EC 135 P2+ / T2+

Version 3

ROTORCRAFT FOR X-PLANE 10.21+

FLIGHT MANUAL

Revision 3.0, June 2013

THIS MANUAL MUST BE CARRIED IN THE HELICOPTER AT ALL TIMES

Published by: DIRK HILLEBOLD
and
PETER SPRINGBORN

Visit ec135.RotorSim.de

MANUAL CONTENT

TABLE OF CONTENTS

LIST OF FIGURES

SECTION 1

INTRODUCTION

The original EC135 is a twin-engine civil helicopter, widely used amongst police and ambulance services and for executive transport. It was started as the BO 108 by MBB of Germany in the mid-eighties. In late 1992, the design was revised with the introduction of the Fenestron tail rotor system, reflecting the creation of Eurocopter that year through the merger of Messerschmitt-Bölkow-Blohm (MBB) and Aérospatiale. In contrast to other helicopters, the tail rotor blades have been integrated into the tailboom and as they are framed by the tailboom, the risk of an accident has been significantly reduced. This tail rotor system, combined with the fuselage's roomy dimensions, means that the EC135 aircraft has become popular with aeromedical helicopter operators. The EC135 is the best selling light twin of the past 10 years. (Source: wikipedia.org)

This device for X-Plane is a widely accurate simulation copy of the original helicopter. Thanks to a plugin we are able to simulate a lot of the EC 135's systems, in particular the Central Panel Display System (CPDS). **This model is only made for entertainment. It is not approved for actual flight training. It is not approved by Eurocopter and it is not related to Eurocopter. If we speak from EC135 in the following, we mean exclusively our virtual model. "Eurocopter" and "EC135" are brands that have nothing to do with this virtual rotorcraft.**

We point to the fact, that the explanations in this manual are not identical with texts and graphics in the manual of the real EC135. Use this manual for flight simulation only!

1.1 CREDITS

Countless people have contributed to the success of the project. Jens Strohmeyer has to be mentioned. He designed the first model of the EC 135 for X-Plane 6. Tobias Reimann adapted the flight model to V8. In the meantime we can speak of quite a new EC 135. But without having a base, we would not have come there.

We'd like to direct special thanks to:

ADAC HEMS Academy where we could fly the first LBA certified Full Flight Simulator for the EC 135 in Europe to get a feeling of the real thing's flight characteristics.

Loris Manozzo for building our plugin at OSX and for a lot of liveries.

Michael Sgier for building our plugin at Linux.

Heiko Schulz, who made the 3D-model of the EC135 for FlightGear. This was the base for the first EC135 in X-Plane.

Pilots of german Bundespolizei, ADAC and other Operators for giving tips and information about the real thing.

1.2 LEGAL NOTICE

1.2.1 Re-paints

We encourage the users of our EC 135 expressly to create und publish their own repaint liveries. Due to the configurator plugin you can simply arm your livery with special equipment like cable cutters, other seats or a hoist. For more information refer to Using the Configurator (page 8–6). Please respect the trade mark rights of Eurocopter and other companies and do not use Logos or registered trade marks in your paintings, if you want to publish them.

1.3 VALIDITY

This Manual is valid for the following release versions:

- 3.00 (June 2013)

SECTION 2

INSTALLATION AND SETUP

2.1 INSTALLATION

Check your X-Plane version. It must be **10.21** or later!

Windows
Simply start the installer and let it install the helicopter on your computer. It will be installed in the folder Aircraft/Helicopters/EC135V3 of X-Plane.

OSX or Linux
Extract the contents of the ZIP file to the folder Aircraft/Helicopters of your X-Plane 10 installation as usual. The installer will come soon.

2.2 UPDATES

To check for updates run the setup program. It is located in the folder Aircraft/Helicopters/EC135V3/setup of X-Plane. (Windows only. At OSX and Linux the will be possible as soon as the installer is ready)

2.3 LIVERIES

We deliver one package of the EC 135. Every livery in this package can be configured individually by a configurator software.

2.4 ASSIGNING CUSTOM COMMANDS

It would be useful to assign some custom commands of the EC 135 to key commands or joystick buttons.

We recommend assigning at least the following custom and X-Plane commands to joystick buttons and/or keyboard:

- ec135/autopilot/force_trim_release ..... → Joystick button
- ec135/autopilot/beep_fwd..... → Joystick four-way switch
- ec135/autopilot/beep_aft ..... → Joystick four-way switch
- ec135/autopilot/beep_left ..... → Joystick four-way switch
- ec135/autopilot/beep_right ..... → Joystick four-way switch

- ec135/cds_audio_reset ..... → Joystick button

If you want to use the autopilot, you should additionally have this commands at your joystick:

- ec135/sas/dcpl ..... → Joystick button
- ec135/autopilot/apmd_dcpl ..... → Joystick button

and if there are enough buttons available also:

- ec135/sas/y_rst ..... → Joystick button
- ec135/sas/pr_rst ..... → Joystick button

To assign a custom command, select **Joystick, Keys & Equipment** from the **Settings** menu. Select the **Buttons** or **Keys** tab depending on whether you want to use a joystick button or a keyboard key.

Fig. 2-1 Assigning a custom command

At the **Keys** tab, click **Add New Key Assignment**. Then click on the empty slot on the left and press the key or key combination you wish to assign. At the **Buttons: Adv** tab press the respective joystick button. Next click the grey check box in the upper right corner. A folder dialog comes up. Go to the **X System folder**. Double click on the **bk117** or **ec135** folder and go through subfolders to the desired command. Then press **open**.

2.5 2D AND 3D COCKPIT

This virtual rotorcraft is flown from the 3D cockpit. In 2D view we provide the following control panel.

Fig. 2-2 Control panel in 2D view

By clicking a door you can open or close the respective door. Opened doors are marked by a green dot. Clicking the view buttons, changes your view, i.e. you can jump to pilot's position in 3D cockpit.

The control panel also contains a FMS console. So it is possible to enter complete flight plans. In X-Plane Garmin 430 does not allow this, but is able to fly a complete route.

NOTE: The view buttons don't work if you're using TrackIR.

2.6 CONTROLS SETUP

Loading the rotorcraft all parameters are automatically set to optimal values for sensitivity and characteristic of the controls. Their former values are stored and will be restored when switching to another aircraft. If you want to have a realistic flight experience, don't change these values, which are all set to zero.

It is strongly recommended to use a joystick with a resolution of at least 10 bit and pedals.

2.7 WEIGHT AND FUEL

The Weight of the helicopter can be changed as usual in X-Plane's **`Weigh and Fuel`** menu.

2.7.1 Crew and Passengers

At **Ordnance** tab you select the crew and passengers. By default the helicopter is manned with four persons: Pilot, flight medic, doctor, patient. You let exit one of them by clicking on the respective button. Another click on the same button and the person will board again.

This procedure changes the weight **and** the balance of the helicopter und thus affects the flight characteristics.

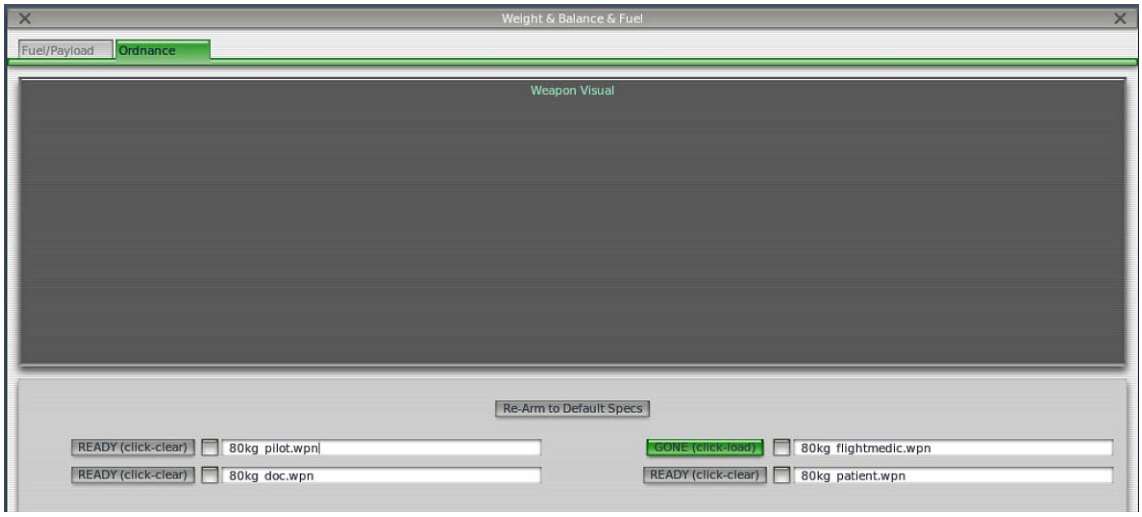


Fig. 2-3 Changing crew and passengers

Fig. 2-3 shows an example, where three persons are on board, the flightmedic is not on board.

