



DCS GUIDE FW190-D9 DORA

By Chuck

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The **Focke-Wulf Fw190** *Würger* (English: Shrike) is a German single-seat, single-engine fighter aircraft designed by Kurt Tank in the late 1930s and widely used during World War II. Along with its well-known counterpart, the Messerschmitt Bf 109, the Fw190 became the backbone of the Luftwaffe's Jagdwaffe (Fighter Force). The twin-row BMW 801 radial engine that powered most operational versions enabled the Fw190 to lift larger loads than the Bf 109, allowing its use as a day fighter, fighter-bomber, ground-attack aircraft and, to a lesser degree, night fighter.

The Fw190A series' performance decreased at high altitudes (usually 6,000 m (20,000 ft) and above), which reduced its effectiveness as a high-altitude interceptor. From the Fw190's inception, there had been ongoing efforts to address this with a turbosupercharged BMW 801 in the B model, the much longer-nosed C model with efforts to also turbocharge its chosen Daimler-Benz DB 603 inverted V12 powerplant, and the similarly long-nosed D model with the Junkers Jumo 213. Problems with the turbocharger installations on the -B and -C subtypes meant only the D model would see service, entering service in September 1944. While these "long nose" versions gave them parity with Allied opponents, it arrived far too late in the war to have any real effect. The D-9 series was rarely used against heavy-bomber raids, as the circumstances of the war in late 1944 meant that fighter-versus-fighter combat and ground attack missions took priority. This model was the basis for the follow-on Focke-Wulf Ta 152 aircraft. The Fw190 was well-liked by its pilots. Some of the Luftwaffe's most successful fighter aces claimed a great many of their kills while flying it, including Otto Kittel, Walter Nowotny and Erich Rudorffer.

Kurt Tank wanted something more than an aircraft only built for speed. He outlined his design philosophy as: *“The Messerschmitt 109 [sic] and the British Spitfire, the two fastest fighters in world at the time we began work on the Fw 190, could both be summed up as a very large engine on the front of the smallest possible airframe; in each case armament had been added almost as an afterthought. These designs, both of which admittedly proved successful, could be likened to racehorses: given the right amount of pampering and easy course, they could outrun anything. But the moment the going became tough they were liable to falter. During World War I, I served in the cavalry and in the infantry. I had seen the harsh conditions under which military equipment had to work in wartime. I felt sure that a quite different breed of fighter would also have a place in any future conflict: one that could operate from ill-prepared front-line airfields; one that could be flown and maintained by men who had received only short training; and one that could absorb a reasonable amount of battle damage and still get back. This was the background thinking behind the Focke-Wulf 190; it was not to be a racehorse but a Dienstpferd, a cavalry horse.”*

In DCS, I realized after a couple of sorties in the FW190 that Kurt was indeed quite right: the ergonomic cockpit layout is a refreshing change from the cluttered interior of the 109 and you can clearly see that the Dora was built as a functional, high-powered war machine. You inevitably feel like you are sitting in a flying tank. And this feeling is pretty awesome.



Kurt Tank
(1898-1983)

CONTROL	FUNCTION
COMM PUSH TO TALK	ALLOWS YOU TO USE RADIO MENU WHILE FLYING
FLAPS LANDING	DEPLOYS YOUR FLAPS IN LANDING POSITION
FLAPS UP	RETRACTS YOUR FLAPS
GUN FIRE	FIRES YOUR 13MM MG 131 AND YOUR 20MM MG 151/20E CANNONS
LANDING GEAR UP/DOWN	RAISES OR DEPLOYS YOUR LANDING GEAR
RADIATOR FLAPS OPEN	THESE RADIATOR CONTROLS ARE USEFUL IN SITUATIONS WHERE YOU WILL NEED TO COOL YOUR ENGINE QUICKLY. HOWEVER, THEY ARE AUTOMATIC BY DEFAULT.
RADIATOR FLAPS CLOSE	
STARTER POWER	STARTER SWITCH. MAP IT TO SOMETHING YOU CAN HOLD OR TOGGLE.
TRIM ELEVATOR DOWN/UP	ELEVATOR TRIM CONTROL
GUNSIGHT RANGE TO TARGET DECREASE/INCREASE	DECREASES/INCREASES YOUR GUNSIGHT RETICLE RANGE
GUNSIGHT TARGET SPAN DECREASE/INCREASE	DECREASES/INCREASES YOUR GUNSIGHT'S TARGET WINGSPAN
MW50 SWITCH	INJECTS WATER-METHANOL, INCREASING MANIFOLD PRESSURE. USE WITH CAUTION.
WEAPON RELEASE	THIS KEY WILL ALLOW YOU TO RELEASE YOUR BOMBS AND ROCKETS.
ZOOM IN SLOW	ALLOWS YOU TO ZOOM IN
ZOOM OUT SLOW	ALLOWS YOU TO ZOOM OUT

OPTIONS X

SYSTEM **CONTROLS** GAMEPLAY AUDIO MISC. SPECIAL VR

Fw 190 D-9 Sim All Clear category Save profile as Load profile

Action	Category	Keyboard	Saitek Pro Flight Comb	Throttle - HOTAS Wart	Joystick - HOTAS Wart
Altimeter Pressure Decrease	Front Dash	LCtrl + P			
Altimeter Pressure Increase	Front Dash	LShift + P			
Ammo counter 1 Decrease	Weapon System	LAlt + 1			
Ammo counter 1 Increase	Weapon System	LAlt + LWin + 1			
Ammo counter 2 Decrease	Weapon System	LAlt + 2			
Ammo counter 2 Increase	Weapon System	LAlt + LWin + 2			
Ammo counter 3 Decrease	Weapon System	LAlt + 3			
Ammo counter 3 Increase	Weapon System	LAlt + LWin + 3			
Ammo counter 4 Decrease	Weapon System	LAlt + 4			
Ammo counter 4 Increase	Weapon System	LAlt + LWin + 4			
Bailout	Systems	LCtrl + E			
Bomb Emergency Release	Weapon System	LCtrl + R			
Bomb fusing selector Left	Weapon System	LShift + B			
Bomb fusing selector OFF	Weapon System	LCtrl + 3			
Bomb fusing selector Right	Weapon System	LCtrl + B			
Bomb fusing selector dive MV	Weapon System	LCtrl + 2			
Bomb fusing selector dive OV	Weapon System	LCtrl + 1			
Bomb fusing selector level MV	Weapon System	LCtrl + 4			
Bomb fusing selector level OV	Weapon System	LCtrl + 5			
Briefing window	General	LAlt + B			
CB Auxilliary Tank Pump Off	Electric System	RCtrl + RWin + 4			
CB Auxilliary Tank Pump On	Electric System	RWin + 4			
CB Battery Off	Electric System	LCtrl + LWin + 8			
CB Battery On	Electric System	LWin + 8			
CB Cover	Electric System	RWin + C			

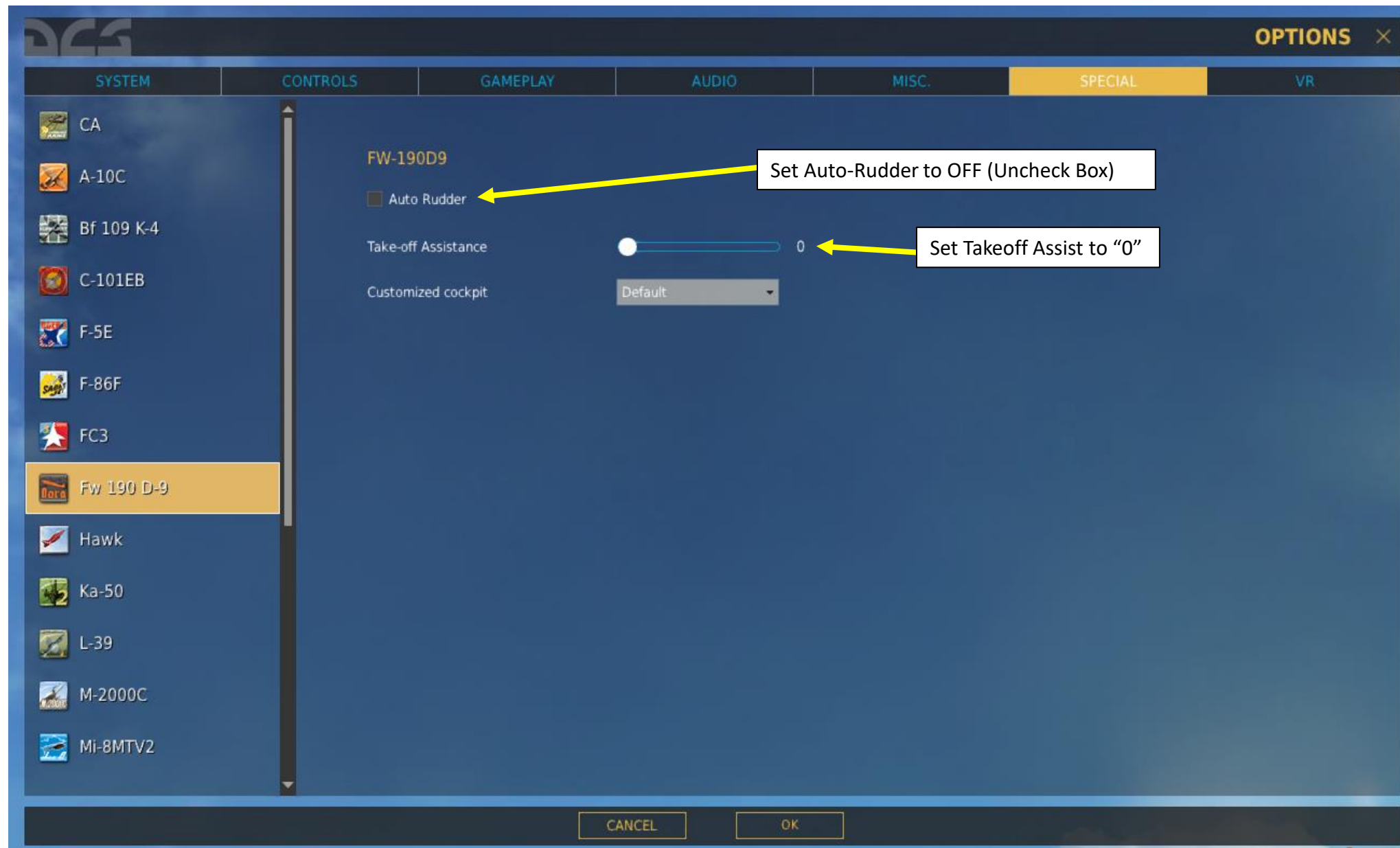
Modifiers Add Clear Default **Axis Assign** Axis Tune FF Tune Make HTML

CANCEL OK

To assign an axis, click on "AXIS ASSIGN". You can also select "AXIS COMMANDS" in the upper scrolling menu.

To modify curves and sensitivities of axes, click on the axis you want to modify and then click on "AXIS TUNE".

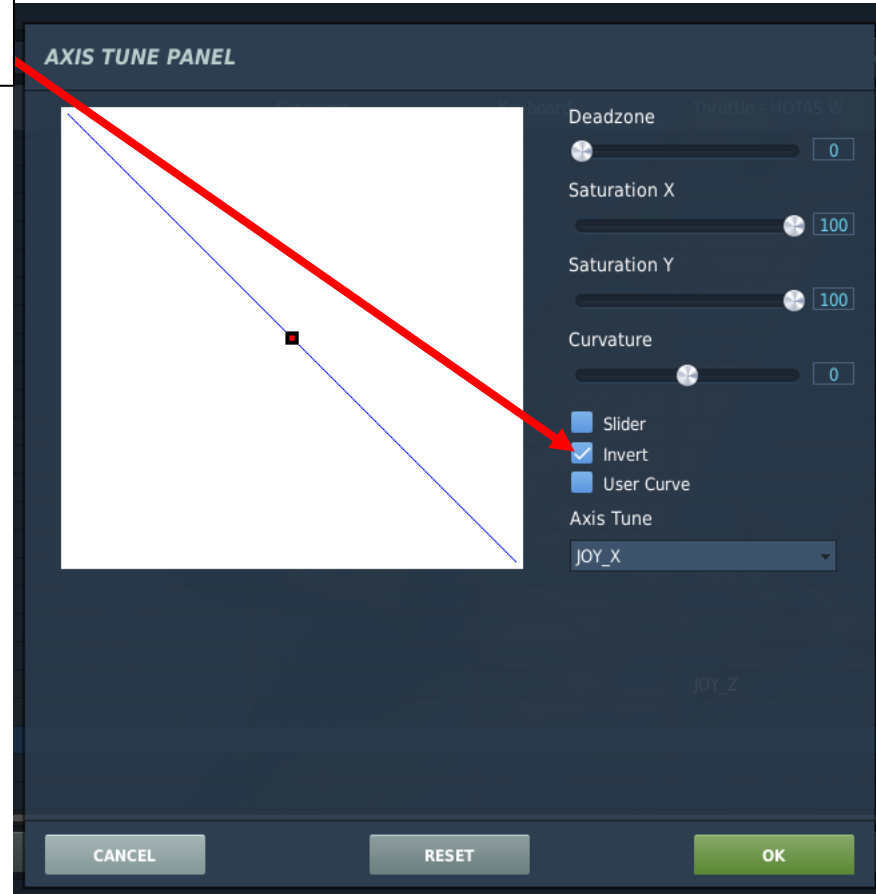
In the “Special” menu in Options, select the FW190 D-9 menu. Make sure to have Takeoff Assist set to “0” (turned off). By default it is set to 100 (ON). This will cause you to crash and burn inexplicably during takeoff. Also uncheck the Auto-Rudder box.



Bind the following axes:

- PITCH, ROLL, RUDDER (DEADZONE AT 0, SATURATION X AT 100, SATURATION Y AT 100, CURVATURE AT 0)
- THROTTLE – CONTROLS ATA/ MANIFOLD PRESSURE / BOOST
- WHEEL BRAKE LEFT
- WHEEL BRAKE RIGHT

When setting wheel brake axis, the axis is not set to “Invert” by default. You need to click on “Invert” in the “Axis Tune” menu” for each wheel brake.



PART 3 - COCKPIT & GAUGES



Tip: Pilot body can be toggled ON/OFF with “RSHIFT+P”



Canopy Jettison Emergency Handle

Emergency Oxygen Valve

- V350 - Flaps, Trimmer & Artificial Horizon Power Circuit Breaker
- E16 - Landing Gear (*Fahrwerk Antrieb*) Power Circuit Breaker
- D1 - Pitot Heat Power (*Heizung*) Circuit Breaker
- F211 - FuG 25A (IFF, Identify-Friend-or-Foe) Power Circuit Breaker
- F136 - FuG 16ZY Radio Power (*FT Anlage*) Circuit Breaker
- V24 - Instrument Lights, Gunsight, Indicators, Compass & Starter Power Circuit Breaker
- A4 - Engine Generator Circuit Breaker
- A6 - Battery (*Sammler*) Circuit Breaker

Note: Black buttons (circuit breaker) power the system when pressed IN, red buttons unpower the system when pressed IN.

Clock

Starter Switch Cover

C1 Navigation Lights (*Kennlichter*) Circuit Breaker

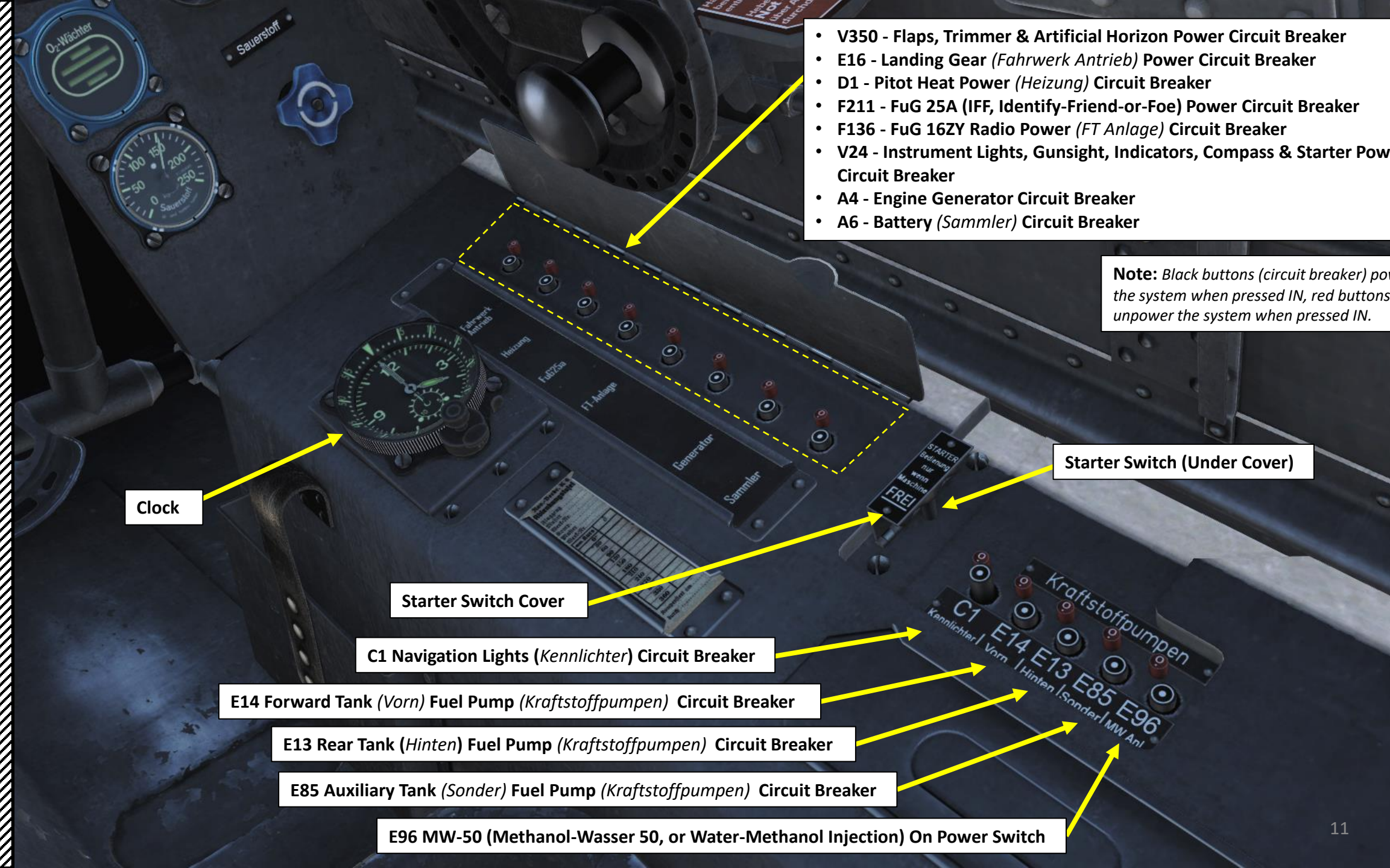
E14 Forward Tank (*Vorn*) Fuel Pump (*Kraftstoffpumpen*) Circuit Breaker

E13 Rear Tank (*Hinten*) Fuel Pump (*Kraftstoffpumpen*) Circuit Breaker

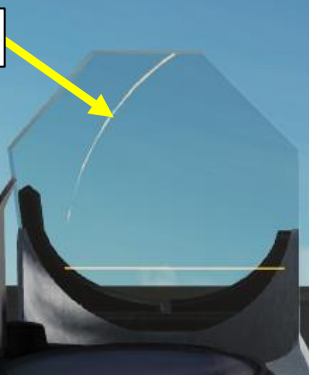
E85 Auxiliary Tank (*Sonder*) Fuel Pump (*Kraftstoffpumpen*) Circuit Breaker

E96 MW-50 (Methanol-Wasser 50, or Water-Methanol Injection) On Power Switch

Starter Switch (Under Cover)



Gunsight



Rumpf Rumpf Flügel



Russische Jäger	100	Moskito	165
Spitfire	112	Beaufighter	177
Mustang	113	Halifax	300
Hurricane	122	Lancaster	300
Thunderbolt	134	Boeing	316
Lightning	148	Liberator	335

Target Range Scale (m)



EZ42 Gunsight Gyro Power Switch



MG-151 Cannon Breechblock Status Signal Lamp
 Illuminated: Open
 Extinguished: Closed
 Lamp flickering when firing the weapon means the breechblock mechanism operates properly. If lamp remains extinguished or illuminated when trigger is pressed, a weapon malfunction has occurred.

Fuselage-Mounted (Rumpf) Gun Power Light
 Illuminated = Powered On

Wing-Mounted (Flügel) Gun Power Light
 Illuminated = Powered On

Master Arm Safety I Switch
 UP: ON / DOWN : OFF

MG-151 Cannon Ammunition Counter

Russische Jäger	100	Moskito	16,5
Spitfire	112	Beaufighter	17,7
Mustang	113	Halifax	30,0
Hurricane	122	Lancaster	30,0
Thunderbolt	134	Boeing	31,6
Lightning			

Master Arm Safety II Switch
 UP: ON / DOWN : OFF

MG-151 Cannon Ammunition Counter

Target Wingspan Scale (m)

Target Wingspan Setting Knob

MG-131 Machinegun Ammunition Counter Setting knob

MG-131 Machinegun Ammunition Counter Setting knob

MG-151 Cannon Ammunition Counter Setting knob

Airspeed Indicator (km/h)



AFN-2 Homing Indicator



Supercharger Pressure Gauge (ATA)
Similar to Boost or Manifold Pressure



Repeater Compass



Engine RPM/Umin x100



Artificial Horizon and Turn & Bank Indicator



Variometer (Climb/Sink Rate in m/s)



Altimeter (km)

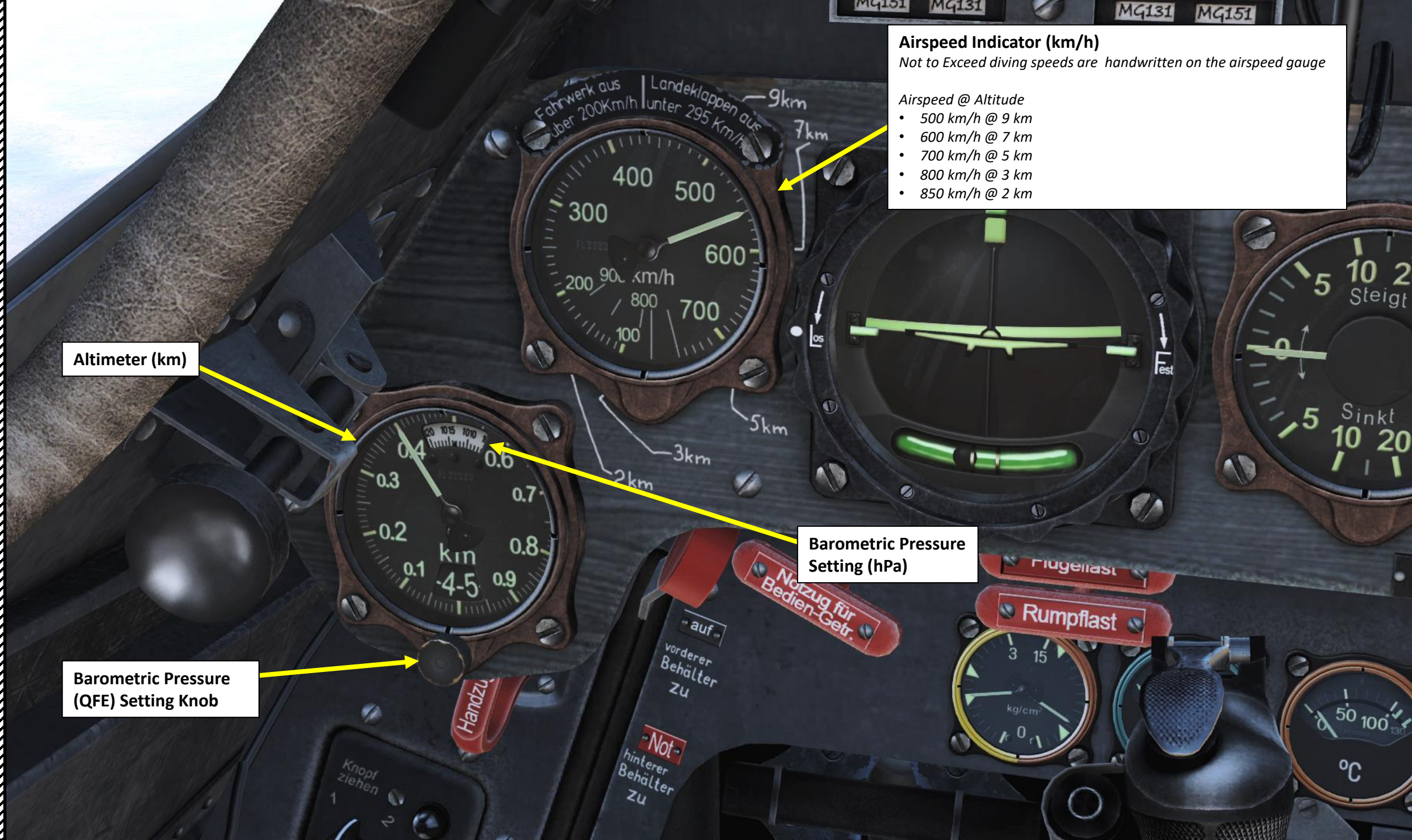
Barometric Pressure (QFE) Setting Knob

Barometric Pressure Setting (hPa)

