

# Junkers Ju-87 D.2/G.5 Stuka



# Military Visualizations Junkers Ju-87 D.5/G.2

## Willkommen!

Welcome to the Milviz Junkers Ju-87 D.2/G.5.

To register for access to our forums (general or support) please contact [roadburner440@milviz.com](mailto:roadburner440@milviz.com). He will be happy to help you!

This guide will direct you on how to start up your brand new Ju-87 Stuka, how to fly it (basic steps) and, how to fight it!

After you first install the product you will note that your engine is OFF. This is as it should be. Should you wish to do a quick start, merely push in the fuel pump circuit breaker (image #3) and then press ctrl E, advance the throttle and you're off. Note that most systems will not be functional until you turn them on...

It will pay off in the long run however, if you read below and learn a bit about how to fly this plane.

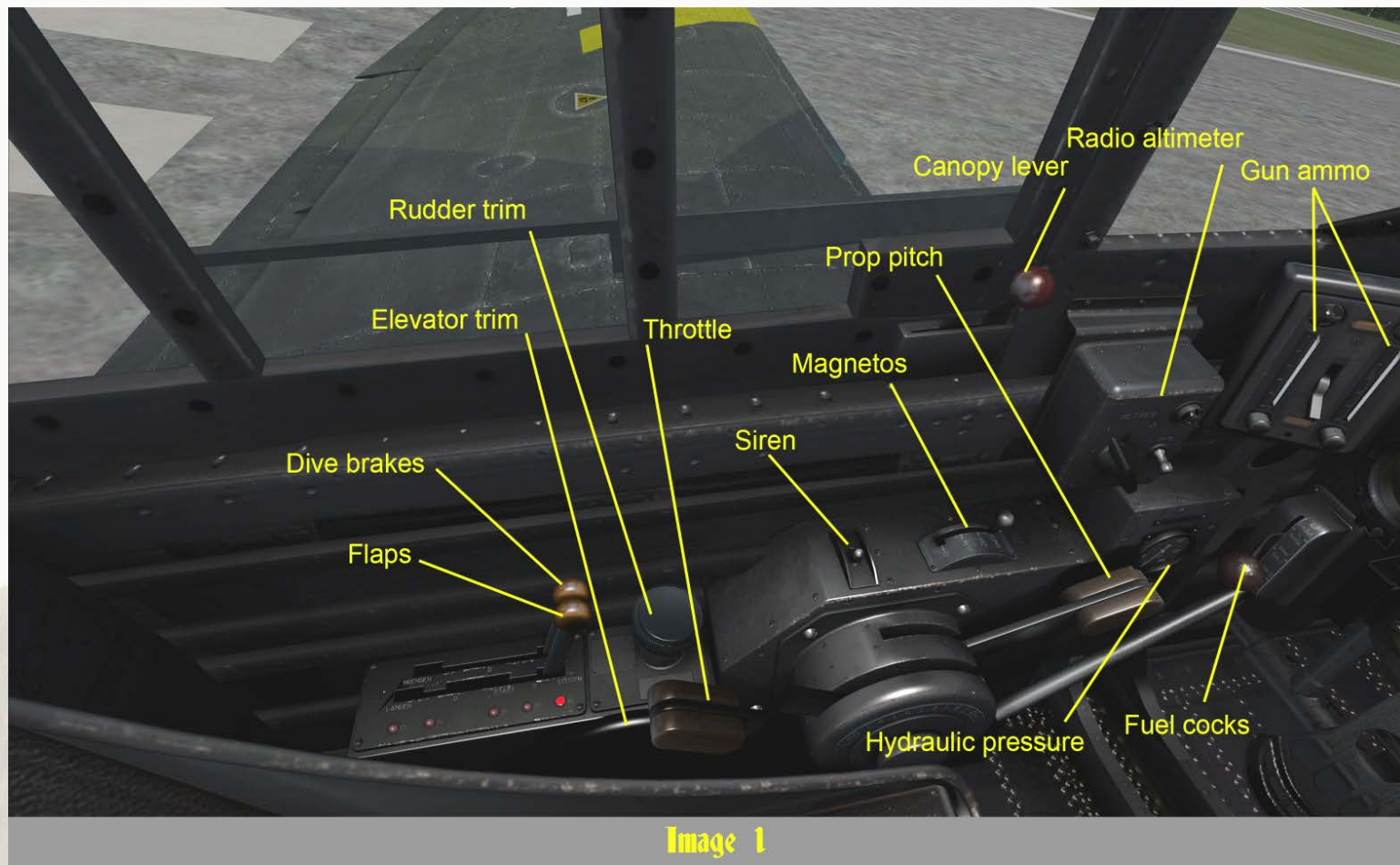
To hide and unhide the pilots, please click the seat in VC view.

D.5 ONLY: To hide the bombs that are loaded up please drop them using the Bomb Jettison handle (image #2, Bomb Jettison). This will then allow you to have a "clean" configuration.