2.8 PILOT VIEW SYSTEM

In 3D cockpit we have a pilot view system that helps the pilot to have a good viewing direction. It is also working fine with head trackers like TrackIR. The system can be configured or disengaged via config.def file. Refer to Ini file format (page 8–6).

2.9 SUPPORT

This Helicopter is a kind of freeware. We cannot provide professional support like for commercial products. But we have established a support forum at http://ec135.rotorsim.de. Be free to use it.

2.9.1 FAQ

Question	Answer
I **can't control** the helicopter.	Is the cyclic stick unlocked?

When starting engines **N1 doesn't exceed ≈ 20 %**.	Check the PRIM PMP switches are ON.
My **TRIM REL** button works not as it should.	Are you sure the AFCS is OFF? With autopilot active the function of the button is different.
The **artificial horizon** shows the helicopter a **bit down at right**, whereas it's standing on a horizontal area	This is like in the real thing. In cruise flight the helo hangs intentionally a bit to the left. This is given, when the artificial horizon is in level.
How can I program a **complete flight plan** into GPS?	X-Plane's GNS 430 can fly a flight plan, but allows not to program it. Therefore we added a FMS to 2D cockpit. Put in your flight plan there.

SECTION 3

LIMITATIONS

3.1 ESSENTIAL LIMITATIONS

Maximum approved gross mass is .....2910 kg

V_{NE} ..... 155 KIAS

This value refers to a pressure altitude of 0 ft and OAT max +30 °C. At higher pressure altitudes and higher temperatures V_{NE} is less.

Maximum operating altitude ..... 20 000 ft

Maximum operating altitude for hover in ground effect / takeoff and landing ..... 15 000 ft

NOTE All altitudes in this manual are pressure altitudes.

3.1.1 Ambient Air Temperature Limitations

Minimum air temperature ..... -30 °C

Maximum air temperature ..... ISA + 39 °C

3.2 ROTOR RPM LIMITATIONS

CONDITION	Power ON	Power OFF
Minimum Transient (max. 20 s)	85 %	
Minimum Continuous	97 %	85 %
Maximum Continuous	104 %	106 %
Maximum Transient (max. 20 s)		112 %

RPM warning light and audio warning:

N_R RPM	RPM Light	Audio tone	Reset
$N_R \leq 97$ %	On	Intermittend low	Yes
$N_R \geq 106$ %	Flashing	Gong	Yes
$N_R \geq 112$ %	Flashing	Continuous high	No

3.3 ENGINE AND TRANSMISSION POWER LIMITATIONS

CONDITION	Transmission (Helicopter) Limits max. TORQUE %	Engine Operating Limits max. TOT °C	max. N1-SPEED %	max. N2-SPEED %
Starting Transient		875 (2 sec)		
Starting		650 (45 sec)		
Transient				107 (5 sec)
OEI 30s, OEI 2 min				
Transient AEO, OEI MCP				112 (20 sec)
Partial power	2 x 10			106
All Engines Operating				
Takeoff Power (5 min, V≤Vy)	2 x 78	869	98.7	104
Max. Continuous Power	2 x 69	835	97.4	104
One Engine Inoperative				
30 sec. Power	128	990	104.3	104
2 min. Power	125	950	102.6	104
Max. Continuous Power	89.5	900	100.4	104

3.4 OPERATIONAL LIMITATIONS

3.4.1 Slope operation

Ground sloping is limited to max. 14°. DO NOT EXCEED THE ALLOWABLE MAST MOMENT LIMITS. Refer to the mast moment indicator displayed on FLI page.

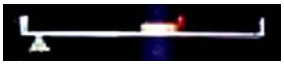


Fig. 3-1 Mast moment indicator

3.4.2 Hover turns

Hover turns.....max. 60°/s

3.5 FUEL TANKS

TANK	TOTAL FUEL		UNUSEABLE FUEL	
	Liters	Kilograms	Liters	Kilograms
Main	594	475.0	4.25	3.4
Supply	112	90.0	2 x 2.6	2 x 2.1
Totals	706	565.0	9.45	7.6

SECTION 4

SYSTEMS DESCRIPTION

4.1 COCKPIT ARRANGEMENT

4.1.1 Overhead Panel

1 Test switches
2 Avionic switches
3 Heating, wiper switches
4 Fuel pump switches
5 Light switches
6 Engine switches

Fig. 4-1 Typical overhead console

4.1.2 Instrument Panel

1 CAD
2 VEMD
3 Analog instruments (e.g. N_R/N_2)
4 Warning Panel
5 DC power/engine control panel
6 SAS and CAT-A / HI NR buttons
7 ILS marker indicator
8 Primary Flight Display (PFD)
9 Navigation Display (ND)
10 Multi Function Display

Fig. 4-2 Main instrument panel (glass)

4.1.3 Warning Panel

Emergency situations requiring immediate action are indicated by a red warning light on the WARNING PANEL. For further information see Warning light indications (page 7–6).

1 FIRE warning light / EMER OFF switch
2 ACTIVE indicates switch position for EMER OFF switch
3 Low fuel warning supply I / supply II
4 Rotor RPM warning
5 Battery temperature warning
6 Battery discharge warning
7 Main transmission oil pressure warning
8 Autopilot (optional)
9 Cargo smoke detection light (optional)

Fig. 4-3 Warning panel

4.1.4 Console

Fig. 4-4 Console

1 GPS / NMS 1
2 GPS / NMS 2
3 Transponder
4 ADF 1
5 ADF 2
6 Audio panel
7 Automatic Flight Control System (AFCS)
8 Instrument Control Panel (ICP) 1
9 Instrument Control Panel (ICP) 2

4.2 FLIGHT CONTROL SYSTEM

4.2.1 Collective Pitch

1	Landing Light	Landing light underside the helicopter
2	Landing Light	Fixed landing light at the nose of the helicopter or external search and landing light

Fig. 4-5 Typical collective pitch

4.2.2 Cyclic Stick

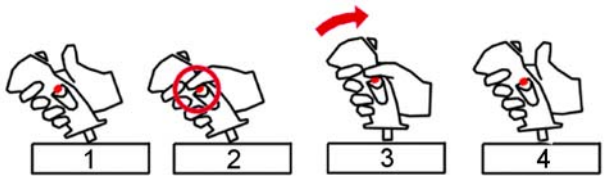
1	ICS RADIO	Intercommunication system
2	FTR	Force Trim Release button
3	BEEP TRIM	4 way attitude trimming
4	SAS/AP CUT	Disengages all engaged SAS and AFCS
5	P&R // YAW RST	SAS Reset – reengages SAS
6	CDS/AUDIO RES	Acknowledgement of new cautions and audio warning tones
7	APMD DCPL	Cancels all autopilot modes, reverts to A.TRIM mode

Fig. 4-6 Typical cyclic stick

Refer to Assigning Custom Commands (page 2–1) for assigning the trim functions to joystick buttons.

TRIM REL

The TRIM REL button is used to easily relieve pilot of cyclic spring forces as follows:



1 Cyclic stick is deflected “out of trim”, against centering springs. This typically occurs during speed or power changes.

2 TRIM REL is depressed. X-Plane temporarily disregards movement of cyclic.

3 Cyclic is relaxed to it’s center position.

4 TRIM REL is released. X-Plane starts listening to cyclic input again. The helicopter is now in trim and flight can be continued with relaxed controls.

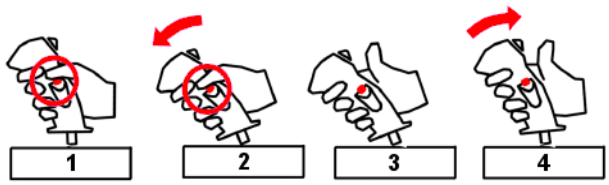
Fig. 4-7 Function of TRIM REL button

Pressing TRIM REL button with rotor RPM less than 80 % (engines idle) will reset all trims to their neutral position.

NOTE: When running idle press always TRIM REL before switching to FLIGHT. This assures that you have a neutral trim position at takeoff.

TRIM REL with AFCS

In AFCS mode, TRIM REL temporarily disconnects the autopilot and allows you to fly the helicopter under manual control.



1 Pilot wishes to change the reference attitude held by AFCS or airspeed or vertical speed.

2 TRIM REL button is depressed; The AFCS temporarily cuts out of attitude hold. Helicopter is maneuvered manually to desired pitch and roll attitude.

3 TRIM REL button is released.

4 The joystick is quickly re-centered. The autopilot holds the new reference attitude, alternatively the new airspeed or vertical speed reference is captured.

