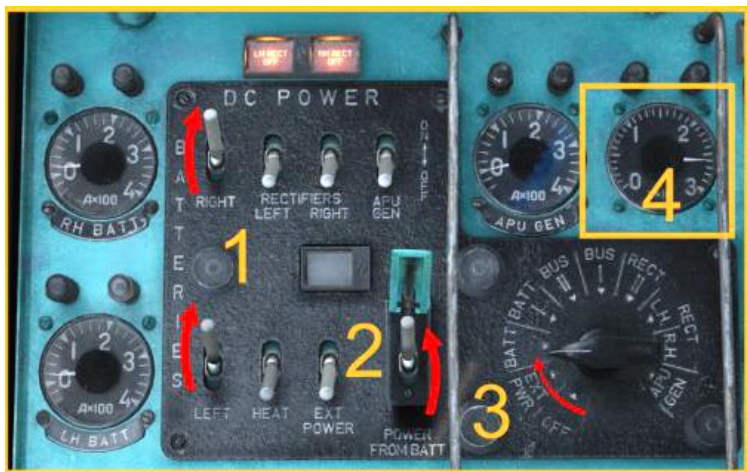


Based on ED Russian QS Manual. In blue items that can be omitted. Summarized by Rudel chw

Minimum startup procedures.
Starting option - from Batteries.

- Enable Left Side Bank of Circuit Breakers, by pulling its mechanical lever, or use **[Rctl + RShf + 1]**.
- Repeat with the Right Side Bank, use **[Rctl + RShf + 2]**.

- Switch ON both “RIGHT” & “LEFT” on-board Batteries (1).
- Turn ON the “POWER FROM BATT” switch (under cyan cover) (2), so that the devices connected to the rectifier bus can get power from the batteries.

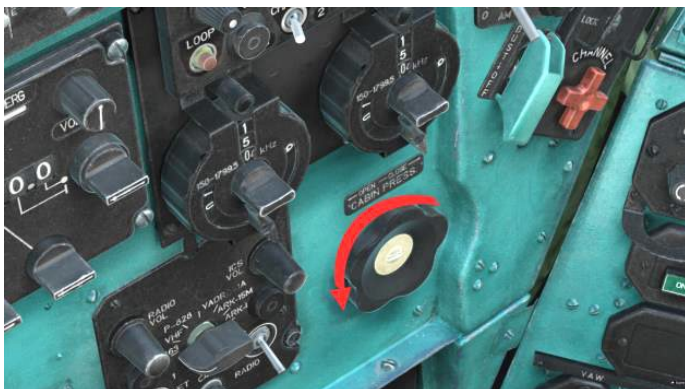


- Set DC Voltmeter knob to the “BATT” position (3), and check it’s over 24V (4).
- You can use **[Backspace]** or click the floor behind the cyclic, to hide the Seat, Collective & Stick, to ease access onto some Panels.

- Set the 115V “INVERTER PO-750A” (under cyan cover) to ON, its annunciator “PO-750A INV ON” illuminates (1). This is necessary to power the Engine and EGT gauges, through the 115/36 transformer.



- Set AC Voltmeter Selector Knob to 115 (2), to check the 115V Bus Voltage (3).
- Close the cabin door by clicking its handle. Instruct the Operator to close his hatch, or use the keys **[LCtrl + C]** to close both cockpits.
- Once both cockpits are closed, rotate the shut-off valve of the sealing system, “CABIN PRESS” to “OPEN” (counter clockwise) on Left Panel, to seal the cabin for NBC (Nuclear, Biological, and Chemical) battlefield conditions.

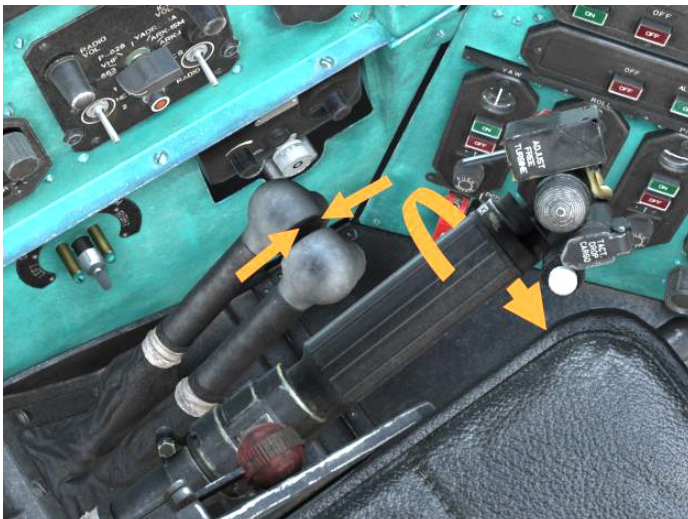


- After about 20 seconds, the advisory light “DOORS UNSEALED” should go off and “DOORS SEALED” should light up on the chassis control panel.

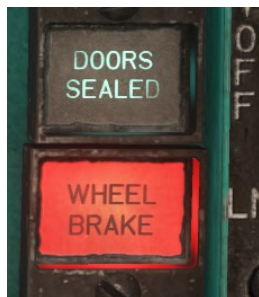


- Release Rotor Brake. Handle to the right of the Pilot Seat, set to full down.