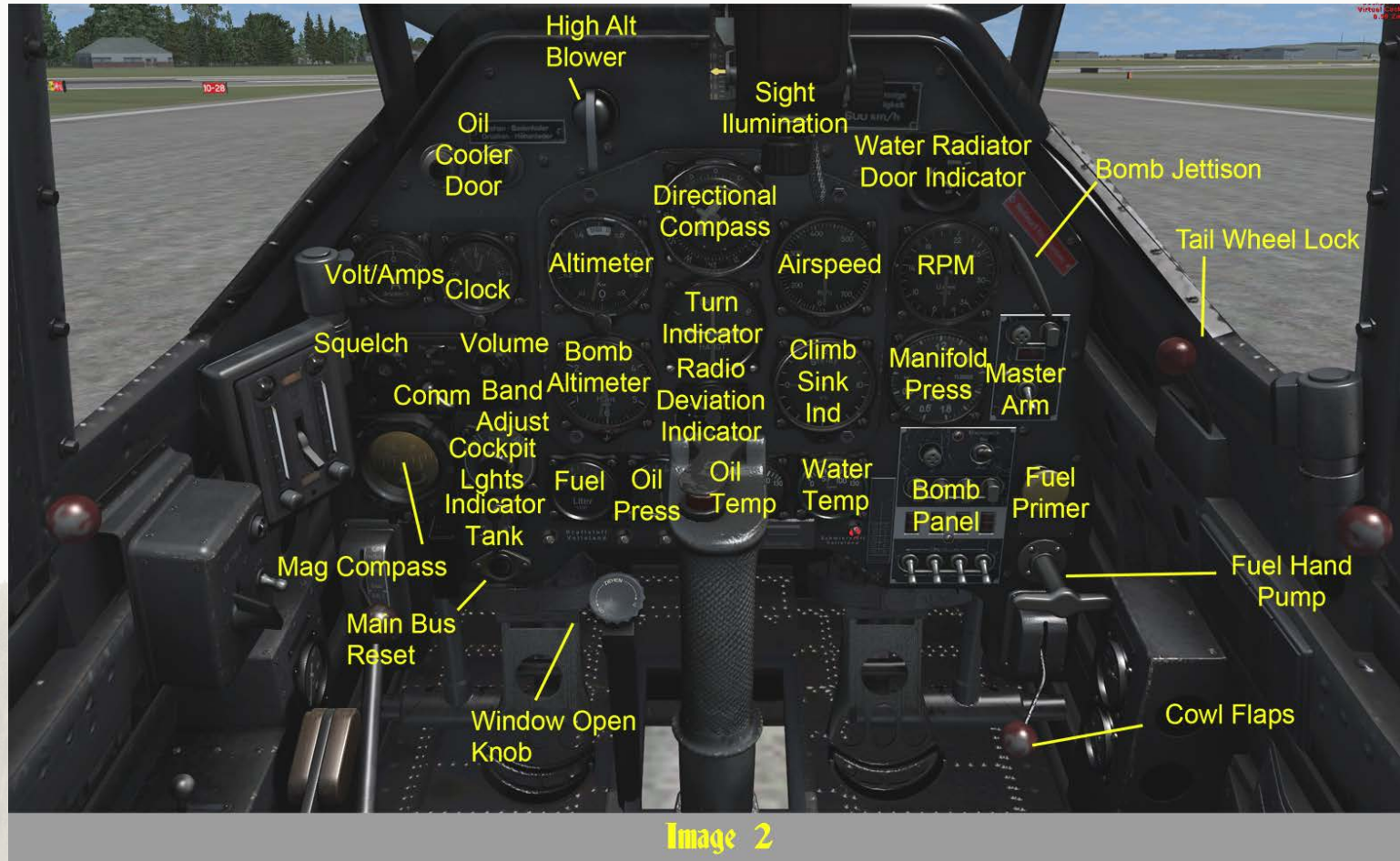
D.5 ONLY: To unhide or hide the siren (the siren wasn't on these versions but we included it for "fun") click on the Siren switch (image #1, Siren switch). Clicking again will enable it on the dive. This will turn on the siren.



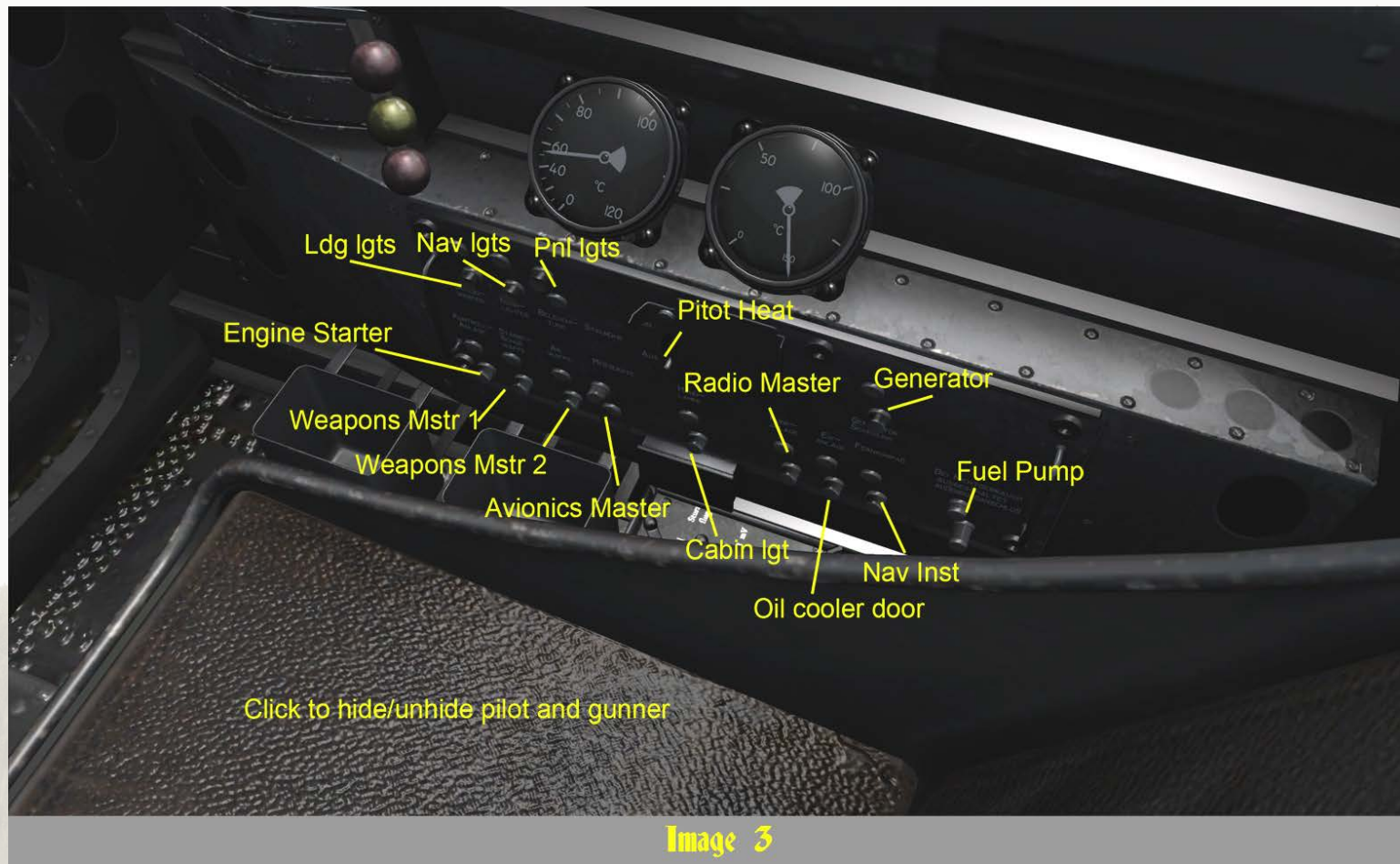
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## Types:

We have included two types of aircraft... The D.5, a typical long wing Stuka dive bomber capable of carrying 4 100kg bombs and one 500Kg bomb and the G.2, the German's version of the IL-2 Tank Killer... Two very large Flak 18 cannons with 6 rounds were mounted on under-wing pylons. Though these guns were unable to penetrate tank armor on the ground, from the air... it was a different story. That the A-10 Warthog is essentially based on the same paradigm is a testament to its capability.