Fig. 4-8 Function of TRIM REL button with AFCS

BEEP TRIM

The BEEP TRIM four-way switch is used to re-trim the cyclic control forward, afterwards, left and right. It works depending on which mode you are flying the helicopter.

	Hands-on control	AFCS control
BEEP TRIM left or right	Roll trim 3 deg/sec	Depends of AFCS mode
BEEP TRIM afterwards or backwards	Pitch trim 3 deg/sec.	Depends of AFCS mode

Stick lock

Cyclic stick (on pilot's side) can be locked by affixing it mechanically to the instruments panel. Clicking with the mouse to the point where stick lock bar is affixed locks or unlocks stick.

Fig. 4-9 Stick lock bar and click point

4.2.3 YAW SAS and P&R SAS

The YAW SAS (stability augmentation system) and P/R SAS provide a stabilization of flight attitude. Both systems are automatically activated with power-up. They become inoperative by pressing the SAS/AP CUT switch. Pressing the reengagement switches P&R RST and Y RST reactivates the systems.

Refer to Assigning Custom Commands (page 2–1) if you want to assign the SAS switches to a joystick button.

4.3 POWER PLANT AND RELATED SYSTEMS

4.3.1 Engine Control System

FADEC

The engines are controlled by the FADEC (Full-Authority-Digital-Engine-Control) system. The rotor speed is governed automatically as a function of density altitude and airspeed as shown in Fig. 4-10 (AEO). Under OEI conditions the RPM values are 3% lower.

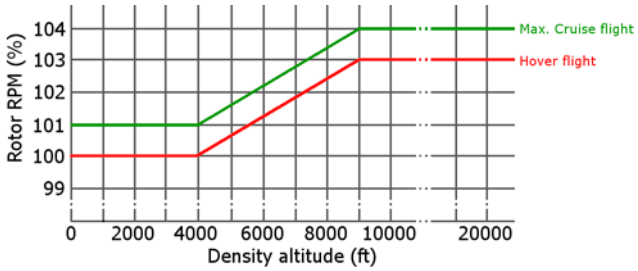


Fig. 4-10 Rotor RPM vs. density altitude

1 Engine main switch
2 FADEC control switch

Fig. 4-11 Engine control panel

For the correct procedure for engine startup and shutdown refer to section 4 Normal Procedures.

Manual Engine Control

In case of FADEC failure during flight or for training, engine's throttles can be controlled manually. **This makes sense only with a hardware that provides two twist grips at collective lever!**

To use this function, position both twist grips in their neutral position (ca. 70-75% position) BEFORE loading the rotorcraft into X-Plane. This will calibrate the twist grip.

Turning the twist grip out of it's neutral position automatically activates the manual mode for the respective engine. Refer to the description of caution indications ENG MANUAL (SYSTEM I or II) and TWIST GRIP (SYSTEM I or II).

4.3.2 HIGH NR mode (optionally)

This mode increases the performance. When the HI NR mode is manually selected, the HIGH NR mode switches automatically between nominal and high rotorspeed.

HIGH NR mod is mandatory for

- Flight with gross mass above 2838 kg
- Cat A operation

NOTE: The use of HIGH NR mode is permitted for all other operations.

The pilot has to select HIGH NR mode prior takeoff by pushing the HI NR button. ON illuminates there. Additionally the advisory indicator HIGH NR (above MASTER CAUTION indicator) illuminates. Pushing the HI NR button again deselects the HIGH NR mode.

When HIGH NR mode is selected rotorspeed increases automatically by up to 3 %. The HIGH NR advisory comes on. When airspeed increases above 55 KIAS, HIGH NR mode is automatically deactivated and rotorspeed decreases to the nominal value. The Advisory goes off. When airspeed reduces below 50 KIAS, HIGH NR mode is automatically reactivated.

NOTE: High rotorspeed is automatically activated in case of CAD is OFF, even if HIGH NR mode is not selected.

4.3.3 CAT A Mode (only if HIGH NR mode not installed)

The activation of the CAT A push-button increases the N_{RO} up to 3 %, depending on the PA and OAT, for category A operations.

The pilot has to select CAT A mode prior takeoff by pushing the CAT A button. ON illuminates there. Reaching an airspeed of more than 55 KIAS CAT A mode has to be deselected manually by pushing CAT A button again.

For category A landing the pilot activates CAT A mode manually below 55 KIAS.

4.4 FUEL SYSTEM

4.4.1 Storage

Fuel is stored in two fuel cells comprising a main tank and a supply tank. From the supply tank fuel is transferred to the engines. The main and the supply tank are interconnected via spill ports. The volume above the spill ports oft the main and supply tank is a part of the main tank capacity.

4.4.2 Supply

The fuel pumps are engine driven and provide enough suction capacity to draw fuel from the supply tank to the engines. Two additional fuel pumps are installed to guarantee a continuous fuel transfer from the main tank to the supply tank. They are activated by the switches XFER-F or -A. A fuel prime pump is installed in each chamber of the supply tank. They are only needed when starting the engines.

Fig. 4-12 Fuel pump switches

4.5 CENTRAL PANEL DISPLAY SYSTEM (CPDS)

The CPDS displays all the necessary engine and vehicle parameters. It consists of the vehicle and engine multifunction display (VEMD) and the caution and advisory display (CAD).

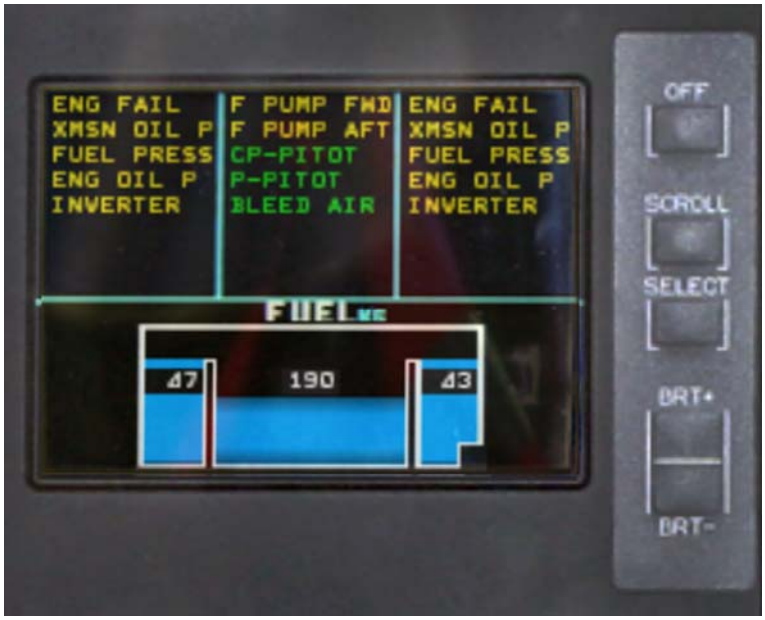


Fig. 4-13 CAD

Fig. 4-14 VEMD

4.5.1 General

The **VEMD** receives power from BUS I and BUS II. Several buttons provide VEMD control as follows:

- OFF1 / OFF2 ..... switches screen 1/2 on or off (on is default)
- RESET ..... resets the FLIGHT REPORT page
- SELECT ..... selects other display page
- +/- ..... selects options for data fields
- BRT+/BRT- ..... controls the brightness of the screens

The **CAD** receives power from BUS I and BUS II. Several buttons provide VEMD control as follows:

- OFF: ..... switches screen on or off (on is default)
- SCROLL: ..... proceeds to the next page

- SELECT:..... confirms CAUTIONs that appear on the CAD
- BRT+/BRT-:.....controls the brightness of the screen

4.5.2 CPDS in Detail

The First Limit Indicator page (FLI)

displays parameters for each engine, mast moment indication and messages.