Airspeed Indicator (km/h)
Not to Exceed diving speeds are handwritten on the airspeed gauge

Airspeed @ Altitude

- 500 km/h @ 9 km
- 600 km/h @ 7 km
- 700 km/h @ 5 km
- 800 km/h @ 3 km
- 850 km/h @ 2 km





Manual Radiator Flap Control

Achtung
Kompaßeinstellung verstellt sich

Kühlerklappen Auf Auf Mischeranla Zu-Scheibenspül Auf

Flügelast
Rumpflast

Fuel Pressure Indicator (kg/cm²)

Oil Pressure Indicator (kg/cm²)

Coolant Temperature Indicator (deg C)

Oil Temperature Indicator (deg C)

MW-50 (Methanol-Wasser 50, or Water-Methanol Injection) Pressure Indicator (kg/cm²)

Oxygen Flow Indicator

Oxygen Flow Valve Control

Oxygen Pressure Indicator (kg/cm²)

Achtung
Kompaßeinstellring verstellt sich

Auf Klappen
Auf Mischanlage
Auf Scheibenspül

Fuel Gauge (x100 Liters)
Vorn/Front Tank Capacity: 232 L (172 kg)
Hinten/Rear Tank Capacity: 292 L (216 kg)
Total Capacity: 524 L (388 kg)

Fuel Gauge Indication Selector
Left: Vorn = Front
Middle: No Tank Selected
Right: Hinten = Rear

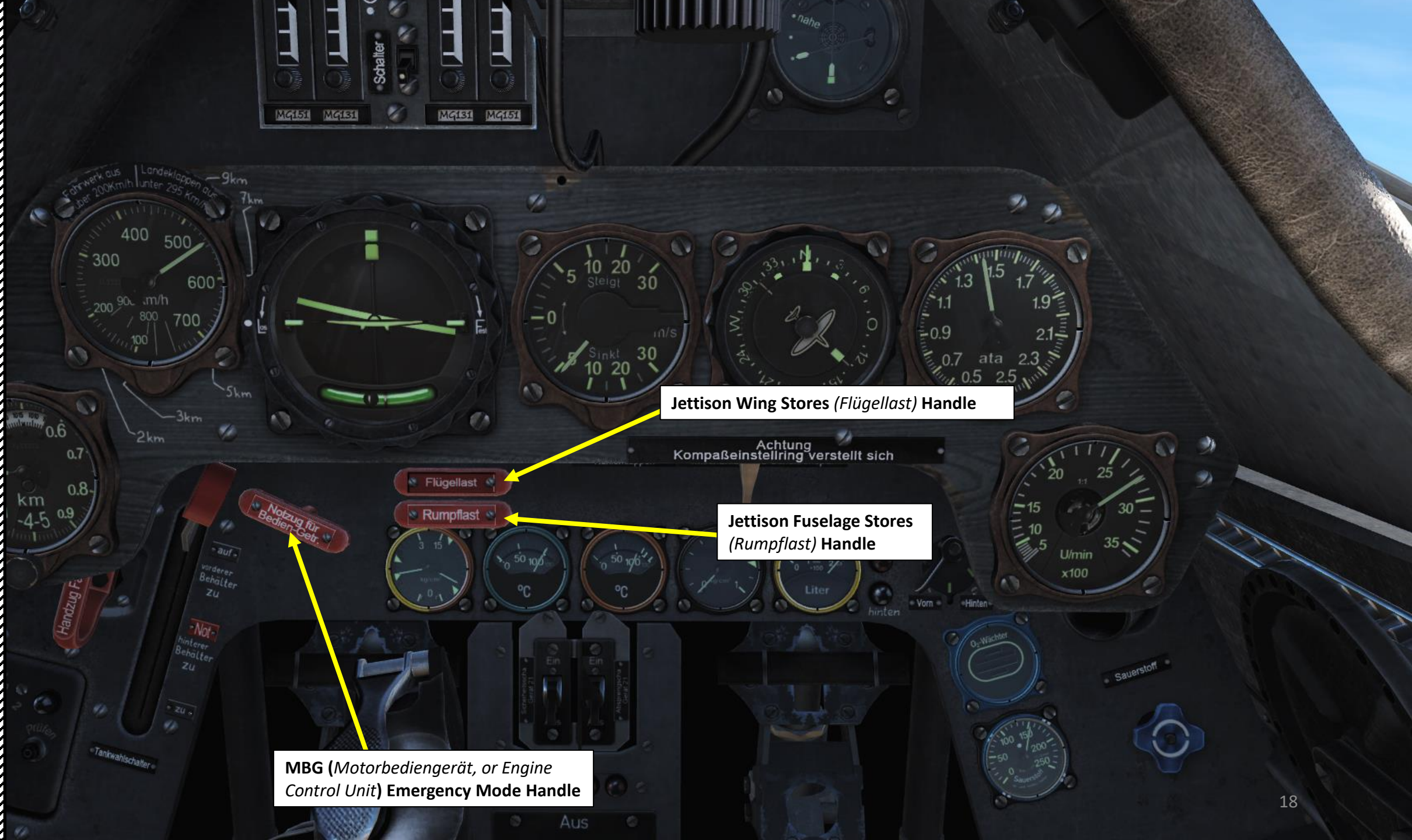
Note: If an external drop tank is installed, selector should be set to "HINTEN" (Rear) since drop tanks feed into the rear tank.



Front (vorn) Tank FUEL LOW warning light
Illuminates when below 80 Liters

Rear (hinten) Tank FUEL LOW warning light
Illuminates when below 10 Liters





Jettison Wing Stores (*Flügelast*) Handle

Jettison Fuselage Stores (*Rumpflast*) Handle

MBG (*Motorbediengerät, or Engine Control Unit*) Emergency Mode Handle

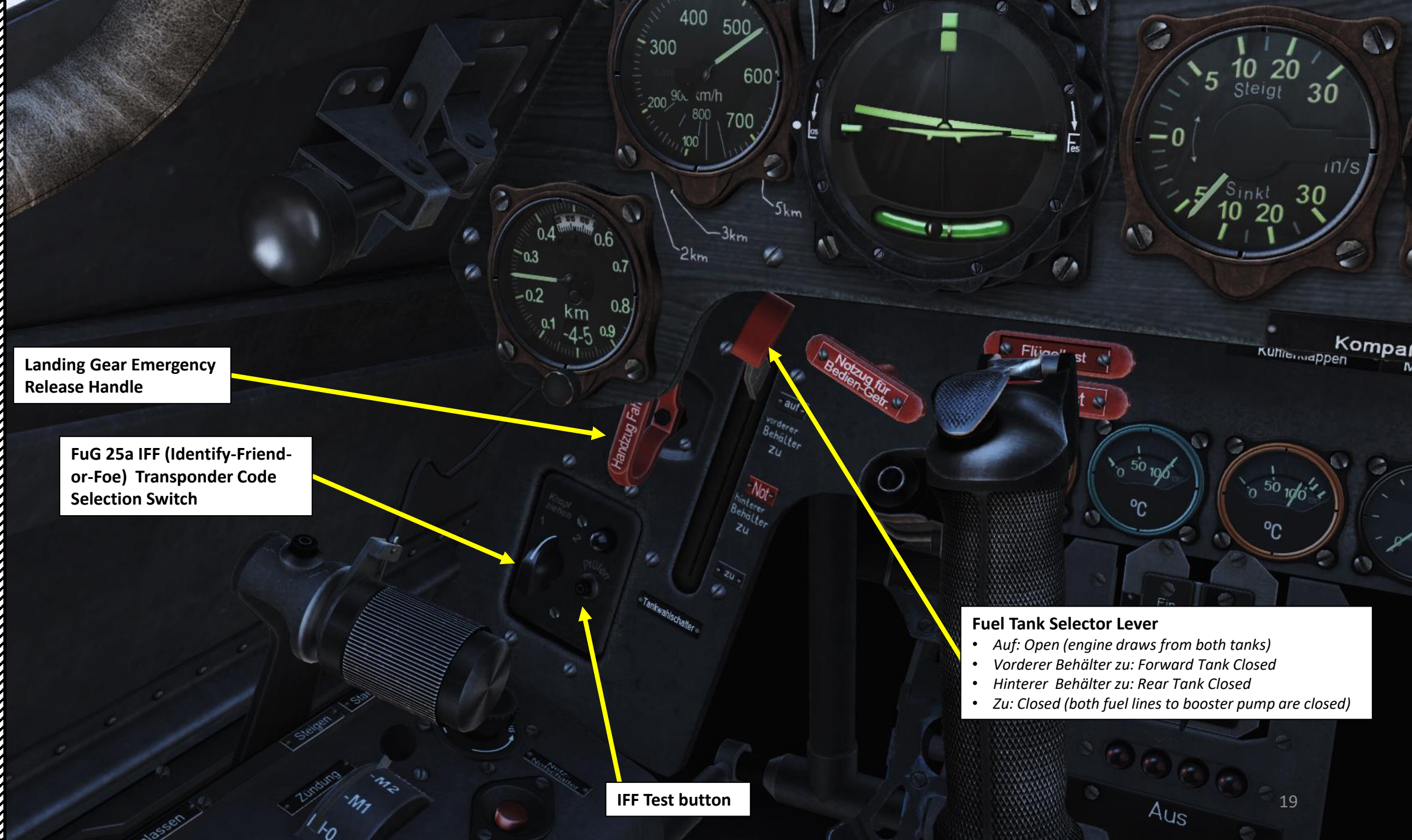
Landing Gear Emergency Release Handle

FuG 25a IFF (Identify-Friend-or-Foe) Transponder Code Selection Switch

IFF Test button

Fuel Tank Selector Lever

- *Auf:* Open (engine draws from both tanks)
- *Vorderer Behälter zu:* Forward Tank Closed
- *Hinterer Behälter zu:* Rear Tank Closed
- *Zu:* Closed (both fuel lines to booster pump are closed)



Throttle Detent Positions
Aus: OFF
Anlassen: Engine Start
Steigen: Climb
Start: Takeoff

Push-to-Talk Switch

Flaps (Landeklappen) Control Buttons
Ein: Flaps retracted
Start: Takeoff Position (10 deg)
Aus: Flaps Deployed (60 deg)

Instruments Lights Brightness Control Knob

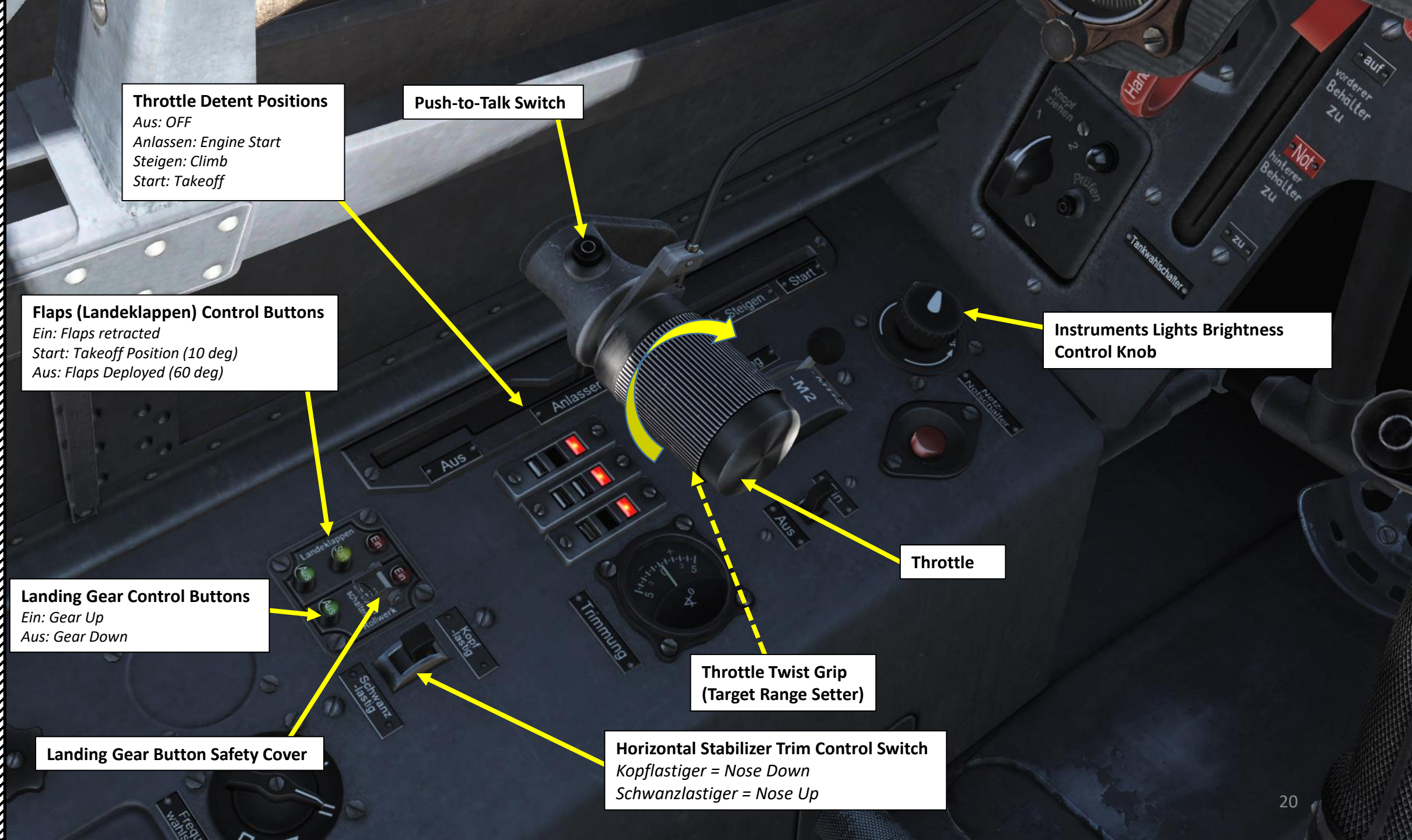
Landing Gear Control Buttons
Ein: Gear Up
Aus: Gear Down

Throttle

Landing Gear Button Safety Cover

Throttle Twist Grip (Target Range Setter)

Horizontal Stabilizer Trim Control Switch
Kopflastiger = Nose Down
Schwanzlastiger = Nose Up





Throttle Lock
Down: Locked
Up: Unlocked

MW-B4 Selector Handle (Not Functional)

Primer Pump Handle

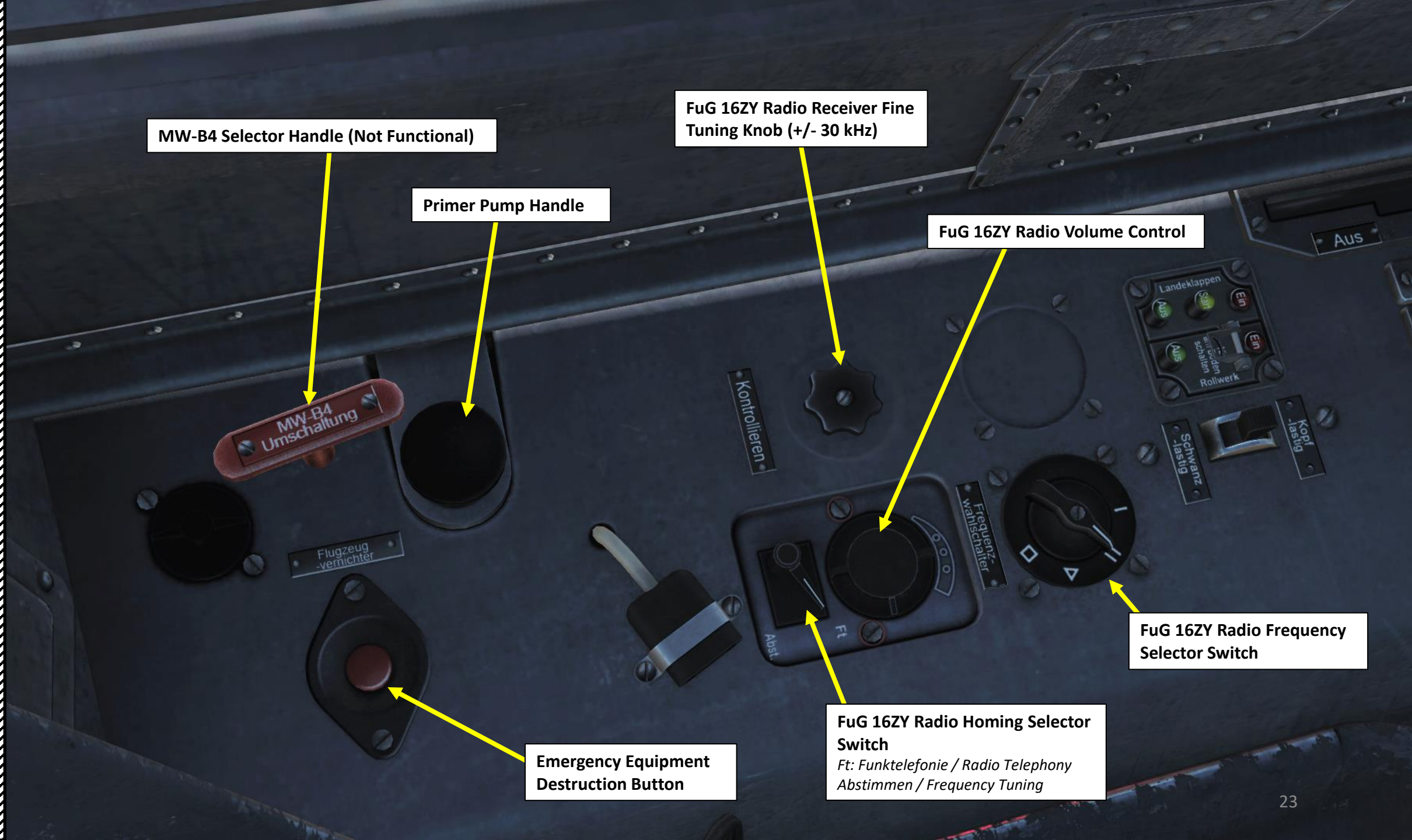
FuG 16ZY Radio Receiver Fine Tuning Knob (+/- 30 kHz)

FuG 16ZY Radio Volume Control

FuG 16ZY Radio Frequency Selector Switch

FuG 16ZY Radio Homing Selector Switch
*Ft: Funktelefonie / Radio Telephony
Abstimmen / Frequency Tuning*

Emergency Equipment Destruction Button



Rocket Arming Switch (SICHERHEITSSCHA. GERÄT 21)

Ein: Armed
Aus: Disarmed

Sicherheits-scha.
Gerät 21

Ein

Aus

Abspreng-scha.
Gerät 21

Ein

Aus

Rocket Jettison Switch (ABSPRENGSCHA. GERÄT 21)

Ein: Armed
Aus: Disarmed

Bomb Loaded Lights

Bomb Release Mode Selector Switch

- Left side: Dive Bombing (Sturz)
 - MV: Mit Verzögerung (with delay)
 - OV: Ohne Verzögerung (without delay)
- Right side: Level Bombing (Wagerecht)
 - MV: Mit Verzögerung (with delay)
 - OV: Ohne Verzögerung (without delay)
- Middle: Aus (Disarmed)

Aus

mv

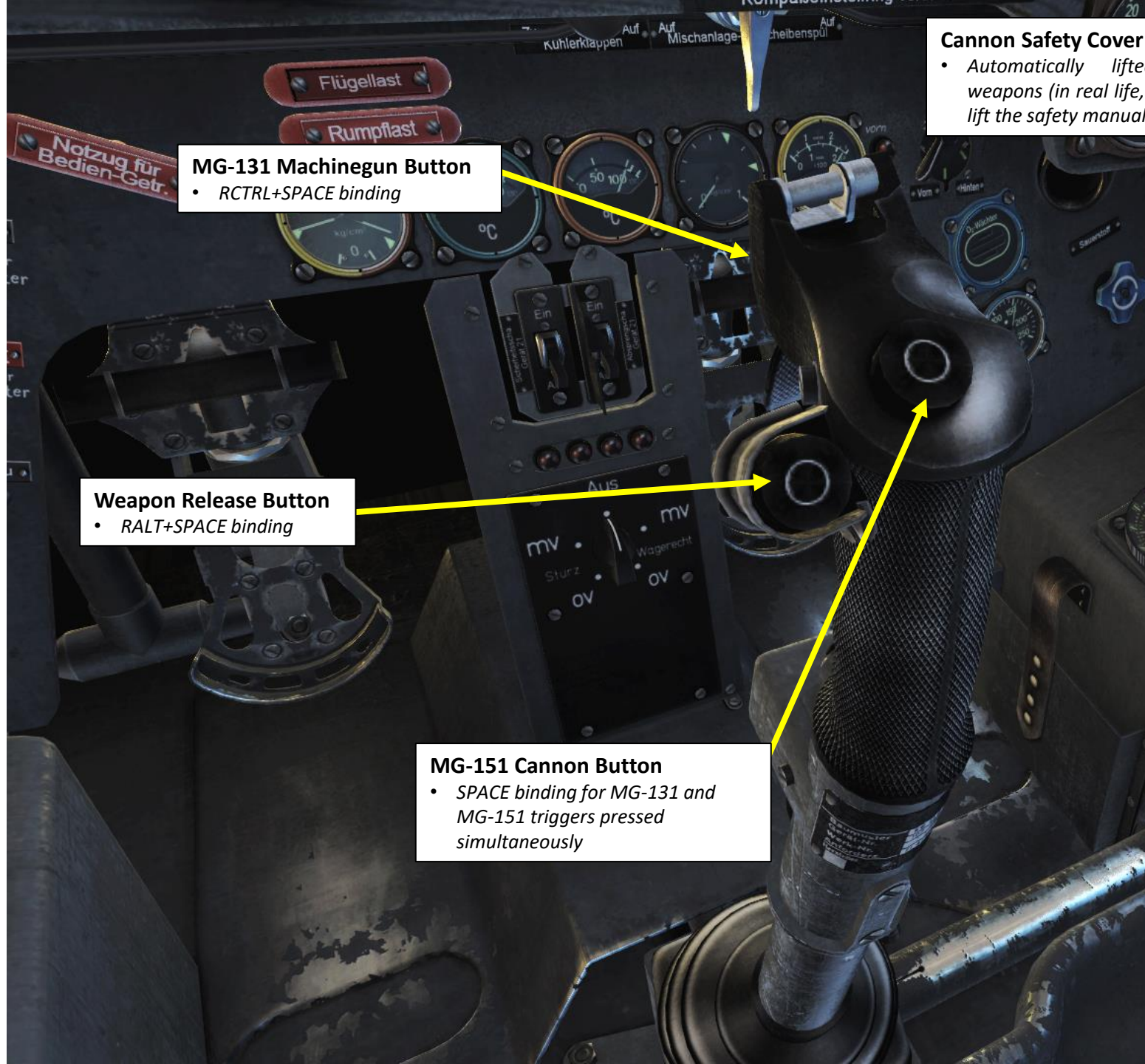
Sturz

OV



Wagerecht

OV



MG-131 Machinegun Button
• *RCTRL+SPACE* binding

Weapon Release Button
• *RALT+SPACE* binding

MG-151 Cannon Button
• *SPACE* binding for MG-131 and MG-151 triggers pressed simultaneously

Cannon Safety Cover
• *Automatically lifted when firing weapons (in real life, the pilot needs to lift the safety manually)*



Achtung!

