



OPERATIONAL EVALUATION REPORT

AIRBUS HELICOPTERS

EC 175 B

(H175)

GRUPO DE AVALIAÇÃO DE AERONAVES – GAA

BRAZILIAN AIRCRAFT EVALUATION GROUP

REVISION 1 – AUGUST 05, 2020

Revision Control

REVISION	DATE	HIGHLIGHTS OF CHANGE
Original	September 18, 2017	Original report
Revision 1	August 05, 2020	<ul style="list-style-type: none"> - Introduction of functional differences between Helionix in Step3.2 and Step3 configuration - Scope Extension of Type Rating for SP IFR Operation - Addition of a TASE on AFCS upper modes - Formal change in “Purpose” - Clarification on pre-entry requirements - Special events and specific trainings simplification

Approval

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1 General

1.1 Evaluation Team

1.1.1 First issue team members

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1.1.2 Revision 1 team members

Name	Task	Organization
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1.2 Acronyms

- ADF – Automatic Direction Finder
- ADU – Air Data Unit
- AEO – All Engines Operative
- AFCS – Automatic Flight Control System
- AHRS – Attitude and Heading Reference System
- AMC – Aircraft Management Computer
- ANAC – Agência Nacional de Aviação Civil (Brazilian Civil Aviation Authority)
- AP – Auto Pilot
- ATO – Approved Training Organization
- ATR – Additional Type Rating
- BKUP – Back Up
- CAS – Calibrated Air Speed
- CBT – Computer Based Training
- CFIT – Controlled Flight Into Terrain
- CRM – Crew Resource Management
- CTR – Conversion to Role
- CWP – Central Warning Panel
- CG – Center of Gravity
- DC – Direct Current
- EASA – European Aviation Safety Agency
- EAPS – Engine Air Particle Separator
- ECL – Electronic Check List
- ECS – Environmental Control System
- EECU – Engine Electronic Control Unit
- EGPWS – Enhanced Ground Proximity Warning System
- EP – Extended Take-Off Power Duration
- ETOPS – Extended-range Twin-engine Operation Performance Standards
- FADEC – Full Authority Digital Engine Control
- FCOM – Flight Crew Operating Manual
- FDS – Flight Display System
- FFS – Full Flight Simulator
- FLI – First Limit Indicator
- FLM – Flight Manual
- FMS – Flight Management System
- FND – Flight and Navigation Display
- FNPT – Flight Navigation and Procedures Trainer

- FOBN – Flight Operation Briefing Note
- FPA – Flight Path Angle
- FSTD – Flight Simulator Training Device
- FT – Flight Training
- FTD – Flight Training Device
- GA – Go Around
- GAA – Grupo de Avaliação de Aeronaves (Brazilian Aircraft Evaluation Group)
- GPS – Global Positioning System
- GTC – Ground Trajectory Command
- H/C – Helicopter
- HMI – Human-Machine Interface
- HIP/SARM – Hovering at Increased Power for Search and Rescue Missions
- HTAWS – Helicopter Terrain Awareness and Warning System
- HUD – Head-Up Display
- HYD – Hydraulic
- IAS – Indicated Air Speed
- IESI – Integrated Electronic Stand-by Instrument
- IFR – Instrument Flight Rules
- ILS – Instrument Landing System
- ILT – Instructor Led Training
- IMC – Instrument Meteorological Conditions
- INSPAC – Inspetor de Aviação Civil (Civil Aviation Inspector)
- IR – Instrument Rating
- IR/H – Instrument Rating in Helicopter Category
- IS – Instrução Suplementar (Supplementary Instruction)
- ITR – Initial Type Rating
- L/G – Landing Gear
- LDP – Landing Decision Point
- LIFUS – Line Flying Under Supervision
- LSK – Lateral Soft Key
- MCP – Maximum Continuous Power
- MDR – Master Difference Requirements
- MEL – Minimum Equipment List
- MET – Multi Engine Turbine
- MFD – Multi Function Display
- MGB – Main Gearbox
- MMEL – Master Minimum Equipment List
- MP – Multi Pilot

- MTOP – Maximum Take Off Power
- NAVD – Navigation Display
- ODR – Operator Differences Requirements
- OEI – One Engine Inoperative
- OGE – Out of Ground Effect
- OSD – Operational Suitability Data
- OTD – Other Training Device
- PC1 – Performance Class 1
- PC2 – Performance Class 2
- PF – Pilot Flying
- PIC – Pilot In Command
- PM – Pilot Monitoring
- POI – Principal Operations Inspector
- RBAC – Regulamento Brasileiro de Aviação Civil
- RBHA – Regulamento Brasileiro de Homologação Aeronáutica
- RFM – Rotocraft Flight Manual
- RMCP – Reduced Maximum Continuous Power
- RPM – Rotations Per Minute
- RTR – Reduced Type Rating
- SAR – Search and Rescue
- SAS – Stability Augmentation System
- SIC – Second in Command
- SP – Single Pilot
- SUP – Supplement
- SW – Software
- TAS – True Air Speed
- TASE - Training Area of Special Emphasis
- TCAS – Traffic Collision Avoidance System
- TDP – Take-Off Decision Point
- TGB – Transfer Gearbox
- TOP – Take Off Power
- TOT –Turbine Outlet TemperatureTRQ – Torque
- TRK – Track
- V/S – Vertical Speed
- VFR – Visual Flight Rules
- VHF – Very High Frequency
- VMC – Visual Meteorological Conditions
- VMS – Vehicle Management System
- VOR – VHF Omnidirectional Range
- V_{toss} – Take-Off Safety Speed

2 Introduction

2.1 Background

The evaluations were conducted by documentation analysis using the information provided by the manufacturer and the determinations of the Operational Suitability Data (OSD) – Flight Crew – Normal Revision 3, approved by the European Aviation Safety Agency (EASA) on December 16th, 2019.

In case more detailed information is required, refer to the OSD mentioned above.

2.2 Objective

This report presents ANAC collection of results obtained from the operational evaluation of the aircraft EC 175 B.

2.3 Methodology

The documental analysis methodology used on this report implies that the GAA team did not get involved in any flight of the aircraft nor in any kind of training session.

Except for pilot rating definition and some references to the Brazilian regulation - RBAC, all the technical data presented in this report are entirely based on the OSD approved by EASA.

Where references are made to requirements and where extracts of reference texts are provided, these are at the amendment state at the date of evaluation or publication of this document. Users should take account of subsequent amendments to any references, in particular concerning requirement for civil aviation aircrew and air operations.

Recommendations and determinations made in this document are based on the evaluations of specific configurations of aircraft models, equipped in a given configuration and in accordance with current regulations and guidance.

Modifications and upgrades to the aircraft evaluated can require additional GAA assessment for type designation, training / checking / currency, operational credits, and other elements within the scope of the operational evaluations.

2.4 Purpose

First main evolution of Helionix Integrated Avionics software configuration led Airbus Helicopters to an evaluation of differences between the previous Helionix configuration (Step 2+) and the new configuration (Step 3).

Afterwards, Airbus Helicopters conducted an evaluation of differences between the previous Helionix configuration (Step 3) and the new configuration (Step 3.2), and an evaluation of SP IFR Operation (only for h/c equipped with Mod 99A05684 - SP IFR option - refer to FLM SUP6).

The outcomes of these evaluations are provided in this report, in terms of ODR tables, pre-entry requirements, familiarization courses, checking and currency.

The purpose of this report is to:

- a. Provide a general description of EC 175 B;
- b. Determine the Pilot Rating assigned for the EC 175 B;
- c. Make recommendations for Type Specific Training, including its Pre-entry requirements;
- d. Make recommendations for training and operations, including Reduced Type Rating for transition from another Helionix Family helicopter type;
- e. Provide additional information on HMI concept; and
- f. Give recommendations for Training Areas of Specific Emphasis (TASE).

2.5 Applicability

This report is applicable to:

- a. Brazilian operators of the EC 175 B who operate under the RBAC 91 and the RBAC 135 requirements;
- b. Approved Training Organizations certified under Brazilian Regulations;
- c. Safety Inspectors related to safety oversight of the EC 175 B;
- d. ANAC Principal Operations Inspectors (POIs) of EC 175 B operators.

2.6 Cancellation

Not applicable.

3 General Description

3.1 Aircraft Specifics

Airbus Helicopters manufacturer produces the EC175 in a single model “EC175-B” (trade name “H175”). This helicopter is a twin Turbine Engine Helicopter certified in EASA under CS-29, the equivalent to the RBAC 29 in Brazil, Categories A and B.

3.2 General

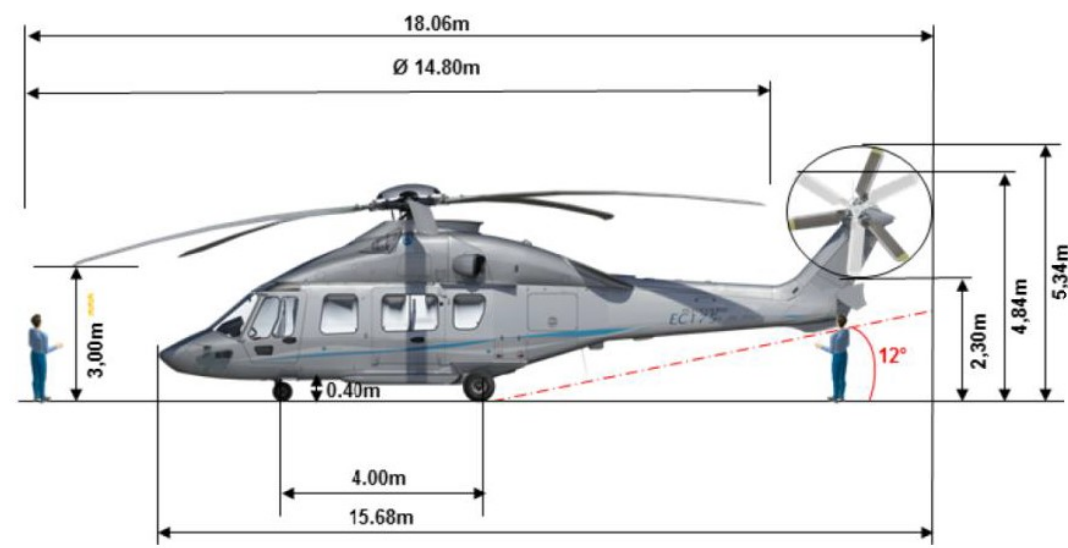
The EC175 B is a 7 tons class multi-mission helicopter, approved for VFR and IFR operations, day and night, in non-icing conditions.

Minimum crew is:

- Two pilots;
- One pilot for VFR flights (refer to Rotorcraft Flight Manual); or
- One pilot for IFR flights (refer to Rotorcraft Flight Manual, Supplement 6)

Note: for single pilot IFR operations aircraft must be equipped with Single Pilot IFR Operation modification (MOD). Operational restrictions may exist for single pilot IFR operations. Operational requirements must be observed.

Passengers: EC175-B can accommodate up to 18 passengers (excluding flight crew).



3.3 Main Rotor

The main rotor system is a five bladed type rotor rotating clockwise. Each glass/carbon-fiber blade is fitted on a SPHERIFLEX® rotor head with lower and upper gust and droop stops. The hub is dissociated from the mast in order to allow disassembling the swash-plates without having to remove the mast and the upper housing.

3.4 Tail Rotor

The tail rotor is a three bladed type rotor located on the left side of the aircraft. It is composed of three glass / carbon-fiber blades. It has also one SPHERIFLEX® rotor head fitted with flapping stops on a tail rotor mast-hub. The integrated mast-hub belongs to the TGB assembly.

3.5 Flight Controls

The EC175 B flight controls consist in one mechanical/hydraulic flight control system in a side-by-side configuration. Controls are totally separated between the main rotor and the tail rotor:

- Main rotor control is fitted with three fixed tandem body main servo-units (on cyclic and collective pitch channels).
- Tail rotor control is fitted with one fixed tandem body rear servo-unit (on tail rotor pitch control channel).

3.6 Drive System

One main gearbox (MGB) with oil level sight, a filler plug with breather device, oil pressure and temperature sensors, and six chip detectors.

The main gearbox accessories stage includes two accessory gearboxes for power transmission to accessories.

- One rotor brake system.
- One lubrication system with one main oil pump and one emergency oil pump.
- One main gearbox oil cooling system consisting in a cooling fan, a heat exchanger and oil pipes.
- MGB suspension system so that the bottom of the MGB is directly linked to the suspension (MGB isolating system).

The tail drive system is composed of the following elements:

- One tail rotor drive line to transmit the power from tail rotor output flange to the tail rotor gearbox via the intermediate gearbox.
- One splash lubricated intermediate gearbox.
- One splash lubricated tail gearbox.

3.7 Engines

The EC175 B is powered by two Pratt & Whitney PT6C-67E engines installed in parallel to each other in two engine compartments. They are controlled via a Full Authority Digital Engine Control (FADEC) system.

The PT6C-67E is a free turbine turbo shaft engine with an output shaft speed of 21000 rpm. It is made of:

- One gas generator - 4 Axial compressor stages,
- One centrifugal compressor stage,
- One Combustion chamber with reverse flow,
- One Single Crystal compressor turbine stage (with blade melting concept),
- Two Power turbine stages (with blade shedding protection) linked to output shaft power in connection with H/C Main Gear Box.

The unusual EP rating allows the rotorcraft to fly extended hover maneuvers while performing search and rescue missions. It corresponds to the same power level than TOP and is limited to a 30 minutes continuous usage.

3.8 Fuel System

The fuel system is crashworthy and includes storage, distribution and indicating system.

The fuel tank installation has five tanks with a total usable capacity of 2,533 liters (669 US gal).

They are refueled via a single port gravity fuel filler or a ground pressure refueling equipment that increases usable capacity to 2,616 liters (691 US gal).



