

Barometric Altimeter

The barometric altimeter indicates the aircraft's current altitude above sea level (ASL). The altimeter dial has two hands: one full rotation of the long hand represents 100 meters and one full rotation of the short hand represents 1,000 meters.

The altimeter has a calibration knob for QFE pressure setting of local barometric pressure (shown in the small window). The scale on the pressure dial is demarcated in millimeters of mercury (mmHg). The local air pressure is usually entered while the helicopter is stationary on the ground.



6-15: Barometric altimeter

1. Short hand (1,000 meters)
2. Long hand (100 meters)
3. QFE knob can be rotated left [RShift + -] and right [RShift + =]
4. Desire altitude bug (set manually)
5. QFE pressure scale in millimeters of mercury (mmHg). The red tick mark indicates normal pressure 760 mmHg.

Vertical Velocity Indicator (VVI)

The VVI measures the aircraft's rate of climb or descent. Vertical velocity is measured in meters per second (m/s) and the maximum measured values are ± 30 m/s.



6-16: Vertical Velocity Indicator (VVI)

Rotor RPM Indicator

The rotor RPM indicator displays the tachometer measurement of rotor's revolutions per minute (RPM) as a percentage of its maximum value. This instrument does not require any electrical power.

If the rotor RPM falls below the minimum safe value of 83% the yellow "HB" (Rotor) warning push-light on the left forward panel will flash, and an audio warning is heard in the pilot's headphones. To reset the warning, you may click on the push-light. [LCtrl + LAlt + R]



6-17: Rotor RPM indicator

1. Maximum allowed rotor RPM – 98%
2. Minimum safe RPM in flight – 83%

Airspeed Indicator

The airspeed indicator displays the aircraft's forward velocity. The indicated values start at 20 km/h and use an expanded scale up to 50km/h. After 50km/h, the scale is demarcated in 10km/h increments. The indicator though is incapable of measuring IAS below 50-70 km/h or when flying backwards.



6-18: Airspeed Indicator

Accelerometer

The accelerometer (or "G-meter") indicates the current maneuver loading on the helicopter; it is measured in regards to normal gravity (1 G). The red needles indicate the highest and lowest G attained during a sortie. A button in the lower right of the scale is used to reset the lowest and highest attained G.

The scale starts at 1 G (the earth's normal gravity) and is demarcated from -2 to +4 G.



6-19: Accelerometer ("G-meter")

1. Lowest G attained
2. Current G
3. Highest G attained
4. Reset needles button [LShift + -]

Radar Altimeter

The radar altimeter displays the helicopter's altitude above ground level (AGL), to a maximum altitude of 300 m AGL. Altitude is measured by a small, downward-facing radar.



6-20: Radar Altimeter

1. Yellow safe altitude threshold bug set by the safe altitude setting knob.
2. A TECT (Test) button for testing the instrument. When this button is pressed, the arrow moves to 15 m altitude and indicates that the altimeter is functioning properly. [**LAlt** + **LShift** + **R**]
3. Instrument failure flag. Presence of this flag indicates that the altimeter is not operating.
4. Combined knob for setting the minimum safe altitude and yellow warning lamp. The triangle yellow warning lamp will illuminate after reaching safe altitude during the descent of the helicopter. Simultaneously, a warning tone will be heard. The knob may be rotated left [**LShift** + **.**] and right [**LShift** + **.**].

The scale is calibrated from 0 to 300 meters and has the following sub-ranges:

- From 0 to 20 m – demarcated in 1 m increments
- From 20 to 50 m – demarcated in 2 m increments
- From 50 to 200 m – demarcated in 10 m increments
- From 200 to 300 m – demarcated in 50 m increments

When flying above 300 m AGL, the arrow goes up to the 300 m sector and the failure flag will drop out to indicate that the altimeter is not operating.

The radar altimeter turns on with activation of the targeting–navigation system by setting the K-041 switch to ON. About 10 seconds after powering on, the arrow will turn to the max range and then go back; the warning flag will go off simultaneously. When the pointer arrow turns past 0, the safe altitude threshold bug will snap into action and the warning yellow lamp and audio warning tone will be heard.

Clock

The mechanical clock displays the current time of day in hours, minutes, and seconds. It can also be used to measure mission time in hours and minutes, and as a chronometer to measure short time periods (up to an hour) in minutes and seconds.



6-21: Clock

1. Mission time clock dial
2. Time of day clock dial
3. Stop-watch clock dial
4. Mission time indicator
5. Right knob
6. Left knob

Clock functions include:

The time of day display operates continuously. Mission time can be activated as desired by pressing the left knob [RCtrl + RAlt + RShift + C]. The stop-watch can be activated as desired by pressing the right knob [RAlt + RShift + C].

To set the time, rotate the right button crown clockwise [RCtrl + RShift + .] when the second hand points to 12: this will stop the clock. Then pull the left button crown [RShift + M] while holding down the right mouse button and rotate it counter-clockwise [LAlt + ,] or clockwise [LAlt + .] to set the desired time. Rotating the right button crown counter-clockwise again resumes clock operation with the new time setting [RCtrl + RShift + ,].

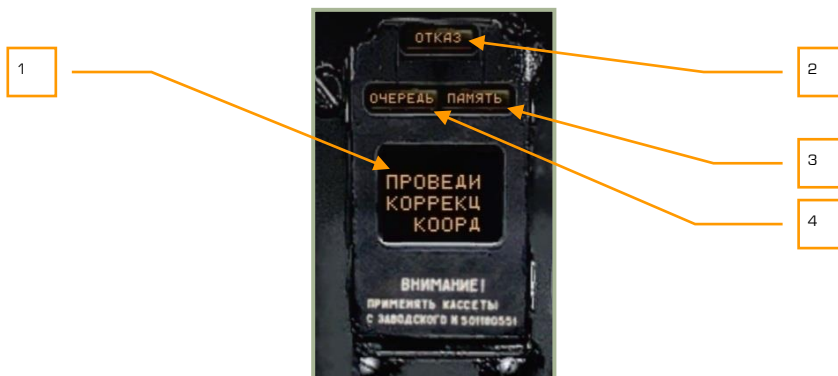
Mission time is indicated on the small scale at the top of the clock face. Press the left red button to start the timer [RCtrl + RAlt + RShift + C]. A red light will glow, and the timer will start ticking. To stop the timer, press the red button again [RCtrl + RAlt + RShift + C]. A red-and-white dot will appear on the timer scale. To reset this timer, press the red button once again [RCtrl + RAlt + RShift + C] or [RShift + M].

The stop-watch is the small scale at the bottom of the clock face and is used to accurately measure short time spans (up to 1 hour). It is controlled with the white button on the right, in a similar fashion as the mission time clock.

The clock spring is wound manually by rotating the left button crown to its mechanical stop. The spring contains enough energy for two days of operation.

EKRAN System

The internal diagnostic and warning system communicates audio and text messages to the pilot via the EKRAN-32-03 display. The EKRAN display is located on the right forward panel.



6-22: Universal signal panel of the EKRAN system

1. Display window
2. FAIL light
3. MEMORY light
4. TURN light

The EKRAN-32-03 ("EKRAN" for short) Built-In Test (BIT) display is part of the integrated cockpit information system. EKRAN functions include:

- Diagnostics of all aircraft systems and components that informs the pilot of any failures, and (in the system-tracing mode) indications of any equipment operation abnormalities in flight.
- Equipment diagnostics using built-in sensors, and documenting test results during pre-flight checks and ground maintenance.

The EKRAN can be activated by setting the "ВМГ ГИДРО ЭКРАН" (Power plant, hydraulics, EKRAN self-test systems) switch [LCtrl + LShift + N] (located on the bottom portion of the auxiliary control panel) to the down position. In case of an emergency, backup electrical power is provided to the EKRAN system from the onboard batteries. [LAlt + LShift + H]

The EKRAN operates in two modes:

- Flight Control
- Ground Control, No function

When in the Flight Control mode, the EKRAN provides the following functions unless power is no longer provided:

- Display of text messages regarding system failures and emergency operation of the components and systems. The messages will provide a recommendation to the pilot (for example: **"ПРОВЕДИ КОРРЕКЦ КООРДИНАТ"** (CHECK COORDINATES CORRECTION), to attract pilot's attention to the cockpit warning system. This warning system generally consists of the flashing master warning light (MWL) and a voice message.
- Storing incoming data for further prioritization and then sending it to the EKRAN display to be accessed by the pilot.
- Documenting the incoming data to the EKRAN information on a special tape with indications of the receiving times calculated from the moment the EKRAN is switched on.
- Automatic printing to tape of the digital codes of the last 64 registered messages (between EKRAN start-up and shut-down).

Depending on the number of controlled parameters, Flight Control mode can be divided into four stages:

1. From EKRAN start to engines start-up.
2. From engines start to take off and landing to EKRAN powered off.
3. Flight.
4. Print the last 64 signals that occurred in flight and eight seconds after landing.

First stage

The first stage begins the moment the EKRAN is turned on and ends when either engine cut-off valve is placed in the OPEN position or a throttle lever is moved to the AUTO position. To avoid premature failure indication during startup, the following engine and gearboxes parameters indication are engaged only:

- **"ДАВЛЕНИЕ МАСЛА ПРИВОДОВ"** (ACCESSORY OIL PRESS)
- **"ДАВЛЕНИЕ МАСЛА ЛЕВ/ПРАВ РЕД"** (GEARBOX OIL PRESS LEFT/RIGHT)
- **"ПРЕДЕЛ ВИБРАЦИЯ ЛЕВ/ПРАВ ДВ"** (CRITICAL VIBRATION LEFT/RIGHT ENG)
- **"ТЕМПЕР МАСЛА РЕД ЛЕВ/ПРАВ"** (GEARBOX OIL TEMP LEFT/RIGHT)
- **"СТРУЖКА ЛЕВ/ПРАВ ДВ"** (LEFT/RIGHT ENGINE CHIP)
- **"ДАВЛЕНИЕ МАСЛА ЛЕВ/ПРАВ ДВ"** (LEFT/RIGHT ENG OIL PRESSURE)
- **"ДАВЛЕНИЕ МАСЛА ГЛАВ РЕД"** (MAIN GEARBOX OIL PRESS)
- **"ТЕМПЕР МАСЛА ГЛАВ РЕД"** (MAIN GEARBOX OIL TEMP)

- **“СТРУЖКА ГЛАВ РЕД”** (MAIN GEARBOX CHIP)

Second stage

The second stage starts when either throttle lever is placed in the AUTO position and ends at takeoff (engagement of the landing gear handle). All data of the monitored systems, components, and modes are engaged except for those turned on at takeoff. After landing, the **“ДОКУМЕНТ”** (DOCUMENT) message is printed on the EKRAN display and the second stage of EKRAN operation will continue until all helicopter power is shut off.

Third stage

The third stage, FLIGHT, begins at lift-off (engagement of the landing gear handle) and the recording of the takeoff time is calculated from the turning on of the EKRAN and the appearance of the **“РЕЙС”** (FLIGHT) message on the EKRAN display. When in the FLIGHT stage, all system, component, and mode monitoring data is connected to the EKRAN, and only part of the data is indicated on the display. The rest of the data is recorded in EKRAN memory. 11 emergency messages are indicated by red lights on the emergency message lamps. Additionally, an audio message of the emergency will be played twice.

Messages played on the display with frame change are accompanied by the audio message **“СМОТРИ ЭКРАН”** (WATCH EKRAN). If the **“ВКЛ АВАР”** (ON EMERG) switch (on the bottom of center panel) is placed in the EMERG position, the voice messages corresponding to the stored messages will play.

This stage ends eight seconds after landing (landing gear compression).

Fourth stage

The Fourth stage consists of the automatic printing to tape of the digital codes of the last 64 messages that occurred during the FLIGHT stage. This begins eight seconds after landing and is indicated by the display of the DOCUMENT message on the EKRAN display. The print-out lasts for about 20 seconds and ends the fourth stage. The second stage continues until all the power on the helicopter is shut off.

Messages recorded on tape and in the memory continue in all stages of operation, while print from the memory is possible only for signals that occurred during the FLIGHT stage.

Priority

Messages are sent to the display after prioritization. In case of a simultaneous collection of messages, the one with the highest priority is displayed, and the **“ОЧЕРЕДЬ”** (ORDER) message appears.

Every new recording to memory of a message is followed by a flashing MWL. Messages can be reviewed by contiguously pressing the MWL.

After the first MWL press, the flashing mode disengages; after the second press, the message displayed on the EKRAN goes to memory, which displays a **“ПАМЯТЬ”** (MEMORY) light on the EKRAN display and then the next signal is displayed. After all messages are reviewed, the MEMORY light goes off; the last signal remains on the EKRAN display.

Digital Message Codes

Digital messages are displayed during print in the following format: message code (three digit number) – time of receiving the signal (four digit number).

In the example below: The first message has code 132, the time of receiving 00 minutes, 17 seconds after turning on the EKRAN, the second message has code 066, time is 03 minutes, 20 seconds.



6-23: Digital codes of the messages for print 8 sec after landing

1. Signal digital code
2. Time – tens of minutes
3. Time – units of minutes
4. Time – tens of seconds
5. Time – units of seconds

Service messages on the EKRAN display in Flight Control mode

САМОКОИТ	SEFLTEST	Beginning of the built-in test (BIT)
ЭКРАН ГОДЕН	EKRAN READY	End of the BIT – EKRAN is serviceable
ЭКРАН ОТКАЗ	EKRAN FAILURE	End of BIT – failure detected
РЕЙС	FLIGHT	FLIGHT stage beginning
ДОКУМЕНТ	DOCUMENT	Beginning of DOCUMENT stage

Table of messages in FC mode

Number in catalogue	Priority	Message (Rus/Eng)		Description
1	1	ПРИНЯТЬ ЦУ	RECEIVE DL TARGET	Information about incoming target via data link
2	2	ОСНОВНАЯ ГИДРО	MAIN HYDRO	Main hydraulic system failure
3	3	ОБЩАЯ ГИДРО	COMMON HYDRO	Common hydraulic system failure
4	4	ВЫПУСТИ ШАССИ	EXTEND GEAR	Landing gear is not down and locked Low level flight with descent and IAS < 30.0 km/h
5	5	ДАВЛЕНИЕ МАСЛА ГЛАВ РЕД	MAIN GEARBOX OIL PRESS	Minimum main gearbox oil pressure
6	6	ТЕМП МАСЛА ГЛАВ РЕД	MAIN GEARBOX OIL TEMP	Main gearbox oil overheat
7	7	СТРУЖКА ГЛАВ РЕД	MAIN GEARBOX CHIP	Main gearbox chip
10	8	ВКЛЮЧИ ЗАП КОД ОТВЕТЧИК	TURN ON BACKUP TRANSP	Turn on backup code of IFF
11	9	СЕТЬ НА АККУМУЛ	ELEC ON ACCUM	Helicopter is on battery bus
30	24	РАБОТАЙ С ИТ	USE TV	K-041 failure, use the TV channel of the «Shkval»
31	25	ВКЛЮЧИ РУ РАБОТАЙ С КИ-ИТ	TURN ON MAN ATCK USE HUD-TV	Combat computer failure during ATGM launch
34	28	ВКЛЮЧИ РЗН	TURN ON NAV BACKUP	Navigation computer failure. Turn navigation tasks backup



14	12	ОТКАЗ СУО-РС	WPN CTRL ROCKET FAILURE	Rockets control failure
247, 250	13	ОТКАЗ ППУ	GUN DRIVE FAILURE	Gun drive system failure Gun control system failure
16	14	ПЕРЕДНИЙ БАК 110	FORWARD TANK 110	Forward fuel tank low fuel level
17	15	ЗАДНИЙ БАК 110	REAR TANK 110	Rear fuel tank low fuel level
20	16	ОБЛЕДЕН ВКЛЮЧИ ПОС ВИНТ	TURN ON ROTOR ANTIICE	Icing detected
21	17	РАДИО ВЫСОТОМ	RADAR ALT	Radio altimeter failure
22	18	КУРСО- ВЕРТИК	INU	Inertial navigation unit failure
23	19	ОТКАЗ ЭЗУ-Ц	DL MEMORY FAILURE	Datalink computer memory failure
24	20	ВКЛЮЧИ СЕТКУ РАБОТАЙ С НПУ	TURN ON SBY RTCL USE FIX GUN	K-041 gun steering connection component failure
25	21	РАБОТАЙ С НПУ	USE FIX GUN	K-041 gun steering control channel failure
26	22	ОТКАЗ ТЕЛЕКОДА	DATALINK FAILURE	Data link failure
40	31	ВКЛЮЧИ ПРЕОБРАЗ	TURN ON INVERTER	Switch inverter to manual
44	35	ОТКАЗ ЛР-РЭП	LWS FAILURE	LWS all channels failure
45	36	ДАВЛЕНИЕ МАСЛА ЛЕВ РЕД	LEFT GEARBOX OIL PRESS	Left gearbox minimum oil pressure
46	37	ТЕМПЕР МАСЛА ЛЕВ РЕД	LEFT GEARBOX OIL TEMP	Left gearbox oil overheat

47	38	СТРУЖКА ЛЕВ РЕД	LEFT GEARBOX CHIP	Left gearbox chip
50	39	ДАВЛЕНИЕ МАСЛА ПРАВ РЕД	RIGHT GEARBOX OIL PRESS	Right gearbox minimum oil pressure
51	40	ТЕМПЕР МАСЛА ПРАВ РЕД	RIGHT GEARBOX OIL TEMP	Right gearbox oil overheat
52	41	СТРУЖКА ПРАВ РЕД	RIGHT GEARBOX CHIP	Right gearbox chip
53	42	ДАВЛЕНИЕ МАСЛА ПРИВООДОВ	DRIVE OIL PRESS	Accessory gearbox minimum oil pressure
54	43	ВКЛЮЧИ БЛОКИР СУО	TURN ON ARM SYS SAFE SW	Weapon system users are off
55	44	РЕЗЕРВ АВИА ГОРИЗОНТ	STANDBY ATTITUDE IND	SAI failure
56	44	ОТКАЗ ОБОГРЕВА ПВД ЛЕВ	LEFT PROBE HEAT FAILURE	Left pitot heating failure
57	44	ОТКАЗ ОБОГРЕВА ПВД ПРАВ	RIGHT PROBE HEAT FAILURE	Right pitot heating failure
60	45	ИК-ВСП	AIR DATA SYS	Air data system failure
61	46	ДИСС	DOPPLER NAV SYS	Doppler device for ground speed and drift angle failure
41	32	НЕСХОД ИЗДЕЛИЯ	HUNG WEAPON	Weapon not launched
42	33	ОТКЛЮЧИ СОЭП-РЭП	TURN OFF L-140	Turn off L-140
62	47	КАНАЛ КУРСА	HEADING INVALID	Heading channel failure

