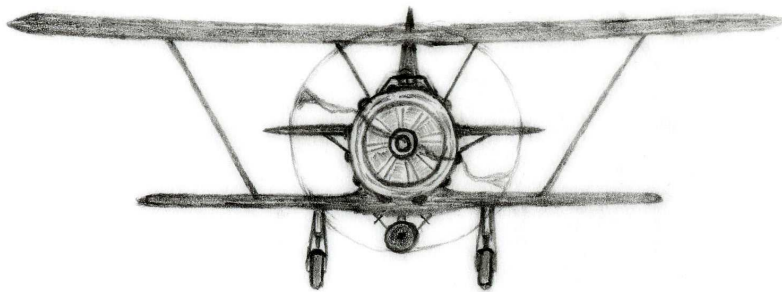


IL-2 FB+AEP+PF  
aircraft & cockpit reference guide

by neural\_dream





# 1 USSR

## 1.1 Polikarpov I-153 “Tchayka” (Seagull) (‘39)

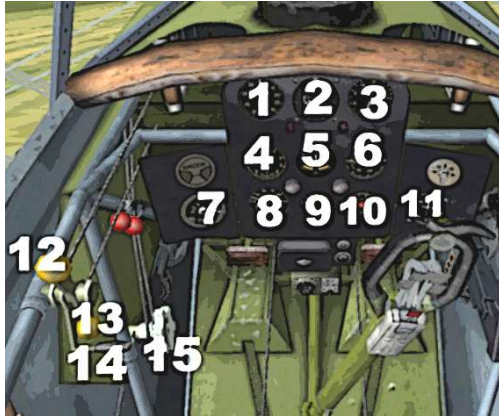
The I-153 was a biplane fighter which could also be used for ground attack. Quite *slow (366km/h at sea level and 444km/h at 3000m)*, but able to outturn almost any opponent (*12-13.5s turn time at 1000m*). The I-153 saw action mainly in the Winter War (1939-40) against the Finns, but was soon withdrawn after the German invasion.

### Tips:

- ◇ Consider switching the supercharger to stage 2 over 2000m. Generally avoid high altitudes (>2500m).
- ◇ Quite surprisingly the I-153 has automatically retractable undercarriage.
- ◇ Avoid long steep dives; it will start disintegrating before it reaches 600km/h.

### Armament:

M62: upper nose - 2x7.62mm ShKAS (left 700rpg/27sec, right 750rpg/29sec),  
lower nose - 2x7.62mm ShKAS (left 500rpg/19sec, right 520rpg/19sec).  
P: nose - 2x20mm ShVAK (left 200rpg/17sec, right 250rpg/21sec).



1. Airspeed indicator
2. Magnetic Compass
3. Tachometer
4. Altimeter
5. Turn and Bank indicator
6. Variometer
7. Engine magnetos position
8. Oil temperature (upper half),  
oil pres. (left), fuel pres. (right)
9. Clock
10. Cylinder head temperature gauge
11. Manifold pressure
12. Supercharger lever: rear - stage 1, front - 2
13. Engine mixture: rear - leaner mixture,  
front - richer mixture
14. Throttle
15. Propeller pitch knob

## 1.2 Polikarpov I-16 “Rata” (‘39)

Although difficult to fly and with poor visibility, the I-16 proved a successful fighter which gained the respect of its opponents in Spain in the civil war, in the Far East against the Japanese and during the opening stages of Operation Barbarossa against the Germans.

Maximum speed: *440km/h at sea level and 490km/h at 3000m*. Turn time *17-18s at 1000m*.

### Tips:

- ◇ The I-16 does have retractable gears, but not automatic; you need to press “raise/lower gear manually” 44 times.
- ◇ Consider switching the supercharger to stage 2 at around 2000m and avoid altitudes over 3500m.
- ◇ The I-16 is very sensitive to engine cutouts (starvings) when pushing the stick forward, since fuel is fed to the engine with gravity. The same stands for many other early war planes such as the I-153, the G.50, the Hurricane etc., who have carburetor engines. To restart the engine you must be at low throttle and have enough airspeed to at least spin the propeller. You may have to wait a few sec for prop and rpm (tachometer (3)) to stabilise and then try restarting.

- ◇ The I-16 starts disintegrating at around 600km/h.

### Armament:

Type 18: nose - 2x7.62mm ShKAS (750rpg/29sec), wings - 2x7.62mm ShKAS (650rpg/25sec).

Type 24 and Type24 SPB: nose - 2x7.62mm ShKAS (650rpg/25sec), wings - 2x20mm ShVAK (120rpg/10sec).



1. Left gear position: green - down,  
red - up, no light - in transition
2. Right gear position: green - down,  
red - up, no light - in transition
3. Tachometer
4. Airspeed indicator
5. Magnetic Compass
6. Altimeter
7. Oil pressure gauge
8. Manifold pressure gauge
9. Turn and Bank indicator
10. Variometer
11. Cylinder head temperature gauge
12. Oil temperature (entering engine)
13. Oil temperature (exiting engine)
14. Fuel gauge
15. Throttle
16. Propeller pitch
17. Gear winch

### 1.3 Mikoyan Gurevich MiG-3 ('40-'42)

The MiG-1 was a high-altitude interceptor developed to meet a 1938 requirement of the Soviet Air Force. The prototype flew for the first time in April 1940 and at the time the Germans invaded (June 1941) it was one of the very few modern fighters that the Soviets possessed. However, it was very difficult to control, prohibitive for all but the very experienced pilots. When production reached 100 units the aircraft was redesignated MiG-3, with aerodynamic changes, fully enclosed cockpit, protected fuel tanks, an additional fuel tank, and attachments for rockets under the wings. In total 3322 MiG-3s were produced.

Maximum speed (basic/ud/UB/ShVak/AM-38/U: *505/515/515/515/545/550km/h at sea level and 620/640/640/640/590/655km/h at 7800m (3400m for AM-38 model).*

**Tips:**

- ◊ At low altitudes (<4500m) the MiG-3s were particularly weaker and stalled easily. Their engine was optimised for an altitude of 6000m, except the MiG-3 AM-38 model which was equipped with a different engine and was optimised for low altitudes.
- ◊ The MiG-3s start disintegrating at about 700km/h.

**Armament:**

MiG-3,ud: nose - 2x7.62mm ShKAS (750rpg/29sec), nose - 1x12.7mm UBS (300rpg/18sec), wings gunpods - 2x12.7mm UBK (145rpg/9sec).

MiG-3 UB: nose - 2x12.7mm UBS (350rpg/21sec).

MiG-3 ShVAK: nose - 2x20mm ShVAK (250rpg/21sec).

MiG-3 AM-38: nose - 2x7.62mm ShKAS (750rpg/29sec), nose - 1x12.7mm UBS (310rpg/18sec).

MiG-3U: nose - 2x20mm ShVAK (150rpg/13sec).



- |   |  |
|---|--|
| 1. Altimeter  | 10. Coolant temperature gauge  |
| 2. Magnetic Compass   | 11. Oil temperature gauge  |
| 3. Manifold pressure gauge  | 12. Gear lever   |
| 4. Fuel gauge   | 13. Propeller pitch lever  |
| 5. Airspeed indicator   | 14. Throttle   |
| 6. Turn and Bank indicator  | 15. Undercarriage position indicator:<br>green - up, red - down, no light - transition |
| 7. Variometer   | 16. Flaps position indicator   |
| 8. Tachometer   | 17. Clock  |
| 9. Oil temperature (upper half),<br>oil pressure (left) and fuel pressure (right) | 18. Break lever  |

### 1.4 Tupolev TB-3 ('32,'33)

In 1930, when the TB-3 first flew, it was one of the world's best heavy bombers (Tyazholy Bombardirovshchik). However, when the Germans invaded it was one of the most outdated military aircraft in the world, both in design and performance. They were used mainly in the first years of the war and more for transport than for bombing. It was also used in the Zveno parasite aircraft experiments, with I-16s hanging under its wings which were detached over the target to launch precision attacks. In total 818 units were delivered until 1937 when production ended. Maximum speed: *200km/h at sea level and 210km/h at 1300m. Range 1350km.*

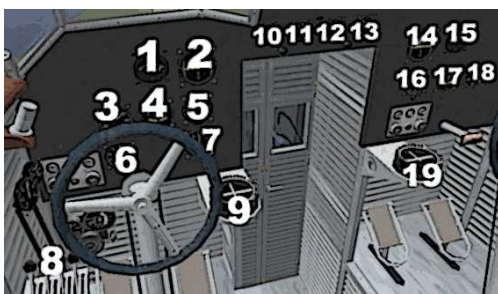
**Tips:**

- ◊ The TB-3 stalls at so low speeds that it can perform some surprising manoeuvres for such a big plane. Still, it is so slow and so under-armed that it has no chance of defending itself on its own or even in groups.
- ◊ In a steep dive the engines will soon be damaged and the aircraft will start disintegrating.

**Armament:**

TB-3 4M-17: nose gunner - 2x7.62mm DA (2352 rounds total/120sec), rear left gunner - 2x7.62mm DA (2352 rounds total/120sec), rear right gunner - 2x7.62mm DA (2352 rounds total/120sec).

TB-3 4M-34R, SPB: nose gunner - 2x7.62mm DA (2352 rounds total/120sec), top gunner - 2x7.62mm DA (2352 rounds total/120sec), tail gunner - 2x7.62mm DA (2352 rounds total/120sec).



- |  |                             |
|--|-----------------------------|
| 1. Repeater Compass  | 10. Engine 1 tachometer     |
| 2. Artificial Horizon  | 11. Engine 2 tachometer     |
| 3. Airspeed indicator  | 12. Engine 3 tachometer     |
| 4. Turn and Bank indicator   | 13. Engine 4 tachometer     |
| 5. Variometer  | 14. Artificial Horizon      |
| 6. Altimeter   | 15. Repeater Compass        |
| 7. Clock   | 16. Altimeter               |
| 8. Throttle levers for all 4 engines<br>(Engine 1 left side out, 2 left side in,<br>3 right side in, 4 right side out) | 17. Turn and Bank indicator |
| 9. Magnetic Compass  | 18. Airspeed indicator      |
|  | 19. Magnetic Compass        |

## 1.5 Polikarpov I-185 M-82A, M-71 ('42)

Designed by Nikolai Nikolaevich Polikarpov, the I-185 was an impressive fighter. Its performance was better than all contemporary enemy aircraft. A few I185s were tested in the Soviet army for a month, but the pilots were ordered not to engage enemies in order not to lose any of the four aircraft. The pilots's reports were enthusiastic about the speed, the vertical manoeuvrability, the strong armament and the ease of flying. However, for reasons not very clear, but probably political (implicating Yakovlev) *the I-185 did not enter production*. The performance of the I-185 of 1942 was matched only two years later by the La-7.



Maximum Speed (M82A/M71): *549/609km/h at sea level and 615/680km/h at 6170m*.  
*Climb to 5000m in 6.0/4.7min. Service Ceiling 10450/10000m. Range 1380/835km.*

### Tips:

- ◊ An additional issue to have in mind when landing the I-185 is the big propeller; it will bend if the pilot isn't careful.
- ◊ The I-185 starts disintegrating and loses its engine at 800km/h.

### Armament:

M-82A,M-71: nose - 3x20mm ShVAK (220rpg/19 sec).



### M-82A

- |   |   |
|---|---|
| 1. Undercarriage position indicator:<br>green - down, red - up, no light - transition | 14. Artificial horizon  |
| 2. Gear lever   | 15. Tachometer  |
| 3. Magnetic Compass   | 16. Engine temperature gauge  |
| 4. Clock  | 17. Carburetor pressure   |
| 5. Fuel gauge   | 18. Oil pressure gauge  |
| 6. Airspeed indicator   | 19. Undercarriage position indicator (left gear)                          |
| 7. Turn and Bank indicator  | 20. Undercarriage position indicator (right gear)                         |
| 8. Variometer   | 21. Propeller pitch lever   |
| 9. Manifold pressure gauge  | 22. Flaps lever   |
| 10. Oil temperature gauge   | 23. Throttle  |
| 11. Engine magnetos position  | 24. Engine mixture:<br>rear position - leaner, front - richer mixture     |
| 12. Altimeter   | 25. Supercharger lever:<br>rear position - stage 1, middle - 2, front - 3 |
| 13. Repeater Compass  | 26. Bomb release lever  |



### M-71

- |   |   |
|---|---|
| 1. Undercarriage position indicator:<br>green - down, red - up, no light - transition | 15. Tachometer  |
| 2. Gear lever   | 16. Engine temperature gauge  |
| 3. Magnetic Compass   | 17. Undercarriage position indicator (left)                               |
| 4. Clock  | 18. Undercarriage position indicator (right)                              |
| 5. Fuel gauge   | 19. Carburetor pressure   |
| 6. Airspeed indicator   | 20. Oil temperature (exiting front engine block)                          |
| 7. Turn and Bank indicator  | 21. Oil temperature (exiting rear engine block)                           |
| 8. Variometer   | 21. Oil temperature (entering engine)                                     |
| 9. Manifold pressure gauge  | 22. Oil pressure gauge  |
| 10. Oil temperature (upper half), oil pressure<br>(left) and fuel pressure (right)    | 23. Propeller pitch lever   |
| 11. Engine magnetos position  | 24. Flaps lever   |
| 12. Altimeter   | 25. Throttle  |
| 13. Repeater compass  | 26. Engine mixture:<br>rear position - leaner mixture, front - richer     |
| 14. Artificial horizon  | 27. Supercharger lever:<br>rear position - stage 1, middle - 2, front - 3 |
|   | 28. Bomb release lever  |

## 1.6 Ilyushin IL-2 “Sturmovik” (‘41-‘43)

One of history’s most important ground attack aircraft, the IL-2 Sturmovik did not start quite as successfully. The lack of a rear gunner and the air superiority that the Germans enjoyed during the early stages of the war meant serious losses for the Sturmovik squadrons. Large-scale production started in 1941 with Series 1. Series 2 and 3 were also single-seat and differed mainly in the armament. The next model was the two-seater field modification, followed by the IL-2M, Type 3, and 3M. The IL-2I was the heavy interceptor version and the IL-2T was the torpedo version. The total number of IL-2 Sturmoviks built was close to 36200, probably more than any other aircraft in history. Their finest hour was the battle of Kursk where the Sturmovik pilots claimed 70 German tanks in 20mins.



Series 1,2,3: Maximum speed: *430km/h at sea level and 450km/h at 2600m. Service Ceiling: 7800m.*  
 field mod.: Maximum speed: *420km/h at sea level and 440km/h at 2460m. Service Ceiling: 6200m.*  
 I: Maximum speed: *415km/h at sea level and 434km/h at 2600m. Service Ceiling: 6500m.*  
 M: Maximum speed: *395km/h at sea level and 410km/h at 2400m. Service Ceiling: 6200m.*  
 T, 3: Maximum speed: *400km/h at sea level and 410km/h at 2500m. Service Ceiling: 5500m.*  
 3M: Maximum speed: *440km/h at sea level and 460km/h at 2600m. Service Ceiling: 5500m.*



### Tips:

- ◊ The single-seater Sturmoviks are quite manoeuvrable and by utilising smart teamwork and their strong armament can defend themselves against fighters if they stay at very low altitudes and use horizontal energy tactics.
- ◊ The Sturmoviks are vulnerable to attacks from below and behind. The best way to protect themselves was to fly very low and in large formations, which increased the effectiveness of their rear gunners and hid their weak spot, the large oil cooler.
- ◊ On loss of engine power the Sturmovik cannot glide well.
- ◊ When attacking tanks aim at the rear where they are most vulnerable.
- ◊ When attacking ships release the torpedo at speed lower than 350km/h and altitude under 100m.



### Armament:

Series 1,2: wings - 2x7.62mm ShKAS (750rpg/25sec), wings - 2x20mm ShVAK (500rpg/37sec).  
 Series 3: wings - 2x7.62mm ShKAS (750rpg/25sec), wings - 2x23mm VYa (300rpg/30sec).  
 field mod.: wings - 2x7.62mm ShKAS (750rpg/25sec), wings - 2x23mm VYa (300rpg/30sec),  
 rear gunner (AI only) - 2x7.62mm DA (500rpg/14sec).  
 I: wings - 2x23mm VYa (150rpg/15sec).  
 T: wings - 2x7.62mm ShKAS (250rpg/8sec), rear gunner - 1x12.7mm UBT (150rpg/9sec).  
 M, Type 3: wings - 2x7.62mm ShKAS (750rpg/25sec), wings - 2x23mm VYa (300rpg/30sec),  
 rear gunner - 1x12.7mm UBT (200rpg/12sec).  
 3M: wings - 2x7.62mm ShKAS (750rpg/25sec), wings - 2x37mm NS-37 (50rpg/12sec),  
 rear gunner - 1x12.7mm UBT (200rpg/12sec).



1. Airspeed indicator
2. Magnetic compass
3. Variometer
4. Altimeter
5. Turn and Bank indicator
6. Artificial Horizon
7. Manifold pressure gauge
8. Coolant temperature gauge
9. Tachometer
10. Oil temperature gauge
11. Oil temperature (upper half),  
oil press. (left) and fuel press. (right)
12. Fuel gauge
13. Throttle
14. Flaps lever
15. Gear lever
16. Clock
17. Undercarriage position indicator:  
green - down, red - up, no light - transition
18. Left gear position indicator:  
up - gear down, down - gear up
19. Right gear position indicator:  
up - gear down, down - gear up

## 1.7 Lavochkin-Gorbunov-Goudkov LaGG-3 ('41-'43)

The LaGG-3 was a significant improvement over the earlier LaGG-1, but still was not liked by its pilots. However, in combat against the German BF109Es it proved to be a capable fighter, durable and resistant to combat damage. The Series 66 model had the more powerful M105PF engine and the IT model was used as a tank destroyer (Istrebitel Tankov).

Maximum speed (Series 4/29/35/IT/66): *500/510/515/515/535km/h at sea level* and *570/560/565/565/590km/h at 3800m (Series 4 at 4800m). Service Ceiling: 9500m.*

### Tips:

- ◊ The LaGG-3 performs better at low altitudes.
- ◊ It loses energy very quickly in continuous manoeuvres.
- ◊ Consider switching the Supercharger to stage 2 over 2200m. Start leaning the fuel mixture at about 3000m for Series 66 and 4000m for the rest.
- ◊ It starts disintegrating at speeds over 700km/h.

### Armament:

LaGG-3 Series 4: nose - 2x7.62mm ShKAS (325rpg/12sec), nose - 2x12.7mm UBS (220rpg/13sec), engine - 1x20mm ShVAK (120rpg/9sec).

LaGG-3 Series 29,35: nose - 1x12.7mm UBS (220rpg/12sec), engine - 1x20mm ShVAK (120rpg/9sec), engine (optional) - 1x23mm VYa (60rpg/6sec).

LaGG-3 Series 66: nose - 1x12.7mm UBS (220rpg/13sec), engine - 1x20mm ShVAK (120rpg/9sec).

LaGG-3 IT: nose - 1x12.7mm UBS (220rpg/13sec), engine - 1x37mm NS-37 (22rpg/5sec).



1. Clock
2. Altimeter
3. Magnetic Compass
4. Manifold pressure gauge
5. Oil temperature (upper half), oil pressure (left) and fuel pressure (right)
6. Temperature warning light
7. Airspeed indicator

8. Turn and Bank indicator
9. Variometer
10. Repeater Compass
11. Tachometer
12. Fuel gauge
13. Undercarriage position indicator: green - down, red - up, no light - transition
14. Throttle
15. Propeller pitch



1. Clock
2. Airspeed indicator
3. Fuel gauge
4. Throttle
5. Propeller pitch lever
6. Tachometer
7. Altimeter
8. Magnetic Compass
9. Manifold pressure gauge

10. Oil temperature (upper half), oil pressure (left) and fuel pressure (right)
11. Repeater Compass
12. Turn and Bank indicator
13. Variometer
14. Oil temperature gauge
15. Warning Light
16. Undercarriage position indicator: green - down, red - up, no light - transition

## 1.8 Bereznyak-Isayev BI-1 ('42)

The BI-1 was the first Soviet military rocket-powered aircraft. On 27 March 1943 it set an unofficial speed record at 800km/h, but it experienced the until then unknown tendency to pitch down in high-speed flight, crashed to the ground and the pilot was killed. The Soviets abandoned rocketplane testing until they captured German ones. Maximum speed: *800km/h at sea level* and *1000km/h at 7000m. Climb to 5000m in 1.1m.*

### Tips:

- ◊ The BI-1 has very limited range due to quick fuel consumption. Climb fast, target a bomber, make one or two firing passes and glide back to your base with empty tanks. Ignore enemy fighters; they are too agile to be targets.
- ◊ The plane noses down suddenly over about 750km/h. Be careful not to reach that speed.
- ◊ The engine is turned on/off moving the throttle to idle and opening it again.

### Armament:

BI-1: nose - 2x20mm ShVAK (45rpg/4sec)



1. Airspeed indicator
2. Altimeter
3. Turn and Bank indicator
4. Undercarriage position indicator: green - down, red - up, no light - transition
5. Fuel gauge

6. Gear lever
7. Flaps lever
8. Throttle

## 1.9 Yakovlev Yak-1 ('41,'42)

The Yak-1 was one of the first modern fighter types that the Soviet Union possessed at the outbreak of the war. Due to the German invasion, the type was pushed into production before the initial problems were fixed, and although very agile, it was reported as seriously underpowered, underarmed and unreliable. Better than the old Polikarpov fighters, but still inferior to the BF 109.