3.9 Avionics

The Avionics System contains the Flight Display and the Vehicle Management Subsystems. The Avionics System contains the Flight Display, Automatic Flight Control Subsystems Computation and the Vehicle Management Subsystems.

The Basic Avionics System performs the following main functions:

- Acquisition and display to the crew of flight parameters,
- Generation of data used by the Automatic Flight Control Subsystem,
- Automatic Flight Control Computation
- Interface to vehicle and systems parts, plus monitoring and display to the crew of the vehicle and system status including alarms,
- Display of maintenance data on ground.



3.10 Automatic Flight Control System

The digital basic 4-axis AFCS offers basic stabilization as well as cruise, approach and navigation upper modes. It can be upgraded to a sophisticated 4-axis AFCS with extended hover and SAR modes. The digital AFCS offers aircraft stabilization and automatic flight path control. It performs a SAS function, long-term attitude retention and upper modes. In addition, it offers several override capabilities (beep trim, effort against the spring loads, trim release), decoupling of the helicopter axis and automatic turn coordination. Depending on sensor availability and the selected configuration, it can offer a wide range of upper modes with combinations thanks to the fourth axis.

It is designed to fulfil RBAC 29 requirements for IFR operation.

3.11 Hydraulic system

The EC175's hydraulic power system includes a main hydraulic system, a standby system and an indicating system.

The main hydraulic system is composed of two independent hydraulic sub-systems feeding the servo-units. Landing gear actuation system and assisted wheel brakes are supplied by main hydraulic system two through the APS (Auxiliary Pressure Supply). Normal operating pressure is 175 bars for main and auxiliary systems. The two main hydraulic pumps are mechanically driven by the MGB.

The stand-by system includes one stand-by auxiliary hydraulic system with electro-pump for landing gear normal activation and for hydraulic assistance in flight or on ground (engines not running), one stand-by sub-system integrated in main right hydraulic system for landing gear emergency extension.

3.12 Electric system

The primary electric power supply of the EC175 is 28V direct current provided by two starter/generators (300 A, 28 V DC), each dedicated to its own network in normal operation. In case of failure of one starter/generator, both electric networks are supplied by the alternate one.

An emergency generator connected both to Emergency bar 1 and 2 supplies the essential equipment in case of total failure of the primary DC generation (main electrical power supply). It allows Emergency flight without duration.

4 Pilot Rating

The specific pilot type rating assigned to the EC 175 B helicopter is designated "**EC175**".

Table 1 - Pilot Type Rating

Fabricante <i>(Manufacturer)</i>	Aeronave <i>(Aircraft)</i>		Observações <i>(Remarks)</i>	Designativo <i>(Designative)</i>
	Modelo <i>(Model)</i>	Nome <i>(Name)</i>		
AIRBUS HELICOPTERS	EC175 B	H175	Relatório de Avaliação Operacional EC175 B <i>ANAC Operational Evaluation Report EC175 B</i>	EC175

5 Master Difference Requirements (MDR)

The MDR table for the EC175B is shown below. Definitions of the various levels for Training/Checking/Currency are those used in IS 00-007 or in any further ANAC Instruction that can succeed it.

EC175B		From		
		Step 2+	Step 3	Step 3.2
To	Step 2+	-	N/A ⁽¹⁾	N/A ⁽¹⁾
	Step 3	B/A/B	-	N/A ⁽¹⁾
	Step 3.2	N/A	B/A/A	-

⁽¹⁾ The paths from Step 3 to Step 2+, from Step 3.2 to Step 3 and from Step 3.2 to Step 2+ were not evaluated because all EC175B shall be upgraded to the Step 3.2 standard.

6 Operator Difference Requirements (ODR)

Operator difference Requirements are the specific requirements necessary to address differences between a base aircraft and a candidate aircraft for type rating, checking and currency assessment and for the content of the difference training syllabus.

ODR tables were produced by AIRBUS HELICOPTERS for pilots converting from:

- 1) EC175B Helionix previous configuration to EC175B Helionix Step 3 configuration
- 2) EC175B Helionix Step 3 configuration to EC175B Helionix Step 3.2.

When relevant, ODR tables are given in Appendix 2.

7 Recommendations for Training, Checking, Currency and Operations

Recommendations for training and checking are detailed on OSD mentioned above.

The assessment is based on the EC 175 B Pilot Initial and Additional Type Rating Training syllabi, proposed by Airbus Helicopters.

7.1 Course Pre-entry Requirements

All candidates to an EC175 type rating should fulfil the requirements corresponding to the applied privilege for either single-pilot or multi-pilot operations, or hold or have held a type rating on another multi-engine turbine helicopter type with the same privilege of operations.

7.1.1 Reduced Type Rating for Helionix Family

Candidates applying for an EC175 reduced type rating should:

- Have been approved in an EC145 (BK117, variant D-2 only) MET MP course for a multi-pilot operation
- Have been approved in an EC145 (BK117, variant D-2 only) MET SP course for a single-pilot operation

Both for the corresponding privileges of operation (VFR or IFR)

And

- Have logged a minimum of 150 hours PIC and/or Co-pilot time on EC145 (BK117, variant D-2)

- Have performed a proficiency check on EC145 within the previous 12 months

7.1.2 IR Extension

Although in Brazil there is no requirement foreseeing the “*IR extension*”, the GAA recommends that, besides the pilot being Instrument rated, a differentiated training should be adopted in order to fly the EC 175 B under IFR in IMC and VMC.

Every time in this report that the term “IR Extension” appears, it is related to this extra part recommended to fly IMC and VMC under IFR.

All candidates for obtaining an IR Extension on EC175 should:

- Hold or have held an IFRH rating for Multi-Engine Helicopter
- Satisfy to the prerequisites stated in RBAC 61.223 requirement

Candidates to a single-pilot extension should in addition:

- Have followed a familiarization training on Helionix Step 3.2 configuration if not addressed during the Type Rating

Candidates to a multi-pilot extension should in addition:

Hold a first helicopter multi-pilot type rating or be able to show a certificate of completion of a Multi-Crew Cooperation course (MCC)

7.2 Type rating Training Footprints

7.2.1 General

Pilot training courses should be divided into following phases:

- Theoretical instruction program, including or not sessions with other training devices (OTD), and including theoretical exam (a minimum of 75% of good results should be requested).

- Practical instruction that can be either on helicopter only or on both, helicopter and flight simulation training device (FSTD)

Due to the complexity of the systems of the EC 175, especially displays and systems integration, to better understand their function, it is highly recommended to integrate other training device (OTD) into the theoretical knowledge instruction and before flight training. OTDs can have different levels of fidelity and functionality. If OTDs are not available, a specific FNPT can be used. Upper level devices like FTD, FFS or an equivalent way of cockpit training can be proposed by the training organization, it could be also the aircraft. However no credit towards flight training is given hereby.

The following tables summarize the minimum training hours required for each Type Rating (Initial Type Rating (ITR), Additional Type Rating (ATR), and Reduced Type Rating for pilots already rated on EC145T2 (RTR)), and for both solutions:

- Training footprints with the use of OTD in the theoretical knowledge instruction
- Training footprints with no use of OTD

7.2.2 Theoretical knowledge Instruction Summary

The following sections present a summary of the material a theoretical type rating training programme should consider.

For theoretical training, different methodologies and aids can be used (e.g. distant training). ATOs will always set up training programs that guarantees competencies are acquired. The following table shows a traditional approach with full on-site training. Following paragraph 7.8, Specific Trainings, shows alternative recommendations based on other pedagogical approaches.

Theoretical knowledge program for Initial and Additional Type Rating

Theoretical training ⁽¹⁾ for type rating courses (ITR or ATR)	Total w/o OTD (course path B)	Total with OTD (course path A)
1. Helicopter description, normal and abnormal systems operations	24h	18h
2. Limitations	3h	3h
3. Performance, flight planning and monitoring	3h	3h
4. Weight and balance, servicing	3h	3h
5. Emergency procedures	5h	5h
6. Integrated avionic system and digital AFCS	16h	4h
7. OTD use for Normal/abnormal procedures & Integrated avionic system and digital AFCS		18h
8. Optional equipment	(as required)	(as required)
Theoretical test	3h	3h
Total training with test	57h	57h
9. (IFR Extension: optional) ^{(2) (3)}	(3h)	(3h)

⁽¹⁾ Theoretical instruction elements can be covered during theoretical training course and/or during flight training briefing phase.

⁽²⁾ Duration may be completed by briefings before flights adapted to pilots' experience

⁽³⁾ For Single Pilot IR Training course, refer to paragraph 7.2.4

Theoretical knowledge program for Reduced Type Rating (EC145T2 Pilot Type rating holder)

Theoretical training ⁽¹⁾ for reduced type rating courses (RTR)	Total w/o OTD (course path B)	Total with OTD (course path A)
1. Helicopter description, normal and abnormal systems operations	15h	13h
2. Limitations	3h	3h
3. Performance, flight planning and monitoring	3h	3h
4. Weight and balance, servicing	3h	3h
5. Emergency procedures	5h	5h
6. Integrated avionic system and digital AFCS	7h	2h
7. OTD use for Normal/abnormal procedures & Integrated avionic system and digital AFCS		13h
8. (Optional equipment)	(as required)	(as required)
Theoretical test	3h	3h
Total training with test	39h	45h
9. (IFR Extension: optional) ^{(2) (3)}	(3h)	(3h)

(1) Theoretical instruction elements can be covered during theoretical training course and/or during flight training briefing phase.

(2) Duration may be completed by briefings before flights adapted to pilots' experience

(3) For Single Pilot IR Training course, refer to paragraph 7.2.4

7.2.3 Practical Training programs summary for type rating

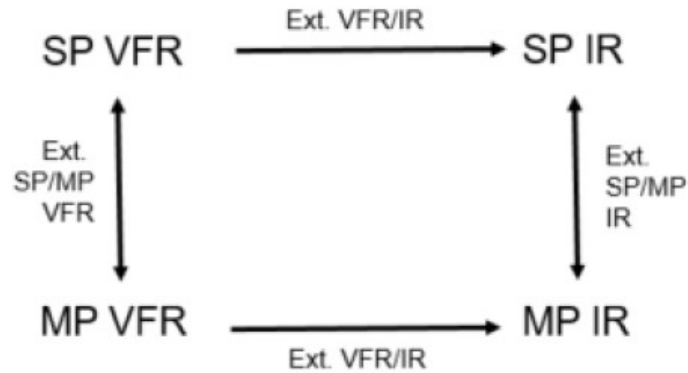
VFR / IR and Single / Multi-pilot privileges

The Helicopter may be operated in VFR or IFR. The Helicopter may be also operated in single or multi-pilot. Flight crew members shall have been trained accordingly.

For VFR / IR privileges, following type rating courses grants that a pilot having successfully attended an IR type-rating course is also VFR qualified. The opposite is not applicable.

For SP / MP privileges, either for VFR or IR qualification, the description of the type rating training courses is applicable to dedicated curriculum only: the pilot may be granted to a SP or MP qualification only, or both SP and MP qualification.

In any case, the applicant needs to go through relevant extension(s) of privileges according to the following logic:



Training duration

The following tables summarize the minimum training hours recommended for each Type Rating and its associated IR extension. Standard flight sessions last 1h30 to 2h but can be adapted at the discretion of the instructor. Additional flight could also be necessary if the trainee has not successfully demonstrated the ability to perform all maneuvers with a sufficient degree of proficiency. A training center may also make up for aeronautical constraints (e.g. training areas far from airport, no OEI exercises on mother base...) by extending flight sessions. All this could result in total course length significantly different from amounts given below.

Additional flights may also be performed by ATOs to enhance basic initial type rating training (minimum syllabus) for different purposes:

- For operations in hostile and congested environment,
- In multi-pilot, for PF/PM duties training (this should be carried out in an acceptable FSTD where CRM techniques can be properly trained and assessed),
- Depending on the specific configuration of the aircraft used,
- On request of customers.

These additional modules are detailed in following paragraphs 7.5, 7.6 e 7.7.

Where ATOs integrate type rating training into an operator's commercial training requirements, figures proposed below may be integrated into the operator's training package. Furthermore, CRM, MCC and Line training should provide additional training benefit, which should be aggregated and acknowledged.

Skill Test

All following tables provide flight training duration without skill test. Skill test is recommended for Initial Type Rating, Additional and IR extension. It can be

performed on helicopter, FFS C or D and FSTD dual qualified FFS B and FTD 3. Recommended duration is similar to standard training sessions and can be adapted to specific environmental constraints.

Training Device

GAA recommends extensive use of FSTDs by Approved Training Organizations. Fidelity level, technical criteria and operational features of such devices allow different achievement of training objectives. In this document, FFS designate standard ANAC qualification levels FFS C or D and devices having dual qualification FFS B & FTD 3.

FCOM/FOBN

Flight Crew Operating Manual (FCOM) and/or Flight Operation Briefing Note (FOBN) provide standard operating procedures and recommendations, covering procedures, limitations and system descriptions. The FCOM and FOBN supplement the approved Flight Manual. They are intended to provide pilots with the necessary data and recommendation to operate the helicopter or a system more efficiently, at an enhanced safety standard.

When published, the FCOM and FOBN should be used as guideline for training standardization.