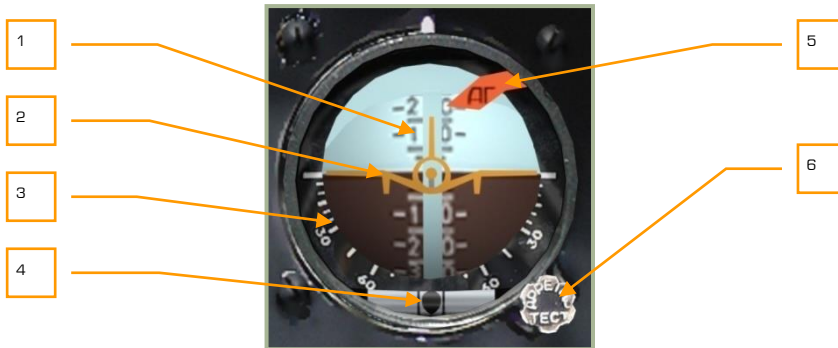


63	48	НЕТ СЧИСЛЕН КООРД	NAV POS INVALID	Navigation coordinates calculation failure
64	49	СБОЙ РАСЧЕТА МАРШРУТА	ROUTE NAV FAILURE	Route navigation failure
65	50	ЭЗУ-Н	NAV DATA MEMORY FAILURE	Navigation computer memory failure
66	51	ПРОВЕДИ КОРРЕКЦ КООРД	PERFORM NAV POS FIX	Enter area coordinates for correction (within R~18 km of the fix point)
67	52	ЛЕВ ГЕНЕР	LEFT GEN	Left generator failure
70	53	ПРАВ ГЕНЕР	RIGHT GEN	Right generator failure
71	54	ЛЕВ ВЫПРЯМИТ	LEFT DC RECTIF FAILURE	Left rectifier failure
72	55	ПРАВ ВЫПРЯМИТ	RIGHT DC RECTIF FAILURE	Right rectifier failure
73	56	ЭЛЕКТРОН РЕГУЛЯТ ЛЕВ ДВ	LEFT ENG GOVERNOR	Left engine electronic engine governor failure
74	57	ЭЛЕКТРОН РЕГУЛЯТ ПРАВ ДВ	RIGHT ENG GOVERNOR	Right engine electronic engine governor failure
43	34	ОТКАЗ ЛТЦ-РЭП	CMD FAILURE	UV-26 flare dispenser failure
35	29	РАЗГЕРМ КАБИНЫ	LOW COCKPIT PRESS	Cockpit depressurization
76	59	НЕТ НАДДУВА ГИДРО	NO HYDRO PRESS	No hydraulic tanks boost pressure
36	29	ОТКАЗ СКВ	AIRCOND FAILURE	Cockpit air conditioning and ventilation system failure
37	30	ОТКАЗ ПОС ВИНТОВ	ROTOR ANTIICE FAILURE	Rotor anti-ice system failure

77	60	ПРЕДЕЛ ВИБРАЦИЯ ЛЕВ ДВ	HI VIBR LEFT ENG	Left engine critical vibrations
100	61	ПРЕДЕЛ ВИБРАЦИЯ ПРАВ ДВ	HI VIBR RIGHT ENG	Right engine critical vibrations
142	62	ОТКАЗ РЕГИСТР	FLIGHT DATA REC FAILURE	Flight data recorder failure
102	63	ЭЗУ-Б	WPN CTRL MEMORY FAILURE	Turn on combat tasks backup
103	64	СТРУЖКА ЛЕВ ДВ	LEFT ENG CHIP	Left engine oil chip
104	65	СТРУЖКА ПРАВ ДВ	RIGHT ENG CHIP	Right engine oil chip
105	66	ДАВЛЕНИЕ МАСЛА ЛЕВ ДВ	LEFT ENG OIL PRESS	Left engine minimal oil pressure
106	67	ДАВЛЕНИЕ МАСЛА ПРАВ ДВ	RIGHT ENG OIL PRESS	Right engine minimal oil pressure
107	68	НЕТ СТОПОРА ППУ	NO GUN STOP LCK	Steering gun lock failure

Standby Attitude Indicator (SAI)

The backup artificial horizon is intended to indicate the bank and pitch attitude of the helicopter, the sideslip, and to provide attitude data to the flight data recorder. It serves as a backup instrument.



6-24: Standby Attitude Indicator

1. Pitch scale
2. Moving aircraft datum
3. Bank scale
4. Sideslip indicator (ball)
5. Warning flag
6. Cage/control test handle

Primary indications on the instrument include:

- Bank is indicated by the rotation of the aircraft datum in relation to the fixed bank scale. In clockwise rotation, right bank and the opposite for left. For bank reference, the scale has 5° step in the 0...30° range and further steps are at 15°. The indications for 30° and 60° bank angles are written on the scale.
- Pitch is indicated by the moving pitch scale in relation to the aircraft datum. When the scale moves down from the neutral (zero) position, a climb is indicated; if it goes up, a dive is indicated. The scale has marks for 5-10-15-20 with 5° steps. The digits 10-20-30-40-50-60-70 angles are written on the scale.

Sideslip is indicated by the moving ball inside the horizontal tube. When the ball moves left of the center (the space between the two vertical bars), right slip is indicated and conversely when the ball moves to the right.

After power has been supplied by the **"РЕЗЕРВ АИ"** (Standby Attitude Indicator power) switch, uncage gyro (release the handle) after 60 seconds. The time needed to align the axis with vertical is up to 30 seconds.

Cage/control test handle's functions:

- To perform a test, press the handle
- Caging. Pull the handle. If necessary, set the handle in pulled position by rotating it clockwise. To do so with the mouse, place the cursor on the SAI handle and rotate the mouse wheel while holding down the right mouse button. While still rotating the mouse wheel, release the right mouse button.

- To set the pitch scale, rotate the handle

When the instrument is receiving power, the localizer/glideslope deviation bars will move outside the instrument field of view.

The red warning flag drops when the artificial horizon fails, when the indicator test is performed, or the gyro is caged.

The true horizon error can be due to the following factors:

- Constant and random gyro drift
- The Earth's rotation
- The helicopter's movement in relation to the Earth
- Drifts caused by mass unbalance – depends on the helicopter's accelerations

Radial correction aligns the gyro's axis with 'imaginary' vertical. By 'imaginary' vertical we mean the vector sum of the gravity acceleration and all other accelerations of the helicopter. The radial correction is inactive when the angle between the total acceleration vector of the helicopter and the main gyro axis exceeds 8 degrees.

The gyro's drift ranges from 0 to 5 degrees per minute.

Exhaust Gas Temperature Indicator

The exhaust gas temperature (EGT) indicator displays the exhaust gas temperature for each engine. The large scales measure temperature in hundreds of degrees centigrade and the two smaller scales provide more precise readings in tens of degrees.



6-25: Exhaust gas temperature indicator



1. **“КОНТРОЛЬ Т ГАЗОВ ДВИГ РАБОТ”** (Running engines exhaust gas temperature indicator test) button [L~~C~~trl + P]. After the button is pressed, the indicator should indicate no more than 150°C.
2. **“КОНТРОЛЬ Т ГАЗОВ ДВИГ НЕ РАБОТ”** (Stopped engines exhaust gas temperature indicator test) button [L~~A~~lt + P]. After the button is pressed, the indicator should indicate no more than 800°C.
3. The large scales measure temperature in hundreds of Celsius degrees.
4. The small scales measure temperature in tens of Celsius degrees.

Temperature readings should first be read from the large scale in hundreds of degrees and then from the small scale in tens of degrees.

Tachometer

The tachometer indicates the RPM of each engine turbine. The scale is calibrated to display RPM as percentage of maximum. 100% is equivalent to 19,537 RPM. The gauge consists of two needles, one for each turbine. Note that this gauge does not require electrical power.



6-26: Engines RPM indicator

Takeoff mode – 97%

Normal flight – 95%

Cruise mode 1 – 93%

Cruise mode 2 – 92%

Idle – 72...78%

Fuel Quantity Indicator

The fuel quantity indicator measures the remaining fuel in the front and rear tanks. The meter is demarcated from 0 to 800 kilograms.



6-27: Fuel quantity indicator

1. Rear tank needle
2. Forward tank needle

3. **"КОНТРОЛЬ ТОПЛИВОМЕРА"** (Self test fuel quantity indicator) button
[LCtrl + LAlt + LShift + P]
4. **"П"** (Forward) and **"З"** (Rear) tank lights

Maximum fuel quantity in front tank is 705 kg and the rear tank is 745 kg.

Upon reaching the 110 kg minimum emergency threshold in either tank, the master warning light starts flashing, and the EKRAN systems displays the text, **"ПЕРЕДНИЙ БАК 110 КГ"** (for forward tank – 110 kg) or **"ЗАДНИЙ БАК 110 КГ"** (for rear tank – 110 kg).

With **"КОНТРОЛЬ ТОПЛИВОМЕРА"** (Self test fuel quantity indicator) button depressed, the fuel indicator needles will display the determined values from current remaining fuel and both tank lights illuminate.

Caution Lights Panel



6-28: Caution light panel

Left Forward Panel Caution Lamps

Russian	English	Description
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п ст ПРЕД ЛЕВ ДВИГ	LH ENG OVERSPD	Left engine power turbine over-speed
п ст ПРЕД ПРАВ ДВИГ	RH ENG OVERSPD	Right engine power turbine over-speed
п_у	OVER-G	G over-limit
ВИБРАЦИЯ ЛЕВ ДВИГ	LH ENG VIBR	Left engine vibration exceeded
ВИБРАЦИЯ ПРАВ ДВИГ	RH ENG VIBR	Right engine vibration exceeded
V_{max доп}	IAS MAX	Maximum allowed IAS exceeded
ГЛАВ РЕД	MAIN GRBX	Minimum main gearbox oil pressure Main gearbox oil overheat Oil metallic chip detected
ПОЖАР	FIRE	Left engine fire Right engine fire APU fire Hydraulics bay fire Main gearbox fire
ОТКАЗ СРО	IFF FAIL	IFF failure
АТАКА БЕРЕГИСЬ	LASER WARNING	Caution! Laser warning new threat is detected
ВЫПУСТИ ШАССИ	EXTEnd GEAR	Extend landing gear

Landing Gear Control Panel



6-29: Gear control panel

- 1. Gear position indicators.** Upper red lamps are ON when the gears are retracted. Lower green lamps indicate that gears are extended.
- 2. Emergency gear hydraulics selector switch.** When in the upper position (default) position, the gears are controlled from the common hydraulics system. If the common system is damaged the main hydraulics system will be used for gear control. To do this, raise red protective cover [LCtrl + G] and move the switch in the lower position. [LAlt + G]
- 3. Raise/Extend gear lever.** This lever is the primary means of raising and lowering the landing gear and is powered by the common hydraulics system. [G]

1

2

3

4

5

6

7

8

1. **Brightness switch for red, green and white wingtip and tail navigation lights.** This is a four position switch that can be cycled with each left button mouse click on the switch. Possible settings include off, 10%, 30% and 100% [RAlt + L]. The fourth **"АНО КОД"** position (right mouse click) is a momentary position and is used to send visual 'coded' signals (Morse code for example) to other aircraft and ground units in the case of radio communication failure. [LAlt + L].
2. **Windshield wiper switch.** This four position switch and three speeds and off positions). To return the wiper to the default position, press the **"СТЕКЛОЧИСТ ВОЗВ ЩЕТКИ"** (Wiper return) switch with a right mouse button click. [LCtrl + LAlt + W]
3. **Windshield washer fluid switch,** No function
4. **Brightness adjustment knob,** No function
5. **Pitot static port and AoA sensors heat switch.** Placing this switch to the up position will warm the sensor and prevent ice from developing on it in cold conditions. Ice development can result in erroneous air speed indications. This switch is also used to control heating of the angle-of-attack (AoA) and side-slip vane sensors. [LAlt + LShift + S].
6. **Pitot ram air and clock heat switch.** Placing this switch to the up position will warm the sensor and prevent ice from developing on it in cold conditions. Ice development can result in erroneous air speed indications. This switch is also used to heat the onboard mechanical clock (otherwise, it may increase the rate of time error). [LCtrl + LShift + S]
7. **Windshield heater switch.**



8. **Magnetic compass.** This is a standard, liquid-filled, back-up compass that requires no electrical power. See magnetic compass section below for more detail.

Left Overhead Panel Warning and Advisory Lamps

Russian	English	Description
Н рв СТАБ	R-ALT HOLD	Radar altitude-hold autopilot mode is ON
ВИСЕНИЕ	AUTO HOVER	Hover autopilot mode is ON
СНИЖЕН	AUTO DESCENT	Controlled descent autopilot mode is ON
МАРШРУТ ЗК	ENR NAV ON	Route navigation with direct flight to steerpoint is enabled
МАРШРУТ ЛЗП	ENR COURSE	Route navigation with course following is enabled
ППМ РАЗВОРОТ	NEXT WP	Notification of passing one waypoint and advancing to the next
КОНЕЦ МАРШРУТА	ENR End	Last waypoint reached notification; end of flight plan
СЧИСЛЕНИЕ ГРУБОЕ	AC-POS. CAL. DATA	Aircraft position is roughly calculated using air data systems information
ВЗРЫВ (red)	WEAP. ARM (red)	Weapons armed
ППУ	CANNON	Cannon has been slewed away from boresight position
ППУ ♦	CANNON ♦	Cannon has been slewed downward away from boresight position, no function
КОЛЬЦЕВ ОТКРЫТО	X-FEED VLV OPEN	Fuel is shared between tanks (crossfeed on)
МУФТА ОТКЛ	TURBO GEAR	Accessory gearbox disconnected from rotor drive
Р масла ПРИВОДОВ	AGB OIL PRESS	Gearbox oil pressure normal (before start)
ЗАМОК ОТКРЫТ	SL HOOK OPEN	Sling load lock (hook) is open, no function



6-31: Overhead panel, right side

1. **Rotor de-icing system switch.** Placing this switch in the up position will warm the rotor blades to the point that it prevents icing. If ice does develop on the rotor blades, they will dramatically lose lift generating capability. It is always best to turn this on when operating in cold air. [Ctrl + Alt + LShift + S]
2. **Engines de-icing/dust-protection systems switch.** To prevent ice from forming in the engine intakes, place this switch in the up position. This will warm the air intake manifolds and prevent ice from forming in cold conditions. If ice forms, the flow of air to the engines will be impeded. The system will also prevent dust build-up in dusty conditions. [Alt + I], [Ctrl + Alt + I]
3. **Left/right pitot heat indicator lamp.** These lamps will be illuminated when the pitot heat control button is pressed and the pitot tube heat system is operating normally.
4. **Pitot heat test button.** Pressing this button will light the left/right pitot heat control lamps (if pitot heat is enabled).
5. **Cockpit ventilation fan switch,** No function

**Right Overhead Panel Message Lamps**

Russian	English	Description
БОЕВАЯ СЕТЬ ВКЛ	MASTER ARM ON	Master ARM is on
ТРЕНАЖ	WAEPON TRAINING	Training mode for guided weapons is on
ОБЗОР (yellow)	HMS FAIL (yellow)	Helmet-Mounted Sight malfunction detected
ПАНЕТ (yellow)	HUD NOT READY (yellow)	HUD failure or not ready
К-ЦВМ	COMPUTER DIAGNOSE	Onboard computers running in diagnostic mode
ЦВС (yellow)	COMPUTER FAIL (yellow)	Failure of one or more central computers
ПРЕОБРАЗ	INVERTER ON	Electrical DC/AC inverter is on
И-251В (yellow)	"SHKVAL" FAIL (yellow)	Shkval targeting system failure detected
ПОС ЛЕВ ДВИГ	LH ENG ANTI-ICE	Left engine de-icing active
ПЗУ ЛЕВ ДВИГ	LH ENG DUST-PROT	Left engine dust protector is active
ОГРАН РЕЖ ЛЕВ (yellow)	LH POWER SET LIM (yellow)	LEFT ENG PWR LIMIT Left engine has over-speed and was limited by electronic engine governor
ПОС ВИНТ	ROTOR ANTI ICE	Rotor de-icing system is active
ПОС ПРАВ ДВИГ	RH ENG ANTI-ICE	Right engine de-icing is active
ПЗУ ПРАВ ДВИГ	RH ENG DUST-PROT	Right engine dust protector is active
ОГРАН РЕЖ ПРАВ (yellow)	RH POWER SET LIM (yellow)	RIGHT ENG PWR LIMIT Right engine has over-speed and was limited by electronic engine governor
ОБОГРЕВ ВУО	WINDSHIELD HEATER ON	Windshield heater is on

БАК ПЕРЕДНИЙ	FWD TANK PUMP ON	Forward fuel tank has pressure
КРАН ЛЕВ ЗАКРЫТ (yellow)	LH VLV CLOSED (yellow)	Left engine fuel valve is closed
БАК ЛЕВ ВНЕШН	LH OUTER TANK PUMP	Left outer fuel tank has pressure
БАК ЛЕВ ВНУТР	LH INNER TANK PUMP	Left inner fuel tank has pressure
БАК ЗАДНИЙ	AFT TANK PUMP ON	Aft fuel tank has pressure
КРАН ПРАВ ЗАКРЫТ	RH VLV CLOSED (yellow)	Right engine fuel valve is closed
БАК ПРАВ ВНЕШН	RH OUTER TANK PUMP	Right outer fuel tank has pressure
БАК ПРАВ ВНУТР	RH INNER TANK PUMP	Right inner fuel tank has pressure

PRTz Data Link Control Panel

The data link control panel is located on the left side of the overhead panel. It is integrated with the Weapons Control System (WCS) and its purpose is to send and receive information about targets on the battlefield to and from other flight members. The pilot can select a target type, exchange target data with other flight members, and assign targets and initial points to wingmen.



6-32: Data link control panel

The control panel consists of three rows of buttons that allow you to send and receive targeting information. Buttons include:

1. **DLINK target #1 as vehicle type.** Indicates the target to send or received from a wingman is a vehicle type of target. [LShift + 1]
2. **DLINK target #2 as SAM or AAA type.** Indicates the target to send or received from a wingman is an air defense target. [LShift + 2]
3. **DLINK to Wingman 1.** Elects to send the data link target to wingman 1. [LCtrl + 1]
4. **DLINK to Wingman 2.** Elects to send the data link target to wingman 2. [LCtrl + 2]
5. **DLINK to Wingman 3.** Elects to send the data link target to wingman 3. [LCtrl + 3]
6. **"СТИР"** button: Clear DLIN. After a target type and target receiver has been entered, this button can be pressed to clear the information. [LShift + 7]
7. **DLINK target #3 as type Other.** Indicates the target to send or received from a wingman is a target other than vehicle or air defense. [LShift + 3]
8. **DLINK Initial point.** Like vehicles, air defenses and other, you may send and receive an initial point to and from wingmen via the data link. This can be useful for communicating a battle position or ambush point. [LShift + 4]
9. **DLINK to Wingman 4.** Elects to send the data link target to wingman 4. [LCtrl + 4]

10. **"БСЕМ"** button: DLINK to All. In addition to sending targeting information to a specific wingman, you may also press this button to send the data to the entire flight. [LCtrl + 5]
11. **"ВЫХОД"** button: DLINK automatic ingress to target. This button activates functionality to automatically point the aircraft in the direction of the assigned data linked target. [LShift + Y]
12. **"ПРД/ПАМ"** button: DLINK send/memory. After you have selected the target type and a data link receiver, you may press this button to send the information over the data link. Additionally, when you receive data link data from another flight member, pressing this button will accept the data/assignment. [LShift + U]

Please see the "Using Data Link" chapter to learn more about using the PRT panel in regards to employing the data link.

Laser Warning Receiver (LWR)

The laser warning receiver (LWR) is located just below the PRT control panel and is capable of providing you warnings of laser energy that is illuminating your aircraft. This is particularly useful because main battle tanks and other combat ground vehicles will often use their laser range finders to input accurate target range data into their fire control systems before firing. A warning on the LWR is a sure indication that a ground vehicle or other helicopter is targeting you. To counter, you may wish to maneuver your aircraft (a still target is a dead target) and/or dispense flare countermeasures if you think an infrared-guided surface-to-air missile may have been launched. To best avoid being hit by a direct fire weapon like a tank gun round or an ATGM, make sure to not fly directly at the shooter. Instead, provide them a crossing target.

Note that tank crews of many armed forces are trained to use their main guns as an anti-helicopter weapon and will engage you if you are within 1,500 meters and present them a non-crossing target. Other vehicles, such as ATGM launchers, will also engage you but at even longer ranges. Additionally, many vehicles have secondary machine guns that they will use to engage you when in close range.