Maximum Speed (Yak-1/1B): *482/539km/h at sea level and 570/600km/h at 4800/4100m.*

### Tips:

- ◇ Consider switching the Supercharger speed to stage 2 at about 2000m and start leaning the fuel mixture at about 4000m.
- ◇ Try to stay at low and medium altitudes, and use your superior manoeuvrability to attack continuously enemy planes. Be careful with your ammo, which is usually not enough for such an aggressive type of plane. The same stands for most Yak fighters of the era.
- ◇ The Yak-1 starts disintegrating at about 700km/h.

### Armament:

Yak-1: nose - 2x7.62mm ShKAS (750rpg/29sec), engine - 1x20mm ShVAK (120rpg/9sec).

Yak-1B: nose - 1x12.7mm ShKAS (201rpg/12sec), engine - 1x20mm ShVAK (120rpg/9sec).



1. Altimeter
2. Magnetic Compass
3. Manifold pressure gauge
4. Airspeed indicator
5. Turn and Bank indicator
6. Tachometer
7. Clock
8. Oil temperature (upper half),  
oil pressure (left) and fuel pressure (right)
9. Engine coolant temperature
10. Gear lever
11. Supercharger lever:  
rear position - stage 1, front - stage 2
12. Propeller pitch lever
13. Throttle
14. Undercarriage position indicator:  
green - down, red - up, no light - transition
15. Flaps lever

## 1.10 Yakovlev Yak-7 ('41,'42)

The Yak-7 was initially designed as an advanced trainer. The Yak-7A was a single-seat variant of the trainer, with the instructor's seat removed, and retractable landing gear. The next version, the Yak-7B had shorter wings, an RSI-4 radio and a few aerodynamic changes. The Yak-7B with the M-105PF engine entered factory assembly lines in August 1942 and first fought in Stalingrad. It had improved flight characteristics over the previous Yak-7B version and was the mount of several Soviet aces.

Maximum Speed (Yak-7A/7B'41/7B'42): *480/478/517km/h at sea level and 560/570/590km/h at 4800/4800/3800m.*

### Tips:

- ◇ The Yak-7 is less manoeuvrable than the Yak-1, but still more manoeuvrable than most German planes.
- ◇ It starts disintegrating at about 700km/h.

### Armament:

Yak-7A: nose - 2x7.62mm ShKAS (750rpg/29sec), engine - 1x20mm ShVAK (120rpg/9sec).

Yak-7B ('41): nose - 2x12.7mm UBS (left 150rpg/9sec, right 250rpg/15sec), engine - 1x20mm ShVAK (120rpg/9sec).

Yak-7B ('42): nose - 2x12.7mm UBS (left 150rpg/10sec, right 250rpg/17sec), engine - 1x20mm ShVAK (120rpg/9sec).



See Yak-1 for cockpit reference.



## 1.11 Yakovlev Yak-9 ('42-'45)

The Yak-9 series was a natural progression from the Yak-7 models. The first variant, the Yak7-DI "Dalny Istrebitel" (long-range fighter), was put into production in 1942 as Yak-9. It was equipped with a M105PF engine and all-round vision canopy, and to reduce weight one of the 12.7mm MG was removed. Some of the next variants were the -9T with a 37mm cannon, the long-range -9D, the -9K with the 45mm cannon, and the -9U Uluchshenny (improved).

Yak-9 (M-105PF,'42): Max Speed *520km/h at sea level* and *600km/h at 4200m*. Turn time *16-17sec at 1000m*.

Yak-9D (M-105PF,'43): Maximum Speed *540km/h at sea level* and *600km/h at 3900m*.

Yak-9T (M-105PF,'43): Maximum Speed *535km/h at sea level* and *600km/h at 4000m*.

Yak-9B (VK-105PF,'44): Maximum Speed *540km/h at sea level* and *600km/h at 3900m*.

Yak-9K (VK-105PF,'44): Maximum Speed *520km/h at sea level* and *580km/h at 3900m*.

Yak-9M (VK-105PF,'44): Maximum Speed *520km/h at sea level* and *575km/h at 3900m*.

Yak-9U (VK-107A,'44): Maximum Speed *580km/h at sea level* and *675km/h at 5000m*.

Yak-9UT (VK-107A,'45): Maximum Speed *585km/h at sea level* and *675km/h at 5000m*.

### Tips:

◊ For the -9D,K,T/U,UT switch Supercharger at 2000/2000m and start leaning the fuel mixture at 3000/4500m.

### Armament:

Yak-9,9B: nose - 1x12.7mm UBS (200rpg/9sec), engine - 1x20mm ShVAK (120rpg/9sec).

Yak-9D: nose - 1x12.7mm UBS (200rpg/10sec), engine - 1x20mm ShVAK (120rpg/9sec).

Yak-9K: nose - 1x12.7mm UBS (200rpg/9sec), engine - 1x45mm NS-45 (29rpg/6sec).

Yak-9M: nose - 1x12.7mm UBS (200rpg/9sec), engine - 1x20mm ShVAK (120rpg/9sec),  
engine optional - 1x37mm NS-37 (30rpg/7sec).

Yak-9T: nose - 1x12.7mm UBS (200rpg/9sec), engine - 1x37mm NS-37 (30rpg/7sec).

Yak-9U: nose - 2x12.7mm UBS (left 170rpg/10sec, right 157rpg/9sec), engine - 1x20mm ShVAK (120rpg/9sec).

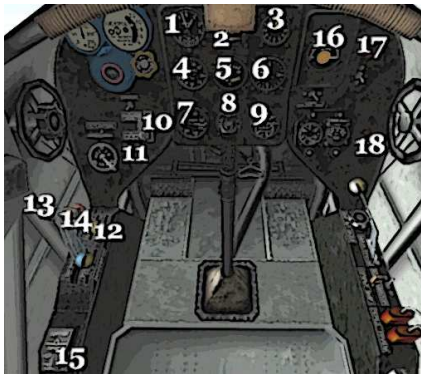
Yak-9UT: nose - 2x20mm B-20S (120rpg/10sec), engine - 1x37mm NS-37 (30rpg/7sec).



### Yak-9,9B,9D,9K,9M,9T

1. Altimeter
2. Magnetic Compass
3. Clock
4. Airspeed indicator
5. Turn and Bank indicator
6. Variometer
7. Manifold pressure gauge
8. Tachometer
9. Oil temperature (upper half),  
oil press. (left) and fuel pressure (right)

10. Repeater Compass (only in -9B, -9D)
11. Electric generator warning light
12. Undercarriage position indicator:  
green - down, red - up, no light - transition
13. Gear lever
14. Propeller pitch lever
15. Throttle
16. Supercharger lever:  
rear position - stage 1, front - stage 2
17. Flaps lever



### Yak-9U,9UT,3

1. Altimeter
2. Magnetic Compass
3. Clock
4. Airspeed indicator
5. Turn and Bank indicator
6. Variometer
7. Manifold pressure gauge
8. Tachometer
9. Oil temperature (upper half),  
oil pressure (left) and fuel pressure (right)

10. Gear Lever
11. Undercarriage position indicator:  
green - down, red - up, no light - transition
12. Supercharger lever:  
rear position - stage 1, front - stage 2
13. Propeller pitch lever
14. Throttle
15. Flaps lever
16. Fuel gauge
17. Low fuel warning light
18. Electric generator warning light

## 1.12 Yakovlev Yak-3 ('44-'45)

The Yak-3 was developed alongside the Yak-9 as an improvement of the Yak-1M. It was lighter and slimmer and was considered such a dangerous opponent that the German pilots were given explicit orders not to engage below 5000m "Yakovlev fighters lacking an oil cooler under the nose". One of the most famous regiments flying the Yak-3 was the "Normandie-Niemen" of the Free French pilots who had fled to the Soviet Union.

Maximum Speed (Yak-3): *572km/h at sea level* and *655km/h at 4100m*. Turn time *19sec at 1000m*.

### Tips:

◊ The Yak-3 and -9 have limited ammo. Use your superior manoeuvrability to get to your enemy's six and don't fire until very close.

◊ Consider switching the Supercharger speed to stage 2 at about 2000m and generally avoid altitudes over 4500m.

### Armament:

Yak-3: nose - 2x12.7mm UBS (150rpg/9sec), engine - 1x20mm ShVAK (120rpg/9sec).

Yak-3P: nose - 2x20mm B-20S (130rpg/11sec), engine - 1x20mm B-20 (120rpg/9sec).



See Yak-9U,UT for cockpit reference.

## 1.13 Lavochkin La-5,5F,5FN ('42-'43)



In order to build the La-5 designer Semyon Alexseyevich Lavochkin kept the lightweight and easy-to-assemble basic airframe of the LaGG-3 and put a Shvetsov M-82F radial engine in it, along with some modifications on the fuselage to improve the visibility and allow for heavier armament. The result was a very successful aircraft, mount of many of the Russian aces of WW2. The La-5FN was equipped with the M-82FN direct-injection engine and had better flying characteristics than the Bf109G and the FW190A-4 at low altitudes.

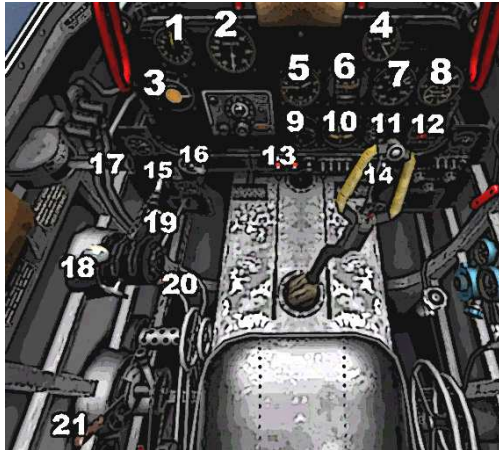
Max. speed: La5,5F/5FN **550/580km/h at sea level** and **600/630km/h at 6250m**. Turn time **20/18.5s at 1000m**.

### Tips:

- ◊ Consider switching the supercharger to stage 2 at about 3500m for La-5 and La-5F, and 4500m for the La-5FN.
- ◊ The La-5 and La-5F are significantly weaker above 4000m. The La-5FN has its worst performance between 3000 and 4500m.
- ◊ Adjust Mixture above 5000m.

### Armament:

La-5,5F,5FN: nose - 2x20mm ShVAK (left 170rpg/15sec, right 200rpg/17sec)



- |  |  |
|--|--|
| <ol style="list-style-type: none"> <li>1. Clock</li> <li>2. Airspeed indicator</li> <li>3. Fuel gauge</li> <li>4. Tachometer</li> <li>5. Altimeter</li> <li>6. Magnetic compass</li> <li>7. Manifold pressure gauge</li> <li>8. Oil temperature (upper half),<br/>oil pressure (left) and fuel pressure (right)</li> <li>9. Repeater compass</li> <li>10. Turn and bank indicator</li> <li>11. Variometer</li> <li>12. Engine temperature gauge</li> </ol> | <ol style="list-style-type: none"> <li>13. Undercarriage position indicator:<br/>green - down, red - up, no light - transition</li> <li>14. External ordnance status light</li> <li>15. Gear level</li> <li>16. Engine magnetos position</li> <li>17. Flaps lever (not present on La-5)</li> <li>18. Engine mixture:<br/>rear - leaner mixture, front - richer</li> <li>19. Throttle</li> <li>20. Propeller pitch lever</li> <li>21. Supercharger lever:<br/>rear position - stage 1, front - stage 2</li> </ol> |
|--|--|

## 1.14 Lavochkin La-7 ('44)



The La-7 was a variant of the La-5 with only a few minor differences. It is considered as the best Soviet piston-engined fighter of WW2 and probably the best overall fighter of the war at low and medium altitudes.

Max. speed: La-7/7.3xB20 **606/611km/h at sea level** and **680km/h at 6000m**. Turn time **18-19s at 1000m**.

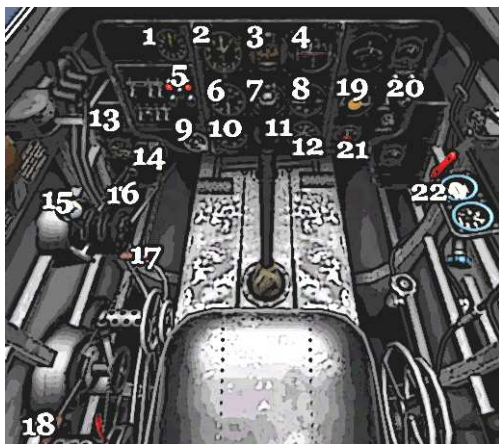
### Tips:

- ◊ The La-7 has two supercharger stages. Consider switching to stage 2 over around 3000m and definitely before 4500m and switch back to stage 1 under that altitude. Lower than 1500m in stage 2 causes engine damage.
- ◊ The La-7 is significantly weaker at high altitudes and is generally slower than contemporary aircraft over 5000m.
- ◊ The La-7 is not a very good diver. If you follow a P-47 or a FW190 in a steep high-speed dive you risk falling apart; it will start disintegrating before it reaches 800km/h.
- ◊ Adjust Mixture above 5000m.

### Armament:

La-7: nose - 2x20mm ShVAK (200rpg/17sec)

La-7.3xB20: nose - 3x20mm B20s (left 150rpg/13sec, middle 150rpg/13sec, right 130rpg/11sec)



- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. Clock</li> <li>2. Altimeter</li> <li>3. Magnetic Compass</li> <li>4. Repeater Compass</li> <li>5. Undercarriage position indicator:<br/>green - down, red - up, no light - transition</li> <li>6. Airspeed indicator</li> <li>7. Turn and Bank indicator</li> <li>8. Variometer</li> <li>9. Engine Magnetos position</li> <li>10. Manifold pressure gauge</li> <li>11. Tachometer</li> <li>12. Oil Temperature (upper half),<br/>oil pressure (left), fuel pressure (right)</li> </ol> | <ol style="list-style-type: none"> <li>13. Flaps lever</li> <li>14. Gear lever</li> <li>15. Engine Mixture:<br/>rear position - leaner mixture, front - richer</li> <li>16. Throttle</li> <li>17. Propeller pitch lever</li> <li>18. Supercharger lever:<br/>rear position - stage 1, front - stage 2</li> <li>19. Fuel Gauge</li> <li>20. External ordnance status light</li> <li>21. Engine temperature gauge</li> <li>22. Oxygen flow indicator</li> </ol> |
|--|---|

## 2 GERMANY

### 2.1 Messerschmitt BF 109E “Emil” (‘40-‘41)

The Messerschmitt BF 109 was destined to become one of history’s greatest fighter aircraft. Although figures vary it is generally accepted that over 30000 of all variants were produced until 1945 (BF stands for Bayerische Flugzeugwerke, the company’s name before Willi Messerschmitt took over). It first flew in 1935, some months before the Spitfire and it was first tried in combat in the Spanish civil war with impressive success. The Bf109E “Emil” with which the Germans entered WW2 was far superior to all its opponents except the Spitfire. The E4 and E7/Z versions were fighters, while the E4/B and E7/B were fighter-bombers (Jabo).

Maximum Speed (4/4B/7B/7Z): *475/450/480/485km/h at sea level* and *545/511/555/590km/h at 4700m (6450m for the 7Z)*. Turn time *21s at 1000m*.

#### Tips:

- ◇ The “Emil” starts losing parts at 830km/h.
- ◇ The E7/Z has a nitrous oxide boost (GM-1) which should be used only in emergencies and never below 6500m. Theoretically it could increase the speed by up to 80km/h.

#### Armament:

Bf109E: nose - 2x7.92mm MG17 (1000rpg/66sec), wings - 2x20mm MG FF/M(60rpg/7sec)



1. Clock
2. Altimeter
3. Repeater Compass
4. Airspeed indicator
5. Turn and Bank indicator
6. Engine magnetos position
7. Throttle
8. Manifold pressure gauge

9. Tachometer
10. Propeller pitch indicator
11. Fuel and oil pressure gauge
12. Undercarriage position indicator:  
green - down, red - up, no light - transition
13. Low fuel warning light
14. Fuel gauge
15. Oil temperature gauge
16. Coolant temperature gauge

### 2.2 Messerschmitt BF 109F “Friedrich” or “Franz” (‘41)

The “Friedrich” differed from the “Emil” in having a cleaned-up airframe, redesigned engine cowling, wing, radiators and tail assembly. It was superior in most respects to the Spitfire MkV of the RAF.

Maximum Speed (F2/F4): *510/519km/h at sea level* and *614/637km/h at 5200/5800m*.

Turn time *19.5s at 1000m*.

#### Tips:

- ◇ Like most Bf109s the “Friedrich” has simple controls, high manoeuvrability and great climb rate.
- ◇ All BF109s are very unstable gun platforms at low speeds.
- ◇ It will start disintegrating at around 860km/h.

#### Armament:

BF109F-2: nose - 2x7.92mm MG17 (500rpg/33sec), engine - 1x15mm MG151 (200rpg/17sec)

BF109F-4: nose - 2x7.92mm MG17 (500rpg/33sec), engine - 1x20mm MG151/20 (200rpg/16sec)



1. Left Machine Gun Ammo
2. Cannon Ammo
3. Right Machine Gun Ammo
4. Clock
5. Engine magnetos position
6. Altimeter
7. Repeater Compass
8. Manifold pressure gauge
9. Undercarriage position indicator:  
green - down, red - up, no light - transition

10. Airspeed indicator
11. Turn and Bank indicator
12. Tachometer
13. Propeller pitch indicator
14. Coolant temperature gauge
15. Low fuel warning light gauge
16. Fuel gauge
17. Fuel and oil pressure gauge
18. Throttle

## 2.3 Messerschmitt BF 109G “Gustav” (‘42-‘44)

The “Gustav” was the most numerous variant of the BF109 and stayed as the main type until the end of the war. Maximum Speed (G2/G6/G6late/G6AS/G14/G10): *530/525/530/530/568/573km/h at sea level and 655/634/640/640/666/698km/h at 7000m (at 6000m for G14 and G10).*

*Turn time 19.6s at 1000m. Climb to 6000m in 6.1mins.*

### Tips:

- ◊ Not the best in any category, but the G-10 is a great overall fighter and favorite plane of many virtual pilots.
- ◊ Like all Bf109s the Gustavs are exceptional at handling their speed; they slow down and accelerate very quickly.
- ◊ The Gustavs start disintegrating before 900km/h.
- ◊ The G6A/S, G14 and G10 have MG50 (refer to the K-4 for details).

### Armament:

BF109G-2: nose - 2x7.92mm MG17 (500rpg/33sec), engine - 1x20mm MG151 (200rpg/16sec), wings gunpods - 2x20mm MG 151/20 (135rpg/11sec)

BF109G-6: nose - 2x13mm MG131 (300rpg/21sec), engine - 1x20mm MG151/20 (200rpg/16sec), engine - 1x30mm Mk108 (65rpg/6sec), wings gunpods - 2x20mm MG151/20(135rpg/11sec), 2x30mm Mk108 (35rpg/4sec)

BF109G-14: nose - 2x13mm MG131 (300rpg/22sec), engine - 1x30mm Mk108 (65rpg/6sec), wings gunpods - 2x20mm MG151/20(135rpg/11sec), 2x30mm Mk108 (35rpg/4sec)

BF109G-10: nose - 2x13mm MG131 (300rpg/21sec), engine - 1x30mm Mk108 (65rpg/6sec), wings gunpods - 2x20mm MG151/20(140rpg/11sec), 2x30mm Mk108 (35rpg/4sec)



- |   |                                     |
|---|-------------------------------------|
| 1. Left Machine Gun Ammo  | 10. Fuel gauge                      |
| 2. Cannon Ammo  | 11. Airspeed indicator              |
| 3. Right Machine Gun Ammo   | 12. Tachometer                      |
| 4. Clock  | 13. Propeller pitch indicator       |
| 5. Engine magnetos position   | 14. Coolant temperature gauge       |
| 6. Repeater Compass   | 15. Low fuel warning light          |
| 7. Artificial Horizon / Turn and Bank indicator                                       | 16. Fuel gauge                      |
| 8. Manifold pressure gauge  | 17. Fuel and oil pressure indicator |
| 9. Undercarriage position indicator:<br>green - down, red - up, no light - transition | 18. Throttle                        |

## 2.4 Messerschmitt BF 109K4 “Kurfürst” (‘44)

The “Kurfürst” has several aerodynamic changes over the “Gustav”. The tail wheel is fully retractable and the wheel wells are fully covered to reduce drag. The result is improved speed and improved climb rate.

Maximum speed: *590km/h at sea level and 720km/h at 5900m. Climb to 6400m in 5.6mins.*

*Service Ceiling: 12000m. Turn time 20s at 1000m.*

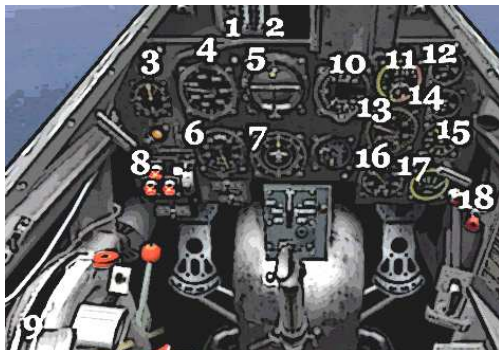
### Tips:

- ◊ Mixture and supercharger generally do not need human intervention; they are automatic (in all BF109s).
- ◊ Max speed before disintegration is around 900km/h and fastest climb around 280km/h.
- ◊ The MW50 boost should be turned on/off only on low RPMs (many switch it on before take-off).  
The fluid starts working only over 100% power and lasts around 26mins. Switch it off then to prevent damage.
- ◊ In overheat condition the engine gets damaged after around 5mins.
- ◊ The K-4 is particularly difficult to control and change direction while in steep high-speed dives.  
However, you can set combat flaps at any speed without flap damage.

