg

Standard weight: 3855 kg

Maximum takeoff weight: 4385 kg

Fuel load: 409 kg / 524 l

Useful load: 1237 kg

Forward-firing armament:

2 x 20mm gun "MG 151/20", 250 rounds, 700 rounds per minute, synchronized

2 x 7.92mm machine gun "MG 17", 900 rounds, 1200 rounds per minute, synchronized

2 x 20mm gun "MG FF", 90 rounds, 540 rounds per minute, wing-mounted (modification)

Bombs:

Up to 4 x 55 kg general purpose bombs "SC 50"

249 kg general purpose bomb "SC 250"

500 kg general purpose bomb "SC 500"

Length: 8.85 m

Wingspan: 10.51 m

Wing surface: 18.3 m^2

Combat debut: March 1942

Additional airplane configurations list:

MG FF/M 20mm additional wing-mounted guns with 60 rounds per each

Additional mass: 123 kg

Ammunition mass: 29 kg

Guns mass: 94 kg

Estimated speed loss: 7 km/h

MG FF/M 20mm additional wing-mounted guns with 90 rounds per each

Additional mass: 144 kg

Ammunition mass: 50 kg

Guns mass: 94 kg

Estimated speed loss: 8 km/h

4 x 55 kg General Purpose Bombs SC 50

Additional mass: 280 kg

Ammunition mass: 220 kg

Racks mass: 60 kg

Estimated speed loss before drop: 85 km/h

Estimated speed loss after drop: 41 km/h

249 kg General Purpose Bomb SC 250

Additional mass: 279 kg

Ammunition mass: 249 kg

Racks mass: 30 kg

Estimated speed loss before drop: 37 km/h

Estimated speed loss after drop: 11 km/h

500 kg General Purpose Bomb SC 500

Additional mass: 530 kg

Ammunition mass: 500 kg

Racks mass: 30 kg

Estimated speed loss before drop: 43 km/h

Estimated speed loss after drop: 13 km/h

Operation features:

- Airplane has a wide automatization of the engine systems, in fact, to control speed it is only necessary to use the throttle lever. There is no need to manually set engine revolutions and mixture or supercharger gear in normal flight. The engine supercharger has an automatic switch system which depends on altitude and engine revolutions.

- To reduce swinging during taxiing due to prop-wash the propeller pitch control should be switched to manual mode and pitch should be reduced to minimum.

- When the angle of attack increases to critical levels the wing may stall suddenly and unexpectedly. There is almost no pre-stall buffet before the stalling. To avoid this the pilot must pay additional attention when performing extreme maneuvering.

- Airplane has no flight-control trimmers. Airplane is equipped with bendable trim tabs that can be set pre-flight by ground personnel.

- Airplane has a manually controlled horizontal stabilizer which is electrically-actuated. It should be set to +1.5° before takeoff and landing. Also, it may be used to trim the flight stick during the flight. In a deep dive the stabilizer should be set so that the pilot must push the flight stick forward to maintain the dive angle.

- Airplane has electrically-actuated landing flaps with three fixed positions: retracted, takeoff (13°) and landing (58°). Flaps control buttons and indicator lights are located on left panel near the throttle. The flap angle may also be checked by indicators on the left and right wing outside the cockpit.

- Airplane has a tail wheel lock system which locks the tail wheel if the flight-stick is pulled backward. The tailwheel should be locked when taxiing straight for a long distance, before takeoff and after touchdown upon landing.

- Airplane has independent left and right hydraulic wheel brake controls. To apply either brake push the upper part of the rudder pedal.

- Airplane has a fuel gauge which shows the amount of remaining fuel in the front or rear fuel tank depending on switch position. In game the fuel indicator switch changes by itself during horizontal flight by every 10 seconds. Also, the airplane has an emergency fuel warning light (100 liters).

- It is impossible to open or close the canopy at high speed due to strong airflow. The canopy has an emergency release system for bailouts.

- The control system for the bomb rack only allows for dropping bombs one by one.

- The gunsight has a sliding sun-filter.