Engine

Junkers Jumo 211 D with blower, height = 3500 m

On ground up to 6 km height                      above 6 km height

Rating	RPM	ata	RPM	ata
1'	2300		1,35	—      —
30'	2300		1,15	2300   1,15
d	2200		1,10	2300   1,10



## Engine Start, Warm Up And Braking

### 1. Engine Start

- Dive brakes lever: position “0”.
- Landing flaps lever-elevator trim: position “0”.
- Check fuel and oil reservoir.

### Hand Start

1. Crank the propeller before 1. start up with deactivated ignition and closed shut off valve once.
2. Carry out step 2-11 from “electrical start”.
3. Insert crank handle for winding the momentum starter into the designed opening left before the bulkhead firewall. Before winding by hand, lift the brushes from the starter handle next to the clutch lever at the winding shaft.
4. Wind the momentum starter with the crank handle until you detect that now increased RPMs can up be achieved.
5. Pull the starter lever (instrument panel). In an emergency, pull the clutch lever next to the crank handle simultaneously with the pulled starter lever (instrument panel). After clutch is in, apply the brushes of the starter. When brushes are lifted, the handle sticks so far out that the engine cowling can only be closed after applying brushes.



## 2. Warm Up

- After start-up let the engine run with 600 U/min[RPM] until oil pressure rises.
- If the oil pressure doesn't rise after 15 seconds, stop the engine immediately.
- Raise the RPMs to 1000-1200 U/min[RPM].
- At rising RPMs, do not let the oil pressure exceed 7 atü.
- Avoid revolutions below 1000 U/min[RPM].
- Let the engine warm up until following values are reached:
  - water outlet temperature 40-50°C
  - oil inlet temperature 20-25°C
  - oil pressure 4-6 atü
- Then with raised revs warm up until:
  - water outlet temperature 60-70°C
  - oil inlet temperature 30-40°C
- Monitor water temperature. Adjustment through actuation of water cooler flaps: push buttons at instrument panel top left.

## Flight

### General

#### Flight Characteristics

- The aircraft is certified for Gruppe H5[group H5] with 4500 kg and H3 with 5000 kg. It has good stability in all axes and of limited suitability for blind flight.
  - By stalling with full throttle at  $v_a = 130$  km/h (landing flaps in “Reise”[travel] position) a gradual, not sudden pitch down begins. After pitching the aircraft is immediately controllable again. A turn around the vertical axis doesn't occur. A tendency to spin is not present. A Spin can only be forced, but is strictly forbidden for aircraft of this weight.
- By stalling -pull in idle at  $v_a = 110$  km/h (landing flaps in “Lande”[landing] position) a little pitch down occurs. The aircraft returns immediately back into the normal flight attitude. The danger of a nose-dive at landing doesn't exist.
- stall at over-pull at full throttle or idle only in the middle.

#### Oil Pressure Device

- The oil pressure device conducts of 2 oil pressure lines I and II. Through that it is possible to activate 2 devices, for instance, water cooler flaps and dive brakes or landing flaps, at the same time.
- In general, only use one device after another; that means only activate the water cooler flaps, when the lever for dive or landing flaps is in position “Aus”[off].
- After every activation return the lever into “0” position, i.e idle-position.



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## Entry

- The entry has to take place at stopped engine.
- To open both canopy through turning of a handle on the left side and pushing the canopy back at the same time.
- •• Closing of the rear canopy through lever below the Ikaria-mount.

## Pilot Departure Preparations

- The pilot checks on entry into the aircraft, if on the switch panel the following buttons are pressed in:
  - Ferntrennschalter
  - Generator
  - Anlaßzündung[starter ignition]
  - Meßgeräte[gauges]
  - Kühlerklappenverstellung[cooler flaps adjuster]
  - Kontrollanlage
  - Fernkompaß[compass]
  - Tankpumpen
- All other circuit breakers are activated if needed.
- All gauge movements must be running smooth running and operating as expected.
- Adjust the fine-rough-altimeter to the height of the airfield above the sea.
- Turn the variometer button to “V”.
- Trim indicator (left cockpit side) to center marks.
- Lever for landing flaps and horizontal stabilizer to position “0”.

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- Lever for dive brakes to position “0”.
- Lever for the propeller pitch to position “Start”.
- Lever for the tail skid lock to “Sporn lose”[skid free].
- Fuel shut off valve in top position “1+r Behälter und Handpumpe”.
- Pull the handle for stage blower in position “Bodenlader”[ground blower].
- Handle for oil cooler flaps in position “Auf”[open].
- Ignition switch in position “M1 + M2”.
- Check fuel reservoir (selector switch and gauge at the instrument panel center below).

### Taxing to departure

- Lever for the tail skid lock to “Sporn lose”[skid free].
- Open cooler (push left pressure button at the instrument panel top left, check position indicator top right, lever for oil cooler in position “Auf”[open].
- Lever for landing flaps/horizontal stabilizer in position “Start”[25°]. If respective signal lamp is on , lever back to position “0”.
- If the aircraft is prepared for cold start and oil entry temperature rises above 30°C, abort departure if possible until the temperature goes down again.
- Nurse the brakes, temporary discontinue brake maneuver.
- To turn on one wheel is prohibited.



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## Take-Off

- Through short rolling straightforward bring the skid in center position.
- Lever for the tail skid lock to “Sporn fest”[skid secured].
- Activate Staurohrheizung[pitot heater] at great density and temperatures below 0°C (circuit breaker at the switch panel).
- Landing flaps in position “Start”[25°]
- Elevator must w/o big resistance be movable to the end positions.
- Propeller pitch in “Start” position.
- Quickly increase throttle, throttle lever until end stop “Auf”
- 1 min power  $n = 2300 \text{ U/min max.}$ 
  - $p = 1,35 \text{ ata}$
- Take-off speed at full load:
- $v_a = 115 \text{ km/h}$
- The take-off distance at full take-off weight in still air and up to an height of 20 m is circa 500 m.
- Straight after take-off throttle back from “Auf” position.
- 30 min power (climb- and fight-power)
  - $n = 2300 \pm 40 \text{ U/min}$
  - $p = 1,15 \text{ ata}$

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## Climb

- Retract landing flaps to “Reise und Steigen”[travel and climb] in sufficient height, because the aircraft loses height through change of airflow.
- If both signal lamps are on, lever back to position “Aus”[off].
- Velocity for best climb
  - $V_a = 215$  km/h at ground
- With each km height  $v_a$  reduces by 10 km/h, so that in 7 km height  $v_a = 145$  km/h is reached.
- Propeller pitch is left in position “Start - Steigen”.
- Engine revolution must not exceed  $n = 2300 \pm 40$  U/min.