Prior to using the LWR, you must set the Laser Warning System (LWS) switch to on. This switch is located on the Auxiliary Control panel on the rear panel.

Use the LWR in conjunction with maneuvers to avoid threats; a still target is a dead target when in range of enemy weapons!



6-33: Laser warning receiver (LWR)

The LWR panel consists of the following elements:

1. **Incoming laser bearing indicator lamps.** These four red lamps indicate the relative direction that laser energy is being detected from. The top and bottom lamps represent detections in front and behind you and the lamps to the left and right indicate laser designation to the left and right. After a lamp has been lit, you will need to press the Reset LWR button to turn it off; the lamps will not automatically turn off once the illumination stops.
2. **Incoming laser hemisphere** (above/below). Depending on the target being above or below you, one of these two lights will be lit. If the upper light is on, it probably indicates that an enemy aircraft is designating you for an attack.
3. **Laser is in range-finding mode.** If this light is on, it indicates that the laser energy is of sufficient strength that the enemy weapon is probably in range of reaching you.
4. **Reset LWR button.** Pressing this button will reset any bearing, altitude hemisphere, and laser range and guidance lamps that are lit. [L]
5. **Laser is in guidance mode.** Some lasers modulate their frequency when actually guiding a weapon. If such a signal is detected, this lamp will light to indicate that a weapon is probably being guided towards you. This is most often the case with ATGM weapons.

UV-26 Countermeasures Control Panel

The UV-26 countermeasures control panel is located to the right of the overhead panel and it is used to configure the release of infrared (IR) flare countermeasures. These are used as decoys against heat-seeking missiles like the Igla (SA-16), FIM-92 Stinger, AIM-9 Sidewinder, R-60 (AA-8 Aphid), and R-73 (AA-11 Archer). The goal of the flare release is to provide the IR missile seeker a more appealing target than your helicopter. The key to successful flare use can often be based on the range you start dispensing flares against

an incoming missile, the number and interval you release them in, and the aspect you keep your aircraft in relation to the released flares and the missile. The UV-26 allows you to program release modes to best fool an enemy IR seeker.

Note that flares will not have any affect on optical or radar guided missiles.

From the mission payload editor, you may select how may flares you wish to load on your helicopter.

To activate the UV-26 panel, you must first set the countermeasure system (CMS) power switch to on. This switch is located on the Auxiliary Control panel, next to the LWS power and test controls on the rear panel.



6-34: UV-26 Countermeasures control panel

The UV-26 panel has the following controls:

1. **Program display.** The digital read-out indicates the currently selected flare dispensing parameters. When the "НАЛИЧ-ПРОГР" switch is in the "НАЛИЧ" (quantity) position, the display shows the remaining quantity of flares (the Ka-50 can carry a maximum of 128). When in the "ПРОГР" (program) position, the first number indicates the "СЕРИЯ" (number of sequences), the second number indicates "ЗАЛП" (flares in sequence) and the third number shows the setting for "ИНТЕРВАЛ" (dispense interval).
2. **Dispenser side lamp** – Indication that flares will be dispensed from the left dispenser.
3. **"БОРТ" (side) release select switch.** This is a three position switch that can be set to the center position for release from both sides; to the left for release of flares from the left wing dispenser or to the right for release of flares

just from the right wing. Depending on the selection, the appropriate lamp(s) will be visible in the display field above. [RAlt + Delete], [RShift + Delete]

4. **"СЕРИЯ"** button. Pressing this button cycles through the number of flare sequences options. The number of sequences is equal to the number of times the program will be run (except for 5 when the number of sequences is 12 and for 7 when the number of sequences is 15). When the value is set to 0, flares will be dispensed continuously. [RShift + Insert]
5. **"ЗАЛП"** (salvo) button. Press this button to cycle between the number of flares to be released in a single program sequence. Values range 1 through 8. [RCtrl + Insert]
6. **"СТОП"** (stop) button. Stops the currently running program. [Delete]
7. Lamp – Indication that flares will be dispensed from the right dispenser.
8. **"НАЛИЧИЕ – ПРОГР"** (quantity-program) switch. When set to **"НАЛИЧИЕ"**, the display indicates the number of flares remaining; when set to **"ПРОГР"**, it shows the current flare program numeric code. [RCtrl + J]
9. **"ИНТЕРВАЛ"** (interval) button. Pressing this button cycles between the time-delay between flare release settings. The delay is in seconds and is equal to the displayed number except for the cases of 7, 9 and 0, for which the intervals are 0.25, 0.5 and 0.125 seconds respectively. [RAlt + Insert]
10. **"СБРОС ПРОГР"** (reset program) button. This button resets the programmed parameters to the default, "110". [RCtrl + Delete]
11. **"ПУСК"** (dispense) button. Pressing this button executes the configured flare dispersion program. [Insert]

Example programs:

110: 1 sequence, dispense 1 flare, delay of 0.125s. Pressing "ПУСК" releases a single flare from the selected side pod (depending on the position of the "БОПТ" switch). This is the default program.

622: 6 sequences, 2 flares in a sequence, 2 second interval. Flares will be dispensed in pairs, one from each side or from one side only, again depending on the "БОПТ" switch position.

529: 12 sequences, 2 flares in a sequence, interval of 0.5 s between releases.

A user-programmable LUA script for controlling the UV-26 countermeasures control panel is located in the \Scripts\Aircrafts\Ka-50\Cockpit\Devices_specs\UV_26.lua file.

Magnetic Compass KI-13

The magnetic compass is an autonomous, self-contained, direction-indicating instrument that does not require a power source. It serves as a backup to other navigation instruments.

Its operation is based on a magnet reacting to the Earth's magnetic field.

The scale is calibrated in 5-degree increments and has a numeric readout every 30 degrees. North and South are marked **"0"** и **"180"** respectively.

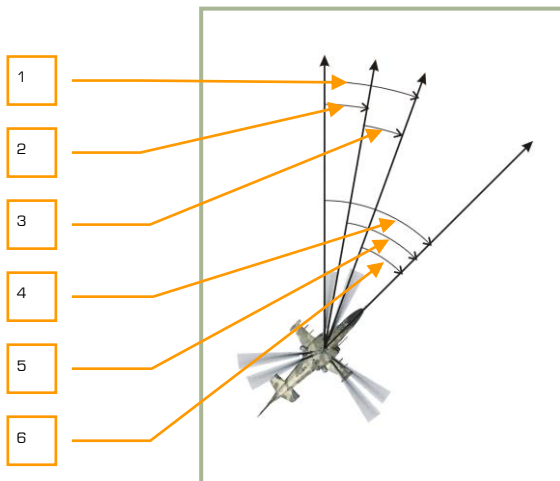


6-35: Magnetic compass

Compass features:

- Measurement of uncertainty is $\pm 1^\circ$
- Compass "stickiness" – under 1°
- Maximum dynamic error – under 35°
- Time for scale to come to a rest – no more than 17 s
- Operating temperature range $\pm 60^\circ\text{C}$

Note that the compass does not indicate true aircraft heading due to magnetic variation, or deviation end-dip error. Thus, appropriate corrections need to be applied when determining true heading.



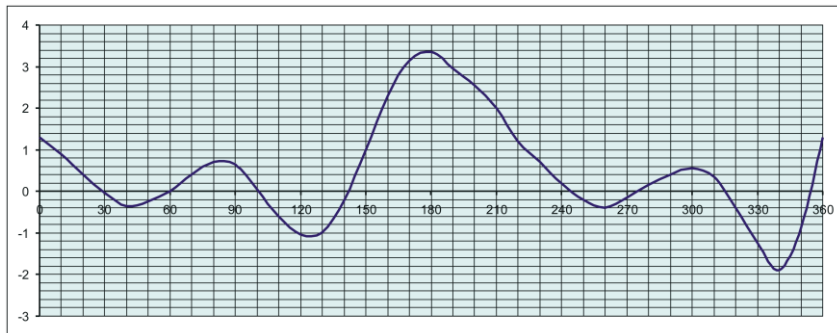
6-36: Aircraft course

1. Full variation

2. Magnetic variation
3. Deviation
4. True heading
5. Magnetic heading
6. Compass heading

In the Caucasus region where DCS: Black Shark takes place, the magnetic variation is approximately 5-degrees.

The compass deviation is caused by the helicopter's own magnetic field.



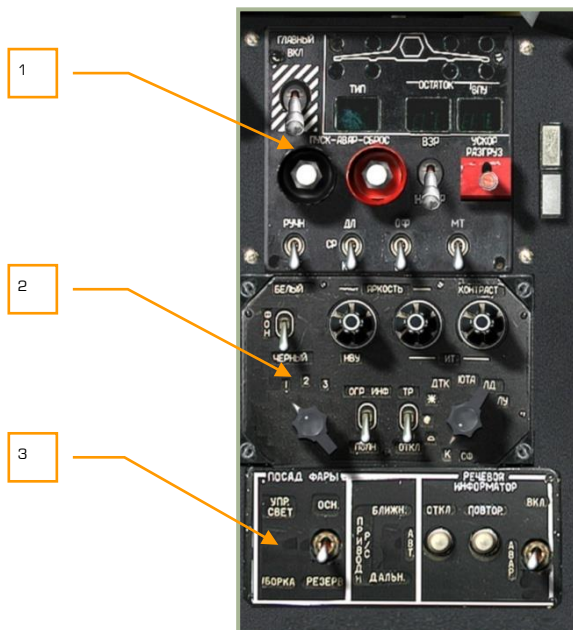
6-37: Compass deviation in Ka-50

Table 6-2 shows the compass deviation in our Ka-50 simulation.

- Y axis – deviation (in degrees)
- X axis – helicopter's compass heading

To find the current deviation, note the helicopter's compass heading on the X axis and then draw the vertical line parallel to the Y-axis. The intersection between the vertical line and the graph will indicate the value for deviation in degrees.

Center Panel



6-38: Center panel

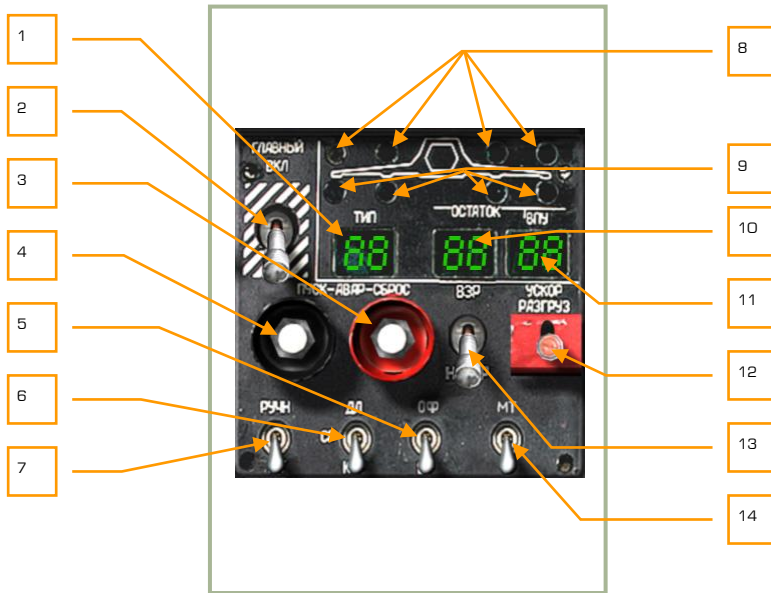
The center panel is located in the lower center of the front dash and has its functions divided into three primary areas:

1. Weapon control panel
2. Targeting display control panel
3. Landing lights and voice warning ("Betty") control panel

Due to the position of the panel, you may need to move the cyclic out of the way or use keyboard commands to access the functions.

PUI-800 Weapon Status and Control Panel

The weapon status and control panel is located at the top of the pedestal and it allows you to select the active weapon type, view weapon inventory and status, and control aspects of weapon employment.



6-39: Weapon status and control panel

The weapons control panel has the following functions:

1. **"ТИП" (Store type).** This field displays a two character indication of the selected store type: "НР" = rockets, "ПС" = anti-tank missiles, "АБ" = bombs, "ПБ" = external fuel tanks.
2. **"ГЛАВНЫЙ" (Master arm switch).** Master arm is set to on when the switch is in the up position. When in the down position, all weapons are safe and weapons may not be employed. [\[LAlt + W\]](#)
3. **"АВАР СБРОС" (Emergency launch button).** Used to jettison all external stores except "Vikhr" ATGM. [\[LAlt + R\]](#)
4. **"АВАР ПУСК".** Emergency jettison of AA missiles. No function.
5. **"ОФ-БР" (HE-API cannon round selector switch).** The 2A42 30mm cannon is fed belts of high explosive and armor-piercing rounds. You may select between the two with this switch: "ОФ" = high-explosive (HE), "БР" = armor-piercing incendiary (API). [\[LCtrl + C\]](#)
6. **"ДЛ-СР-КР" (Long-medium-short weapon mode switch).** The 2A42 cannon has three firing modes: long burst "ДЛ", medium burst "СР", and short burst "КР". Use this three position switch to select the mode. This switch

also controls rocket salvo amounts and if Vikhr is launched one at a time or in pairs. [S], [LShift + S]

7. **"PY4H-ABT" (Manual/Auto weapon control switch).** Placing this switch in the up **"PY4H"** position commands manual weapon and sensor control, and placing the switch in the down **"ABT"** position commands automatic control. When in manual mode, computed launch authorization, automated gate tracking size, and vertical compensation Vikhr launcher to target are absent. You should only use the manual mode when the automatic mode is inoperative. [A]
8. **Weapon readiness indicator.** The four green lamps represent each of the four under-wing hardpoints. When a store attached to a hardpoint is ready to fire, the green lamp over the station will light.
9. **Weapon presence indicator.** These four yellow lamps beneath each of the hardpoints represent a store being loaded on the station.
10. **Selected weapons remaining.** This field consists of two digits and displays the number of selected weapons (rockets or Vikhr) remaining.
11. **Cannon rounds remaining.** This field displays the number of cannon rounds remaining according to the cannon round selector switch setting. This number is displayed in tens.
12. **ATGM jettison selector "YCKOP PA3TPY3" switch.** When this switch is held down, all Vikhr ATGM will launch quickly off the launcher with no guidance. [RCtrl + W]
13. **"B3P – HE B3P" (Armed/Disarmed weapon jettison arming switch).** This switch determines if the weapon will be armed prior to being jettisoned. **"B3P"** = armed, **"HE B3P"** = disarmed for jettison. [LAlt + LShift + W]
14. **"MT-BT" (Low-High cannon rate of fire (ROF) switch).** The 30mm cannon has two rates of fire that can be selected with this switch: **"MT"** = low and **"BT"** = high. [LShift + C]

Targeting Display Control Panel

Located directly below the weapon control panel, this panel controls how data is displayed on the different targeting and navigation displays.



6-40: Targeting display control panel

The targeting display control panel has the following functions:

1. **"ЯРКОСТЬ НВУ" (HMS Brightness control knob)**. This knob can be rotated to control the brightness of the night vision goggles and Helmet Mounted Sight (HMS) reticle. This knob may be rotated up [RCtrl + RAlt + RShift + J] and down. [RCtrl + RAlt + RShift + I]
2. **"ФОН БЕЛЫЙ – ЧЕРНЫЙ" (Shkval polarity switch)**. Using this switch, you may display either "БЕЛЫЙ" = white indication or "ЧЕРНЫЙ" = black indication on the Shkval display. [RCtrl + RShift + B]
3. **"ОГР ИНФ – ПОЛН" (HUD declutter switch)**. Use this switch to remove non-essential symbology from the heads up display: "ОГР ИНФ" = declutter, "ПОЛН" = full data. [RCtrl + S]
4. **Laser code selector**. The rotary dial has three positions and can be used to select the laser code that the Shkval will use when laser illuminating a target. This dial can be rotated left [RCtrl + RAlt + RShift + I] and right. [RCtrl + RAlt + RShift + O]
5. **"ЯРКОСТЬ ИТ" (TV display brightness knob)**. Rotate this knob left [RCtrl + RAlt + J] and right [RCtrl + RAlt + I] to adjust the brightness of the Shkval TV display.
6. **"КОНТРАСТ ИТ" (TV display contrast knob)**. Rotate this knob left [RCtrl + RShift + J] and right [RCtrl + RShift + I] to adjust the contrast of the "Shkval" TV display.
7. **"ТР – ОТКЛ" (Tracer switch)**. No function.

8. "СФ", "К", "☰", "●", "✱", etc. color optic filters dial. This dial adjusts the Shkval optics for various weather conditions. No function.

Landing Lights and Voice Warning ("Betty") Control Panel

The landing and voice warning ("Betty") control panel is located in the lower part of the center panel. It controls landing lights, navigation channels, and the automatic voice message unit (VMU). The landing lights are used to illuminate the landing position in the absence of lighting on the ground. The landing lights are located underneath the fuselage and can be slewed.



6-41: Landing lights and voice warning ("Betty") control panel.