**Haubenabwurf
durch Sprengladung**

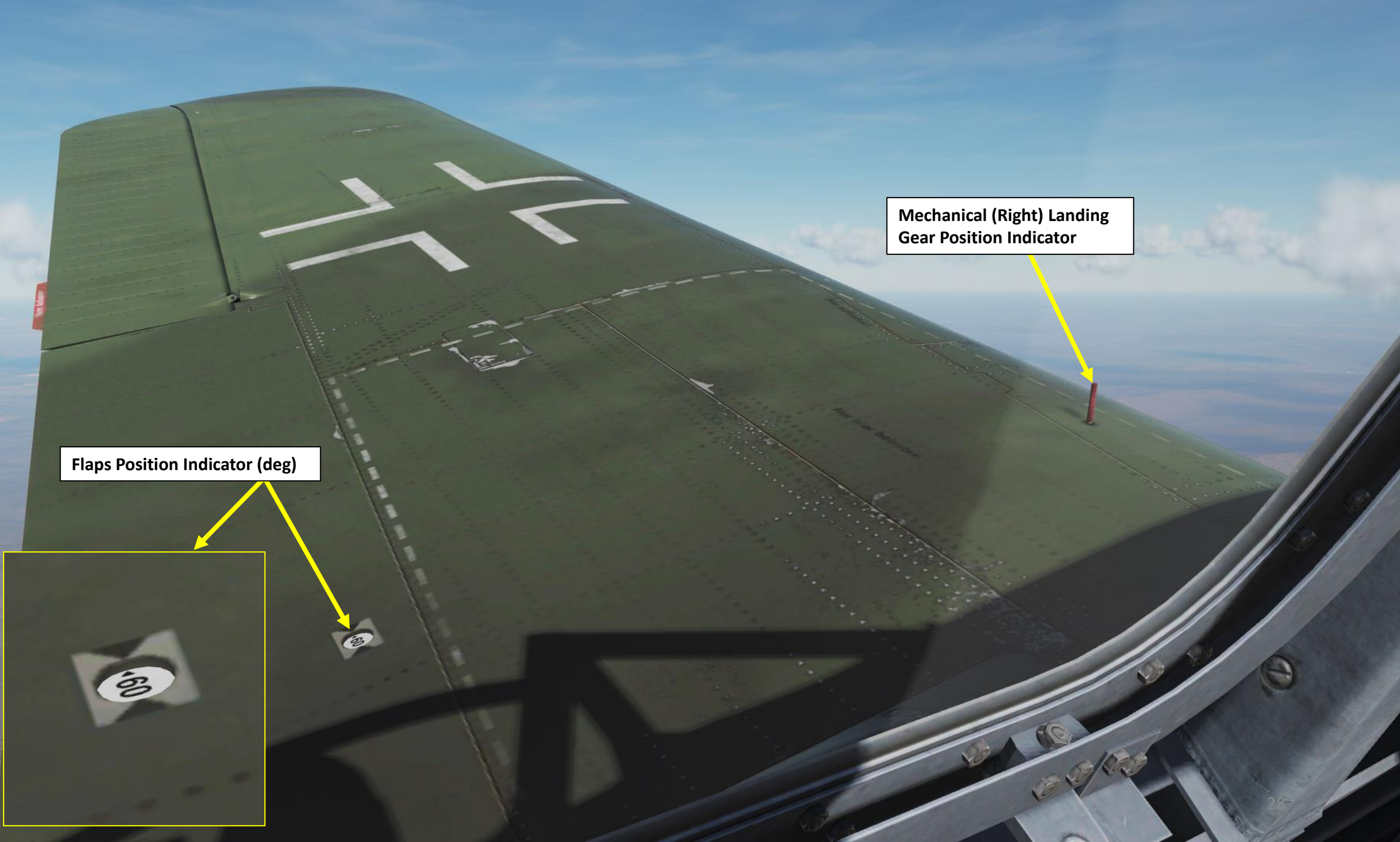
Abwurfhebel nicht berühren. Im Probefall
vorherige Einstellung des Schlagbolzens.



Red Navigation Light

White Navigation Light

Green Navigation Light



Flaps Position Indicator (deg)

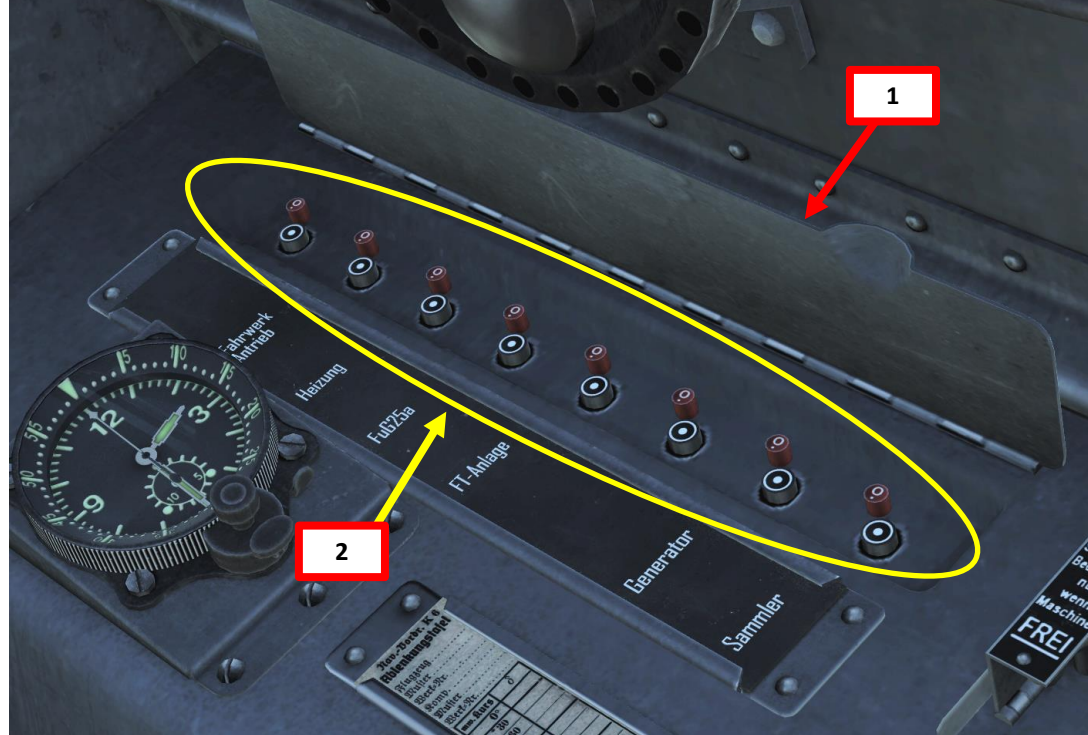


Mechanical (Right) Landing Gear Position Indicator



PRE-START

1. Click on the Circuit Breaker panel to open it
2. All forward circuit breakers – ON (IN)
3. Check fuel in Rear (*Hinten*) and Forward (*Vorn*) tanks
4. Oxygen Valve – OPEN



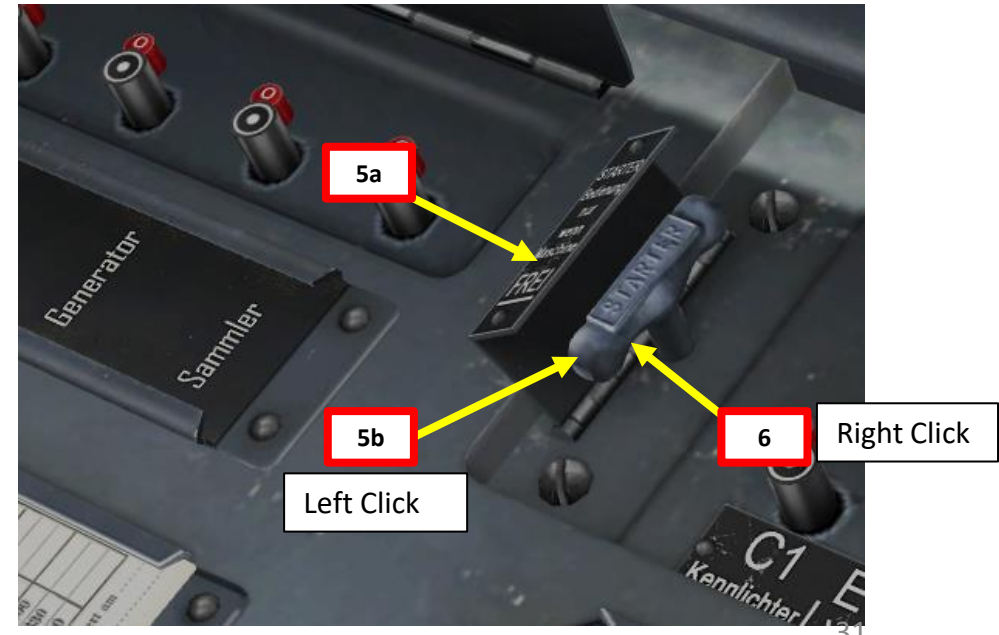
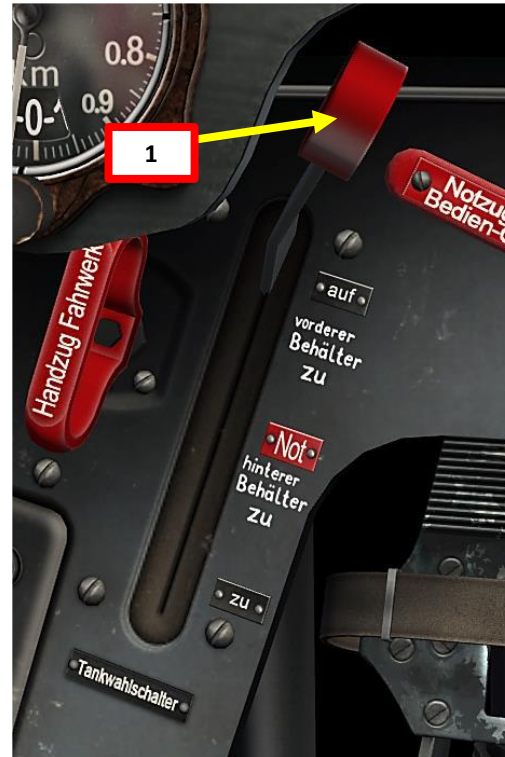
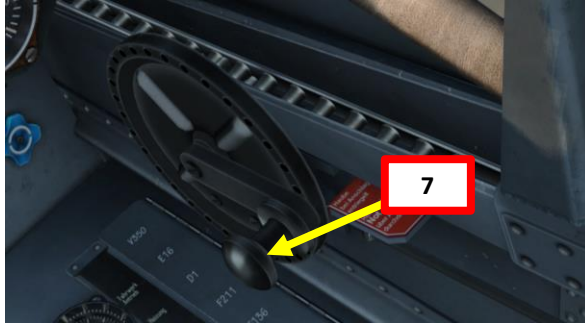
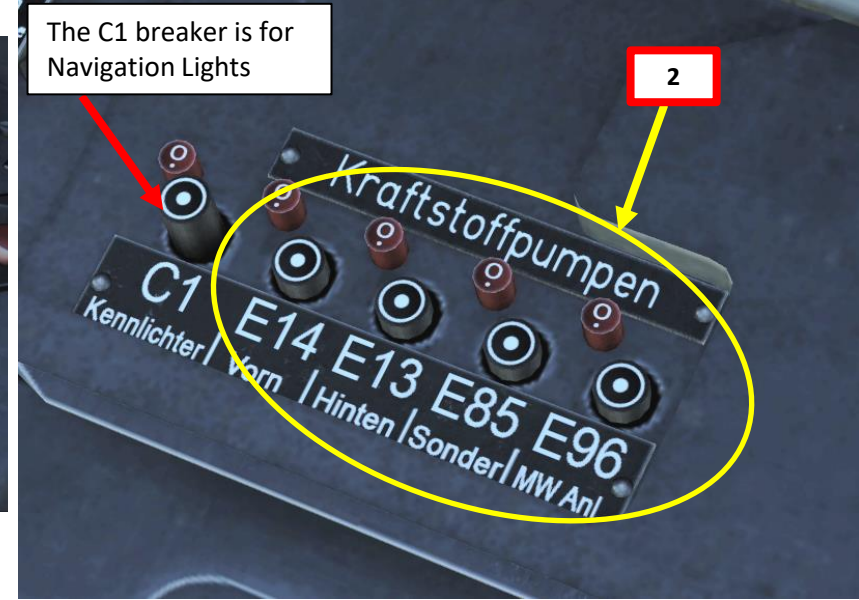
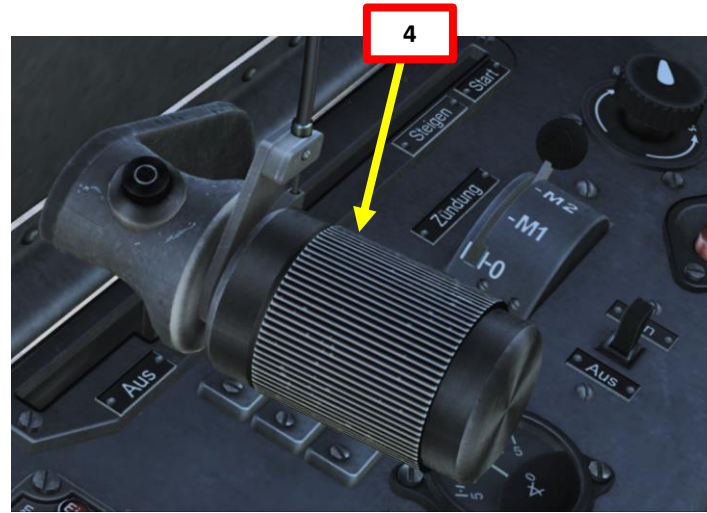
Fuel Gauge (x100 Liters)
 Vorn/Front Tank Capacity: 232 L (172 kg)
 Hinten/Rear Tank Capacity: 292 L (216 kg)
 Total Capacity: 524 L (388 kg)

Fuel Gauge Indication Selector
 Left: Vorn = Front
 Middle: No Tank Selected
 Right: Hinten = Rear
 Note: If an external drop tank is installed, selector should be set to "HINTEN" (Rear) since drop tanks feed into the rear tank.



ENGINE START

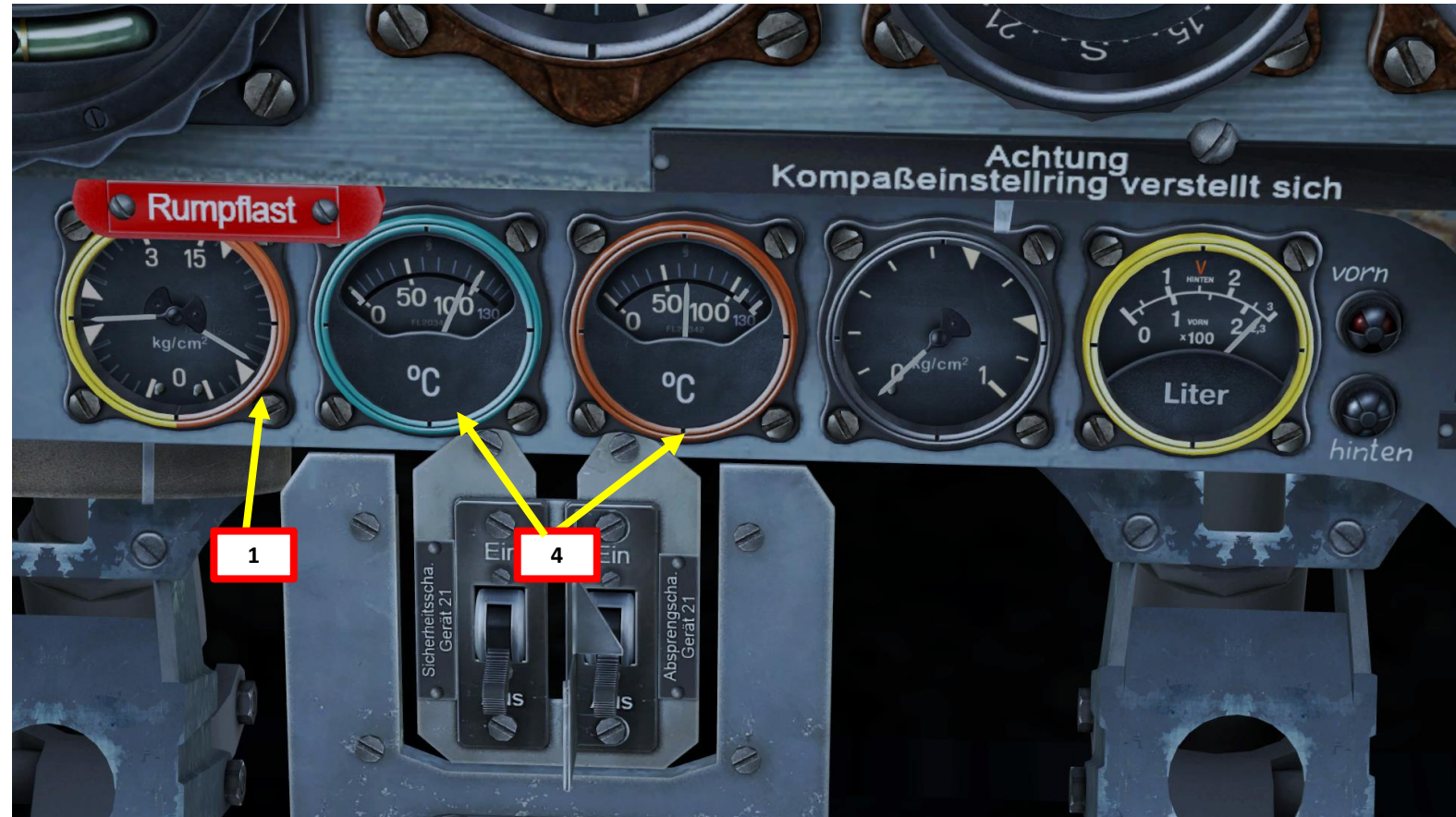
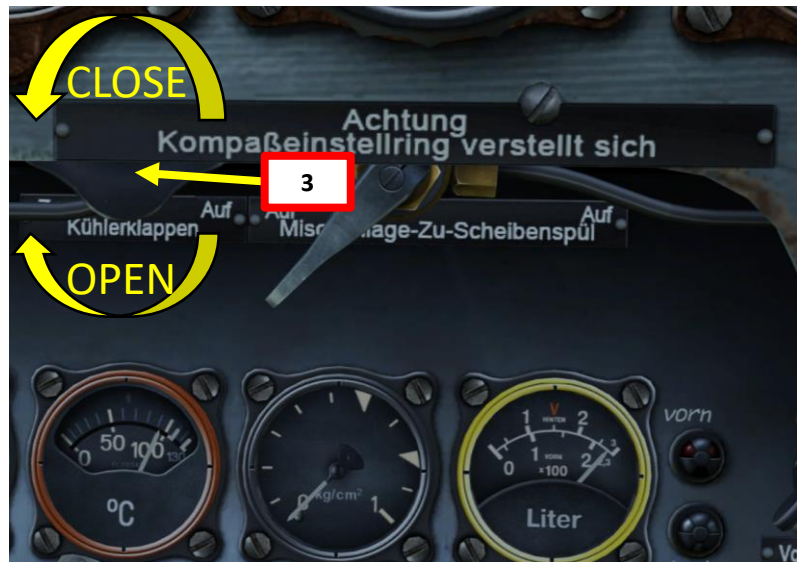
1. Set fuel selector lever to “AUF” (OPEN, FULLY UP) by right-clicking on it
2. E14, E13, E85, E96 Fuel Pump power switches – ON
3. Magnetos (Ignition) Switch – Set to M1+M2
4. Set throttle to ANLASSEN (START-IDLE) by pressing RALT+HOME.
5. Flip starter cover and left click and hold the starter lever (pushed down) for 25 seconds (map it to a toggle key). The inertial flywheel will crank up.
6. Right click (Pull) the Starter Lever and hold it until the engine fires up.
7. Close your canopy (“LCtrl+C” or by clicking on canopy handle).



ENGINE WARM-UP

1. Ensure oil pressure is between 3 and 13 kg/cm².
2. Adjust throttle to reach a RPM of about 2000.
3. Open cowling flaps by scrolling mousewheel on the *Kühlerklappen*.
4. Wait until engine **oil** warms up to at least 110-130 deg C and **coolant** temperature is at least 70-120 deg C.
5. Start taxiing when engine is warmed up.

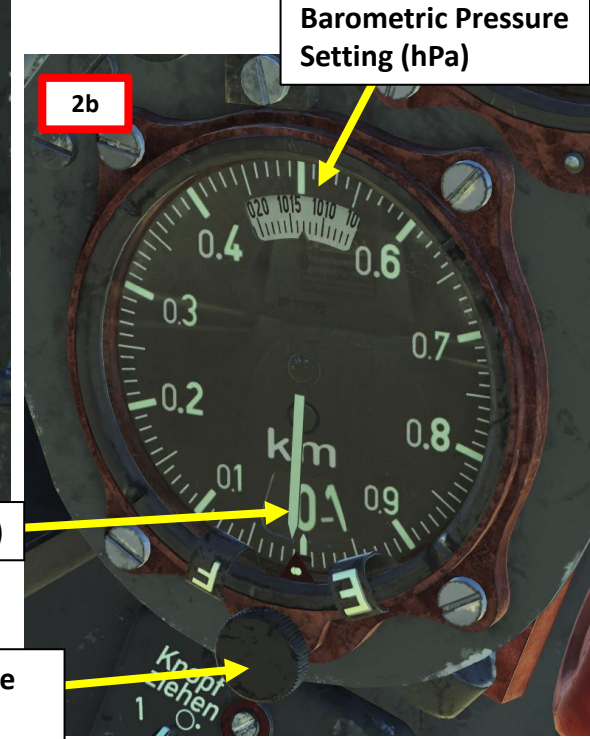
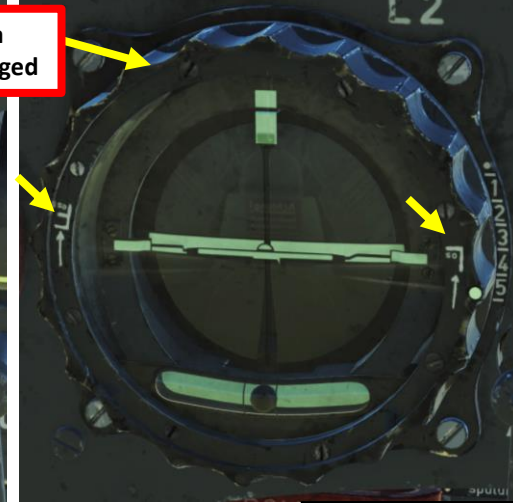
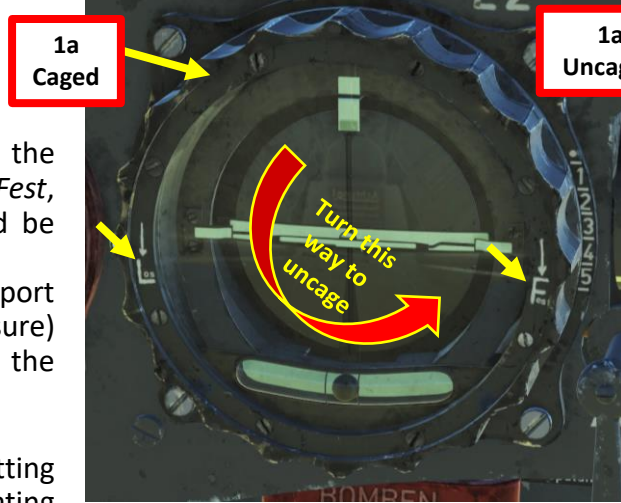
Note: Attempting a takeoff with low oil or coolant temperature can lead to dire consequences. Waiting for proper engine warm-up is often overlooked by virtual pilots and the engine leaves no room for error when engine temperatures are concerned.