## Blower shift heights

in climb from ground blower[BL] to height blower[HL] at 2,5 km

in dive from height blower[HL] to ground blower[BL] at 2,2 km

- By manually shifting, it is not necessary to reduce the throttle beforehand. After shifting adjust the engine again to travel power.

## Water out-let temperatures

- The temperature should not sink below  $60^\circ\text{C}$ , in travel flight between  $70\text{-}80^\circ\text{C}$  and not exceed the following values:
  - 0-3000 m  $95^\circ\text{C}$
  - 4000 m  $90^\circ\text{C}$



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- 6000 m      85°C
  - 8000 m      80°C
- Adjust through cooler flaps.
- Attention! If the overpressure valve of the cooling-device releases steam (water sprays on the right sight of the windowpane), then completely open the cooler flaps and reduce throttle, until the water temperature decreases. Afterwards operate the engine normally again, but continuously monitor the water temperature. If it exceeds again, abort flight because of water loss.
- If the valves open below the given values for the heights, then it must be overhauled. Inform the “1. Wart”[1. warden/mechanic].
- At a failure of the electric-oil-activated cooler-device, the flaps can be opened manually with the handle (Notzug) at the instrument panel right below. After pulling the handle the clutch for the water-cooler-flaps will snap in again, if the oil pressure device is functioning.

### Oil temperatures

- **Entry:**
  - gauge at the instrument panel.
  - Temperatures not below 30°C and not above 90°C, in travel flight between 70-80°C.
  - Adjustment through lever at the instrument panel right below.
  - By exceeding of allowed temperatures for water or oil reduce throttle.
- Outlet: max. 95°C

## Oil pressure

- between 4-6 atü. Indication shouldn't fluctuate.
- In height above 7 km the pressure can fall to 3,5 atü.

## Fuel Pressure

- 1,0-1,5 atü.
- fuel pressure must not fall below 0,8 atü.
- By pressure below 0,8 atü activate electrical fuel pumps.
- Otherwise activate the electrical fuel pumps only at take-off, landing(touch-and-go) and at flight in high height, when engine power reduces (fuel-deficit through insufficient delivery of the engine pump).

## Travel Flight

- propeller pitch lever in position “Sturz-Reise”[Dive-travel].
  - Revolution  $n = 2100 \text{ U/min}$
  - Manifold Pressure  $p = 1,10 \text{ ata}$
- True Air Speed
  - on ground  $vw = \sim 300 \text{ km/h}$
  - in 5 km height  $vw = \sim 350 \text{ km/h}$
- For more info about
  - velocity



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- beneficial heights
- RPM and manifold pressure
- flight distances and times as well as
- fuel consumption (see also operation data card)
- see the Flugstreckentabelle Ju 87 B-2[flight distance chart], issued from the Erprobungsstelle Rechlin[test center Rechlin].
- At distance flights above 6 km with engines with mechanical fuel-rich, do not set the throttle continuously the end position “Auf”, since fuel-rich will be activated. Strong reduction of flight distance w/o major power gain.
- In this case reduce throttle until the manifold pressure begins to fall (needle width).
- Oil consumption at  $n = 2100$  U/min and 1,10 ata, circa 10,6 l/h.

### Fuel metering

- Indication electrical. Keep in mind to drain the tanks equally.
- Fuel warning indication for each tank through electrical lamps. By activation for each tank min. 30 l are left.
- Cross-feeding is built-in, by a failure of a fuel line, fuel distribution is ensued from only one tank
- Use the hand pump only at tank selection “l + r Behälter” (top position) or “r Behälter II” (right tank), since only in the right shut-off-valve is a hand pump (membrane pump) integrated.
- At malfunction of the complete fuel delivery a contingency rating can be maintained.
- oil supply indication during flight is impossible.

## Flight at height

- At 4000 m height activate the O2 breathing-device. Open bottle vents (beside the lungs).
- Check oxygen-pressure. By a pressure of 150 atü the supply is sufficient for 3 hours.
- Keep in mind to regulate the additional-air-valve for heights between 4-6 km and 6-10 km.
- Above 6000 m height only pure oxygen-breathing.
- At freezing mask reduce height immediately below 4000 m.
- If pressure of 20 atü is reached, also reduce height below 4000 m.
- Close valves after usage.
- For more information for the breathing-device see L.Dv.291.
- **Night Flight**
- Position lights.
- Cockpit lights.
- Activate landing light (only at take-off and landing) through pressing the circuit breaker at the switch panel on the right cockpit side.
- Regulation of the cockpit light through dimmer at the instrument panel left and on the panel