- Lower the collective step lever all the way down; move the correction handle to the extreme left position; check the Engine Condition Levers are set to their middle position ("on the latch").



- Enable the Parking Brake with **[LSHf + W]**, to prevent helicopter movement during the start. The “WHEEL BRAKE” indicator should illuminate.

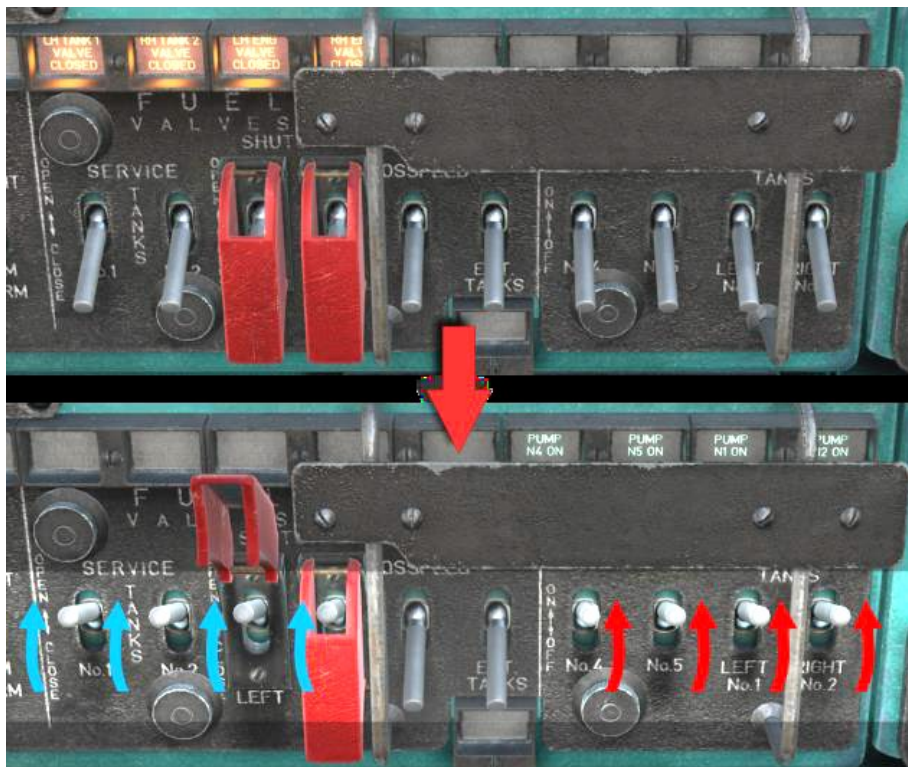


- On the Fire Protection System Panel, set the “FIRE-EXT” switch UP, to enable the fire extinguishers (1); and set the Fire Protection Power switch to ON (2). All lights of the panel should be off.



On the Fuel Panel:

- Set "SERVICE TANKS" pumps 1 & 2 to ON; "SHUT-OFF" Fire Fuel Valves LEFT & RIGHT (under red cover) to ON. (Blue arrows). Their annunciator lights above should go out.
- Turn on the fuel pumps of the supply tanks "LEFT. No. 1" and "RIGHT. No. 2" and tanks No. 4 and 5 (red arrows); Check their status with the advisory lights located above the switches.
- **Note:** To save batteries, temporarily do not turn ON the pumps of tanks No. 4 and 5.



- When mounting external fuel tanks, additionally turn on the "EXT TANKS" switch and make sure that its green annunciator lights up.

Enable Communications Equipment:

Power the Communication Devices on the Radio Panel:



- “INTERCOM 1 & 2”: Used to contact the Ground Crew and the Gunner.
- Radio “R-863”: VHF/UHF AM/FM Radio with 19 Pre-Set Channels, use to contact ATC, AWACS, JTAC and other aircrafts. Can be tuned between 100 to 149.974 MHz on VHF and 220 to 399.975 MHz on UHF.
- Radio “HF”: AM long range radio, manually tuned between 2 to 17.999 MHz.
- Radio “R-828”: FM VHF Radio with 10 Pre-Set channels that can be tuned between 20 to 59.975 MHz.