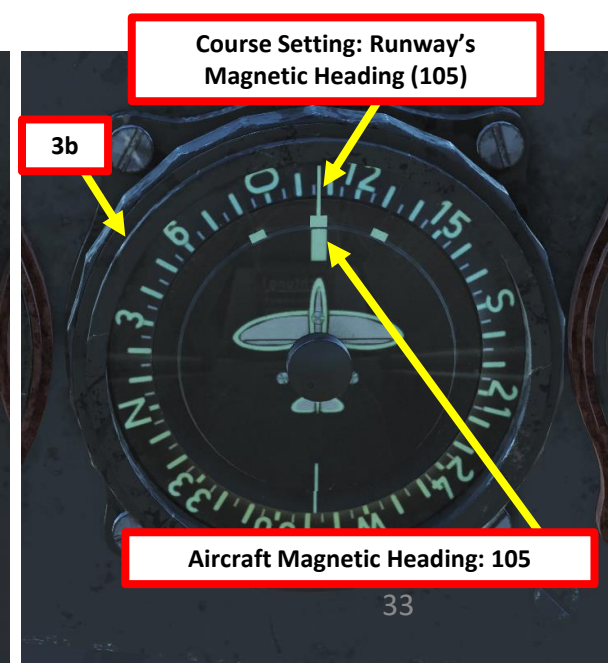
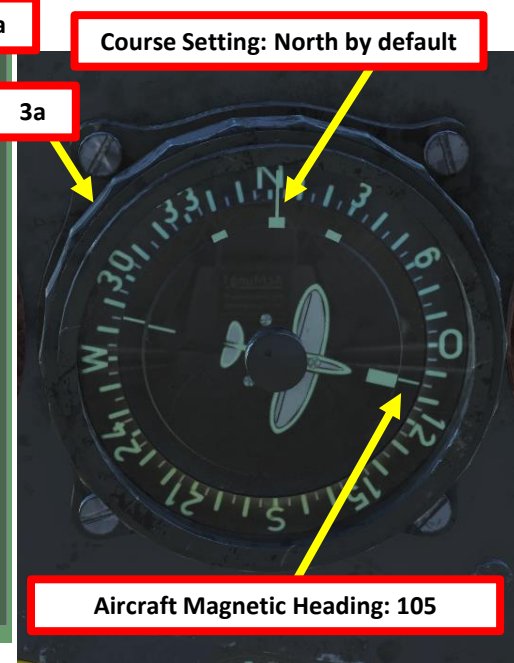
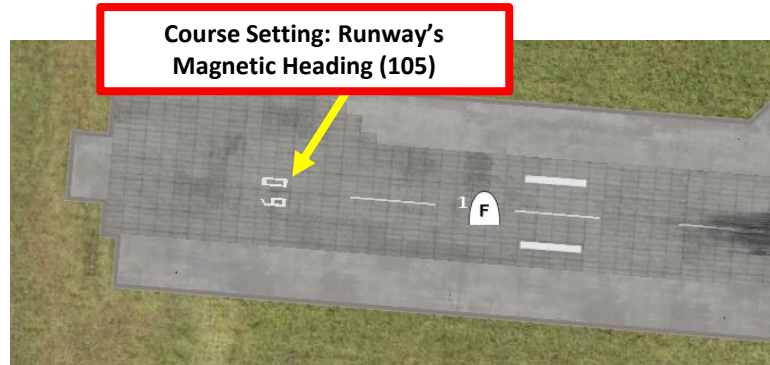
PRE-FLIGHT

1. Uncage the Artificial Horizon by rotating the outer ring. In UNCAGED position, the F (*Fest*, Caged) and L (*Los*, Uncaged) letters should be upside down.
2. Use F10 key to display your map and airport information. Adjust QFE (Barometric Pressure) Setting to match the altimeter reading to the airport elevation.
 - 42 ft = 13 meters
3. **OPTIONAL:** If desired, adjust your course setting to the departure runway's heading by rotating the outer ring of the Repeater Compass.
4. Start taxiing when engine is warmed up.

Note: Attempting a takeoff with low oil temperature can lead to dire consequences. Waiting for proper engine warm-up is often overlooked by virtual pilots and the engine leaves no room for error when engine temperatures are concerned.



AIRDROME DATA	
NAME	Senaki-Kolkhi
ICAO	UGKS
COALITION	Blue
ELEVATION	43 ft
RWY Length	7256 ft
COORDINATES	42°14'19"N 42°03'39"E
TACAN	31X (TSK)
VOR	--
RSBN	--
ATC	4.300, 132.000, 40.600, 261.000
RWYs	27 9
ILS	-- 108.90 (ITS)
PRMG	-- --
OUTER NDB	-- 335.00 (BI)
INNER NDB	-- 688.00 (B)
RESOURCES	

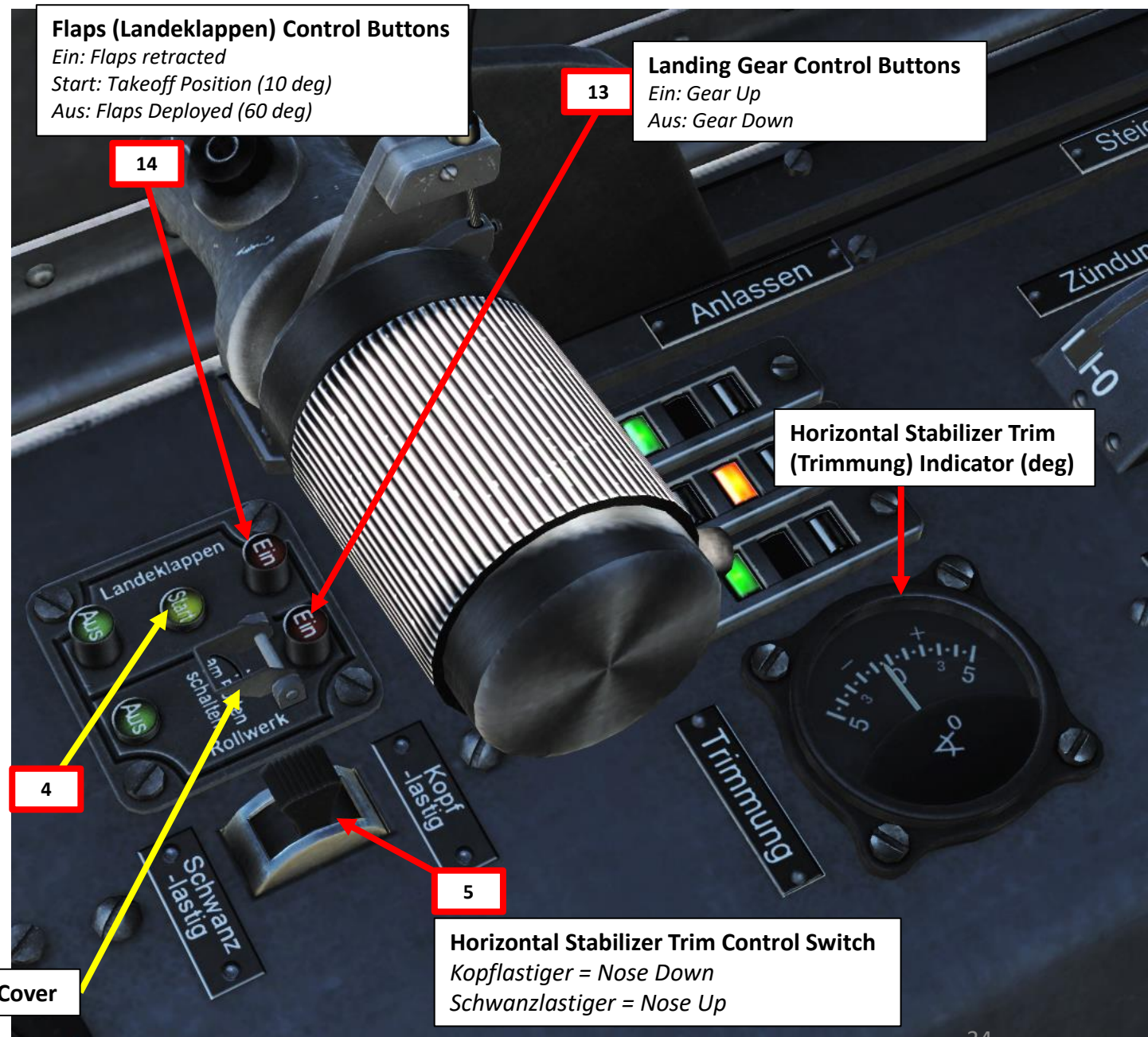


TAKEOFF PROCEDURE

- 1) Taxi by pulling your stick aft to lock the tailwheel and steering the aircraft by tapping your toe brakes to turn.
- 2) Once you are lined up with the runway, make sure your tailwheel is straight by moving in a straight line to straighten the wheel.
- 3) Keep your tailwheel locked on the ground by pulling your stick AFT.
- 4) Set flaps to TAKEOFF (Start) position
- 5) Set Horizontal Stab trim to 0 deg
- 6) Pull your stick fully AFT and hold it there.
- 7) Hold wheel brakes.
- 8) Throttle up to 2000 RPM, ensure engine parameters are within safety limits, and then throttle up to 2500 RPM.
- 9) Release brakes and slowly throttle up to 3300 RPM.
- 10) Do not use your brakes to steer your aircraft: use your rudder instead to make small adjustments.
- 11) At 170 km/h, center your control stick to allow you to pick up more airspeed. Your tailwheel should begin to rise: make sure that your propeller does not hit the ground.
- 12) Rotate at 200 km/h.
- 13) Raise landing gear by pressing the *Rollwerk* EIN button IN before reaching 250 km/h
- 14) Raise flaps by pressing the *Landeklappen* EIN button IN before reaching 250 km/h
- 15) Start climbing

VIDEO DEMO:

<https://www.youtube.com/watch?v=ArgtdYGial>



Flaps (Landeklappen) Control Buttons
 Ein: Flaps retracted
 Start: Takeoff Position (10 deg)
 Aus: Flaps Deployed (60 deg)

Landing Gear Control Buttons
 Ein: Gear Up
 Aus: Gear Down

Horizontal Stabilizer Trim (Trimmung) Indicator (deg)

Horizontal Stabilizer Trim Control Switch
 Kopflastiger = Nose Down
 Schwanzlastiger = Nose Up

Landing Gear Button Safety Cover



LANDING PROCEDURE

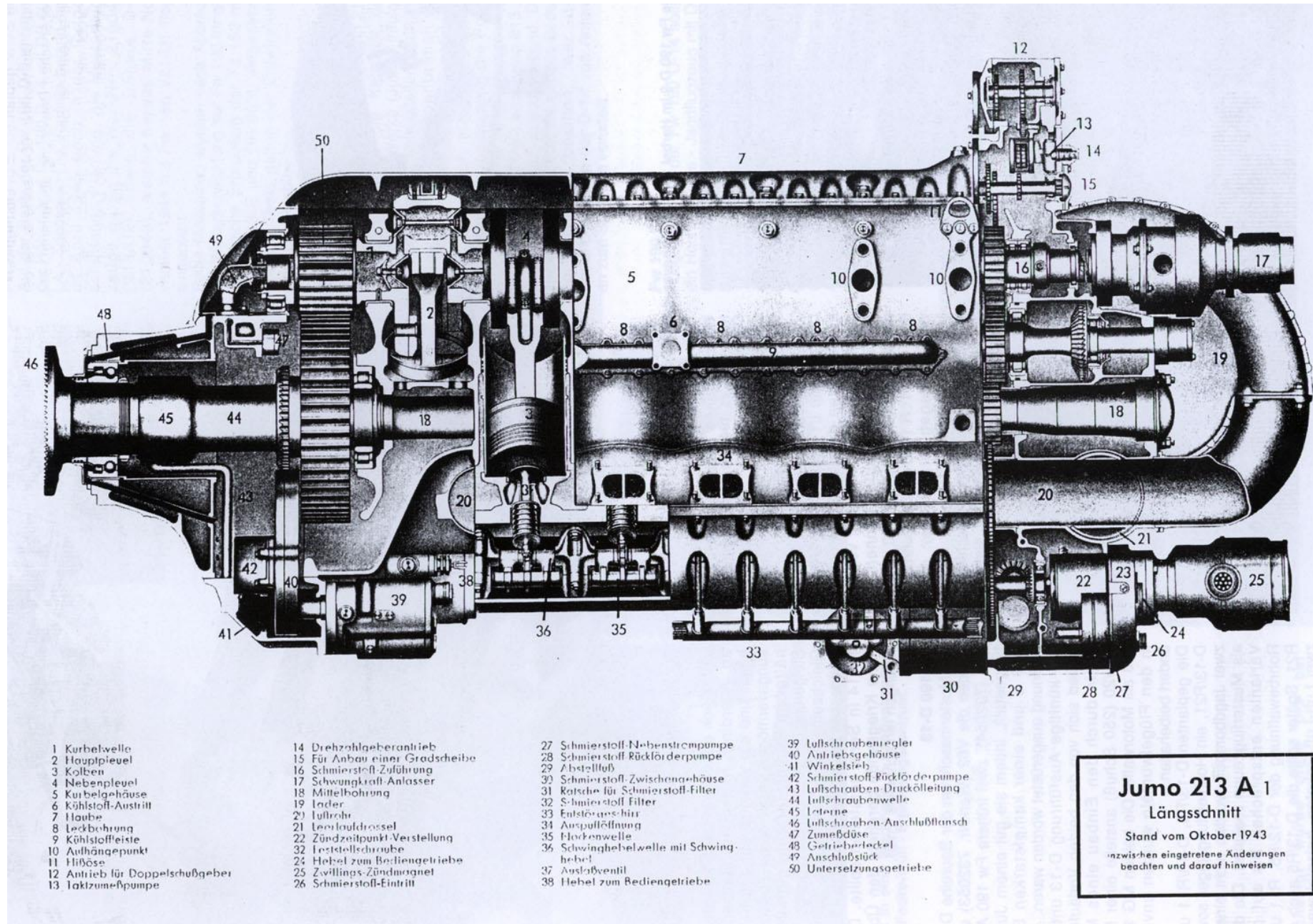
1. Line up with the runway and make sure to keep the runway centered with your nose.
2. Deploy landing gear and extend flaps in LANDING (AUS) position when below 250 km/h.
3. Keep your nose aimed to the end of the runway, not the beginning. You tend to go where you aim.
4. Approach the airfield with a speed of 220 km/h, and a sink rate between 2.5 and 5 m/s.
5. Reach the runway with a speed of approx. 200 km/h and a sink rate of 2.5 m/s.
6. Touchdown with a speed of 190 km/h with IDLE throttle. Do not start pulling on the stick to lock your tailwheel down yet: you can still generate enough thrust to bounce, stall and crash at any speed over 170 km/h if you are not careful. Glide your way through the runway... gravity and deceleration will keep you on a straight trajectory.
7. When decelerating to 100 km/h or less, lock your tailwheel by pulling back on your stick.
8. Do not use your brakes to steer the aircraft yet: use small rudder input instead.
9. When you start losing rudder authority (due to the decreasing airspeed), gently tap your brakes to slowly bring the airplane to a full stop.

VIDEO DEMO:

<https://www.youtube.com/watch?v=uSHRI1u5zKM>



The Fw 190 D-9 "Dora" is powered by a Junkers Jumo 213 A-1 engine, a 12-cylinder liquid-cooled inverted inline Vee. The Jumo 213 features a single stage, two-speed supercharger and an automatic manifold pressure regulator. The engine drives a three-blade constant-speed propeller.



RECOMMENDED ENGINE SETTINGS:

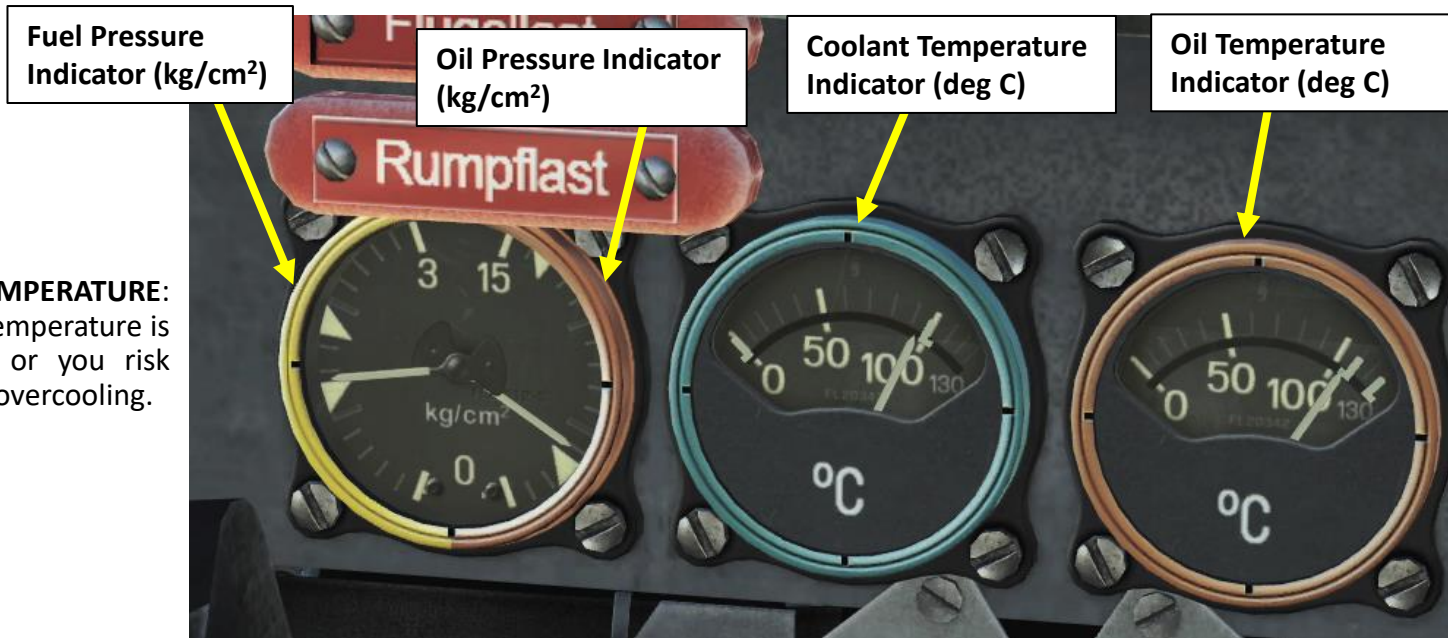
TAKEOFF: Full Throttle, FULL RPM
LANDING: 1000 RPM
NORMAL OPERATION: 3000 RPM

GENERAL RULE FOR COOLANT AND OIL TEMPERATURE:
 Keep them in the “Safe Region” on the scales as shown. When oil temperature is above 120 deg C, make sure your Radiator Flaps are Open or you risk overheating. When oil temperature is below 70, close it to prevent overcooling.

ENGINE LIMITS:

- Coolant Temperature: Min 70 deg C – Max 120 deg C
- Oil Temperature: Min 110 deg C – Max 130 deg C
- Oil Pressure: Min 3 kg/cm² – Max 13 kg/cm²

MW-50: Similar role to WEP (War Emergency Power) or Boost-Cut-Out override. Only use it during combat or for emergencies. Check temperature gauges to know when to turn it OFF.

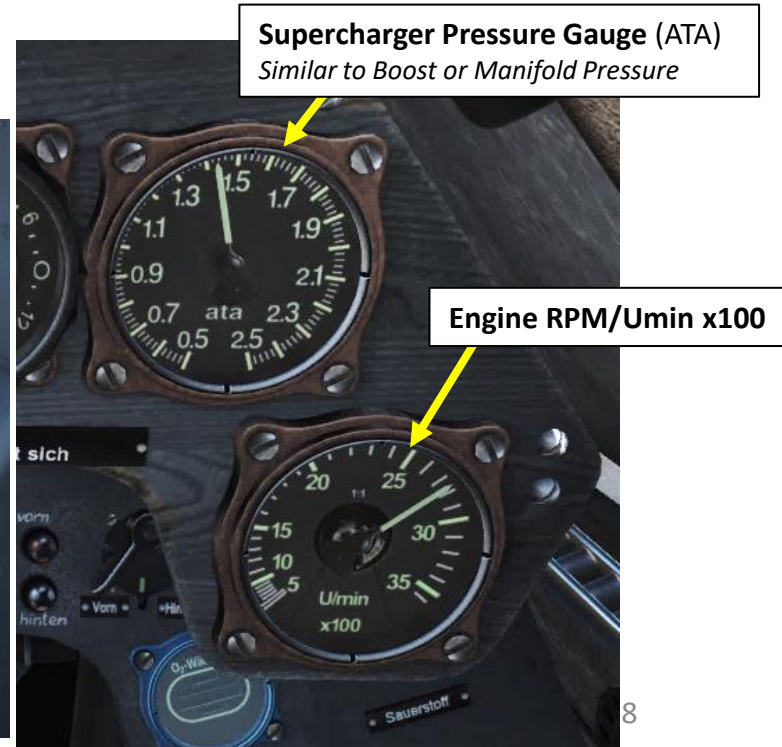


Manual Radiator Flap Control



MW-50 (Methanol-Wasser 50, or Water-Methanol Injection) Switch

Ein = Enabled
 Aus = Disabled



Supercharger Pressure Gauge (ATA)
 Similar to Boost or Manifold Pressure

Engine RPM/Umin x100

BEDIENGERÄT ENGINE CONTROL UNIT

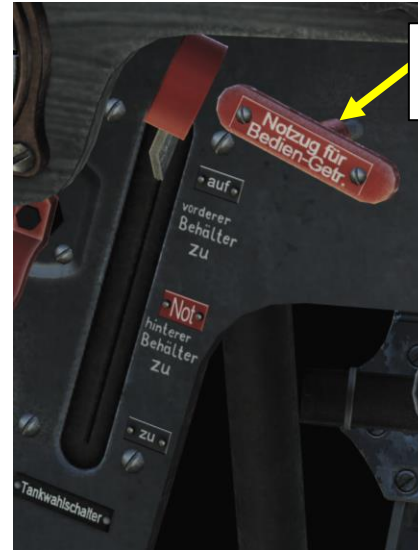
The Junkers Jumo 213 engine comes equipped with a "Bediengerät" (engine control unit), which is similar in function to the "Kommandogerät" (command device) used on BMW-801-powered earlier variants of the Fw 190.

The "Bediengerät" is a hydromechanical multifunction integrator that dramatically simplifies engine control. While in most other contemporary aircraft the pilot had to constantly operate a slew of levers to manage throttle level, propeller pitch, fuel mixture, and supercharger stages, the "Bediengerät" takes the majority of the workload away. The pilot simply has to move the throttle lever to set the desired manifold pressure. The "Bediengerät" takes care of the rest, setting all other parameters to allow the engine to properly operate at the desired manifold pressure, given the current flight conditions.

MBG (MOTORBEDIENGERÄT)

The Jumo 213 engine also has a "MBG" handle. This handle is connected via cable to the aircraft's "Motorbediengerät" (MBG). In normal position the MBG operates in automatic mode. In case of emergency, the handle can be pulled to allow the engine to operate at higher boost pressure than normal.

- If at all possible, the handle should be pulled when the throttle is in Idle setting.
- Speed control remains automatic.
- Please take extra care to watch engine speed and boost. The engine must be loaded only as far as absolutely necessary in "Notzug" mode.
- When flying in "Notzug" mode (handle pulled), boost pressure of 1.55 ATA should never be exceeded!
- When flying in "Notzug" mode (handle pulled), engine speed of 2,700 RPM should never be exceeded!