The lights and VMU panel contains the following functions:

1. **"ОСН-РЕЗЕРВ"** (Main and backup landing light switch). To select either the main or backup landing lights, set this switch to the **"ОСН"** position to turn on the main landing light or select the **"РЕЗЕРВ"** position to select the backup light. [RCtrl + :]

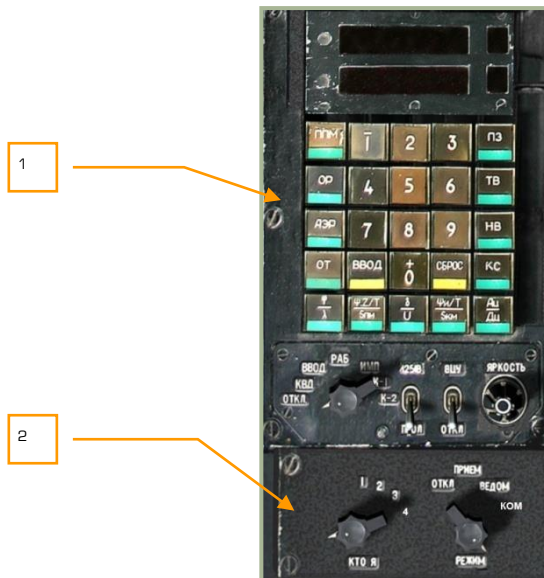
Note that both lights can also be controlled via the **"ПОСАД ФАРЫ"** switch on the collective, independent of the **"ОСН-РЕЗЕРВ"** switch position. Additionally, you may slew the main landing light by holding down the right control key and pressing [;], [,], [.] and [/]

2. **"УПР. СВЕТ – УБОРКА"** (Landing light ON/OFF switch). This is a three-position switch that controls the main landing light. The **"УПР СВЕТ"** extends the light and turns it on; the middle position turns the light off, and the **"УБОРКА"** position will turn off the light and retract it. [RShift + L], [RCtrl + RAlt + L]
3. **"ПРИВОД Р/С. БЛИЖН-АВТ-ДАЛЬН"** (NDB's INNER-AUTO-OUTER beacon mode switch). The Non-Directional Beacon (NDB) mode switch has three positions and is used to select the ADF channel. **"ДАЛЬН"** (Outer) selects navigation mode referenced to an outer airfield beacon while the **"БЛИЖН"** (Inner) setting is for navigation to the inner airfield beacon. The **"АВТ"** (Auto) mode is not implemented in the helicopter. [LAlt + =]



4. **"РЕЧЕВОЙ ИНФОРМАТОР ОТКЛ"** (VMU cease message button). The **"ОТКЛ"** (OFF) button ceases current voice messages. [LShift + LAlt + V]
5. **"РЕЧЕВОЙ ИНФОРМАТОР ПОВТОР"** (Repeat VMU message button). This button initiates a replay of the active failures messages. [LAlt + V]
6. **"ВКЛ – АВАР"** (On-Emergency) switch. **"ВКЛ"** is normal mode and **"АВАР"** is emergency mode with doubling all EKRAN messages with VMS sound. [LCtrl + V]

Wall panel, Forward Section

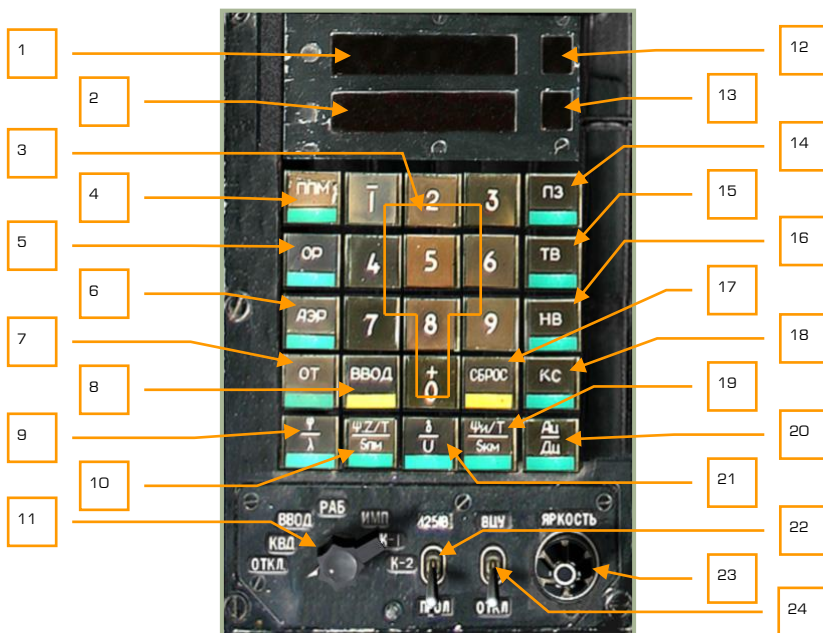


6-42: Wall panel, forward section

1. PVI-800 navigator control panel
2. PVTz-800 off-board targeting data link mode panel

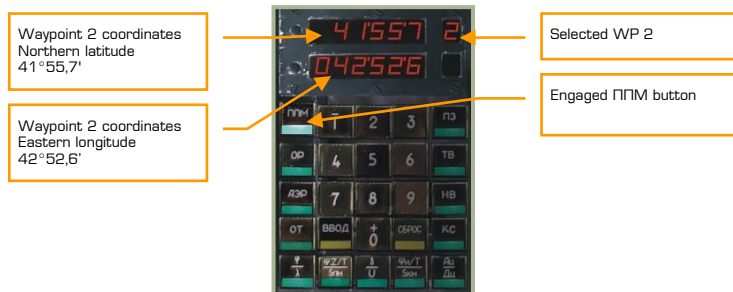
PVI-800 Navigation Control Panel

The PVI-800 works in parallel with the ABRIS navigation system, but whereas the ABRIS uses satellite navigation system inputs, the PVI-800 uses data from the Inertial Navigation Unit (INU).



6-43: PVI-800 panel

1. Upper display window
2. Lower display window
3. Keypad [RAIt + 0 - 9]
4. "ПНМ" (Waypoint mode) button. To select a waypoint from the flight plan, press this modal button (the button will light) and then press the button of the desired waypoint from the keypad. Upon selection, the waypoint will become the steerpoint. The PVI-800 can store up to the six waypoints. When in "ПНМ" mode, the upper window will display the latitude coordinate and the lower window will display the longitude coordinate. The selected waypoint number will be displayed in the waypoint window. Note that waypoint steering information displayed on the HUD will be from the PVI-800 and not the ABRIS. [RAIt + Q]



5. **"OP"** (Reference point update) button. Used to select a reference point for an INU update. Up to four INU reference points can be set in the mission editor.
[RAlt + E].



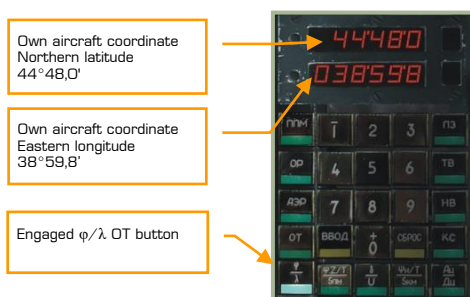
6. **"A3P"** (Airfield) button. This mode is used to select an airfield for RTB mode and it displays the coordinates of one of two airfields. In the simulation, airfield 1 will be your takeoff location and airfield 2 will be your landing location. If no landing or takeoff location is specified in the mission editor, this function will do nothing. [RAlt + T]



7. **"OT"** (Target point) button. This mode is used to select a Target Point (TP) for ingress and entering coordinates for new TPs. Up to 10 TPs can be saved. TPs can be defined either as a fly over location, or with a Shkval lock. [RAlt + U]



8. "ВВОД" (Enter) button. Used for the entering of data [RAlt + I].
9. "φ/λ" (Own aircraft coordinates) button. Displays ownship coordinates. [RAlt + A]



10. "Ψ:Z/T/Snm" button. Indication of DTA (DH sub-mode) or XTE (DT sub-mode), time and distance to current waypoint in the Waypoint, Reference, Airfield, and Target navigation modes. [RAlt + S]

DH sub-mode indication:



DT sub-mode indication:



11. PVI Master Mode selector can be rotated left [RAlt + V] and right [RAlt + B]:

- **"ОТКЛ"** = Powers the PVI-800 off.
- **"КВД"** = Verification of entered data. This mode allows you to check a waypoint's coordinate and other data without changing the active navigation mode or steerpoint.
- **"ВВОД"** = Edit waypoint. This function allows you to enter waypoint coordinates, wind conditions, and other data. To do so:
 - Select EDIT
 - Press **"ППМ"** and the small upper window will display the total number of waypoints currently stored.
 - Press 1 – 6 on the keypad to select the desired waypoint number and the current waypoint coordinates will be displayed.
 - Using the keypad, enter new coordinates for the selected waypoint. Note that you should indicate N/S or E/W prior to entering the coordinate. To make the coordinate positive, press the 0 key first; to make the coordinate negative, press the 1 key first. When set to negative, a "-" symbol will appear left of the coordinate.
 - After the coordinate has been entered, press the Enter button. Or, you may press CANCEL to clear the data on the display.
- **"РАБ"** = OPER (normal operation)
- **"ИМП"** = Simulated flight. This mode will simulate the entered flight plan with a simulated ground speed of 1,000 km/h. This can be used to check all bearings, ranges, tracks, and other data prior to flight.
- **"К-1", "К-2"** = Non-functional programming modes.

12. Waypoint display

13. Airfield number, fixed point, target point, or correction point display.

14. "ПЗ" (Rerun) button. Inertial navigation unit (INU) for in-flight realignment. No function.
15. "ТБ" (Precise alignment) button. INU precise alignment. This will align the INS gyrocompass and provide the most precise alignment with the heading finding function. This alignment takes about 30 minutes to complete. [RAlt + R]
16. "НВ" (Normal alignment) button. INU normal alignment. [RAlt + Y]
17. "СБРОС" (Reset) button. Press this button to remove data entered when in EDIT mode. [RAlt + O]
18. "КС" (Initial point coordinates) button. Pressing this button will display your initial coordinate point and allow you to enter a new one. By default, the initial point coordinate comes from the mission editor. In this case, the initial point (KC) and own aircraft ("Ф/Л") coordinates will similar. [RAlt + P]



19. "Ψи/Т/Скм" (True heading/time/distance) button. Indication of true heading, time, and distance to final waypoint in the Waypoint, reference, airfield, and target modes. [RAlt + F]



20. "Ац/Дц" (Heading/range to target point) button. Indication of heading and range to target in the Ingress mode. [RAlt + G]



21. **"δ/V"** (Wind direction/speed) button. Indication of the wind direction and wind speed. Used meteo wind direction (from) that differs on the 180° degrees from navigation wind (to). [RAlt + D]



22. **"И-251В - ПРОЛ"** (I-251V Shkval – Fly over INU update) switch. Mode of operation for INU correction. When set to **"И-251В"**, INU coordinates will be corrected using the Shkval optics. When set to **"ПРОЛ"**, the coordinates will be corrected by over-flying a reference point. [RCtrl + V]
23. **"ЯРКОСТЬ"** (Brightness) knob. Adjust panel backlighting brightness. Increase brightness [RShift + RCtrl + P] and decrease brightness [RShift + RAlt + P].
24. **"ВЦУ - ОТКЛ"** (Data link – Off) switch. Off-board targeting data link power ON-OFF, respectively. [RCtrl + B]

PVI navigation indication form

Param	Display window	Sign	Digits						Range	Comments
			1	2	3	4	5	6	Units	
φ	Upper		Degrees			Minutes		Decimals	±0...75°	Indication during FLIGHT mode with engaged φ/λ button (9)
		±	Tens		Units '	Tens	Units '			
λ	Lower		Degrees			Minutes		Decimals	±0...180°	
		±	Hundreds	Tens	Units '	Tens	Units '			
ψ:Z/T	Upper		Degrees			Minutes of time			0...360° ±0...99.9km	Indication during ROUTE, RETURN, INGRESS modes with engaged ψ:Z/T / Snm button (10) ψ – in DH mode; Z – in DTA mode («+» XTE right, «-» XTE left).
		Hundreds	Tens	Units '						
			Kilometers			Hundreds	Tens	Units	0...300 minutes	
		±	Tens	Units	Decimal '	* Units '		Decimals		
S nm	Lower		Kilometers						0...999.9 km	* Indication with time remainder less 10 minutes.
		Hundreds	Tens	Units '	Decimals					
ψ/T	Upper		Degrees			Minutes of time			0...360°	Indication during ROUTE, RETURN, INGRESS modes with engaged ψ _n /T / S km button (19) * Indication with time remainder less 10 minutes.
		Hundreds	Tens	Units '	Hundreds	Tens	Units	0...300 minutes		
					* Units '		Decimals			
S km	Lower		Kilometers			Decimals			0...999.9 km	
		Hundreds	Tens	Units '						
δ	Upper		Degrees						0...360°	Indication during FLIGHT mode with engaged δ/V button (21)
		Hundreds	Tens	Units '						
V	Lower		Meters per second						0...50 m/s	
		Tens	Units							
A _U	Upper		Degrees						0...360°	Indication during FLIGHT mode with engaged A _U /D _U button (20)
		Hundreds	Tens	Units '						
D _U	Lower		Kilometers			Decimal			0...999.9 km	
		Hundreds	Tens	Units '						

PVTz-800 Off-Board Targeting Data Link Mode Panel

This panel is located directly below the PVI-800 navigation control panel described above. The function of the PVTz-800 is to manage ownship data link identification and send-receive mode.



6-44: PVTz-800 off-board targeting data link mode panel

The PVTz-800 data link panel allows you to set your data link identification number and the manner in which you send and receive information with your flight members over the data link (maximum of four aircraft per data link group). Please reference the ABRIS section of this manual to learn how data link information is visually presented to you.

In a multiplayer mission, it is possible to have multiple data link groups in the mission at the same time; however, each would have to be on a different frequency.

The data link panel consists of two dials, the **"КТО Я"** dial and the **"РЕЖИМ"** dial.

The **"КТО Я"** (my ID number) dial, can be set 1 through 4 and allows you to set your own data link identification number. Each flight member should be assigned a unique ID number and the flight leader should be assigned ID 1. [LCtrl + I]

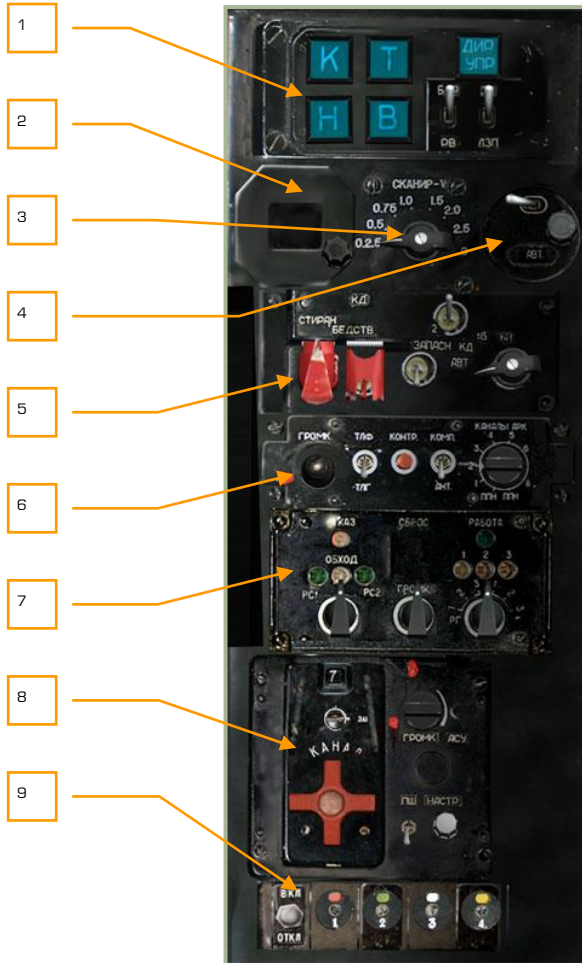
The **"РЕЖИМ"** (data mode) dial, allows you to select one of four options regarding how you receive and pass data link information to the rest of your flight. [LCtrl + M], [LShift + M] The options include:

1. **"ОТКА"** (Disable) disables data link communication with your flight.
2. **"ПРИЕМ"** (Receive) is a receive data only mode (you cannot send data) and it is a secure mode that is difficult to detect by enemy electronic emission detection systems.
3. **"ВЕДОМ"** (Wingman) mode allows you to send and receive information from other flight members including the flight lead (ID 1). Wingman icons will be displayed on the ABRIS.
4. **"КОМ"** (Commander) mode allows you to send and receive information from just the flight leader. Wingman icons will be displayed on the ABRIS.

For more information about sending and receiving data link information, please consult the earlier PRT Data Link Control Panel chapter in this manual.

Right Panel, Middle Section

This panel is located under the pilot's right arm:



6-45: Right panel, middle section

1. Autopilot panel. See Autopilot Panel section.
2. Magnetic variation panel. This panel displays the magnetic variation as inputted by the control knob below it. For the Caucasus region, the magnetic variation value is about 5-degrees.

3. Shkval optics scan rate. When placed in automatic scan mode, this dial can be adjusted to control the speed at which the Shkval scans side to side. Increase scan rate [LCtrl + LShift + M] or decrease rate [LCtrl + RAlt + M].
4. Latitude correction. Depending on what latitude hemisphere the helicopter is operating in, this switch and knob allow the operator to adjust needed latitude navigation compensation.
5. Identify-Friend-or-Foe (IFF) transponder control, No function.
6. Automatic direction finder. See ADF ARK-22 section.
7. Special uplink control, No function.
8. R-828 army radio system panel. See R-828 Control Panel section.
9. Signal flares control. See Signal Flare Panel section.

Autopilot Panel

The autopilot system serves two primary functions. First it can act as a stability augmentation system and second it can be used in conjunction with several automatic flight modes.



6-46: Autopilot panel

1. **T** – Pitch dampener - Pitch hold. Enables pitch autopilot channel. [LShift + P]
2. **K** – Bank dampener - Bank hold. Enables bank autopilot channel. [LShift + B]
3. **H** – Lateral dampener - Heading/course hold. Enables lateral autopilot channel. [LShift + H]
4. **B** – Altitude hold. Enables altitude hold. The altitude source depends on the position of the “**БАР - РВ**” (Baro – Radar altitude) switch. [LShift + A]
5. “**ДИР УПР**” – Flight director mode button. Disengages autopilot automatic angular stabilization (except for dampener function) and enables flight director mode on the HUD. [LCtrl + A]
6. “**БАР-РВ**” (Baro – Radar altitude) Autopilot altitude hold data source selection [LCtrl + X], [LShift + X]:
“**БАР**” – by pressure altimeter;

“PB” – by radar altimeter;
Neutral – disable sub-modes.

7. “3K-ЛЗП” (Desired Heading – Desired Track Angle) Autopilot Heading/Course hold mode [LAlt + X], [LCtrl + LAlt + X]:
“3K” – desired heading hold;
“ЛЗП” – desired track angle hold;
Neutral – disable sub-modes.

Automatic Direction Finder (ADF) ARK-22

The ARK-22 ADF controls the Radio Magnetic Indicator (RMI) needle on the Horizontal Situation Indicator (HSI), pointing it in the direction of the transmitting signal. Using the ADF, you can select one of eight preset channels, each of which stores two radio frequencies. You can manually select which of the two frequencies on the selected channel to home on using the NDB's INNER-AUTO-OUTER beacon mode switch. For example, the first frequency in a given ADF channel may be set to home on the airfield outer locator beacon and the second on the inner locator beacon, etc. The pilot can verify selection of the correct beacon by configuring the ADF to provide an audio transmission of the beacon's ID. While in real life the frequencies for each ADF channel are set by ground personnel, you can edit these in the ADF configuration files outside the simulation.


The ARK-22 ADF can also be slaved to the R-800L1 VHF radio. In this case, the RMI needle on the HSI is directed toward the transmitter on the frequency currently selected for the R-800L1 radio. For example, the flight leader can maintain bearing to his wingman when the wingman is transmitting a radio call.



6-47: ADF panel

The ADF panel is powered-on when either “K-041” is turned on or when the “ПНК” navigation system on/off switch is turned on (right side panel).

1. “КОМП” (Test) self test button. When pressed, the bearing to radio beacon arrow on the HSI rotates to a set angle. When pressed in “АНТ” (antennae) mode, a continuous tone is emitted. Note that the “УКВ-1” VHF-1 R-828 radio switch and “УКВ-2” VHF-2 R-800 radio switch on the right panel should be set to on (up). [LCtrl + LAlt + T]
2. “ТЛГ-ТЛФ” (Telegraph-Telephone) mode switch. Non-directed beacon (NDB) can transmit in two modes, “ТЛГ” or “ТЛФ”. In this simulation, all beacons transmit in the “ТЛГ” mode (switch in the down position). [LCtrl + LAlt + J]

3. **"ГРОМК"** (Volume) volume control. Rotating this knob left [LCtrl + LAlt + =] and right [LCtrl + LAlt + -] controls the volume of the NDB audio signal code and the self test tone.
4. **"АНТ-КОМП"** (Antenna – Compass) ADF mode switch. This switch allows you to select either **"АНТ"** antenna mode or **"КОМП"** compass mode. When in **"АНТ"** mode, the ADF provides you the NDB audio signal as a Morse code. When in the **"КОМП"** mode, the ADF provides you RMI steering data on your HSI and ABRIS HSI. [LCtrl + LAlt + 
5. **"КАНАЛЫ АРК"** (ADF channels) compass channel dial. This dial has 10 positions, any of which allow you to tune the ADF to a pre-configured NDB pair (**"ДАЛЬНИЙ – БЛИЖНИЙ"**, Outer-Inner beacons). A list of these preconfigured channels can be seen on the white sheet attached to the right wall of the cockpit. You can select between inner and outer beacons by use of the beacon mode switch on the landing and voice message panel. The two service channels (positions 9 and 0) are used for preliminary setup by ground crew. The channels can be selected by turning the dial to the left [LCtrl + =] and right. [LCtrl + -]

ADF in conjunction with ground-based non-direction beacons (NDBs) is an angle-measuring, radio-navigation system that provides you direction towards an active radio transmitter in the VHF frequency range. Each frequency has its own unique callsign or commands transmitted on it. ADF allows the following navigation tasks:

- Flight towards an NDB with visual indication of course angle (bearing)
- Landing approach in **"ОСП"** mode (ICAO 2NDB Approach) in conjunction with other indicators
- Continuous calculation and display of bearing
- Audio reception of NDB callsign tones

Bearing to NDB is indicated on the HSI and on the HSI ABRIS page based on bearing to radio beacon RMI arrow position. To display bearing on ABRIS HSI page, you first need to set the ADF signal source for RMI-1 or RMI-2. To do this, go to the ABRIS MENU page and select OPTIONS. Scroll down the list of options and select RMI-1 or RMI-2, and using the CHANGE button, set the ADF's source to RADIO. On the ABRIS HSI and ARC pages, the corresponding RMI-1 (2) RADIO arrow will now show course angle similar to the RMI arrow on the HSI.