### Armament:

Bf109K-4: nose - 2x13mm MG131 (300rpg/21sec), engine - 1x30mm MK108 (65rpg/6sec),

wings gunpods - 2x20mm MG151/20 (135rpg/11sec), wings gunpods - 2x30mm MK108 (60rpg/6sec).



- |   |                                 |
|---|---------------------------------|
| 1. Left Machine Gun Ammo  | 10. Variometer                  |
| 2. Right Machine Gun Ammo   | 11. Fuel and oil pressure gauge |
| 3. Clock  | 12. Coolant temperature gauge   |
| 4. Airspeed indicator   | 13. Tachometer                  |
| 5. Artificial Horizon / Turn and Bank indicator                                       | 14. Oil temperature gauge       |
| 6. Altimeter  | 15. Propeller pitch indicator   |
| 7. Repeater compass   | 16. Manifold pressure gauge     |
| 8. Undercarriage position indicator:<br>green - down, red - up, no light - transition | 17. Fuel gauge                  |
| 9. Throttle   | 18. Low fuel warning light      |

### - How to choose your late-war Bf109?

The K4 is the fastest and best climber but overheats quite quickly, while the G6/AS is the most agile. The G10 is a compromise between those two. It was an attempt to bring older, repairable Gustavs up to the standard of the K-4 in the cheapest manner possible. These three are the most popular BF109 models online.

## 2.5 Messerschmitt BF 109Z “Zwilling” (‘44)

The “Zwilling” was designed as a heavy interceptor, by joining two BF109s together to achieve good flight characteristics and good armament. However, it never entered production. The prototype was ready in 1943 but was destroyed in one of the Allied raids.

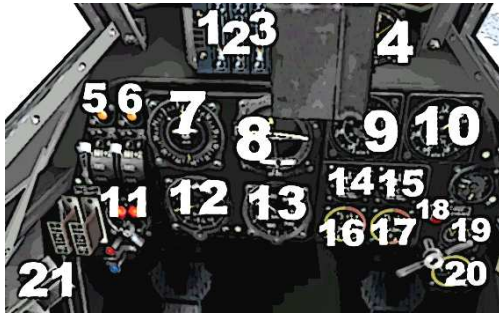
Maximum Speed: *600km/h at sea level* and *740km/h at 8000m*. *Service Ceiling 11700m*.

### Tips:

◊ The Zwilling starts disintegrating at around 830km/h.

### Armament:

BF109Z: engines - 2x30 mm Mk108 (65rpg/6sec), wings - 2x30mm Mk108 (35rpg/4sec), center wing gunpod - 1x30mm Mk103 (35rpg/5sec).



1. Left Cannon Ammo
2. Optional Mk103 Ammo
3. Right Cannon Ammo
4. Clock
5. Left engine magnetos position
6. Right engine magnetos position
7. Repeater Compass
8. Artificial Horizon / Turn & Bank indicator
9. Left engine manifold pressure gauge (white needle) and tachometer (yellow needle)
10. Right engine manifold press. gauge (white needle) and tachometer (yellow needle)
11. Undercarriage position indicator: green - down, red - up, no light - transition
12. Altimeter
13. Airspeed indicator
14. Left engine coolant temperature gauge
15. Right engine coolant temperature gauge
16. Left engine fuel and oil pressure indicator
17. Right engine fuel and oil press. indicator
18. Low fuel warning light
19. Propeller pitch indicator for left and right engine
20. Fuel gauge
21. Left and Right engine throttles

## 2.6 Messerschmitt BF 110G2 “Zerstörer” (‘42)

The Bf110 originally was designed as a strategic fighter that would clear the way for the bomber formations that followed. They made their presence felt during the early part of the Battle of Britain when the Luftwaffe began their attacks on the Channel convoys. After a while they started meeting Hurricanes and Spitfires and their losses rose quickly, since they weren't sufficiently manoeuvrable to face single-engine fighters.

Maximum speed: *510km/h at sea level*, *570km/h at 5000m* and *595km/h at 7300m*.

*Service Ceiling: 11000m*.

### Tips:

◊ The BF110G2 starts losing parts at speeds higher than 720km/h.

◊ Avoid facing enemy single-engine fighters. It has good maximum speed which can save it from Hurricanes, but not from Spitfires. You should avoid turning at all costs. Forcing the BF110 to turn was the main tactic used by the Hurricanes against the earlier version of the “Zerstörer” during the Battle of Britain.

### Armament:

Bf110G-2: nose - 4x7.92mm MG17 (1006rpg/66sec on average) or 2x30mm Mk108 (135rpg/12sec), nose - 2x20mm MG151/20 (left 350rpg/28sec, right - 300rpg/24sec), belly gunpod - 1x dual 20mm MG151/20 (200rpg/16sec) or 1x37mm Bk3.7 (72rpg/54sec), rear gunner - 1x7.92mm MG81Z.



1. Clock
2. Left Cannon Ammo
3. Optional Mk108 cannon Ammo
4. Right Cannon Ammo
5. Right Cannon warning light
6. Left Cannon warning light
7. Gear position indicator: green - down, red - up, no light - transition
8. Repeater Compass
9. Visual Homing indicator
10. Turn and Bank indicator
11. Variometer
12. Höhe über Grund (0-750m)
13. Outside temperature
14. Directional Gyro
15. Artificial Horizon
16. Airspeed indicator
17. Altimeter
18. Left Engine tachometer
19. Right Engine tachometer
20. Left Engine manifold pressure gauge
21. Right Engine manifold pressure gauge
22. Left engine cooling liquid temperature gauge
23. Low fuel warning light for left front/rear fuel tank
24. Fuel gauge
25. Low fuel warning light for Right front/rear fuel tank
26. Right engine cooling liquid temperature gauge
27. Left/Right Engine manifold pressure gauge
28. Left/Right Engine Throttle



29. Propeller pitch indicator
30. Oil temperature gauge
31. Fuel and oil pressure indicator

## 2.7 Focke-Wulf Fw 190A “Anton” (‘42-‘44)

Designed by Kurt Tank to complement the BF 109, the FW 190 was by far the most advanced fighter aircraft in the world when it entered service in autumn 1941. The deliveries of the A-4 began in the summer of 1942. The A-5 overcame the overheating problems of the previous variants by relocating the engine 15cm forward. It was used among other roles as ground attack, night fighter, torpedo-bomber and interceptor. The next variant, introduced in June 1943, the A-6 had lighter wing structure and slightly improved armament. The final major version of the A series was the A-8 which had increased internal fuel capacity, improved armament and better pilot protection. The A-9 version had the same airframe but new engine and a few minor additions over the A-8. Also based on the A-8 was the F-8, which was fitted with four bomb racks. The total production number was about 20000 units of all FW 190 variants.

A-4: Maximum Speed: *540km/h at sea level* and *640km/h at 6000m*.

A-5,6: Maximum Speed: *570km/h at sea level* and *675km/h at 6200m*.

A-8: Maximum Speed: *580km/h at sea level* and *665km/h at 6000m*.

A-9: Maximum Speed: *585km/h at sea level* and *685km/h at 6000m*.

F-8: Maximum Speed: *565km/h at sea level* and *645km/h at 5200m*.

### Tips:

- ◊ The FW190s excel in Boom&Zoom tactics. Fly high, spot a target, dive, quick burst, and up again. In diving abilities they are equal to the P-47s.
- ◊ Do not stay in a dogfight for long. Every manoeuvre will bleed energy and you'll quickly lose the upper hand.
- ◊ The strongest point of the FW190s is probably the armament. Very effective guns and lots of ammo.
- ◊ The roll rate is impressive. Use it to quickly change direction or for rolling scissors.
- ◊ The FW190s are very difficult to down. They can take more hits than most other planes of the era.
- ◊ The fuel control and propeller pitch control are automatic.
- ◊ The cockpit layout is superb, and the cockpit visibility is not bad either.
- ◊ In-game the A-4 variant does not feature any boost system. All the rest have the “Erhöhte Entleistung” boost system.
- ◊ Use of the boost in the F-8 is prohibited at altitude higher than 1000m.
- ◊ These are not planes for the novice; mistakes cost.

### Armament:

FW190A-4,5: nose - 2x7.92mm MG17 (1000rpg/66sec), inner wings - 2x20mm MG 151/20E (250rpg/22sec), outer wings - 2x20mm MG FF/M (60rpg/7sec).

FW190A-6: nose - 2x7.92mm MG17 (1000rpg/66sec), inner wings - 2x20mm MG 151/20E (250rpg/22sec), outer wings - 2x20mm MG 151/20E (125rpg/10sec).

FW190A-8,9: nose - 2x13mm MG131 (400rpg/28sec), inner wings - 2x20mm MG151/20E (250rpg/22sec), outer wings - 2x20mm MG151/20E (125rpg/10sec), gunpods - 2x20mm dual MG151/20E (145rpg/12sec), gunpods - 2x30mm MK103 (35rpg/5sec), gunpods - 2x30mm MK108 (35rpg/4sec).

FW190F-8: nose - 2x13mm MG131 (400rpg/29sec), inner wings - 2x20mm MG 151/20E (200rpg/17sec).



### FW 190A-4,5,6

1. Warning light for left MG
2. Warning light for right MG
3. Left Machine Gun Ammo
4. Left Inboard Cannon Ammo
5. Right Inboard Cannon Ammo
6. Right Machine Gun Ammo
7. Airspeed indicator
8. Artificial Horizon / Turn & Bank indicator
9. Variometer
10. Repeater Compass
11. Manifold pressure gauge
12. Altimeter
13. Fuel and oil pressure gauge
14. Oil temperature gauge

15. Fuel gauge
16. Propeller pitch indicator
17. Low fuel warning light
18. Tachometer
19. Throttle
20. Engine magnetos position
21. Undercarriage position indicator:  
green - down, red - up, no light - transition
22. Flaps position indicator:  
red - up, red (middle) - combat and take-off,  
green - landing
23. Elevator trim indicator
24. External Ordnance status (only on the A-5):  
two inner lights - belly bombs/tanks,  
two outer lights - wing bombs/tanks
25. Clock



### FW 190A-8,9, F-8

1. Left Machine Gun Ammo
2. Left Inboard Cannon Ammo
3. Right Inboard Cannon Ammo
4. Right Machine Gun Ammo
5. Airspeed indicator
6. Artificial Horizon / Turn & Bank indicator
7. Altimeter
8. Fuel and Oil pressure gauge
9. Oil temperature gauge
10. Throttle lever
11. Engine magnetos position

12. Undercarriage position indicator:  
green - down, red - up, no light - transition
13. Elevator trim indicator
14. Variometer
15. Repeater Compass
16. Manifold pressure gauge
17. Fuel gauge
18. Propeller pitch indicator
19. Low Fuel warning light
20. Tachometer
21. External Ordnance status light  
(F-8: upper row - wing bombs,  
lower row - fuselage bombs).
22. Clock

## 2.8 Focke-Wulf Fw 190D “Dora” (‘44,‘45)

Known as the “Dora 9” or “long-nose 190”, the FW 190D-9 was designed as a high-altitude interceptor. To increase its maximum speed it was equipped with the MW50 water-methanol injection system in January 1945. Maximum Speed (FW190D-9): **605km/h at sea level** and **715km/h at 5900m**.

**Climb to 5200m in 5.6min. Service Ceiling 11000m. Range 837km.**

### Tips:

- ◊ The FW190D-9 of '45 features an MW50 boost (refer to the BF109K4 for details on its use). The MW50 is useful up to around 6000m; upwards of that it will warm your engine quicker to no great advantage, so switch it off. Using MW50 the '45 model climbs quicker than the '44 model.
- ◊ Contrary to the Anton, which is more of a point and shoot aircraft (you have to aim at your required deflection shot and hope the enemy flies through it; you can't really turn to adjust without losing lots of energy), the Dora retains energy a lot more, which allows you to make corrections. Still it is best suited to B'n'Z tactics.
- ◊ The Dora features a great roll rate but is easy to stall, and although it will outdive most enemies, it will not necessarily outclimb them too. Speed is gained quicker than almost any other plane on the game, so you can easily outrun most enemies.
- ◊ Like most FW190s, it turns better at over 400km/h.

### Armament:

FW190D-9: nose - 2x13mm MG131 (750rpg/54sec), inner wings - 2x20mm MG 151/20E (250rpg/22sec).



- |   |  |
|---|--|
| 1. Left MG Ammo                               | 12. Oil temperature gauge  |
| 2. Left Inboard Cannon Ammo                   | 13. Coolant temperature gauge  |
| 3. Right Inboard Cannon Ammo                  | 14. Fuel gauge   |
| 4. Right MG Ammo                              | 15. Low fuel warning light   |
| 5. Airspeed indicator                         | 16. Tachometer   |
| 6. Artificial horizon / turn & bank indicator | 17. Throttle   |
| 7. Variometer                                 | 18. Engine magnetos position   |
| 8. Repeater Compass                           | 19. Elevator trim indicator  |
| 9. Manifold pressure gauge                    | 20. Undercarriage position indicator:<br>green - down, red - up, no light - transition |
| 10. Altimeter                                 | 21. Clock  |
| 11. Fuel and oil pressure gauge               |  |

## 2.9 Focke-Wulf Ta 152 (‘45)

Derived by the Fw 190D series, the Ta 152 was designed for even better high altitude performance. It featured high aspect ratio long-span wings, MW50 boost system and an engine-mounted 30mm Mk108 cannon along with another two 20mm cannon in the wing roots. The only production version was the Ta152H-1s with about 190 units built in total.

Maximum Speed (TA152H-1): **560km/h at sea level** and **750km/h at 9000m**.

**Climb to 9200m in less than 12min. Service Ceiling 14800m. Range 1200km.**

### Tips:

- ◊ The Ta 152 has two boost systems. MW50 for low altitude climb rates up to around 6000m (like most MW50 systems it is ineffective above this altitude so switch it off or it will cook your engine). Once above 9000m, the Ta 152 has a second boost system, called GM-1, which can be enabled by switching your boost key back on. It is a Nitrous Oxide system which gives you an impressive advantage against any other aircraft above 9000m. Do not use any boost system between 6000 and 9000m.
- ◊ Due to its wingspan, the Ta 152 turns much better than the Dora, but is more likely to flat spin, which is hard to recover from.
- ◊ To get the best handling characteristics in a dogfight, you have to be at over 350km/h.

### Armament:

TA152H-1: engine - 1x30mm MK108 (90rpg/9sec), inner wings - 2x20mm MG 151/20E (175rpg/15sec).



- |   |  |
|---|--|
| 1. Left Inboard Cannon Ammo                   | 11. Coolant temperature gauge  |
| 2. Right Inboard Cannon Ammo                  | 12. Pressure gauge   |
| 3. Airspeed indicator                         | 13. Fuel gauge   |
| 4. Artificial horizon / turn & bank indicator | 14. Low fuel warning light   |
| 5. Variometer                                 | 15. Tachometer   |
| 6. Repeater Compass                           | 16. Gear lever   |
| 7. Manifold pressure gauge                    | 17. Throttle   |
| 8. Altimeter                                  | 18. Undercarriage position indicator:<br>green - down, red - up, no light - transition |
| 9. Fuel and oil pressure gauge                | 19. Engine magnetos position   |
| 10. Oil temperature gauge                     |  |

## 2.10 Junkers Ju 87B-2 “Stuka” (‘41)

It wasn't the first and perhaps not even the best, but the Junkers Ju87 Stuka quickly became the definitive dive-bomber of the WWII era. The name Stuka is an abbreviation of the German word for dive-bombing aircraft (Sturzkampfflugzeug). It was first tested in battle during the Spanish Civil War but established its reputation during the Blitzkrieg on Poland. Although far from invincible, it definitely was a terrifying war machine, delivering bombs with unprecedented accuracy while signalling its arrival with a screaming siren. Max. speed: *338km/h at sea level* and *380km/h at 4400m*. Climb to *5000m in 12min*.

*Service Ceiling: 8100m.*

### Tips:

◊ Consider switching the Supercharger to stage 2 at around 2800m.

### How to dive-bomb:

Make sure you can see your target under you through the floor window, then invert the plane, pull the dive-brake lever, throttle back to 0% and dive vertically over your target continuously adjusting your direction. Release the bombs no later than 600m over the ground, release the airbrake and fly away. The higher you initiate the dive the better, but never below 1500m. Max Dive Speed: 600km/h.

### Armament:

wings - 2x7.92mm MG17 (500rpg/33sec), rear gunner - 1x7.92mm MG15 (900rpg/56sec).



1. Supercharger lever:  
rear position - stage 1, front - 2
2. Contact Altimeter
3. Repeater Compass
4. Airspeed indicator
5. Tachometer
6. Clock
7. Altimeter
8. Turn and Bank indicator
9. Variometer
10. Manifold pressure gauge
11. Magnetic Compass

12. Fuel gauge
13. Fuel and Oil pressure gauge
14. Oil temperature gauge
15. Coolant temperature gauge
16. Propeller pitch lever
17. Throttle
18. Dive brakes lever:  
rear position - deployed, front - stowed.  
In the game the siren is switched ON/OFF together with this Dive brakes lever
19. Flaps lever

## 2.11 Junkers Ju 87D-3,5 “Stuka” (‘42)

Although by 1941 the Stuka was already suffering appalling losses, the Luftwaffe continued deploying it. The next important production model was the Ju87D, with a new engine, extra armour protection for the ground-attack role (the D-3) and larger wing span to cope with the heavier bomb loads (the D-5).

Max. speed: *334km/h at sea level* and *382km/h at 4350m*. Climb to *5000m in 19min*.

*Service Ceiling: 6500m.*

### Armament:

D-3: wings - 2x7.92mm MG17 (500rpg/33sec), rear gunner - 1x7.92mm MG81Z (1500rpg/37sec).

D-5: wings - 2x20mm MG151/20 (250rpg/20sec), rear gunner - 1x7.92mm MG81Z (1500rpg/37sec).



1. Supercharger lever:  
rear position - stage 1, front - stage 2
2. Clock
3. Altimeter
4. Repeater Compass
5. Airspeed indicator
6. Engine Tachometer
7. Ammo left and right Machine Guns  
(cannons in G-1)
8. Magnetic Compass
9. Contact Altimeter (not in G-1)
10. Turn and Bank indicator
11. Variometer

12. Manifold pressure gauge
13. Fuel gauge
14. Fuel and Oil pressure gauge
15. Oil temperature gauge
16. Coolant temperature gauge
17. Propeller pitch lever
18. Throttle
19. Dive brakes lever (not in G-1):  
rear position - deployed, front - stowed  
In the game the siren is switched ON/OFF together with this Dive brakes lever
20. Flaps lever



## 2.12 Junkers Ju 87G-1 ('43)



The Ju87G was the last variant of the Stuka, although technically it wasn't a Stuka, since it wasn't a dive-bomber. It was a standard Ju87D-3 equipped with a BK37 cannon under each wing for tank-busting.

Max. speed: *320km/h at sea level and 340km/h at 4000m*. Climb to *5000m in 20min*.

**Service Ceiling:** *6500m*.

**Tips:**

◊ The Ju87G-1 is more vulnerable to enemy fighters than the previous models. Due to its heavy armament it is slower and has worse manoeuvrability.

**Armament:**

wings - 2x37mm BK3.7 (12rpg/9sec), rear gunner - 1x7.92mm MG81Z (1500rpg/37sec).

The Ju87G-1 has the same cockpit as the Ju87D-3 and D-5.

## 2.13 Heinkel He111 H-2,6 ('41)

Designed originally as a Lufthansa airliner, the He111 became the principal heavy bomber of the Luftwaffe.

H-2/6: Speed: *360/380km/h at sea level and 405/410km/h at 6000m*. Climb to *2000m in 8+/8-10min*.

**Tips:**

◊ Go to the bombardier position (default 'c') and use the bombsight (default 'shift-F1') to decide where to release the bombs. Keep in mind that you need to use the approximate real speed, not the one indicated in your instruments, e.g. for altitude 2500m and indicated speed 300km/h the real speed is about 350km/h.

◊ Banking over 4 degrees will disrupt the sight mechanism and switch off the crosshair lighting.

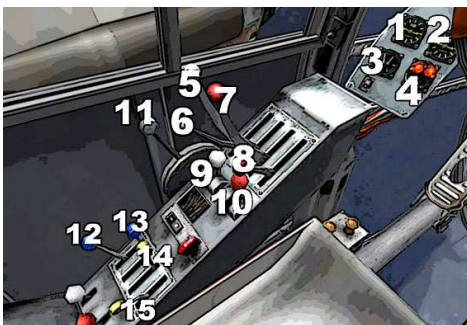
**Armament:**

H-2: nose gunner - 1x7.92mm MG15(150rpg/10sec), left gunner - 1x7.92mm MG15 (750rpg/50sec), right gunner - 1x7.92mm MG15 (750rpg/50sec), upper gunner - 1x7.92mm MG15 (1000rpg/66sec), lower gunner - 1x7.92mm MG15 (750rpg/50sec).

H-6: nose gunner - 1x20mm MG/FF (250rpg/29sec), left gunner - 1x7.92mm MG15 (750rpg/50sec), right gunner - 1x7.92mm MG15 (750rpg/50sec), upper gunner - 1x7.92mm MG15 (1000rpg/66sec), lower gunner - 1x7.92mm MG15 (750rpg/50sec), tail cone gunner (AI only) - 1x7.92mm MG15 (750rpg/50sec).



