

# EUROPEAN AVIATION SAFETY AGENCY



## Hélicoptères Guimbal Cabri G2

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## Introduction

Hélicoptères Guimbal Manufacturer has developed a new two-seat piston engine helicopter in the EASA CS-27 category the CABRI G2 and the first issue of EASA type certification is December 14th, 2007 under Data Sheet N° EASA.R.145.

This Helicopter has already been included in the JAA – Administrative and Guidance Material. Section Five: Personnel Licensing Part 2: Procedures / Class and type Rating List (Helicopters) Table 9.

The manufacturer has made an official request to EASA, Certification Directorate Flight Standards Manager , to include this new helicopter in the piston engine table of the Appendix 11 of Part FCL, this will allow cross crediting of proficiency checks for revalidation of type rating with other single engine piston helicopter involved in that table.

## Revision Record

Revision No.	Section	Pages No.	Date
Initial	All	18	22/05/09

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## Acronyms

AMC	Acceptable Means of Compliance
ATPL (H)	Airline Transport Pilot Licence (Helicopter)
ATO	Approved Training Organisation
ATR	Additional Type Rating
CEV	Centre d'Essais en Vol
CPL	Commercial Pilot Licence
DGAC	Direction Générale de l'Aviation Civile (French Civil Aviation Authority)
EASA	European Aviation Safety Authority
FNPT	Flight and Navigation and Procedure Trainer
FSTD	Flight Simulation Training Device
FTO	Flight Training Organisation
IEM	Interpretative and Explanatory Material
ITR	Initial Type Rating
JAA	Joint Aviation Authorities
JAR-FCL 2	Joint Aviation Requirements Flight Crew Licensing (Helicopters)
JAR-OPS 3	Joint Aviation Requirements Operations 3 (Commercial Transport Helicopters)
JOEB	Joint Operational Evaluation Board
MDR	Master Difference Requirements
MEL	Minimum Equipment List
MMEL	Master Minimum Equipment List
MLI	Multi Limit Instrument
NAA	National Aviation Authority
N/A	Not Applicable
OCV	Organisme du Contrôle en Vol
ODR	Operator Differences Requirements
OEB	Operational Evaluation Board
RFM	Rotorcraft Flight Manual
SEP (H)	Single Engine Piston (Helicopter)
TRTC	Type Rating Training Course
TRTO	Type Rating Training Organisation
VEMD	Vehicle and Engine Multifunction Display
VFR	Visual Flight Rules

## Preamble and Executive Summary

This operational evaluation was conducted to check compliance of the pilot training courses for this Helicopter, and to evaluate objectively and subjectively this light single engine piston helicopter in comparison of those already mentioned in the appendix 2.261 of JAR-FCL 2 and in the NPA No 2008-17 b - Appendix 11.

In accordance with the processes detailed in the JAA Administrative and Guidance Material, Section One, Part Two, Chapter 5 and

Two helicopter flight inspectors from French Civil Aviation Authority (DGAC), the flight test pilot in charge of flight tests for aircraft certification, and the chairman of this JOEB team have participated in this evaluation.

As part of this evaluation process, the Normal, Abnormal, and Emergency procedures were reviewed.

The JOEB recommends the pilot training courses included in this report for approval by the JAA NAAs.

### **Note on references and reference texts:**

**Where references are made to requirements and where extracts of reference texts are provided, these are at the amendment state at the date of publication of the report.**

**Readers should take note that it is impractical to update these references to take account of subsequent amendments to the source documents.**



**Evan Nielsen**  
Head of Flight Standards  
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## I. Purpose and applicability

This report follows an evaluation of the Cabri G2 helicopter based on, in flight evaluations and ground courses performed by the two Helicopter Flight inspectors from French Civil Aviation Authority “DGAC”. These Flight Inspectors hold both FI/TRI and FE/TRE ratings and have a strong flying background on light single engine piston helicopter.

These Flight Inspectors have followed the first differences training courses approved by DGAC France. At the date of this report a FTO is operating **Cabri G2**.

This document:

- Defines the Type Rating assigned to the Cabri G2
- Makes recommendations for initial type rating training (ITR)
- Makes recommendations for additional type training (ATR)
- Makes recommendations for checking
- Proposes to change in the existing “Class and type ratings list (Helicopters)” the License Endorsement code from **G2** to **Cabri G2**
- Proposes to include **Cabri G2** in both documents :  
Appendix 1 to JAR-FCL2.245 (b) (3)  
and  
Appendix 11 of NPA N° 2008 – 17B “ Implementing Rules for Pilot Licensing “ B. Part-FCL

The JOEB performed a T5 test, according to the JOEB guidance material.