The ADF works as a classic, automatic VHF NDB receiver. The signal emitted by the NDB is received simultaneously by non-directed and a directed stationary frame antennas. The signal from these antennas is transformed, (frequency selection, amplification, and detection) and then phase compared. As a result, a signal is created that corresponds to the bearing misalignment. This signal then drives an electromotor (with gearbox) that moves the directional pattern of the fixed frame antenna until the directional pattern receives a minimum signal to align with the NDB's location (bearing). The rotation of the directional pattern is transmitted electrically and rotates the RMI needle of the HSI and the ABRIS HSI (RADIO caret) to indicate the current NDB bearing.

ADF modes:

- **КОМПАС (КОМП)** – compass mode



- **АНТЕННА (АНТ)** – receiving audio signals from non-directional antenna
- **КОНТРОЛЬ** – ADF self test

ADF operating parameters:

- Frequency range from 150 to 1750 kHz
- 16 channels
- Frequency adjustment step – 0.5 kHz
- Bearing calculation uncertainty $\pm 1.5^\circ$
- Indication speed no less than 30 deg/sec
- Time to switch between channels no more than 2.5 sec

The initial ADF channel setup is performed by the ground crew from the initial setup panel located at the rear of helicopter. In the game, you may alter the initial setup by editing the following file: BS\Scripts\Plane\Cockpit\Ka-50\ARK\ARK.lua. The default channels are listed on the white sheet of paper attached to the right wall of the cockpit.

In-flight ADF use should be used according to the flight plan or as a backup navigation system in the event of ABRIS failure. The channels can be changed using the **"КАНАЛЫ АРК"** switch or the **"ДАЛЬН-БЛИЖН"** (Outer-Inner beacons) switch on the central pedestal panel (lights and voice message unit control panel).

To hear the audio signal from an NDB radio station, set the **"КОМП-АНТ"** switch to **"АНТ"**. Volume can be adjusted using the volume adjustment knob on the ADF panel.

To select NDB data from ABRIS, you should do the following: on the MAP page, go to INFO and select the desired radio station and press INFO again. Radio station information will be displayed including type, name, frequency, callsign, Morse code coordinates and magnetic deviation. The sound signal should correspond to its Morse code.

Pre-set ADF channels

Channel	ДАЛЬНИЙ – БЛИЖНИЙ, (Outer-Inner knob position)	Object	Type	Callsign	Freq. KHz
1	ДАЛЬН	Krasnodar-Center	Outer NDB	OyO; MB	625.0
1	БЛИЖН	Krasnodar-Center	Outer NDB	O; M	303.0
2	ДАЛЬН	Majkop-Hanskaya	Outer NDB	DG; RK	288.0
2	БЛИЖН	Majkop-Hanskaya	Outer NDB	D; R	591.0
3	ДАЛЬН	Krymsk	Outer NDB	KW; YuO	408.0

3	БЛИЖН	Krymsk	Inner NDB	K; O	830.0
4	ДАЛЬН	Anapa-Vityazevo	Outer NDB	AN; AP	443.0
4	БЛИЖН	Anapa-Vityazevo	Inner NDB	N; P	215.0
5	ДАЛЬН	Mozdok	Outer NDB	DO, RM	525.0
5	БЛИЖН	Mozdok	Inner NDB	D, R	1064.0
6	ДАЛЬН	Nalchik	Outer NDB	NL	718.0
6	БЛИЖН	Nalchik	Outer NDB	N	350.0
7	ДАЛЬН	Mineralniye Vody	Outer NDB	NR; MD	583.0
7	БЛИЖН	Mineralniye Vody	Inner NDB	N; M	283.0
8	ДАЛЬН	Kislovodsk	NDB	KW	995.0
8	БЛИЖН	Peredovaya	NDB	PR	1210.0

\\Scripts\Aircrafts\Ka-50\Cockpit\ARK\ARK.lua script for ADF
Beacons list: \\Bazar\Terrain\Beacons.lua

Troubleshooting for when an NDB signal is not received:

If the Morse code callsign is heard, check that the **"КОМП-АИТ"** switch is set it to the **"КОМП"** position (audio signal will be heard). The radio physics model calculates every transmission in real time and determines the local signal strength according to numerous variables, including time of day (ionosphere effect), surface type (rough terrain, paved surface, water, etc.), wavelength, range, transmitter power, etc. Because radio traffic is carried "live," reception can be interrupted at any point by either natural or artificial interference, such as terrain topology or radio configuration. For example, if you change radio frequency, reception will cease, but can resume at its actual point upon reconfiguring the radio back to the transmitter's frequency.

If the Morse code callsign cannot be heard, check the volume control knob **"ГРОМК"**, the channel selector and the **"ДАЛЬН-БЛИЖН"** selector. If all is set up properly, then the helicopter may be out of station range. If this happens, switch to another station in the vicinity.

R-828 Radio Control Panel

The R-828 VHF radio is used for communication with a Forward Air Controller (FAC) and other ground force units. The system provides constant radio communication within line-

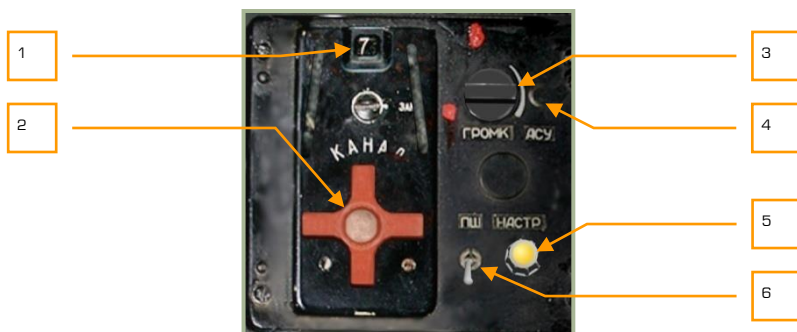
of-sight and it does not require frequency searching and adjustment. The frequency range is 20 - 60 MHz.

The radio is turned on by setting the VHF-1 "YKB-1" switch to the up, on position. The switch is located on the right panel. The communications channel is set using the channel selection knob and the transmission is active when the selector VHF-1 "YKB-1" switch is on.

The control panel allows for:

- Switching between 10 channels that have been set in advance
- Volume control

Noise reduction when noise-reduction system is activated.



6-48: R-828 control panel

The R-828 control panel has the following functions:

1. **Selected channel ID.** The active radio channel selected via the channel selector wheel is displayed in this window. This can display 1 through 10.
2. **"КАНАЛ"** (Channel) selector. This red wheel can be rotated using left [RCtrl + RAlt + M] and right [RCtrl + RAlt + N] mouse clicks or keyboard input. The wheel cycles channels 1 through 10.
3. **"ГРОМК"** (Volume) radio volume control. Rotating this knob left [LCtrl + LShift + J] and right [LCtrl + LShift + K] adjusts the volume level of audio received over the R-828 radio.
4. **"АСУ"** (Automatic tuner) button. After you have selected a channel, you will need to press the tuner button to tune the radio to the selected channel. Every time you select a new channel, you will need to press this button. [RCtrl + RShift + T]
5. **"НАСТР"** (Tuner) automatic tuner indicator lamp. If the R-828 is under power and the automatic tuner button is pressed, this will light if the radio has not been tuned to the selected channel.
6. **"ПШ"** (Noise reduction system) switch (squelch). [RCtrl + RAlt + R]

Once the required channel is set and you have pressed the “**ACY**” button, the system will tune to the selected channel’s frequency and the tuner indicator lamp will be lit. Once the tuning is complete, the lamp will turn off.

Signal Flare Panel

The signal flares panel is used to control power to the signal flare system and fire the flares. The flares come in four colors: red, green, white, and yellow. A cassette with four flares is located at the edge of helicopter’s left wing.

Signal flares are most often used when radio systems have failed or when maintaining radio silence.

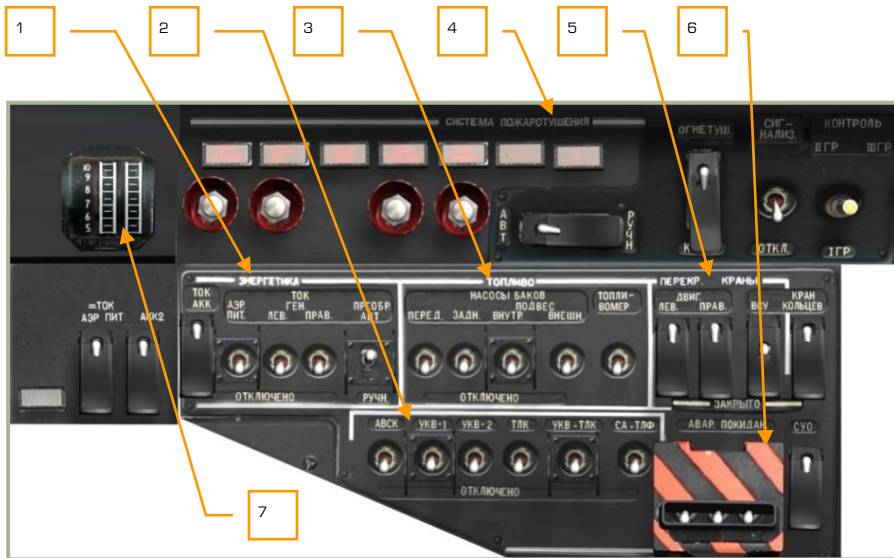


6-49: Signal flare control panel

1. Fire red flare button. [LAlt + 1]
2. Power supply ON/OFF switch. Placing the switch in the up position provides power to the signal flare system. [RCtrl + 0]
3. Fire green flare button. [LAlt + 2]
4. Fire white flare button. [LAlt + 3]
5. Fire yellow flare button. [LAlt + 4]

Wall Panel

The wall panel is located at the right side of the cockpit and includes several controls for electrical, radio, fuel, and emergency systems. Several of the switches have protective covers that need to be raised before the switch can be placed in the on, up position. When discussing the wall panel, we will divide it into the forward and aft sections.



6-50: Wall panel, forward section

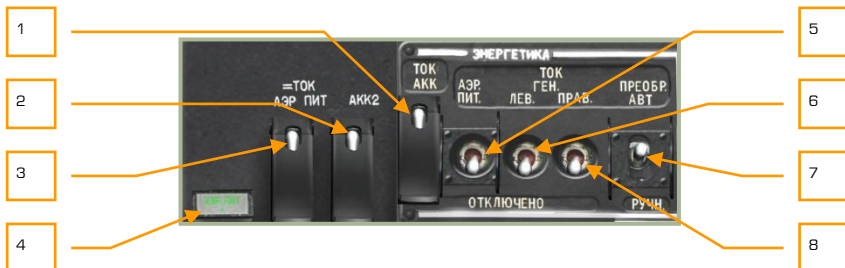
1. “ЭНЕРГЕТИКА” Electrical power controls
2. Radio and data link power controls
3. “ТОПЛИВО” Electrical fuel pumps power controls
4. “СИСТЕМА ПОЖАРОТУШЕНИЯ” Fire extinguishers control panel
5. “ПЕРЕКР. КРАНЫ” Fuel shutoff valves controls
6. “АВАР. ПОКИДАН” Pilot ejection system controls
7. Engine power indicator



6-51: Wall panel, aft section

1. Transmission and engine oil pressure and temperature gauges
2. Onboard equipment control
3. Lighting control
4. Electronic Engine Governors

Electrical Power Controls



6-52: Electrical power controls

1. **"ТОК АКК"** (Battery 1) After flipping up the cover [LCtrl + LAlt + LShift + E] and selecting this switch [LCtrl + LShift + E], electrical power will be drawn from battery 1. When performing a ground start with no ground power, you will need to set this switch to on in order to start the APU and engines.
2. **"ТОК АКК2"** (Battery 2). Enable this switch to draw electrical power from battery 2. This switch [LCtrl + LShift + W] also has a cover. [LCtrl + LAlt + LShift + W]
Note: Enable both battery 1 and battery 2 for normal operations.
3. **"=ТОК АЭР ПИТ"** (Ground DC power). If on the ground at an airfield or FARP, you may radio ground maintenance to provide direct current (DC) ground electrical power. Before radioing though, be sure that the SPU-9 intercom dial is set to the **"НОП"** ground crew position. Once this order has been given, use this switch [LCtrl + LShift + Q] to activate DC ground power to start the APU and engines. This switch also has a cover. [LCtrl + LAlt + LShift + Q]
4. **DC ground power source lamp.** When DC ground power is on, this lamp will be lit.
5. **"АЭР ПИТ"** (Ground AC power). If on the ground at an airfield or FARP, you may radio ground maintenance to provide alternating current (AC) ground electrical power. Before radioing though, be sure that the SPU-9 intercom dial is set to the **"НОП"** ground crew position. Once this order has been given, use this switch to activate AC ground power to start the APU and engines. [LCtrl + LShift + R]
6. **"ТОК ГЕН. ЛЕВ."** (Left generator) switch. After the engines are fully operating, the throttles are in automatic mode and rotor RPM is stable above 83-85%, you may turn on the left generator. This will supply power to the main AC and DC busses and onboard batteries. [LCtrl + LShift + Y]
7. **"ПРЕОБР. АВТ – РУЧН"** (Electrical power inverter auto – manual) switch. This is a three-position switch that allows DC power to be converted to AC power that is required by several onboard systems. The up **"АВТ"** position provides automatic conversion, the down **"РУЧН"** position requires manual conversion and the middle position turns off conversion. [LCtrl + LShift + I]

8. **"ТОК ГЕН. ПРАВ."** (Right generator) switch. After the engines are fully operating, the throttles are in automatic mode and rotor RPM is stable above 83-85%, you may turn on the right generator. This will supply power to the main AC and DC busses and onboard batteries. [[L](#)Ctrl + [L](#)Shift + [U](#)]

Radio and Data Link Power Control Panel



6-53: Radio and data link power control panel

This panel consists of seven switches that toggle power to the radio and data link systems on the aircraft. Prior to powering any of these systems, the aircraft will have to be supplied with AC power. These controls include:

1. **"INT.COM"** (Intercom) switch. **"INT.COM"** stands for Intercommunication and Radio Commutation system. This switch provides power to the SPU-9 intercom system. The SPU-9 provides simultaneous commutation with the R-800 radio, R-828 radio, ground intercom equipment, voice message system (VMS), and caution tones to pilot's headphones. [[L](#)Ctrl + [L](#)Alt + [Z](#)]
2. **"УКВ-1"** switch. VHF-1 R-828 radio power switch. [[R](#)Ctrl + [R](#)Alt + [P](#)]
3. **"УКВ-2"** switch. VHF-2 R-800 radio power switch. [[L](#)Ctrl + [L](#)Alt + [P](#)]
4. **"ТЛК"** switch. Data link equipment power switch. [[L](#)Ctrl + [L](#)Shift + [O](#)]
5. **"СА-ТЛФ"** switch. Radio equipment data link SA-TLF switch. No function.
6. **"УКВ-ТЛК"** switch. Data link equipment provides jam-resistant secure communications via VHF-TLK channel for remote target designation. [[L](#)Ctrl + [L](#)Shift + [P](#)]

Fuel Boost Pump Controls



6-54: Fuel pump controls

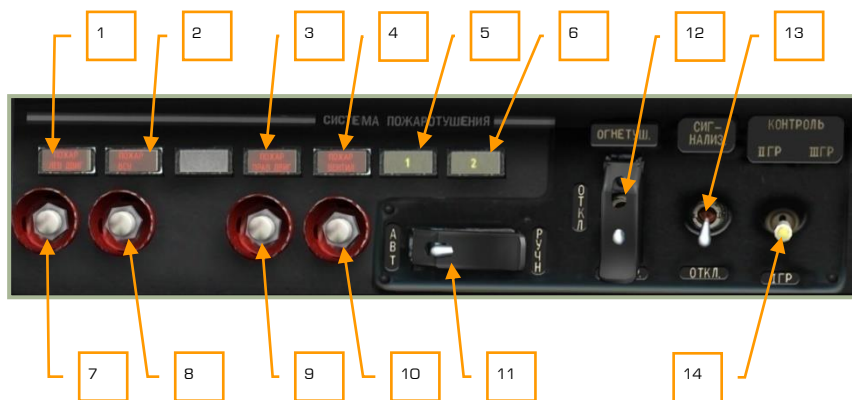
In addition to transferring fuel from the storage tanks to the engines using the suction-force generated by operating engines, boost pumps are employed to provide uninterrupted flow and for APU and engine start. While the boost pumps need to be on for APU and engine start, they do not always need to be on once the engines are running; it is best though to always have at least the internal front and rear pumps active as long as the engines are operating.

The Ka-50 has two internal fuel tanks (forward and aft) and attachment points for two external fuel tanks on each stub-wing. Each fuel tank has a dedicated boost pump.