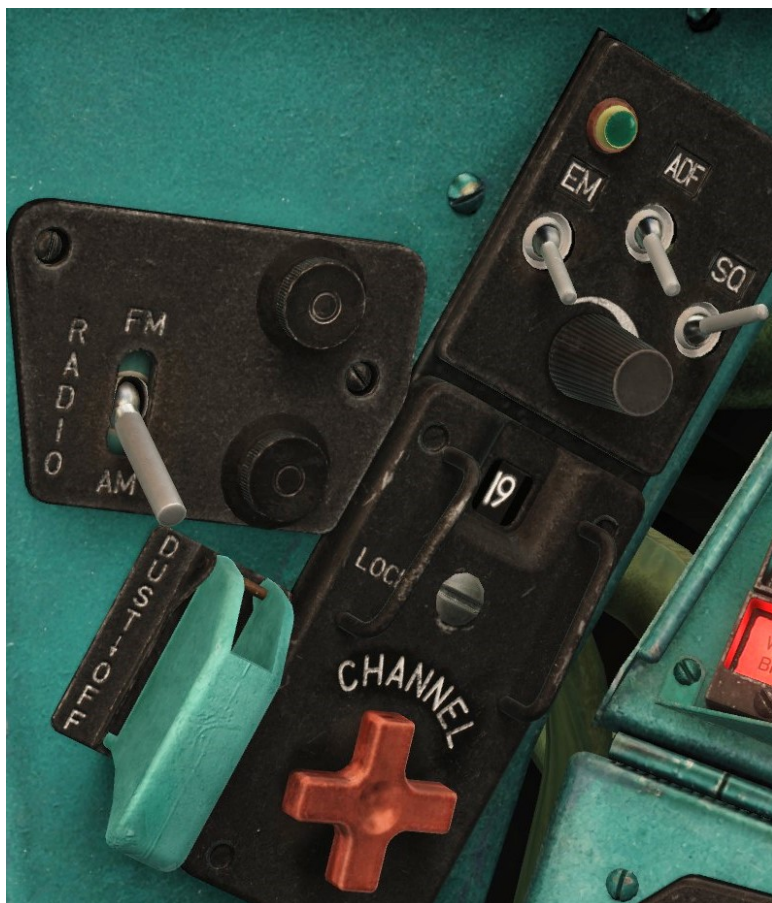
How to contact Ground Crew with cabin sealed:

- On the Communications Selector Panel, switch to “ICS” and set the “ICS VOL” knob up.
- Next, use the HOTAS (Trigger 1st stage) or the [N] key, to open up the Communications Menu and communicate with the Ground Crew.



Contact ATC using the R-863 Radio:

- On the Communications Selector Panel switch to “RADIO”, and set the “RADIO VOL” knob up.
- On the R-863 panel, select “AM” modulation



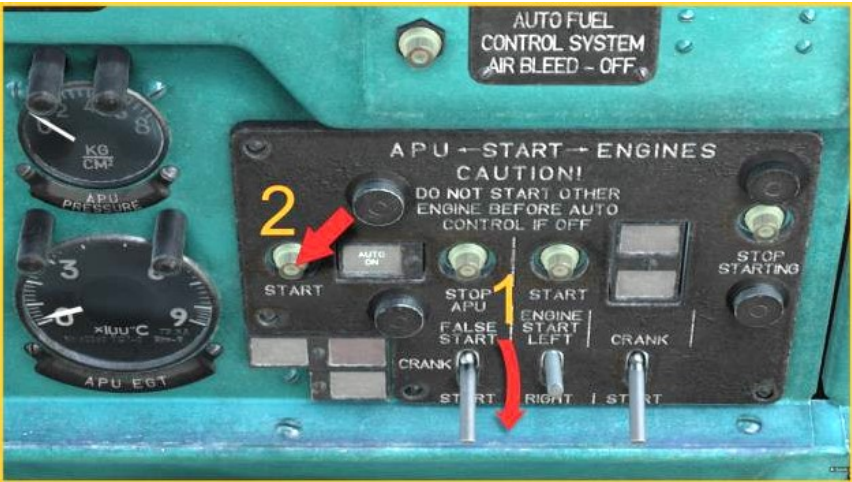
- Select the Channel that corresponds to the frequency you want to use. On the figure, Channel 19 corresponds to the frequency 137 MHz used by Mozdok's ATC.
- The SQ switch enables the noise filter.
- Next, use the PTT HOTAS command (Trigger, 2nd Stage) or the **[RALT + I]** key, to open up the Communications Menu, and there contact ATC to request Engine start clearance.

APU Start:

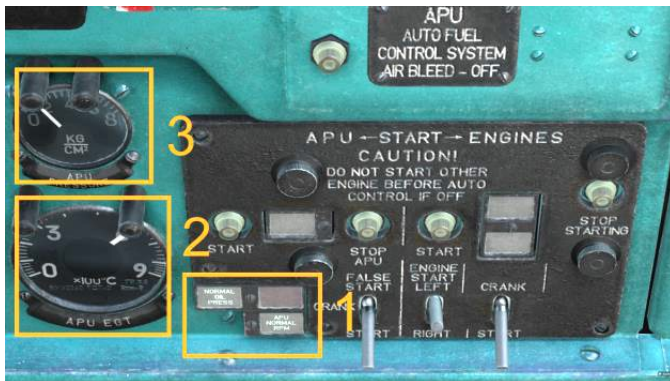
- On the DC Power Panel, confirm that the “APU GEN” switch is set to OFF (1).
- Select on the DC voltmeter (2) the position corresponding to the source from which the power is supplied, on this case BATTERies, to confirm its Voltage (3).



- On the APU – ENGINES - START panel, ensure the selector switch for the APU is set to the “START” position (1).
- Press the START button for 2-3 seconds (2), to begin the automated start sequence of the APU.



The APU goes to idle mode automatically, indicated by the "AUTO ON" annunciator. A few seconds later the "NORMAL OIL PRESSURE" light will illuminate. Once the APU reaches its operating speed, the "APU NORMAL RPM" light will come on (1).