### Note:

**In addition to this report, knowing that every aircraft could be customised, optional equipment could be installed at the request of the customer; all optional equipment that would require additional pilot training will be addressed through a specific ODR table.**

## 2. General description of Cabri G2

The Cabri G2 is a light two-seat piston engine helicopter, on EASA certification basis CS-27 Small Rotorcraft category. This aircraft is basically approved for VFR by day and by night operation and the minimum flight crew is one pilot on the right seat

### Airframe

The Cabri G2 airframe is composed of three sections:

main fuselage, including cabin, central structure, baggage and fuel compartments. It is all made of composite sandwich.

The engine section, isolated between a front and an aft firewalls. It is made of the steel truss engine mount, and composite cowlings.

The aft structure, a composite shell combining the tail boom, the fins, and the tail rotor shroud, with the horizontal stabilizer.

### Landing gear

The main landing gear is composed of two tubular bows, and two skids. It is attached to the fuselage by soft elastomeric mounts in three points, giving adequate frequency tuning against ground resonance. There is no damper.

### Seating

The cabin features two high-energy absorbing, stroking-seats, improving occupants' protection in case of a crash.

### Main rotor

The Cabri G2 main rotor is a three-bladed, fully articulated, soft-in plane rotor. The rotor hub is forged from aluminium alloy, and attached to the stainless-steel mast, by a large splines and cones attachment, with a thrust nut. The hub is belted with a tough fiberglass winding, which increases its tolerance to damage.

The blades are made of carbon and fiberglass-reinforced composite, with a large internal steel tip weight, and lead balance weight, to increase rotor inertia. Their fork attachment is directly connected to an elastomeric, spherical thrust bearing which ensures pitch, flap, and lead-lag motions.. Each blade is linked to the rotor hub via an elastomeric lead-lag damper, made of a single cylindrical layer of special rubber. The blades are restrained in flapping-down, by a reciprocal droop-stop ring, guided in the rotor hub. They are restrained in flapping-up by an upper positive stop.

### Tail rotor

The tail rotor is shrouded in the vertical fin. It has seven reinforced-plastic-injected blades. Pitch change is permitted by their stainless steel laminated tension-torsion pack. The tail rotor hub is directly mounted on, and driven by the tail gearbox, and its pitch control mechanism is part of the gearbox. The tail gearbox is rigidly supported inside the shroud, by a three-tube mount. The front tube houses the tail rotor driving shaft.

### Drive system

The primary transmission is composed of a pulley directly bolted to the engine output flange, a poly-V belt transmitting the power, and an upper pulley connected through a freewheeling unit to the gearbox input. The power is transmitted forward to main gear box, and aft to the tail rotor transmission.

The main gearbox contains a splash-lubricated spiral bevel-gear set which transmits power to the rotor mast. It is equipped with a filler plug / breather, a sight gage and a self-closing magnetic chip detector. The main gearbox upper and lower casings act as a tough central structure, rigidly bolted in the middle of the fuselage structure. The steel tail rotor transmission shaft runs inside the tail cone, on three ball bearings. A disc rotor brake is installed on the fore portion of tail transmission shaft. The brake jaws are actuated through a cable control, from an overhead control quadrant.

The tail gearbox contains a splash-lubricated spiral bevel-gear set which transmits power to the tail rotor. It also incorporates the tail rotor pitch control mechanism. It is equipped with a filler plug / breather, a sight gage and a self-closing magnetic chip detector.

### Flight controls

The Cabri G2 has dual flight controls which includes cyclic stick, collective stick and pedals.

Left controls are totally removable, without tools, if needed. Cyclic and collective controls actuate main rotor blade pitch through push-pull rods, bell cranks and the swash plate. Yaw control is transmitted from the pedals to the tail rotor by a long flexible push-pull control. The collective stick grip is divided into one fixed part and one twist grip to enable sensitive throttle control, and to allow governor motion. The collective stick is equipped with a friction mechanism, which is controlled by the pilot, without releasing his hands from the controls. The cyclic sticks have no friction mechanism, but a dual-axis electric trim, allowing to completely release the static forces in flight.

### Rotor brake

This rotor brake is mounted on the tail rotor transmission. It is actuated by a cable connected to a pull handle located above the pilot (yellow handle).

### Engine

The engine is a four-cylinder, direct-drive, carburetted gasoline engine. It is installed in the central compartment, suspended through elastomeric vibration mounts. It moves slightly to control the main transmission belt tension for clutch engagement / disengagement.

### Ignition system

The engine has a dual-plug, mixed ignition system comprising:

- One magneto with constant timing,
- One solid-state electronic capacitor-discharge system, with variable timing. The electronic system is direct-fed by the battery through a dedicated circuit breaker, located on the cabin breaker panel.