The fuel boost pump control panel has the following controls:

1. **"НАСОСЫ БАКОВ ЗАДН"** Aft fuel pumps. Toggles power to the aft fuel boost pumps. [LCtrl + LShift + D]
2. **"НАСОСЫ БАКОВ ПЕРЕД"** Forward fuel pumps. Toggles power to the forward fuel boost pumps. [LCtrl + LShift + A]
3. **"НАСОСЫ БАКОВ ПОДВЕС ВНУТР"** Inner stub-wing station external tank pumps. Toggles power to the two inboard stub-wing station pumps that can support external fuel tanks. [LCtrl + LShift + F]
4. **"НАСОСЫ БАКОВ ПОДВЕС ВНЕШН"** Outer stub-wing station external tank pumps. Toggles power to the two outboard stub-wing station pumps that can support external fuel tanks. [LCtrl + LShift + G]
5. **"ТОПЛИВОМЕР"** Fuel metering system ON/OFF power switch. [LCtrl + LShift + H]

Fire Extinguisher Control Panel



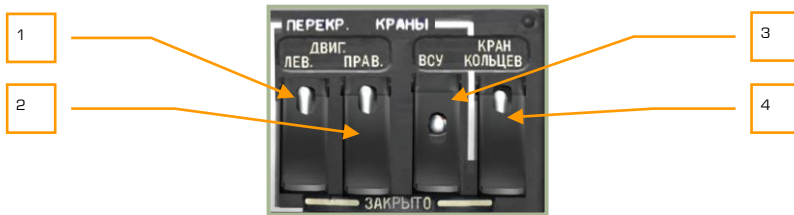
6-55: Fire extinguisher control panel

The Ka-50 has an extensive suite of fire monitoring and fire extinguisher systems that are controlled from the fire extinguisher panel. Each fire extinguisher system uses fire

retardant contained within a pressurized bottle to flood the desired compartment. The fire extinguisher panel has the following functions:

1. **"ПОЖАР ЛЕВ ДВИГАТЕЛЯ"** (Left engine) fire lamp. This lamp indicates that a fire has been detected in the left engine bay.
2. **"ПОЖАР ВСУ"** (Auxiliary Power Unit (APU)) fire lamp. This lamp indicates that a fire has been detected in the APU bay.
3. **"ПОЖАР ПРАВ. ДВИГАТЕЛЯ"** (Right engine) fire lamp. This lamp indicates that a fire has been detected in the right engine bay.
4. **"ПОЖАР ВЕНТИЛ"** (Oil-coolers) fire lamp. If a high temperature has been detected in the oil-coolers compartment, this lamp will light.
5. **"1"** Fire extinguishing bottle No.1 is charged and ready for use. After bottle "1" has been discharged (either automatically or manually) the light will go OFF.
6. **"2"** Fire extinguishing bottle No.2 is charged and ready for use. After bottle "2" has been discharged (only manually) the light will go OFF.
7. **Discharge left engine fire extinguisher button.** Press this button when in manual mode to discharge the fire extinguisher to the left engine bay. [LShift + F]
8. **Discharge APU fire extinguisher button.** Press this button when in manual mode to discharge the fire extinguisher to the APU bay. [LAlt + LShift + F]
9. **Discharge right engine fire extinguisher button.** Press this button when in manual mode to discharge the fire extinguisher to the right engine bay. [RShift + F]
10. **Ventilator extinguisher.** Press this button when in manual mode to discharge the fire extinguisher to the oil-coolers compartment. [LCtrl + LAlt + LShift + F]
11. **"БАЛЛОНЫ АВТ - РУЧН"** (Fire extinguisher select) Fire extinguisher activation mode switch. Normally it's in the ("АВТ"), automatic mode which means that in case of fire bottle "1" will be automatically discharged. If bottle "1" doesn't discharge automatically you can do it manually by pressing the button of the corresponding compartment. When the switch is in ("РУЧН") position you can discharge bottle "2" but only manually, by pressing the button of the corresponding compartment. Cover [RCtrl + RAlt + RShift + Z], switch. [RCtrl + RShift + Z]
12. **"ОГНЕТУШ – ОТКЛ – КОНТР"** (Fire extinguisher Work – Off – Test) Fire extinguisher Work – Off – Test switch. Cover [LCtrl + LAlt + LShift + Z], switch. [LCtrl + LShift + Z]
13. **"СИГНАЛИЗ – ОТКЛ"** (Alarm - OFF). Enable the fire monitoring and alarm system. [RAlt + RShift + Z]
14. **"КОНТРОЛЬ ДАТЧИКОВ I ГР – II ГР – III ГР"**. Select 1st/2nd/3rd fire warning sensors groups BIT selector.

Fuel Shutoff Valve Control



6-56: Fuel shutoff valve control

This panel controls flow of fuel from the fuel tanks to the engine and allows the main fuel tanks to cross feed from each other. This panel is also used to open fuel flow to the APU. Prior to APU and engine start, you will need to enable these switches.

1. **"ДВИГ. ЛЕВ. – ЗАКРЫТО"** (Left engine – Closed) left engine fuel valve switch [RCtrl + RShift + J] and cover. [RCtrl + RAlt + RShift + J] Placing this switch in the up position opens the fuel valve between the fuel tanks and the left engine. Open this valve prior to left engine start. Placing it in the down position closes the valve.
2. **"ДВИГ. ПРАВ. – ЗАКРЫТО"** (Right engine – Closed) right engine fuel valve switch [RCtrl + RShift + K] and cover. [RCtrl + RAlt + RShift + K] Placing this switch in the up position opens the fuel valve between the fuel tanks and the right engine. Open this valve prior to right engine start. Placing it in the down position closes the valve.
3. **"ВСУ – ЗАКРЫТО"** (APU – Closed) APU fuel valve [RCtrl + RShift + L] switch and cover. [RCtrl + RAlt + RShift + L] Placing this switch in the up position opens the fuel valve between the fuel tanks and the APU. Prior to starting the APU, this valve must be open. Placing it in the down position closes the valve.
4. **"КРАН КОЛЬЦЕВ. – ЗАКРЫТО"** (Cross feed – Closed) fuel tank cross feed switch [RCtrl + RShift + ;] and cover. [RCtrl + RAlt + RShift + ;] The crossfeed valve allows fuel supply of one engine from all tanks, in case of other engine's failure or both engines/APU supply from one tank in case of loss of fuel from the other tank (rupture by enemy fire). It's normally closed and should be open in case one of the above mentioned events occurs. Also, it is recommended to open the cross feed valve upon warning for 110 kg fuel quantity remaining in any of the tanks.

Transmission/Oil Pressure and Temperature Gauges

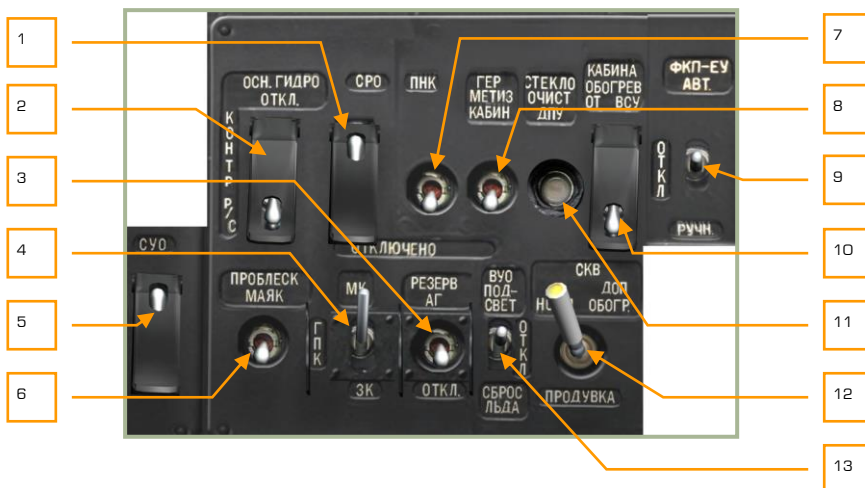


6-57: Transmission and engine oil pressure and temperature gauges

This set of six gauges provides monitoring of oil pressure, transmission oil pressure, and engine oil pressure for both engines.

1. Left engine oil pressure
2. Right engine oil pressure
3. Transmission oil pressure
4. Left engine oil temperature
5. Right engine oil temperature
6. Transmission oil temperature

Onboard Equipment Control Panel



6-58: Onboard equipment control

Unlike other panels on the right side of the cockpit that are grouped into like-controls, this panel has a wide assortment of controls. These controls include:

1. **"СРО - ОТКЛ"** (IFF power – OFF) IFF power switch [LAlt + LShift + I] and cover. [LCtrl + LAlt + LShift + I] No function.
2. **"ОСН ГИДРО – ОТКЛ"** (Main hydraulics – OFF) switch [LAlt + LShift + H] and cover. [LCtrl + LAlt + LShift + H] Switch flight control system hydraulic source between main and common hydraulics.
3. **"РЕЗЕРВ АГ – ОТКЛ"** (SAI – OFF) Standby Attitude Indicator ON-OFF. Provides power to the SAI. [RShift + N]
4. **"МК – ГПК – ЗК"** (Magnetic Heading - Flight gyroscope – Manual Heading) switch. Heading data selector for INU alignment. Flight gyroscope is used by default. [LShift + LAlt + G], [LCtrl + LAlt + G]
5. **"СУО – ОТКЛЮЧЕНО"** (Weapon system – OFF) Weapon control system power (WCS), ON-OFF switch [LShift + LAlt + D] and cover [LCtrl + LShift + LAlt + D] Provides power to weapon control system.
6. **"ПРОБЛЕСК МАЯК"** (Anti-collision beacon). When placed in the up position, the rotating, red anti-collision beacon will operate. To turn off the beacon, place the switch to the down position. [RShift + J]
7. **"ПНК ВКЛ – ОТКЛ"** (Targeting Navigation system ON – OFF) switch. This switch governs power and ground checks for the targeting navigation system. [LShift + N]

Note: When in flight, use the K-041 switch to provide electrical power for both navigation and targeting systems.

8. **"ГЕРМЕТИЗ КАБИН – ОТКЛЮЧЕНО"** (Cockpit pressurization ON – OFF) switch. No function.
9. **"ФКП-ЕУ АВТ – ОТКЛ – РУЧН"** (Gun camera, Automatic – OFF – Manual) switch. No function.
10. **"КАБИНА ОБОГРЕВ ОТ ВСУ – ОТКЛ"** (Cockpit heating from APU, ON-OFF) switch. No function.
11. **"СТЕКЛООЧИСТ ДПУ"** (Windshield wiper Shkval optics ON-OFF) button [LShift + RCtrl + M].
12. **"СКВ НОРМ – ДОП ОБОГР – ПРОДУВКА"**. Air conditioner ON – Additional Heat-Fan ON, middle position – OFF. No function.
13. **"ВУО ПОДСВЕТ – ОТКЛ – СБРОС ЛЬДА"** Deicing system, back lighting ON – OFF – Deicing ON. No function.

Lighting Control Panel



6-59: Lighting control

This panel is devoted to external and cockpit lighting controls. Functions include:

1. **"КОНТУР. ОГНИ"** (Rotor tip lights) switch. Tip lights on the lower three blades can be turned on by setting this switch to the up position. Tip lights can be useful in helping to gauge blade clearance to nearby obstacles and for formation flying. [\[RAlt + J\]](#)
2. **"СТРОЕВ. ОГНИ"** (Formation lights) switch. Formation lights are low-intensity light-strips located on the back of the fuselage and the wings. The switch has four positions that include off and three levels of brightness (10%, 30% and 100%). Formation lights can only be seen at close range, so they are often used for formation flying at night without being too visible to enemy units. [\[RCtrl + J\]](#)
3. **"ПОДСВЕТ АГР ПКП."** (SAI and ADI lighting) switch. Although most of the panels and controls can be illuminated with the cockpit panel lighting switch, the SAI and ADI must have their own lighting controlled with this switch. [\[RAlt + RShift + K\]](#)
4. **"ПОДСВЕТ ПРИБОРЫ"** (Night vision cockpit lighting) switch. [\[RShift + K\]](#). When using night vision goggles (NVG), it is best to use this setting to provide reduced illumination compared to the general cockpit lighting panel. You may further wish to adjust the brightness of the NVGs to maximize cockpit clarity. Night vision brightness adjustment is done with the **"ЯРКОСТЬ ПОДСВЕТА ПРИБОРЫ"** (Brightness instruments) knob on the lower part of the control panel.
5. **"ПОДСВЕТ ПУЛЬТЫ"** (Cockpit panel lighting) switch. Except for the ADI and SAI, this switch turns on panel lighting for the cockpit. You would generally use such lighting when in low-light conditions and not using the night vision goggles. [\[RCtrl + K\]](#)

Note that the flood light switch is located along the rear left panel of the cockpit and the navigation lights are located on the overhead panel.

Electronic Engine Governors

Two ERD-3VMA electronic engine governors are installed on the Ka-50. Each Electronic Engine Governor (EEG) is part of the electronic engine control system and is intended to control the fuel flow at high gas-generator (GG) RPM and to shut down the engine in case of power (free) turbine (PT) over-speed.

Each EEG functionally consists of GG RPM limitation contour and automatic PT protection and has the following functions.

For the GG contour:

- Maximum GG RPM limitation as a function of the ambient temperature and barometric pressure, with the purpose of maintaining constant takeoff power.
- Maximum physical GG RPM limitation up to 101%.

When the maximum GG RPM has been reached for a given temperature and pressure, the EEG reduces fuel flow via a solenoid valve. Simultaneously, the **"ОГРАН РЕЖ ЛЕВ"** (LEFT ENG PWR LIMIT) or **"ОГРАН РЕЖ ПРАВ"** (RIGHT ENG PWR LIMIT) yellow lights on the overhead panel illuminate.

For the PT protection:

- This generates an engine shut down command signal with a flashing MWL and illumination of the **"н ст ПРЕД ЛЕВ ДВИГ"** (LEFT ENG PT OVRSPD) and **"н ст ПРЕД ПРАВ ДВИГ"** (RIGHT ENG PT OVRSPD) red lights on the left portion of the main instrument panel. Simultaneously, the audio message **"Раскрутка турбины левого двигателя"** (Left engine power turbine over-speed) or **"Раскрутка турбины правого двигателя"** (Right engine power turbine over-speed) is played.

The control panel for turning EEG off and on is located on the right wall panel. There are switches for turning off and on both EEG's (left and right engines), a selector switch for GG channel test, and another switch to test both the channels of the PT contour.

When the **"ЭРД ЛЕВ"** (EEG LEFT) and **"ЭРД ПРАВ"** (EEG RIGHT) switches are in the ON (up) position and the two **"КОНТР. ЭРД"** (EEG TEST) selectors are in the **"РАБОТА"** (OPERATION) position, the electronic governors are ready for normal operation.

The **"СТ-1"** (PT-1) and **"СТ-2"** (PT-2) channels operate independently from each other. To generate an engine shut down signal it is necessary that both channels have detected a PT over-speed with a time difference of no more than 0.2 seconds. In case of a PT RPM over-limit detection by only one channel, or by both of them but with a time gap of more than 0.2 seconds, the signal is ignored as a false alarm and no action is taken.

If during test mode with an illuminated warning light and a rotor RPM of 86.5%, the selector can be rapidly switched to the other channel (**СТ-1 – СТ-2**) without holding it in the middle **"РАБОТА"** (OPERATION) position; the tested engine will shut down.



6-60: Electronic Engine Governors

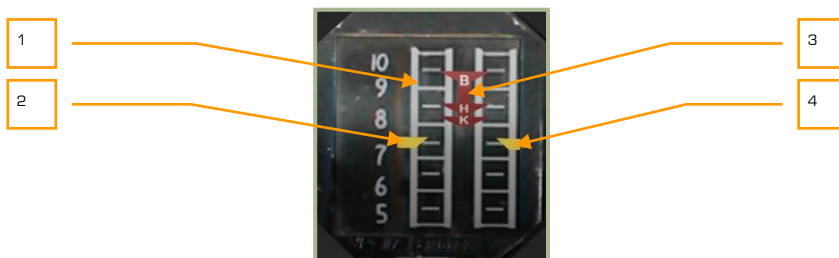
1. **"ЭРД ЛЕВ"** (Left EEG – Off) Left engine Electronic Engine Governor switch [RCtrl + HOME] and cover. [RCtrl + RAlt + HOME]
2. **"ЭРД ПРАВ"** (Right EEG – Off) Right engine Electronic Engine Governor switch [RCtrl + End] and cover. [RCtrl + RAlt + End]
3. **"КОНТР. ЭРД ТК – РАБОТА"** (EEG GG Test – Operation) Electronic engine governor gas generator test – Operate switch [RAlt + RShift + End] and cover. [RCtrl + RShift + End]
4. **"КОНТР. ЭРД СТ-1 – РАБОТА – СТ-2"** (EEG PT-1 Test – Operation – EEG PT-2 Test) EEG power turbine channel 1 test – Operate – EEG power turbine channel 2 test, three-switch contactor [LCtrl + LAlt + End] and cover [LShift + LCtrl + End].

Engine Power Indicator

The Engine Power Indicator is a tool to measure the equipment used to control engine power. Monitoring and control of the engines is based on the measurement of the compressor's outlet air pressure, whose value is indicated by the two yellow markers on the vertical scale. These are then compared to the central red markers on the scale that represent different engine operating modes. The position of these mode markers is proportional to the ambient air pressure and temperature.

On the central index there are three red markers: **"B"**, **"H"**, **"K"**. These correspond to the compressor's outlet air pressure at takeoff, maximum continuous, and cruise modes.

To control the operation of any mode, it is necessary to compare the position of the yellow index markers with the red mode marks (B, H, K) on the scale.



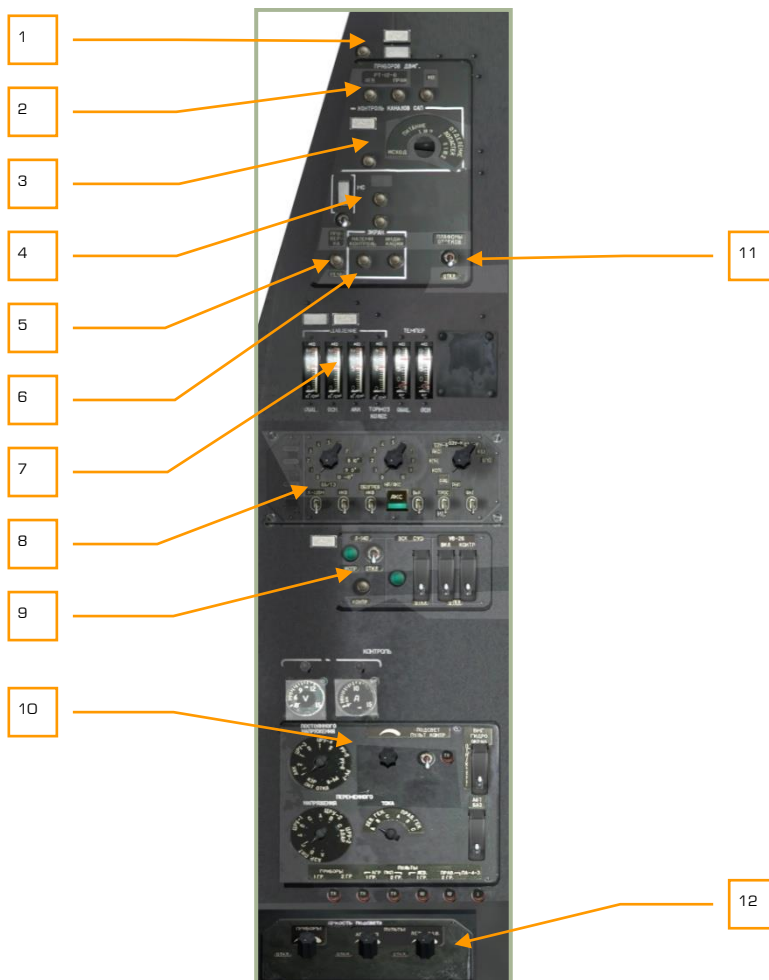
6-61: Engines power indicator



1. Compressor outlet air pressure scale. Scaled from 5 to 10 kgf/cm². One division equals 0.5 kgf/cm².
2. Left engine marker
3. Central index with marks:
 - **B** – takeoff mode
 - **H** – maximum continuous mode
 - **K** – cruise mode
4. Right engine marker

Rear Auxiliary Panel

This panel is located on the back wall of the cockpit, to the pilot's right side. Like the onboard equipment control panel, this panel also has a wide assortment of controls.



6-62: Rear auxiliary panel

1. Deicing control panel.
2. Engine indicators control panel.
3. Ejection system BIT panel.
4. "INT.COM" Intercommunication and Radio Commutation system BIT panel.

5. Voice message unit system ("Betty") BIT.
6. EKRAN warning system Built-In Test (BIT) controls.
7. Hydraulic temperature and pressure indicators.
8. PPK-800 systems preparation and check panel.
9. L-410 laser warning system, weapon system, and UV-26 countermeasure system controls.
10. Electrical system control panel.
11. Equipment bays lighting switch.
12. Lighting brightness control panel.

Ice Defrosting Control Panel



6-63: Ice defrosting control panel

1. Heating system BIT button. No function.
2. Heating system intact indicator.
3. Ice detected.

Engines Control Instruments Panel



6-64: Engines' control instruments panel

1. "РТ-12-6 ЛЕВ" left EGT governor button. [Alt + RShift + G]
2. "РТ-12-6 ПРАВ" right EGT governor button. [RCtrl + RShift + G]
3. "ИБ" engines vibrations monitoring system control button. [RCtrl + Alt + RShift + V]

"РТ-12-6 ЛЕВ" and "РТ-12-6 ПРАВ" buttons decrease the control threshold of the EGT governors to check the serviceability of the EEG. When either of these buttons are pressed, the GG contour of the EEG disengages. If the EGT is no less than 850°C and GG RPM is no less than 87%, then the EGT decreases by 30°C or more and the GG RPM decreases to 84% of the maximum value.