Flight Type Rating instruction associated to a theoretical instruction with OTDs

a) Initial Type Rating courses

Initial Type Rating (ITR)						
	MET SP or MP IR			MET SP or MP VFR		
	Helicopter only	FFS Helicopter +	FTD Helicopter +	Helicopter only	FFS Helicopter +	FTD Helicopter +
Helicopter	15h	2h	4h	10h30	2h	4h
FFS		15h			10h30	
FTD			14h			10h30
Total PF ⁽¹⁾	15h	17h	18h	10h30	12h30	14h30
Total PF + PM ⁽¹⁾⁽²⁾	17h	23h	26h	12h30	17h	19h

- (1) Skill test excluded
- (2) Only for the MP privilege, the minimum training duration as PM is 2h (in addition to total PF) to reach the MP skill test requirements. When an FSTD is used, it is recommended that trainees attempt several sessions as PF and PM as far as possible

b) Additional Type Rating courses

Additional Type Rating (ATR)						
	MET SP or MP IR			MET SP or MP VFR		
	Helicopter only	FFS Helicopter +	FTD Helicopter +	Helicopter only	FFS Helicopter +	FTD Helicopter +
Helicopter	9h30	2h	4h	7h30	2h	4h
FFS		11h			9h	
FTD			11h			9h
Total PF ⁽¹⁾	9h30	13h	15h	7h30	11h	13h
Total PF + PM ^{(1) (2)}	11h30	20h	22h	9h30	16h	18h

- (1) Skill test excluded
- (2) Only for the MP privilege, the minimum training duration as PM is 2h (in addition to total PF) to reach the MP skill test requirements. When an FSTD is used, it is recommended that trainees attempt several sessions as PF and PM as far as possible

c) Reduced Type Rating courses (according to paragraph 7.1.3)

Reduced Type Rating (RTR)						
	MET SP or MP IR			MET SP or MP VFR		
	Helicopter only	FFS Helicopter +	FTD Helicopter +	Helicopter only	FFS Helicopter +	FTD Helicopter +
Helicopter	8h	2h	4h	6h	2h	4h
FFS		8h			7h30	
FTD			7h			6h
Total PF ⁽¹⁾	8h	10h	11h	6h	9h30	10h
Total PF + PM ^{(1) (2)}	10h	12h	13h	8h00	11h30	12h

- (1) Skill test excluded
- (2) Only for the MP privilege, the minimum training duration as PM is 2h (in addition to total PF) to reach the MP skill test requirements. When an FSTD is used, it is recommended that trainees attempt several sessions as PF and PM as far as possible

Flight Type Rating instruction associated to a theoretical instruction with no use of OTD

a) Initial Type Rating courses

Initial Type Rating (ITR)						
	MET SP or MP IR			MET SP or MP VFR		
	Helicopter only	FFS Helicopter +	FTD Helicopter +	Helicopter only	FFS Helicopter +	FTD Helicopter +
Helicopter	18h	2h	4h	14h	2h	4h
FFS		18h			14h	
FTD			17h			14h
Total PF ⁽¹⁾	18h	20h	21h	14h	16h	18h
Total PF + PM ^{(1) (2)}	20h	28h	29h	16h	24h	26h

- (1) Skill test excluded
- (2) Only for the MP privilege, the minimum training duration as PM is 2h (in addition to total PF) to reach the MP skill test requirements. When an FSTD is used, it is recommended that trainees attempt several sessions as PF and PM as far as possible

b) Additional Typer Rating courses

Additional Type Rating (ATR)						
	MET SP or MP IR			MET SP or MP VFR		
	Helicopter only	FFS + Helicopter	FTD + Helicopter	Helicopter only	FFS + Helicopter	FTD + Helicopter
Helicopter	13h30	2h	4h	11h30	2h	4h
FFS		14h30			12h30	
FTD			14h30			12h30
Total PF ⁽¹⁾	13h30	16h30	18h30	11h30	14h30	16h30
Total PF + PM ⁽¹⁾⁽²⁾	15h30	25h	27h	13h30	23h	25h

- (1) Skill test excluded
- (2) Only for the MP privilege, the minimum training duration as PM is 2h (in addition to total PF) to reach the MP skill test requirements. When an FSTD is used, it is recommended that trainees attempt several sessions as PF and PM as far as possible

c) Reduced Type Rating courses (according to paragraph 7.1.3)

Reduced Type Rating (RTR)						
	MET SP or MP IR			MET SP or MP VFR		
	Helicopter only	FFS + Helicopter	FTD + Helicopter	Helicopter only	FFS + Helicopter	FTD + Helicopter
Helicopter	12h	2h	4h	10h30	2h	4h
FFS		12h30			11h	
FTD			12h			10h30
Total PF ⁽¹⁾	12h	14h30	16h	10h30	13h	14h30
Total PF + PM ⁽¹⁾⁽²⁾	14h	23h	25h	12h30	20h	22h

- (1) Skill test excluded
- (2) Only for the MP privilege, the minimum training duration as PM is 2h (in addition to total PF) to reach the MP skill test requirements. When an FSTD is used, it is recommended that trainees attempt several sessions as PF and PM as far as possible

d) Extension of Privileges:

For any extension of privilege detailed in following tables:

- FSTD means FFS C/D or FTD 6/7

- Any other breakdown between FSTD and HEL is acceptable, according to the ANAC regulations and provided that the total amount of hours complies with the recommended duration.

- The skill test is always required. Following durations do not include the skill test, which may be performed either in an FFS C/D or in-flight.

VFR Extension SP to MP or MP to SP		
	Helicopter only	FSTD and Helicopter
FSTD		1h30
Helicopter	3h00	1h30
Total PF	3h00	3h00
Recommended Total PF + PM ⁽¹⁾	4h30	4h30

⁽¹⁾ For MP extension only, minimum training duration of 1h30 as PM to reach the MP skill test requirements

Extension SP VFR to SP IR		
	Helicopter only	FSTD ⁽¹⁾ and Helicopter
FSTD ⁽¹⁾		4h00 ⁽²⁾
Helicopter	4h00	(2)
Total PF	4h00	4h00

⁽¹⁾ FSTD: only when qualified in Helionix Step 3.2 configuration or above

⁽²⁾ When the FSTD is not qualified in Helionix Step 3.2 configuration, a minimum of one session in flight on an h/c in Step 3.2 is recommended

Extension MP VFR to MP IR		
	Helicopter only	FSTD and Helicopter
FSTD		4h00
Helicopter	4h00	
Total PF	4h00	4h00
Recommended Total PF + PM ⁽¹⁾	6h00	6h00

⁽¹⁾ Minimum training duration of 1h30 as PM to reach the MP IR skill test requirements

IR Extension SP to MP		
	Helicopter only	FSTD and Helicopter
FSTD		1h30
Helicopter	2h00	2h00
Total PF	2h00	3h30
Recommended Total PF + PM ⁽¹⁾	4h00	5h00

(1) Minimum training duration of 1h30 as PM to reach the MP skill test requirements

IR Extension MP to SP ⁽¹⁾		
	Helicopter only	FSTD ⁽²⁾ and Helicopter
FSTD ⁽²⁾		3h00 ⁽¹⁾
Helicopter	5h00 ⁽¹⁾	2h00
Total PF	5h00	5h00

(1) This last extension is sized for pilots already qualified MP IR only. When the applicant is also already SP (VFR) qualified on the type, the training program can be reduced up to a final total PF of 2h00 in helicopter only, or 3h00 in FSTD and helicopter.

(2) The complete MP to SP extension on FSTD is possible only when the FSTD is qualified in Helionix Step 3.2 configuration or above

7.2.4 Recommendation for SP IFR Training

For any SP IFR training (Initial or Additional Type Rating or extension), following principles should apply:

- The theoretical part of training or familiarization should cover:
 - Information and procedures detailed in the FLM SUP-6 (SP IFR), especially related to FND management in IMC
 - SOPs (normal and emergency procedure, use of check-lists)
 - Cockpit organization
 - Management of emergency situation, including reconfiguration philosophy and relevant CRM features

- For the practical part of the training:
 - The h/c used for training flights must be equipped with Mod 99A05684 as mentioned before in paragraph 2.4 – Purpose
 - For pilots not already qualified SP (VFR) on the type, at least one session about abnormal procedures (take-off and landing on various profiles)
 - Flights in IFR (FSTD and/or aircraft) in order to train the pilot in application of standard procedures, workload management, communication, etc.

7.3 Familiarization Training

EC175B Helionix Step3: to convert from EC175B Helionix previous configuration to Helionix Step3 configuration, familiarization training is recommended (result of the ODR table analysis), as follows:

- Following subjects can be taught through self-instruction:
 - Limitations (Displays, warnings);
 - Performance (with EAPS when installed);
 - Warning Panel & Master List;
 - AFCS;
 - Normal and abnormal operations:
 - Air conditioning;
 - AFCS;
 - Declutch mode.
- Following subjects should be taught through aided instruction:
 - Flight Displays;
 - VMS;
 - Normal and abnormal operations:
 - Engine
 - Navigation system.

EC175B Helionix Step3.2: to convert from EC175B Helionix previous configuration to Helionix Step3.2 configuration, familiarization training is recommended (result of the ODR table analysis), as follows:

- Following subjects can be taught through self-instruction:
 - Master list improvement
 - VMS
- Following subjects should be taught through aided instruction:
 - Flight displays, especially:
 - New law of automatic reconfiguration of MFDs in case of failures of 1 or several MFDs
 - Configurable DH audio alert (highest DH or lowest DH)
 - AFCS, especially:
 - Improvement of NR management under OEI conditions 4 axis
 - Restoration of MCP power limitation just after EPC
 - New alerting message for override detection

7.4 Training Area of Special Emphasis (TASE)

The following recommendations and procedures should receive special attention during initial and recurrent training.

For detailed evaluation of EC175 cockpit interface and HMI, refer to Appendix 1, HMI concepts which provides additional recommendations for operations and training of the EC175. For a better understanding, TASEs description are listed by domain, following the same structure than the Appendix 1.

Helionix family aircraft are fitted with many safety equipment and highly integrated systems (TCAS, HTAWS, Weather radar, Digital Map, FMS...) that could lead aircrews to allocate too much attention to the displays inside the cockpit and be confident that doing so is now possible thanks to the aircraft high level of safety. Instructors shall remind the trainees all the basic safety concerns, in particular: CFIT, midair collision and deteriorated visual environment risks that remain the main killers in the aeronautical community.

The EC175 helicopter is a highly automated aircraft and training should be specifically designed to ensure that pilots master all features, automations of the avionics.

The EC 175 can be operated single pilot or multi pilot, so due to its high level of automation, CRM should be reinforced to cover both operational issues.

This leads to two separated but connected issues:

- Understanding how to use automation, hidden protections and aircraft projects of action, and
- For all AFCS failures, the ability to identify remaining system capabilities.

Initial training and recurrent training are the major effective mitigation actions for these issues. Automation and its integration with all the helicopter's systems should be taught in a comprehensive and global approach, rather than treating it as a separate subject.

Training providers should ensure that pilots completing training courses for highly automated aircraft have a detailed operational knowledge of the automatic flight systems and have demonstrated competence in their use.

7.4.1 Cockpit Settings and Helicopter Handling

Pilot seat height: as stated in the RFM section 4, adjust height to have a tangential view above instrument panel sunshield, in order to maintain the landing area in sight, on short final.

Controls centering on ground: A 2 cm left pedal on ground allows having neutral yaw thus on ground especially necessary for rotor start up and shut down phases. For that purpose, the AFCS automatic centering make the cyclic stick but also the yaw pedal control moving to neutral position.

Collective pitch friction: The collective stick position is normally changed by pressing the trigger. Nevertheless, if needed, the collective axis can be moved without pressing the trigger but with an increased friction force.

Taxiing: Yaw pedals input tend to roll the helicopter in the opposite way, compensate roll effect with cyclic.

Take Off: At transition lift, increase collective pitch up to MTOP, in order to comply with the trajectory.

Landing: The main landing gear touches the ground before the nose wheel. Consequently, if collective pitch is decreased too fast after main L/G touch down, a nose down effect may occur. Do not act against this effect by aft cyclic

but by maintaining neutral cyclic position while decreasing more slowly the collective pitch during the phase.

Nose-up attitude must not exceed 10° near ground level to prevent tail rotor guard from striking the ground (12°).

7.4.2 Operations and training

a) AFCS

Use and understanding of AFCS is one of the key features of the EC 175. Training objectives shall comply with good practices described in section 4.10, 7.13 and 9.6 of RFM.

An accurate AFCS tend to decrease crew awareness. Particular crew management is required: PF closely monitors primary flight and AFCS status.

Hands on mode means that the pilot must be close to the flight control and make any necessary adjustment to keep the flight path:

- Basic stabilization with any AP or BKUP SAS is considered hands-on.
- AP1 or AP2 performances are similar.
- ATT (nominal AP stabilization mode) offers long-term stabilization.
- DSAS (degraded AP stabilization mode) or BKUP SAS offer short-term stabilization and require closer pilot attention.

AFCS protections, which allow a high level of safety in the trajectory management, need to be fully demonstrated in order to emphasize the notion of hidden project.

Demonstrate how to leave unusual position in flight, above and below 30 kt: double click on recovery button, stress on the level off flight, GA button stress on reversion to V/S and IAS.

A highlight of specific AFCS upper modes should be done on novelty such as: GTC, GTCH, TRK, etc.

b) Power indicating system

- NR vary according IAS, Altitude or Height variation, so to avoid MCP exceedance during climb or fly over mountain, set the power to RMCP on FLI.

c) Engine Governing

Declutch mode

- During start-up with de-clutch mode, pay attention of main rotor blades location to prevent damage on blades with exhaust gases of the left engine. Refer to SUP.13 of RFM.

Engine Failure

- In case of power loss of one engine, set the power on blue safety pitch symbol in the FLI, in order to keep the current flight path.

d) Fuel system

- Fuel transfer logic makes center of gravity computation easier. However, a special attention should be taken on CG, particularly with high fuel quantity.
- An estimated fuel quantity is given to the flight crew in case of degraded gauging.

e) Part Time Display – Master List

- Master list: Except for engine start up, FND present all normal and critical data requested to fly. Especially any abnormal event is raised through the FND Master List or the dedicated alert in the corresponding area. Pilot has to rely on this Master list as primary alert and thus it is not necessary to monitor VMS page during normal operation. VMS allows getting precise vehicle data following FND event. NUM button clutters the display and then could be used temporarily.
- Optimized configuration for flying is then FND and second display adapted to the flight phase, thus not necessarily a VMS page. Except FND format, all other MFD can then be changed at discretion during the flight. NUM button clutters the display and then should be used temporarily.

f) Clearance test

- Emphasize the clearance test which is performed following 4 different steps before the flight.