MBG (Motorbediengerät, or Engine Control Unit) Emergency Mode Handle

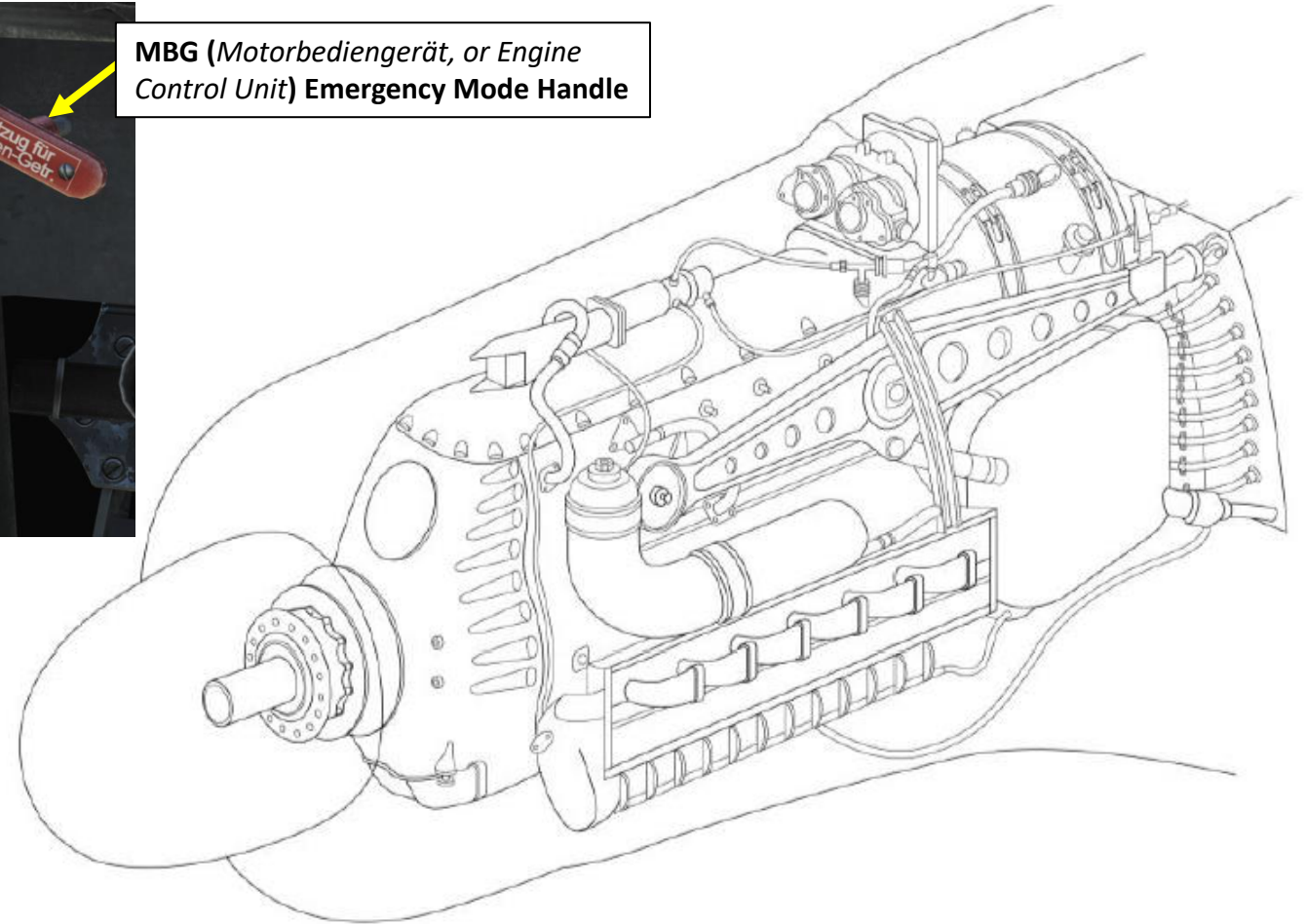


Figure 15: Junkers Jumo 213 A-1 assembly

MW-50 (METHANOL-WASSER 50, OR WATER-METHANOL INJECTION)

The primary effect of the MW-50 mixture spray is cooling of the air-fuel mixture.

The secondary effect of the MW-50 mixture spray is its anti-detonant effect, which is how the increase in boost pressure is achieved.

While the secondary boost-increasing effects deteriorate with altitude, the primary cooling effects are still noticeable. Therefore, the MW-50 system can be used to cool down the air-fuel mixture at all altitudes in the event of an emergency.

The boost provided by the MW-50 begins to decrease in power at altitudes above 6,000 meters.

Note: Make sure MW-50 Mix is enabled in the MW/Fuel Tank via the Mission Editor, or else the tank will be filled with fuel and MW50 will not be available.

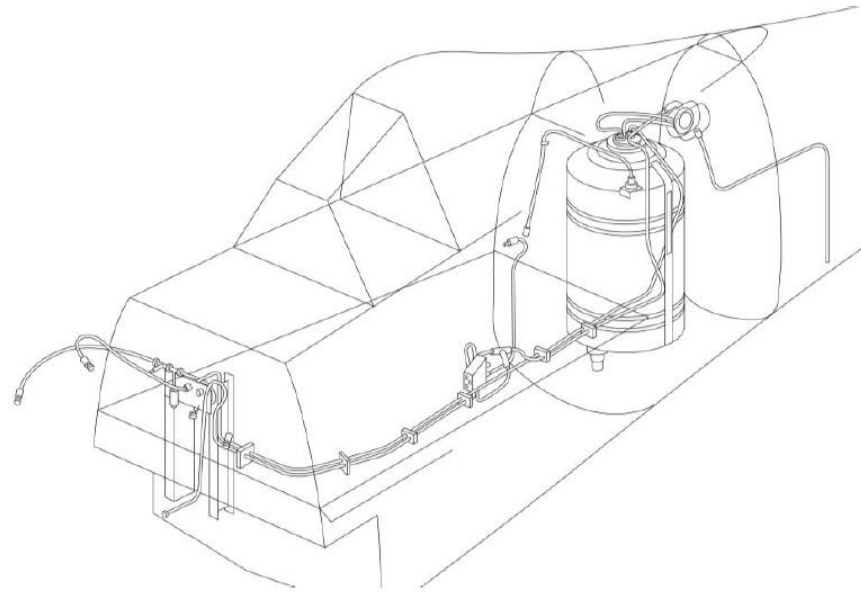


Figure 16: MW-50 system diagram

AIRPLANE GROUP

NAME: New Airplane Group

CONDITION: % < > 100

COUNTRY: Germany

TASK: CAP

UNIT: < > 1 OF < > 1

TYPE: Fw 190 D-9

SKILL: Player

PILOT: Pilot #001

TAIL #: 119 ✓ COMM: 38.4 MHz AM

CALLSIGN: Enfield 1 1

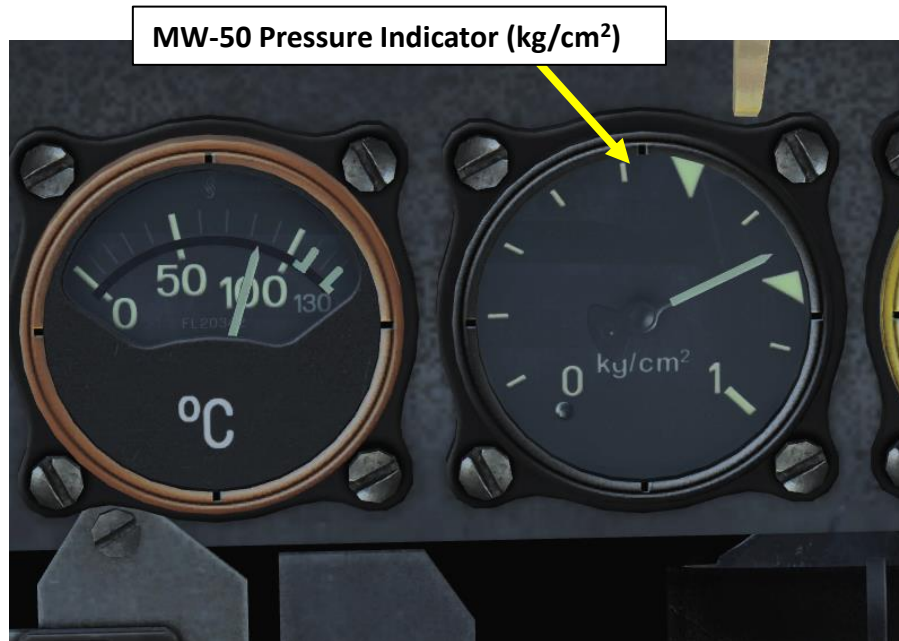
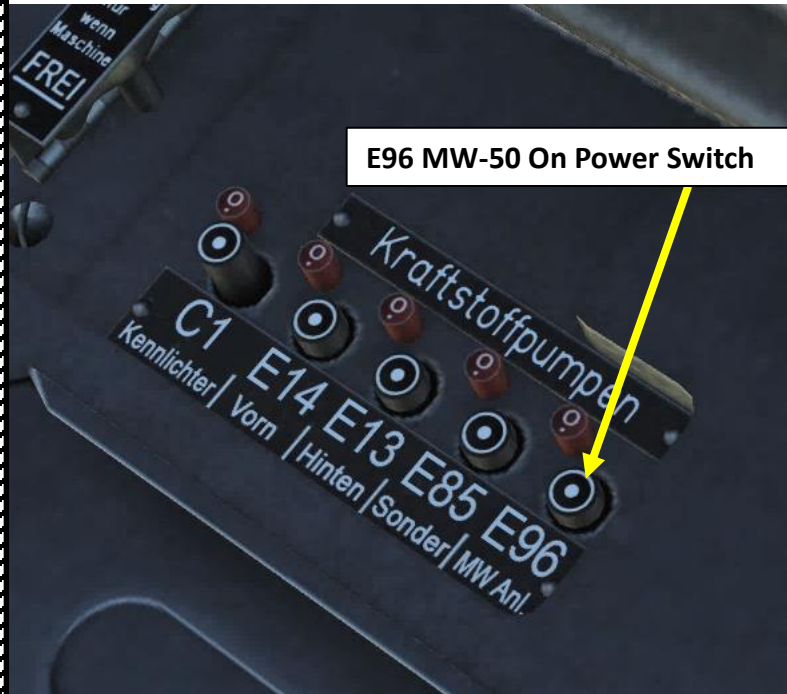
HIDDEN ON MAP

HIDDEN ON PLANNER

LATE ACTIVATION

Additional properties for aircraft

MW/Fuel Tank Contents: MW-50 Mix



POWER SETTINGS

Throttle Position (deg)	Power Output	RPM	Permissible Time	Fuel Consumption (Liter/Hour)
90	Emergency Power (increased take-off power)	3250	3 min	620
90	Take-Off, Combat and Climb Power	3250	30 min	590
75	Continuous Power	3000	Constant	530
60	Economy I	2700	Constant	375
47	Economy II	2400	Constant	285
34	Economy III	2100	Constant	215
0	Idle (In-Flight)	Approx. 1200	-	-
-10	Engine Stop Position		-	-

SUPERCHARGER BASICS

A **supercharger is an engine-driven air pump or compressor that provides compressed air to the engine to provide additional pressure to the induction air so the engine can produce additional power.** It increases manifold pressure and forces the fuel/air mixture into the cylinders. The higher the manifold pressure, the more dense the fuel/air mixture, and the more power an engine can produce.

With a normally aspirated engine, it is not possible to have manifold pressure higher than the existing atmospheric pressure. A supercharger is capable of boosting manifold pressure above 1.0 ATA (30 in Hg). For example, at 2500 meters (8000 ft) a typical engine may be able to produce 75 percent of the power it could produce at mean sea level (MSL) because **the air is less dense at the higher altitude.** The supercharger compresses the air to a higher density allowing a supercharged engine to produce the same manifold pressure at higher altitudes as it could produce at sea level.

Thus, an engine at 8,000 feet MSL could still produce 0.85 ATA of manifold pressure whereas without a supercharger it could produce only 0.75 ATA. Superchargers are especially valuable at high altitudes (such as 18,000 feet / 5500 m) where the air density is 50 percent that of sea level. The use of a supercharger in many cases will supply air to the engine at the same density it did at sea level. With a normally aspirated engine, it is not possible to have manifold pressure higher than the existing atmospheric pressure.

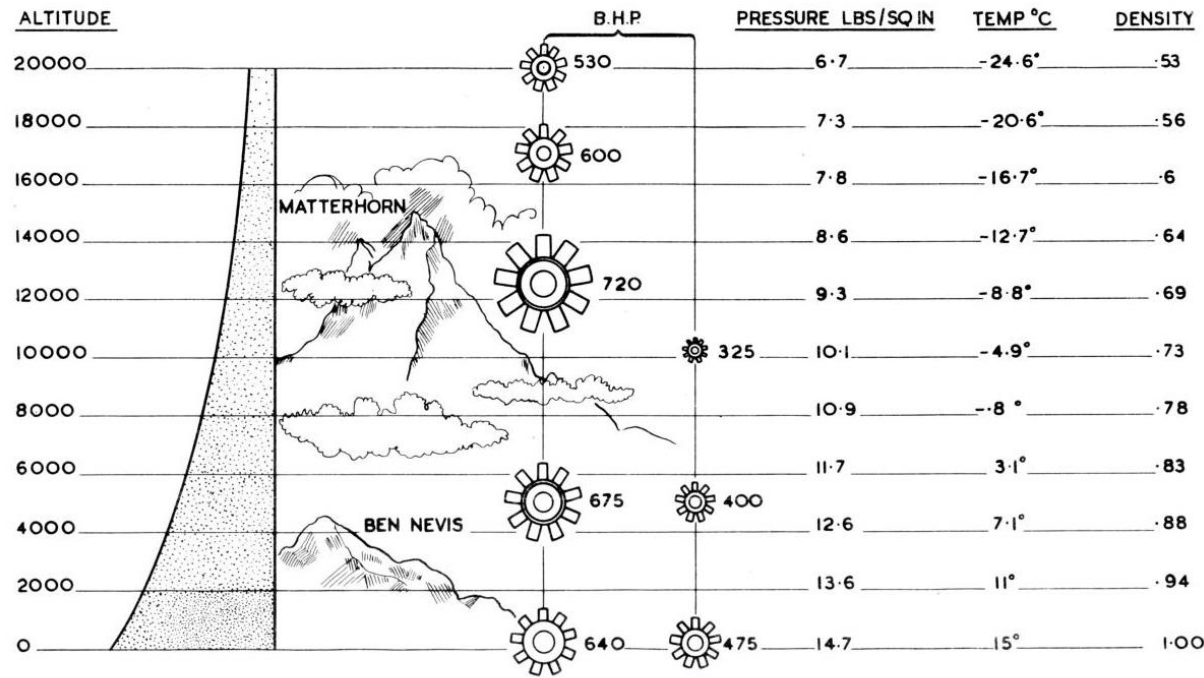
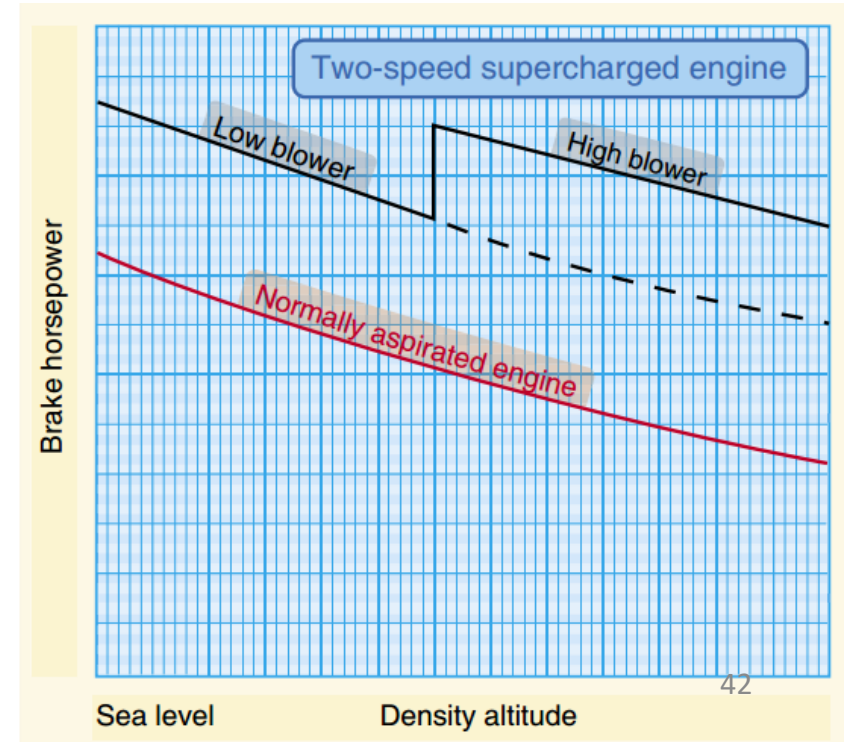


DIAGRAM SHOWING ATMOSPHERIC AND POWER VARIATIONS



SUPERCHARGER OPERATION

The Junkers Jumo 213 engine is equipped with a single stage, two-speed centrifugal supercharger with MW-50 water-methanol injection. In the 1930's-1940's, the first few aircraft that had a two-speed supercharger had a manual control that had to be set once the aircraft was high enough (air density was low enough to see a noticeable difference once the supercharger is shifted into second gear). In our case, the supercharger shifts gear automatically (managed by the *Bediengerät* Control Unit) once a threshold altitude is reached. In practice, you will notice the manifold pressure gauge (ATA) will suddenly increase once the supercharger shifts into high gear.

At an altitude of approximately 5500 +/- 200 meters, the supercharger automatically switches supercharger speed from low to high. Try not to fly or frequently change your altitude within this threshold.

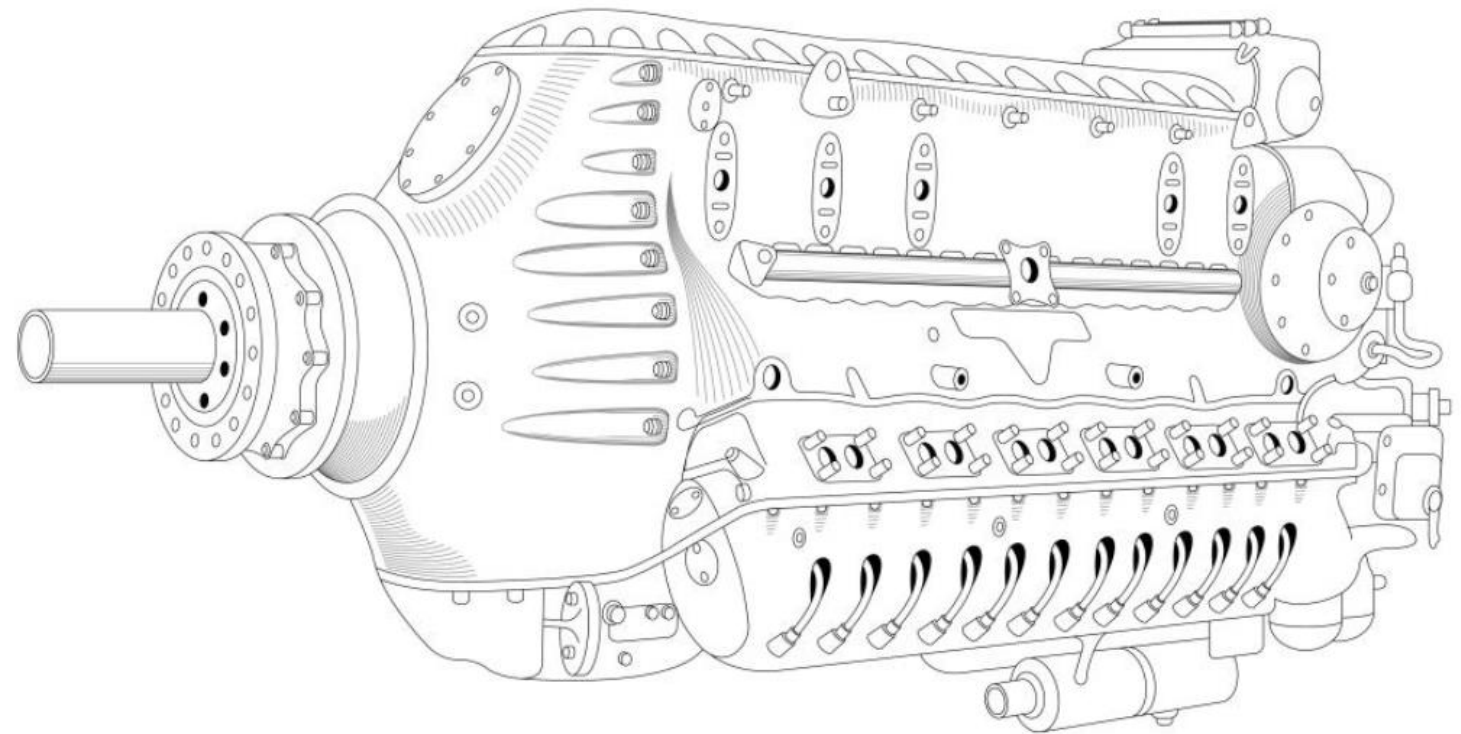


Figure 14: Junkers Jumo 213 A-1

FUEL TANKS

Fuel Capacity

Vorn/Front Tank Capacity: 232 L (172 kg)

Hinten/Rear Tank Capacity: 292 L (216 kg)

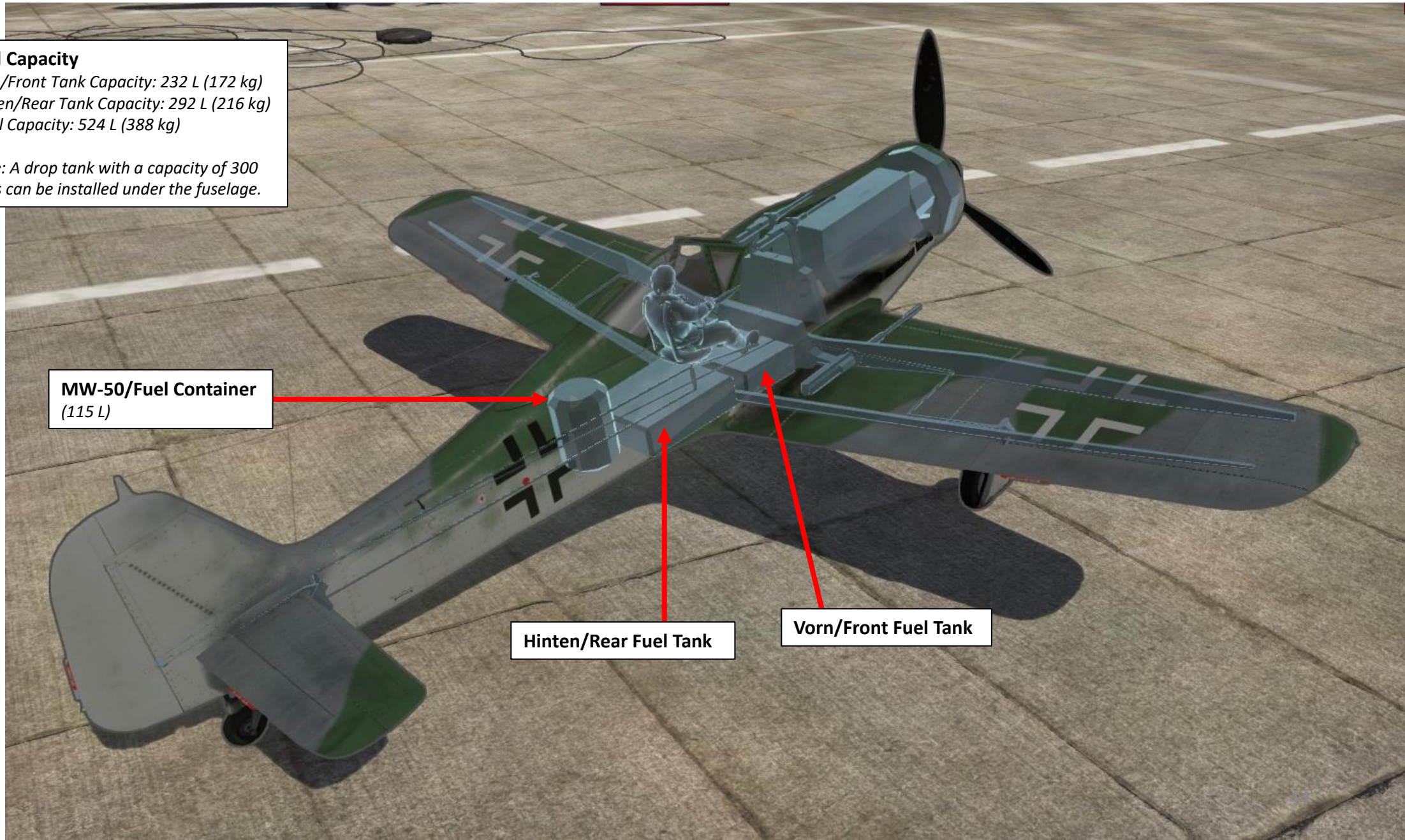
Total Capacity: 524 L (388 kg)

Note: A drop tank with a capacity of 300 liters can be installed under the fuselage.