Automatic Ejection System BIT Panel

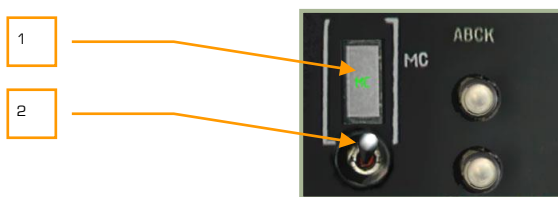


6-65: Automatic ejection system BIT panel

1. Ejecting system check lamp.
2. Circuit test button. This is a circuit test of the egress system. Perform this test after the three egress switches on the wall panel have been armed. You may further set the egress mode dial to each position and press the circuit test (with the exception of the ИСХОД position). [RCtrl + RShift + E]
3. **ИСХОД – ПИТАНИЕ – ОТДЕЛЕНИЕ ЛОПАСТЕЙ** – egress mode: manual, assisted, or full ejection with rotor blade separation.

Intercom Check Panel

Intercom check panel serves for conducting pre-flight intercom SPU-9 and video tape recorder checks.



6-66: Intercom check panel

1. Tape recorder on/off indicator. No function.
2. Tape recorder ground check switch. No function.

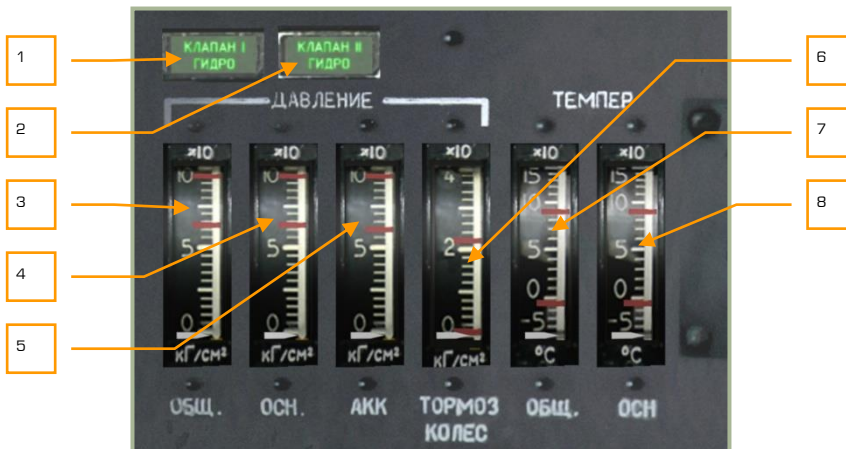
EKRAN and Voice Warning System Control



6-67: EKRAN Warning System and ALMAZ Voice Message Unit ("Betty") BIT controls

1. "ПРОВЕРКА РЕЧЬ" (ALMAZ Voice message ("Betty") system BIT) button. Pressing this button will run a built in test (BIT) of the EKRAN system. If the test passes, you will receive an affirmative voice message. [RCtrl + RAlt + V]
2. EKRAN ground control button. No function.
3. EKRAN revert to flight control button. No function.
4. Equipment bays lighting switch. No function.

Hydraulic Temperature and Pressure Indicators



6-68: Hydraulic Temperature and Pressure Indicators

This set of indicators monitor the hydraulic pressure to the aircraft's sub-systems and the state of the hydraulic systems.

1. "КЛАПАН I ГИДРО" (Hydraulic valve #1) lamp. When the supply of the servo actuators switches from the main hydraulic system to the common hydraulic system these lamps will light. This may happen either automatically in case of failure of the main system or manually for ground checks by selecting the switch "Main hydraulics - OFF" to the OFF position.



2. **"КЛАПАН II ГИДРО"** (Hydraulic valve #2) lamp. When the supply of the servo actuators switches from the main hydraulic system to the common hydraulic system these lamps will light. This may happen either automatically in case of failure of the main system or manually for ground checks by selecting the switch "Main hydraulics - OFF" to the OFF position.
3. **"ДАВЛЕНИЕ ОБЩ"** (Common pressure) hydraulic pressure indicator.
4. **"ДАВЛЕНИЕ ОСН"** (Main pressure) hydraulic pressure indicator.
5. **"ДАВЛЕНИЕ АКК"** (Accumulators pressure) hydraulic pressure indicator.
6. **"ДАВЛЕНИЕ ТОРМОЗ КОЛЕС"** (Wheel brakes pressure) hydraulic pressure indicator.
7. **"ТЕМПЕР ОБЩ"** (Common temperature) common hydraulic temperature indicator.
8. **"ТЕМПЕР ОСН"** (Main temperature) main hydraulic temperature indicator. Please refer to the hydraulics section of this manual for greater detail.

PPK-800 Systems Preparation and Check Panel



6-69: System preparation and check panel

Located mid-way down the back right panel, the PPK-800 panel provides additional weapon and navigation controls. These include:

1. Computer malfunction lights. There are five lights that illuminate in regards to a computer malfunction:
 - "ЦВМ-Б" (combat computer)
 - "ЦВМ-Н" (navigation computer)
 - "ЦВМ-И" (indication computer)
 - "ЦВМ-Ц" (data link computer)
 - "УВВ" (input-output device). No function.
2. "ББ/ТЗ" selector. Outside temperature setting for anti-tank guided missile (ATGM) flight control system pre-launch adjustments. No function.
3. "HP/АКС" selector. Unguided rocket and gun pods ballistics data settings.
 - 0 – S-8KOM rockets with anti-tank/antipersonnel warhead
 - 1 – S-8TsM rockets with smoke warhead
 - 2 – S-13 rockets
 - 3 – S-24 heavy rockets. Not used

- 4 – S-8M HE rockets
- 5 – UPK-23 gun pods, twin 23mm

The ballistic data is used for impact point calculation. The selector position must match the selected weapon; if not, the impact point will not be calculated correctly.

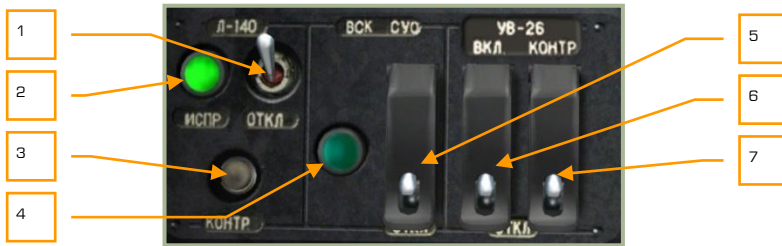
At the start of a mission, the rocket selector switch will be automatically set to comply with selected rockets from the mission planner. If more than one rocket type is selected, the selector will set first rockets by hard point number (outer on the left wing is #1 and outer on the right wing is #4).

Before a second rocket type is used, you must select the dial position manually for the rocket type of gun pod.

The same operation must be done after rearming the helicopter during a mission.

4. **"РНП"** selector. Weapon control BIT mode selector. No function.
5. **"К-ЦВМ – ОТКЛ"** switch. Computer BIT. No function.
6. **"ИКВ – ОТКЛ"** (INU – OFF) switch. Inertial Navigation Unit (INU) power. INU starts alignment procedure automatically upon power on [RCtrl + RAlt + I].
7. **"ОБОГРЕВ ИКВ – ОТКЛ"** (INU heater – OFF) switch. This switch is turned on prior to Inertial Navigation Unit (INU) alignment and must be enabled during INU operation. No function.
8. **"АКС"** button. Weapon control system BIT. No function.
9. **"Вн.К – ОТКЛ"** switch. No function.
10. **"ТРОС – ОТКЛ"** (Stabilization of sling load suspension cable - Off) switch. No function.
11. **"ФКП – ОТКЛ"** (HUD video recorder – Off). No function.

LWS, WS and CMS Power and Test Panel



6-70: Laser warning system L-140, weapon system and UV-26 countermeasures system control equipment panel

This panel is the power and test panel for the laser warning system (LWS), weapon system (WS), and counter measures system (CMS).

1. “**Л-140 – ОТКЛ**” (LWS power – OFF) switch. Setting this switch to the up position provides power to the LWS system. Once power is provided, you may perform a self-test and use the LWR panel. [\[LCtrl + N\]](#)
2. “**Л-140 ИСПР**” (LWS operation) lamp. After the LWS has been provided power and the system has fully powered up after approximately 30 seconds, this green indicator lamp will come on. If you perform an LWS self-test, the lamp will shut off for approximately 30 seconds while the test is performed.
3. “**Л-140 КОНТР**” (LWS self-test) button. Pressing this button while the LWS is powered will initiate a 30 second self-test. During this time, the operation lamp will be off to indicate that the LSW is offline. [\[LCtrl + LAlt + N\]](#).
4. “**ВСК-СУО**” (Weapon system built-in test) indicator. No function.
5. “**ВСК-СУО – ОТКЛ**” (Weapon system built-in test) switch. No function.
6. “**УВ-26 ВКЛ – ОТКЛ**” (Countermeasures system power) switch [\[LCtrl + LShift + C\]](#) and cover. [\[LAlt + LShift + C\]](#) Placing this switch in the up position will provide power to the UV-26 system and the control panel over the front dash will be operational.
7. “**УВ-26 КОНТР – ОТКЛ**” (Countermeasures system self-test) switch [\[LCtrl + LAlt + C\]](#) and cover. [\[LCtrl + LAlt + LShift + C\]](#) Setting this switch to on will place the UV-26 in a self test mode as long as the switch is in the up position. If the system is operating normally, the UV-26 will display a “990” status code.

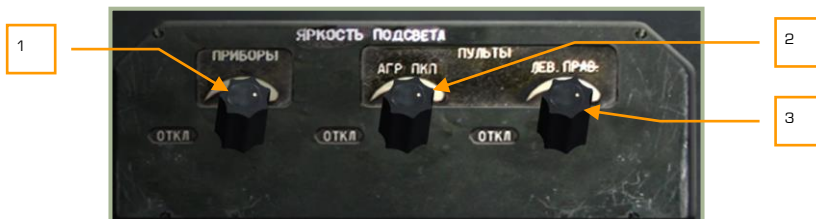
Electrical System Control Panel



6-71: Electrical System Control panel

1. **Amp meter.** No function.
2. **Volt meter.** No function.
3. **DC volt meter electric distribution assembly selection.** No function.
4. **Alternate current ammeter phase selector.** No function.
5. **AC voltmeter electric distribution assembly selection.** No function.
6. **Rear panel lighting brightness knob.** By rotating this knob, you can control the brightness of the rear panel illumination. Increase [LShift + LCtrl + LAlt + U] and decrease [LShift + LCtrl + RAlt + U].
7. **"ПОДСВЕТ ПУЛЬТ КОНТРОЛЯ - ОТКЛ"** (Panel lighting – Off) switch. Place this switch in the up position to turn on rear panel switch and indicator illumination. [RAlt + RShift + L]
8. **"ВМГ ГИДРО ЭКРАН - ОТКЛ"** (Hydraulics/transmission group and EKRAN power supply) switch [LCtrl + LShift + N] and cover. [LCtrl + LAlt + LShift + N] Provides power to EKRAN Warning System, hydraulics, and transmission group control sensors.
9. **Circuit breakers.** No function.

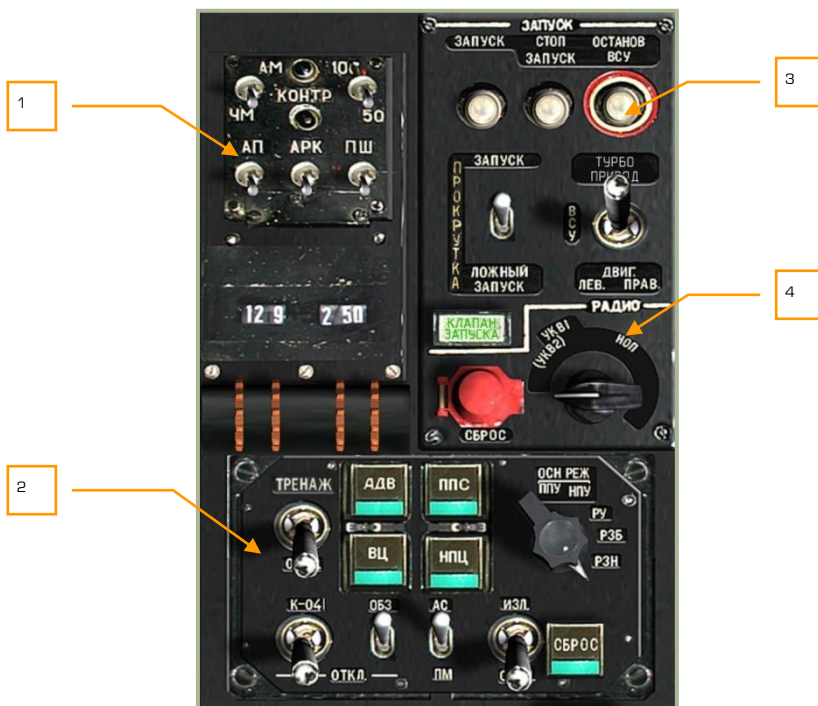
Lighting Brightness Control Panel



6-72: Lighting brightness control panel

1. "ПРИБОРЫ" Blue cockpit lighting brightness for night operations. Rotating this knob allows you to adjust the brightness level of the blue cockpit lighting. Increase [LCtrl + LAlt + K] and decrease [LShift + LCtrl + K].
2. "ПУЛЬТЫ АГР. ПКП" SAI/ADI brightness regulator. Increase [LCtrl + LAlt + J] and decrease [LShift + LCtrl + J].
3. "ПУЛЬТЫ ЛЕВ. ПРАВ" Left/right panels brightness regulator. Increase [LCtrl + LAlt + L] and decrease [LShift + LCtrl + L].

Left Panel



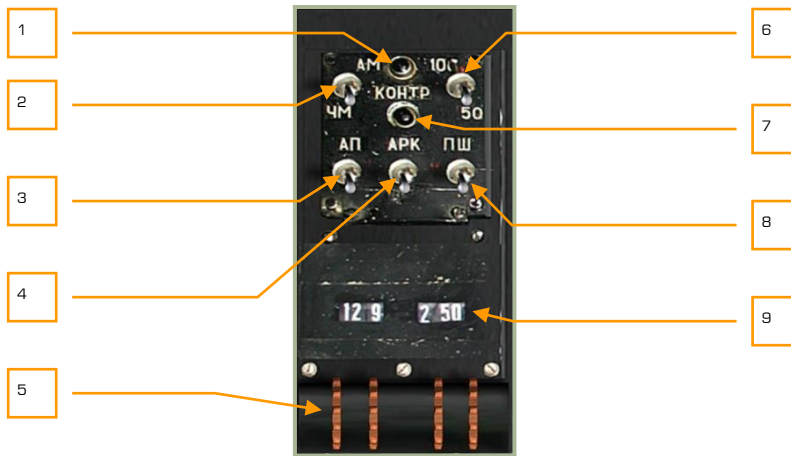
6-73: Left panel

The left panel is comprised of four primary areas that include:

1. R-800L1 command VHF radio station control
2. Targeting mode control panel
3. Engine start-up control panel
4. Radio intercom control

R-800L1 VHF Radio Control System

The R-800L1 is a VHF-2 command radio system. The radio system is turned on using the VHF-2 ("УКВ-2") switch on the right panel. This radio can be used to communicate with other airborne units and provide reception of ADF signals.



6-74: R-800L1 radio control system

The R-800L1 is a VHF transceiver radio that can operate in both FM and AM bands and also has the ability to receive navigation beacon signals. To receive information from this radio, you will need to set the radio intercom dial to the "(CA)УКВ-2" position.

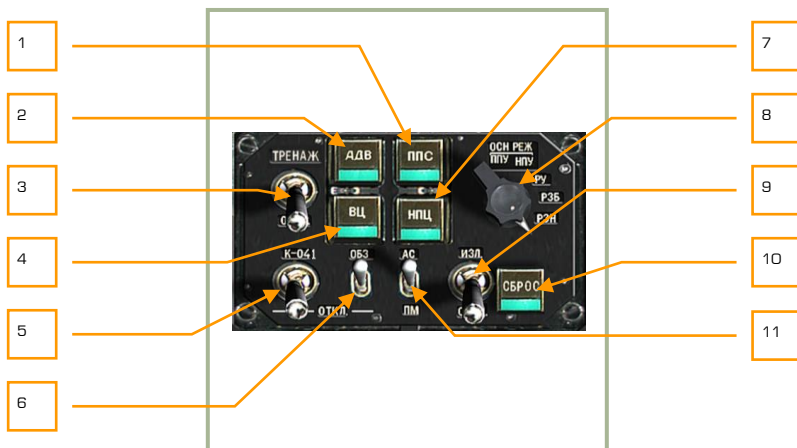
1. **"КОНТРОЛЬ"** (Test) lamp. If the **"КОНТРОЛЬ"** built-in-test (BIT) test button is held down and the radio passes the test, this lamp will light. Note that the **"УКВ-1"** VHF-1 R-828 radio switch and the **"УКВ-2"** VHF-2 R-800 radio switch on the right panel should be set to on (up).
2. **"АМ-ЧМ"** (AM-FM) switch. Selecting this switch allows you to toggle between AM (up) and FM (down) bands on the radio. [[LAlt + LShift + LCtrl + M](#)]
3. **"АП"** (Emergency radio receiver) switch. When placed in the up position, this places the radio in a fixed emergency radio receiver frequency, used to receive emergency signals. In the western world, this may be viewed as a guard channel. When activated, the frequency automatically switches to 121.5 MHz and the transmitter is turned off. [[LCtrl + LAlt + E](#)]
4. **"АРК"** (ADF) switch. When this switch is moved to the up, on position, the radio is used for automatic direction finding (ADF). The radio compass antenna is then connected to the R-800L1 radio receiver, and the receiver controls radio compass antenna direction (this in turn controls direction of the HSI RMI arrow). The HSI RMI arrow will now point in the direction of the transmitter with the frequency that is defined on the R-800L1. [[LCtrl + LAlt + A](#)]
A complete list of available ADF channels can be viewed in the Automatic Direction Finder (ADF) ARK-22 section of this manual.
5. Radio frequency thumb wheels. These four ridged wheels can be rotated to input frequencies. The frequency is entered in kHz in 25 kHz steps. The two left wheels indicate integer MHz values and the two right wheels indicate one-thousandths of MHz values.

- Rotary 1 up [[LCtrl + LShift + 1](#)]



- Rotary 1 down [LCtrl + LAlt + 1]
 - Rotary 2 up [LCtrl + LShift + 2]
 - Rotary 2 down [LCtrl + LAlt + 2]
 - Rotary 3 up [LCtrl + LShift + 3]
 - Rotary 3 down [LCtrl + LAlt + 3]
 - Rotary 4 up [LCtrl + LShift + 4]
 - Rotary 4 down [LCtrl + LAlt + 4]
6. "100-50" switch. This switch controls data transfer rate [LCtrl + LAlt + 5].
 7. "КОНТРОЛЬ" (BIT) button. Pressing this button performs radio system self-diagnostics. If self-diagnostics passes, the "КОНТРОЛЬ" indicator test lamp will light. [LCtrl + LShift + T]
 8. "ПШ" (Noise reduction) switch. Placing this switch in the up position activates the noise reduction system (squelch). This reduces volume if the inputted frequency is not detected. [LCtrl + LAlt + R]
 9. Selected frequency display. These two fields combine to show the inputted frequency as determined by the thumb wheels.