### Fuel system

The fuel system comprises :

- a single, crash-resistant fuel tank,
- an submersed electric booster pump,
- the engine-driven pump,
- a shut-down valve,
- a gascolator.

### Electrical circuit

The electrical systems are powered by a 12 V, 25 ampere-hour battery located in the left engine compartment, and a 13.7 V, 60 A alternator controlled by a voltage regulator.

### Instrument panel and console

The standard flight instruments include airspeed indicator, altimeter, variometer, magnetic compass and an Electronic Pilot Monitor - EPM. The basic avionics stack includes a VHF transceiver, transponder and an intercom.

### Electronic Pilot Monitor - EPM

Flight screen including:

Multiple limit indicator (MLI), Engine and rotor, speed indicator, Fuel gage /, fuel flow, Carburetor temperature, Cylinder head temperature, Engine oil temperature, Engine oil pressure, Fuel pressure, Outside air temperature, Battery, charging rate, Exhaust gas temperature, CO alarm, Clock Flight time /Stopwatch (CHRONO), Keys, Magnetic Chips and carburetor heating, message box

## 3. Helicopter main characteristics:

Cabri G2			
Dimensions	Fuselage	Length	6.31 m
		Width	1.24 m
		Height	2.37 m
	Main rotor	Diameter	7.2 m
	Tail rotor		0.6 m
Engine			One Lycoming O360-J2A with Modification N° J45-002
	Engine speeds		2585 – 2700 rpm
Fuel tank			170 L
Fuel			AVGAS 100LL
Air Speed	Power ON	Absolute VNE	130 Kt
	Power OFF		110 Kt
Rotor Speed	Power ON		515-540 rpm
	Power OFF		450-610 rpm
Recommended Safety Speed	- Climbing - Approach - Autorotation descent		50 Kt
Maximum Operating	Pressure Altitude		13000ft
MTOW with Internal load			700 Kg

-Table 1-



#### 4. Operator Differences Requirements (ODR) Tables:

Due to the fact that the Cabri G2 is a new type of helicopter, no Master Difference Requirement tables have been produced.

#### 5. Master Differences Requirements (MDR) Tables:

Due to the fact that the Cabri G2 is a new type of helicopter, no Master Difference Requirement tables have been produced.

#### 6. Licence endorsement

The proposal of this JOEB is to modify the table 9 of “Class and Type Ratings List (Helicopters)” and to replace:

- in column 1 “Manufacturer” the name “**Guimbal**” by “**Hélicoptères Guimbal**” and
- in column 4 “Licence Endorsement” the code G2 by Cabri G2 .

as follows:

1 Manufacturer	2 Helicopter	3	4 Licence endorsement
<b>Hélicoptères Guimbal</b>			
<b>-SE Piston-</b>	Cabri G2		Cabri G2

## 7. Specification for Training

### 7.1 Training Courses

The Type Rating Training Courses proposed by first Approved Training Organisation for the **Cabri G2** fulfils JAR-FCL 2 requirements.

During the evaluation, the JOEB has adopted the training course structure proposed by the manufacturer and by operator which are already approved by the NAA.

JOEB suggests few minor changes and the training courses proposed are divided into the following phases:

- Theoretical knowledge instruction
- Cockpit or Computer Trainer Self instruction
- Flight training program
- Skill test(s)

Note: The TRTC is recommended for approval in ATO like FTO , TRTO and others and also for operator specific training, provided the operator specific documentation is used throughout the course.

### 7.2 Licensing requirements

Appendix 1 to JAR FCL 2.261(b) and NPA No 2008-17B - AMC No 2 to FCL.725 (a) require for:

- an initial type rating on a SEP (H), an approved flight instruction of **5** flight hours in the helicopter. (excluding skill test)
- an additional type rating on a SEP (H) **within** the Appendix 1to JAR-FCL 2.245(b) (3), an approved flight instruction of **2** flight hours in the helicopter (excluding skill test).
- an additional type rating on a SEP (H) **not include** in Appendix 1to JAR-FCL 2.245(b) (3), an approved flight instruction of **5** flight hours in the helicopter (excluding skill test).

*(See Appendix 1 and Appendix 2).*

### 7.3 Type rating training programmes summary

- ITR corresponds to the training for initial type rating
- ATR corresponds to the training for additional type rating applying to candidates who already hold or have held a SEP(H) type rating.