MW-50/Fuel Container
(115 L)

Hinten/Rear Fuel Tank

Vorn/Front Fuel Tank

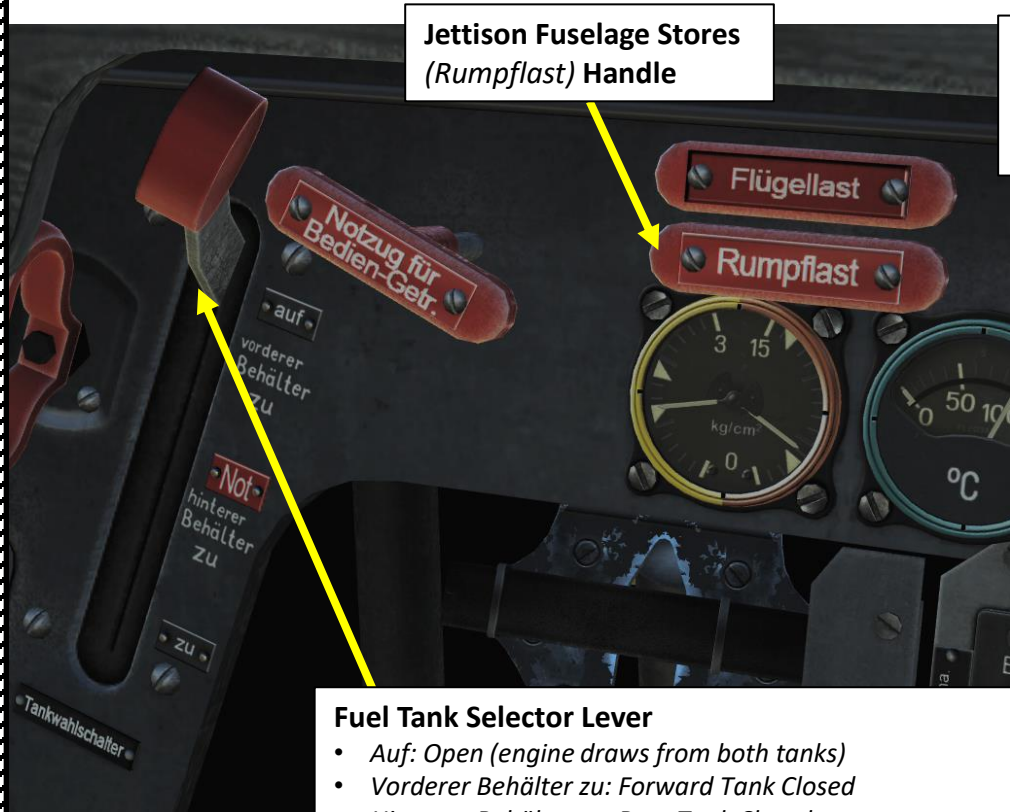
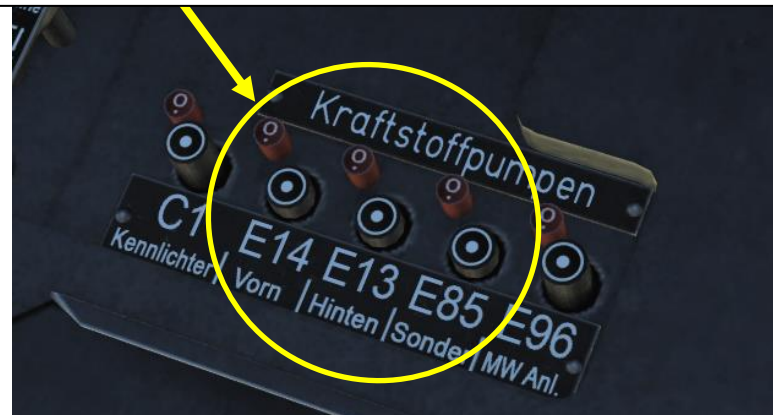


FUEL MANAGEMENT

Since if there are additional fuel tanks (auxiliary fuselage and/or external drop tank), the fuel from them enters the rear fuel tank via two lines. When the fuel level in the aft tank reaches exactly 240 liters, the restrictor valve opens up the auxiliary line. The additional tanks continue to feed the aft tank until they are fully depleted. The additional tanks are not equipped with any fuel gauge sensors, and so the only way to tell that they have been fully depleted is when the aft tank's fuel level begins to drop below 240 liters.

When flying with drop tanks, drop tank fuel should be used first (Set Fuel Tank Selector to "Vorderer Behälter zu" to close the forward tank and use fuel from the drop tank, which feeds into the rear tanks). When the fuel inside the drop tank is exhausted, the fuel tank selector lever is set to "Auf" and the E85 Auxiliary Drop Tank Fuel Pump should be turned off.

E14 Forward Tank (vorderer Behälter) Fuel Pump Circuit Breaker
E13 Rear Tank (hinterer Behälter) Fuel Pump Circuit Breaker
E85 Auxiliary Tank (Sonder) Fuel Pump Circuit Breaker



Jettison Fuselage Stores (Rumpflast) Handle

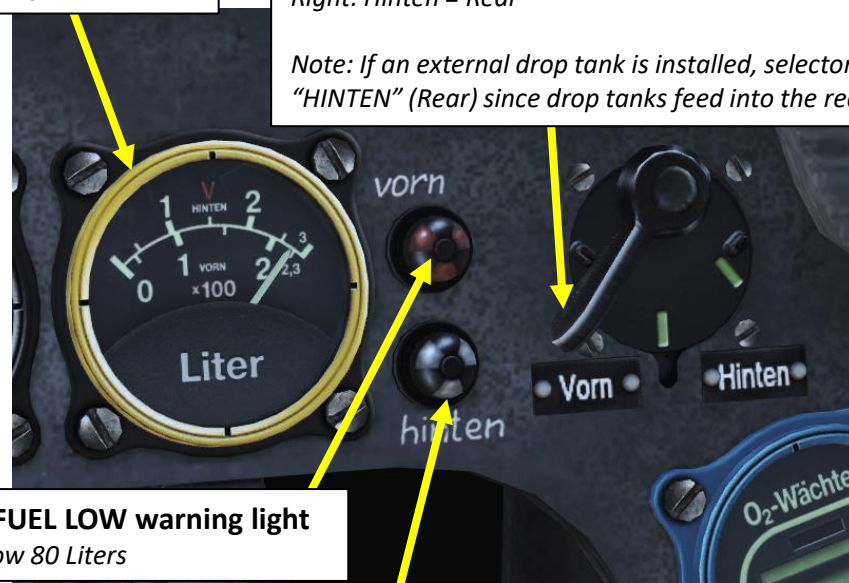
Fuel Gauge (x100 Liters)

Vorn/Front Tank Capacity: 232 L (172 kg)
 Hinten/Rear Tank Capacity: 292 L (216 kg)
 Total Capacity: 524 L (388 kg)

Fuel Gauge Indication Selector

Left: Vorn = Front
 Middle: No Tank Selected
 Right: Hinten = Rear

Note: If an external drop tank is installed, selector should be set to "HINTEN" (Rear) since drop tanks feed into the rear tank.



Front (vorn) Tank FUEL LOW warning light

Illuminates when below 80 Liters

Rear (hinten) Tank FUEL LOW warning light

Illuminates when below 10 Liters

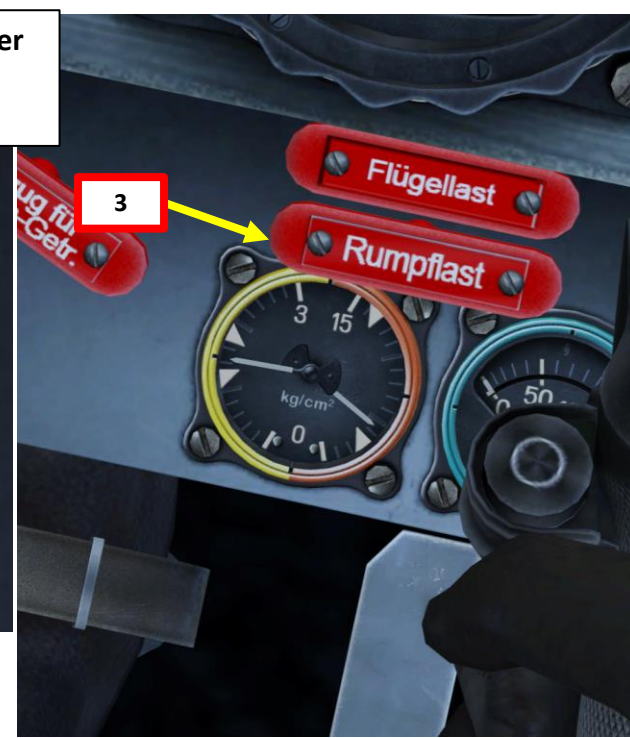
Fuel Tank Selector Lever

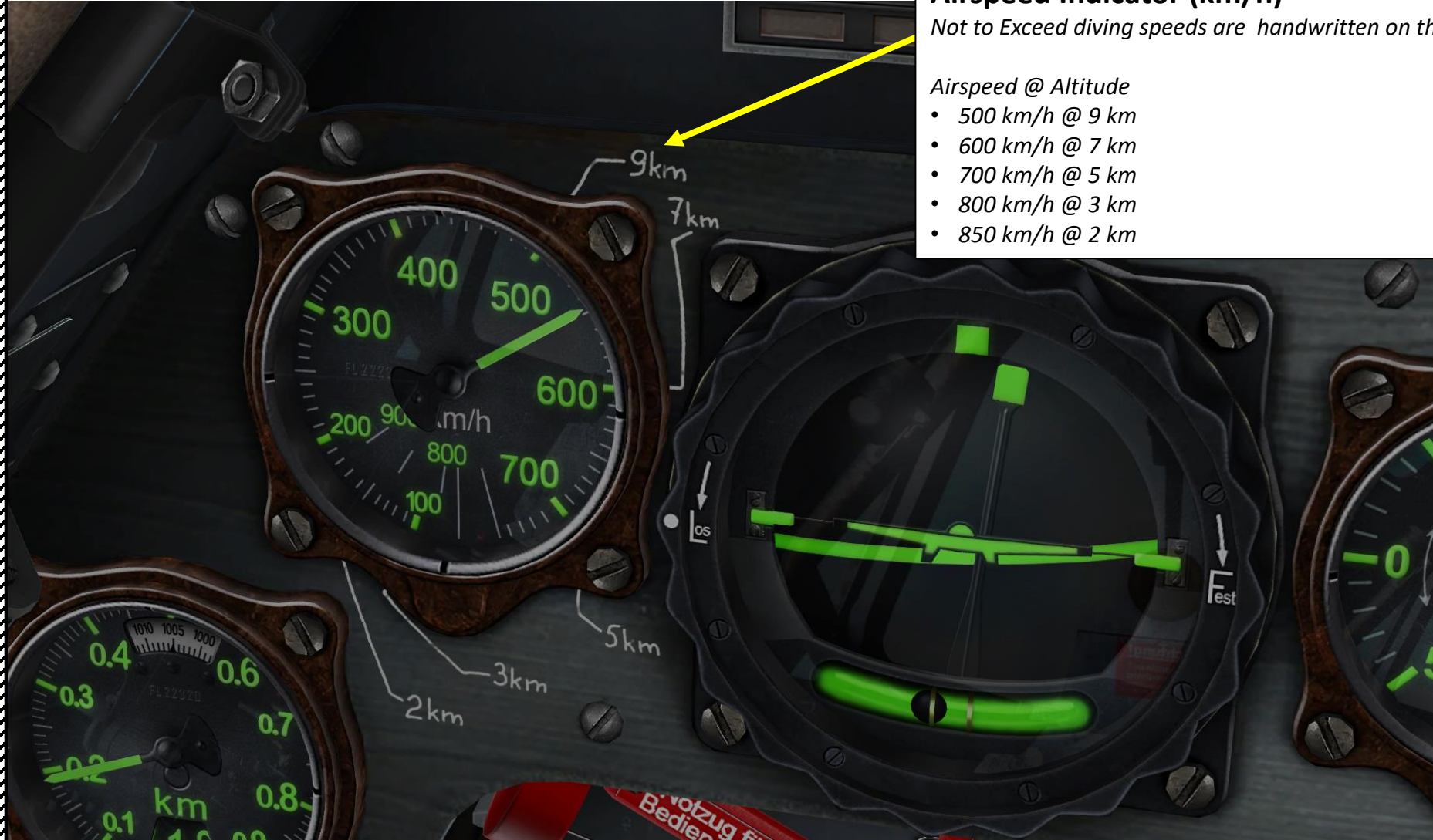
- Auf: Open (engine draws from both tanks)
- Vorderer Behälter zu: Forward Tank Closed
- Hinterer Behälter zu: Rear Tank Closed
- Zu: Closed (both fuel lines to booster pump are closed)

FUEL DROP TANK OPERATION

1. Since the drop tank feeds into the rear fuel tank, set fuel tank selector lever to “VORDERER BEHÄLTER ZU” (FORWARD TANK CLOSED) and turn on the E85 Auxiliary Drop Tank Fuel Circuit Breaker to consume fuel from the drop tank first.
2. When ready to jettison drop tank, make sure that your fuel tank selector is set to “AUF” (OPEN) and turn off the E85 Auxiliary Drop Tank Fuel Circuit Breaker.
3. To jettison fuel drop tank, pull the “RUMPFLAST” (FUSELAGE JETTISON) handle.

E14 Forward Tank (*vorderer Behälter*) Fuel Pump Circuit Breaker
 E13 Rear Tank (*hinterer Behälter*) Fuel Pump Circuit Breaker
 E85 Auxiliary Tank (*Sonder*) Fuel Pump Circuit Breaker





Airspeed Indicator (km/h)

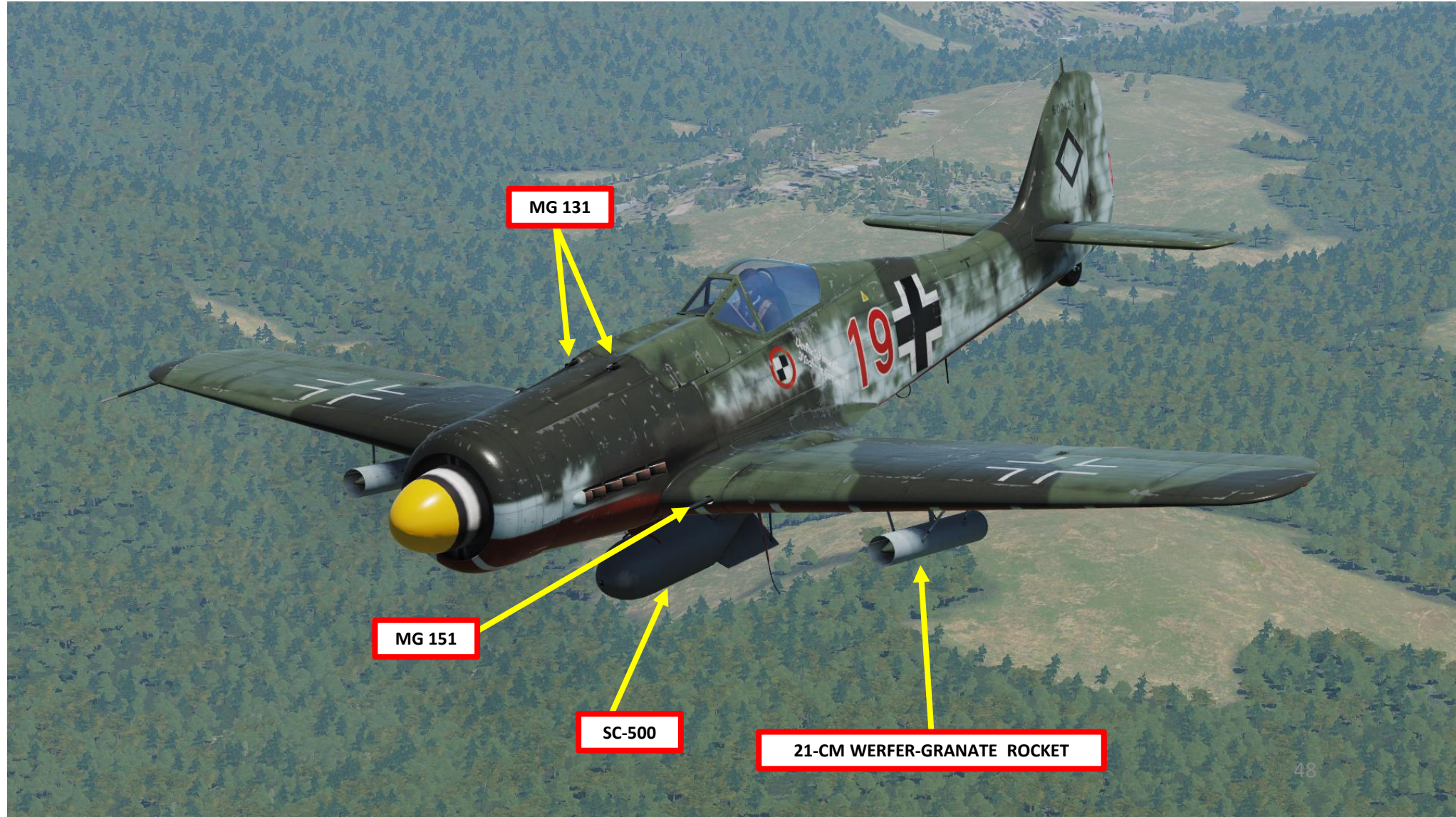
Not to Exceed diving speeds are handwritten on the airspeed gauge

Airspeed @ Altitude

- 500 km/h @ 9 km
- 600 km/h @ 7 km
- 700 km/h @ 5 km
- 800 km/h @ 3 km
- 850 km/h @ 2 km

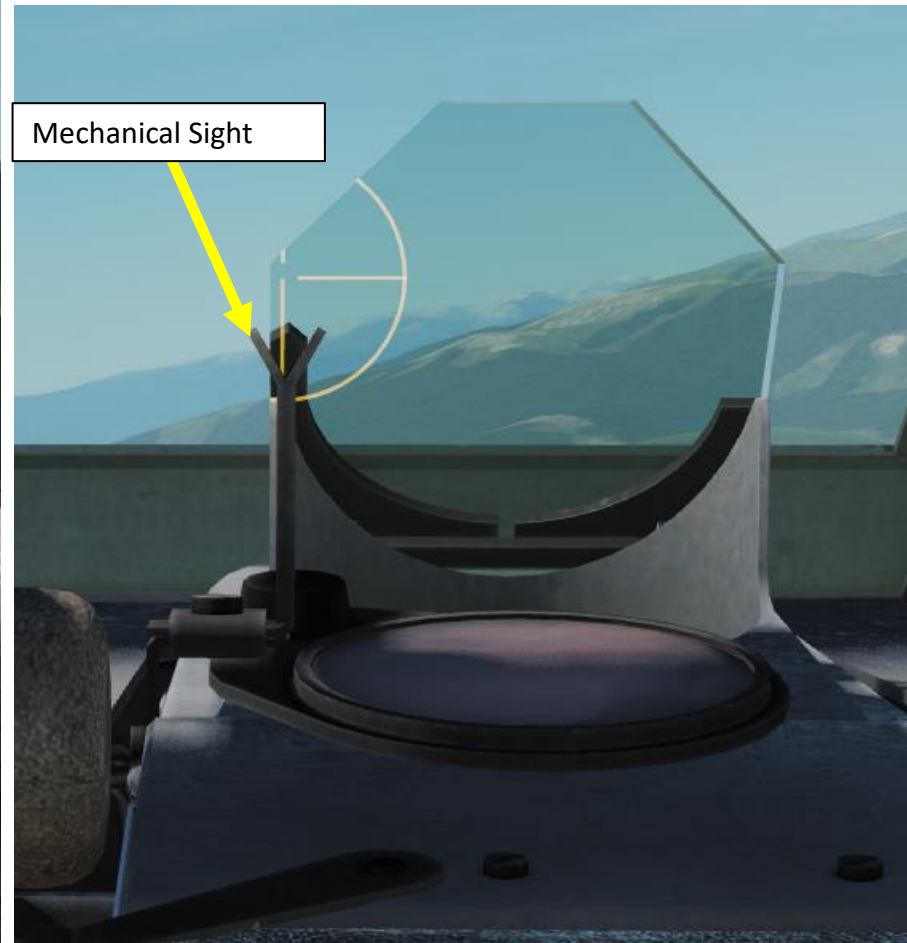
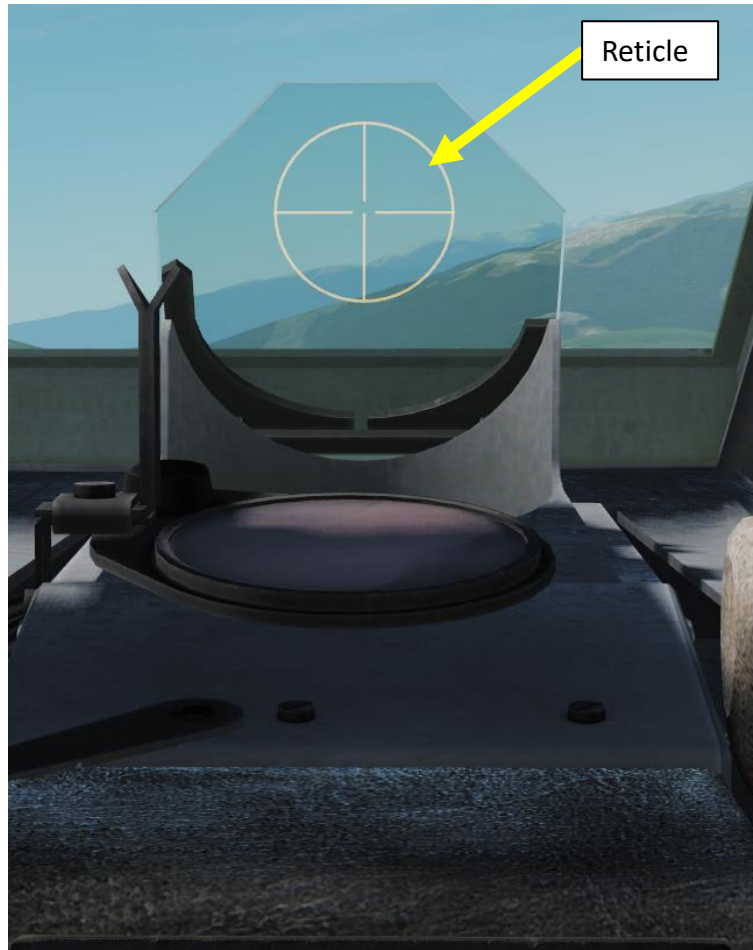
ARMAMENT OVERVIEW

- 2 x Mauser MG151 20 mm Cannons (250 rounds per cannon)
- 2 x Rheinmetall-Borsig MG131 13 mm Machineguns (475 rounds per gun)
- 26 x R4M 4 kg anti-air Rockets
- 2 x Werfer-Granate 21-cm anti-air Rockets
- 4 x SC-50 kg bombs
- 1 x SC-500 kg bomb



EZ42 GUNSIGHT

- The Fw 190 D-9 is equipped with the pioneering EZ 42 gunsight that is roughly equivalent to the well-known K-14 gunsight used on the North American P-51D Mustang.
- The design history of the EZ gunsight began before the war, but the Reich Air Ministry continued to focus on conventional reflector sights, installing the ubiquitous Revi (Reflexvisier) sight on most aircraft.