- |                             |   |
|-----------------------------|---|
| 1. Artificial horizon       | 11. Left engine manifold pressure gauge           |
| 2. Visual homing indicator  | 12. Right engine tachometer                       |
| 3. Turn and bank indicator  | 13. Right engine manifold pressure gauge          |
| 4. Blind approach indicator | 14. Left engine oil temperature gauge             |
| 5. Variometer               | 15. Left engine cooling liquid temperature gauge  |
| 6. Airspeed indicator       | 16. Right engine oil temperature gauge            |
| 7. Altimeter                | 17. Right engine cooling liquid temperature gauge |
| 8. Repeater compass         | 18. Left engine fuel and oil pressure gauge       |
| 9. Directional gyro         | 19. Right engine fuel and oil pressure gauge      |
| 10. Left engine tachometer  | 20. Clock   |



- |  |   |
|--|---|
| 1. Left side propeller pitch indicator                                       | 9. Left side propeller pitch lever  |
| 2. Right side propeller pitch indicator                                      | 10. Right side propeller pitch lever  |
| 3. Flaps position indicator  | 11. Flaps lever   |
| 4. Gear position indicator:<br>green - down, red - up, no light - transition | 12. Left engine oil radiator lever:<br>rear position - closed, front - open       |
| 5. Left engine supercharger lever:<br>rear position - stage 1, front - 2     | 13. Left engine mixture lever:<br>rear position - leaner mixture, front - richer  |
| 6. Left engine throttle  | 14. Right engine mixture lever:<br>rear position - leaner mixture, front - richer |
| 7. Right engine throttle   | 15. Right engine oil radiator lever:<br>rear position - closed, front - open      |
| 8. Right engine supercharger lever:<br>rear position - stage 1, front - 2    |   |



- |   |
|---|
| 1. Low fuel warning light                   |
| 2. Left wing tank fuel gauge                |
| 3. Right wing tank fuel gauge               |
| 4. Low fuel warning light                   |
| 5. Left engine fuel and oil pressure gauge  |
| 6. External air temperature gauge           |
| 7. Right engine fuel and oil pressure gauge |

## 2.14 Messerschmitt Me 262 ('44,'45)

The Messerschmitt Me 262 was the first ever jet fighter to enter combat and the only one with significant contribution to the Luftwaffe. The Me 262 squadrons were manned by the top German aces and served in various roles, including those of fighter, interceptor and light bomber. In total around 1430 of all variants were built. Maximum Speed: *835km/h at sea level* and *870km/h at 6000m*.

### Tips:

- ◊ Be very gentle with the throttle to avoid surprises (as with all jets). The Me262 explodes at 1100km/h.
- ◊ In the Jumo004 powered jets you can slam the throttles back and forth if the engine RPM is over 6000; there is a regulator that prevents flame-outs.
- ◊ If an engine is hit, the Me262 can fly pretty well, but even if you shut down that engine the fire will not go out and it will explode sooner or later.
- ◊ During the landing procedure the Me262 is extremely vulnerable. It takes some time to slow down to safe landing speed and it cannot accelerate again quickly enough if an enemy fighter appears suddenly.
- ◊ At 95% throttle a smoke trail will appear, which is a major handicap as you are quickly spotted and followed when you return to base. At 85% the engines emit a blue flame which also makes it easier to spot you.
- ◊ The nose wheel is not steerable, so when taxiing use differential brakes (and/or thrust).

### Armament:

Me262-1a: upper nose - 2x30mm Mk108 (100rpg/10sec), lower nose - 2x30mm Mk108 (80rpg/8sec).

Me262-2a: nose - 2x30mm Mk108 (100rpg/10sec).

Me262-1a/U4: nose - 1x50mm Mk214A (28rpg/11sec).



- |  |                                  |
|--|----------------------------------|
| 1. Airspeed indicator  | 15. Elevator trim lever          |
| 2. Artificial Horizon  | 16. Left engine Tachometer       |
| 3. Variometer  | 17. Right engine Tachometer      |
| 4. Altimeter   | 18. Left engine gas pressure     |
| 5. Repeater Compass  | 19. Left engine gas temperature  |
| 6. Clock   | 20. Right engine gas temperature |
| 7. Left upper cannon ammo (not present on a1/U4)                                       | 21. Right engine gas pressure    |
| 8. Right upper cannon ammo (not present on a1/U4)                                      | 22. Left engine fuel pressure    |
| 9. Cannon warning lights (not present on a1/U4)  | 23. Left engine oil pressure     |
| 10. Undercarriage position indicator:<br>green - down, red - up, no light - transition | 24. Right engine oil pressure    |
| 11. Flaps contactor switch   | 25. Right engine fuel pressure   |
| 12. Gear contactor switch  | 26. Low fuel warning light       |
| 13. Left engine throttle   | 27. Front fuel tank gauge        |
| 14. Right engine throttle  | 28. Rear fuel tank gauge         |
|  | 29. Low fuel warning light       |

## 2.15 Messerschmitt Me 163 "Komet" ('45)

The Me 163 was a rocket-propelled fighter designed mainly to counter the Allied daylight bombing. It was based on the DFS 194 glider of Dr Alexander Lippisch, whose team joined Messerschmitt in January 1939. The main variant was the Me163B1-A, of which around 400 were built. Although a plane with incredible flight characteristics, the Komet came too late to have any impact. Their total number of victories were around 9-15.

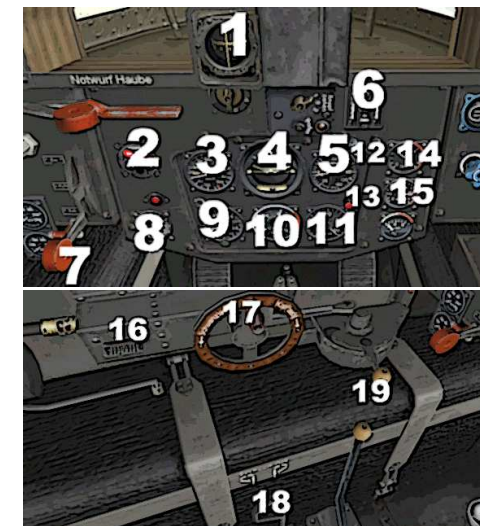
Maximum Speed: *825km/h at sea level* and *960km/h at 10000m*. *Service Ceiling: 12000m*.

### Tips:

- ◊ The fuel used is a highly volatile mixture of T-Stoff (80% hydrogen peroxide and 20% water) and C-Stoff (hydrazine hydrate, methyl alcohol, and water). Avoid sudden throttle changes to avoid surprises.
- ◊ The extremely narrow undercarriage makes flawless landing very difficult.
- ◊ The Komet explodes at 1100km/h.

### Armament:

Me163B-1A: wings - 2x30mm MK 108 (60rpg/6sec).



- |   |   |
|---|---|
| 1. Compass  | 8. Clock                                |
| 2. Undercarriage position indicator:<br>green - down, red - up, no light - transition | 9. Altimeter                            |
| 3. Altimeter  | 10. RPM counter                         |
| 4. Artificial horizon / Turn and Bank indicator                                       | 11. Consumption indicator               |
| 5. Variometer   | 12. Left and Right Cannon warning light |
| 6. Ammo counter for Left and Right Cannon   | 13. Low fuel warning light              |
| 7. Gear lever   | 14. Thrust indicator                    |
|   | 15. Thrust indicator                    |
| 16. Trim adjustment indicator   |   |
| 17. Elevator trim wheel   |   |
| 18. Flaps lever   |   |
| 19. Throttle: 0, 35, 65, 100%   |   |

## 2.16 Heinkel He 162 A-2 “Spatz” (Sparrow) or “Volksjäger” (‘45)



The “Volksjäger” (people’s fighter) was the rather hasty answer to a late-war requirement for a very light (less than 2000kg), very cheap (made of wood), very simple (if produced in quantity many of the pilots would be from the Hitler Youth) jet-propelled interceptor. Stunningly, the He-162 flew for the first time only 10 weeks after the first designs. When the allies captured the underground production facilities, 116 had been produced and 800 more were unfinished.

Maximum Speed: *890km/h at sea level* and *905km/h at 6000m*. *Service Ceiling: 12300m*.

**Tips:**

- ◊ The He-162 starts disintegrating over 1000km/h.
- ◊ The He-162 features ejection seat. Do not eject below 500m or stationary on the ground.

**Armament:**

He-162A-2: fuselage - 2x20mm MG151/20 (120rpg/10sec).



- |                            |  |
|----------------------------|--|
| 1. Turn and Bank indicator | 8. Fuel pressure gauge                     |
| 2. Airspeed indicator      | 9. Oil pressure gauge                      |
| 3. Variometer              | 10. Clock                                  |
| 4. Jet pipe temperature    | 11. Fuel gauge                             |
| 5. Tachometer              | 12. Ammo counter for Left and Right Cannon |
| 6. Altimeter               | 13. Floor window                           |
| 7. Compass                 |  |
- 
- |                           |
|---------------------------|
| 14. Elevator trim control |
| 15. Gear lever            |
| 16. Throttle              |

## 2.17 Gotha Go-229 (‘45)



Created by the Horten brothers (famous for their 1930’s gliders), the Go-229 (or Ho-229) was a twin-engine jet-powered flying wing, way ahead of its time. Although probably not on purpose, the special paint finishing of the plane provided “stealth” characteristics, one of several reasons to consider it the predecessor of today’s B-2 Stealth Bomber. By the time the production center was overrun by the Allies no Go229 had been completed.

Maximum speed: *795km/h at sea level* and *977km/h at 12000m*.

**Tips:**

- ◊ Although very fast, the Go-229 is too large for a fighter, and thus vulnerable to enemy fighters.
- ◊ The Go-229 explodes at around 1100km/h.
- ◊ The Go-229 features ejection seat. Do not eject below 500m or stationary on the ground.

**Armament:**

Go229A-1a: wings - 2x30mm Mk103 (120rpg/17sec)



- |   |                                  |
|---|----------------------------------|
| 1. Variometer   | 10. Left engine oil pressure     |
| 2. Artificial Horizon / Turn and Bank indicator   | 11. Left engine gas temperature  |
| 3. Altimeter  | 12. Left engine tachometer       |
| 4. Repeater Compass   | 13. Right engine tachometer      |
| 5. Undercarriage position indicator:<br>green - down, red - up, no light - in transition  | 14. Right engine gas temperature |
| 6. Flaps position indicator:<br>upper red light (Ein) - raised and combat flaps<br>middle red light (Start) - take-off flaps<br>lower green light (Aus) - landing flaps<br>no light - in transition | 15. Right engine oil pressure    |
| 7. Airspeed indicator   | 16. Outside temperature          |
| 8. Left tank fuel gauge   | 17. Gear lever                   |
| 9. Right tank fuel gauge  | 18. Flaps lever                  |
|   | 19. Left engine throttle         |
|   | 20. Right engine throttle        |
|   | 21. Fuel pressure                |

## 3 United Kingdom

### 3.1 J8 (Swedish version of the Gloster Gladiator MkI) ('37)



The Gloster Gladiator was RAF's last biplane fighter. The prototype first flew in 1934 and deliveries started in 1937. Although outclassed by most opponents, the Gladiators fought very well during the opening stages of World War II. It was used in Norway, France, North Africa, the Middle East and the Balkans. 38 Gladiators were sold to Sweden, where they were designated J8.

Maximum speed: *340km/h at sea level* and *400km/h at 4400m*. Turn time *12-13s at 1000m*.

**Tips:**

- ◊ The Gladiator has awful cockpit visibility, very low top speed and mediocre armament. It is however better than almost all other planes in terms of manoeuvrability.
- ◊ The Gladiator is susceptible to engine starvings. Refer to the I-16 for relevant tips.
- ◊ It has fixed propeller pitch and manual fuel mixture.

**Armament:**

J8: fuselage - 2x7.7mm Browning (600rpg/36sec), wings - 2x7.7mm Browning (400rpg/24sec).



- |                              |   |
|------------------------------|---|
| 1. Variometer                | 8. Oil pressure gauge                             |
| 2. Tachometer                | 9. Manifold pressure gauge                        |
| 3. Angle of attack indicator | 10. Fuel gauge                                    |
| 4. Airspeed indicator        | 11. Clock   |
| 5. Turn and Bank indicator   | 12. Magnetic Compass                              |
| 6. Altimeter                 | 13. Engine mixture: rear - leaner, front - richer |
| 7. Oil temperature gauge     | 14. Throttle                                      |

### 3.2 Hawker Hurricane ('38-'42)

The Hurricane was derived by the earlier Hawker Fury biplane, RAF's main fighter in the early 1930s. It saw action in the Battle of France and in Norway, but it was in the Battle of Britain that it earned its everlasting fame.

During those 5 months of 1940 nearly 57% of all German losses were claimed by Hurricanes, including 272 Bf109s.

Maximum speed (I/IIb/IIc/II field): *415/410/410/420km/h at sea level* and *520/540/540/550km/h at 5600m (6100 for MkI)*. Turn time *21s at 1000m*.

**Tips:**

- ◊ The Hurricane is a relatively sturdy plane; it usually takes more hits to down than a Spitfire.
- ◊ The Hurricane, like the Spitfire, has only two flaps positions (raised/landing).
- ◊ Consider switching the Supercharger to stage 2 at about 2800m.
- ◊ The Hurricanes start falling apart at about 750km/h.

**Armament:**

MkI: wings - 8x7.7mm Browning (333rpg/20sec on average).

MkIIb: wings - 12x7.7mm Browning (336rpg/20sec on average).

MkIIc: wings - 4x20mm Hispano MkI (91rpg/8sec).

MkII field mod.: wings - 2x12.7mm UBK (100rpg/6sec), wings - 2x20mm ShVAK (120rpg/9sec).



- |   |                               |
|---|-------------------------------|
| 1. Undercarriage position indicator:<br>green - down, red - up, no light - transition | 10. Fuel pressure gauge       |
| 2. Tachometer   | 11. Fuel gauge                |
| 3. Airspeed indicator   | 12. Oil temperature gauge     |
| 4. Artificial Horizon   | 13. Coolant temperature gauge |
| 5. Variometer   | 14. Magnetic Compass          |
| 6. Manifold pressure gauge  | 15. Propeller pitch lever     |
| 7. Altimeter  | 16. Throttle                  |
| 8. Magnetic Compass   | 17. Radiator flap position    |
| 9. Turn and Bank indicator  | 18. Gear / flaps lever        |

### 3.3 Supermarine Spitfire MkVb,c ('41-'43)

Designed by Reginald Mitchell, the Spitfire prototype first flew on 5 March 1936. During the Battle of Britain, the Spitfire MkI was probably the only fighter in the world able to confront the German Messerschmitt BF 109 as equal (1566 MkIs were built). The next major production variant was the MkV (6479 units), which utilised the Rolls Royce Merlin 45 engine for improved speed and high altitude performance. The MkVb version was equipped with cannon, necessary against the better armour of the newer German planes. Compared to the Bf109F-2, the MkV was worse at low altitudes, but generally equal at medium to high altitudes, where most fighting took place.

MkVb (Merlin 45 engine): Maximum Speed: *455km/h at sea level* and *600km/h at 7100m*.

MkVb(CW) (Merlin 46): Maximum Speed: *460km/h at sea level* and *610km/h at 7100m*.

L.F.MkVb (Merlin 50): Maximum Speed: *505km/h at sea level* and *555km/h at 2900m*.

L.F.MkVb(CW) (Merlin 50): Maximum Speed: *510km/h at sea level* and *560km/h at 2900m*.

MkVc(2-cannon) (Merlin 45): Maximum Speed: *455km/h at sea level* and *600km/h at 7100m*.

MkVc(4-cannon) (Merlin 45): Maximum Speed: *455km/h at sea level* and *600km/h at 7100m*.

#### Tips:

- ◇ Do not use the MkVs outside the altitude range that they are built for; the MkVb,c are too slow to engage German aircraft below 3000m, and the L.F.MkVb are too slow over 4000m.
- ◇ The MkVb has very little cannon ammo. Set cannon convergence range to about 100m and do not fire before that.
- ◇ They start disintegrating over 750km/h.

#### Armament:

Vb: wings - 4x7.7mm Browning (350rpg/21sec on average), wings - 2x20mm Hispano (60rpg/6sec).

Vc(2): wings - 4x7.7mm Browning (350rpg/21sec on average), wings - 2x20mm Hispano (120rpg/12sec).

Vc(4): wings - 4x20mm Hispano (120rpg/12sec).



- |   |                               |
|---|-------------------------------|
| 1. Flaps lever  | 12. Propeller pitch lever     |
| 2. Airspeed indicator   | 13. Elevator trim wheel       |
| 3. Artificial Horizon   | 14. Rudder trim wheel         |
| 4. Variometer   | 15. Magnetic Compass          |
| 5. Altimeter  | 16. Tachometer                |
| 6. Magnetic Compass   | 17. Low fuel warning light    |
| 7. Turn and Bank indicator  | 18. Manifold pressure gauge   |
| 8. Clock  | 19. Oil pressure gauge        |
| 9. Undercarriage position indicator:<br>down - down, up - up, no light - transition | 20. Oil temperature gauge     |
| 10. Elevator trim indicator   | 21. Coolant temperature gauge |
| 11. Throttle  | 22. Fuel gauge                |
|   | 23. Gear lever                |

#### Understanding the different Spitfire variants

The (CW) variants had clipped wings for better roll rate and a small increase in low altitude speed. The L.F. variants were designed for better performance at low altitudes and the H.F. for high altitudes.

### 3.4 Supermarine Spitfire MkVIII ('43)

The Spitfire MkVIII was designed for low-level air superiority operations. Although it was intended to become the next major line of development, the MkIX was preferred. The total production of the MkVIII was 1652 units. Maximum Speed: *535km/h at sea level* and *665km/h at 6400m*. *Service Ceiling: 12200m*.

#### Tips:

- ◇ The MkVIII's are much sturdier than earlier models; they start disintegrating over 920km/h.
- ◇ The advantages of the Spitfires over the BF109s are that they lose less energy while turning and have much better elevator control at high speed dives. The main disadvantage is that they don't climb as impressively well.

#### Armament:

VIII: wings - 4x7.7mm Browning (350rpg/21sec on average), wings - 2x20mm Hispano (120rpg/12sec).



- |   |                               |
|---|-------------------------------|
| 1. Flaps lever  | 12. Oil pressure gauge        |
| 2. Airspeed indicator   | 13. Oil temperature gauge     |
| 3. Artificial Horizon   | 14. Coolant temperature gauge |
| 4. Variometer   | 15. Fuel gauge                |
| 5. Tachometer   | 16. Elevator trim indicator   |
| 6. Undercarriage position indicator:<br>down - down, up - up, no light - transition | 17. Throttle                  |
| 7. Altimeter  | 18. Propeller pitch lever     |
| 8. Magnetic Compass   | 19. Elevator trim wheel       |
| 9. Turn and Bank indicator  | 20. Rudder trim wheel         |
| 10. Supercharger warning light  | 21. Magnetic Compass          |
| 11. Manifold pressure gauge   | 22. Gear brakes lever         |
|   | 23. Gear lever                |

### 3.5 Supermarine Spitfire MkIXc,e ('43,'44)

The Spitfire MkIX variant was initially an interim solution, rushed into service to confront the FW190, until the initial problems of the MkVIII were solved. It was assembled from old MkV components and ended up being the next major Spitfire variant of the war, with a total production of 5665 units.

MkIXc (Merlin 66): Maximum Speed: *535km/h at sea level* and *685km/h at 7100m*.

L.F.MkIXc(CW) (Merlin 66): Maximum Speed: *540km/h at sea level* and *680km/h at 7100m*.

MkIXe (Merlin 66): Maximum Speed: *540km/h at sea level* and *685km/h at 7100m*.

L.F.MkIXe(CW) (Merlin 66): Maximum Speed: *545km/h at sea level* and *685km/h at 6400m*.

H.F.MkIXe (Merlin 70): Maximum Speed: *535km/h at sea level* and *705km/h at 8200m*.

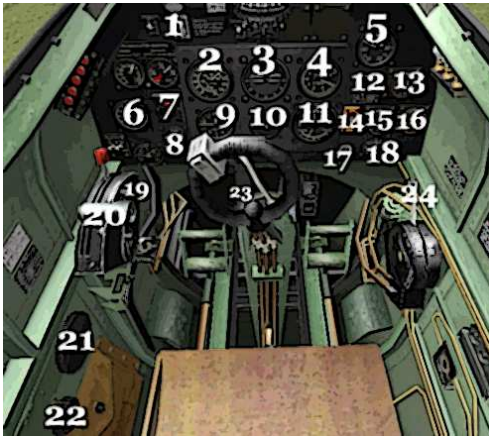
**Tips:**

- ◊ The MkIX Spitfires weigh a little less and have smaller range, but are generally similar in performance to the MkVIII.
- ◊ They start disintegrating at about 900km/h.

**Armament:**

IXc: wings - 4x7.7mm Browning (350rpg/21sec on average), wings - 2x20mm Hispano (120rpg/12sec).

IXe: wings - 2x12.7mm Browning (250rpg/20sec), wings - 2x20mm Hispano (140rpg/13sec).



- |   |                               |
|---|-------------------------------|
| 1. Flaps lever  | 13. Manifold pressure gauge   |
| 2. Airspeed indicator   | 14. Oil pressure gauge        |
| 3. Artificial Horizon   | 15. Oil temperature gauge     |
| 4. Variometer   | 16. Coolant temperature gauge |
| 5. Tachometer   | 17. Low fuel warning light    |
| 6. Clock  | 18. Fuel gauge                |
| 7. Undercarriage position indicator:<br>down - down, up - up, no light - transition | 19. Propeller pitch lever     |
| 8. Elevator trim indicator  | 20. Throttle                  |
| 9. Altimeter  | 21. Elevator trim wheel       |
| 10. Magnetic Compass  | 22. Rudder trim wheel         |
| 11. Turn and Bank indicator   | 23. Magnetic Compass          |
| 12. Supercharger warning light  | 24. Gear lever                |

### 3.6 Supermarine Seafire MkIII ('43)

In 1940 the Royal Navy twice asked the Air Ministry to supply Spitfires, but was turned down both times, since the Spitfires were badly needed for the defence of Britain. When the Battle of Britain ended, the Navy placed an order for MkVa and Vb Spitfires, which with some quick modifications became the (Sea Spitfires) Seafires MkI. Then came the MkII with strengthened landing gear, plus new engine and propeller, and the MkIII with even more powerful engine (1585hp Merlin 55) and double folding wing. The MkIII was mainly used in the Indian Ocean with the Far Eastern Fleet and in the Pacific with the British Pacific fleet.