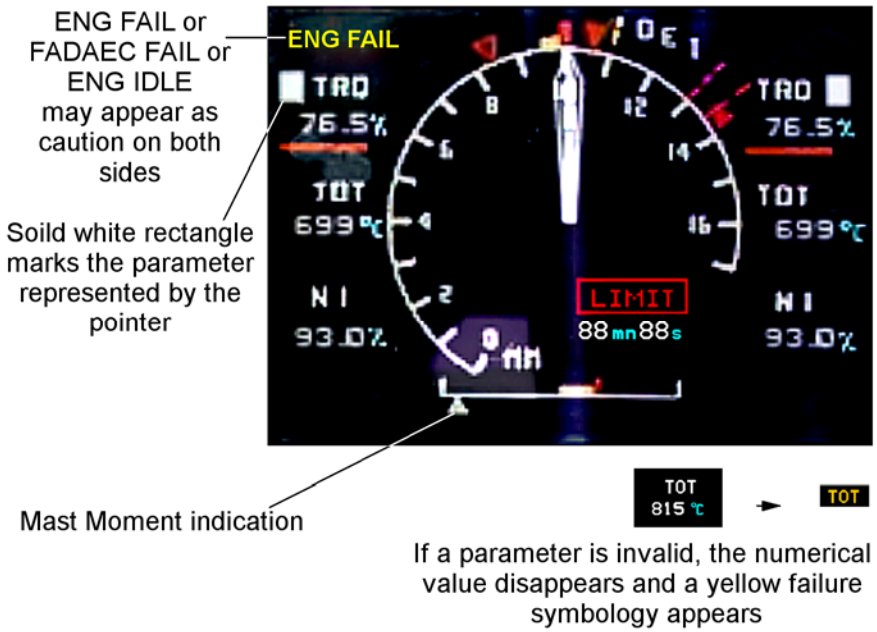


Fig. 4-15 FLI page

The dial scale is arbitrary and does not represent a percent value. The following markings are available:

	Max. TOT starting (appears only during starting)
	TOT starting transient (appears only during starting)
	AEO Max Continuous Power
	AEO Takeoff Power; max. 5 min
	OEI Max Continuous Power
	OEI 2.5 min. Power
	OEI Transient; max. 20 sec.

Fig. 4-16 FLI markings and symbology

The LIMIT sign appears in the following cases (for N_1, TOT, Tq and Mast Moment):

- when operating in a red region or

- when operating under AEO TOP (5 min.) condition, after 4 min 55 sec the red box flashes; after 5 min the red box is fixed.
- when operating under OEI (2 min) condition after 1 min 55 sec the red box flashes; after 2 min the red box is fixed.
- When operating under OEI (30 sec) condition after 25 sec the red box flashes; after 30 sec the red box is fixed.
- when Mast Moment exceeded.

NOTE: When the Countdown has expired and the pilot leaves the time limited range, the limit box stays for another 5 seconds.

If operation in a yellow range is detected, the digital data is yellow underlined. When the countdown has expired or if the limit has been exceeded, the red box is fixed and the red underlining of the digits flashes. For the 2 min. and the 30 sec limit the countdown is visible as shown in Fig. 4-15.

The Engine and Electrical Parameter page (ELEC/VEH)
displays OAT, electrical parameters and transmission parameters. A typical ELEC/VEH page is shown in the lower part of Fig. 4-14

Pressing the +/- button toggles displayed electrical parameters between DC [V], GEN [AMPS] and BAT [AMPS].

Caution and Fuel page (CAU/FUEL)
The upper part of the CAD represents the caution/advisory half page, the lower part the fuel half page (Fig. 4-13).

The caution/advisory half page
displays all yellow cautions as well as green advisories. The yellow cautions are associated with yellow master. The cautions are listed from the page top to the bottom and the advisories beneath.

"**Start**" mode

After power up the following cautions appear and will be automatically acknowledged:

SYSTEM I	MISC	SYSTEM II
ENG FAIL	F PUMP AFT	ENG FAIL
ENG OIL P	F PUMP FWD	ENG OIL P
FADEC FAIL	EPU DOOR	FADEC FAIL
FUEL PRESS	BAT DISCON	FUEL PRESS
HYD PRESS	EXT POWER	HYD PRESS
XMSN OIL P		XMSN OIL P
GEN DISCON		GEN DISCON
INVERTER		INVERTER

"**Before acquisition**" mode

When new cautions appear, all cautions already acknowledged are cleared, a thick yellow line flashes above and underneath the new cautions.

New cautions wait for acquisition by a crew member (CAD SELECT key or the RESET button you mapped to your joystick)

"**After acquisition**" mode

When the cautions are acknowledged, the flashing lines disappear. If one column is full, "1 of 2" message appears on top of the middle column, indicating that a second page has been generated. The second page can be selected by the SCROLL button. The system returns automatically to page 1 after 15 seconds.

Any caution, new or acknowledged, that is no longer evident disappears and after 5 seconds the one underneath moves one line up.

For the meaning of the cautions refer to CPDS caution indications (page 7–6).

The following advisories can be displayed:

- BLEED AIR ..... Bleed air is in use
- S/L LIGHT ..... Standard landing light and/or optional landing light is switched on

The fuel half page

displays the fuel level in main tank and supply tanks digitally and in a graphic. For reliable values use only the digital data.

At fuel half page fuel flow of both engines can be displayed as well as the remaining flight time. Remaining flight time is calculated by fuel level in main tank. It is not reli-

able, if the fuel transfer pumps are not working. This fuel management System is optional an not installed in all liveries.

The System Status page
shows actual status of both Fadecs and related systems. Press SCROLL button to alternate between ELEV/VEH page and SYSTEM STATUS page.

The Flight Report page
is displayed automatically after engine shutdown on ground on lower VEMD screen. To go back to ELEC/VEH page press RESET button. With +/- buttons you can browse in older flight reports. For performance reasons the count of available flight reports can be limited.

The Configuration page
displays the actual configuration of the rotorcraft including installed software version. Configuration page is displayed on lower VEMD screen. It can be activated only when all engines are in shut-down mode, the rotorcraft is on the ground and both VEMD screens are switched off. To activate this page press the following buttons within max. 2 seconds: OFF1 → OFF2 → SELECT.

4.6 ELECTRONIC FLIGHT INSTRUMENT SYSTEM

The Electronic Flight Instrument System consists of a Primary Flight Display, a Navigation Display and an Instrument Control Panel (ICP).

4.6.1 Primary Flight Display (PFD)

The PFD displays the most important flight data and the operation modes of the (optional) autopilot.

The BRT knob controls the brightness of the screen. The OFF button switches the display off or on. The setup of PFD is determined by ICP.

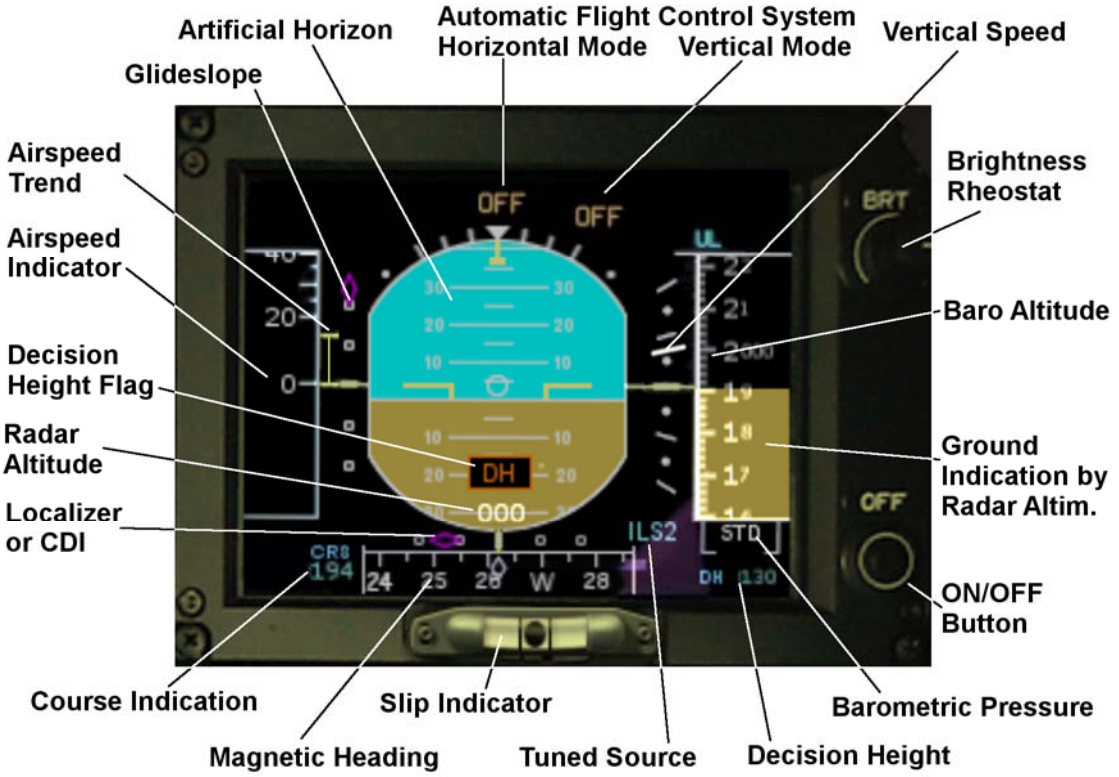


Fig. 4-17 Primary Flight Display in composite mode

4.6.2 Navigation Display (ND)

The ND displays all important navigation information:

The BRT knob controls the brightness of the screen. The OFF button switches the display off or on.