7.5 Special Events Training

Special events training to improve basic crew understanding and confidence regarding aircraft handling qualities, options and procedures as these relate to design characteristics and limitations may include the following:

- Recovery from unusual attitudes;

- Manual flight with minimum use of automation, including flight under degraded levels of automation;
- Handling qualities and procedures during recovery from an upset condition with AFCS and degraded modes
- Controlled Flight Into Terrain (CFIT), TCAS, HTAWS (emphasis on avoidance and escape maneuvers, altitude awareness, TCAS/HTAWS warnings, situational awareness and crew co-ordination, as appropriate).

For those special events training, FSTDs are strongly recommended.

7.6 Multi Engine Consolidation

Pilots from a single engine background need to develop skills and competence in operating a multi-engine helicopter. A specific module should be integrated in training to provide trainees with additional multi-engine consolidation training:

- PC1 and PC2 normal procedures
- OEI during take-off and landing
- OEI scenarios in the cruise
- Engine shutdown and re-start
- Entry into autorotation

Multi Engine Consolidation – Specific Training		
	Theoretical	OTD
Recommended Duration	1h	3h

7.7 Transition to Digital Cockpit

The switch from an analogue cockpit to a glass/digital cockpit with last generation of AFCS and the Helionix avionics suite will represent a challenge and imply specific training requirements. To support the acquisition of the identified skills linked to the effective use of such systems, training should be adapted with additional sessions to consolidate:

- “Hands-off” piloting into flying maneuvers that are performed “hands-on” on other helicopter types

- Scanning techniques and situational awareness adapted to digital display design and multiple information versus analogue cockpits
- Crew workload assessment to tackle the risk for a pilot to be overwhelmed by the availability of data and information

Transition to Digital Cockpit – Specific Training		
	Theoretical	OTD
Module Description	1h	8h

7.8 Specific Trainings

7.8.1 Practical Training – Conversion to Role

Conversion to Role consists of stand-alone modules that train the knowledge, skills and attitudes required for individual aircraft roles. Using a modularized approach to CTR allows maximum flexibility for companies to target skills appropriate to their needs.

Conversions to role and mission phases are essential for a safe and efficient entry into service of flight crew. Indications on role training module content are given below.

For each following Role Training module, the “Previous experience” should be defined by the training organization.

Appropriate training duration are to be adapted by operators and training organization to comply with applicable regulation and pilots competence-based requirements.

7.8.2 Offshore module – Role Training

Training objectives:

- Stabilized approaches to a rig
- Rig operating procedures, AFCS modes
- Take-offs and landings to stable and moving rig decks
- Rig instrument approaches utilizing the FMS, GPS and weather radar
- Management of emergencies when operating to a rig and platform (Ditching)

7.8.3 Performance Class 1 Advanced Techniques – Role Training

Training objectives:

- PC1 techniques and procedures from a clear area, confined area and elevated helipad
- Vertical approach techniques
- OEI during PC1 operations
- PC1 techniques during night take-offs and landings

7.8.4 SAR Technique module – Role Training

Training objectives:

- SAR techniques and procedures
- Crew coordination
- Search patterns, AFCS modes
- Workload management and optimization of automation
- Night search techniques
- Management of emergencies during SAR

7.8.5 Hoisting module – Role Training

Training objectives:

- Hoist operation and limitations
- Crew coordination during a hoist
- Maintaining an OGE hover manually and using automation
- Hoisting from a vessel techniques
- Night hoist technique
- Management of hoisting emergencies

7.8.6 External Loads module – Role Training

Training objectives:

- External load techniques and procedures
- Crew coordination

- Flying with an external load
- Use of automation
- Management of emergencies during external load operations

7.9 Training Means

7.9.1 Considerations on Distance Learning (DL)

Distance learning concept allows additional value and progressive discovery of the helicopter and the main technical and operational concepts which underline its design. Training providers should design their distance learning modules focusing on general presentation of helicopter and systems. The intended benefit is to allow self-pace training during this phase. To increase trainee motivation, a limited part of distance learning can be presented as a serious game.

In any case, it is recommended to take advantage of visualization, interactivity and repetition to ensure a deep anchorage of core knowledge.

7.9.2 Instructor Led Training (ILT)

Based on experience and charisma of instructors, traditional classroom training remains one of the most affordable and efficient pedagogical approach. It is one of the key elements for theoretical training. ATOs will pay attention to instructor deep knowledge of the helicopter systems and behavior. Trainees most benefit from classroom presentations with exchanges and discussions with the instructor. It enhances comprehension and understanding of systems and avionic logic.

However, GAA recommends supplementing Instructor Lead Training with other Theoretical Training approaches that will tackle the need for trainees to interact with systems.

7.9.3 Computer Based Training (CBT)

Deployable or On-Site, Computer Base Training is a pedagogical approach that aims at putting the trainee in situation to interact with the helicopter system. Based on avionic emulators that can be very realistic and include a basic flight loop, CBT will guide the trainee from discovering avionic design to using basic and complex functions and modes to get familiar with their use.

EC175 is a highly automated helicopter and requires a deep understanding of its AFCS and Avionic suite. CBT is an effective way to consolidate knowledge prior to practical training and thus allows better effectiveness of flight and simulator training time.

7.9.4 Other Training Devices (OTD)

About the fully integrated avionic of the EC175 and its high level of automation, trainees should be given the opportunity to get familiar to the avionic general concept and philosophy and its standard use. Devices of different level of fidelity and accreditation can be used for this purpose and Airbus Helicopters highly recommends their integration in any training plan. Training organisations should provide elements to develop required job skill in a simulated, job specific environment. Training programmes should allow a progressive immersion of trainees in the aircraft avionic system from the beginning of theoretical phase to the end of in-flight training. OTDs enable development of such skills without risk to aircraft or personnel and reduce cost to conduct each flying sequence.

Integration of an OTD in a training plan is highly encouraged by Airbus Helicopters in dedicated instructor lead sessions during the theoretical training phase. However, such a device should also be kept accessible to trainees to support individual consolidation of knowledge.

The following points should be considered:

Technical aspect:

- Type Specific cockpit layout with switches and controls in a spatially correct position.
- Avionic and system integration should be representative of EC175 avionic.
- Subsystems, control panels, instruments and switches can be actuals or graphically simulated with interactive touch panels.
- Helicopter systems must be operative for flight and ground conditions. Simulated systems should be fully integrated to ensure correct interaction, especially between FMS, AFCS, flight instrument displays.
- Warning and caution system must be representative and fully integrated.

Flight Loop:

- The device should be capable of aircraft performance and should be representative to all AFCS upper modes.

Operating System:

- Environment should be realistic and capable of different set of conditions, in flight and on ground.

Other recommendations:

- Specific operator customization can be included
- The competent Authority approving the Training Organization should review the device for suitability to complete the customer specific training programme.
- If the training device used is not certified to a specific FSTD standard, the training organization operating the device should have a Quality Assurance Programme in place to cover, at least, the following training device aspects:
 - Recording, monitoring and rectification of failures and discrepancies;
 - Failure analysis and reliability figures;
 - Link with the aircraft manufacturer to ensure the device continuously reflects the real aircraft;
 - Link with the training device manufacturer for the incorporation of updates and modifications;
 - Configuration control processes to ensure adequate tracking and recording of software and hardware modifications;
 - Resources and personnel training to support its operation.

Mixed Devices Management

As a result, according to the simulation capabilities, different kinds of OTD could be considered as follows:

- OTDs that are dedicated to HMI training of a single instrument or display e.g. FMS emulation tool.
- OTDs that replicate interaction between instruments and automated systems. They can be a simple generic fixed base instrument panel, or a desktop trainer, that may allow or not multi-pilots techniques training.
- OTDs that consist of a simple fixed-base cockpit which simulates most aircraft systems interacting with each other, and may have sticks or not. (e.g. cockpit with touch screens panels).

Mixing devices qualified at different level in the same training course should be clearly planned and training objectives dedicated to each training device should be specified.

In such configuration, one device, if unavailable, should be replaced by a device of equivalent or higher level of fidelity (e.g. An FTD unavailable should be replaced by an FFS or the real helicopter).

7.10 Recurrent Training

Recurrent training must be compliant with aircrew and air operations, as applicable, and include the identified Training Areas of Special Emphasis.

Operators should establish an approved recurrent training and checking programme that is relevant to the aircraft variant flown and its intended operation.

The requirements for a recurrent training programme may vary with several factors which have a significant influence. Some of these factors are: actual exposure of the flight crew member(s), specific routes and aerodromes (heliport, helidecks etc...) used by the operator and new developments in technology. These factors and/or a combination thereof will determine the required recurrent training.

The applicable requirements established in ANAC regulations for civil aviation aircrew and air operations should be considered as a minimum and expanded, as appropriate, for pilots who have had only limited exposure and/or who do no longer fulfil the currency requirements.

Recurrent training should incorporate special events training as described in this report, on a rotational basis.

EC175B Helionix Step3:

Currency is common to both EC175B Helionix configurations. It is recommended to review specific knowledge on following items through pilot's self-reviews.

- Limitations (Displays, warning)
- Performance (with EAPS when installed)
- AFCS

7.11 Recurrent Checking

Checking must be performed in accordance with applicable ANAC regulations for civil aviation aircrew and air operations.

Recurrent checking should incorporate Training Area of Special Emphasis as described in this report, on a rotational basis.

EC175B Helionix Step3 and Step3.2:

When coming from the previous Helionix configuration (Step2+ or Step3) to the Step3.2 configuration, no specific check related to differences is required. Knowledge of the helicopter configuration remains the pilot's responsibility.

7.12 Line flying under supervision (LIFUS) / Supervised

Operating Experience (SOE)

There is a variety of reasons why the GAA may recommend LIFUS. One or more of the reasons described below may apply:

- a. Introduction of new aircraft types or variants;
- b. Introduction of new systems (e.g., FMS, ECL, TCAS, HUD);
- c. Introduction of new operation (e.g. oceanic, polar or ETOPS operations);
- d. Experience for a particular crew position (e.g. PIC, SIC);
- e. Post qualification skill refinement (e.g. refining alternate or multiple ways to use particular equipment to increase operating efficiency, operating flexibility, or convenience); or
- f. Special characteristics (e.g. mountainous areas, unusual or adverse weather, special air traffic control procedures, non-standard runway surfaces and dimensions, etc.).

In the case of a type rating course the Operator should conduct Line Flying under supervision as required, followed by a line check on type.

Where there is a change of operating conditions or route structure this should also be taken into account and may need the addition of route sectors to cover these elements.

NOTE: Although similar to the item 121.434 from RBAC 121, nowadays LIFUS is not foreseen in Brazilian regulations. However, the GAA found technically relevant that these items should be accomplished by the pilot after the regular training, as defined by EASA.

8 Compliance to RBAC 91 and 135

The manufacturer did not provide compliance checklists with RBAC 91 and RBAC 135.

9 Technical Publications

9.1 Master Minimum Equipment List – MMEL

Brazilian operators shall use the MMEL approved by EASA as a basis for developing their MEL.

9.2 Flight Manual – FLM

Brazilian operators shall use the FLM approved by GGCP/SAR as a basis for developing their Operator Helicopter Operations Manual.

Appendix 1
EC 175 HMI CONCEPTS

Synthesis of Human Factor substantiation for operating instruction and training purpose

All data in this annex just provide additional recommendations for operating instruction and training purpose issued from flight test experience (development and certification ground and flight tests) and Human factor analysis.

For evaluation of HMI, reference is done to the most recent variants of Airbus Helicopters range like Super Puma EC225 and Dauphin EC155 in what regards novel aspects and human factors aspects.

The EC175 is the most advanced helicopter in terms of HMI concept in the Airbus helicopter fleet.

1. Fly the rotorcraft

1.1 AFCS

In order to alleviate the flying task, EC175 is permanently piloted through a four axis AFCS offering a basic stabilization mode and upper modes:

- The basic stabilization of the AFCS is performed through modes that are engaged by default by the system once it is initialized and without additional action of the flight crew.
- The upper modes are selected (coupled or armed) by the flight crew through the dedicated control of the Auto Pilot Control Panel. Specific modes are provided (GTC, TRK, FPA).
- In case of disconnection (respectively disarmament), specific aural alerts are triggered.

EC 175 must not be flown without any stabilization and it has been demonstrated that it is extremely improbable to lose in flight both AP and SAS:

- Protection over basic stabilization disengagement is insured thanks to the double action that is required to disengage SAS using the dedicated control of the cyclic grip. The first action on that control disengages ongoing AP upper mode, hence the remaining SAS allows piloting, and then the pilot can reengage an upper mode through AP control panel.

Untimely disengagement of the basic stabilization is signaled in FND through the AFCS strip symbols and an aural alert. To recover, the pilot has to reengage SAS mode through recovery push button on the cyclic grip.

Navigation sources selection and coupling to AFCS are performed by the flight crew through dedicated MFD keys (one key to manage the selection, one other key to manage coupling) available on both FND and NAVD.

A dedicated VMS sub-format provides a synoptic view of AFCS systems. This synoptic view eases the normal monitoring of the AFCS, as well as information gathering in case of emergency procedures.

A specific message AFCS OVERRIDE in the AFCS strip has been added to alert the crew about an overriding of the upper modes by the PF. The good use of AFCS is to let the system fly as soon as upper modes are coupled. In case of AFCS override, a call should be done.