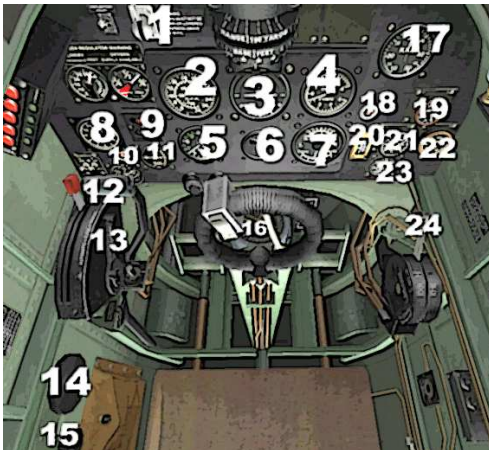
Maximum speed (L/F): *510/465km/h at sea level* and *540/580km/h at 2000/5700m*.

**Tips:**

- ◊ The Seafires have poor ground handling and poor visibility when taxiing.
- ◊ They have good manoeuvrability, but not as good as the contemporary Japanese aircraft.
- ◊ They start disintegrating at about 750km/h.

**Armament:**

Seafire III: wings - 4x7.7mm Browning (350rpg/21sec on average), wings - 2x20mm Hispano (120rpg/12sec).



- |   |                               |
|---|-------------------------------|
| 1. Flaps lever  | 12. Throttle                  |
| 2. Airspeed indicator   | 13. Propeller pitch lever     |
| 3. Artificial Horizon   | 14. Elevator trim wheel       |
| 4. Variometer   | 15. Rudder trim wheel         |
| 5. Altimeter  | 16. Magnetic Compass          |
| 6. Magnetic Compass   | 17. Tachometer                |
| 7. Turn and Bank indicator  | 18. Low fuel warning light    |
| 8. Clock  | 19. Manifold pressure gauge   |
| 9. Undercarriage position indicator:<br>down - down, up - up, no light - transition | 20. Oil pressure gauge        |
| 10. Arresting hook indicator light:<br>no light - up, green light - down            | 21. Oil temperature gauge     |
| 11. Elevator trim indicator   | 22. Coolant temperature gauge |
|   | 23. Fuel gauge                |
|   | 24. Gear lever                |

### 3.7 Bristol Beaufighter Mk.21 ('44)

The Beaufighter was based on the earlier Bristol Beaufort torpedo-bomber and was initially called Beaufort Fighter. Production started in December 1940. Most variants were used for the night defence of Britain and some others as torpedo-bombers. The total British-built Beaufighters produced were around 5500. The Mk21 is the Australian licence-built version of the British MkX (a total of 364 were built).

Maximum speed: *485km/h at sea level* and *515km/h at 4700m*. *Service Ceiling: 8000m*.

**Tips:**

- ◊ In-game the Beaufighter has a major disadvantage: zero rearward visibility and the rear crewman doesn't help.
- ◊ It starts disintegrating at 760km/h.
- ◊ The Beaufighter is a very durable plane. It can take a lot of damage and still keep going. That plus its impressive armament make it deadly in Head-On attacks.
- ◊ At low altitudes the Beaufighter is faster than many Japanese fighters. Use that advantage by bombing and turning back full throttle at sea level.

**Armament:**

Beaufighter Mk21: wings - 4x12.7mm Browning .50 (350rpg/30sec), nose - 4x20mm Hispano MkI (250rpg/23sec).



1. Clock
2. Airspeed indicator
3. Altimeter
4. Altimeter
5. Artificial Horizon
6. Magnetic Compass
7. Variometer
8. Turn and Bank indicator
9. Outside temperature
10. Left engine manifold gauge
11. Right engine manifold gauge
12. Left engine tachometer
13. Right engine tachometer
14. Left engine fuel pressure
15. Right engine fuel pressure
16. Suction
17. Left engine cooling liquid temperature
18. Right engine cooling liquid temperature
19. Left engine oil pressure
20. Right engine oil pressure
21. Left engine oil temperature
22. Right engine oil temperature
23. Gear brakes lever
24. Elevator trim wheel
25. Left tank fuel gauge
26. Right tank fuel gauge
27. Left and Right propeller pitch lever
28. Engine mixture lever:  
rear position - leaner mixture, front - richer
29. Throttle
30. Flaps lever
31. Gear lever

## 4 JAPAN

### 4.1 Mitsubishi A6M2,3,5,7 “Zero” or “Zeke” (‘40-‘45)

The A6M “Zero” was the most famous Japanese aircraft of World War II. Although the Allies received reports of its incredible performance against the Chinese as early as 1937, they did not seem to take them seriously. As a result, when the War started and they first met them it came as a complete surprise that the Japanese were so advanced in military aircraft design. In fact, thanks to its almost unbelievable manoeuvrability, good speed and unsurpassed range for carrier-born aircraft, the A6M2 accounted almost single-handedly for the air superiority that the Japanese enjoyed in the Pacific up to the battle of Midway (June 1942). Although faster, the A6M3 that followed was not anymore superior to the Allied planes. Next was the A6M5, an attempt to bridge the gap created by the excellent Grumman F6F Hellcat. The A6M5a had strengthened wings and increased ammunition, and the A6M5b introduced self-sealing tanks and armoured glass in the cockpit canopy. The A6M5c was a land-based variant (in-game equipped with Water-methanol injection system). The A6M7, the last production model (entered service in mid 1945), was built as a fighter-bomber, with a special bomb rack, reinforced tailplane and underwing attachments for two drop tanks. In total a little less than 10500 A6Ms were built, 2/3 of which by Nakajima and 1/3 by Mitsubishi.



A6M2,2-21: Maximum speed: *430km/h at sea level* and *515km/h at 4600m*. *Turn Time 15.5sec at 1000m*.  
A6M2-N “Rufe” seaplane: Maximum speed: *395km/h at sea level* and *470km/h at 4400m*. *Turn Time 17.5sec*.  
A6M3: Maximum speed: *465km/h at sea level* and *560km/h at 6000m*. *Turn Time 16sec at 1000m*.  
A6M5,5a,5b: Maximum speed: *455km/h at sea level* and *545km/h at 6000m*. *Turn Time 16sec at 1000m*.  
A6M5c,7: Maximum speed: *460km/h at sea level* and *555km/h at 6000m*. *Turn Time 16.5sec at 1000m*.

#### Tips:

- ◇ The Zeros are not good at diving. The early models disintegrate at 650km/h and the later ones over 740km/h.
- ◇ They are extremely vulnerable to enemy fire. Until the A6M5b model they lacked sufficient pilot protection and self-sealing fuel tanks. The Japanese mindset was purely “Attack”. Do not stalk and wait, attack. Do not jockey for the best position, attack. Do not evade or defend, attack. The A6M series exemplifies this. As you cannot absorb hits, run, or dive away, attack constantly.
- ◇ The earlier versions will instantly snap into position. Use rudder to increase your roll rate then allow the large surface areas to hold you on your mark. Roll out, dive hard on your target yet begin to pull out early losing sight of him under the nose. After practice you will find him suddenly in front of you, where you should fire all guns.
- ◇ Trust the Zero to hold a climb well. It is quick, and when your opponent stalls and must struggle to regain control use your superior manoeuvrability to stabilise quickly and attack.
- ◇ Do not hesitate to turn fight.
- ◇ Feel confident at very low speeds, 140-150km/h is stable for the Zero and it can quickly regain speed if needed. Lure your opponents into wasting their energy, so that you can utilise your plane’s abilities at low speed. Use your climb to force them to struggle, then loop with flaps causing your opponent to stall.
- ◇ Generally lower is better for the Zero. Supercharger 2nd stage shifts comfortably at 2.8km (A6M3 and later).
- ◇ Early WEP systems (up to A6M5b) can be run indefinitely at 95% power, 85% prop pitch and radiator 6. Water methanol systems overheat after roughly 5 minutes, yet quickly can be restarted after brief cooling.
- ◇ Up to A6M5a the Zeros have excellent nose guns with copious ammunition.



#### Armament:

A6M2,3: nose - 2x7.7mm Type97 MG (1000rpg/66sec), wings - 2x20mm Type99 cannon (60rpg/7sec).  
A6M5: nose - 2x7.7mm Type97 MG (500rpg/33sec), wings - 2x20mm Type99 cannon (100rpg/11sec).  
A6M5a: nose - 2x7.7mm Type97 MG (1000rpg/33sec), wings - 2x20mm Type99 cannon (125rpg/14sec).  
A6M5b: nose - 1x13.2mm Type3 MG (230rpg/16sec), wings - 2x20mm Type99 cannon (125rpg/14sec).  
A6M5c,7: nose - 1x13.2mm Type3 MG (230rpg/16sec), wings - 2x13.2mm Type3 MG (240rpg/15sec), wings - 2x20mm Type99 cannon (125rpg/14sec).



1. Water-methanol tank gauge (only on A6M5c and A6M7-62)
2. Artificial Horizon
3. Turn and Bank indicator
4. Mixture indicator
5. Clock
6. Airspeed indicator
7. Magnetic Compass
8. Variometer
9. Fuel and oil pressure indicator
10. Tachometer
11. Repeater Compass
12. Engine magnetos position
13. Altimeter
14. Manifold pressure gauge
15. Oil temperature
16. Engine temperature gauge
17. Throttle
18. Engine mixture: rear - leaner, front - richer
19. Propeller pitch
20. Supercharger lever: rear - stage 1, front - stage 2
21. Fuel gauge
22. Fuel gauge



## 4.2 Nakajima Ki-43-Ia,b,c Hayabusa, “Oscar” or “Jim” (‘41)

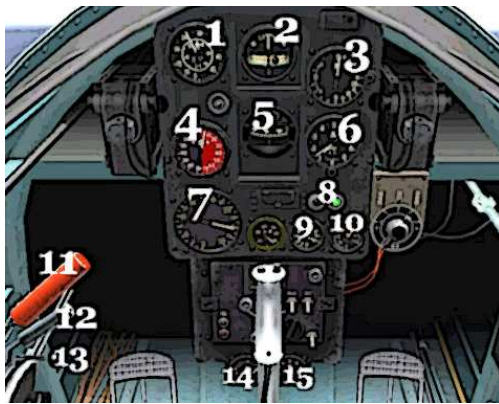
Designed under similar principles, the Ki43 was the Japanese army’s counterpart of the navy’s zero (A6M). It was an *incredibly manoeuvrable* but quite *slow* army fighter with a maximum speed of only *440km/h at sea level* and *500km/h at 4000m*. It was the mount of most Japanese aces and enjoyed considerable successes at the beginning of the Pacific War, but became obsolete rather quickly. Still, with continuous improvements the Ki43 was used throughout the whole of the war. The allies were calling it “Oscar” in the Pacific and “Jim” in southeast Asia.

### Tips:

- ◊ By default the gunsight is covered. Open it by pressing the “Tinted Reticle Dimmer” button.
- ◊ Avoid power dives; the Ki43 starts disintegrating at little over 650km/h.
- ◊ Just like the Zero, the Ki43 is very vulnerable to enemy fire; it lacks armour plating and self-sealing fuel tanks.
- ◊ Best tactics in the Ki-43-I are initial diving or climbing attacks on those unaware, then taunting your opponent into flying “your way” and conserving ammunition till you have clear shots. Utilize the stall, loops, tight turns and sudden climbs to bleed your opponents’ energy. Then when they are floundering to regain a footing strike accurately and hard.
- ◊ Trust the Ki-43’s ability to recover, press its stall limits, and force your opponents to fly incorrectly and perish, or give up and sprint for home.

### Armament:

- Ia: above engine - 2x7.7mm Type80 MG (500rpg/33sec).
- Ib: above engine - 1x7.7mm Type80 MG (500rpg/33sec), above engine - 1x12.7mm Ho103 MG (250rpg/17sec).
- Ic: above engine - 2x12.7mm Ho103 MG (250rpg/17sec).



- |   |                                     |
|---|-------------------------------------|
| 1. Airspeed indicator   | 9. Oil pressure gauge               |
| 2. Turn and Bank indicator  | 10. Oil temperature gauge           |
| 3. Variometer   | 11. Throttle                        |
| 4. Manifold pressure gauge  | 12. Propeller pitch lever           |
| 5. Magnetic Compass   | 13. Mixture lever                   |
| 6. Altimeter  | 14. Cylinder head temperature gauge |
| 7. Tachometer   | 15. Exhaust temperature gauge       |
| 8. Undercarriage position indicator:<br>green - up, red - down, no light - transition |                                     |

## 4.3 Kawasaki Ki-61-I Ko,Otsu,Hei Hien “Tony” (‘43-‘44)

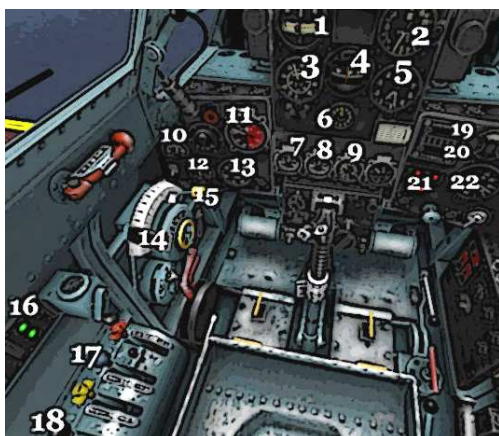
Codenamed “Tony” by the allies, the Ki61 was a capable aircraft, quite similar to the Bf109 both in appearance and performance (which caused some erroneous reports of allied pilots about Japanese Bf109s). Maximum speed: *480km/h at sea level* and *590km/h at 4850m*.

### Tips:

- ◊ All three versions have self sealing fuel tanks and pilot armour.
- ◊ The Ki61-I’s start disintegrating at around 850km/h.
- ◊ Very high altitude (>7km) combat should not be avoided as the low speed stability of the plane and quick diving ability give it an advantage up high where most opponents become too unstable to manoeuvre.
- ◊ Energy conservation is a must. Once slow the Ki-61 takes too much time to get back up to speed.

### Armament:

- Ki-61-I Ko: wings - 2x7.7mm Type89 MG (500rpg/32sec), above engine - 2x12.7mm Ho103 MG (250rpg/16sec).
- Ki-61-I Otsu: above engine - 2x12.7mm Ho103 MG (250rpg/16sec), wings - 2x12.7mm Ho103 MG (250rpg/15sec).
- Ki-61-I Hei: above engine - 2x12.7mm Ho103 MG (250rpg/16sec), wings - 2x20mm MG151/20 (120rpg/10sec).



- |                                     |  |
|-------------------------------------|--|
| 1. Turn and Bank indicator          | 13. Tachometer   |
| 2. Variometer                       | 14. Throttle   |
| 3. Airspeed indicator               | 15. Propeller pitch  |
| 4. Magnetic Compass                 | 16. External Weapons indicator light   |
| 5. Altimeter                        | 17. Radiator lever   |
| 6. Clock                            | 18. Flaps lever  |
| 7. Engine Coolant temperature gauge | 19. Flaps position indicator   |
| 8. Oil temperature gauge            | 20. Radiator position indicator  |
| 9. Oil pressure gauge               | 21. Undercarriage position indicator:<br>green - up, red - down, no light - transition |
| 10. Outside temperature gauge       | 22. Fuel gauge   |
| 11. Manifold pressure gauge         |  |
| 12. Exhaust temperature gauge       |  |

#### 4.4 Nakajima Ki-84-Ia,Ib,Ic Hayate “Frank” (‘44-‘45)

The Ki-84 was an impressive aircraft, with better manoeuvrability and climb rate than most contemporary American planes. It made its first significant appearance in the battle of Leyte towards the end of 1944 and was used by the Japanese till the end of the war in various roles pretty much everywhere. In total 3514 Ki-84 were built in those few months (mainly Ia and Ib).

Maximum Speed: **585km/h at sea level** and **680km/h at 6100m**. **Turn time 19.6s at 1000m**.  
**Climb to 6000m in 6.1mins**.

**Tips:**

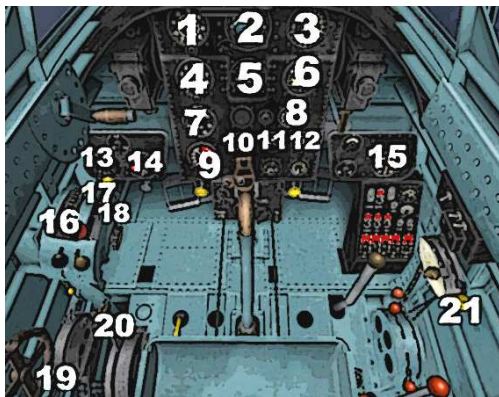
- ◊ The Ki-84 may start disintegrating at 850km/h. Also, in very fast hard turns too much strain in the wings will break them.
- ◊ The Ki-84 is a superb gunnery platform, one of the easiest planes to hit with its cannon.
- ◊ The MW injection can be used at all throttle settings and until the fuel tank is empty.
- ◊ You may want to engage 120% fuel mixture below 700m.
- ◊ Switch Supercharger Speed at 2500m.
- ◊ Although the Ki-84 can be used as a high altitude interceptor you should avoid facing enemy fighters (like P-47, P-51) at very high altitudes (over 7000m).

**Armament:**

Ia: nose - 2x12.7mm Ho103 MG (350rpg/24sec), wings - 2x20mm Ho5 cannon (150rpg/10sec).

Ib: nose - 2x20mm Ho5 cannon (150rpg/11sec), wings - 2x20mm Ho5 cannon (150rpg/10sec).

Ic: nose - 2x20mm Ho5 cannon (150rpg/11sec), wings - 2x30mm Ho105 cannon (65rpg/6sec).



- |                               |  |
|-------------------------------|--|
| 1. Airspeed indicator         | 12. Oil temperature  |
| 2. Artificial Horizon         | 13. Engine magnetos position   |
| 3. Variometer                 | 14. Undercarriage position indicator:<br>green - down, red - up, no light - transition |
| 4. Altimeter                  | 15. Fuel gauge with low fuel warning light inside                                      |
| 5. Magnetic compass           | 16. Throttle   |
| 6. Turn and Bank indicator    | 17. Propeller pitch lever  |
| 7. Tachometer                 | 18. Engine mixture: rear - leaner, front - richer                                      |
| 8. Clock                      | 19. Gear lever   |
| 9. Manifold pressure gauge    | 20. Flaps lever  |
| 10. Cylinder head temperature | 21. Radiator lever   |
| 11. Exhaust temperature       |  |

#### 4.5 Kawasaki Ki-100-I Ko (‘45)

The Ki-100 was the last of the Japanese single-engine fighters to enter service in WW2. Derived by the earlier Ki-61 Hien, the Ki-100 was first designed as an interim high-altitude interceptor. Changing to the Ha-112 engine the Japanese realised they had an excellent fighter at low altitudes, better than the F6F Hellcat, but rather weak at high altitudes, where it was supposed to intercept the B-29s. It came too late in the war and was not given a codename by the Allies.

Maximum speed: **510km/h at sea level**, **590km/h at 6000m** and **515km/h at 10000m**.

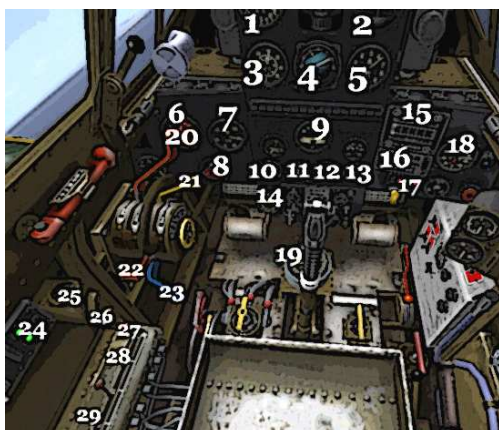
**Climb to 6000/10000m in 6/20mins**. **Service Ceiling: 10670m**.

**Tips:**

- ◊ The Ki-100 is very easy and comfortable to fly, but rather slow at most altitudes.
- ◊ It had great manoeuvrability, not much worse than the Ki-43.
- ◊ Switch supercharger speeds at 3500/4000m and set fuel mixture to 80/60/40% at 6300/7800/9800m.
- ◊ The Ki100 starts disintegrating before 900km/h.

**Armament:**

Ki100: wings - 2x12.7 mm Ho103 MG (250rpg/16sec)), nose - 2x20mm Ho5 cannon (250rpg/15sec)



- |                                     |  |
|-------------------------------------|--|
| 1. Variometer                       | 16. Radiator position indicator  |
| 2. Magnetic Compass                 | 17. Undercarriage position indicator:<br>green - down, red - up, no light - transition |
| 3. Airspeed indicator               | 18. Fuel gauge   |
| 4. Artificial Horizon               | 19. Magnetic Compass   |
| 5. Altimeter                        | 20. Throttle   |
| 6. Manifold pressure gauge          | 21. Propeller pitch  |
| 7. Tachometer                       | 22. Mixture lever  |
| 8. Engine magnetos position         | 23. Boost lever  |
| 9. Turn and Bank indicator          | 24. External weapons indicator light   |
| 10. Oil pressure gauge              | 25. Elevator trim indicator  |
| 11. Oil temperature gauge           | 26. Elevator trim  |
| 12. Cylinder head temperature gauge | 27. Flaps lever  |
| 13. Exhaust temperature gauge       | 28. Radiator lever   |
| 14. Clock                           | 29. Gear lever   |
| 15. Flaps position indicator        |  |

## 4.6 Aichi D3A “Val” (‘39)

Codenamed Val by the Allies, the Aichi D3A was one of the world’s first monoplane dive-bombers. 126 D3A1s participated in the attack on Pearl Harbor on December 7, 1941 (most numerous type involved in the attack). The total number of Vals produced were close to 1500, one third of which were D3A1s. Towards the end of the war they were modified as trainers or used in kamikaze attacks.