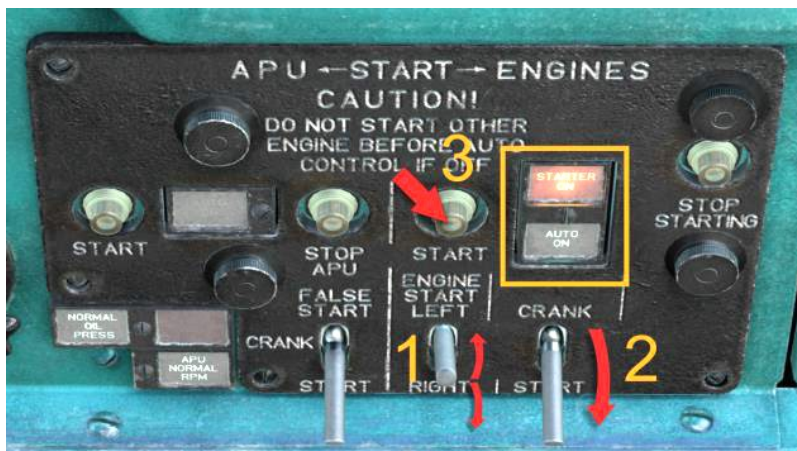
After the Auxiliary Power Unit reaches idle speed, make sure that:

- The EGT (exhaust gas temperature) increases, but does not rise above 720°C (2).
- The APU Pressure Gauge indicates at least 2 Kg². (3)
- The "AUTO ON", annunciator light goes out within 30 seconds.
- Before starting the Engines, you can use the APU generator by setting the "APU GEN" switch to the "ON" position (1). This is done to conserve batteries during the warm-up period of the APU.
- Turn the Voltmeter to "APU GEN" (2), to check its Voltage (3).
- It is recommended to turn off the APU generator before starting the engine.



Starting the Engines:

- Turn on the Anti-Collision Light (on the left wall panel).
- Set the "ENGINE START" switch to "RIGHT" or "LEFT" (1), depending on which engine is downwind. If the Wind is coming from the right, then start the Left engine first and vice-versa.
- Set the crank Mode to "START" (2)
- Press the "START" button (3) for 1-2 seconds.



During the start-up process, check:

- Activation of the automatic start device, when the "AUTO ON" annunciator lights up.
 - Activation of the Air Starter, when the "STARTER ON" light comes on.
-
- Move the stop valve lever of the corresponding engine (Left or Right), to its lower position, by clicking on it.
 - The engine should reach IDLE mode automatically within 60 seconds.



During the Engine start-up process, check:

- A continuous increase in the RPM of the Engine, and the Main Rotor should begin to rotate at not more than 25% of engine RPM.
- The presence of oil pressure in the engine according to the pressure gauge on the right front panel, which at an engine speed of 45% or more must be at least 1 Kg/cm².



- During the starting process, do not: Move the Engine Condition Levers, the collective pitch lever, the correction handle, nor attempt to start the other engine.
- After the started Engine reaches idle mode, cool down the APU for 1 min.
- After starting the engine to idle, check the following parameters of its operation:

The RPM speed of the Engine (2), depending on the outside air temperature, should be within 62-79%.

The Exhaust Gas Temperature, should not exceed 780°C (3).



The Engine oil pressure, must be at least 2 Kg/cm²; Oil temperature must be in the range from minus 40 to plus 150 °C (1).
 Oil pressure in the main gearbox, must be at least 0.5 Kg/cm² (2); Oil temperature, should be at least minus 40 °C.



Starting the Second Engine:

Set the switch "ENGINE START" to the position for starting the second engine and start it by repeating the same procedure as with the first.

After Engine Start:

- Allow at least 60 seconds at IDLE, for the engines to warm up.
- Switch ON (Up) the dust protection device of the engines. After about 35-40 seconds, there will be an increase in the EGT of 10-15 °C and a possible increase in the RPM speed of the engines of no more than 0.5%.



- While the power plant is warming up, turn on the APU Generator (1), to save battery power.



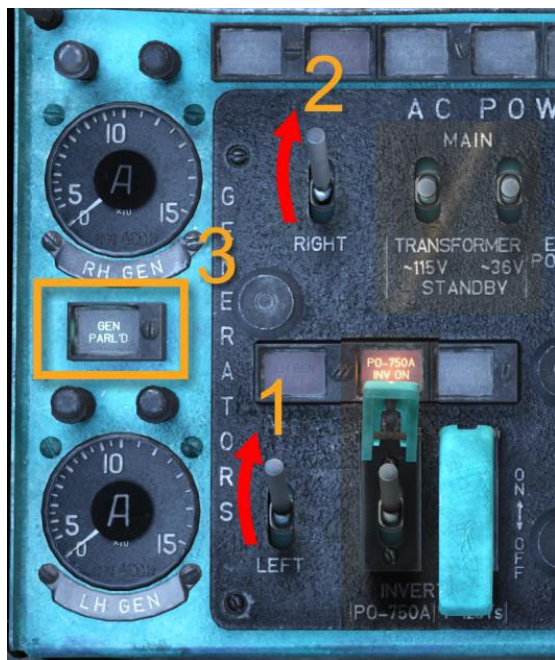
- Note: If the engines were started using on-board Batteries, then the APU Generator should not be turned off until the engines are warmed up, and until the main rotor speed is 88% and the main generators are turned on.