MC.202 series VIII

Indicated stall speed in flight configuration: 151..166 km/h

Indicated stall speed in takeoff/landing configuration: 139..152 km/h

Dive speed limit: 850 km/h

Maximum load factor: 14.8 G

Stall angle of attack in flight configuration: 19.6 °

Stall angle of attack in landing configuration: 17.4 °

Maximum true air speed at sea level, engine mode - Combat: 500 km/h

Maximum true air speed at 2000 m, engine mode - Combat: 543 km/h

Maximum true air speed at 5000 m, engine mode - Combat: 604 km/h

Service ceiling: 11300 m

Climb rate at sea level: 17.3 m/s

Climb rate at 3000 m: 15.1 m/s

Climb rate at 6000 m: 10.6 m/s

Maximum performance turn at sea level: 22.6 s, at 270 km/h IAS.

Maximum performance turn at 3000 m: 28.2 s, at 270 km/h IAS.

Flight endurance at 3000 m: 2.2 h, at 350 km/h IAS.

Takeoff speed: 160..190 km/h

Glideslope speed: 190..200 km/h

Landing speed: 140..150 km/h

Landing angle: 13.9 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates are given for Combat power, turn times are given for Boosted power.

Engine:

Model: RA.1000

Maximum power in Boosted mode at sea level: 1175 HP

Maximum power in Combat mode at sea level: 1050 HP

Maximum power in Combat mode at 3700 m: 1100 HP

Engine modes:

Nominal (unlimited time): 2200 RPM, 1.23 ata

Combat power (up to 5 minutes): 2400 RPM, 1.35 ata

Boosted power (up to 1 minute): 2500 RPM, 1.45 ata

Water rated temperature in engine intake: 70..80 °C

Water rated temperature in engine output: 94 °C

Water maximum temperature in engine output: 100 °C

Oil rated temperature in engine intake: 60..75 °C

Oil maximum temperature in engine intake: 85 °C

Oil rated temperature in engine output: 90..100 °C

Oil maximum temperature in engine output: 110 °C

Supercharger gear shift altitude: fluid coupling

Empty weight: 2448 kg

Minimum weight (no ammo, 10% fuel): 2622 kg

Standard weight: 2967 kg

Maximum takeoff weight: 3197 kg

Fuel load: 307 kg / 430 l

Useful load: 749 kg

Forward-firing armament:

2 x 12.7mm machine gun "Breda SAFAT 12.7", 400 rounds, 700 rounds per minute, synchronized

2 x 7.7mm machine gun "Breda SAFAT 7.7", 500 rounds, 900 rounds per minute, wing-mounted (modification)

2 x 20mm gun "MG 151/20", 135 rounds, 700 rounds per minute, wing-mounted (modification)

Bombs:

2 x 50 kg general purpose bombs "50-T"

2 x 100 kg general purpose bombs "100-T"

Length: 8.85 m

Wingspan: 10.58 m

Wing surface: 16.8 m^2

Combat debut: June 1942

Additional airplane configurations list:

Breda SAFAT 7.7mm wing-mounted machineguns with 500 rounds per each

Additional mass: 49 kg

Ammunition mass: 24 kg

Guns mass: 25 kg

Estimated speed loss: 0 km/h

MG 151/20 20mm guns in wing-mounted gun pods with 135 rounds per each

Additional mass: 212 kg

Ammunition mass: 55 kg

Guns mass: 157 kg

Estimated speed loss: 15 km/h

2 x 55 kg General Purpose Bombs 50-T

Additional mass: 130 kg

Ammunition mass: 110 kg

Racks mass: 20 kg

Estimated speed loss before drop: 14 km/h

Estimated speed loss after drop: 7 km/h

100 kg General Purpose Bomb 100-T

Additional mass: 220 kg

Ammunition mass: 200 kg

Racks mass: 20 kg

Estimated speed loss before drop: 20 km/h

Estimated speed loss after drop: 7 km/h

Additional pilot protection: armoured triplex wind screen

Additional mass: 10 kg

Estimated speed loss: 0 km/h

Operation features:

- Throttle lever is inverted: backward = full throttle, forward = idle throttle.

- Engine is equipped with automatic mixture control system and supercharger with fluid coupling which does not requiring manual control.

- Engine RPM has an automatic governor with two fixed modes: 2200 RPM - normal mode, 2400 RPM - boosted mode. Also, it is possible to turn off the governor and control the propeller pitch manually by mechanical actuator.