Maximum speed: *345km/h at sea level* and *380km/h at 3000m*. *Range 1820km*.

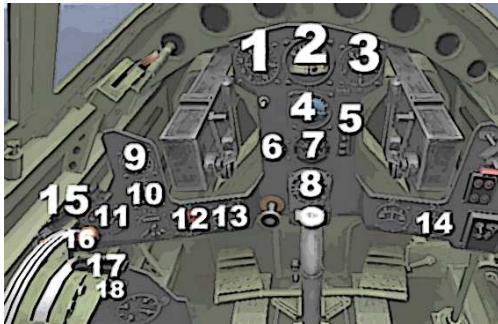
Maximum total bomb loadout: *370kg*.

### Tips:

- ◊ The D3A1 has impressively low stall speed. With trimming and sensible use of the rudder you’ll never stall.
- ◊ The gunsight is covered by default. Open it with the “Tinted Reticule Dimmer” button (default: ctrl-D).
- ◊ Don’t expect the rear gunner to shoot down anyone even if the enemy has parked at your six.
- ◊ Below 200km/h you can fold the wings in-flight.

### Armament:

D3A1: nose - 2x7.7mm Type97 MG (600rpg/40sec), rear gunner - 1x7.7mm Type92 MG (600rpg/40sec).



- |  |   |
|--|---|
| 1. Airspeed indicator                                      | 11. Repeater Compass                                      |
| 2. Turn and Bank indicator                                 | 12. Manifold pressure gauge                               |
| 3. Altimeter   | 13. Tachometer  |
| 4. Artificial horizon                                      | 14. Cylinder head temperature gauge                       |
| 5. Variometer  | 15. Throttle  |
| 6. Clock   | 16. Propeller pitch                                       |
| 7. Magnetic (lower half) and Repeater Compass (upper half) | 17. Engine mixture: rear - leaner, front - richer mixture |
| 8. Magnetic Compass  | 18. Fuel gauge  |
| 9. Fuel and oil pressure indicator                         |   |
| 10. Oil temperature gauge                                  |   |

## 4.7 Mitsubishi G4M-1 “Betty” (‘41)

Designed as response to a 1937 IJN specification for a new land-based bomber, the Mitsubishi G4M was quite fast and had superb range. A little after Pearl Harbor G4M1s were part of the force that sank HMS Prince of Wales and HMS Repulse. However, by late 1942 the war had already moved closer to Japan and Betty’s advantages were not anymore that important, while its weaknesses were. The unprotected fuel tanks, the lack of armour protection for the crew, and the weak defensive armament made it easy prey for Allied fighters. On 19 August 1945 two G4M1s carried the Japanese surrender delegation. In total about 2500 units of all variants were produced.

Maximum speed: *383km/h at sea level* and *425km/h at 4200m*. *Range 6000km*.

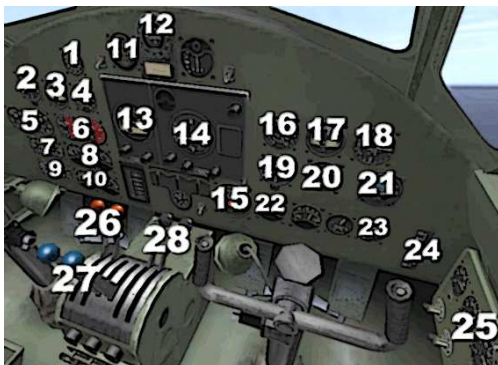
Maximum total bomb loadout: *1000kg*.

### Tips:

- ◊ The G4M1 can carry a single Type91 torpedo.
- ◊ The G4M1s are not very well protected; unprotected fuel tanks and relatively weak armament.
- ◊ Consider switching Supercharger speed around 3000m.

### Armament:

G4M1-11: nose, top, left beam, and right beam gunner - each 1x7.7mm Type92 MG (500rpg/33sec), tail gunner - 1x20mm Type99 cannon (250rpg/28sec).



- |   |                              |
|---|------------------------------|
| 1. Clock  | 15. Gear and Flaps indicator |
| 2. Height over Ground                                 | 16. Airspeed indicator       |
| 3. Turn and Bank indicator                            | 17. Turn and Bank indicator  |
| 4. Airspeed indicator                                 | 18. Variometer               |
| 5. Tachometers for left/right engine                  | 19. Height over Ground       |
| 6. Manifold pressure gauges for left/right engine     | 20. Magnetic Compass         |
| 7. Fuel and Oil pressure gauges for left/right engine | 21. Artificial Horizon       |
| 8. Exhaust temperature gauges for left/right engine   | 22. Engine air temperature   |
| 9. Oil temperature gauges for left/right engine       | 23. Flaps position indicator |
| 10. Cylinder head temp. gauges for left/right engine  | 24. Variometer               |
| 11. Magnetic Compass                                  | 25. Fuel gauges (all five)   |
| 12. Repeater Compass                                  | 26. Engine mixture levers    |
| 13. Magnetic Compass                                  | 27. Throttle levers          |
| 14. Artificial Horizon                                | 28. Propeller Pitch levers   |

## 5 USA

### 5.1 B-239 (Finnish modification of the Brewster F2A-1 “Buffalo” (‘39))

By the early months of 1939 it was already obvious that a new war was imminent in Europe. So, several European countries turned among others to the United States for additional combat aircraft. The Finns bought 44 F2A-1 “Buffalos” from the US Navy (including the prototype!), but to their surprise all US Navy “property” had been removed (guns, sights, instruments, carrier equipment etc.) before delivery. The Finnish modified version of the F2A-1 was designated B-239 and had several changes and improvements, including different engine (refurbished 950HP Wright R-1820 G-5 engines taken from DC-3 airliners), pilot seat armour and a conventional gunsight instead of the telescopic sight of the original F2A-1. Thanks to these changes the B-239 was a whole new plane and delightful to fly according to the Finnish pilots. The B-239s came too late to participate in the Winter War of 1939, but they thrived during the Continuation War of 1941-44. One specific B-239, the BW-393 is probably the aircraft with the most air victories in the history of air warfare, 41 (28 of which by Finnish Ace Hans Wind). Maximum speed: *425km/h at sea level and 480km/h at 4700m. Service Ceiling: 9900m.*



#### Tips:

- ◇ The B-239 has strong torque and needs constant trimming.
- ◇ Switch supercharger speed at around 3000m and generally avoid high altitudes (>5000m).
- ◇ Unless you climb very high you usually do not need to lean the fuel mixture.
- ◇ It starts disintegrating at about 800km/h.

#### Armament:

B-239: fuselage - 2x12.7mm Browning .50 (250rpg/22sec), wings - 2x12.7mm Browning .50 (250rpg/22sec).



- |                                    |  |
|------------------------------------|--|
| 1. Airspeed indicator              | 14. Right fuselage Machine Gun Ammo  |
| 2. Turn and Bank indicator         | 15. Engine temperature   |
| 3. Magnetic Compass                | 16. Repeater Compass   |
| 4. Altimeter                       | 17. Oil temperature (upper half),<br>oil pressure (left) and fuel pressure (right) |
| 5. Repeater Compass                | 18. Tachometer   |
| 6. Artificial Horizon              | 19. Throttle   |
| 7. Variometer                      | 20. Propeller pitch  |
| 8. Manifold pressure gauge         | 21. Engine mixture: rear - leaner, front - richer                                  |
| 9. Clock                           | 22. Fuel gauge   |
| 10. Gear warning Light             | 23. Fuel gauge   |
| 11. Gear position indicator        | 24. Gear lever   |
| 12. Flaps position indicator       | 25. Flaps lever  |
| 13. Left fuselage Machine Gun Ammo |  |

### 5.2 Brewster F2A-2 “Buffalo” (‘40)

The F2A-2 Buffalo was an upgraded version of the F2A-1 with a 1200HP R-1820-G40 engine and a 10-foot 3-inch cuffed Curtiss electric propeller among the several changes. The result was a much heavier plane which had worse climb rate than its predecessor despite the much more powerful engine. The Buffalos were quickly rejected by the US Navy in favour of the Wildcats.

Maximum speed: *465km/h at sea level and 550km/h at 5000m. Service Ceiling: 10300m.*

#### Tips:

- ◇ The Buffalo has very strong torque and needs constant trimming.
- ◇ To use the telescopic gunsight of the Buffalo switch to “gunsight view” (default: shift+f1).
- ◇ The F2A-2 starts disintegrating at about 750km/h.

#### Armament:

F2A-2: fuselage - 2x12.7mm Browning .50 (250rpg/22sec), wings - 2x12.7mm Browning .50 (250rpg/22sec).



- |                                    |  |
|------------------------------------|--|
| 1. Airspeed indicator              | 15. Right fuselage Machine Gun Ammo  |
| 2. Magnetic Compass                | 16. Cylinder head temperature  |
| 3. Turn and Bank indicator         | 17. Tachometer   |
| 4. Altimeter                       | 18. Air temperature  |
| 5. Repeater Compass                | 19. Oil temperature (upper half),<br>oil pressure (left) and fuel pressure (right) |
| 6. Artificial Horizon              | 20. Engine magnetos position   |
| 7. Variometer                      | 21. Throttle   |
| 8. Manifold pressure gauge         | 22. Engine mixture: rear - leaner, front - richer                                  |
| 9. Clock                           | 23. Supercharger lever: rear - stage 1, front - 2                                  |
| 10. Propeller pitch                | 24. Fuel gauge   |
| 11. Gear position indicator        | 25. Fuel gauge   |
| 12. Flaps position indicator       | 26. Gear lever   |
| 13. Engine starter                 | 27. Flaps lever  |
| 14. Left fuselage Machine Gun Ammo |  |

### 5.3 Grumman F4F-3,4,FM-2 “Wildcat” (‘41-‘43)

The F4F-3 Wildcat was generally inferior to the Zero, but it was all the Americans had against the Japanese during the early stages of the Pacific War. The F4F-4 had a few improvements, including folding wings, two more guns and self-sealing fuel tanks. When Grumman started concentrating towards their new aircraft, the Hellcat, General Motors took over the Wildcat production (designated as FM-1) and later created an improved version, the FM-2. Maximum speed (F4F/FM-2): *460/470km/h at sea level and 520/530km/h at 5750m.*

*Service Ceiling: 11000m/10500m.*

**Tips:**

- ◊ The Wildcats do not have automatically retractable gears. You need to press “raise/lower gear manually” as indicated by the landing gear position indicator (26).
- ◊ Consider changing the supercharger speed to stage 2 at around 8200ft and stage 3 at around 19000ft.
- ◊ Consider using 120% fuel mixture for take-off and landing, but switch back to 100% over 400m.
- ◊ The Wildcats are quite sturdy and can withstand some damage. This is probably their only advantage over their principal opponents, the Japanese Navy’s Zeros. They disintegrate at about 830km/h.
- ◊ The Flaps are automatically retracted at 250km/h (155mph)

**Armament:**

F4F-3: wings - 4x12.7mm Browning .50 (430rpg/37sec).

F4F-4: wings - 6x12.7mm Browning .50 (240rpg/20sec).

FM-2: wings - 4x12.7mm Browning .50 (430rpg/37sec).



- |  |  |
|--|--|
| 1. Directional Gyro  | 15. Engine mixture   |
| 2. Artificial Horizon  | 16. Aileron trim wheel   |
| 3. Oil temperature   | 17. Rudder trim wheel  |
| 4. Altimeter   | 18. Elevator trim wheel  |
| 5. Airspeed indicator  | 19. Supercharger lever:<br>front - stage 1, middle - 2, rear - 3                 |
| 6. Turn and Bank indicator                                       | 20. Flaps lever  |
| 7. Variometer  | 21. Repeater Compass   |
| 8. Manifold pressure gauge                                       | 22. Radiator handle  |
| 9. Tachometer  | 23. Outside temperature gauge  |
| 10. Arrestor hook lever  | 24. Oil temperature (upper half), oil press. (left)<br>and fuel pressure (right) |
| 11. Clock  | 25. Fuel gauge   |
| 12. Propeller pitch  | 26. Landing Gear position indicator  |
| 13. Rear wheel locking lever:<br>front - locked, rear - unlocked | 27. Gear winch   |
| 14. Throttle   |  |

### 5.4 Grumman F6F-3late,5 “Hellcat” (‘43,‘44)

The Grumman Hellcat was the successor of the Wildcat, a much bigger aircraft with several improvements, including wider and automatically retractable undercarriage, more powerful engine, improved cockpit armour, and more ammunition. It excelled against the Japanese Zero and played a prominent role in all US naval operations. Total Hellcat production was more than 12000 units from 1943 to 1945.

Maximum speed: *515km/h at sea level and 612km/h at 7100m. Service Ceiling: 11400m.*

**Tips:**

- ◊ Consider changing the supercharger speed to stage 2 at around 8200ft and stage 3 at around 19000ft.
- ◊ The Hellcats start disintegrating over 820km/h.

**Armament:**

F6F: wings - 6x12.7mm Browning .50 (outer four 270rpg/23sec, inner two 400rpg/34sec)



- |                                       |  |
|---------------------------------------|--|
| 1. Clock                              | 15. Propeller pitch  |
| 2. Magnetic Compass                   | 16. Throttle   |
| 3. Repeater Compass                   | 17. Supercharger lever:<br>front - stage 1, middle - 2, rear - 3               |
| 4. Artificial Horizon                 | 18. Engine mixture: rear - 100%, front - 120%                                  |
| 5. Tachometer                         | 19. Radiator lever   |
| 6. Altimeter                          | 20. Rudder trim wheel  |
| 7. Airspeed indicator                 | 21. Elevator trim wheel  |
| 8. Turn and Bank indicator            | 22. Fuel gauge   |
| 9. Variometer                         | 23. Engine temperature gauge   |
| 10. Manifold pressure gauge           | 24. Oil temperature gauge  |
| 11. Ammo                              | 25. Oil temperature (upper half),<br>oil press. (left) and fuel press. (right) |
| 12. Flaps and Gear position indicator |  |
| 13. Gear lever                        |  |
| 14. Flaps lever                       |  |

## 5.5 Curtiss P-40B,C,Hawk 81A-2,Tomahawk Mk.IIa,b ('41)

Derived by the earlier P-36A Hawk, the Curtiss P-40 was one of the most controversial fighters of the era. Not particularly capable but sturdy, it served pretty much everywhere and in most Allied Air Forces. The P-40B (Tomahawk MkIIa in the RAF) had armoured windscreens and armour plating for the pilot. The P-40C had larger, self-sealing fuel tanks and two more wing guns. It served in the RAF as Tomahawk MkIIb and performed particularly well as tactical support in North Africa. In total 2097 P-40s of all types were delivered to the Soviet Union following the German invasion of 1941.



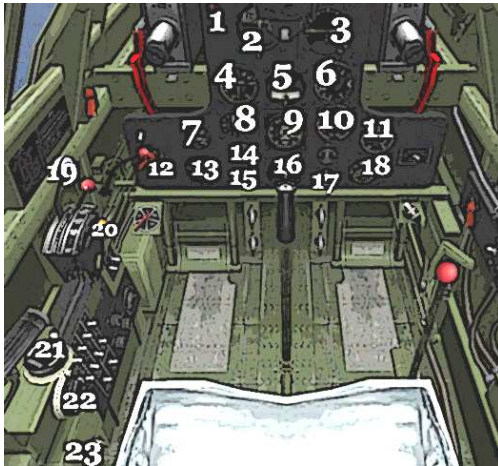
Max. speed: *457km/h at sea level and 573km/h at 6250m. Turn time 21s at 1000m.*

### Tips:

◊ The P-40C/MkIIb start disintegrating at 810km/h. The others at around 780km/h.

### Armament:

P-40B,C: nose - 2x12.7mm Browning .50 (250rpg/22sec), wings - 4x7.62mm Browning .30, (left 300rpg/17sec, right 240rpg/14sec)



- |                              |  |
|------------------------------|--|
| 1. Overheat warning light    | 13. Flaps and gear position indicator  |
| 2. Magnetic Compass          | 14. Suction  |
| 3. Artificial Horizon        | 15. Carburetor air temperature gauge   |
| 4. Airspeed indicator        | 16. Magnetic Compass   |
| 5. Turn and Bank indicator   | 17. Coolant temperature gauge  |
| 6. Variometer                | 18. Oil temperature (upper half),<br>oil press. (left) and fuel press. (right) |
| 7. Fuel gauge                | 19. Throttle   |
| 8. Clock                     | 20. Propeller pitch  |
| 9. Altimeter                 | 21. Rudder trim wheel  |
| 10. Manifold pressure gauge  | 22. Elevator trim wheel  |
| 11. Tachometer               | 23. Gear lever   |
| 12. Engine magnetos position |  |

## 5.6 Curtiss P-40E,M “Warhawk” ('41,'42)

The P-40E version had a new engine, improved visibility and better armour than its predecessors. The Soviets made several modifications to the P-40E that they received from the US through the Lend-Lease program. They used different engine and different propeller, not for performance reasons, but because the Soviet ground crews were more familiar with the Soviet engine, which had almost identical performance and dimensions to the American one. The first P-40M appeared in November 1942. It was very similar to the P-40E, only with more powerful engine, dorsal fin and longer fuselage.

Max. speed (E/E.field.mod/M): *470/472/475km/h at sea level and 578/566/580km/h at 4500/4800/6300m. Turn time 20.5/19.5/18.7s at 1000m.*

### Tips:

- ◊ All P-40s are very stable gunnery platforms, have minimal torque, are very easy to fly and easier than most to land; In other words they are *recommended for training newcomers to the game.*
- ◊ The P-40s are generally weaker than their contemporary German aircraft, but can fight as equals at low altitudes in slow rolling scissors or turn fights.
- ◊ The Warhawks do not perform well at altitudes higher than 3500m.
- ◊ The E and M start losing parts after 820km/h. The P-40E Soviet Field Mod earlier.
- ◊ For the P-40E.field.mod and P-40M switch the Supercharger to stage 2 at 2200m. Also consider to start leaning the mixture at 4000m.
- ◊ For casual climbing use throttle 103%, prop pitch 95%, radiator 4. For shallow dives and combat pursuit drop prop pitch to 90%, while for a steep fast dive drop further to 75-80%, adjusting throttle accordingly. To quickly climb back up increase prop pitch to 100%.

### Armament:

P-40E,M: wings - 6x12.7mm Browning .50 (left wing & right inboard 300rpg/24sec, right wing two outboard 240rpg/18sec)



- |   |  |
|---|--|
| 1. Low fuel warning light                   | 11. Coolant temperature gauge  |
| 2. Magnetic Compass                         | 12. Flaps and landing gear position indicator                                  |
| 3. Artificial Horizon                       | 13. Clock  |
| 4. Overheat warning light                   | 14. Tachometer   |
| 5. Turn and Bank indicator                  | 15. Magnetic Compass   |
| 6. Airspeed indicator                       | 16. Oil pressure   |
| 7. Altimeter                                | 17. Oil temperature (upper half),<br>oil press. (left) and fuel press. (right) |
| 8. Variometer                               | 18. Throttle   |
| 9. Manifold pressure gauge                  | 19. Propeller pitch lever  |
| 10. Carburetor intake air temperature gauge |  |

## 5.7 Bell P-39 “Airacobra” (‘41-‘44)

The Airacobra had a very unusual design, with the engine installed behind and below the pilot’s seat. While in Western Europe and in the Pacific it was considered more of a failure, it really excelled with the Soviets. Soviet ace Aleksandr Pokryshkin scored most of his 59 victories in a P-39. The Soviets as well as the Americans were using it for high-speed passes from higher altitude and escapes at full throttle. They had very little time to aim but with a single hit the 37mm cannon would easily destroy the enemy aircraft. The total production of the P-39 was around 9500 aircraft, about half of which went to the Soviet Union under the Lend-Lease program.

Max speed(D1,D2,N1,Q1,Q10): *490/537/505/520/529km/h at sea level*  
and *571/627/589/608/619km/h at 3500m. Turn time 22/19.5/20/20/19s at 1000m.*

### Tips:

- ◊ The P-39 stalls easily if not flown gently, it has very low climb rate and it’s performance drops at high altitudes.
- ◊ The 37mm nose cannon needs a little practice. Then you’ll destroy enemy aircraft with a single hit.

### Armament:

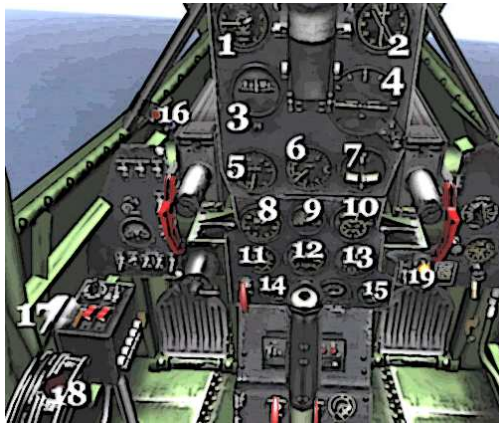
P-39D-1 & P-400: wings - 4x7.62mm Browning .30 (500rpg/29sec), nose - 2x12.7mm Browning .50 (200rpg/18sec), nose - 1x20mm Hispano M2 (60rpg/6sec).