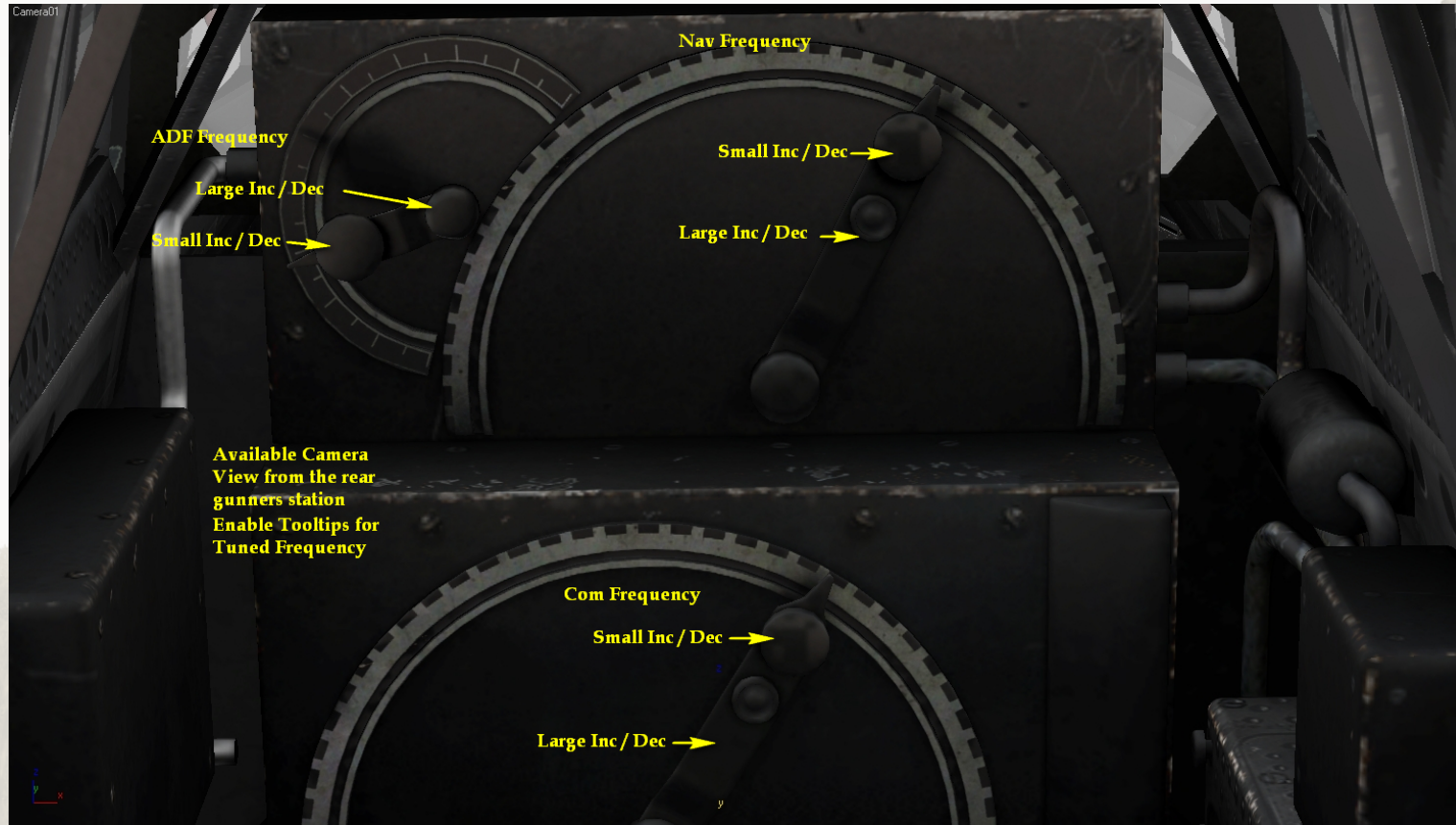
## Navigation

**Radio Tuning** The rear cockpit has the three tuning heads available for NAV , COM and ADF Frequencies

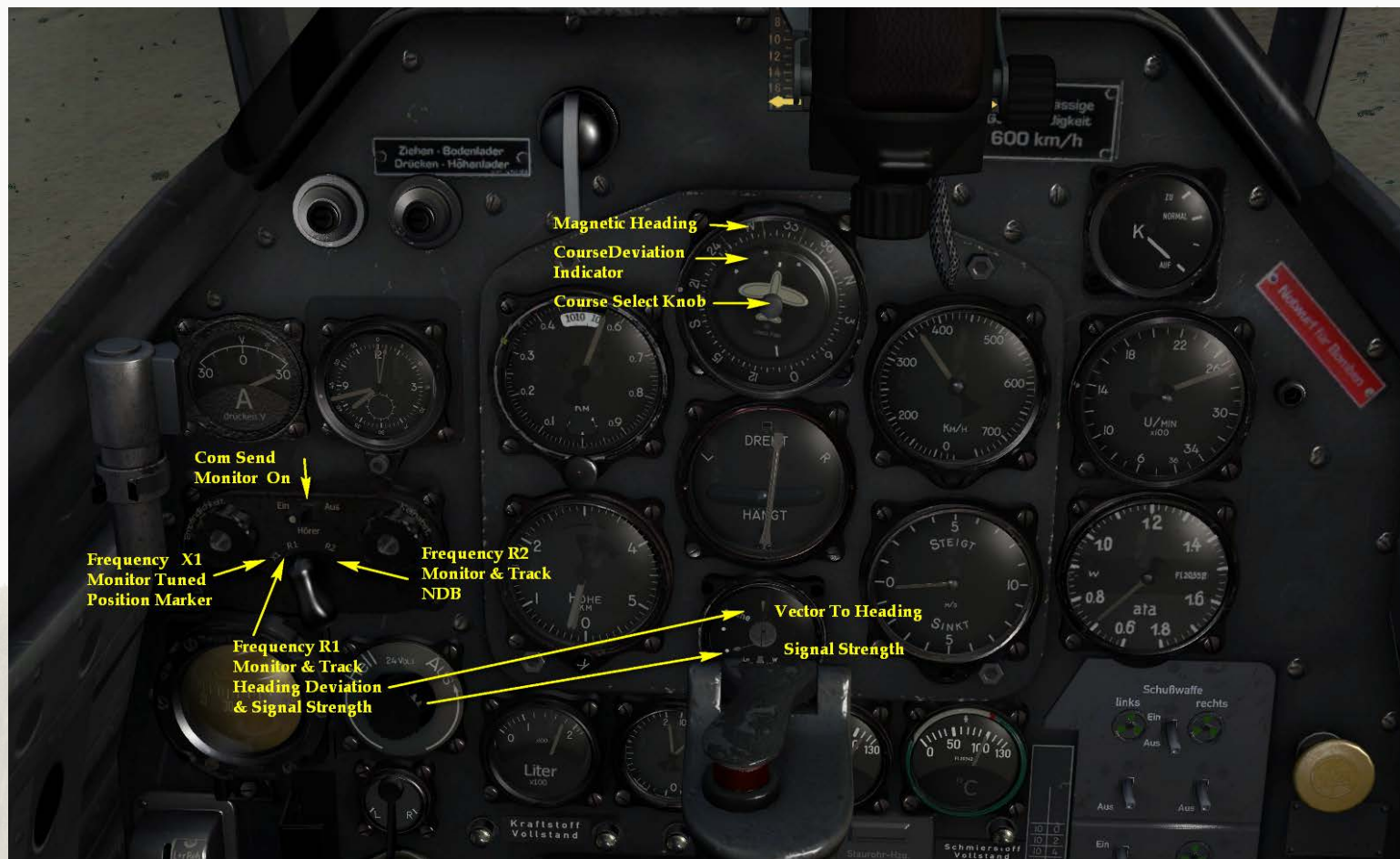
Tuned Stations are read in the Tool Tip and frequency adjustments made by clicking the indicated positions below.