Turning on Generators, Electrical equipment and turn off the APU:

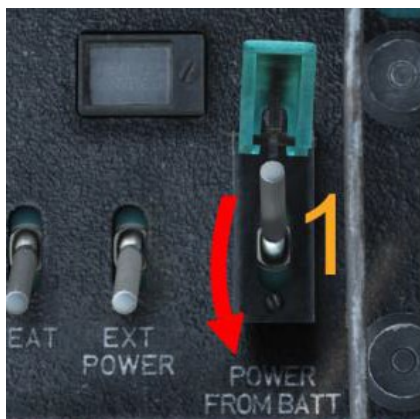
- Increase engine RPM only when the engine oil temperature is greater than $+30^{\circ}\text{C}$ and the main gearbox temperature is greater than -15°C .
- Set the Main Rotor RPM to $95 \pm 2\%$ by moving the correction handle to the extreme right position, using HOTAS or the [PgUp] key.



- With the engines started, we can now enable the "LEFT" (1) and "RIGHT" (2) Generators. The annunciators "LEFT GEN. OFF", "RIGHT GEN. OFF" should go out; and the annunciator "GEN PARL'D " (3) should illuminate.



- When starting from batteries (like in the current example), after turning on the Generators, set the "POWER FROM BATT" (1), and "PO-750A INVERTER" (2) switches, to their "OFF" position.



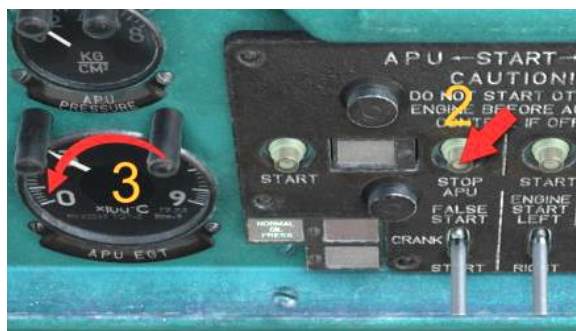
- Check the voltage of the Generators, by setting the voltmeter to each of the 3 phases of each GENERATOR. The voltage should be in the range of 203-204 V.



- On the DC Power Panel, enable the “LEFT & RIGHT RECTIFIERS” (1). Their Red annunciators above should go out.
- On the AC Power Panel, enable the 115 and 36 Volts transformers (2), by switching them UP, to their “MAIN position”.



- Switch off the APU Generator if active (1); and the APU, after cooling it at idle speed for 30-60 seconds. To turn off the APU, press the “STOP” button (2).



Enabling Avionics & Radio-electronic equipment

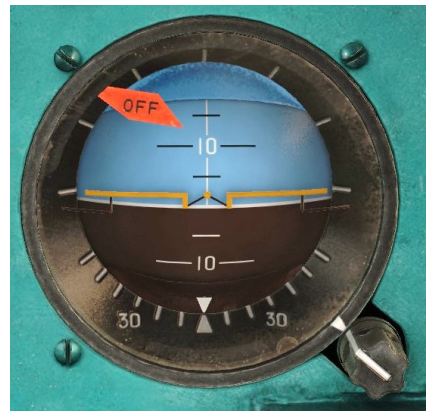
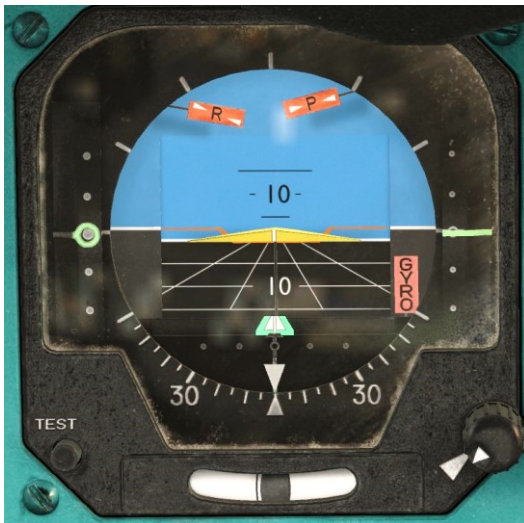
Enable the following Systems:

- Flasher lights Switch "BLINK" (2).
- Communication Radios (3), Radar Altimeter and Doppler Drift System, if not already enabled.
- Heading Compass System (1, right) by setting the "COMP SYSTEM" switch to the "ON" position.
- Turn on both Gyroscopes by setting the switches "VERT GYROS 1, 2" to the "ON" position. (1, left and center).
- Radar Warning receiver (4).



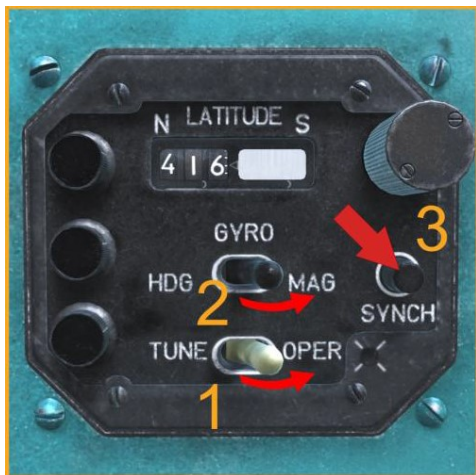
Vertical Gyros:

- Check the functionality of the Gyros by moving the cyclic and observing the Roll and Pitch indicators on both the Main ADI and backup ADI.
- 1–2 minutes after turning on the Gyros, press and hold down the “CAGE” buttons for each for a few seconds. The "VERT GYRO 1 FAIL" and "VERT GYRO 2 FAIL" annunciators, should go out.
- The red flags from both ADI should be removed. If the aircraft is parked on an incline, both instruments should show the parking angles of the roll and pitch of the helicopter.