1.2 Automatic reconfiguration

Novel aspects

The H/C system (i.e. Flight Monitoring Function / Primary sensors management) will perform an automatic reconfiguration of primary sensors in case of:

- Localized discrepancy between sensors or channels
- Failure or degradation of a sensor or a channel

As this novel feature is fully integrated within the overall concept of alerting, the flight crew is made aware of the reconfiguration and of the resulting system status. Nevertheless, due to the high level of redundancy, possibly automatic reconfiguration is not signaled to the flight crew because the level of redundancy requested for the current flight or the next take off is still granted.

Tasks and responsibility of the flight crew are modified because the system is partially responsible of the reconfiguration task, as the flight crew has to cope manually with any unsolved discrepancy.

The notion of operational source corresponds to one sensor associated to a computed channel that allows displaying related information to crewmembers. The automatic reconfiguration role is to ensure the continuous availability of the sources in case of localized discrepancy between sources and in case of failure of source.

The crew is notified about the automatic reconfiguration of a source (e.g. ATT1, HDG2) when only one operational sensor (e.g. APIRS1) remains or when both operational computed channels linked to one sensor have failed (e.g. AHRS), because in that case the next failure will lead to use the IESI. The number of events before notification depends therefore on the redundancy of the

sensors and the number of computed channel. This logic does not apply to IESI, the failure of which is signaled independently.

- Indications displayed in FND
 - The notification about the automatic reconfiguration is done through master list messages.
 - Caution for the total loss of a source and caution for unsolved discrepancy are presented directly through the related indicator.
- Indications displayed in VMS

The reconfiguration page is dedicated to the reconfiguration of the primary sources: Attitude, Altitude and IAS, magnetic heading. It presents the resulting system status after an automatic or a manual reconfiguration and allows the pilots to reconfigure manually among available sources.

Human Factor aspects

- Actions necessary to reach an intended goal

Regarding actions necessary to reach an intended goal, automatic reconfiguration aims at decreasing the amount of tasks linked to sources reconfiguration and limiting crew action to the monitoring of the automatisms.

Compared to previous design, the flight crew has to get to the reconfiguration page in order to reconfigure manually.

- Feedback

As in previous design, EC175 reconfiguration concept is based on a gathered presentation of information necessary to monitor the configuration of the sources in FND. This encompasses the behavior of the automatic reconfiguration, manual reconfiguration need and the current functional status of the sources.

In addition, the principle that consists in gathering information and controls dedicated to a function is reinforced for detailed information presentation. Detailed information is available on reconfiguration and system pages to support crew comprehension of the result of automatic reconfiguration and the current functional status of the sources. The reconfiguration page also allows crewmembers to perform manual reconfiguration and to see directly the result of the action on the H/C system.

- Integration aspects

- After an automatic reconfiguration, the on-going task can be pursued without an immediate interruption, because the system is functioning properly with the remaining sources. In that case, the automatic reconfiguration is able to alleviate the level of workload.
- In case of unsolved discrepancy, the flight crew may choose to interrupt or not the on-going task in order to manage the unsolved discrepancy. Compared to previous design, the access to related controls is no more direct; the flight crew has to get to the reconfiguration page. Here a little delay is introduced by the new design. This is acceptable because manual reconfiguration becomes remote.

1.3 Power Indicating system

Novel aspects

NR/N2 indicator is integrated in MFD as a dedicated symbol:

- In FND as a partial scale indicator
- Complementary indicator (full scale) in VMS display

This novel design feature is part of an overall concept where power indications are grouped inside FND (NR/ N2 indicator plus FLI) and associated with audio alerting.

In FND, NR/N2 indicator is located above the FLI scale, in that way power indications are grouped inside FND. This layout is of importance in case of exceeding of NR limits. Visual alerting cues are displayed for NR high and low limits (i.e. amber or red filled arcs and reverse video of numerical value). Complementary visual alerting cues are displayed in FLI (i.e. amber or red flashing chevrons), indicating the action to be achieved on the collective grip (upward vs. downward). In addition, for red limits of NR, specific audio alerts are generated, indicating as well the way to handle the collective grip.

Visual alerting cues are displayed for N2 high and low limits (i.e. amber or red needles and arcs. Inverse video of numerical values are displayed in VMS page only).

In case of NR sensor loss, an ESTIMATED NR message appears in the master list. Training should highlight that in case of autorotation, the NR value is no more valid in case of NR and N2 split.

The NR law induce some variation following IAS, Altitude or height variation. Especially, in case of climb at MCP, the NR increase makes torque to increase and then MCP could be exceeded if the collective pitch is not decreased. For

that purpose, a reference in the FLI scale is indicated in order to be able to climb or fly over mountain area and permit the NR to change without exceeding MCP.

Human Factor aspects

- Perception and mnemonic load

Regarding perception and mnemonic load, this design do not introduces specific issues as it follows HMI design conventions for EC175:

- Normal operating ranges are not marked with green arcs (application of dark cockpit concept).
- Precautionary operating ranges are marked with amber arcs associated to numerical values displayed using reverse video color coding (black text over amber background).
- Maximum/minimum operating ranges are marked with red arcs associated to numerical values displayed using reverse video color coding (white text over red background).
- The respective arcs are displayed “empty” (i.e. only with the outline and no filling color) when the current monitored value is out of the precautionary or Min/Max areas; then the arc is filled once the indicating needle has entered the corresponding area.
- As usual in FND after a failure (input data failure), only the frame of the indicator remains displayed in amber, values and limits are not displayed.

- Feedback

Considering the feedback, compared to a conventional NR/N2 indicator, there is no additional time delay between the action on collective and the display of the NR value, and the resulting range after a corrective action is clearly stated.

- Integration aspects

There is no tasks linked to the use of FLI (FND) and the parameters relating to engines (TQ, TOT and N1 displayed in VMS main), which are the other power indicators used in the same sequence of time than the NR/N2 indicator, that can be modified (extended time of use or workload) by the presence of NR/N2 indicator. Quite the reverse, a significant and positive difference from

previous design is the fact that engines and NR indicators are displayed on the same formats (FND and VMS main), as such this layout is intended to ease information gathering, because there is no need to glance out of a given screen.

1.4 Engine Governing

Overview

- FADEC failures ENG X TALK, FADEC FAIL and PWR SPLIT should be particularly studied. These procedures deal with events which can cause engines misalignments. Due to the part time display a particular HMI has been developed in the FLI and the master list. This HMI permits to revert to OEI as soon as misalignment is no more acceptable.
- A specific rotor Rpm variation is done for noise reduction purpose while maintaining the full performance capability. The system automatically change the N2 governed value depending on IAS, Height, Altitude and Temperature. The law is described in the FLM EC 175.
- Due to rotor Rpm change, the power can change while FLI position stays steady. A collective pitch symbol has been added in the FLI (RMCP) in order to be able to position the FLI pitch at low altitude and avoid exceeding limitation while the Rpm is increasing during climb or non-flat ground.
- A white symbol in the FLI has been added for the pilot to detected pitch of rotor de-synchronization from the free turbine. Below this pitch the torque is around zero and the rotor Rpm increase.
- A blue line in the FLI (safety pitch) gives the information of the pitch which permits to continue the flight path in case of power loss of one engine.
- Declutch mode is an option that allows to start the engine driving only the accessory box without the rotor. Then electrical power, hydraulic power and heating/ air conditioning are available. In order to avoid any damage, the declutch/clutch LSK is available only when conditions to execute perform a declutch are met. All limitations and HMI related to that mode should be demonstrated.

Engine Failure

- The EC 175 is equipped with very powerful engines and gear box. Inside an important flight envelope, torque is the only limitation in case of engine failure.

- The Audio triple gong linked to the engine power loss is the primary cue for the pilot to detect an engine failure. It is the reason why this audio is triggered on ground during engine start in order to accustom the pilot to recognize this critical sound.
- As soon as an engine failure occur, the pilot is also helped by a low Rpm audio and the engine topping which allows to drive the low Rpm while looking at more critical parameters such as altitude and IAS.

After gain airspeed and when Vtoss is reached and the climb phase begins, the pilot can reduce the pitch to maintain OEI Hi limitation while increasing Nr to 100%. Then OEI Lo' can be selected and a standard OEI CT second segment climb can be followed thanks to the FND.

It is important to highlight the fact that at constant torque the power given to the rotor and the performance of the helicopter decrease when the NR decrease. It is the reason why during second segment, rotor Rpm target is 100% which is above NR low RPM audio.

Training mode

The training mode allows safer and more realistic training of OEI situations in the helicopter (clear area or runway is highly recommended to perform such exercises). However, synthetic device shall be preferred for OEI training procedures.

- The training to simulated engine failure can be divided in two parts:
 - An emergency phase including the recognition of an engine failure and the handling of the helicopter trajectory during the transient phase up to the stabilized flight attitude. To be consistent with the part time display concept, it will be recommended to start the engine failure training with VMS not displayed during this first phase.
 - A stabilized phase consisting in the follow-up procedure in stabilized flight attitude, when the crew can perform the diagnosis of the engine failure.
- In training mode all red warning are replaced by green information in order to be able to detect and react quickly in case a real failure occurs.
- The power available in training mode is the same as with a real engine failure. Both engines deliver half the power which is computed by FADEC and supposed to be the one that FADEC would deliver in case of real power loss. It means that in case of real engine failure in training, the

power delivered would be the same. In order to give safety margin, the training session is done with a performance weight decreased by 300 kg compared to real OEI.

- As soon as the training switch is engaged manually, in the FND the FLI present OEI limits, the T symbol is displayed and the Training mode message is displayed in the master list. All other information in the FND is real cues. In the VMS the biased information are the analogue Torque, N1 and TOT as well as the inverse video which is coherent of the needle position. All limitations are also removed on the simulated failed engine. The numerical values are all real and all other parameters in the VMS page are real.
- Several safety devices are available to increase safety. It is developed in the SUP 3 of the EC 175 FLM.

For example, training is automatically disabled when any of the following conditions are met on either engine:

- OEI condition is detected
- Request to disable training is received
- Engine crosstalk fault is detected
- A major or critical fault is set on either engine or EECU
- One engine is not in FLIGHT mode
- Appropriate low Nr detection

1.5 Performance

- The blue safety pitch symbol in the FLI helps to know the OEI margin. This symbol identifies the pitch value to keep the current flight path (hover, descent ...). It is calculated according to the OEI power: above 70kt, it refers to OEI 2 minutes, under 70kt, it refers to OEI 30 seconds.

1.6 Maneuverability

- A limit warning with gong is triggered to protect the EC 175 from excessive g-load maneuver and particularly at high altitude. It is to be noted that generally there is a vibration increase and that the consequence is mainly an impact on life limit of helicopter parts in case of prolonged periods of flight in such condition.

2. Managing systems of the rotorcraft

2.1 Part time display

Novel aspects

As a set of vehicle parameters (i.e. parameters for power plant, rotor drives, hydro mechanical and electrical systems) supposed to be monitored regularly are displayed part time on VMS, EC175 cockpit provides to flight crew compensating factors, i.e. compensating display and compensating monitoring for parameters subject to part time display.

It consists in permanent presentation of synthetic indications in FND (FLI, NR/N2, and Fuel Quantity), and in presentation of alerting messages within the master list, which is also permanently displayed in the FND. Alerting messages are displayed in the master list after the monitoring system of vehicle parameters has detected a significant event, including a novel trend monitoring regarding the significant behavior of a vehicle parameter inside its normal operating range. Those alerting messages are warning, caution and, a novel type of advisory for advance notice in normal operating range.

The detection of an undesired event, regarding part time displayed vehicle parameters, is now a primary responsibility of the system when VMS is not displayed. This task is shared with the flight crew if VMS is displayed. In the first case, which is the basic concept, flight crew's task to monitor vehicle parameter is therefore modified. The flight crew will monitor full time displayed indicators and alerts. The efficiency of the concept depends on the fact that full time displayed information is understandable by the flight crew without referring to the VMS.

The crew has the possibility to check at each moment, but especially after a message has been triggered on the FND format master list, the part time displayed parameter on the VMS page. In order to ease localization of the parameter for which a significant behavior has been, corresponding numerical value is highlighted.

Human Factor aspects

- Perception and mnemonic load

The novel item that relates to the monitoring within the normal operating range is considered as an advisory condition. To distinguish this message from abnormal conditions, the associated message in the master list is displayed in white. In the VMS the reverse video design convention is used in order to indicate which parameter is associated to the message displayed in the master list. The white color is therefore used for background of the numerical value.

- Intrinsic vulnerabilities

In order to avoid masking of primary information displayed in FND, the following procedure will be applied:

- On a crew station occupied by a pilot, if only one screen is operative it is configured with FND page.
- The pilot is authorized to consult shortly other pages.

2.2 Master list

Novel aspects

Design of alerts so far based on flight crew's interpretation of discrete lights will be now based on avionic system synthesis, which result is explicit messages (i.e. indications at warning, caution, advisory and system message levels), displayed in FND (Master list area). This novel design feature is part of an overall concept of alerting, including aural alerting, and where the FND is the primary display to present alerting annunciations.

This design induced a new kind of interaction between the flight crew and the alerting system, linked to location of related indications in FND, use of messages, scrolling mode and automatism implemented to manage presentation of messages.

The master list is a permanently displayed and dedicated area of the FND where each non-normal rotorcraft system conditions and annunciations are displayed as a dedicated message. In association with aural alerts and the warning panel, the master list is one of the main primary alerting cues. The location of the master list within the FND, itself installed within the primary field of view of each pilot, aims at insuring the visibility of the alerting cues and the readability of the messages.

In the master list area, the list of messages for not-acknowledged alerting items, if any, is displayed instead of the list of messages for acknowledged alerting items.

Master alerting cues consist of HMI means to highlight the master list where messages are displayed and the messages themselves such as inverse video, blinking, boxing. After acknowledgement, those master alerting cues are removed. Only the messages that are effectively visible on the MFD are considered as acknowledgeable. After acknowledgement, the alerting items are sorted and displayed within the list of acknowledged alerting items. To avoid untimely acknowledgement of the master list, acknowledgement is inhibited if a

non-acknowledgeable aural display (not linked to the master list) is being played.