ND provides two different display modes. Default is HSI-NAV mode. Alternatively there is a sector mode which shows a map. In sector mode weather radar information can be added. The setup of ND is determined by ICP.

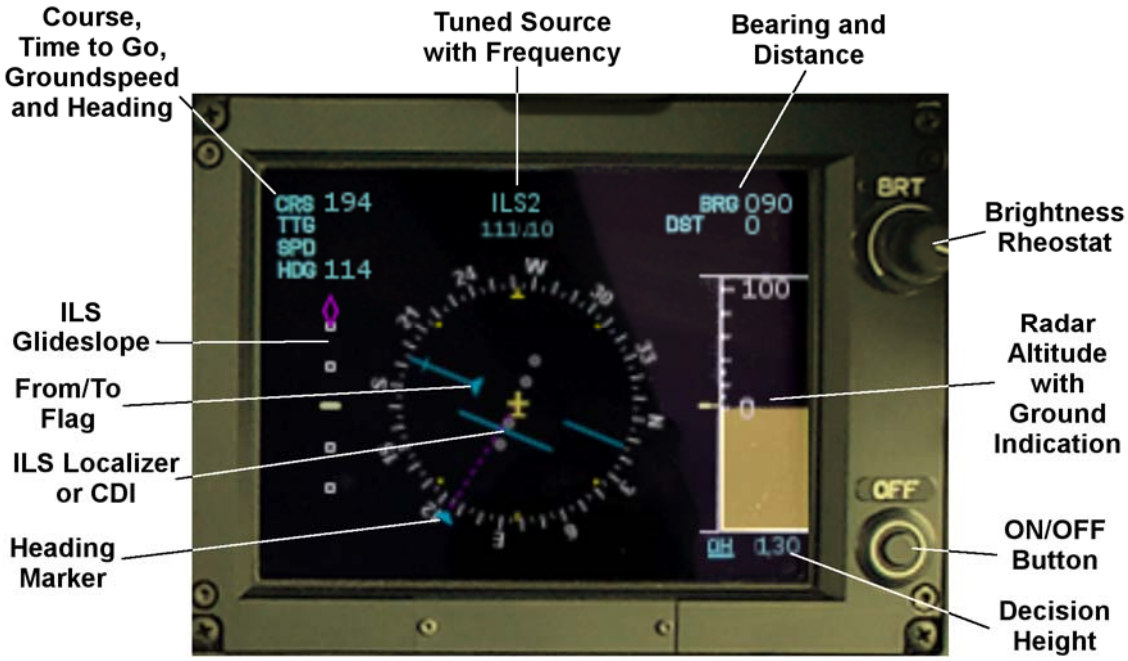


Fig. 4-18 Navigation Display (HSI Mode)

Fig. 4-19 Navigation Display (sector mode)

4.6.3 Multi Functional Display (MFD)

The MFD at co-pilot's side is a Mirror of PFD and ND from pilot's side. At moment it cannot be controlled by it's ICP (1).

4.6.4 Instrument Control Panel (ICP)

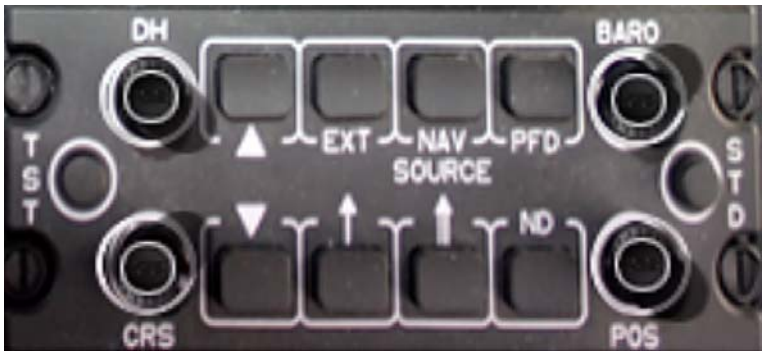


Fig. 4-20 Instrument Control Panel

The Instrument Control Panel is placed at the console between pilot and co-pilot seat. It provides PFD and ND control as follows:

- DH ..... sets decision height
- CRS ..... adjusts heading bug (VOR)
- BARO ..... sets barometric pressure
- POS ..... adjusts pitch reference value (attitude indicator)
- ▲ ..... zoom out map
- ▼ ..... zoom in map
- PFD ..... toggles PFD between normal mode and composite mode
- ND ..... toggles ND between HSI-NAV mode and sector mode
- NAV SOURCE ..... VOR1/ILS1, VOR2/ILS2, NMS
- EXT ..... adds or removes weather radar (ND sector mode)
- ↑ ..... direction needle to ADF1 or VOR1
- ⇑ ..... direction needle to ADF2 or VOR2

Currently only the ICP (2) on the pilot side is operational.

4.7 ROTOR BRAKE

The rotor brake lever is located directly in front of the overhead panel. Apply rotor brake only when rotor RPM is below 50% and with both engines shutdown!

4.8 HELLAS SYSTEM

The Helicopter Laser Radar System (HELLAS) is an obstacle warning system for helicopters. If installed, the display is located above the main panel beside the compass.

The System can be engaged and disengaged by clicking with the mouse to the display. In this simulation HELLAS is implemented as a camera with night sensing equipment.

SECTION 5

AUTOMATIC FLIGHT CONTROL SYSTEM

The AFCS is an autopilot. It controls the pitch and roll attitude of the helicopter and is able to automatically fly a course given by other instruments including GPS/NMS. Its panel is placed at the console between pilot and co-pilot seat.

Fig. 4-21 AFCS control panel

5.1 ENGAGEMENT

Pressing AP button engages AFCS. OFF Light in the button will disappear. A.TRIM mode is engaged.

5.2 DISENGAGEMENT

Pressing AP button will disengage the AFCS.

SAS/AP CUT button (cyclic stick) disengages AFCS and all SAS.

When disengaged (default after power-up) OFF light is in AP Button is illuminated, in PFD both AFCS status lines show OFF. When AFCS is manually or automatically disengaged or has a malfunction on warning panel AP A.TRIM light, on CAD the caution “AUTOPILOT” will come on for 10 seconds an a warning Gong will be activated.

5.3 OVERRIDING AFCS

With TRIM REL button the pilot can override AFCS temporarily as described in TRIM REL with AFCS (page 4–5).

With BEEP TRIM Buttons the pilot can override AFCS depending on AFCS mode as described at the respective mode.

5.4 A.TRIM MODE

After Engagement AFCS normally works in A.TRIM mode. (OFF light at A.TRIM button is not activated.) In this mode the autopilot will maintain the helicopter's actual flight attitude (pitch and roll). In PFD the AFCS status lines are blank.

Disengage Press A.TRIM Button. AFCS now provides enhanced AFCS SAS.

Override BEEP TRIM buttons will change the reference attitude (pitch and roll).

5.5 UPPER MODES

In addition to A.TRIM this AFCS provides 10 upper modes. The respective buttons illumine a yellow "A" when mode is armed, a green "C" or "ON" when coupled. Coupling of HDG mode or ALT.A mode is indicated by a green triangle next to label. In PFD all upper modes coupled are displayed green, armed modes are displayed cyan.

All upper modes can only be activated if AFCS is switched on. If an upper mode is disengaged on CAD the caution "DECOUPLE" will come on for 10 seconds. All upper modes can be disengaged pressing A.TRIM button. In this case autopilot reverts to AFCS SAS.

5.5.1 ALT Mode

Holds current altitude by adjusting pitch attitude (vertical mode).

Engage Press ALT button.

Disengage Press ALT button or engage another vertical mode.

Override BEEP TRIMs buttons FWD and AFT change reference altitude.

5.5.2 IAS Mode

Holds current airspeed by adjusting pitch attitude (vertical mode).

Engage Press IAS button

Disengage Press IAS button or engage another vertical mode.

Override BEEP TRIM buttons FWD and AFT change reference airspeed.

5.5.3 VS Mode

Holds vertical speed by adjusting pitch attitude (vertical mode).

Engage Press VS button.

Disengage Press VS button or engage another vertical mode.

Override BEEP TRIM buttons FWD and AFT change reference vertical speed.

5.5.4 GS Mode

Flies the glideslope of an ILS (vertical mode).

Engage Press GS button. GS mode will be armed. If another vertical mode is coupled it will remain coupled until glideslope is captured. AFCS changes GS armed automatically to coupled when glideslope is captured.

Disengage Press GS button or engage another vertical mode.

5.5.5 HDG Mode

Flies the heading commanded by the rheostat (lateral mode).

Engage Select heading by turning the rheostat. Press HDG button.

Disengage Press HDG button or engage another lateral mode.