- Water and oil radiator shutter control is manual.

- Airplane has no flight-control trimmers. Airplane is equipped with bendable trim tabs that can be set pre-flight by ground personnel.

- Airplane has asymmetric half-wings for roll-compensation: the left one is 20 cm longer than right one.

- Airplane has a manually controlled horizontal stabilizer. It should be set to neutral before takeoff and landing. Also, it may be used to trim the flight stick during the flight. In a deep dive the stabilizer should be set so that the pilot must push the flight stick forward to maintain the dive angle.

- Landing flaps have a hydraulic actuator and they can be extended to any angle up to 45°. The flap system includes a "pneumatic spring" which allows flaps to be pressed upwards by airflow at airspeed more than 200 km/h.

- Airplane has a manual tail wheel lock. Wheel should be locked when taxiing straight for a long distance and before takeoff and landing.

- Airplane has differential pneumatic wheel brakes with shared control lever. This means that if the brake lever is held and the rudder pedal the opposite wheel brake is gradually released causing the plane to swing to one side or the other.

- Airplane has a fuel gauge which indicates only the front fuel tank level.

- The design of the cockpit canopy does not allow it to be opened during flight. The canopy should be closed before takeoff to prevent damage. The canopy has an emergency release system for bailouts.

- The control system of wing-mounted bomb racks only allows the dropping of bombs one by one.

- The gunsight has a sliding sun-filter. There is also a back-up folding mechanical sight which can be used if main sight is damaged.

Hs 129 B-2

Indicated stall speed in flight configuration: 143..159 km/h

Indicated stall speed in takeoff/landing configuration: 136..150 km/h

Dive speed limit: 670 km/h

Maximum load factor: 9 G

Stall angle of attack in flight configuration: 20.0 °

Stall angle of attack in landing configuration: 18.0 °

Maximum true air speed at sea level, engine mode - Combat: 349 km/h

Maximum true air speed at 3000 m, engine mode - Combat: 396 km/h

Service ceiling: 7000 m

Climb rate at sea level: 8.4 m/s

Climb rate at 3000 m: 8.1 m/s

Climb rate at 6000 m: 2.6 m/s

Maximum performance turn at sea level: 30.0 s, at 255 km/h IAS.

Maximum performance turn at 3000 m: 46.0 s, at 270 km/h IAS.

Flight endurance at 3000 m: 2.1 h, at 300 km/h IAS.

Takeoff speed: 145..155 km/h

Glideslope speed: 180..200 km/h

Landing speed: 135..145 km/h

Landing angle: 10.6 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates and turn times are given for Combat power.

Engine:

Model: Gnome-Rhone 14 M

Maximum power in Take-off mode at sea level: 700 HP

Maximum power in Combat mode at sea level: 580 HP

Maximum power in Combat mode at 4000 m: 650 HP

Engine modes:

Nominal (unlimited time): 2350 RPM, 1.1 ata

Combat power (up to 30 minutes): 2750 RPM, 1.25 ata

Take-off power (up to 1 minute): 3030 RPM, 1.5 ata

Oil rated temperature in engine intake: 60..75 °C

Oil maximum temperature in engine intake: 125 °C

Supercharger gear shift altitude: single gear

Empty weight: 3992 kg

Minimum weight (no ammo, 10% fuel): 4200 kg

Standart weight: 4756 kg

Maximum takeoff weight: 5170 kg

Fuel load: 451 kg / 610 l

Useful load: 1178 kg

Forward-firing armament:

2 x 7.92mm machine gun "MG 17", 1000 rounds, 1200 rounds per minute, nose-mounted

2 x 20mm gun "MG 151/15", 250 rounds, 700 rounds per minute, nose-mounted

2 x 20mm gun "MG 151/20", 250 rounds, 700 rounds per minute, nose-mounted (modification)

4 x 7.92mm machine gun "MG 17", 1000 rounds, 1200 rounds per minute, underbelly (modification)

30mm gun "MK 101", 30 rounds, 250 rounds per minute, underbelly (modification)

30mm gun "MK 103", 80 rounds, 400 rounds per minute, underbelly (modification)

Bombs:

Up to 6 x 55 kg general purpose bombs "SC 50"

249 kg general purpose bombs "SC 250"