The messages in the master list are sorted from top to bottom according to the category of the alerting item (i.e. warnings, then cautions, then advisories, then information messages), and its rank in the allocation table.

Concatenation logic is managed by the system in order to alleviate the number of messages. Hence, two or more messages can be replaced by one message.

Scrolling of the list is possible when acknowledged alerting items are displayed. In that case, specific indications are presented within the master list area, and by default, the rotary knob is assigned to scrolling. After a time delay without any scrolling action, the message corresponding to the first alerting item is displayed on top of the master list area.

Functionality allows the crew to recall temporarily the previous set of not acknowledged alerting items (i.e. Alerting items that were untimely acknowledged by the crew and/or alerting items that became inactive before being acknowledged by the crew).

Human Factor aspects

- Perception and mnemonic load

Regarding perception and mnemonic load, this design has introduced specific issues for the design concerning:

- The influence of the layout and the vocabulary of the messages on data reading.
- The influence of the logic of concatenation of the messages on the comprehension of the system status.

- Feedback

Considering the feedback, the design introduces tasks for the management of the master list. The design is foreseen so that the response time between acknowledgement, as well as scrolling actuation, and updating of the display is adequate with flight crew's expectation.

- Integration aspects

- Due to the integration of the master list, the density of information in the FND is increased. Behind this, there is a rationale in order to

provide to the flight crew a single location for primary information, including a consistent gathering of all alerting information.

- VMS pages are not redundant with the master list. The master list is the reference to determine the severity of the alert(s). As in previous designs, vehicle indicators present complementary information in order to help the crewmembers to make a diagnosis upon the situation as far as the vehicle system is concerned by the alert(s).
- Routine monitoring is compatible with the other possible tasks (i.e. to fly, navigate, communicate), because alerting information is part of the primary data displayed in FND. Then, there is no specific effort linked to a check of the master list when using data of the FND that may impair the performance of other possible tasks. In case of alert, the tasks that are required to be performed during the same sequence of time are not additional due to the integration of the master list, nor unusual compared to the use of a conventional panel of alerts.

2.3 Clearance test

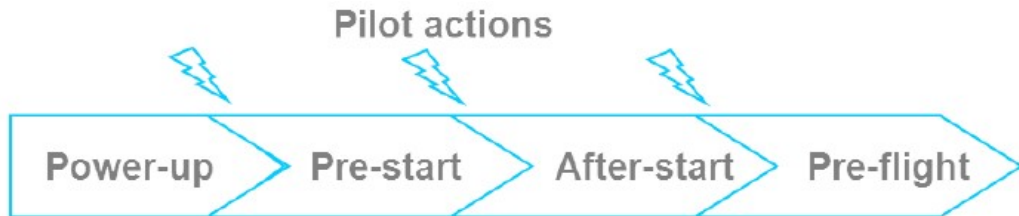
As a general constraint of design, the cockpit of EC175 is arranged without overhead panel. This induces a cockpit arrangement where the number of controls installed on control panels has been decreased, in order to control from control panels only relevant functionalities. This has been done for example through the automation of several pre-flight tests:

- Helionix system
- FDS equipment (VOR, ADF, FMS...)
- Vehicle systems
- AFCS

The flight crew can take benefit of an automatic and systematic testing of the equipment, compared to a checklist where items may be missed. The testing phase does not induce time loss before the flight and enhances the accuracy of the tests, compared to tests using indicator lights where interpretation can be requested. Some tests, concerning hydraulic system remains that have to be triggered and managed by the flight crew (i.e. Auxiliary pump and AFCS). This is done through dedicated controls located on the instrument panel. The results of the tests are displayed in FND as master list messages. Details of the test failure are displayed on vehicle page.

The test of aural displays generation and visual indications display is triggered on flight crew demand through a dedicated control located on the instrument panel. When the test is activated, visual indications are displayed and the speech message “audio test” sent out once. When the lamp test is released, visual indications are removed (except relevant indications).

- Clearance test process is performed following 4 steps:



- Automatic power up test is initiated automatically when both AMCs powered-up and VMS is operational.
 - Pre-start tests are initiated manually when activating the Auxiliary Hydraulic Pump.
 - Automatic after start-up tests are initiated automatically when one of the engines has finished starting.
 - Pre-flight tests are initiated manually.
- Clearance tests failure messages
 - A concatenated message reminds any test failure even during the flight.
 - Tests messages do not indicate the impact on the flight, reference to MEL is necessary

2.4 Emergency procedures

Following particular procedures described in the EC 175 FLM should be highlighted:

- Emergency generator benefit.
- No tail rotor control failure procedure due to flight control design.

- Estimated Nr which doesn't allow NR/N2 de-synchronization.
- MGB total loss of oil. The procedure limits the flight time after red warning to 15min.
- Cargo fire procedure. After amber caution smoke detection, temperature monitoring is requested using sensors located behind the cargo panels. They raise a red warning in case of temperature reaching 80°C and landing as soon as possible is required. Alarm is re-triggered (same message) when temperature reaches 120°C and immediate landing is required. The red warning is latched even if the temperature drops below 80°C.

Appendix 2
OPERATOR DIFFERENCE REQUIREMENT (ODR) TABLE

ODR are necessary to address differences between a base aircraft and a candidate aircraft for type rating, checking and currency assessment and for the content of the difference training syllabus.

ODR include both a description of differences and a corresponding list of Training, Checking and Currency compliance methods that address pertinent OEB and regulatory requirements.

Table

1. EC175B Helionix Step 3 (candidate aircraft) versus previous Helionix configuration (base aircraft)

Following ECP define the Helionix Step3 configuration on EC175B:

- 99A04333-00-M-ECP – Helionix v6,0 Step 3 SW for Step 2 PTF
- 99A04334-00-M-ECP – Helionix v6,0 Step 3 SW for Step 2R PTF
- 99A05204-00-M-ECP – Helionix V6 Step3 SW for MFD Step2/Step2R PTF
- 99A04771-00-M-ECP – FMS upgrade to V322
- 99A04007-00-M-ECP – GSE Soft Data Loader v4.0 for delivery to end customers
- 99^a04143-00-M-ECP – P262 Elec. Platform approach improvement
- 99R01161-00-M-ECP – FMS configuration activating Rig'n Fly function
- 99A04924-00-M-ECP – ADS Phase 1.5 – Mission Data Preparation
- 99A04925-00-M-ECP – Mission Databases for HLX Step3
- 99A04926-00-M-ECP – DMAP Mission Databases for HLX Step3
- 99A04398-00-M-ECP – DMAU computer change
- 99A04399-00-M-ECP – DMAU SW upgrade
- 99A05297-00-M-ECP – P041 Additional label for HLX DMAP pointer mode

The following ODR tables present the comparison in training, checking and currency from the EC175B Helionix pre-Step 3 configuration (Step2+) (base aircraft) to the EC175B Helionix Step 3 (candidate aircraft). **The reverse comparison is not presented, as all EC175B shall be upgraded to the**

Step3.2 standard (at the time of this first evaluation, Step3 was the most upgraded configuration available).

This comparison aims at:

- Evaluating the differences between these standard configurations for type rating assessment and the content of type rating training syllabus.
- Identifying the differences on flight characteristics and procedures, in terms of general characteristics, systems and maneuvers.
- Defining precisely the possible consequences of the upgrade in terms of training, checking and currency.

In accordance with the difference level definition (IS 00-007) and the outcome of this Airbus Helicopters study, there is no new difference variant/model of the EC175B type. Differences identified on procedures can be covered with familiarization training.

Base Aircraft: EC175 B Step 2+ / **Candidate aircraft:** EC175 B Step 3

Table 1: ODR 1 – General

Base aircraft: EC 175 B Step 2+ Candidate aircraft: EC 175 B Step 3		COMPLIANCE METHOD				
General	Differences	FLT CHAR	PROC CHNG	Training	Checking	Currency
Limitations	<p>Refer to FLM section 2 for precise data</p> <p><u>EC 175 B Step 2+:</u></p> <ul style="list-style-type: none"> • Maximum gross weight in flight : 7800 kg (17196 lb) • OAT: from -40°C to ISA+40°C, limited to a maximum of +50°C • Altitude limits <ul style="list-style-type: none"> ○ Take-off and Landing <ul style="list-style-type: none"> Category A: from -1500 ft Hp up to +13 000 ft H_σ Category B: from -1500 ft Hp up to +13 000 ft H_σ ○ Flight: from -1500ft Hp to +15 000 ft H_σ • VNE <ul style="list-style-type: none"> ○ Power-on depend on Hp Max = 175KIAS (324km/h IAS) ○ Power-off: VNE power-on - 40KIAS (74km/h IAS) • Engine: 2 X PT6C-67E <ul style="list-style-type: none"> ○ Limits: N1, TOT, Torque AEO: MTP 20s / MTOP 5min / MCP unlimited / EP 30min continuous within 50min cumulated during the same flight OEI: Overshoot / HI 30s / LO 2min / CT unlimited ○ Free turbine – N2 : Max; max continuous / Min continuous ○ Min Fuel Pressure in operation ○ Engine oil temperature: depend on oil type ○ Engine pressure in operation • Rotor <ul style="list-style-type: none"> ○ Power-On flight: Maximum continuous rotor speed 107% (298.5rpm) Minimum continuous rotor speed 96% (265.2rpm) Minimum transient rotor speed in flight AEO and OEI 83% (231.7rpm) ○ Power-Off flight: Maximum transient rotor speed (20s max.) 117% (326.7rpm) Maximum continuous rotor speed 110% (307.1rpm) Minimum continuous 87.5% (244.3rpm) Minimum transient rotor speed 83% (231.7rpm) • MGB <ul style="list-style-type: none"> ○ Temperature Max: 120°C Emergency lubrication: 200°C ○ Pressure No Max MGB Pressure Min MGB Pressure: 0.5 bar <p><u>EC 175 B Step 3:</u></p> <ul style="list-style-type: none"> • New display of OEI HI and LO clock (clock appears without 5 sec delay) • Upgrade of LIMIT indicator (anticipation in case of abrupt input) • New NR noise law(variation from 800ft to 1200ft) 	NO	YES	A	A	A
Performance	<p><u>EC 175 B Step 2+:</u></p> <p>Demonstrated Wind Envelope Air Data system calibration Hover Performance Climb performance Take-off and Landing Performance TAS-CAS correspondence chart Noise levels Additional section SUPP 1 for Category "A" operation Performance with winter kit</p> <p><u>EC 175 B Step 3:</u></p> <ul style="list-style-type: none"> • Performances with EAPS 	NO	YES	A	A	B
Weight & balance	<p><u>EC 175 B Step 2+:</u></p> <ul style="list-style-type: none"> • Minimum gross weight in flight: 4900 kg (10803 lb) • Maximum gross weight in flight : 7800 kg (17196 lb) • Maximum gross weight on the ground : 7850 kg (17306 lb) • Longitudinal CG limited from 7,15m to 7,50m (refer to FLM section 2) • Lateral CG from - 0.05 m to + 0.05 m of symmetric plane <p><u>EC 175 B Step 3:</u></p> <p>Identical</p>	NO	NO	N/A	N/A	N/A

Table 2: ODR 2 – Systems

Base aircraft: EC 175 B Step 2+ Candidate aircraft: EC 175 B Step 3				COMPLIANCE METHOD		
Systems	Differences	FLT CHAR	PROC CHNG	Training	Checking	Currency
Engine & MGB Oil cooling system	<p><u>EC 175 B Step 2+:</u> MGB One cooler is installed forward the MGB compartment. A pump draws the oil from the MGB sump through a strainer and delivers it through the oil cooler system installed in the air duct of a fan. Once cooled, the oil is injected into the MGB.</p> <p>Engines Engines compartments are cooled by a circulation of air induced by a Venturi effect created between the primary and the secondary nozzles of each engine exhaust.</p> <p><u>EC 175 B Step 3:</u> Identical</p>	NO	NO	N/A	N/A	N/A
Air conditioning system	<p><u>EC 175 B Step 2+:</u> Environmental Control System (ECS) ensures fresh air and warm air circulation inside the aircraft. Air Conditioning System (ACS) (optional) cools down cockpit and cabin compartments. ECS and optional ACS separately control the cockpit and the cabin. The cockpit and cabin ECS / ACS (opt) main functions are: • ECS demisting, • ECS ventilation, • ECS heating, • ECS / ACS cooling. Cockpit and cabin ECS (with ACS) equipment are identical in their concept and in most of their components. The difference is relevant to the air distribution circuit design.</p> <p><u>EC 175 B Step 3:</u> Identical</p>	NO	NO	N/A	N/A	N/A
Warning Panel & Master List	<p><u>EC 175 B Step 2+:</u> Integrated to HELIONIX, the alerting system: • Centralizes all aircraft input parameters, • Computes the alert activation logic, • Prioritises alerts, • Displays alerts on the MFDs (master list concept) and on the CWP, • Generates the audio alert signals.</p> <p><u>EC 175 B Step 3:</u> • New Master List messages</p>	NO	YES	A	A	A
Flight displays	<p><u>EC 175 B Step 2+:</u> 4 MFDs, format tree, under crew control: • The outer MFDs display FND page (Flight and Navigation Display), • The inner MFDs pages are selectable by the crew; default page at power-up is VMS page (Vehicle Management System). Upon outer MFD failure, inner MFD is automatically reconfigured with FND page.</p> <p><u>EC 175 B Step 3:</u> • Upgraded SVS on FND • Upgraded NAVD page • Upgraded DMAP page • Improved HTAWS • New AHRS compensation HMI</p>	NO	YES	B	A	B