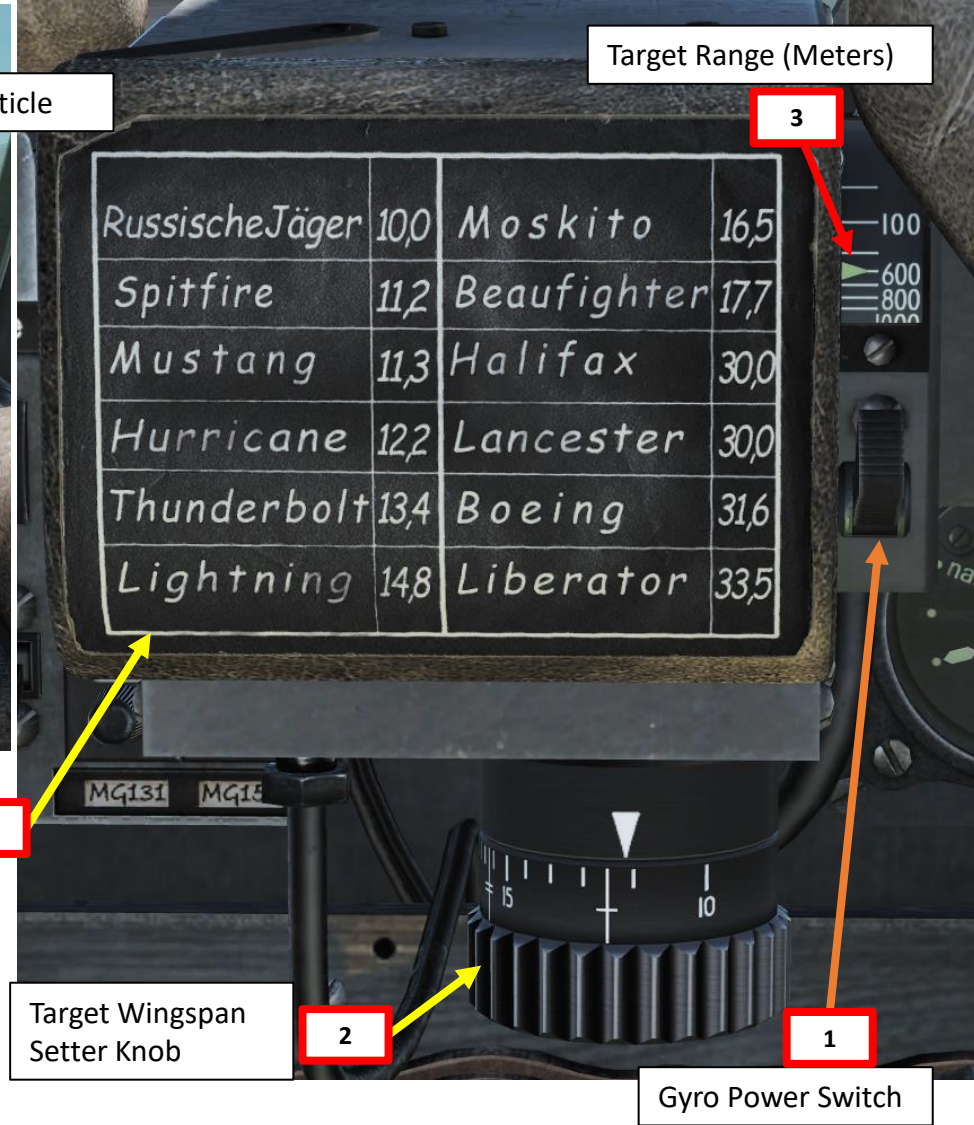
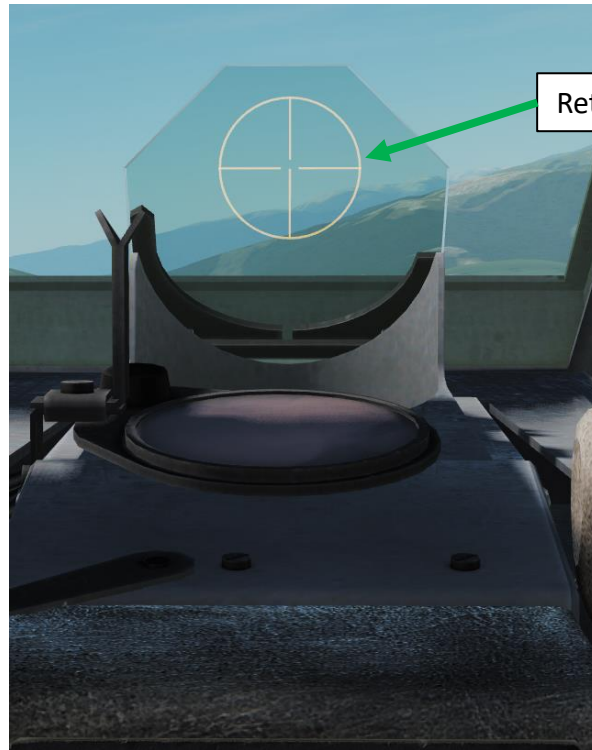
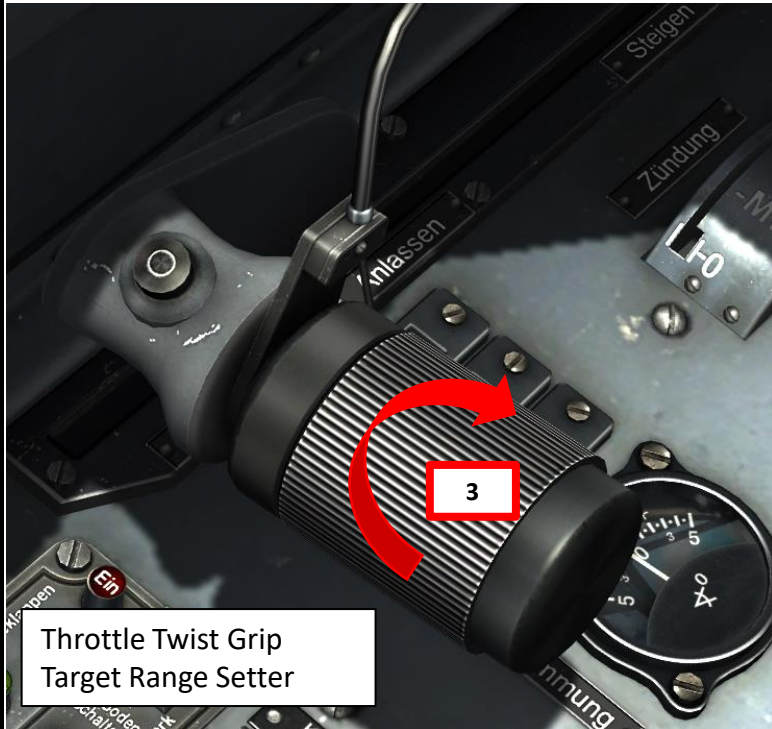


EZ42 GUNSIGHT

1. Turn ON your gunsight Gyro Switch (UP)
2. Set Gunsight Wingspan to 11.2 (typical Spitfire and Mustang wingspan)
3. Set Gunsight Range to 600 m (optimal range for horizontal gun convergence)
4. When the wing of the target fits in your gunsight, you are now in the range set in step 3).

Gunsight tutorial:

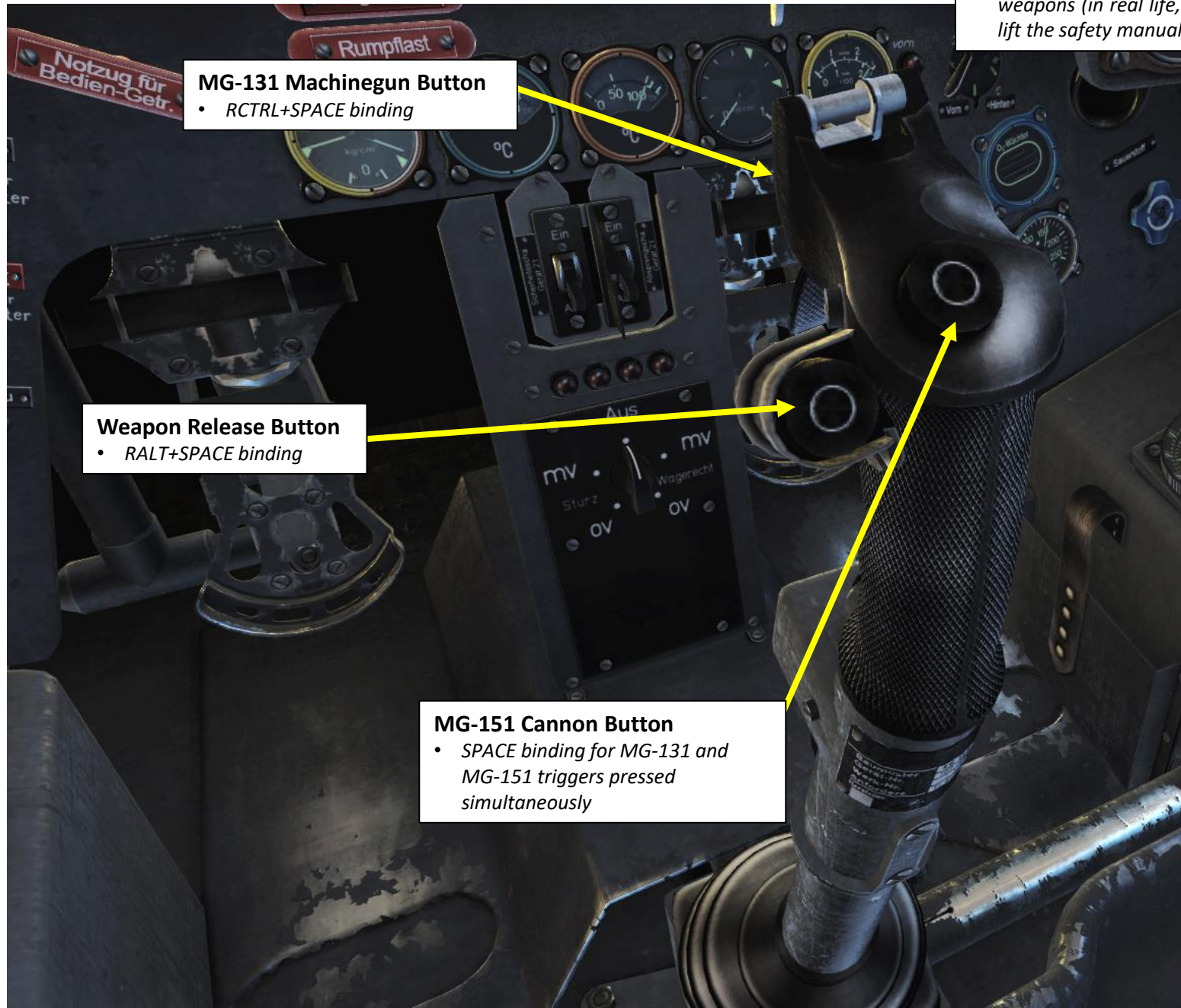
<https://www.youtube.com/watch?v=MeQLbYHVMiA>



Russische Jäger	100	Moskito	16,5
Spitfire	112	Beaufighter	17,7
Mustang	113	Halifax	30,0
Hurricane	122	Lancaster	30,0
Thunderbolt	134	Boeing	31,6
Lightning	148	Liberator	33,5

CONTROL OPTIONS				
Action	Category	Keyboard	Throttle - HOTAS W...	Joystick - HOTAS Wa...
EZ42 Gunsight Target Distance Control (Throttle Twist Grip) - CCW/Decrease	EZ42 Gunsight	.		JOY_BTN13
EZ42 Gunsight Target Distance Control (Throttle Twist Grip) - CW/Increase	EZ42 Gunsight	.		JOY_BTN11
EZ42 Gunsight Target Distance Control (Throttle Twist Grip) - CW/Increase	EZ42 Gunsight	.		JOY_BTN11
EZ42 Gunsight Target Wingspan Knob - CCW/Decrease	EZ42 Gunsight	/		JOY_BTN14 50
EZ42 Gunsight Target Wingspan Knob - CW/Increase	EZ42 Gunsight	.		JOY_BTN12

WEAPON CONTROLS



MG-131 Machinegun Button
• *RCTRL+SPACE* binding

Weapon Release Button
• *RALT+SPACE* binding

MG-151 Cannon Button
• *SPACE* binding for MG-131 and
MG-151 triggers pressed
simultaneously

Cannon Safety Cover
• *Automatically lifted when firing
weapons (in real life, the pilot needs to
lift the safety manually)*



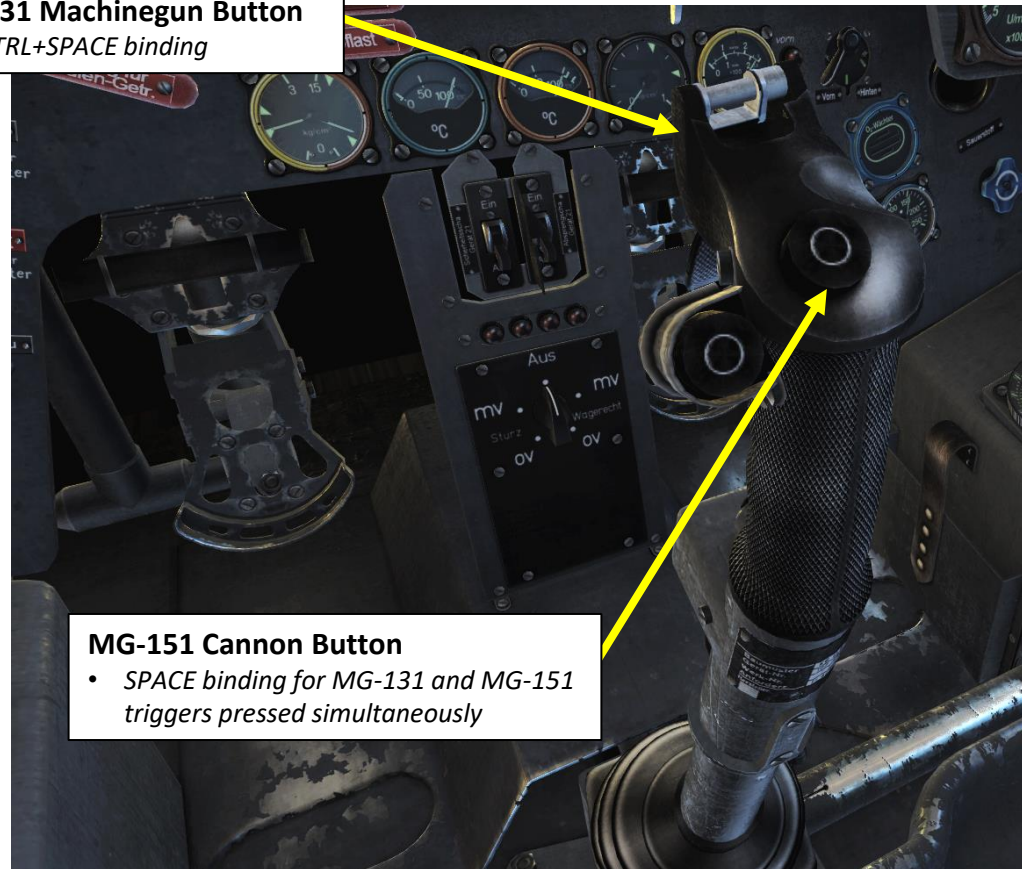
WEAPON EMPLOYMENT (CANNONS + MACHINEGUNS)

1. Arm your guns using the “GRUPPE” Safety Switch (UP)
2. Turn ON your gunsight Gyro Power switch (UP)
3. Press the “MG131/151 FIRE” button (SPACE) to press both the MG131 Machineguns and MG151 Cannon Triggers. Alternatively, you can press on the MG-131 Machinegun trigger alone (RCTRL+SPACE) to fire machineguns only.

Take note that the Cannon Safety cover will automatically be lifted when you press the triggers (in real life you would need to lift it by yourself).

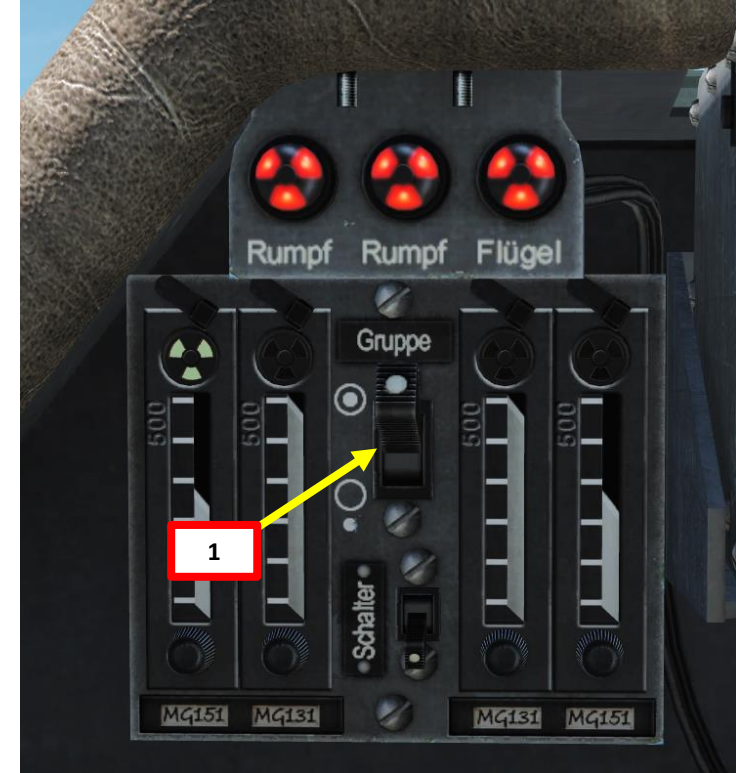
MG-131 Machinegun Button

- RCTRL+SPACE binding



MG-151 Cannon Button

- SPACE binding for MG-131 and MG-151 triggers pressed simultaneously



FW190-D9
DORA

PART 9 - WEAPONS

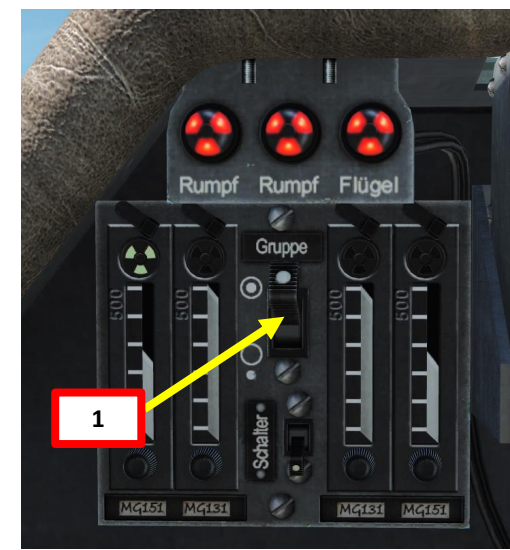
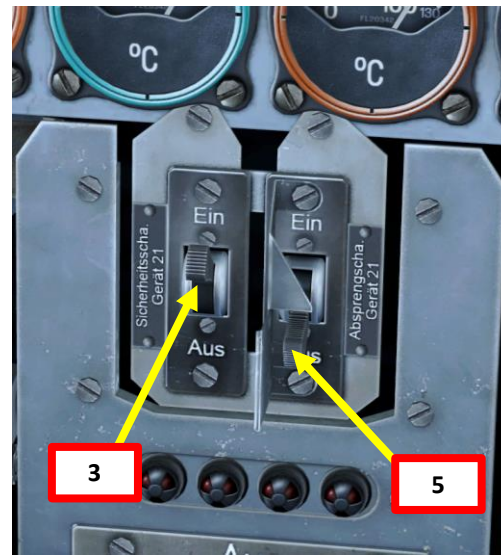
WEAPON EMPLOYMENT (CANNONS + MACHINEGUNS)



WEAPON EMPLOYMENT (ROCKETS)

1. Arm your guns using the “GRUPPE” Safety Switch (UP)
2. Turn ON your gunsight Gyro Power switch (UP)
3. Arm rockets by setting the “SICHERHEITSSCHA. GERÄT 21” switch to EIN (UP).
4. Press the “Weapon Release” button (RALT+SPACE) to fire rockets.
5. To jettison rocket racks, set the “ABSPRENGSCHA. GERÄT 21” switch to EIN (UP) to arm the explosive jettison charges on the rocket racks and press the “Weapon Release” (RALT+SPACE) to jettison them. **(Not Currently Implemented)**

Note: 21-cm Werfer-Granate Rockets and R4M (Rackete 4-Kilogramm Minenkopf) were used as anti-air rockets against the heavy bomber combat boxes.