Override BEEP TRIM buttons LEFT and RIGHT or turning rheostat change reference heading.

5.5.6 APP Mode

Follows the VOR selected at HSI or the locator of an ILS (lateral mode).

Engage Tune in VOR or ILS frequency. Press APP button. APP mode will be armed and automatically engaged when VOR or ILS is captured. While armed another coupled lateral mode remains coupled.

Disengage Press APP button or engage another lateral mode.

Displays VOR or ILS at PFD.

5.5.7 NAV Mode

Flies the course commanded by GPS/NMS or VOR as selected at HSI (lateral mode).

Engage Tune in VOR frequency or programm GPS/NMS. Press NAV button. NAV mode will armed and automatically engaged when VOR is captured or engaged if GPS/NMS is selected. While armed another coupled lateral mode remains coupled.

Displays VOR or NMS at PFD.

Disengage Press NAV button or engage another lateral mode.

5.5.8 ALT.A Mode

Flies to a preselected altitude by adjusting pitch attitude (vertical mode).

Engage Select desired altitude with the rheostat. Press ALT.A button.

Disengage Press ALT.A button or engage another vertical mode.

Override BEEP TRIM buttons FWD and AFT change reference of vertical speed.

5.5.9 GA Mode

The Go Around Mode is used in case of a missed approach. It holds an indicated airspeed of 75 kt.

Engage Press GA button on collective grip. (Only available as key or joystick command “sim/autopilot/take_off_go_around”.)

Override BEEP TRIM buttons FWD and AFT change reference airspeed.

5.5.10 BC Mode

Back Course mode is not available.

SECTION 6

NORMAL PROCEDURES

6.1 PRE-START CHECK

	Overhead panel:		
	All switches	–	OFF or NORM
	Instrument panel:		
	All switches	–	OFF or NORM
	BAT MSTR switch	–	ON; CPDS internal test starts
NOTE	Do not switch off CPDS during or after flight.		
	CAD	–	Check no INP FAIL message
NOTE	If INP FAIL appears in conjunction with the appropriate caution(s), this caution(s) will not be provided during flight. Abort pre-start check.		
	Overhead panel:		
	FIRE EW 1 test switch	–	EXT/WARN
	CAD	–	FIRE EXT and FIRE E TST must come on (system I)
	Warning panel	–	FIRE I must come on
	FIRE EW 1 test switch	–	OFF
	FIRE EW 2 test switch	–	EXT/WARN
	CAD	–	FIRE EXT and FIRE E TST must come on (system III)
	Warning panel	–	FIRE II must come on
	FIRE EW 2 test switch	–	OFF
	CDS/WARN UNIT TEST sw	–	WARN UNIT (all warning lights and gong must come on)
	CDS/WARN UNIT TEST sw	–	CPDS: Check display self test
	Fuel XFER pumps (AFT and FWD)	–	ON; Check caution (F PUMP AFT/FWD) off
	Fuel XFER pumps (AFT and FWD)	–	OFF
	Both fuel PRIME pumps	–	ON and check cautions coming on
	A-COLL light sw	–	ON
	Instrument panel:		
	CAD & VEMD brightness	–	Adjust as required
	VEMD	–	DC voltage: minimum 24V DC
	CAD fuel quantity indication	–	Check quantity
	FADEC sw I then II	–	ON
		–	Check following cautions:

- TRAINING
- ENG MANUAL
- DEGRADE
- REDUND

Cyclic stick:

TRIM REL sw – Press

6.2 STARTING ENGINES

6.2.1 Before starting engines

Rotor area – Clear

6.2.2 Abort start procedure

IMMEDIATELY ABORT START FOR ANY OF THE FOLLOWING:

IF IGNITION DOES NOT TAKE PLACE AFTER REACHING OF N1 = 20% BUT LATEST AFTER 15 SECONDS. WAIT FOR 30 SECONDS BEFORE TRYING STARTING AGAIN.

TOT RISES ABNORMALLY RAPIDLY ABOVE 650°C AND IS QUICKLY APPROACHING 760°C.

IF ENGINE HANGS. (Stagnation in N1 below 54%)

NO POSITIVE ENGINE OR TRANSMISSION OIL PRESSURE INDICATIONS UPON REACHING GROUND IDLE CONDITION.

IF N_1 OR N_2 INCREASE BEYOND ENGINE LIMITS.

ENG MAIN sw(s) – OFF

6.2.3 Starting First Engine

NOTE Either engine may be started fist.

First Limit Indicator – Check needle shows TOT

ENG MAIN sw first engine – IDLE, simultaneously start clock

Monitor:

- N_1 increase
- TOT rise (≈ 570 °C);
  note that FLI needle moves not until ≈ 350 °C.
- Engine oil pressure increase
- N_2 and NRO increase

Ground IDLE – Check N_2 ≈ 74%

HYDRAULIC Check:	
TRIM REL sw (on cyclic stick)	– Press
Cyclic stick	– Unlock
HYD test sw	– SYS 1
	Check caution indication
	HYD PRESS (System 2)
	– SYS 2
	Check caution indication
	HYD PRESS (System 1)
	– NORM

6.2.4 Starting Second Engine

First Limit Indicator	– Check needle shows TOT
ENG MAIN sw second engine	– IDLE, simultaneously start clock
	Monitor:
	- N_1 increase
	- TOT rise (≈ 570 °C);
	note that FLI needle moves
	not until ≈ 350 °C.
	- Engine oil pressure increase
	- N_2 and NRO increase
When IDLE speed of N_2 ≈ 74% is reached:	
Both Fuel XFER pumps	– ON
Both Fuel PRIME pumps	– OFF
Inverter sw	– ON
Avionic Master switches	– ON
Instruments	– Set and check
Both ENG MAIN switches	– FLIGHT
After rotor RPM has stbilized:	
Both ENG MAIN switch guards	– Close

6.2.5 Engine quick start procedure

INVERTER 1sw	– ON
TRIM REL sw (on cyclic stick)	– Press
Cyclic stick	– Unlock and hold in neutral pos.

NOTE Only one engine will begin starting cycle. After reaching N_1≈50%, the second engine will begin its starting cycle automatically.

First Limit Indicator	– Check needles show TOT
Both ENG MAIN sw's	– FLIGHT, simultaneously start clock
	Monitor:

		- N_1 increase - TOT rise (≈ 570 °C); note that FLI needle moves not until ≈ 350 °C. - Engine oil pressure increase - N_2 and NRO increase
When N_2 > 74% at both engines:		
Both Fuel XFER pumps	–	ON
Both Fuel PRIME pumps	–	OFF
INVERTER 2 sw	–	ON
Avionic Master switches	–	ON
When both engines in Flight idle:		
Both ENG MAIN switch guards	–	Close
Instruments	–	Set and check
HYDRAULIC Check:		
Cyclic stick	–	Unlock
HYD test sw	–	SYS 1 Check caution indication HYD PRESS (System 2) – SYS 2 Check caution indication HYD PRESS (System 1) – NORM

6.3 SYSTEM CHECKS

6.3.1 Miscellaneous Checks

Optional equipment checks	–	As required

6.3.2 SAS Check

SAS / AP CUT push-button	–	Press Check CAUTION indication: YAW SAS P/R SAS
SAS Y RST switch	–	Reset YAW
SAS PR RST switch	–	Reset P/R

6.3.3 AFCS Test (when AFCS is intended to be operated in A.TRIM mode)

TEST button	–	Press to initiate system test
Warning panel	–	AP/A.TRIM appears

CAD	– During test the following cautions appear: - AUTOPILOT - TRIM - ACTUATION - P/R SAS - GYRO - DECOUPLE - YAW SAS - P DAMPER
PFD	– / YR / P / flashing
Cyclic stick	– Check motion during trim test
If system test was successful (lamp of the test button out):	
CAD	– All autopilot relevant cautions disappear
AP button	– Press to engage the autopilot (OFF lamp of the AP button goes off)

6.4 PRE-TAKEOFF CHECK

N_{RO} / N_2	– Check ≈ 98 %
All WARNING, CAD & VEMD indications	– Check
All Doors	– Closed
Collective pitch	– Unlock

6.5 TAKEOFF

NOTE If AFCS is engaged, it is required to override the autopilot temporarily during takeoff procedure by using the Force Trim Release button. Alternatively A.TRIM mode can be deactivated while lifting off. Autopilot then operates in SAS mode.