P-39D-2: wings - 4x7.62mm Browning .30 (500rpg/29sec), nose - 2x12.7mm Browning .50 (200rpg/18sec), nose - 1x20mm Hispano M2 (60rpg/6sec), nose (optional) - 1x37mm M4 (30rpg/11sec).

P-39N-1: wings - 4x7.62mm Browning .30 (500rpg/29sec or 1000rpg/58sec), nose - 2x12.7mm Browning .50 (200rpg/18sec), nose - 1x37mm M4 (30rpg/11sec).

P-39Q-1: wings - 2x12.7mm Browning .30 (300rpg/23sec, nose - 2x12.7mm Browning .50 (200rpg/18sec), nose - 1x37mm M4 (30rpg/11sec).

P-39Q-10: nose - 2x12.7mm Browning .50 (200rpg/18sec), nose - 1x37mm M4 (30rpg/11sec).



- |  |                                     |
|--|-------------------------------------|
| 1. Altimeter   | 11. Fuel gauge                      |
| 2. Repeater Compass  | 12. Tachometer                      |
| 3. Magnetic Compass  | 13. Clock                           |
| 4. Artificial Horizon  | 14. Oil pressure gauge              |
| 5. Airspeed indicator  | 15. Suction                         |
| 6. Variometer  | 16. Gear warning light              |
| 7. Turn and Bank indicator   | 17. Throttle                        |
| 8. Manifold pressure gauge   | 18. Propeller pitch lever           |
| 9. Coolant temperature gauge   | 19. Low fuel pressure warning light |
| 10. Oil temperature (upper half),<br>oil press. (left) and fuel press. (right) |                                     |

## 5.8 Bell P-63 “Kingcobra” (‘44)

The P-63 was bigger and faster than its predecessor, the P-39. Most of the Kingcobras were flown by the Soviets and a few by the Americans and the Free French.

Max. speed: *600km/h at sea level, 694km/h at 6100m and 656km/h at 7625m.*

*Turn time 19.4s at 1000m.*

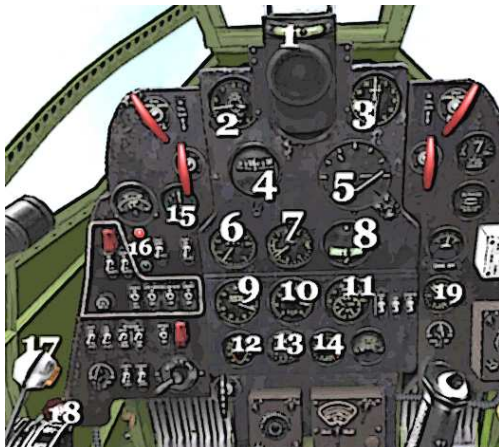
### Tips:

- ◊ Just like the P-39, the P-63 has low climb rate and is prone to spinning and stalling. However, it is very fast, has good turning rate and excellent armament.

- ◊ The P-63 has terrible rearward visibility.

### Armament:

P-63C5: nose - 2x12.7mm Browning .50 (200rpg/18sec, nose - 1x37mm M10 (58rpg/21sec),  
gunpods - 2x12.7mm Browning .50 (300rpg/23sec)



- |                            |  |
|----------------------------|--|
| 1. Bank indicator          | 11. Oil temperature (upper half),<br>oil pressure (left) and fuel pressure (right)     |
| 2. Altimeter               | 12. Fuel gauge   |
| 3. Repeater Compass        | 13. Clock  |
| 4. Magnetic Compass        | 14. Oil pressure gauge   |
| 5. Artificial Horizon      | 15. Suction gauge  |
| 6. Airspeed indicator      | 16. Undercarriage position indicator:<br>green - down, red - up, no light - transition |
| 7. Variometer              | 17. Throttle   |
| 8. Turn and Bank indicator | 18. Propeller pitch lever  |
| 9. Manifold pressure gauge | 19. Oil pressure gauge   |
| 10. Tachometer             |  |

## 5.9 North American P-51 “Mustang” (‘43,‘44)

Destined to be one of the greatest aircraft in the history of aviation, the P-51 Mustang was developed to meet a 1940 requirement of the RAF. Although very promising from the beginning, its performance became really impressive when it was fitted with the Rolls-Royce Merlin 61 engine (P-51B). The most numerous variant was the P-51D with about 8000 units.

Maximum Speed (P-51B/C/D/MkIII): *580/560/605/650km/h at sea level and 715/705/700/710km/h at 7900m (6900m for P-51D and MkIII). Climb to 7900/6900m in 7.5/6.5min. Service Ceiling 12800m. Range 3520/3900/1613km.*



### Tips:

- ◊ The Mustangs were dominant over 20000ft, but not as impressive at low altitudes (except the MkIII). Although fast at all altitudes, they suffer at low altitudes in terms of acceleration, climb rate and roll rate.
- ◊ Avoid turn-fights. Keep high speed and high altitude, engage at will and run away when at a disadvantage.
- ◊ The British Mustang, the MkIII, had better cockpit visibility thanks to a structureless round hood, the Malcolm hood.
- ◊ The P-51s start disintegrating over 900km/h.
- ◊ The P-51D could be destroyed by damage that would not affect other aircraft so seriously. This was due to the liquid-cooled engine that could be disabled with a single shot.

### Armament:

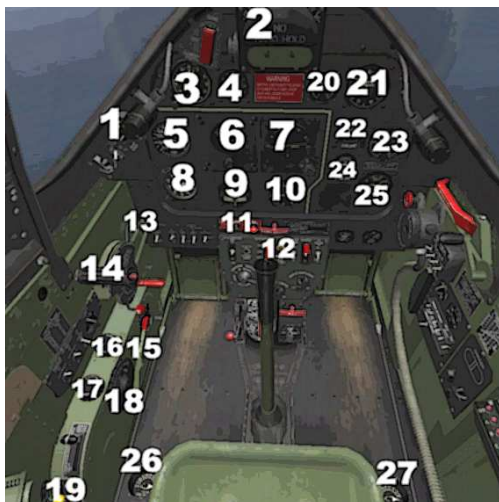
P-51B-NA, C-NT, Mustang Mk.III: wings - 4x12.7mm Browning .50 (350rpg/27sec).

P-51D-5NT, D-20NA: wings - 6x12.7mm Browning .50 (inner pair 400rpg/31sec, outer four 270rpg/21sec).



### P-51B,C, Mustang Mk.III

1. Repeater compass
2. Clock
3. Suction gauge
4. Manifold pressure gauge
5. Altimeter
6. Magnetic Compass
7. Artificial horizon
8. Tachometer
9. Undercarriage position indicator:  
green - down, red - up, no light - transition
10. Airspeed indicator
11. Turn and Bank indicator
12. Variometer
13. Coolant temperature gauge
14. Oil temperature (upper half),  
oil pressure (left) and fuel pressure (right)
15. Supercharger warning light
16. Throttle
17. Propeller pitch
18. Rudder trim wheel
19. Aileron trim wheel
20. Elevator trim wheel
21. Gear lever
22. Flaps lever
23. Left wing tank fuel gauge
24. Right wing tank fuel gauge



### P-51D

1. K-14 gunsight wingspan selection  
(only on D-20NA)
2. K-14 mode selector knob (only on D-20NA)
3. Repeater compass
4. Clock
5. Airspeed indicator
6. Magnetic compass
7. Artificial Horizon
8. Altimeter
9. Turn and Bank indicator
10. Variometer
11. Undercarriage position indicator:  
green - down, red - up, no light - transition
12. Supercharger warning light
13. Propeller pitch
14. Throttle
15. Gear lever
16. Rudder trim wheel
17. Aileron trim wheel
18. Elevator trim wheel
19. Flaps lever
20. Suction gauge
21. Manifold pressure gauge
22. Coolant temperature gauge
23. Tachometer
24. Carburetor intake air temperature gauge
25. Oil temperature (upper half),  
oil pressure (left) and fuel pressure (right)
26. Left wing tank fuel gauge
27. Right wing tank fuel gauge



28. Fuselage tank fuel gauge (left of headrest on P-51B,C,D and Mustang Mk.III)



## 5.10 Republic P-47 “Thunderbolt” “The Jug” (‘43,‘44)

One of the heaviest fighter aircraft of World War II, ironically the P-47 was designed to meet a 1940 USAAC requirement for a lightweight interceptor. It was designed by Alexander Kartveli based on the earlier P-35 design of Alexander Seversky. When reports on air combat in Europe came to the USA, it became clear that armour, heavy armament, self-sealing fuel tanks and a very powerful engine (Pratt & Whitney R-2800 Double Wasp) should be preferred over any weight-saving compromises. The result was an impressive, very heavy fighter, which excelled as escort fighter and fighter-bomber. The most extensively built variant was the P-47D (about 13000 units). The P-47 was nicknamed “The Jug” (short for Juggernaut or because of the milkjug shape of the fuselage).

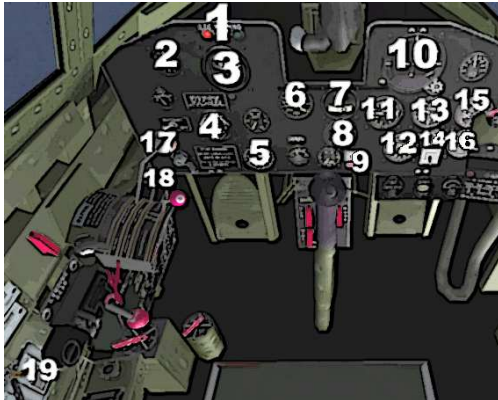
Maximum Speed (P-47D10,22,27/-47D): *575/581km/h at sea level and 730/730km/h at 7000m. Range 3060km.*

### Tips:

- ◊ The P-47 and the FW190 are the best power divers of the game, with the Thunderbolt having a much higher break-up speed (approximately 1030km/h vs 900km/h).
- ◊ The P-47 is not sufficiently fast and manoeuvrable for dogfighting at low altitudes. Against other fighters use strictly B'n'Z tactics.
- ◊ Turning to evade shots at medium and long distance only allows the enemy to come closer. If he is very close make one last-moment hard turn and dive away. Otherwise, trust your armour and escape with a shallow dive.
- ◊ Try to stay at altitudes over 5000m and utilise team tactics. Although not good at dogfighting, the P-47 can withstand a lot of damage and can keep escaping for a long time thanks to its second-to-none diving ability. All this time the enemy is vulnerable to attacks from your friends.
- ◊ Best roll rate is at about 400km/h.
- ◊ The P-47D is only slightly faster at sea level and a bit better climber than the previous models.

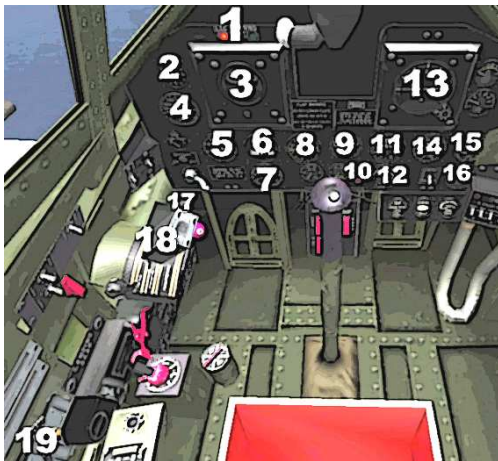
### Armament:

P-47: outer wings - 4x12.7mm Browning .50 (200rpg/15sec or with extra ammo 425rpg/33sec),  
inner wings - 4x12.7mm Browning .50 (200rpg/15sec or with extra ammo 425rpg/33sec).



#### P-47D-10,22

- |   |  |
|---|--|
| 1. Undercarriage position indicator:<br>green - down, red - up, no light - transition | 11. Variometer   |
| 2. Clock  | 12. Manifold pressure gauge  |
| 3. Magnetic Compass   | 13. Altimeter  |
| 4. Fuel gauge   | 14. Tachometer   |
| 5. Accelometer  | 15. Oil temp. (upper half), oil pressure (left)<br>and fuel pressure (right) |
| 6. Airspeed indicator   | 16. Oil temperature gauge  |
| 7. Turn & Bank indicator  | 17. Throttle   |
| 8. Magnetic Compass   | 18. Propeller pitch  |
| 9. Low fuel warning light   | 19. Flaps lever  |
| 10. Artificial Horizon  |  |



#### P-47D-27,D

- |   |  |
|---|--|
| 1. Undercarriage position indicator:<br>green - down, red - up, no light - transition | 11. Manifold pressure gauge  |
| 2. Clock  | 12. Fuel gauge   |
| 3. Magnetic Compass   | 13. Artificial Horizon   |
| 4. Airspeed indicator   | 14. Tachometer   |
| 5. Altimeter  | 15. Oil temp. (upper half), oil pressure (left)<br>and fuel pressure (right) |
| 6. Turn & Bank indicator  | 16. Oil temperature gauge  |
| 7. Accelometer  | 17. Propeller pitch  |
| 8. Variometer   | 18. Throttle   |
| 9. Magnetic Compass   | 19. Flaps lever  |
| 10. Low fuel warning light  |  |

## 5.11 Vought F4U “Corsair” (‘43-‘45)

The Corsair was developed in response of a 1938 US Navy request for a new single-seat carrier-based fighters. In order to make full use of the new, very powerful Pratt & Whitney R-2800 Double-Wasp engine, the designers decided to use a very big propeller, which created the need for very tall landing gear, and that in turn lead to Corsair’s famous distinctive gull-shaped wing. Early models proved too tricky to use on carriers due to the poor forward visibility, a tendency to drop one wing just before flaring, bouncing, and poor rudder effectiveness on the ground. As a result the first F4U were sent to the US Marine Corps in Guadalcanal. The aircraft performed superbly and earned the nickname “whistling death” by the Japanese. The F4U1-A had improved cockpit visibility thanks to the bubble canopy. The F4U1-C and D had a new engine and were generally similar, apart from the different armament.

Maximum speed: *575km/h at sea level and 678km/h at 7000m. Service Ceiling 11450m.*

### Tips:

- ◊ The Corsairs have three-stage Superchargers. Switch speeds at 2600m and 8200m.
- ◊ They are equipped with speed brakes that utilise a part of the gear mechanism. Do not use this function during take-offs and landing, as in this way the gear isn’t supported by additional hydraulic pump and may very well break off under the stress.
- ◊ The Corsair is a high-speed energy fighter. Do not attempt tight turns the way you would in a Hellcat and definitely not against the very agile Japanese aircraft. Use your better speed and acceleration for hit&run tactics instead.
- ◊ Although designed as a carrier-based aircraft, the Corsair is quite difficult to land on a carrier.

### Armament:

F4U-1A,D, Corsair Mk.I,II,IV: wings - 6x12.7mm Browning .50 (inner pair 375rpg/32sec, outer four 400rpg/34sec).  
F4U-1C: wings - 4x20mm Hispano M2 (250rpg/23sec).



- |   |                                       |
|---|---------------------------------------|
| 1. Water injection warning light              | 16. Gear lever                        |
| 2. Stall warning light                        | 17. Aileron trim wheel                |
| 3. Altimeter                                  | 18. Elevator trim wheel               |
| 4. Magnetic Compass                           | 19. Rudder trim wheel                 |
| 5. Repeater Compass                           | 20. Wing fold lever:                  |
| 6. Tachometer                                 | front - wings folded, rear - extended |
| 7. Manifold pressure gauge                    | 21. Artificial Horizon                |
| 8. Airspeed indicator                         | 22. Clock                             |
| 9. Turn and Bank indicator                    | 23. Oil temperature gauge             |
| 10. Flaps lever                               | 24. Variometer                        |
| 11. Undercarriage and air brakes indicator:   | 25. Cylinder head temperature gauge   |
| left position - up, right - down              | 26. Accelometer                       |
| 12. Propeller pitch                           | 27. Oil pressure gauge                |
| 13. Throttle                                  | 28. Fuel pressure gauge               |
| 14. Supercharger lever:                       | 29. Fuel gauge                        |
| front - stage 1, middle - 2, rear - 3         | 30. Arrestor hook lever:              |
| 15. Engine mixture: rear - 100%, front - 120% | front - down, rear - up               |

## 5.12 Lockheed YP-80 “Shooting Star” (‘44)

The Lockheed P-80 was the first operational jet fighter of the USAAF. The first YP-80s were delivered in October 1944. When the test pilot demonstrating the P-80 in England was killed due to fire in the jet engine, the type was grounded and didn’t see combat in WW2. Later in the Korean War it scored history’s first actual jet vs jet success, against a MiG-15.

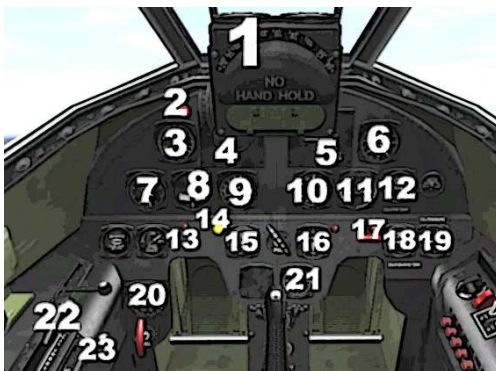
Maximum speed: *890km/h at sea level and 785km/h at 12000m. Service Ceiling 13700m.*

### Tips:

- ◊ Compared to the Me262, the YP-80 is much more manoeuvrable, although generally not faster at most altitudes. It lacks, however, in armament. Expected, since it is a fighter, while the Me262 is an interceptor.

### Armament:

YP-80: nose - 6x12.7mm Browning .50 (300rpg/23sec).



- |   |                                    |
|---|------------------------------------|
| 1. K14 gunsight wingspan selection            | 12. Tailpipe temperature           |
| 2. Undercarriage position indicator:          | 13. Low fuel warning light         |
| green - down, red - up, no light - transition | 14. Low speed warning light        |
| 3. Airspeed indicator                         | 15. Clock                          |
| 4. Magnetic Compass                           | 16. Fuel gauge                     |
| 5. Artificial horizon                         | 17. Engine fire warning light      |
| 6. Tachometer                                 | 18. Rear bearing temperature gauge |
| 7. Altimeter                                  | 19. Oil pressure gauge             |
| 8. Turn and Bank indicator                    | 20. Accelometer                    |
| 9. Variometer                                 | 21. Engine pressure                |
| 10. Repeater Compass                          | 22. Throttle                       |
| 11. Fuel pressure gauge                       | 23. Engine starting lever          |

## 5.13 Lockheed P-38 “Lightning” (‘43,‘44)

The P-38 Lightning was a unique aircraft which despite an unconventional design performed very well in a variety of roles and played a significant part in winning air superiority for the Allies. On 18 April 1943 16 P-38s of 339th Squadron took off from Guadalcanal and covered 1770km to intercept the Japanese bomber carrying Admiral Yamamoto while he was on an inspection tour of his forward bases.

Maximum Speed (P-38J/L/L.late): *570/560/593km/h at sea level and 670/660/670km/h at 8000m*.  
*Climb to 7500m in 9/8min. Service Ceiling 13400/12200m.*

### Tips:

- ◊ The major weakness of the P-38 seems to be the very stiff control in high speeds, especially in dives.
- ◊ Although large for a fighter, the P-38 can pull off impressive manoeuvres; It turns well (particularly with combat flaps), has no torque and even features an airbrake.
- ◊ Very few planes can follow a P-38 in a 10% climb.
- ◊ To perform a hammerhead manoeuvre go into a steep climb and when speed is about 120mph kill the throttle in one of the engines and then give full aileron and rudder in the direction of the dead engine.

### Armament:

P-38J: nose - 4x12.7mm Browning (500rpg/39sec), nose - 1x20mm Hispano M2 (150rpg/14sec).

P-38L: nose - 4x12.7mm Browning (500rpg/39sec), nose - 1x20mm Hispano M2 (150rpg/14sec), wings gunpods - 2xdual.50cal (350rpg/27sec).



- |  |  |
|--|--|
| 1. Clock   | 15. Carburetor intake air temperature for left and right engine            |
| 2. Repeater Compass  | 16. Fuel gauge - rear tank   |
| 3. Magnetic Compass  | 17. Undercarriage indicator: green - down, red - up, no light - transition |
| 4. Artificial Horizon  | 18. Left engine ampmeter   |
| 5. Manifold pressure for left and right engine   | 19. Right engine ampmeter  |
| 6. Tachometer for left and right engine  | 20. Left side propeller pitch  |
| 7. Coolant temp. for left and right engine   | 21. Right side propeller pitch   |
| 8. Fuel gauge - front tank   | 22. Left engine throttle   |
| 9. Altimeter   | 23. Right engine throttle  |
| 10. Airspeed indicator   | 24. Elevator trim wheel  |
| 11. Turn and Bank indicator  | 25. Gear lever   |
| 12. Variometer   | 26. Flaps lever  |
| 13. Left engine oil temperature (upper half), oil pressure (left), fuel pressure (right) |  |
| 14. Left engine oil temperature (upper half), oil pressure (left), fuel pressure (right) |  |

## 5.14 Douglas SBD-3,5 “Dauntless” (‘42,‘43)

Designed as a scout and dive-bomber, the SBD performed very well as the main attack plane of the US Navy's carrier forces in the early stages of the War in the Pacific, particularly in the battle of Midway. The SBD-3 introduced self-sealing and larger fuel tanks, armour protection, bullet-proof windshield, and four machine guns. The SBD-5 featured a more powerful engine (1200HP) and reflector gunsight. In total almost 6000 units of all variants were built.