Targeting Mode Control Panel



6-75: Targeting mode control panel

The targeting mode control panel is your primary means of manipulating the Ka-50 as an integrated weapon system. From this panel you can control aspects of the sensors, weapons, and laser.

If you have a programmable joystick, you may find it useful to map some of these functions to your stick. In the heat of battle, taking your hand off the stick to activate a targeting mode may get you killed.

1. **"ППС"** (Head-on airborne target) button. Pressing this button will adjust the fuze of the Vikhr ATGMs onboard to use a proximity fuze suited to attacking airborne targets in the forward hemisphere (high aspect). [\[LAlt + S\]](#)
2. **"АДВ"** (Automatic turn on target) button. If you have a target designated with the Shkval and press this button, the aircraft will automatically point its nose towards the target. This is a useful function when you have locked a target far off the weapon system boresight. [\[Q\]](#)
3. **"ТРЕНАЖ – ОТКЛ"** (Training mode – OFF) switch. Placing this switch in the up **"ТРЕНАЖ"** (Training mode) position places the weapon system in training mode and it will not allow a weapon to be released. However, full weapon aiming and target locking is allowed. When in the lower **"ОТКЛ"** (OFF) position, the system is taken out of training mode.
4. **"ВЦ"** (Airborne target) button. When targeting an aircraft with Vikhr and the aspect is changing or is other than high-aspect, press this button to set the missile to use a general proximity fuze. With a proximity fuze, the warhead will detonate when it is close to the target and does not require a direct hit. [\[V\]](#)
5. **"К-041 – ОТКЛ"** (K-041 Targeting and Navigation systems power – OFF) switch. When this switch is in the up position, power is sent to the K-041 targeting and navigation systems and the Shkval display will activate. This system is turned off by setting the switch to the down position. [\[LShift + D\]](#)

6. **"ОБЗ – ОТКЛ"** (Helmet-Mounted Sight (HMS) / night vision goggle system power – OFF) switch. This switch allows you to either enable the HMS or NVG systems. These can be interchanged when you are on the ground and in radio contact with the ground crew. Returning the switch to the down position turns them off. [H]
7. **"НПЦ"** (Moving ground target mode) button. If the Shkval is tracking a moving target and you press this button prior to launching a Vikhr ATGM, the weapon control system will adjust the Vikhr launch parameters to account for a moving target and thereby increase accuracy. The targeting system will also calculate lead for gun and rockets employment. [N]
8. **"ОСН РЕЖ"** Weapon system mode selector dial can be rotated left [LCtrl + F] and right. [LAlt + F] This five position dial allows you to adjust the fire control system. These positions are:
 - **"ПНУ"** (Moving canon – automatic weapons mode) allows the cannon to be slaved to the Shkval line of sight. The ATGMs launchers will adjust their vertical angle automatically. This is the primary automatic mode and all functions are calculated using a full set of weapon data for employment.
 - **"ННУ"** (Fixed cannon) fixes the cannon boresight along the zero sight line of the aircraft fuselage. This is generally used in case of a cannon-drive malfunction.
 - **"РУ"** (Backup/manual mode) can be used as a backup/manual mode for weapon employment. In this mode, range and lead are not calculated, the gun is fixed, the ATGMs launchers do not adjust their vertical angle, the Shkval tracking gate does not adjust automatically, and there is no memory mode target tracking.
 - **"РЗН"** (Backup navigation tasks on the combat computer) mode can be used to update the aircraft's inertial navigation unit (INU). This is a less capable way of updating navigation but both the navigation and weapon computers can partially replace each other.
 - **"РЗБ"** (Backup combat tasks on the navigation computer) mode. In case of a combat computer malfunction, you can select this mode to route combat tasks to the navigation computer with limited functionality.
9. **"ИЗЛ – ОТКЛ"** (Laser standby – OFF) switch. Place this switch in the up position to arm the laser. Note that to get accurate targeting range and be able to designate for the Vikhr ATGM, the laser must be active. [RShift + O]
10. **"СБРОС"** (Targeting mode reset) button. To cease targeting and return the HUD to the navigation mode, press this button. [Backspace]
11. **"АС – ПМ"** (Automatic tracking – gun sight) automatic tracking/targeting without Shkval system with manual laser sight ranging. Without laser ranging, the gun reticle is adjusted to a fixed range of 1100 m. [P]

Engine and APU Start-Up Controls



6-76: Engine start-up controls

This panel provides you the controls to start either engine or the APU. To start an engine though, several conditions must be met:

- APU running (see APU section below and the steps needed to start the APU)
- Left/right engine fuel shutoff valves to open
- Left/right engine cutoff levers to the up position
- Rotor brake to the down position
- Engine / APU select switch to either engine 1 or engine 2
- Press engine start button
- Monitor engine RPM and temperature

The engine start-up panel has the following functions:

1. **"ЗАПУСК"** (Start) engine/APU start button. Assuming all start-up conditions are met, pressing this button will start either the APU or one of the engines, depending on the position of the engine selector switch. [\[HOME\]](#)
2. **"ЗАПУСК – ПРОКРУТКА – ЛОЖНЫЙ ЗАПУСК"** (Start up – crank – false start) start-up mode selector. This is a three position selector that determines the method of start-up ignition. The most often used mode will be the top **"ЗАПУСК"** (start) setting. The middle **"ПРОКРУТКА"** (crank) position is used to purge fuel after a failed start and the bottom **"ЛОЖНЫЙ ЗАПУСК"** (false start) setting is used for start-up check procedure during ground maintenance. [\[LAlt + Home\]](#), [\[LCtrl + Home\]](#)
3. **"КЛАПАН ЗАПУСКА"** (Start valve) lamp. Indicates when the start valve of the engine's air-starter is open, during main engine startup cycle. The light goes off when the start valve closes, either automatically at GG RPM~60% or manually after pressing the interrupt startup sequence button.

4. **“СТОП ЗАПУСК”** (interrupt start-up sequence) button. If during an engine start cycle you need to abort it, you may press this button to shut down the engine start. [RAlt + HOME]
5. **“ОСТАНОВ ВСУ”** (APU shutdown) button. After both engines are running normally and the batteries are recharging from the generators, you may press this button to turn off the APU. With both engines running, there is no need for it. [End]
6. **“ТУРБОПРИВОД – ВСУ – ДВИГ ЛЕВ – ДВИГ ПРАВ”** (Turbo gear – APU – Left Engine – Right Engine) select switch. This is a four position switch that enables you to select either the APU (center), left engine (lower left), or right engine (lower right). When set to the top position, the system is placed in “turbo gear” mode and allows for system tests (generators and hydraulics primarily) without starting the engines. This is generally done only for maintenance and must be requested through a maintenance radio command. [E]

Radio Intercom SPU-9 Panel



6-77: Radio panel

This SPU-9 panel allows you to select the radio audio source that you hear through your headphones and what radio you transmit on. This is a rotary dial with four possible selections:

1. **“СБРОС”** (Reset) button. This button resets the jam-resistant secure communications codes. No function.
2. The intercom source selector dial for the SPU-9 has four settings: [LCtrl + LAlt + /]
 - **“(СА)УКВ-2”** (VHF-2) – Selects the VHF-2 R-800L1 radio.
 - **“УКВ-1”** (VHF-1) – Selects the VHF-1 R-828 radio for communications with ground units.
 - **“КВ”** (SW) – Short waves band. Not used.
 - **“НОЛ”** (Ground crew intercom) – used to communicate with ground crew through the wired telephone. When rearming or refueling at an airfield or FARP, you will need to select this setting to communicate with the ground crew unless the cockpit door is open and the rotors are not turning.

Auxiliary Power Unit (APU) Control

The control panel for the auxiliary power unit (APU) is located along the left side of the cockpit, next to the collective. The APU serves two primary functions: it can provide bleed air to start the engines, and it can generate electrical power (via turbo gear). In order to start the engines, you must first have the APU operating.

To power on the APU, you must first satisfy the following conditions:

1. Electrical power on (batteries or ground power source)
2. Aft fuel tank pumps turned on. In case the aft tank is empty you can supply the APU from the forward tank after opening the cross feed valve
3. Open the APU fuel shutoff valve
4. Set the Engine / APU select switch to the APU position
5. Press the engine start button



6-78: Auxiliary Power Unit (APU) panel

1. **"КРАН ВСУ ОТКРЫТ"** (APU fuel shutoff valve is open) light. This light indicates that the APU fuel shutoff valve is set to open.
2. **"ОСТАНОВ ВСУ ПО n"** (APU shutdown due to RPM limit) light. Although you will not see this often, this light indicates that the APU has stopped running due to an over-revving state. This would most likely happen if you are operating at high altitudes such as a mountain FARP.
3. **"П МАСЛА ВСУ"** (Oil pressure) light. This light will be visible when APU oil pressure is detected within acceptable limits.
4. **"ВСУ ВКЛЮЧЕНА"** (APU operate) light. If the APU has been started successfully, this light will indicate nominal operation.
5. APU exhaust gas temperature gauge. After the APU has been started, it will begin generating heat and this can be monitored from this gauge. The APU will peak at 680°C at start but will generally stabilize at 590...600°C.

After both engines have been started and are running normally, you may turn off the APU. To turn off the APU, it is best to press the stop APU button and then close the APU fuel shutoff valve.

ВНИМАНИЕ!
ПРИМЕНЯТЬ КАССЕТЫ
С ЗАВОДСКОГО № 501180551



КОНТРОЛЬ Т° ГАЗ
ДВИГ

РАБОТ НЕ РАБОТ



ТОК

АЗР ПИТ

АКК2

ТОК

АКК-1

АЗ

ПИТ

ОТКЛЮЧ

7

ABRIS
AMMS

7 ADVANCED MOVING MAP SYSTEM AMMS (ABRIS)

Purpose

The ABRIS is designed to supplement other onboard navigation systems, like the PVI-800, and to accomplish aerial navigation through: route preparation and planning, map support in all the sortie phases, processing of information from the navigational sensors, output of information to interfaced systems, navigation calculations, tactical situation display, and data link of target coordinates.

The ABRIS provides:

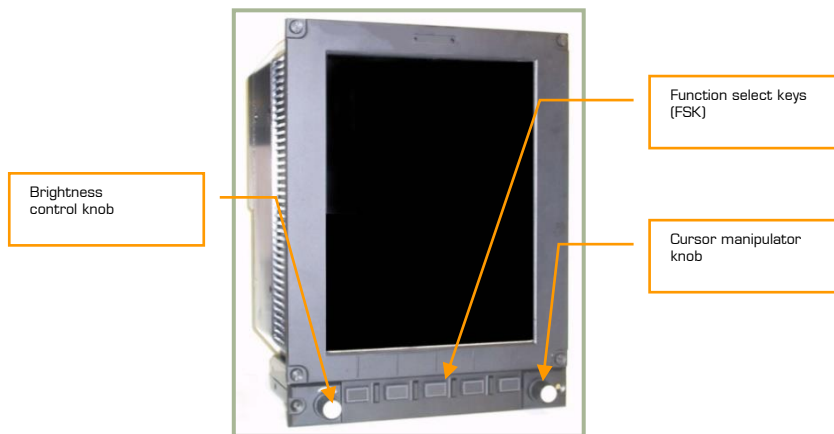
- Storage and presentation of electronic, topographic maps on the color display and the ability to electronically update and reload multiple map data-sets.
- Continuous determination of ownship "ACFT" position coordinates and display of the ACFT position on the moving map (on a scale suitable for the operator).
- Creation and display of flight plan information for tasks in different sortie phases.
- Creation of a flight route, the recording of the route in the database, and being able to load a route from the database.
- Ability to quickly modify a route while in-flight.
- The reception and display of information from interfaced systems and the output of information to other interfaced systems.

ABRIS Panel Controls

The ABRIS controls are arranged along the bottom of the control panel and the controls include:

- **Function select keys (FSK).** There are five function select buttons that have a variable function according to the system's current operation mode or sub-mode.
 - Button 1 [1]
 - Button 2 [2]
 - Button 3 [3]
 - Button 4 [4]
 - Button 5 [5]

- **Brightness control knob.** Located to the left of the FSK buttons, this knob may be rotated to adjust the backlighting of the display up [0] and down. [9]
- **Cursor manipulator knob.** Located in the bottom right corner of the panel, this knob allows the on-screen cursor to be moved horizontally and vertically. A press of the button [6] cycles a function or toggles vertical control and horizontal control. Rotating the knob moves the cursor either left [7] and right [8] or up and down depending on movement mode. This knob can also be used to input alphanumeric information, selection of menu items, and input desired track angle. When in Alphanumeric/numeric data input mode, rotate the knob (mouse wheel) to search for the necessary characters and then press and release the knob (mouse right button click) to switch to the next character position. When the cursor manipulator is pressed in the position of the rightmost character, it automatically switches to the leftmost (first) character (home).



7-1: The ABRIS panel and controls

For the brightness and cursor manipulator knobs, you can also rotate them by clicking on them and while holding the left mouse button down, moving the mouse either side to side or up and down.

Display and Input of Information in ABRIS

Digital and graphical information is shown in different colors on the ABRIS display depending on its function:

Message type	Color displayed in
Warnings	Yellow
Cautions	Green



Scales	White
Currently measured parameters	White
Mode	Green
Activated route	Blue

Data input is possible in all ABRIS operating modes:

The ABRIS consists of many menus and these can be navigated through by use of the cursor manipulator (right knob on control panel) or by using the '↑' and '↓' arrow FSK buttons. Rotating the cursor manipulator clockwise moves menu item selection up and rotating it counter-clockwise moves selection of menu items down. When the cursor manipulator is used to select items from a menu, it ensures a smooth transition from one item to the next with a mandatory stop on each item. When two of the function select key (FSK) buttons are set as "Up" and "Down" arrows, these can be used to select items from a menu; one press corresponds to one item step up or down.

Input of alphanumeric values is also provided via the cursor manipulator:

- Clockwise rotation of the cursor manipulator increases the digital value and cycles through the letters of the alphabet, numbers, and special symbols. A counter clockwise rotation reduces/moves backwards through the selections.
- To switch from one character to the next, press the cursor manipulator axially.

Turning ABRIS On/Off

After AC electrical power is supplied (ground power, batteries, or generators) and the ABRIS power switch has to be set to on, the ABRIS will start to function. Using the batteries, the AC/DC inverter must set to "ABT" (Auto position). Once turned on, the ABRIS will start an automatic self-test that can take up to 120 seconds. After the self-test is complete, the self-test page will be replaced by the MENU operating mode page. At start up, the ABRIS will automatically go through an alignment process and NAV ERROR will be displayed at the top of the MENU page in yellow until alignment is complete. To shut down the ABRIS, turn off the ABRIS power switch or remove electrical power. [RShift + 0]

```

STARTING BIOS .....
CPU :486DX4.....OK
MEMORY :2097152KB.....OK
VIDEO :EDGA32768KB.....OK
MOUNTED FLASH
BOOTING EDOS.....
ABRIS STARTED
ABRIS PERFORMING FULL TEST
  
```

7-2: ABRIS in self-test mode

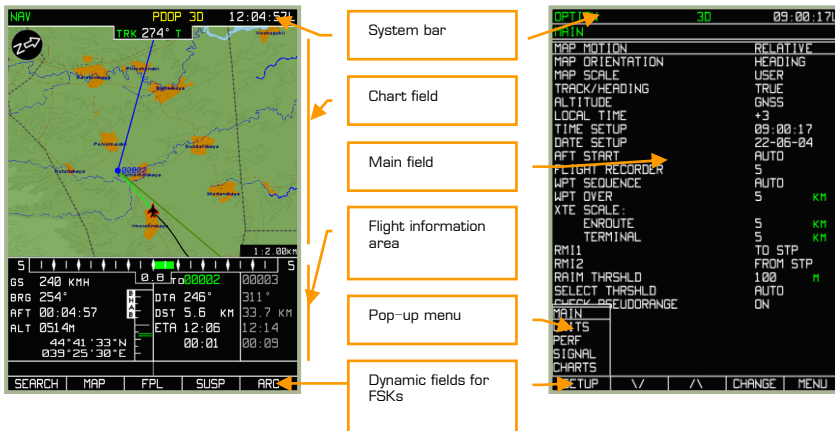
MENU		30	09:00:13L
DATA	DATE SETUP:	22:06:2004	
NAVIGATION DATA		22:06:2004	
TOPO DATA		22:06:2004	
COMPANY ROUTES	1	22:06:2004	
ADDITIONAL INFO	2	22:06:2004	
TERRAIN DATA		22:06:2004	
PERF		22:06:2004	
ROUTES	2	22:06:2004	
METEO		22:06:2004	
SEA CHARTS	NO		
NAV SENSORS			
GNSS	READY		
ALTIMETER	READY		
RESOURCE	15		
S/N	BP8UVCRTC84NYEQCAES35J7		
VERSION SW	LO12BETA		
OPTION	CTRL	PLAN	GNSS NAV

7-3: ABRIS MENU page after self-test and alignment

Display of Information in ABRIS

The ABRIS display is divided into the following areas:

- System bar
- Main field
- Chart field
- Flight information area
- Fields for dynamic Function Select Keys
- Pop-up menu



7-4: Main information display areas

System Bar

The system bar is used to display current time, Global Navigation Satellite System (GNSS) sensor status, and the selected ABRIS operating mode. The system bar is displayed along the top of the display regardless of the selected operating mode. The system bar consists of the three main fields.



7-5: System bar fields

For modes that have sub-modes, the current sub-mode is indicated in the top left corner of the screen under the mode field.

Navigation and GNSS messages that can be displayed in the system bar field are listed in the table below:

Message	Meaning
3D	3D navigation supplied by onboard sensor
EXCL 3D	3D navigation with one satellite in constellation turned off manually
PDOP 3D	Position precision dilution
HDOP 3D	Bad geometric factor
RAIM 3D	Loss of data integrity provided to the GNSS receiver
2D	ABRIS is only providing 2D navigation
ADSB 3D	3D navigation based on data transponder
ADSB	Transponder mode: 2D or unknown.
DR	Calculations of aircraft motion parameters in case of the GNSS failure, using the last received data on the ground speed and actual track angle. This mode is used for one minute after the GNSS failure, whereupon the NAV ERROR message is displayed
NAV ERROR	Impossible to determine aircraft coordinates
THRESHOLD	If the manually entered RAIM threshold value exceeds the value suitable for the route leg: non-precision approach (0.3 nm), approach (1 nm), otherwise - 1 nm

6-2: Navigational sensor operating mode messages

Two formats can be used in the current time field:

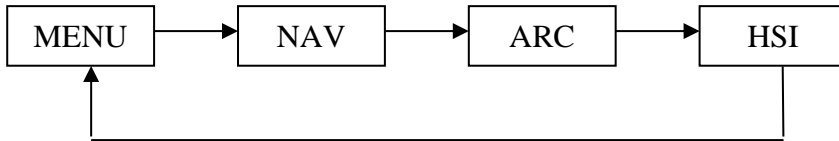
HH:MM:SS Z

HH:MM:SS L

In this format, HH - for hours, MM – for minutes, and SS – for seconds. If no time zone value is entered, Greenwich Time is defaulted to; in such a case the "Z" (Zulu time) indicator appears after the time. If a time zone value is entered, the field displays local time, and the time value is followed by an "L" indicator.

Operating Modes

The ABRIS has four principal operating modes: **MENU**, **NAV**, **ARC**, and **HSI**. In each mode you can switch to various sub-modes using the FSK buttons. After the ABRIS has been turned on and gone through its self-test, the main MENU mode page is displayed. With each successive press on the right-most FSK button, the main modes are cycled as shown.



The current mode is indicated on the left side of the system bar. Navigational calculations and reception and transmission of information are performed continuously regardless of the current operating mode.