Base aircraft: EC 175 B Step 2+ Candidate aircraft: EC 175 B Step 3				COMPLIANCE METHOD		
Systems	Differences	FLT CHAR	PROC CHNG	Training	Checking	Currency
Automatic Flight Control System	<p>EC 175 B Step 2+: The AFCS consists of :</p> <ul style="list-style-type: none"> • Duplex Digital 4 axes autopilot. • Dual AFCS processing unit. <p>Purpose</p> <ul style="list-style-type: none"> • To acquire helicopter parameters (attitudes, angular rates...). • To compute and transmit relevant orders to the actuators (parallel and series actuators). <p>Main functions</p> <ul style="list-style-type: none"> • Basic stabilization mode on 3 axis: Pitch, Roll and Yaw. • Upper modes on 4 axis: Pitch, Roll, Yaw and Collective. <p>EC 175 B Step 3:</p> <ul style="list-style-type: none"> • New Display of ACAS mode coupling (color from Red to green) • Automatic recoupling of IAS mode after Engine Power Check 	NO	YES	A	A	B
Vehicle parameters indicators	<p>EC 175 B Step 2+: Integrated to HELJONIX, the functions of the Vehicle and engine Management System (VMS) are:</p> <ul style="list-style-type: none"> • Landing gear controls and monitoring (status...). • Air conditioning (ECS) controls and monitoring. • Ice and rain protection controls and monitoring. • Hydraulic system controls and monitoring (level...). • Engines controls (NR laws) and monitoring (N1/N2/TOT/TRQ). • Engine states elaboration (OEI/AEO). • Engine power limits displays. • First Limit Indicator (FLI) computation and display (Respect of the engines and Main Gear Box limitations). • Roll over avoidance computation and display. • Collective pitch position display. • Transmission monitoring (MGB/ TGB oil pressures...). • Rotor monitoring (NR values). • Electrical system monitoring. • Fuel system controls and monitoring (quantity, status...). • Fire protection controls and monitoring. • Miscellaneous (door indicating, VNE, Float, Emergency lighting...). <p>EC 175 B Step 3:</p> <ul style="list-style-type: none"> • Upgraded VMS main page with fuel temperature if NUM • New N2 setting à 102,5% in declutch mode (102.5% instead of 102%): limitation of 1 minute cancelled • Improved displays: VMS ELEC, VMS HYD, VMS FUEL, and VMS XMSN. • VMS SYST page: new interface • automatic of Engine Power Check (EPC) on ground and capable of winter kit • Noise abatement law below 1200 ft • Capability of AHRS LCR350 model with virtual control panel on VMS RCONF page (instead of current AHRS model with physical AHRS control panel) Capability but not activated 	NO	YES	B	A	A
Flight controls	<p>EC 175 B Step 2+:</p> <ul style="list-style-type: none"> • Conventional mechanical flight control systems (rods and flexible cables) and hydraulic servo controls. • Classical side-by-side configuration. • Totally separated controls systems for main rotor and tail rotor. <p>EC 175 B Step 3: Identical</p>	NO	NO	N/A	N/A	N/A
Air data circuit	<p>EC 175 B Step 2+:</p> <ul style="list-style-type: none"> • Pitot's probes 3 total pressure ports (2 RH + 1 LH) forward the cockpit. • Static ports 2 triple static pressure ports located on each side of the tail boom. • Temperature probes 2 temperature probes located close to the pitot probes. • Cockpit static pressure ports 2 cockpit standby static pressure ports are located on the stand-by selectors. • Processing <p>Air data are managed by Air Data Units (ADU) and AMCs. Information is provided to the crew via:</p> <ul style="list-style-type: none"> o Helionix MFDs for displays and controls, o Integrated Electronic Stand-by Instrument (IESI). <p>EC 175 B Step 3: Identical</p>	NO	NO	N/A	N/A	N/A

Table 3: ODR 3 – Maneuvers

Base aircraft: EC 175 B Step 2+ Candidate aircraft: EC 175 B Step 3				COMPLIANCE METHOD		
Manoeuvres	Differences	FLT CHAR	PROC CHNG	Training	Checking	Currency
Flight manoeuvres and procedures (JAR-FCL 2 Section 1 – Appendix 3 to JAR-FCL 2.240 Section 2)						
Take-offs (various profiles)	Identical	NO	NO	N/A	N/A	N/A
Sloping ground take-offs & landings	Identical	NO	NO	N/A	N/A	N/A
Take-off at maximum take-off mass (actual or simulated maximum take-off mass)	Identical	NO	NO	N/A	N/A	N/A
Take-off with simulated engine failure shortly before reaching TDP. Clear airfield	Identical	NO	NO	N/A	N/A	N/A
Take-off with simulated engine failure shortly after reaching TDP. Clear airfield	Identical	NO	NO	N/A	N/A	N/A
Take-off with simulated engine failure shortly before reaching TDP. Helipad	Identical	NO	NO	N/A	N/A	N/A
Take-off with simulated engine failure shortly after reaching TDP. Helipad	Identical	NO	NO	N/A	N/A	N/A
Climbing and descending turns to specified headings	Identical	NO	NO	N/A	N/A	N/A
Turns with 30 degrees bank, 180 degrees to 360 degrees left and right, by sole reference to instruments	Identical	NO	NO	N/A	N/A	N/A
Autorotative descents	Identical	NO	NO	N/A	N/A	N/A
Autorotative landing or power recovery	Identical	NO	NO	N/A	N/A	N/A
Landings, various profiles	Identical	NO	NO	N/A	N/A	N/A
Go-around or landing following simulated engine failure before LDP. Clear airfield	Identical	NO	NO	N/A	N/A	N/A
Landing following simulated engine failure after LDP. Clear airfield	Identical	NO	NO	N/A	N/A	N/A
Go-around or landing following simulated engine failure before LDP. Helipad	Identical	NO	NO	N/A	N/A	N/A
Landing following simulated engine failure after LDP. Helipad	Identical	NO	NO	N/A	N/A	N/A
Normal and abnormal operations of the following systems and procedures (JAR-FCL 2 Section 1 – Appendix 3 to JAR-FCL 2.240 Section 3)						
Engine	<ul style="list-style-type: none"> • New advisory messages on ground • New engine fuel pre-clogging advisory message (on ground and in flight) • Automatic EPC improvements • Automatic recoupling of IAS mode after Engine Power Check 	NO	YES	B	A	A
Air conditioning (heating, ventilation)	Modified emergency procedures	NO	YES	A	A	A
Pitot/static system	Identical	NO	NO	N/A	N/A	N/A
Fuel system	Identical	NO	NO	N/A	N/A	N/A
Electrical system	Identical	NO	NO	N/A	N/A	N/A
Hydraulic system	Identical	NO	NO	N/A	N/A	N/A
Flight control and Trim-system	Identical	NO	NO	N/A	N/A	N/A
Anti- and de-icing system	Identical	NO	NO	N/A	N/A	N/A
Auto-Pilot/Flight Director	Up dated display of ACAS mode	NO	YES	A	A	A
Stability augmentation devices	Identical	NO	NO	N/A	N/A	N/A
Weather radar, radio altimeter, transponder	Identical	NO	NO	N/A	N/A	N/A

Navigation system	New SVS & DMAP functions + NAVD new data area	NO	YES	B	A	A
Landing gear system	Identical	NO	NO	N/A	N/A	N/A
Auxiliary power unit (declutch mode)	New procedures	NO	YES	A	A	A
Radio, navigation equipment, instruments flight management system	Identical	NO	NO	N/A	N/A	N/A
Fire drills (including evacuation if applicable)	Identical	NO	NO	N/A	N/A	N/A
Smoke control and removal	Identical	NO	NO	N/A	N/A	N/A
Engine failures, shut down and restart at a safe height	Identical	NO	NO	N/A	N/A	N/A
Fuel dumping (simulated)	Identical	N/A	N/A	N/A	N/A	N/A
Tail rotor control failure (if applicable)	Identical	N/A	N/A	N/A	N/A	N/A
Tail rotor loss (if applicable) <i>Helicopter shall not be used for this exercise</i>	Identical	NO	NO	N/A	N/A	N/A
Transmission malfunctions	Identical	NO	NO	N/A	N/A	N/A
Other emergency procedures: Engine failure simulation	Identical	NO	NO	N/A	N/A	N/A
Other emergency procedures: Major governing failure	Identical	NO	NO	N/A	N/A	N/A
Instrument Flight Procedures (To be performed in IMC or simulated IMC)						
<i>(JAR-FCL 2 Section 1 – Appendix 3 to JAR-FCL 2.240 Section 5)</i>						
Instrument take-off	Identical	NO	NO	N/A	N/A	N/A
Engine failure during departure	Identical	NO	NO	N/A	N/A	N/A
Holding procedures	Identical	NO	NO	N/A	N/A	N/A
ILS-approaches down to CAT 1 decision height	Identical	NO	NO	N/A	N/A	N/A
ILS-approaches manually, without flight director	Identical	NO	NO	N/A	N/A	N/A
ILS-approaches manually, with flight director	Identical	NO	NO	N/A	N/A	N/A
ILS-approaches with coupled autopilot	Identical	NO	NO	N/A	N/A	N/A
Non-precision approach	Identical	NO	NO	N/A	N/A	N/A
GNSS approaches with vertical guidance (LPV, LNAV/VNAV)	Identical	NO	NO	N/A	N/A	N/A
GNSS approaches without vertical guidance (LNAV)	Identical	NO	NO	N/A	N/A	N/A
Go-around with all engines operating	Identical	NO	NO	N/A	N/A	N/A
Missed approach procedures	Identical	NO	NO	N/A	N/A	N/A
Go-around with one engine inoperative	Identical	NO	NO	N/A	N/A	N/A
Recovery from unusual attitudes	Identical	NO	NO	N/A	N/A	N/A

2. EC175B Helionix Step 3.2 (candidate aircraft) versus previous Step 3 configuration (base aircraft)

Following ECP define the Helionix Step3.2 configuration on EC175B:

- 99A05288-00-M-ECP - HELIONIX V8.0 Step3E/Step3.2 SW for AMC Step2 & TechRefresh PTF
- 99A05289-00-M-ECP - HELIONIX V8.0 Step 3E/Step3.2 SW for AMC STEP2R PTF
- 99A05290-00-M-ECP - HELIONIX V8.0 Step 3E/Step3.2 SW for MFD step2R/step2 & Techrefresh PTF
- 99R05681-00-M-ECP - HLX step3E first configuration file
- 99A05682-00-M-ECP - P041 - DMAP Mission databases for HLX Step3E file
- 99A05683-00-M-ECP - Mission Databases for HLX step3E
- 99A05684-00-M-ECP - P106 - SPIFR option
- 99A05751-00-M-ECP - Removal of DMAP step3 placard
- 99A05625-00-M-ECP - ELEC _ OBSOLESCENCE AMC FROM STEP2 TO TECHREFRESH
- 99A05626-00-M-ECP - ELEC _ OBSOLESCENCE MFD FROM STEP2 TO TECHREFRESH
- 99A05627-00-M-ECP - ELEC _ OBSOLESCENCE DTD FROM STEP2 TO TECHREFRESH
- 99A05727-00-M-ECP - GSE Soft –Configuration file for MGS 1.6 – H175 step 3.2
- 99A05782-00-M-ECP - Configuration files for Maintenance Ground Station MGS V1.6 - HLX step3.2-DMAU3.2
- 99A05726-00-M-ECP - GSE Soft –Maintenance Ground Station (MGS V1.6)
- 99A05728-00-M-ECP - GSE Soft- ADS Phase 1.7 – MyAerodata v1.1

The following ODR tables present the comparison in training, checking and currency from the EC175B Helionix Step 3 configuration (base aircraft) to the EC175B Helionix Step 3.2 (candidate aircraft). **The reverse comparison is not presented, as all EC175B shall be upgraded to the Step3.2 standard.**

This comparison aims at:

- Evaluating the differences between these standard configurations for type rating assessment and the content of type rating training syllabus.
- Identifying the differences on flight characteristics and procedures, in terms of general characteristics, systems and maneuvers.
- Defining precisely the possible consequences of the upgrade in terms of training, checking and currency.

In accordance with the difference level definition (IS 00-007) and the outcome of this Airbus Helicopters study, there is no new difference variant/model of the EC175B type. Differences identified on procedures can be covered with familiarization training.