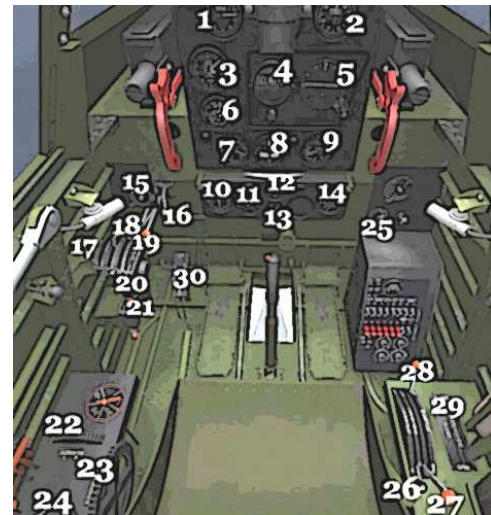
Maximum Speed: *360km/h at sea level and 405km/h at 4500m*. *Climb to 4200m in less than 9min.*

### Tips:

- ◊ The SBD can absorb a lot of damage and still return home.
- ◊ It was an extremely accurate dive-bomber, so use it as such. Max Dive speed: 445km/h.

### Armament:

SBD-3,5: nose - 2x12.7mm Browning .50 (350rpg/30sec), rear gunner - 2x7.62mm Browning .30 (500rpg/30sec).



- |   |   |
|---|---|
| 1. Tachometer   | 16. Radiator lever                                      |
| 2. Manifold pressure gauge  | 17. Supercharger lever: rear - stage 1, front - stage 2 |
| 3. Altimeter  | 18. Throttle  |
| 4. Magnetic Compass   | 19. Engine mixture                                      |
| 5. Artificial Horizon   | 20. Propeller pitch                                     |
| 6. Oil temperature (upper half), oil pressure (left), fuel pressure (right) | 21. Bomb release lever                                  |
| 7. Airspeed indicator   | 22. Aileron trim wheel                                  |
| 8. Turn and Bank indicator  | 23. Elevator trim wheel                                 |
| 9. Variometer   | 24. Rudder trim wheel                                   |
| 10. Clock   | 25. Engine starter                                      |
| 11. Cylinder head temperature gauge   | 26. Flaps lever   |
| 12. Suction   | 27. Gear lever  |
| 13. Oil temperature gauge   | 28. Dive brakes lever                                   |
| 14. Fuel gauge  | 29. Flaps position indicator                            |
| 15. Engine magnetos position  | 30. Gear position indicator                             |

## 5.15 Douglas A-20G “Havoc” (‘43)

Although not particularly distinguished, the Douglas A-20 was built in large enough numbers to be considered significant. Under the general term “light bomber” it served in various roles and in several theatres. The A-20G variant had R-2600-23 engines and was longer than its predecessors to allow for nose armament. Most of the early production were provided to the Soviets and the later ones were mainly used in New Guinea and Burma. In total about 2850 A-20Gs were built. All were manufactured in Santa Monica.

Maximum speed: *430km/h at sea level* and *520km/h at 3700m*. *Range 1650km*.

Maximum total bomb loadout: *2200lb*.

### Tips:

- ◇ The A-20G can carry a single Mk.13 Torpedo.
- ◇ Consider switching Supercharger speeds at 2200m (7200ft).
- ◇ Maximum traverse speed for the electric top turret is 60deg/sec.

### Armament:

A-20G: nose - 6x12.7mm Browning .50 (350rpg/30sec), dorsal gunner - 2x12.7mm Browning .50 (400rpg/34sec), ventral gunner - 1x12.7mm Browning .50 (400rpg/34sec).



- |  |   |
|--|---|
| 1. Airspeed indicator                  | 15. Left engine oil pressure gauge  |
| 2. Artificial horizon                  | 16. Right engine oil pressure gauge   |
| 3. Variometer                          | 17. Left engine carburetor air temperature gauge                              |
| 4. Left engine manifold pressure       | 18. Right engine carburetor air temperature gauge                             |
| 5. Right engine manifold pressure      | 19. Fuel gauge  |
| 6. Magnetic Compass                    | 20. Left engine cylinder head temperature gauge                               |
| 7. Altimeter                           | 21. Right engine cylinder head temperature gauge                              |
| 8. Magnetic Compass                    | 22. Left and Right engine throttle  |
| 9. Turn and Bank indicator             | 23. Left and Right side propeller pitch lever                                 |
| 10. Left engine tachometer             | 24. Left and Right engine supercharger lever:<br>down - stage 1, up - stage 2 |
| 11. Right engine tachometer            | 25. Bomb release lever  |
| 12. Flaps and gear position indicator  |   |
| 13. Left engine oil temperature gauge  |   |
| 14. Right engine oil temperature gauge |   |

## 5.16 North American B-25J “Mitchell” (‘44)

The B-25 Mitchell was North American’s response to a USAAC proposal for a twin-engine attack bomber. It became famous when Lt Col Doolittle’s 16 B-25Bs of USS Hornet launched the first attack on the Japanese homeland on 16 April 1942. The most numerous was the B-25J precision bomber variant, with over 4300 built. The B-25Js remained in service until well after WW2 and were also supplied to countries like Brasil, Cuba, Peru, Colombia and Venezuela.

Maximum speed: *385km/h at sea level* and *440km/h at 4000m*. *Range 2050km*.

Maximum total bomb loadout: *3000lb*.

### Tips:

- ◇ Consider switching Supercharger speeds at 2700m (8850ft).
- ◇ Maximum traverse speed for the electric top turret is 60deg/sec.

### Armament:

B-25J: nose - 5x12.7mm Browning .50 (400rpg/34sec), nose gunner - 1x12.7mm Browning .50 (450rpg/38sec), dorsal gunner - 2x12.7mm Browning .50 (450rpg/38sec), tail gunner - 2x12.7mm Browning .50 (450rpg/38sec), right waist gunner - 1x12.7mm Browning .50 (400rpg/34sec), left waist gunner - 1x12.7mm Browning .50 (400rpg/34sec).



- |  |  |
|--|--|
| 1. Plane drift indicator                       | 16. Carburetor air temp. for left and right engine                                     |
| 2. Radio Compass                               | 17. Oil temperature gauge for left and right engine                                    |
| 3. Repeater Compass                            | 18. Fuel gauge - front tanks   |
| 4. Manifold pressure for left and right engine | 19. Flaps and gear position indicator  |
| 5. Tachometer for left and right engine        | 20. Cylinder head temperature gauge for left and right engine                          |
| 6. Airspeed indicator                          | 21. Air temperature  |
| 7. Magnetic Compass                            | 22. Fuel gauge - rear tanks  |
| 8. Artificial Horizon                          | 23. Fuel gauge - auxiliary tank  |
| 9. Altimeter                                   | 24. Undercarriage position indicator:<br>green - down, red - up, no light - transition |
| 10. Turn and Bank indicator                    | 25. Left and Right engine throttle   |
| 11. Variometer                                 | 26. Left and Right side propeller pitch lever  |
| 12. Suction gauge                              | 27. Left and Right engine Supercharger lever:<br>down - stage 1, up - stage 2          |
| 13. Clock                                      | 28. Flaps lever  |
| 14. Fuel pressure for left and right engine    | 29. Cowl Flaps (Radiator) lever  |
| 15. Oil temp. for left and right engine        |  |

## 6 Romania

### 6.1 IAR-80 ('40)



The IAR-80 was strongly based on the Polish PZL P.24, which was built under license in Romania before the war. It was a capable fighter, with excellent manoeuvrability and very good cockpit forward visibility. It performed quite well in the defensive role. In total around 200 were built.

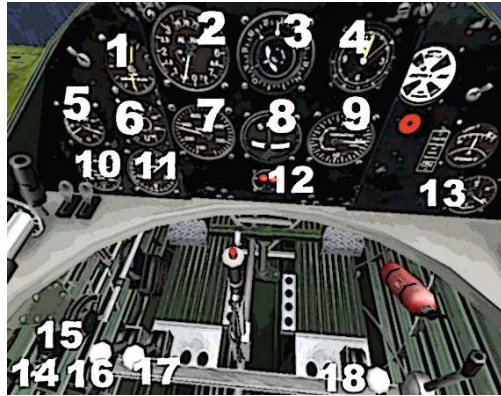
Maximum speed: *485km/h at sea level and 555km/h at 6900m. Service Ceiling: 10500m.*

**Tips:**

- ◊ Despite its great flight characteristics the IAR-80's weak armament makes it quite ineffective.
- ◊ It starts disintegrating at around 750km/h.

**Armament:**

IAR-80: wings - 4x7.62mm Browning FN (1000rpg/60sec)



- |                                    |  |
|------------------------------------|--|
| 1. Propeller pitch indicator       | 11. Tachometer   |
| 2. Altimeter                       | 12. Undercarriage position indicator:<br>green - down, red - up, no light - transition |
| 3. Repeater Compass                | 13. Fuel gauge   |
| 4. Clock                           | 14. Engine magnetos position   |
| 5. Fuel and oil pressure indicator | 15. Throttle   |
| 6. Oil temperature gauge           | 16. Flaps lever  |
| 7. Airspeed indicator              | 17. Gear lever   |
| 8. Turn and Bank indicator         | 18. Radiator lever   |
| 9. Variometer                      |  |
| 10. Manifold pressure gauge        |  |

### 6.2 IAR-81 ('40)



The IAR-81 was the fighter-bomber version of the IAR-80, although it was supposed to be a dive-bomber as an interim solution for the delay in the German Stuka deliveries to Romania. The IAR-81c had improved armament thanks to the delivery of the Mauser guns from Germany. During the campaign for Stalingrad they suffered heavy losses. In total around 200 of all variants were built.

Maximum speed: *480km/h at sea level and 545km/h at 7000m. Service Ceiling: 10500m.*

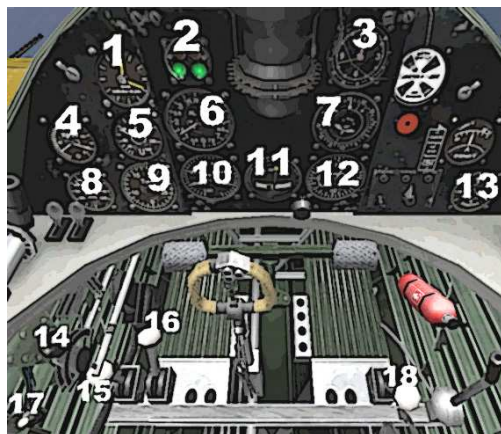
**Tips:**

- ◊ The IAR-81's very strong armament and good flight characteristics make it a worthy opponent.
- ◊ The IAR-81a starts disintegrating at about 750km/h and the 81c a little before that.

**Armament:**

IAR-81a: wings - 4x7.62mm Browning FN (1000rpg/60sec), wings - 2x13mm MG131(350rpg/25sec).

IAR-81c: wings - 4x7.62mm Browning FN (1000rpg/60sec), wings - 2x20mm MG151/20 (250rpg/20sec).



- |   |                              |
|---|------------------------------|
| 1. Propeller pitch indicator  | 10. Airspeed indicator       |
| 2. Undercarriage position indicator:<br>green - down, red - up, no light - transition | 11. Turn and Bank indicator  |
| 3. Clock  | 12. Variometer               |
| 4. Fuel and oil pressure indicator  | 13. Fuel gauge               |
| 5. Oil temperature gauge  | 14. Throttle                 |
| 6. Altimeter  | 15. Flaps lever              |
| 7. Repeater Compass   | 16. Gear lever               |
| 8. Manifold pressure gauge  | 17. Engine magnetos position |
| 9. Tachometer   | 18. Radiator lever           |

## 7 Italy

### 7.1 FIAT CR.42 “Falco” (‘38)

The CR.42 was the last (and supposedly the best) biplane fighter to be designed, built and flown operationally. Until then, there was still the belief in the Italian Air Force that the very high manoeuvrability of biplanes would give their pilots the upper hand in dogfights. In most cases the CR.42 suffered severe losses by the RAF. The last operations by CR.42 were made in May 1945.

Maximum speed: *343km/h at sea level and 430km/h at 5300m*. Turn time *17s at 1000m*

#### Tips:

- ◊ Avoid power dives; the CR.42 starts disintegrating at a little over 550km/h.
- ◊ The CR.42 and the Gloster Gladiator are supposed to be similar in performance. However, the Cr.42 is prone to spins, a weakness that the Gladiator can take advantage of.
- ◊ You can use 100% mixture till 4500m and 80% till 6200m before the black thick smoke.

#### Armament:

CR.42: nose - 2x12.7mm Breda SAFAT (400rpg/37sec).



1. Left Machine Gun Ammo
2. Manifold pressure gauge
3. Compass
4. Turn and Bank indicator
5. Altimeter
6. Fuel pressure gauge
7. Oil pressure gauge
8. Tachometer
9. Airspeed indicator
10. Variometer

11. Right Machine Gun Ammo
12. Engine magnetos position
13. Oil temperature gauge
14. Engine mixture:  
rear position - leaner mixture, front - richer
15. Throttle
16. Propeller pitch lever
17. Radiator lever
18. Fuel gauge
19. Clock

### 7.2 FIAT G.50 “Freccia” (‘38)

The G.50 was not a success story. Designed by Giuseppe Gabrielli, it started showing its tendency to spin even from the test flight of the prototype in 1937. It was first used for a few weeks in Spain towards the end of the Civil War and then in France, Belgium, Albania, Greece, Croatia, Libya etc. In some of these places the G.50 proved inadequate mainly due to its very limited range. It was generally outclassed considerably by the Gloster Gladiator and the Hawker Hurricane, and had some successes only when the Italians were wise enough to avoid facing enemy fighters. However, the Finns did have some considerable success with it against the USSR during the Continuation War (‘41-‘44).

Maximum speed: *390km/h at sea level and 440km/h at 5000m*. Turn time *17-18s at 1000m*.

#### Tips:

- ◊ Just like the I-16 and all other aircraft with carburetor engines, the G.50 is prone to engine starvings.
- ◊ When flying against contemporary aircraft, try to maintain higher altitude, since the G.50 has quite good zoom & boom capabilities. It is also surprisingly sturdy and in a steep dive it will start disintegrating at around 750km/h.
- ◊ You can use 100% mixture till 4500m and 80% till 6200m before the black thick smoke.

#### Armament:

G.50: nose - 2x12.7mm Breda SAFAT (300rpg/28sec).



1. Fuel pressure gauge
2. Oil pressure gauge
3. Tachometer
4. Altimeter
5. Airspeed indicator
6. Flaps lever
7. Gear lever
8. Manifold pressure gauge
9. Airspeed indicator
10. Turn and Bank indicator
11. Variometer

12. Oil temperature gauge
13. Cylinder head temperature
14. Left Machine Gun Ammo
15. Compass
16. Right Machine Gun Ammo
17. Undercarriage position indicator:  
green - down, red - up, no light - transition
18. Propeller pitch lever
19. Throttle
20. Mixture lever:  
rear position - leaner mixture, front - richer

## 8 Poland

### 8.1 PZL P.11c ('39)



The P.11 of the Panstowe Zaklady Lotnicze was one of the best aircraft in the world when it first flew in 1931. By the time the Germans invaded Poland, however, the P.11c was woefully outclassed by the Messerschmitts. Still, the Polish pilots fought bravely, flew the aircraft to its limits and achieved considerable successes against the Luftwaffe. In total 175 units were built.

Max. speed: *275km/h at sea level* and *370km/h at 4500m*. *Stalling speed 120km/h*.

**Tips:**

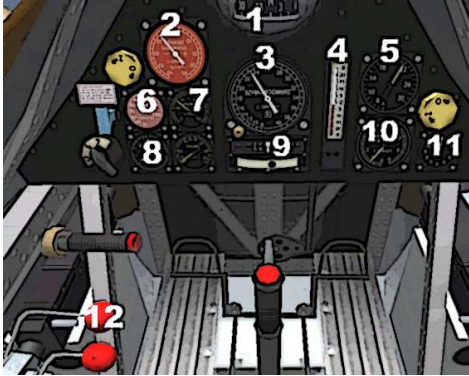
◊ Make sure you are in gunsight view (default: shift+f1). Otherwise the crosshair is misleading.

◊ The P.11c stalls at about 120km/h.

◊ It has fixed-pitch propeller.

**Armament:**

fuselage - 2x7.92mm PWU wz.33 (750rpg/45sec), wings - 2x7.92mm PWU wz.33 (350rpg/18sec).



- |                             |                            |
|-----------------------------|----------------------------|
| 1. Magnetic Compass         | 7. Fuel pressure gauge     |
| 2. Manifold pressure gauge  | 8. Oil temperature gauge   |
| 3. Airspeed indicator       | 9. Turn and Bank indicator |
| 4. Variometer               | 10. Altimeter              |
| 5. Tachometer               | 11. Clock                  |
| 6. Engine temperature gauge | 12. Throttle               |

## Complex Engine Management

### Single-Engine Management

**Supercharger** Compresses the fuel/air mixture in the engine. Most planes with two-stage manual control of the Supercharger have to switch stage at around 3000m. If you switch to stage 2 and there is no increase in the RPMs then switch back to stage 1 until you have to climb higher.

**Fuel Mixture** The lower the altitude the richer the mixture needs to be. The higher the leaner, e.g. at very high altitudes thick black smoke coming from your engine is indication that the mixture needs leaning. Aircraft with Supercharger generally do not need leaning the mixture at high altitudes. For take-off and landing the suggested value is 100 or 120%. Enriching the mixture to 120% at very low altitudes (<300m) may also provide additional speed, but should be quickly leaned back to 100% when over that altitude.

**WEP** Many aircraft have War Emergency Power, which acts as a boost to the engine for a short period of time. Such boosts generally cause faster overheating and may damage the engine if used for too long or incorrectly (e.g. if the MG50 of the BF109K-4 is switched on/off at high RPMs it will instantly damage the engine). Depending on the aircraft, WEP is activated either by exceeding 100% throttle or by pressing the corresponding key (default “w”).

**Radiator** Cools the engine. You can switch between *closed* -> 2 -> 4 -> 6 -> 8 -> *open* by pressing the “Cowl Flaps” button. The more open the radiator the bigger the drag (lower speed), the less the overheating. In some planes you can switch the Radiator to “auto” (after “open”).

**Prop Pitch** The angle at which the propeller blade “bites” into the air; its angle of attack. In the game it works more like a RPM governor. Decrease the Prop Pitch percentage to decrease the RPMs and accelerate faster in a dive. The Propeller stops rotating with Engine Off and Prop Pitch 0%, which can be useful for a quicker emergency landing.

### Multiple-Engine Management

**Take-off** Select each engine separately and start it. Then, select all engines to have throttle control of all of them.

**Engine fire** Select it, switch it off and press the “Fire extinguisher” button several times.

**Engine does not run** Try starting it by pressing the “Feather Prop” button.

### Some useful conf.ini lines

**SubTitlesLines=3** Edit this one to show more than 1 line of subtitles (section: [game]).

**eventlogkeep=1** Edit this line to make sure the event log of the game is not emptied every time you start a new mission. Useful for those who keep personal flight logs (section: [game]).

**CampaignLength=Short** Add this line in the [DGen] section to decrease the number of missions per campaign from over 100 to something like 20-25. All options: VeryShort, Short, Medium, Long, VeryLong (default).

**MissionDistance=30** Add this line in the [DGen] section to avoid very long distance missions (if that is possible depending on the map and the targets). Accepted range is 10 to 200 (km).



## Instruments

**Airspeed indicator** The *Indicated Airspeed (IAS)*. The True Airspeed (TAS) is always higher than the IAS and that difference increases with the altitude. In kilometers per hour, miles per hour or knots, where 1 mile = 1.61 km (310mph = 500kph approx.) and 1 knot (nautical miles/hour) = 1.151 statute miles/hour (500kph = 270 knots). Generally Russian and German planes use Kilometers per hour, British use knots and American planes use Miles per hour and knots.

**Altimeter** Tells the *altitude* by sensing air pressure. 1 km = 3280 feet (3km = 10000ft approx.).

**Höhe über Grund** Tells the *height over the ground* (only in BF110G2 and G4M1).

**Artificial Horizon** Also known as Attitude Indicator(AI). Shows the *angle of the nose and the wings* of the plane.

**Repeater Compass** Gives the *direction of the next waypoint*. When that is reached it automatically points towards the next one.

**Magnetic Compass** A typical *compass*.

**Turn and Bank indicator** Shows both the *rate and coordination of the turn*. The ball shows the actual direction and is one of the main criteria for correct trim setting.

**Variometer** Shows the *rate of descent or climb*. Also known as Rate-of-Climb indicator, Vertical Speed indicator (VSI), or Vertical Velocity indicator (VVI). It can be in feet per minute (ft/min), knots (nautical miles per hour) or metres per second (m/s) depending on the country or type of aircraft.

**Tachometer** Shows the *RPMs of the engine*.

**Coolant temperature** When over a marked limit the engine needs cooling.

**Oil temperature** Shows whether the engine is overheating.

**Oil pressure** Strange behaviour of the oil pressure indicates a damaged engine.

**Fuel Gauge** When you run out of *fuel* you 'd better have enough altitude to glide to the nearest airfield :).

**Undercarriage position indicator** Shows whether your *gear* is up, down or in transition.

## Thanks

- For most of the cockpits' instruments and ammo information i consulted <http://www.partizanska-eskadrila.com/reference/cockpit.htm> of Partizanska Eskadrila's Pe\_Mosor.
- LEBillfish provided lots of tips for the Japanese planes.
- Numerous members of the official Pacific Fighters forum contributed to this guide by spotting mistakes and offering their tips in 25 relative threads.

22 October 2005