Length: 9.7 m

Wingspan: 14.2 m

Wing surface: 28.9 m^2

Combat debut: May 1942

Additional airplane configurations list:

2 x MG 151/20 20mm nose-gun with 250 rounds per each

Additional mass: 14.4 kg

Ammunition mass: 105 kg

Gun mass: 42 kg

Estimated speed loss: 0 km/h

Four MG 17 7.92mm machineguns in fuselage mounted gun pod with 1000 rounds per each

Additional mass: 194.8 kg

Ammunition mass: 106 kg

Guns mass: 88.8 kg

Estimated speed loss: 4 km/h

30mm MK 101 autocannon gun pod with 30 rounds

Additional mass: 179 kg

Ammunition mass: 24 kg

Guns mass: 155 kg

Estimated speed loss: 6 km/h

30mm MK 103 autocannon gun pod with 80 rounds

Additional mass: 234.2 kg

Ammunition mass: 74.7 kg

Guns mass: 159.5 kg

Estimated speed loss: 6km/h

Peilrahmen PR 16 fixed loop radio compass for navigation with radio beacons

Additional mass: 10 kg

Estimated speed loss: 0 km/h

Rear view mirror

Additional mass: 1 kg

Estimated speed loss: 1 km/h

Operation features:

- Controlling the propellers RPM is possible only in the manual mode by changing the propeller pitch. The automatic mode keeps the RPM at 2750.

- The engine control lever allows setting the pressure up to the combat mode (1.25 ATA).

- To switch the engines to the take-off mode, move the boost lever to 1.5 ATA position and set the propellers to 3030 RPM.

- Engine mixture control is automatic. Leaning the mixture manually reduces the fuel consumption during flight.

- The oil radiator shutters are controlled automatically and don't have a manual mode.

- The propellers have a feathering system which should be activated in case of engine damage to reduce drag of the propeller in auto-rotation.

- The aircraft has only pitch and yaw flight-control trimmers.

- The aircraft has independent left and right hydraulic wheel brake controls. To apply either brake push the upper part of the rudder pedal.

- Landing flaps have a hydraulic actuator and they can be extended to any angle up to 40° or to the fixed take-off position.

- The tail wheel rotates freely and does not have a lock. For this reason, it is necessary to confidently and accurately operate the rudder pedals during the takeoff and landing.

- The aircraft fuel gauges are positioned directly on the engine nacelles and show only the amount of fuel remaining in the wing tanks (the fuel remaining in the central fuel tank is not indicated).

- The aircraft isn't equipped with an oxygen supply system, so flying above 4000 meters is forbidden.

- The aircraft is equipped with an electric bomb release controller that allows dropping the bombs only one by one.

- The gunsight has a sliding sun-filter.

Ju 52/3m g4e

Indicated stall speed in flight configuration: 105..117 km/h

Indicated stall speed in takeoff/landing configuration: 92..109 km/h

Dive speed limit: 330 km/h

Maximum load factor: 4.0 G

Stall angle of attack in flight configuration: 20 °

Stall angle of attack in landing configuration: 17.2 °

Maximum true air speed at sea level, engine mode - Climb: 260 km/h

Maximum true air speed at 3000 m, engine mode - Climb: 258 km/h

Maximum true air speed at 6000 m, engine mode - Climb: 241 km/h

Service ceiling: 6800 m

Climb rate at sea level: 6.9 m/s

Climb rate at 3000 m: 4.2 m/s

Climb rate at 6000 m: 1.4 m/s

Maximum performance turn at sea level: 24.0 s, at 165 km/h IAS.

Maximum performance turn at 3000 m: 35.4 s, at 165 km/h IAS.

Flight endurance at 3000 m: 5.3 h, at 205 km/h IAS.

Takeoff speed: 100..120 km/h

Glideslope speed: 140..155 km/h

Landing speed: 95..110 km/h

Landing angle: 11.7 °

Note 1: the data provided is for international standard atmosphere (ISA).

Note 2: flight performance ranges are given for possible aircraft mass ranges.

Note 3: maximum speeds, climb rates and turn times are given for standard aircraft mass.

Note 4: climb rates are given for Climb power, turn times are given for Take-off power.