Collective	– Perform small input; check starting triangles disappeared
Hover flight	– Perfom
NR/N2 instrument	– Check ≈ 100 %
FLI needles	– Check matched at same parameter
All WARNING, CAD & VEMD indications	– Check
Recommended takeoff procedure:	
Acceleration and climb	– Start nose down pitch rotation and simultaneously increase power smoothly so that the helicopter gains speed and height.
When reaching 50 KIAS	– Maintain airspeed until reaching 50ft AGL, then accelerate to V_Y

	(65 kt) and climb through 100ft AGL

6.6 PRE-LANDING-CHECK

All instruments	– Check
All WARNING, CAD & VEMD indications	– Check

6.7 LANDING

NOTE If AFCS is engaged, it is required to override the autopilot temporarily during landing procedure by using the Force Trim Release button. Alternatively A.TRIM mode can be deactivated while landing. Autopilot then operates in SAS mode.

Recommended landing procedure:

After reaching 50 ft AGL	– Descent with ≤ 500 ft/min at 40 KIAS
Before touchdown	– Establish flare attitude to reduce ground speed and raise collective lever to cushion landing
Touchdown	– Establish with zero groundspeed
Cyclic stick	– Neutral
Collective pitch	– Lock

6.8 ENGINE SHUTDOWN

ENG I / II main switches	– IDLE
Inverter sw(s)	– OFF
Avionic Master switches	– OFF
STBY/HOR sw (if installed)	– OFF
Fuel XFER F + A pumps	– OFF
All electrical consumers	– OFF; except anti-collision light and FADEC sw
Cyclic stick	– Lock
ENG I/II main switches	– OFF
Engine parameters	– Monitor
When rotor has stopped:	
Anti-collision light	– OFF
VEMD	– Check FLIGHT REPORT page for counter cycles and exceeded mast moment limitations.
FADEC switches (2)	– OFF
BAT MSTR switch	– OFF

SECTION 7

EMERGENCY AND MALFUNCTION PROCEDURES

7.1 WARNINGS AND CAUTIONS

7.1.1 Warning light indications

AP A. TRIM
AFCS is disconnected manually or due to failure. This warning is indicated for 10 seconds and disappears automatically even if AFCS remains disconnected.

Procedure: Fly the helicopter manually.

BAT DISCH
Battery is the only electrical power source. Normal during engine start.

Procedure: Reduce electrical consumption as much as possible. Land as soon as practicable.

BAT TEMP
Battery overtemperature

Procedure: BAT MSTR off. In flight: Land as soon as possible.

FIRE (ENGINE 1 or ENGINE 2)
Overtemperature in engine compartment

Procedure: If in flight, establish OEI condition. Press respective EMER OFF switch and shutdown the affected engine. Land immediately.

Note: Pressing the FIRE switch, the emergency shut off valve will be closed. When the emergency shut off valve is closed the caution F VALVE CL appears on the CAD.

LOW FUEL 1 and/or LOW FUEL 2
Respective supply tank fuel quantity below 24 kg

Procedure: Check both XFER pumps on. If both FUEL LOW warning lights remain on: Land within 10 minutes.

ROTOR RPM
N_{RO} 97% or less – steady light

N_{RO} 106% or above – flashing light

Procedure: Adjust collective lever as necessary to maintain N_{RO} within normal range.

XMSN OIL P
XMSN oil pressure is below minimum

Procedure: Land as soon as possible.

7.1.2 Caution light indications

MASTER CAUTION
Caution indication appeared on CAD

Procedure: Check indication on CAD and perform corresponding emergency procedure. Push CDS/AUDIO RES switch (on cyclic stick) or SELECT button (on CAD) to reset.

7.1.3 CPDS caution indications

ACTUATION (MISC)
Failure of a series actuator (AFCS)

AUTOPILOT (MISC)
AFCS is disconnected manually or due to failure.

Procedure: Fly the helicopter manually.

BAT DISCON (MISC)
Battery is off-line (normal when BAT MSTR switch is in OFF position).

Procedure: Check BAT MSTR switch. If indication remains on, land as soon as practicable.

DECOUPLE (MISC)
An upper AFCS mode is decoupled. This caution is indicated for 10 seconds.

DEGRADE (SYSTEM I or II)
Indicates a change or loss of a number of governing functions.

ENG FAIL (SYSTEM I or II / CAD and FLI)
Respective N_1-RPM below threshold value.

Procedure: Establish OEI flight conditions. Perform emergency shutdown of affected engine. Land as soon as practicable.

ENG IDLE (SYSTEM I or II / CAD and FLI)
The respective engine switch is in IDLE position.

ENG MANUAL (SYSTEM I or II)

Engine MANUAL mode is selected by switching ENG MODE SEL from NORM to MAN. There is no automatic governing function. Throttle has to be controlled manually by twist grip.

Returning to NORM mode: ENG MODE SEL switch to NORM. ENG MANAUL caution disappears. Then turn twist grip carefully to neutral Position. Check TWIST GRIP caution off.

ENG OIL P (SYSTEM I or II)

Affected engine oil pressure below minimum.

Procedure: Establish OEI flight conditions. Perform emergency shutdown of affected engine. Land as soon as practicable.

FADEC FAIL (SYSTEM I or II / CAD and FLI)

Fuel metering valve is blocked. Automatic acceleration, deceleration during power changes and NORM start are impossible.

F PUMP AFT (MISC)

Failure of aft fuel transfer pump, or dry run.

Procedure: Check fuel quantity in main tank. If quantity is sufficient to keep both fuel pumps wet, check FUEL PUMP XFER-A switch on. Switch OFF if indication remains on. If main tank fuel quantity is low, switch FUEL PUMP XFER-A OFF.

F PUMP FWD (MISC)

Failure of forward fuel transfer pump, or dry run.

Procedure: Check fuel quantity in main tank. If quantity is sufficient to keep both fuel pumps wet, check FUEL PUMP XFER-F switch on. Switch OFF if indication remains on. If main tank fuel quantity is low, switch FUEL PUMP XFER-F OFF.

FUEL PRESS (SYSTEM I or II)

Engine fuel pump inlet pressure low.

Procedure: Switch FUEL PRIME PUMP (affected engine) ON. If caution indication remains, switch pump OFF and land as soon as practicable.

FUEL VALVE (SYSTEM I or II)

Fuel valve is in a position other than commanded.

Procedure: Land as soon as practicable.

F VALVE CL (SYSTEM I or II)

Fuel valve is in closed position.

NOTE The F VALVE CL caution indication will come on after pressing the respective EMER OFF switch marked “FIRE”.

GEN DISCON (SYSTEM I or II)
Respective generator has failed or is disconnected from the power distribution system. Normal while Starter is running.

Procedure: Affected GEN switch OFF. If battery is discharged: Reduce electrical consumers as much as possible and land as soon as practicable.

GEN DISCON (SYSTEM I and II)
Both generators have failed or are disconnected from the power distribution system.

Procedure: Both GEN switches OFF. Land as soon as practicable.

GYRO (MISC)
Failure of a sensor such as AHRS or Rate Gyro.

HYD PRESS (SYSTEM I or II)
Pressure loss in the respective system, the other system retains power.

Procedure: Land as soon as practicable.

P DAMPER (MISC)
Failure of the Pitch Damper.

PITOR HTR (SYSTEM I or II)
Pitot/Static heater is switched off or failed

P/R SAS (MISC)
Failure of P/R SAS or inoperative.

PRIME PUMP (SYSTEM I and / or II)
Prime pump(s) in operation.

NOTE Prime pumps must be OFF during normal flight operations.

REDUND (SYSTEM I or II)
Indicates loss of redundancy or failure with no effect on fuel control system.

ROTOR BRK (MISC)
Rotor brake engaged.

Procedure: Check rotor brake lever in Off position. If indication remains on, land as soon as possible.

STARTER (SYSTEM I or II)
If STARTER caution indication remains on after reaching IDLE speed a relay blockade is evident. The indication is normal during engine starting.

Procedure: Perform emergency shudown of affected engine. Land as soon as practicable.

TRIM (MISC)
Failure of AFCS's autotrim.

TWIST GRIP (SYSTEM I or II)
Twist grip is not in its neutral position.

Returning to NORM mode: ENG MODE SEL switch to MANUAL, then NORM. ENG MANAUL caution disappears. Then turn twist grip carefully to neutral Position. Check TWIST GRIP caution off.

XMSN OIL P (SYSTEM I or II)
XMSN oil pressure in respective pump system is below minimum.

Procedure: Land as soon as practicable.

XMSN OIL T (MISC)
Transmission oil temperature above maximum.

Procedure: Reduce power as much as possible. Land as soon as possible.

YAW SAS (MISC)
Failure of Yaw SAS or inoperative.

7.2 ENGINE EMERGENCY CONDITIONS

7.2.1 Single Engine Emergency Shutdown

Make certain that the collective lever is adjusted to maintain the normal engine within OEI limits.