Base Aircraft: EC175 B Step 3 / Candidate aircraft: EC175 B Step 3.2**Table 1: ODR 1 – General**

Base aircraft: EC 175 B Step 3 Candidate aircraft: EC 175 B Step 3.2		COMPLIANCE METHOD				
General	Differences	FLT CHAR	PROC CHNG	Training	Checking	Currency
Limitations	<p>Refer to FLM section 2 for precise data</p> <p><u>EC 175 B Step 3:</u></p> <ul style="list-style-type: none"> • Maximum gross weight in flight : 7800 kg (17196 lb) • OAT: from -40°C to ISA+40°C, limited to a maximum of +50°C • Altitude limits <ul style="list-style-type: none"> ○ Take-off and Landing <ul style="list-style-type: none"> Category A: from -1500 ft Hp up to +13 000 ft Hc Category B: from -1500 ft Hp up to +13 000 ft Hc ○ Flight: from -1500ft Hp to +15 000 ft Hc • VNE <ul style="list-style-type: none"> ○ Power-on depend on Hp <ul style="list-style-type: none"> Max = 175KIAS (324km/h IAS) ○ Power-off: VNE power-on - 40KIAS (74km/h IAS) • Engine: 2 X PT6C-67E <ul style="list-style-type: none"> ○ Limits: N1, TOT, Torque <ul style="list-style-type: none"> AEO: MTP 20s / MTOP 5min / MCP unlimited / EP 30min continuous within 50min cumulated during the same flight OEI: Overshoot / HI 30s / LO 2min / CT unlimited ○ Free turbine – N2 : Max; max continuous / Min continuous ○ Min Fuel Pressure in operation ○ Engine oil temperature: depend on oil type ○ Engine pressure in operation • Rotor <ul style="list-style-type: none"> ○ Power-On flight: <ul style="list-style-type: none"> Maximum continuous rotor speed 107% (298.5rpm) Minimum continuous rotor speed 96% (265.2rpm) Minimum transient rotor speed in flight AEO and OEI 83% (231.7rpm) ○ Power-Off flight: <ul style="list-style-type: none"> Maximum transient rotor speed (20s max.) 117% (326.7rpm) Maximum continuous rotor speed 110% (307.1rpm) Minimum continuous 87.5% (244.3rpm) Minimum transient rotor speed 83% (231.7rpm) • MGB <ul style="list-style-type: none"> ○ Temperature <ul style="list-style-type: none"> Max: 120°C Emergency lubrication: 200°C ○ Pressure <ul style="list-style-type: none"> No Max MGB Pressure Min MGB Pressure: 0.5 bar <p><u>EC 175 B Step 3.2:</u> Identical</p>	NO	NO	N/A	N/A	N/A
Performance	<p><u>EC 175 B Step 3:</u></p> <p>Demonstrated Wind Envelope Air Data system calibration Hover Performance Climb performance Take-off and Landing Performance TAS-CAS correspondence chart Noise levels Additional section SUPP 1 for Category "A" operation Performance with winter kit</p> <p><u>EC 175 B Step 3.2:</u> Identical</p>	NO	NO	N/A	N/A	N/A
Weight & balance	<p><u>EC 175 B Step 3:</u></p> <ul style="list-style-type: none"> • Minimum gross weight in flight: 4900 kg (10803 lb) • Maximum gross weight in flight : 7800 kg (17196 lb) • Maximum gross weight on the ground : 7850 kg (17306 lb) • Longitudinal CG limited from 7,15m to 7,50m (refer to FLM section 2) • Lateral CG from - 0.05 m to + 0.05 m of symmetric plane <p><u>EC 175 B Step 3.2:</u> Identical</p>	NO	NO	N/A	N/A	N/A

Table 2: ODR 2 – Systems

Base aircraft: EC 175 B Step 3 Candidate aircraft: EC 175 B Step 3.2				COMPLIANCE METHOD		
Systems	Differences	FLT CHAR	PROC CHNG	Training	Checking	Currency
Engine & MGB Oil cooling system	<p><u>EC 175 B Step 3:</u> MGB One cooler is installed forward the MGB compartment. A pump draws the oil from the MGB sump through a strainer and delivers it through the oil cooler system installed in the air duct of a fan. Once cooled, the oil is injected into the MGB.</p> <p>Engines Engines compartments are cooled by a circulation of air induced by a Venturi effect created between the primary and the secondary nozzles of each engine exhaust.</p> <p><u>EC 175 B Step 3.2:</u> Identical</p>	NO	NO	N/A	N/A	N/A
Air conditioning system	<p><u>EC 175 B Step 3:</u> Environmental Control System (ECS) ensures fresh air and warm air circulation inside the aircraft. Air Conditioning System (ACS) (optional) cools down cockpit and cabin compartments. ECS and optional ACS separately control the cockpit and the cabin. The cockpit and cabin ECS / ACS (opt) main functions are: • ECS demisting, • ECS ventilation, • ECS heating, • ECS / ACS cooling. Cockpit and cabin ECS (with ACS) equipment are identical in their concept and in most of their components. The difference is relevant to the air distribution circuit design.</p> <p><u>EC 175 B Step 3.2:</u> • Automatic ACS cut off in case of MGB oil lubrication total loss</p>	NO	YES	A	A	A
Warning Panel & Master List	<p><u>EC 175 B Step 3:</u> Integrated to HELIONIX, the alerting system: • Centralizes all aircraft input parameters, • Computes the alert activation logic, • Prioritises alerts, • Displays alerts on the MFDs (master list concept) and on the CWP, • Generates the audio alert signals.</p> <p><u>EC 175 B Step 3.2:</u> • New Master List messages</p>	NO	YES	A	A	A
Flight displays	<p><u>EC 175 B Step 3:</u> 4 MFDs, format tree, under crew control: • The outer MFDs display FND page (Flight and Navigation Display), • The inner MFDs pages are selectable by the crew; default page at power-up is VMS page (Vehicle Management System). Upon outer MFD failure, inner MFD is automatically reconfigured with FND page.</p> <p><u>EC 175 B Step 3.2:</u> • New law of automatic reconfiguration of MFDs in the event of failures of 1 or several MFDs • New HTAWS page • Implementation of FPA decluttering • Configurable DH audio alert (highest DH or lowest DH) via PCF</p>	NO	YES	B	A	A

Base aircraft: EC 175 B Step 3 Candidate aircraft: EC 175 B Step 3.2				COMPLIANCE METHOD		
Systems	Differences	FLT CHAR	PROC CHNG	Training	Checking	Currency
Automatic Flight Control System	<p><u>EC 175 B Step 3:</u> The AFCS consists of :</p> <ul style="list-style-type: none"> • Duplex Digital 4 axes autopilot. • Dual AFCS processing unit. <p>Purpose</p> <ul style="list-style-type: none"> • To acquire helicopter parameters (attitudes, angular rates...). • To compute and transmit relevant orders to the actuators (parallel and series actuators). <p>Main functions</p> <ul style="list-style-type: none"> • Basic stabilization mode on 3 axis: Pitch, Roll and Yaw. • Upper modes on 4 axis: Pitch, Roll, Yaw and Collective. • Automatic recoupling of IAS mode after Engine Power Check <p><u>EC 175 B Step 3.2:</u></p> <ul style="list-style-type: none"> • Improvement of NR management under OEI conditions 4 axis • Restoration of MCP power limitation just after EPC • Improvement of AFCS law in climbing flight 4 axis • New alerting message for Override detection • New ACAS RA (RA) climb law with no upper mode previously coupled 	YES	YES	B	A	A
Vehicle parameters indicators	<p><u>EC 175 B Step 3:</u> Integrated to HELIONIX, the functions of the Vehicle and engine Management System (VMS) are:</p> <ul style="list-style-type: none"> • Landing gear controls and monitoring (status...). • Air conditioning (ECS) controls and monitoring. • Ice and rain protection controls and monitoring. • Hydraulic system controls and monitoring (level...). • Engines controls (NR laws) and monitoring (N1/N2/TOT/TRQ). • Engine states elaboration (OEI/AEO). • Engine power limits displays. • First Limit Indicator (FLI) computation and display (Respect of the engines and Main Gear Box limitations). • Roll over avoidance computation and display. • Collective pitch position display. • Transmission monitoring (MGB/ TGB oil pressures...). • Rotor monitoring (NR values). • Electrical system monitoring. • Fuel system controls and monitoring (quantity, status...). • Fire protection controls and monitoring. • Miscellaneous (door indicating, VNE, Float, Emergency lighting...). <p><u>EC 175 B Step 3.2:</u></p> <ul style="list-style-type: none"> • New law for displaying fuel quantity when low fuel conditions are met • New fuel density unit • New flight report page to display exposure flight times (K factors) • New HMI for manual downloading 	NO	YES	B	A	A
Flight controls	<p><u>EC 175 B Step 3:</u></p> <ul style="list-style-type: none"> • Conventional mechanical flight control systems (rods and flexible cables) and hydraulic servo controls. • Classical side-by-side configuration. • Totally separated controls systems for main rotor and tail rotor. <p><u>EC 175 B Step 3.2:</u> Identical</p>	NO	NO	N/A	N/A	N/A
Air data circuit	<p><u>EC 175 B Step 3:</u></p> <ul style="list-style-type: none"> • Pitot's probes 3 total pressure ports (2 RH + 1 LH) forward the cockpit. • Static ports 2 triple static pressure ports located on each side of the tail boom. • Temperature probes 2 temperature probes located close to the pitot probes. • Cockpit static pressure ports 2 cockpit standby static pressure ports are located on the stand-by selectors. • Processing <p>Air data are managed by Air Data Units (ADU) and AMCs. Information is provided to the crew via:</p> <ul style="list-style-type: none"> o Helionix MFDs for displays and controls, o Integrated Electronic Stand-by Instrument (IESI). <p><u>EC 175 B Step 3.2:</u> Identical</p>	NO	NO	N/A	N/A	N/A

Table 3: ODR 3 – Maneuvers

Base aircraft: EC 175 B Step 3 Candidate aircraft: EC 175 B Step 3.2				COMPLIANCE METHOD		
Manoeuvres	Differences	FLT CHAR	PROC CHNG	Training	Checking	Currency
Flight manoeuvres and procedures (JAR-FCL 2 Section 1 – Appendix 3 to JAR-FCL 2.240 Section 2)						
Take-offs (various profiles)	Identical	NO	NO	N/A	N/A	N/A
Sloping ground take-offs & landings	Identical	NO	NO	N/A	N/A	N/A
Take-off at maximum take-off mass (actual or simulated maximum take-off mass)	Identical	NO	NO	N/A	N/A	N/A
Take-off with simulated engine failure shortly before reaching TDP. Clear airfield	Identical	NO	NO	N/A	N/A	N/A
Take-off with simulated engine failure shortly after reaching TDP. Clear airfield	Identical	NO	NO	N/A	N/A	N/A
Take-off with simulated engine failure shortly before reaching TDP. Helipad	Identical	NO	NO	N/A	N/A	N/A
Take-off with simulated engine failure shortly after reaching TDP. Helipad	Identical	NO	NO	N/A	N/A	N/A
Climbing and descending turns to specified headings	Identical	NO	NO	N/A	N/A	N/A
Turns with 30 degrees bank, 180 degrees to 360 degrees left and right, by sole reference to instruments	Identical	NO	NO	N/A	N/A	N/A
Autoratative descents	Identical	NO	NO	N/A	N/A	N/A
Autoratative landing or power recovery	Identical	NO	NO	N/A	N/A	N/A
Landings, various profiles	Identical	NO	NO	N/A	N/A	N/A
Go-around or landing following simulated engine failure before LDP. Clear airfield	Identical	NO	NO	N/A	N/A	N/A
Landing following simulated engine failure after LDP. Clear airfield	Identical	NO	NO	N/A	N/A	N/A
Go-around or landing following simulated engine failure before LDP. Helipad	Identical	NO	NO	N/A	N/A	N/A
Landing following simulated engine failure after LDP. Helipad	Identical	NO	NO	N/A	N/A	N/A
Normal and abnormal operations of the following systems and procedures (JAR-FCL 2 Section 1 – Appendix 3 to JAR-FCL 2.240 Section 3)						
Engine	Identical	NO	NO	N/A	N/A	N/A
Air conditioning (heating, ventilation)	Identical	NO	NO	N/A	N/A	N/A
Pitot/static system	Identical	NO	NO	N/A	N/A	N/A
Fuel system	Identical	NO	NO	N/A	N/A	N/A
Electrical system	Identical	NO	NO	N/A	N/A	N/A
Hydraulic system	Identical	NO	NO	N/A	N/A	N/A
Flight control and Trim-system	Identical	NO	NO	N/A	N/A	N/A
Anti- and de-icing system	Identical	NO	NO	N/A	N/A	N/A
Auto-Pilot/Flight Director	Identical	NO	NO	N/A	N/A	N/A
Stability augmentation devices	Identical	NO	NO	N/A	N/A	N/A
Weather radar, radio altimeter, transponder	Identical	NO	NO	N/A	N/A	N/A
Navigation system	Identical	NO	NO	N/A	N/A	N/A
Landing gear system	Identical	NO	NO	N/A	N/A	N/A
Auxiliary power unit (declutch mode)	Identical	NO	NO	N/A	N/A	N/A
Radio, navigation equipment, instruments flight management system	Identical	NO	NO	N/A	N/A	N/A
Fire drills (including evacuation if applicable)	Identical	NO	NO	N/A	N/A	N/A
Smoke control and removal	Identical	NO	NO	N/A	N/A	N/A
Engine failures, shut down and restart at a safe height	Identical	NO	NO	N/A	N/A	N/A
Fuel dumping (simulated)	Identical	N/A	N/A	N/A	N/A	N/A
Tail rotor control failure (if applicable)	Identical	N/A	N/A	N/A	N/A	N/A
Tail rotor loss (if applicable) <i>Helicopter shall not be used for this exercise</i>	Identical	NO	NO	N/A	N/A	N/A
Transmission malfunctions	Identical	NO	NO	N/A	N/A	N/A

Other emergency procedures: Engine failure simulation	Identical	NO	NO	N/A	N/A	N/A
Other emergency procedures: Major governing failure	Identical	NO	NO	N/A	N/A	N/A
Instrument Flight Procedures (To be performed in IMC or simulated IMC)						
<i>(JAR-FCL 2 Section 1 – Appendix 3 to JAR-FCL 2.240 Section 5)</i>						
Instrument take-off	Identical	NO	NO	N/A	N/A	N/A
Engine failure during departure	Identical	NO	NO	N/A	N/A	N/A
Holding procedures	Identical	NO	NO	N/A	N/A	N/A
ILS-approaches down to CAT 1 decision height	Identical	NO	NO	N/A	N/A	N/A
ILS-approaches manually, without flight director	Identical	NO	NO	N/A	N/A	N/A
ILS-approaches manually, with flight director	Identical	NO	NO	N/A	N/A	N/A
ILS-approaches with coupled autopilot	Identical	NO	NO	N/A	N/A	N/A
Non-precision approach	Identical	NO	NO	N/A	N/A	N/A
GNSS approaches with vertical guidance (LPV, LNAV/VNAV)	Identical	NO	NO	N/A	N/A	N/A
GNSS approaches without vertical guidance (LNAV)	Identical	NO	NO	N/A	N/A	N/A
Go-around with all engines operating	Identical	NO	NO	N/A	N/A	N/A
Missed approach procedures	Identical	NO	NO	N/A	N/A	N/A
Go-around with one engine inoperative	Identical	NO	NO	N/A	N/A	N/A
Recovery from unusual attitudes	Identical	NO	NO	N/A	N/A	N/A