Engine:

Model: BMW-132a

Maximum power in Take-off mode at sea level: 640 HP

Maximum power in Take-off mode at 900 m: 660 HP

Maximum power in Climb mode at sea level: 575 HP

Maximum power in Climb mode at 900 m: 590 HP

Engine modes:

Nominal (unlimited time): 1925 RPM

Climb power (up to 30 minutes): 1975 RPM

Take-off power (up to 5 minutes): 2050 RPM

Oil rated temperature in engine intake: 60 °C

Oil maximum temperature in engine intake: 80 °C

Oil rated temperature in engine output: 80 °C

Oil maximum temperature in engine output: 100 °C

Empty weight: 6305 kg

Minimum weight (no ammo, 10% fuel): 7017 kg

Standard weight: 10003 kg

Maximum takeoff weight: 11333 kg

Fuel load: 1824 kg / 2400 l

Useful load: 5028 kg

Defensive armament:

Top: 7.92mm machine gun "MG 15", 1125 rounds, 1000 rounds per minute

Length: 18.9 m

Wingspan: 29.25 m

Wing surface: 111.5 m^2

Combat debut: 1936

Additional airplane configurations list:

2300 kg of military cargo payload

Additional mass: 2300 kg

Estimated speed loss: 2 km/h

10 x 250 kg drop transport container with parachute MAB 250

Additional mass: 2550 kg

Containers mass: 2500 kg

Racks mass: 50 kg

Estimated speed loss before drop: 2 km/h

Estimated speed loss after drop: 0 km/h

12 paratroopers with ammunition

Additional mass: 1200 kg

Estimated speed loss before drop: 2 km/h

Estimated speed loss after drop: 0 km/h

Rear turret with MG 15 7.92mm machinegun with 1125 rounds

Additional mass: 130 kg

Estimated speed loss: 4 km/h

Operation features:

- Engine has a single stage mechanical supercharger which does not require manual control.

- Engine mixture control is manual; it is necessary to lean the mixture if altitude is more than 1 km for optimal engine operation. Also, leaning the mixture allows a reduction in fuel consumption during flight.

- All three propellers are fixed pitch ones, so thrust can only be controlled by adjusting the engines throttle (from idle at 25% to maximum power at 100%). 0 - 20% throttle range is used for braking the landing gear wheels. Engine modes can be determined only by watching the engine RPM gauges.

- Radiator bypass valve and engine cowls are controlled manually.

- Pedals in the cabin are equipped with adjustable load feel mechanism to reduce the pilot's work load.

- Airplane has a manually controlled horizontal stabilizer. It should be set to 0° before takeoff, to +2° during flight and to -1.5° for landing. Also, it may be used to trim the flight stick during the flight.

- The mechanical flaps control system can be controlled simultaneously with the horizontal stabilizer, these two systems can be linked or unlinked (by using flaps control buttons). It is important to note that it is possible to render the system inoperable so it would not be able to control either the stabilizer or the flaps by deviating from a standard control procedure described below.

- Before taking off, set the stabilizer to flight position +2°, engage the link and then move the stabilizer to take-off position 0° - flaps will be extended to 25°.

- When airborne, move the stabilizer back to flight position (flaps should also fully retract) and unlink these controls.

- Before landing, set the stabilizer to flight position +2°, engage the link and then move the stabilizer to landing position -1.5° - flaps will be fully extended to 40°.

- Airplane tail wheel rotates freely and does not have a lock. For this reason, it is necessary to confidently and accurately operate the rudder pedals during the takeoff and landing.

- Airplane has separate pneumatic wheel brakes. To brake left or right wheels, move their corresponding left or right engine throttle to 20% or less. Setting the central engine throttle to 20% or less will brake both wheels. Maximum braking efficiency can be achieved by moving the trottle all the way down. In the sim, you can also use the brake buttons to move left and right engine throttles to braking position.

- Airplane is equipped with a hydraulic tail wheel parking brake system.

- Airplane is equipped with two mechanical fuel float level gauges for left and right fuel tank groups, located on the left and right engine nacelles outside the cabin.

- Airplane has three mechanical oil float level gauges on each of the three engine nacelles outside the cabin.

- Cargo unload doors can be opened on the ground only.

- The left passenger door must be removed before flight for dropping paratroopers or cargo containers. Use the bomb drop button ("B" by default) to drop them.