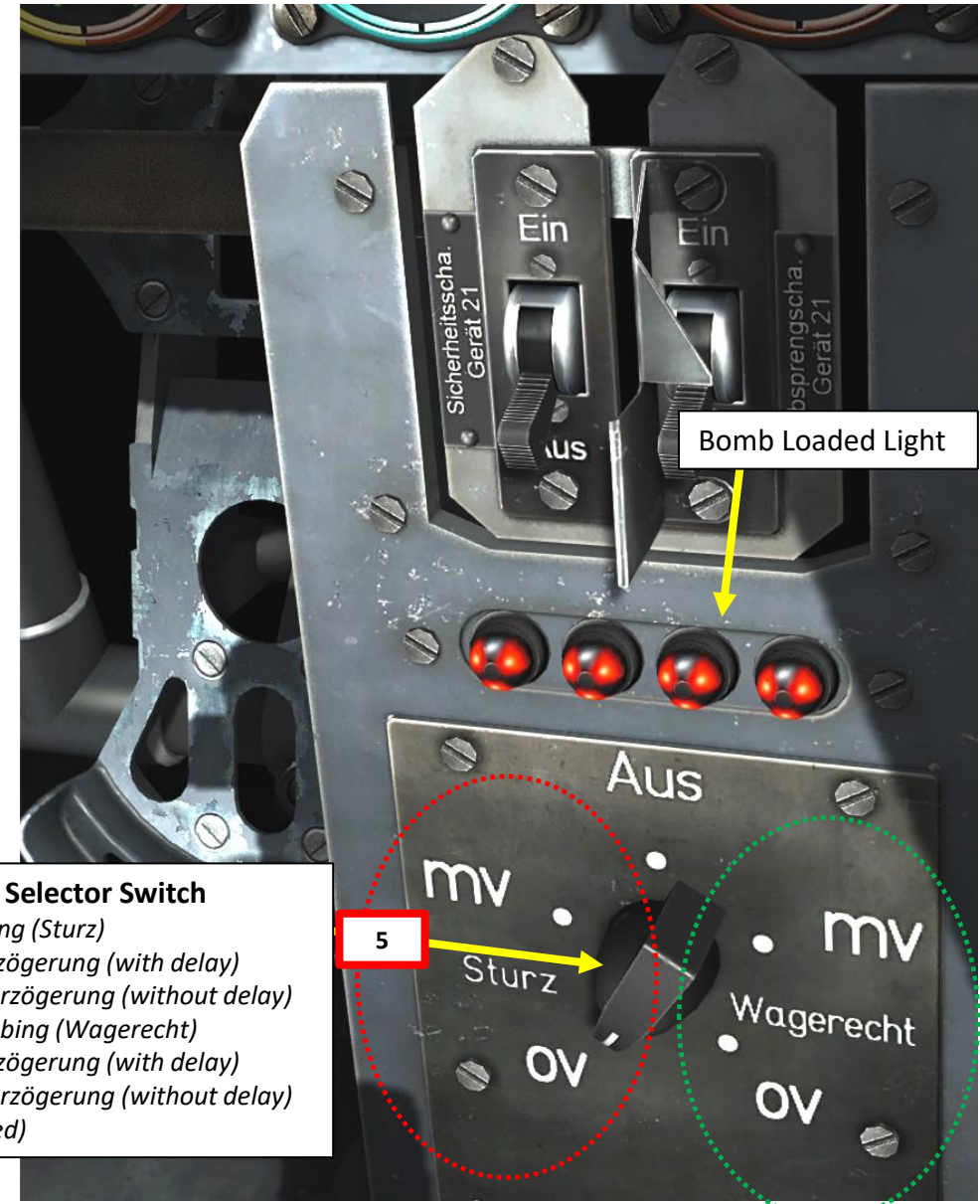
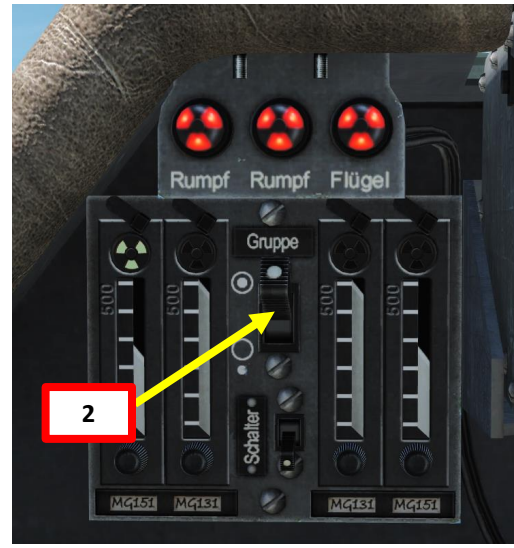
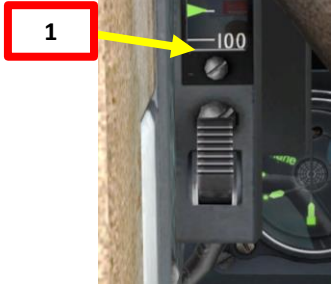


Weapon Release Button
• RALT+SPACE binding



WEAPON EMPLOYMENT (BOMBS)

1. Set gunsight range to 0.
2. Arm your guns using the “GRUPPE” Safety Switch (UP)
3. Choose bomb release mode
 - **Left Side (Red) = Sturz = Dive Bombing**
 - **Right Side (Green) = Wagerecht = Level Bombing**
4. Choose desired fuse delay
 - MV = *Mit Verzögerung* = With Delay
 - OV = *Ohne Verzögerung* = Without Delay
5. Select appropriate release mode on console.
6. Release bomb using the “WEAPON RELEASE” button (RALT+SPACE).



Weapon Release Button
• RALT+SPACE binding



Bomb Release Mode Selector Switch

- **Left side: Dive Bombing (Sturz)**
 - MV: *Mit Verzögerung* (with delay)
 - OV: *Ohne Verzögerung* (without delay)
- **Right side: Level Bombing (Wagerecht)**
 - MV: *Mit Verzögerung* (with delay)
 - OV: *Ohne Verzögerung* (without delay)
- **Middle: Aus (Disarmed)**

FW190-D9
DORA

PART 9 – WEAPONS

WEAPON EMPLOYMENT (BOMBS)



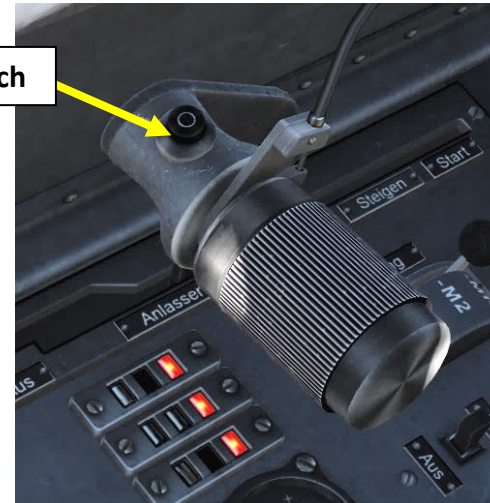
The FW190 is equipped with a FUG 16ZY radio transmitter and receiver. Radio frequencies are preset in the mission editor in 4 different channels and cannot be tuned manually during flight.

1. Set FUG 16ZY Power Switch (FT ANLAGE) ON.
2. Set the radio channel selector to the desired frequency (I, II, Δ or □).

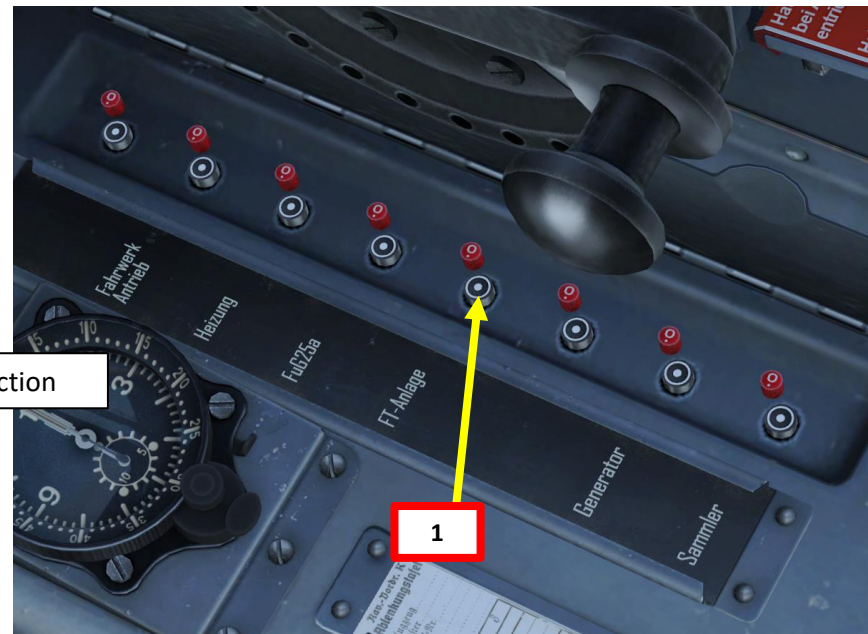
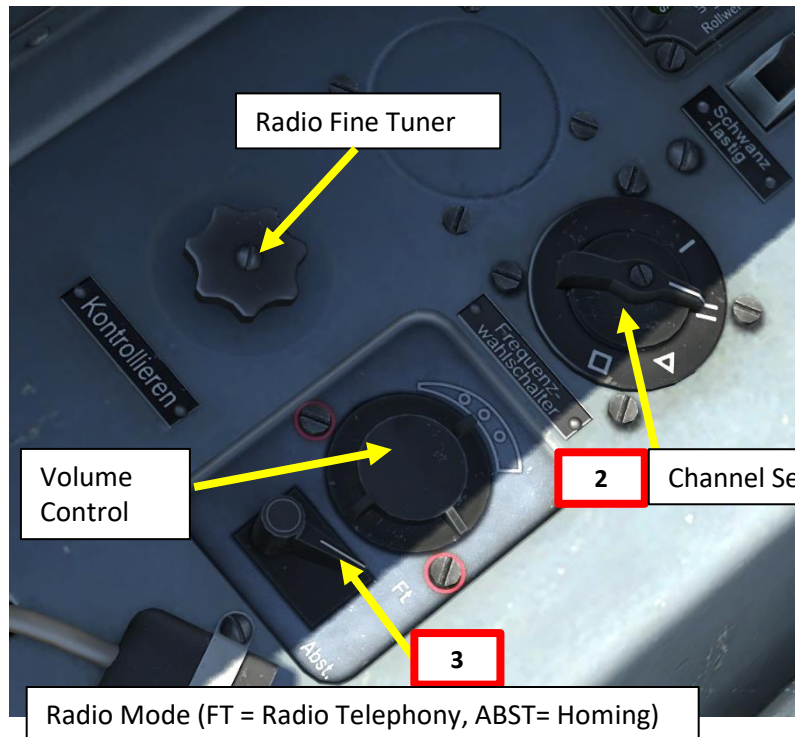
 - See note on next page about the real-life functions of these frequencies.

3. Set radio mode to “FT” (FUNKTELEFONIE = RADIO TELEPHONY)
4. Press the PUSH-TO-TALK switch on your throttle to transmit (“COMM PUSH TO TALK” CONTROL, OR “RALT+\”)

Push-to-Talk Switch



RADIO FREQUENCY RANGE: 38.4- 42.4 MHz



AIRFIELD	FREQUENCY
Anapa	38.40 MHz
Batumi	40.40 MHz
Beslan	42.40 MHz
Gelendzhik	39.40 MHz
Gudauta	40.20 MHz
Kobuleti	40.80 MHz
Kutaisi	41.00 MHz
Krasnodar-Center	38.60 MHz
Krasnodar-Pashkovsky	39.80 MHz
Krymsk	39.00 MHz
Maykop	39.20 MHz
Mineralnye Vody	41.20 MHz
Mozdok	41.60 MHz
Nalchik	41.40 MHz
Novorossiysk	38.80 MHz
Senaki	40.60 MHz
Sochi	39.60 MHz
Soganlug	42.00 MHz
Sukhumi	40.00 MHz
Tbilisi	41.80 MHz
Vaziani	42.20 MHz

The "I" position is for "*Y-Führungsfrequenz*", or Management frequency, is used for communication within the flight or squadron. A mission maker will typically preset this frequency to the same frequency used by your wingmen of your flight and mention it in the mission briefing.

The "II" position is for "*Gruppenbefehlsfrequenz*", or Group Order frequency, is used to communicate between several flights from different squadrons participating in a single raid. A mission maker will typically preset this frequency to the same frequency used by other flights or friendly units and mention it in the mission briefing.

The "Δ" position is for "*Nah-Flugsicherungsfrequenz*", or the Air Traffic Control frequency. It is used to communicate with the designated Air Traffic Controller. A mission maker will typically preset this frequency to the same frequency used by your departure airfield and mention it in the mission briefing.

The "□" position is for "*Reichsjägerfrequenz*", or Reich Fighter Defense Frequency, and is used to coordinate country-wide air defense efforts in large scale raids.

Homing Switch	Frequency Selector	Push-To-Talk Open	Push-To-Talk Depressed	Transm	Recvr
"Ft"	I	Listen	Talk	I	II
"Abst"	I	Homing Listen	Homing Listen+Talk	I	II
"Ft"	II, Δ or □	Listen	Talk	II, Δ or □	
"Abst"	II, Δ or □	Listen to loop antenna Targeting	Talk	II, Δ or □	

Because on the first frequency selector position (I) sending and receiving are conducted at different frequencies, it is not used in this simulation.

For communication, use II, Δ or □ selector positions with "Ft" position of communications - homing switch.

AIRPLANE GROUP
✕

NAME

CONDITION %

COUNTRY

TASK

UNIT OF

TYPE

SKILL

PILOT

TAIL # COMM MHz AM

CALLSIGN

HIDDEN ON MAP

HIDDEN ON PLANNER

LATE ACTIVATION

📍
📏
🔗
Σ
🚫
📄
📡
⋮

FuG 16

Channel 1 MHz AM

Channel 2 MHz AM

Channel 3 MHz AM

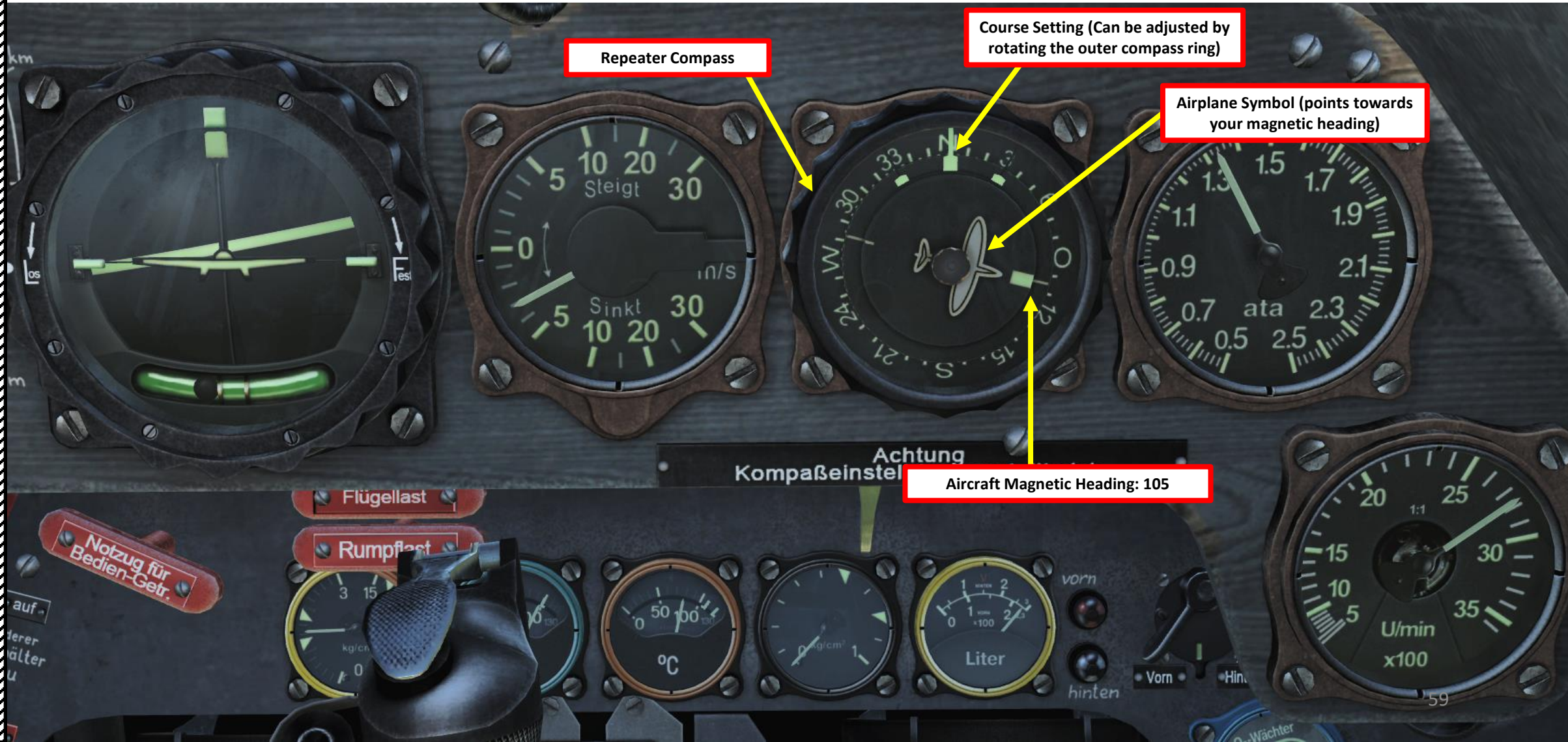
Channel 4 MHz AM

AFN2 Base Frequency MHz AM

The Repeater Compass

Most of the navigation must be done visually in the FW190. Consult the Repeater Gyrocompass.

If desired, you can adjust your course setting by rotating the outer ring of the Repeater Compass. You can then steer the aircraft until the Aircraft Magnetic Heading needle (front of the airplane symbol) is lined up with the Course Setting reference mark.



Repeater Compass

Course Setting (Can be adjusted by rotating the outer compass ring)

Airplane Symbol (points towards your magnetic heading)

Aircraft Magnetic Heading: 105

Achtung Kompaßeinstellung

Flügelast

Rumpfest

Notzug für Bedien-Getr.

Liter

°C

U/min x100

AFN-2 Homing:

- 1) AFN-2 Frequency must be set via Mission Editor prior to flight
- 2) Set FuG 16ZY Power Switch (FT ANLAGE) ON.
- 3) Select Preset Channel II
- 4) Select "ABST." (ABSTIMMEN = Frequency Tuning) Homing Mode
- 5) Track beacon using the indicator by centering the AFN-2 Indicator's vertical needle (direction of beacon). Your distance to the beacon can be determined by watching the horizontal needle (Signal Intensity/Beacon Distance: Low = FAR, High = NEAR)

The AFN-2 Homing Indicator can be used to track beacons. It is used in conjunction with the FUG 16 radio system and it uses a preset frequency as well that is set with the mission editor. Currently, AFN-2 navigation is not yet modelled in DCS.

Marker Lamp
Beacon Distance



AIRPLANE GROUP

NAME: New Airplane Group

CONDITION: % < > 100

COUNTRY: Germany

TASK: CAP

UNIT: < > 1 OF < > 1

TYPE: Fw 190 D-9

SKILL: Player

PILOT: Pilot #001

TAIL #: 119 COMM: 38.4 MHz AM

CALLSIGN: Enfield 1 1

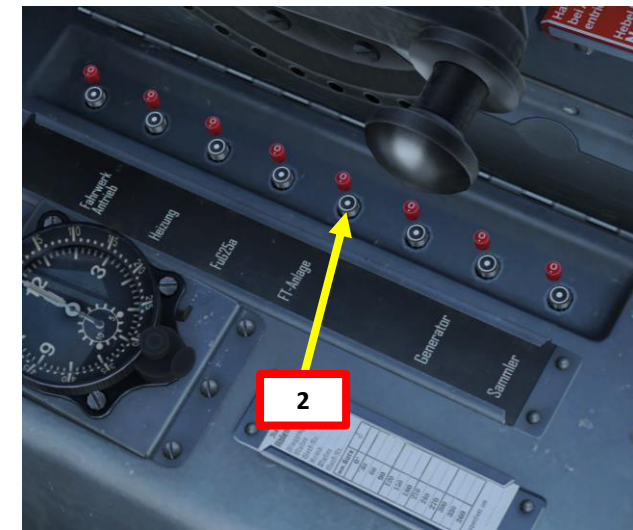
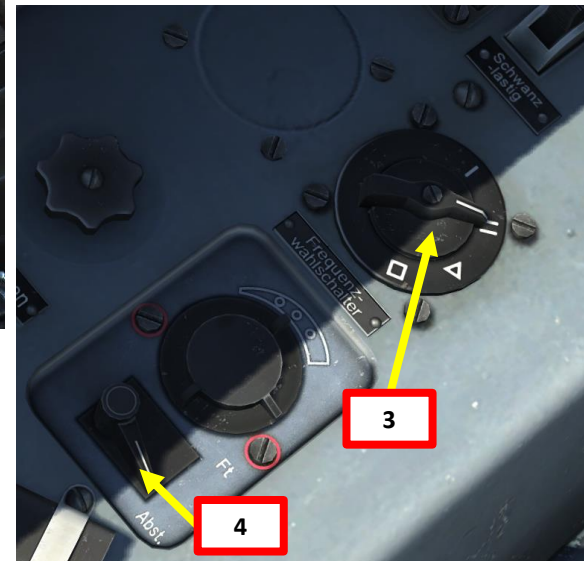
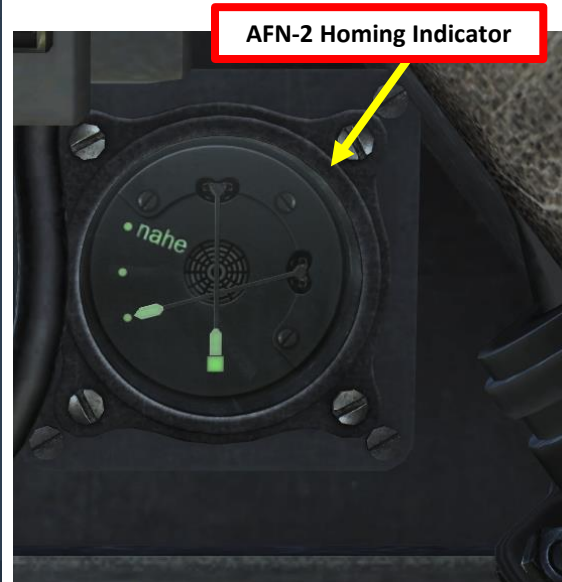
HIDDEN ON MAP

HIDDEN ON PLANNER

LATE ACTIVATION

FuG 16

Channel 1	< > 39	MHz	AM
Channel 2	< > 38.4	MHz	AM
Channel 3	< > 41	MHz	AM
Channel 4	< > 42	MHz	AM
AFN2 Base Frequency	< > 38	MHz	AM



1

The FW.190D-9 variant modelled in DCS is one of the deadliest WWII fighters when flown properly.

The way to fly a FW.190 is pretty much the same in every simulator: keep your energy state high (meaning that you must keep your airspeed and your altitude up) at all times and avoid turning with an enemy fighter that turns hard to try to make you bleed your energy. In most situations, a Focke-Wulf will easily outclimb a P-51 Mustang or a Spitfire. Use this to your advantage.

The 190 is first and foremost an energy fighter. In combat, a pilot is faced with a variety of limiting factors. Some limitations are constant such as gravity, drag, and thrust-to-weight-ratio. Other limitations vary with speed and altitude, such as turn radius, turn rate, and the specific energy of the aircraft. The fighter pilot uses BFM (Basic Flight Manoeuvres) to turn these limitations into tactical advantages. A faster, heavier aircraft may not be able to evade a more maneuverable aircraft in a turning battle (like the Spitfire), but can often choose to break off the fight and escape by diving or using its thrust to provide a speed advantage. A lighter, more maneuverable aircraft can not usually choose to escape, but must use its smaller turning radius at higher speeds to evade the attacker's guns, and to try to circle around behind the attacker. This is the principle behind “energy fighting”: use boom and zoom tactics instead of trying to turn with an enemy aircraft that has a smaller turn radius.

The 190 has a high power-to-weight ratio, meaning that it has a good acceleration. It is equally quite manoeuvrable and can reach higher airspeeds than the Mustang at altitudes under 20,000 ft (6 km). I would recommend avoiding dogfights above these altitudes since this is where the Mustang has the advantage.



Taming taildraggers is much more difficult than meets the eye, especially during the takeoff and landing phase. Here is a useful and insightful essay on the art of flying taildraggers wonderfully written by *Chief Instructor*. I highly recommend you give it a read.

Link: <https://drive.google.com/open?id=0B-uSpZROuEd3V3Jkd2pfa0xRRW8>

TAMING TAILDRAGGERS

Essay by Chief Instructor (CFI)

PART 1

Why taildraggers are tricky and how to overcome it

What do I know about it? Well, I have spent a significant proportion of my professional flying career teaching both experienced and novice pilots how to fly and handle tail-dragging aircraft. This amounts to several thousand hours of tailwheel training alone, though who's counting! These aircraft include among them modern high performance aerobatic aircraft and a variety of more vintage types from DH Tiger Moths, to Harvards. I can't recall off the top of my head exactly how many students I've worked with over the years, but it's well over 200! Best of all, they have all gone on to fly extensive tailwheel ops in a variety of types and to the best of my knowledge, only 2 of them have crashed anything since!

As a significant number of pilots here are expressing difficulties with tailwheel handling,

Fw190D-9 DORA



- INSTANT ACTION
- CREATE FAST MISSION
- MISSION
- CAMPAIGN
- MULTIPLAYER

- LOGBOOK
- ENCYCLOPEDIA
- TRAINING
- REPLAY

- MISSION EDITOR
- CAMPAIGN BUILDER

EXIT



Bf 109 K-4	C-101	CA	F-86F	FC3	Fw 190 D-9	Hawk	Ka-50	L-39	M-2000C	Mi-8MTV2	MiG-15bis	MiG-21	P-51D	SA3342	Su-25T	TF-51
1.5.3 beta	1.5.3 Beta	1.5.3	1.5.3	1.5.3	1.5.3	1.5.3 Beta EFM	1.5.3	1.5.3	1.5.3 Beta	1.5.3 beta	1.5.3	1.5.3	1.5.3	1.5.3 beta	1.5.3	1.5.3