Calibrate Course System:

Three minutes after switching on the Course system, it will need to be calibrated: On the control panel of the Course system "COMP" PU-38, check the position of the switches:



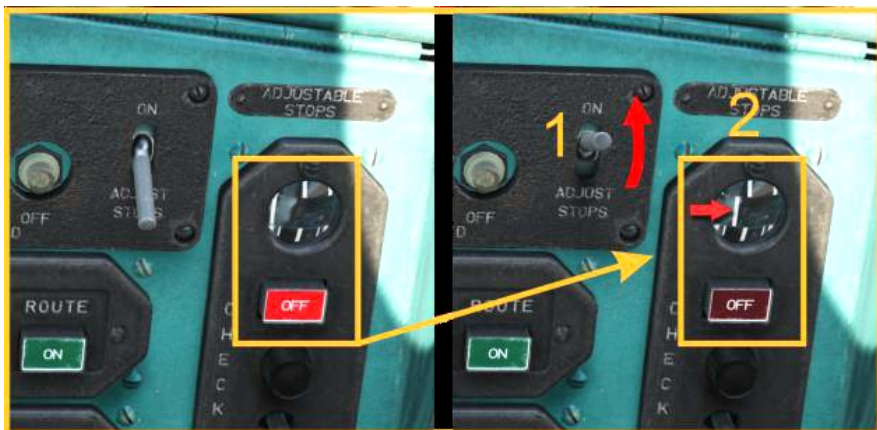
- 1) Set the "OPERATION" switch to "OPER".
- 2) Set the Operating Mode switch to "MAG".
- 3) Calibrate the heading system (3), by keeping the button pressed until the scale stops rotating on the RMI indicator (on the dashboard).



Note: To move the viewpoint down, use **[RCtrl + RShift + Num2]**. The **[Num5]** key returns the camera to its default position.

Tail Rotor Pitch Limiter (SPUU-52-3):

- Set the "ADJUST STOP" switch to the "ON" position, and make sure that the SPUU-52-3 system is operational by pressing the "ADJUSTABLE STOPS" red button on the control panel:



- Check that the control indicator bar on the adjustable stops panel is to the left of the neutral position (the higher the altitude density the closer it will appear to the extreme left position).
- At high density altitudes, the control indicator moves to the right from the leftmost position. At low density altitudes, the index may remain at the leftmost position or close to it.

Set ARK-15 Navigation Radio:

- Set the Mode knob on the ARK-15 control panel to the COMP (Compass) position:



- Set the switch on the ARK-U2 radio compass control panel, to the "ON" position.



- Set the switch on the DISS-15D equipment control panel to the "OPER" position, on the right front instruments panel:

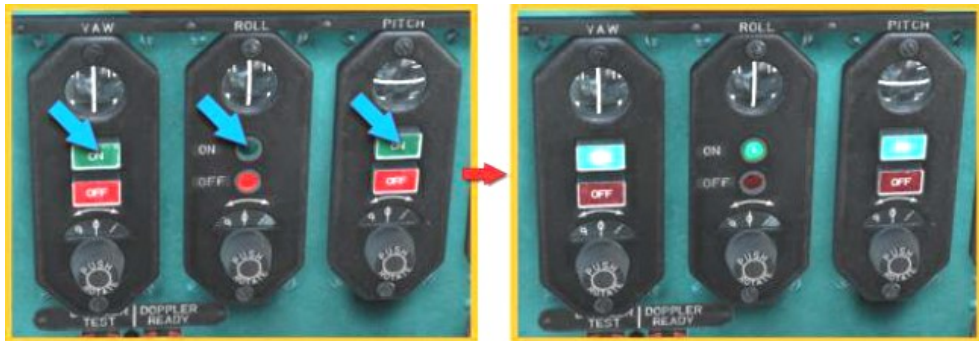


- On the Air Conditioning panel, set the Mode switch to the "CONDITION" position:



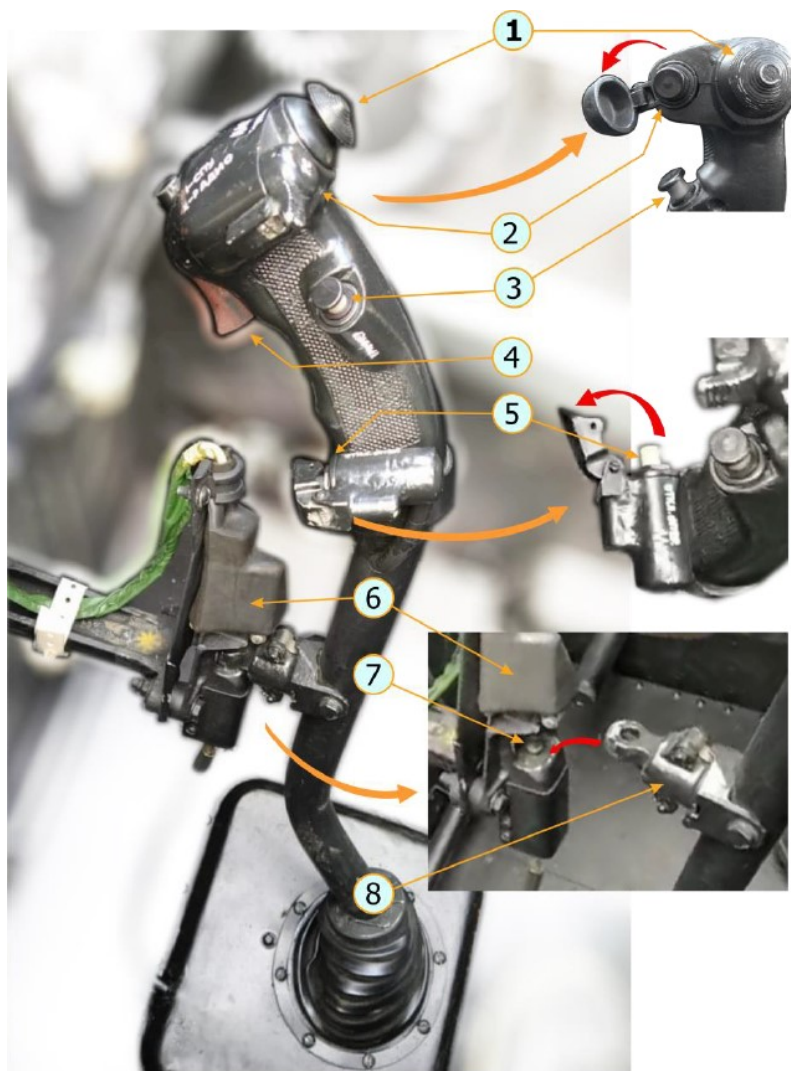
Enabling Autopilot (Stabilization) system:

- Before taxiing, turn on the "YAW", "ROLL" and "PITCH" channels of the autopilot, by clicking on their green light-button.
- For training purposes, flights with the autopilot OFF are allowed.



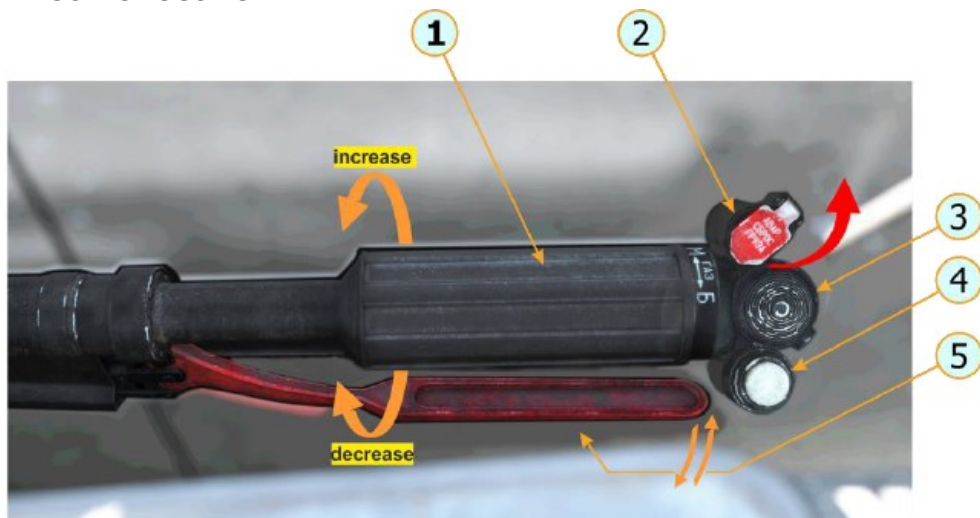
- If the buttons are blocked by the collective lever, you can press the **[Backspace]** key or click the front center of the pilot's seat to hide it. Press the **[Backspace]** key or click the seat again to un-hide the collective.

Pilot Cyclic:



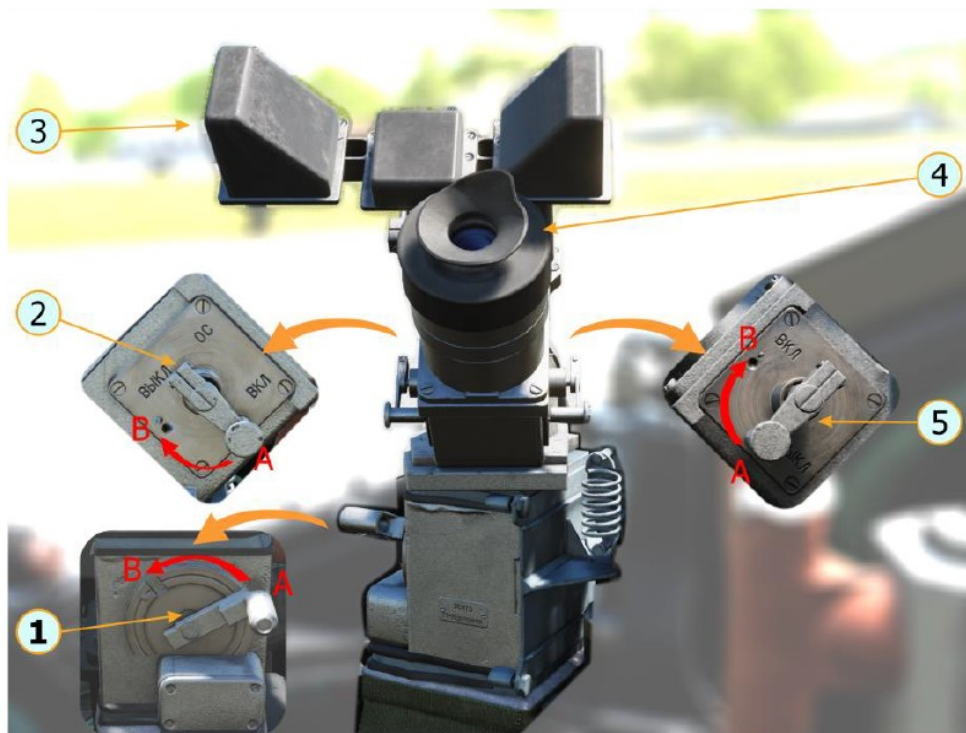
1. Eight Position Trim Switch
2. Weapon Release button under the safety cap.
3. TRIMMER button
4. Trigger "SPU-RADIO" (trigger button)
5. Button for disabling the operator's PPU handle from helicopter control under a protective cap.
6. Helicopter retainer housing.
7. Locking bush.
8. Disconnecting latch.

Pilot Collective:



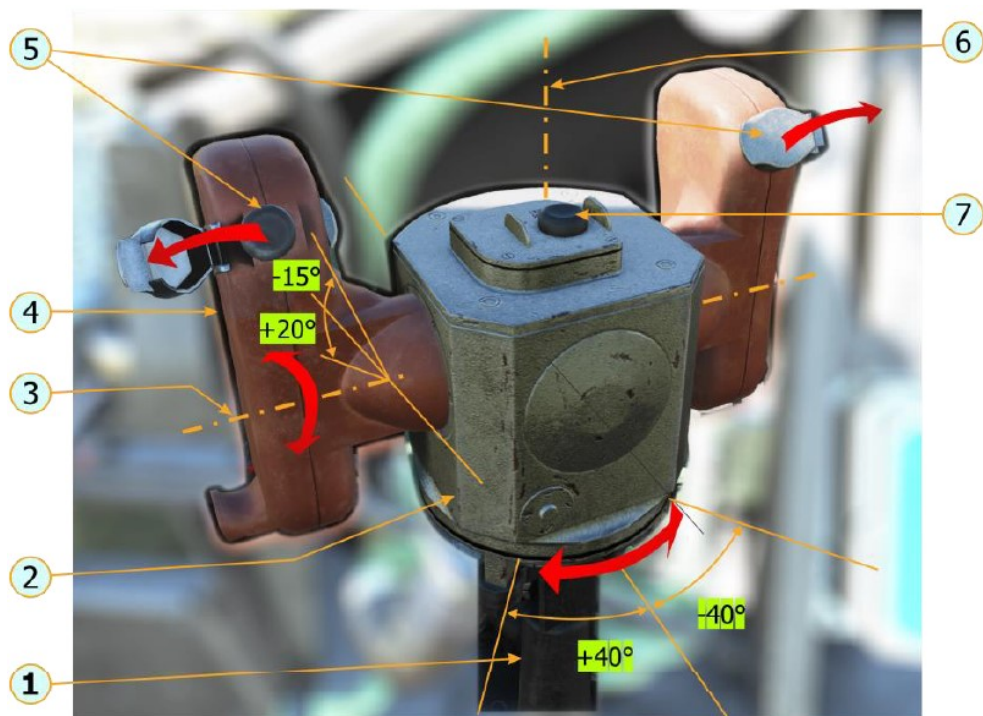
1. Correction handle.
2. Emergency release button under the safety cap.
3. FPP-7 landing and search light control button (joystick).
4. General step lever clutch release button.
5. Trigger for connecting the handle of the longitudinal-transverse control and pedals of the operator's directional control.

Missile Guidance Unit:



1. Knob for switching the magnification level. Position A: 3.3X, Position B: 10X.
2. Orange filter, for use in hazy conditions, or poor target contrast due to weather. Position A: ON, Position B: OFF.
3. Operator's forehead support.
4. Eyepiece visor, with rubber shock absorber.
5. SZS Green filter, to protect eyes against laser radiation. Position B: ON, Position A: OFF.

Guidance device control panel (PU PN)



1. Bracket for attaching PU to the floor of the helicopter.
2. Swivel head PU.
3. The axis of rotation of the rotary handles PU.
4. Rotary handles PU.
5. START buttons under protective caps: Left & Right buttons with protective caps. Serves to launch the software mechanism of the URV equipment, which ensures the launch of the UR when all other necessary conditions are met.
6. The axis of rotation of the head PU PN.
7. BEAM RESET button. Stops the radio emission transmitter before the end of the full cycle of operation, and activates the preparation for the launch of the next guided missile.