Procedure

1. ENG MAIN sw (affected engine)	– IDLE, check right engine then OFF

7.2.2 Inflight Restart

Procedure

1. Collective lever	– Adjust to OEI MCP or below
2. Collective lever friction	– Adjust to maintain position of lever

		when released
3. Electrical consumption	–	Reduce
4. ENG MAIN sw	–	Check OFF
5. FADEC sw	–	Check ON
6. Engine PRIME PUMP sw	–	ON
7. ENG MAIN sw	–	FLIGHT; STARTER caution comes on
When N_1 > 50%:		
8. Engine PRIME PUMP sw	–	OFF
9. Electrical consumption	–	As required
10. Starting triangles	–	Check disappeared
If restart is not successful:		
11. Single engine emergency shutdown	–	Perform
12. LAND AS SOON AS PRACTICABLE		

7.2.3 Autorotation

Procedure

1. Collective lever	–	Reduce to maintain N_{RO} within limits
2. Airspeed	–	75 KIAS recommended

NOTE Maximum range airspeed ..... 90 KIAS

Minimum rate-of-descent airspeed ..... 60 KIAS

3. Double engine emergency shutdown	–	Perform
AT APPROXIMATELY 100 FT AGL:		
4. Flare attitude	–	Establish
TOUCHDOWN:		
5. Landing attitude	–	Establish
6. Heading	–	Maintain
7. Collective lever	–	Increase to stop descent and cushion landing
AFTER TOUCHDOWN:		
8. Collective lever	–	Raise slowly to prevent an abrupt stop
9. BAT MSTR sw	–	OFF

SECTION 8

APPENDIX

8.1 ABBREVIATIONS AND SYMBOLS

A	A	Ampere
	AC	Alternating current
	ADF	Automatic direction finder
	AEO	All engines operating
	AFCS	Automatic flight control system
	AGL	Above ground level
	ALT	Altitude
	AP	Autopilot
	ASL	Above sea level
B	BAT	Battery
C	CAD	Cautions and advisories display
	CAU	Caution
	CDS	Cockpit display system
	CPDS	Central panel display system
D	DA	Density altitude
	DC	Direct current
	DISCH	Discharge
	DME	Distance measuring equipment
E	EGT	Exhaust gas temperature
	EMER	Emergency
	ENG	Engine
	EPU	External power unit
	EXT	External extinguisher
F	FADEC	Full authority digital engine control
	FLI	First limit indication
	fpm	Feet per minute
	ft	Feet
G	GEN	Generator
	GM	Gross mass
	GS	Ground speed
H	HIGE	Hover in ground effect
	HOGE	Hover out of ground effect
	hPa	Hectopascal

	HTR sw	Heater switch
	HSI	Horizontal situation indicator
I	IAS	Indicated airspeed
	ICP	Instrument control panel
	IFR	Instrument flight rules
	IMC	Instrument meteorological conditions
	in	Inch
	IND	Indicator
	INV	Inverter
	ISA	International standard atmosphere
K	kg	Kilogram
	KIAS	Knots indicated airspeed
	km	Kilometer
	kt	Knots
	kW	Kilowatt
L	L, l, LRT, ltr	Liter
	Lb	Pound
	LBA	Luftfahrtbundesamt
	LDG	Landing
	LDP	Landing decision point
M	m	Meter
	Max	Maximum
	MC, mc	Maximum continuous
	MCP	Maximum continuous power
	min	Minimum
	min	Minutes
	MM	Mast moment
	MSL	Mean sea level
N	N	Newton
	N_1	Gas generator speed
	N_2	Power turbine speed
	NAV	Navigation (radio)
	ND	Navigation display
	No.	Number
	NORM	Normal mode of operation
	NR, N_{RO}	Rotor speed
O	OAT	Outside air temperature
	OEI	One engine inoperative
	OGE	Out of ground effect
P	Pa	Pascal

	PA	Pressure altitude
	PAX	Passenger
	PFD	Primary flight display
	PWR	Power
R	RPM, rpm	Revolutions per minute
S	s, sec	Seconds
	SAS	Stability augmentation system
	SEL	Selector
	SHP	Shaft horse power
	SL	Sea level
	STBY	Standby
	std	Standard
	SW, sw	Switch
	SYS	System
T	TAS	True airspeed
	TDP	Takeoff decision point
	TEMP	Temperature
	TOP	Takeoff power
	TOT	Turbine outlet temperature
V	V	Volt
	VEMD	Vehicle and Engine Multifunction Display
	VFR	Visual flight rules
	V_H	Maximum horizontal speed
	VHF	Very high frequency
	VMC	Visual meteorological conditions
	VNE, V_{NE}	Never-exceed speed
	VOR	VHF omnidirectional radio ranging
	V_{TOSS}	Takeoff safety speed
	V_Y	Best rate-of-climb speed
X	XMSN	Transmission

8.2 USING THE CONFIGURATOR

This rotorcraft contains a configurator that allows to have different equipment in different liveries. Therefore we need a ini file (config.ini) in the root folder of the respective livery. Another ini file in the root folder of the aircraft defines the equipment of the default livery. If the ini file of a livery is missing the respective livery will be loaded with the standard configuration.

8.2.1 Ini file format

config.ini and config.def are simple text files. They consist of sections (e.g. [COCKPIT]) and keys (e.g. RotorBrake=0). The files are case sensitive.

config.ini

This file describes the configuration of a livery. “0” in a configuration line means, that the helicopter is not equipped with the respective system, “1” means it is equipped. This means that the equipment will become visible and the takeoff weight of the helicopter will be adjusted automatically.

Every system has to be listed on it’s own line. Systems not listed will be not equipped.

The following entries are available:

[COCKPIT]

RotorBrake ..... Rotor brake

HiNrSwitch ..... 1=HI NR mode installed, 0=CAT A mode installed

HiNrEngaged.....HI NR or CAT-A switch locked in at startup

DualControl ..... 1=second control for copilot, 0=only pilot control

Hellas ..... Hellas display in cockpit

FuelManagementSystem ..... Fuel Management System installed

[INTERIOR]

Backseats ..... 0=EMS equipment, 1=backseats instead of EMS

[EXTERIOR]

RadarDome .....Radar dome

Hoist ..... Hoist

Hellas ..... Hellas box outside the helicopter

Speaker ..... Loudspeakers for high skid

InfraredCam ..... Infrared camera (police equipment)

CableCutterUp .....Wirecutter system

CableCutterDown .....Cable cutters down

[SKID]

Stepskid ..... Steps for landing skid

Snowskid ..... Snow skid

[ANTENNA]

SpecialWhiteChris7 ..... Special Antenna white Christoph 7 and german Bundespolizei

BlackHookBehindRotor .....

BlackHookDownAtTail ..... black hook antenna down at tail

BlackRodAerialDownAtTail ..... black rod aerial down at tail

WhiteHookAntennaFront ..... white hook antenna front

WhiteNearBeacon ..... white antenna near beacon

SpecialPoliceHeli ..... special antenna for police heli

[LIGHT]

FrontLight ..... landing light in front with extra taxi light at the body

LandingLight ..... landing light at skid with extra taxi light at the body

SearchLight ..... Police Equipment

[GLOBALSWITCH]

LandingSkid ..... 0=normal skids, 1=high skids

config.def

This file in the root folder of the aircraft provides the system keys used in config.ini files and their weights in relation to the standard configuration. Never change these entries!

Only the following entries should be changed or added by the user:

[HORIZONTAL]

Engaged ..... set form 1 to 0 to disengage the horizontal pilot view control

RateMax ..... Turnrate (default 35)

Deflection ..... Deflection of view in degrees at RateMax (default 12)

Curve ..... 1: linear, 2 and more: factor of nonlinearity (default 2)

[VERTICAL]

Engaged ..... set form 1 to 0 to disengage the vertical pilot view control

RateMax ..... Turnrate (default 20)

Deflection ..... Deflection of view in degrees at RateMax (default 4)

Curve ..... 1: linear, 2 and more: factor of nonlinearity (default 2)

[ROLL]

Engaged ..... set form 1 to 0 to disengage the pilot view roll control

RateMax ..... Turnrate (default 30)

Deflection ..... Deflection of view in degrees at RateMax (default 5)

Curve ..... 1: linear, 2 and more: factor of nonlinearity (default 1)

[SETTINGS]

FtrButtonDelayOnRelease ..... Delaytime after release of FTR button in s (default 0.3)

LandingLight1AtRunning ..... 1 = Light is on at startup with running engines

LandingLight2AtRunning ..... 1 = Light is on at startup with running engines

StrobeLightsAtRunning ..... 1 = Light is on at startup with running engines

PositionLightsAtRunning ..... 1 = Light is on at startup with running engines

ReportLogLimit ..... Max number of flight reports (default -1 for no limit)

8.3 PAINT KIT

The paint kit is available as separate download and delivered with its own manual. For further Information refer to that manual.