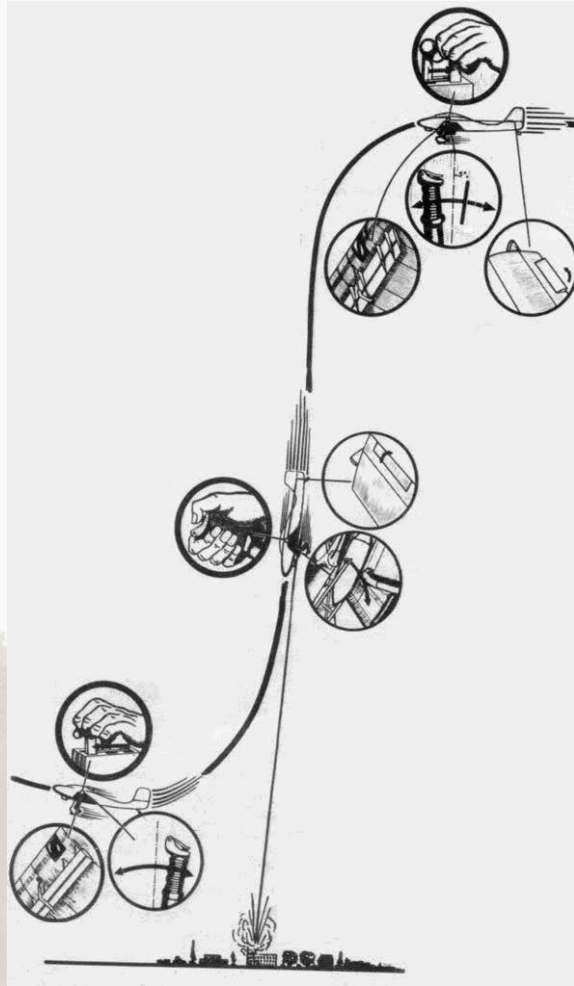
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## Target Acquisition and Weapons Release

- Open the cover of the floor window. (the window between the legs of the pilot)
- Pull handle in front-left of the stick and turn it counter-clockwise.
- Activate weapon systems as per diagram Pages 24 through 27

## Dive

- Pay attention to following points:
  1. Do not dive over 90°. Begin the dive in a manner that, at aiming in the dive the aircraft will not be pushed over the 90° position (as example the case of back wind). In this case begin more shallow or go around.
  2. Dive height is optional to the extent that you must have sufficient height to pull out, Min 1000 m level ground.
  3. Do not dive w/o extended dive-brakes. The extension of dive-brakes within the dive is forbidden.
  4. Dive speed will at a weight of 4300 kg in a 90°-dive limited to + - 550 km/h with the dive-brakes. This velocity will be reached after ca. 1500 m dived height. Highest allowed dive speed of the Ju 87 B-2: 600 km/h.
  5. Though pressing the Button on the stick will initiate flare out the setting of the contact-height-altimeter can initiate

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drop and recovery , the pilot should pull the stick further until the security stop (in an emergency push over it). The flare out with the stick at the security stop correlate with the max. load-factor of 6 G and command a radius of 450 m. From that with an addition of a small security-factor the lowest release-height for training flights will be 1000 m. It is forbidden to operate trim within the dive and the flare out.

6. Course corrections through the aileron and the rudder in a dive are OK , as long they are not abrupt.
7. Flare out as well as landing with bombs is uncritical.
8. After flare out the Dive Brakes must be retracted and the water-cooler-flaps opened.

NOTE: You cannot drop bombs in this aircraft (using the dive system) at anything other than 1000m, 1500m, or 2000m.

NOTE: You cannot drop bombs using any other method and have them do a contact explosion at anything above 2000m.

NOTE: The weapons have NO EFFECT.

- Before the dive follow these steps:
  1. Points 1-4 are omitted at travel-flight to dive
  2. Landing flaps to “Reise” and lever to “0”-position.
  3. Elevator trim to “Reise”.
  4. Rudder to “Reise”.
  5. Propeller pitch to “Reise”.
  6. Activate the circuit breaker for the “Kontakthöhenmesser”[contact-height-altimeter] at the switch panel.
  7. Adjust the contact height meter to release height.