QUALIFICATION HOLD	ITR	ATR
Single Engine Piston ----- >>>		√
Single Engine Turbine ----- >>>	√	
Multi Engine Turbine ----- >>>	√	
<b>Total of theoretical knowledge instruction + Test</b>	<b>10h00</b>	<b>7h00</b>
<b>Cockpit or Computer Trainer Self Instruction</b>	<b>2h00</b>	<b>1h00</b>
<b>Flight Training</b>	<b>5h00</b>	<b>2h00</b>

### 7.4 Theoretical knowledge Instruction programmes and test(s) summary

Type Rating	ITR	ATR
<ul style="list-style-type: none"> <li>• <i>Presentation of the aircraft, structure, transmission, rotors and equipment,</i></li> <li>• <i>Limitations</i></li> <li>• <i>Normal and Abnormal procedures</i></li> <li>• <i>Emergency procedures</i></li> <li>• <i>Performances</i></li> <li>• <i>Weigh and Balance</i></li> <li>• <i>Systems description</i></li> <li>• <i>Normal and contingency operation of the systems</i></li> <li>• <i>Avionics, EPM,MLI</i></li> </ul>	<b>8h00</b>	<b>5H00</b>
<b>Total theoretical knowledge instruction</b>	<b>8h00</b>	<b>5h00</b>
<b>Final Theoretical knowledge test</b>	<b>2h00</b>	<b>2h00</b>
<b>Cockpit or Computer Trainer Self Instruction</b>	<b>2h00</b>	<b>1h00</b>
<b>Total Theoretical knowledge instruction + Test</b>	<b>12h00</b>	<b>8h00</b>

## 7.5 Helicopter flight training programmes and skill test(s) summary

Type Rating	ITR	ATR
1. General Handling	1h00	0h45
2. Circuits and Various touch-downs	1h00	
3. Emergency Procedures EPM, Governor RRM	1h30	
4. Emergency Procedures EPM, Governor RRM and advanced autorotation.	1h30	1h15
<b>Total Flight Training</b>	<b>5h00</b>	<b>2h00</b>

  

<b>SKILL TEST</b>	Required	Required
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## 8. Specification for checking

### 8.1 Skill test

As required by JAR-FCL 2.240, JAR-FCL 2.262 and Appendix 3 to JAR FCL 2.240

### 8.2 Proficiency Checks

As required by JAR-FCL 2.245 and Appendix 3 to JAR FCL 2.240

## 9. Specification for Flight Simulation Training Devices

When this draft has been finalised no **Cabri G2** Flight Simulation Training Device where available. By the future if any **Cabri G2** FSTD are built, they will be qualified in accordance with JAR-FSTD (H).



## 10. Cross-crediting of proficiency checks for revalidation of type ratings helicopters

The JOEB team is considering that the Cabri G2 has been assessed, manoeuvrable, well designed and demonstrative for pilot trainings. It offers an autorotation capability with high inertia rotor and safe main rotor speed range. In addition an efficient engine governor monitoring engine speeds also when main rotor is desynchronized. It is fitted with an ergonomic engine and rotor parameters glass cockpit display and an automatic power margin indicator integrating altitude and temperature effects. The absence of mast bumping and dynamic rollover phenomena are increasing safety aspects of this helicopter.

Based on the evaluation JOEB **recommends** to include the **CABRI G2** as followed:

- in the table of the Appendix 1 JAR–FCL 2.245(b)(3). This Appendix includes a list of single-engine piston helicopter types and licence endorsement for the purpose of revalidation of type ratings according to JAR-FCL 2.245 (b) (3)

and

- In the table of the Appendix 11 of NPA 2008-17b / EASA / B. PART-FCL :  
CROSS-CREDITING OF PROFICIENCY CHECKS FOR REVALIDATION OF TYPE RATINGS HELICOPTERS

Manufacturer	Helicopter Type and Licence Endorsement
<b>Agusta-Bell</b>	
- SE piston	Bell47
<b>Bell Helicopters</b>	
- SE piston	Bell47
<b>Brantley</b>	
-SE piston	BrantleyB2
<b>Breda Nardi</b>	
- SE piston	HU269
<b>Enstrom</b>	
- SE piston	ENF28
<b>Hélicoptères Guimbal</b>	
- SE piston	Cabri G2
<b>Hiller</b>	
- SE piston	UH12
<b>Hughes/Schweitzer</b>	
- SE piston	HU269
<b>Westland</b>	
- SE piston	Bell47

## 11. Application of JOEB report

This JOEB report applies to commercial operations. However, the JOEB also recommends private, corporate operations and general aviation to follow the findings of this report.

## 13. Appendices

- Appendix 1 : JAR-FCL2 Type rating requirements
- Appendix 2: NOTICE OF PROPOSED AMENDMENT (NPA) NO 2008-17B – **AMC N° 2 to FCL.725 (a)**
- Appendix 3 : NOTICE OF PROPOSED AMENDMENT (NPA) NO 2008-17B – **APPENDIX 11.**