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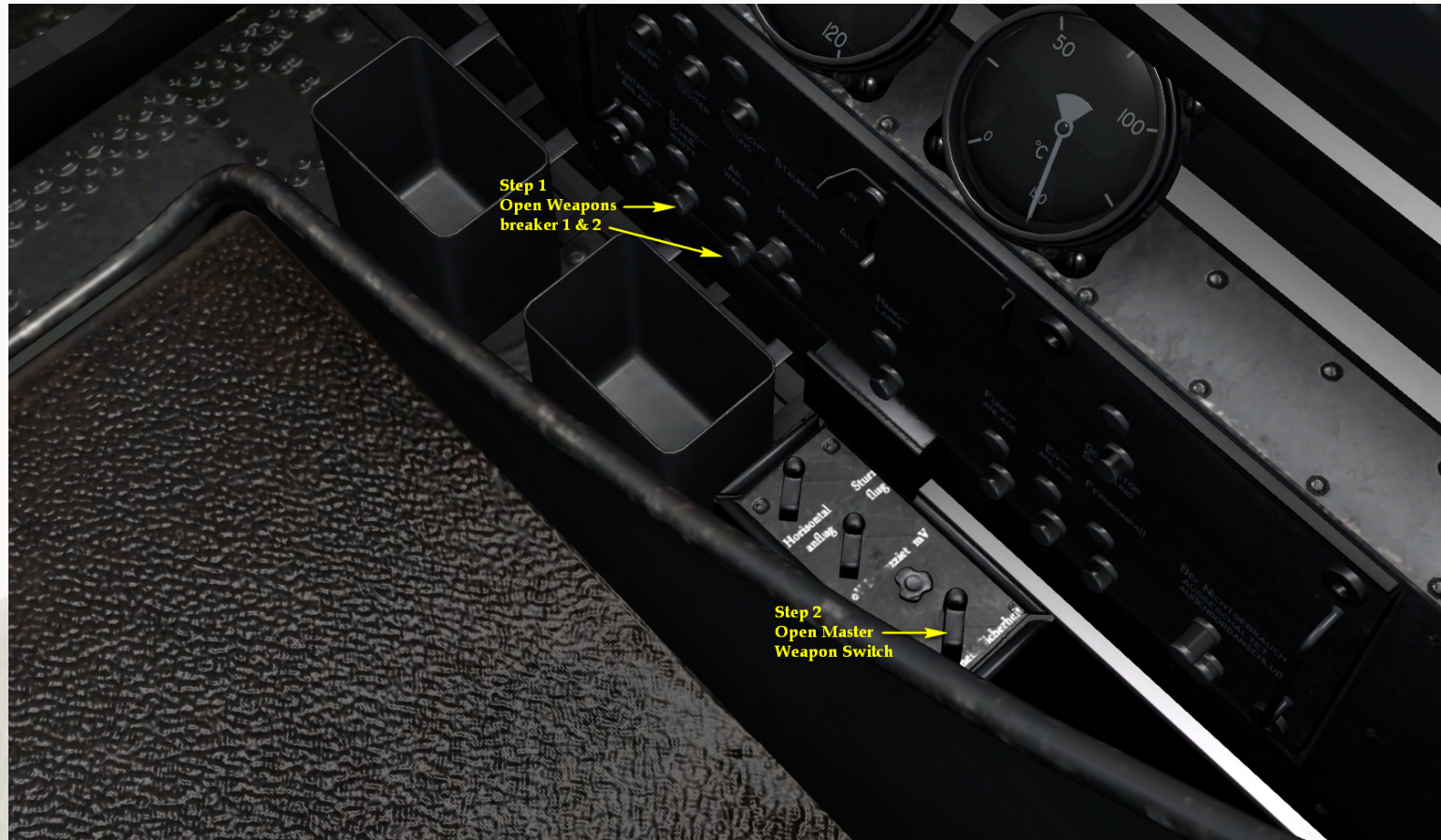
8. Blower shift Lo
  9. Throttle back.
  10. close cooler-flaps.
  11. Extend dive-brakes.
    - With extension of the dive-brakes the aircraft tends to, through automatic and simultaneous activation of the flare-out-mechanism, nose-down into a dive. It is still possible to continue to fly horizontal.
    - To prevent undercooling of the engine by a dive from high height add some throttle.
    - The grade lines (angle scale) at the right front side-window of the pilot canopy for the angles of 30-90° serve to control the dive-angle to the horizon.
    - Attention! Do not dive, if the brakes don't extend.
    - If the Aircraft doesn't flare out, it is possible to flare out manually by overcoming high elevator forces (security control of 30 kg) respectively with the help of the elevator trim.
- Following Climb
    - Retract Dive-brakes.
    - Propeller pitch to “Start-Steigen”.
    - Throttle up until 1,15 ata manifold pressure.
    - At enemy fire can be flown with  $n = 2300$  U/min and 1,35 ata manifold pressure.
    - open cooler flaps.
  - Close Dive-Brakes
    - The dive-brake is actuated through setting the lever to “Bremsen”, whereby simultaneously the safeguard actuator and the flare-out-mechanism is activated. At push out of the red indication rods on

each wing you can see, that the dive brake is extracted. Afterwards follows automatically the activation of the safeguard actuator and flare-out-mechanism.

- In the same way works the retraction of the dive-brake through setting the lever to “Einziehen”. As soon as the dive-brake is retracted and the indication rods are back in the wing, the safeguard actuator deactivates itself. Circa a half minute (not longer than a minute), after the indication rods are retracted into the wing, set the lever back to “0”-position, to unload the oil-pressure-device and release the landing flap actuation.
- Flare-out-mechanism
  - Purpose of the Flare-out-mechanism is to bring back the elevator trim flaps, which are actuated at the extraction of the dive-brakes, after release of the bomb, to initiate the flare-out from the dive.
- Safeguard actuator is turned off when Dive brakes are closed
- Refer to the following pages for the 12 steps involved in activating the weapons

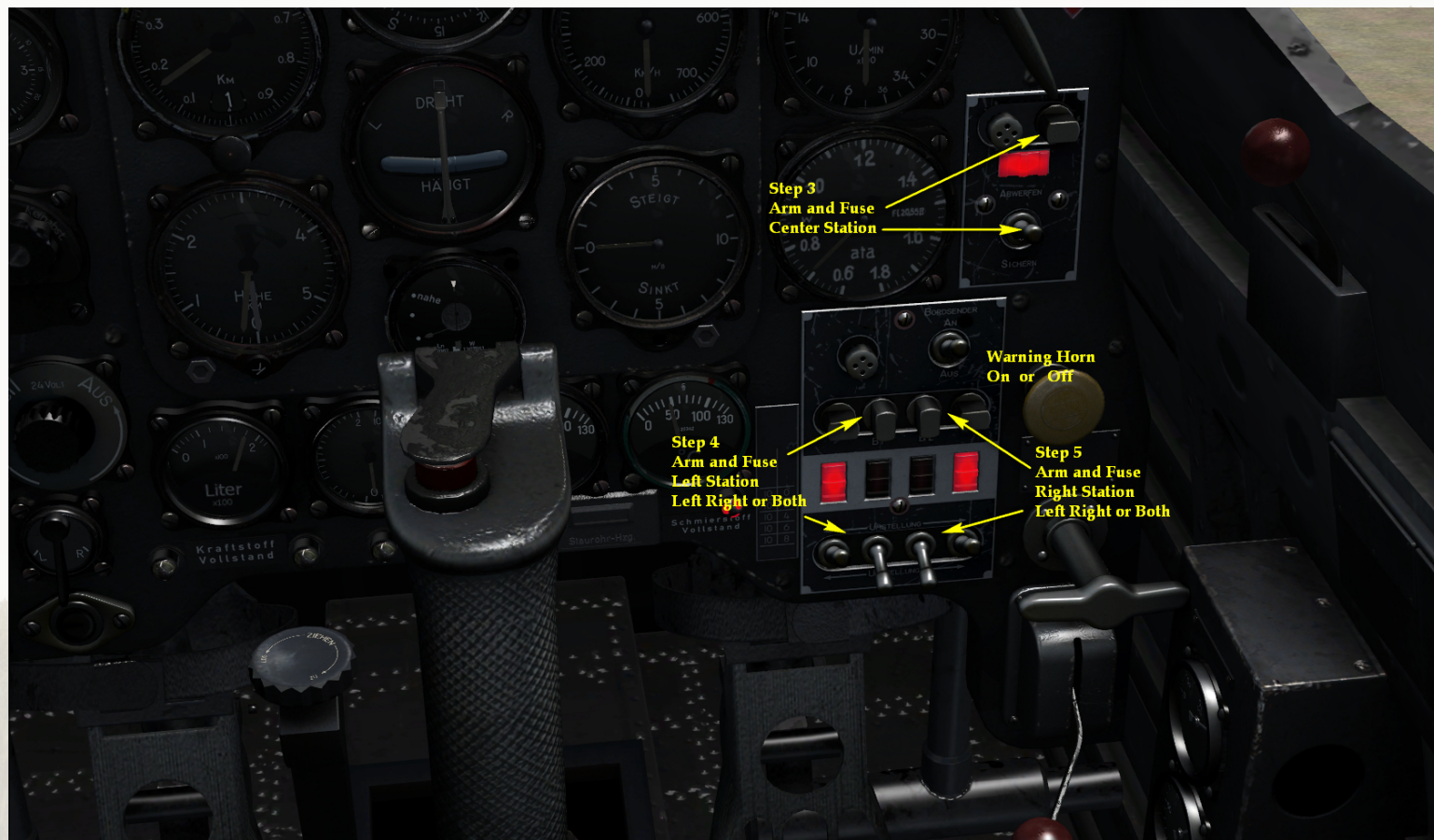


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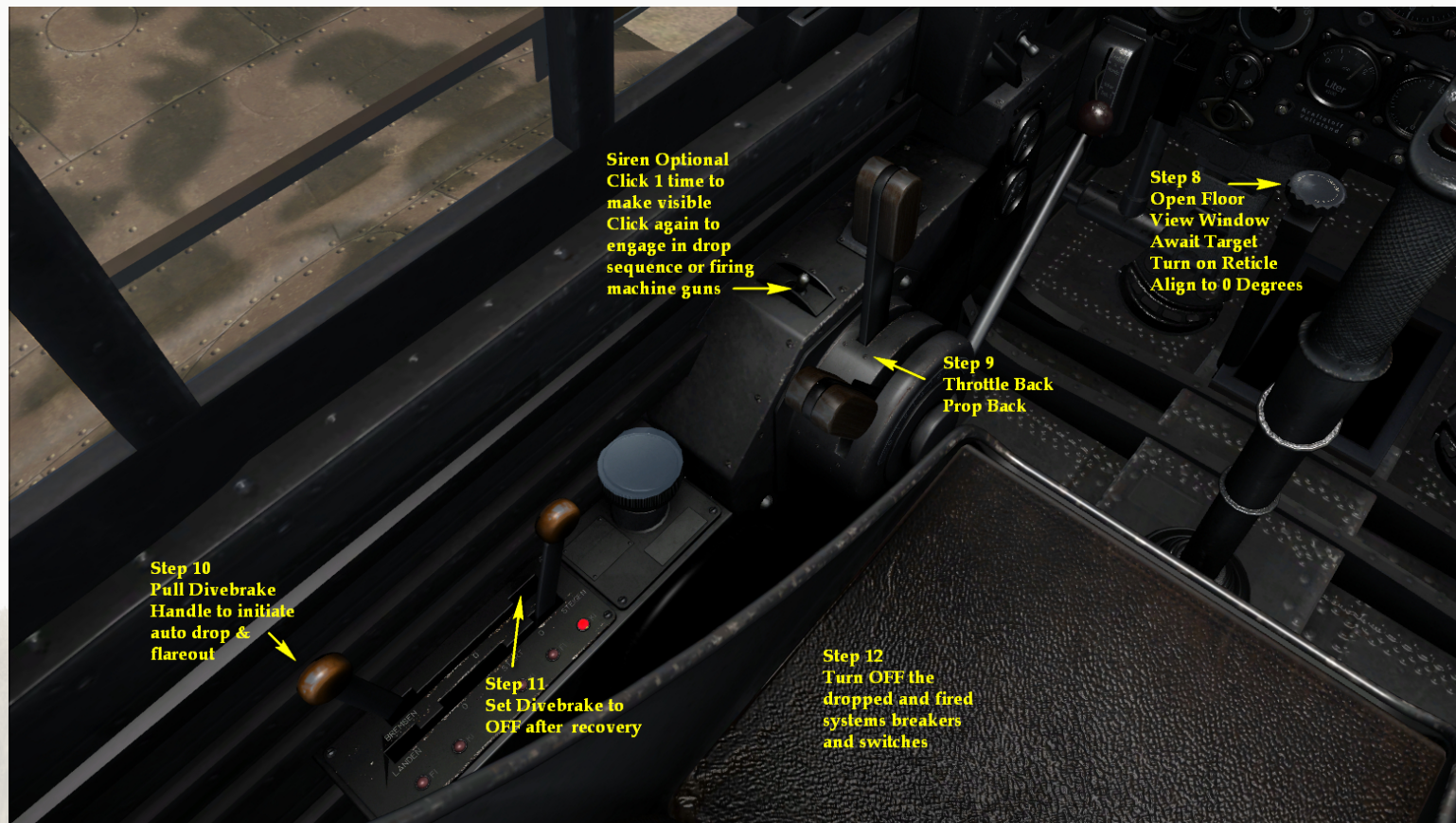




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## Landing

- Landing with full bomb load is allowed, but only in case of emergency, if it must be done with extended dive-brakes respectively activated security-device, it is nonhazardous, but the security-device (30kg) has to be over-pushed by pull through.
- Set Propeller pitch to position “Start”.
- Distance for landing
  - The distance for landing at fully extended landing flaps, weight of 4300 kg and still air at an approach speed of  $v_a = 150$  km/h: from touch-down to stand 300 m with wheel brakes.
  - After roll-out tail skid lock to “Sporn lose”[skid loose].
  - Retract landing flaps to position “Reise und Steigen”.
- Landing training
- Engine Shut Down
  - Open cooler flaps.
  - Let the engine run with 1400 U/min (for min. of 2 minutes), until the water outlet temperature if possible below 60°C. Simultaneously switch for 1 minute each to M1 respectively M2.
  - Propeller pitch in position “Reise”.
  - Leave throttle at 1400 U/min.
  - Close cooler flaps.
  - Close the Fuel-shut-off valve (simultaneously the fast stop device at the engine is applied).
- Ignition off.

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Further information can be had at our [forums](#) and the original manual .

We would like to thank Mathias Pommerien for his great assistance in making this project possible!

## Credits:

Chuck Jodry	Model/Paint/Lead code
Bernt Stolle	Flight Dynamics
Dmitriy Usatiy/3D Reach	Lead Model/Paint
Diego Menendez	Project Management
Gunnar van der Meeren	Liveries
Ville Keranen	Videos, tutorials and testing

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