



## **OPERATIONAL EVALUATION REPORT**

### **AIRBUS HELICOPTERS**

### **ECUREUIL SINGLE ENGINE FAMILY**

### ***“FAMÍLIA ESQUILO MONOMOTOR”***

**(AS 350 B, D, B1, B2, BA, BB, B3, B3 ARRIEL 2B1, B3E AND EC 130 B4, T2)**

### **GRUPO DE AVALIAÇÃO DE AERONAVES – GAA**

**BRAZILIAN AIRCRAFT EVALUATION GROUP**

**AGÊNCIA NACIONAL DE AVIAÇÃO CIVIL**

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## Revision Control

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# Approval

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# 1 General

## 1.1 Evaluation Team

### 1.1.1. First issue team members

Name	Task	Organization
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## 1.2 Acronyms

- AHTS – Airbus Helicopters Training Services
- ATO – Approved Training Organization
- CWP – Caution and Warning Panel
- EASA – European Aviation Safety Agency
- FADEC – Full Authority Digital Engine Control
- GAA – Grupo de Avaliação de Aeronaves (Brazilian Aircraft Evaluation Group)
- HYD - Hidraulic
- IAC – Instrução de Aviação Civil (Civil Aviation Instruction)
- INSPAC – Inspetor de Aviação Civil (Civil Aviation Inspector)
- MDR – Master Difference Requirements
- MEL – Minimum Equipment List
- MMEL – Master Minimum Equipment List
- N/A – Not Applicable
- ODR – Operator Differences Requirements
- OEB – Operational Evaluation Board
- POI – Principal Operations Inspector
- RBAC – Regulamento Brasileiro de Aviação Civil
- RBHA – Regulamento Brasileiro de Homologação Aeronáutica
- RFM – Rotorcraft Flight Manual
- SCU – System Control Unit
- SET – Single Engine Turbine
- T/R – Tail Rotor
- VEMD – Vehicle and Engine Multi-Functions Display
- VFR – Visual Flight Rules
- VNE – Velocity Never Exceed

## 2 Introduction

### 2.1 Background

The evaluation was conducted by documentation analysis using the information provided by the manufacturer and the determinations of the Operational Evaluation Board (OEB) Report Revision 4, issued by the European Aviation Safety Agency (EASA) on June 8<sup>th</sup>, 2012.

From all aircraft of the Ecureuil single engine family, only the AS 350 B is exempt of Brazilian Type Certification.

When this report was published, the AS 350 D and BB had not been certified under RBAC 27 yet.

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

### 2.2 Objective

This report presents ANAC collection of results obtained from the operational evaluation of the aircraft from the Ecureuil single engine family (*Família Esquilo Monomotor*, in Brazil), AS 350 B, D, B1, B2, BA, BB, B3 B3 Arriel 2B1, B3e and EC 130 B4, T2.

### 2.3 Purpose

The purpose of this report is to:

- a. Provide a general description of all Ecureuil / Single Engine Family;
- b. Define the pilot rating assigned for the aircraft from the Ecureuil single engine family;
- c. Define the requirements for training, checking and currency applicable to flight crew for the aircraft from the Ecureuil single engine family; and
- d. Provide the Master Differences Requirements (MDR) for crews requiring differences qualification for mixed-fleet-flying.

AS 350 B, D, B1, B2, BA, BB variants/models are all equipped with hydromechanical governing system, GAA is considering that the design and training differences between to be essentially the same variant. In this report to

an easy reading the AS 350 B, D, B1, B2, BA, BB are sometimes named and grouped together under “AS 350 Series”.

## **2.4 Applicability**

This report is applicable to:

- a. Brazilian operators of any of the aircraft from the Ecureuil single engine family who operate under the RBHA 91 and the RBAC 135 rules;
- b. Approved Training Organizations certified under Brazilian regulations;
- c. Civil Aviation Inspectors (INSPAC) related to safety oversight of any of the aircraft from the Ecureuil single engine family;
- d. ANAC Principal Operations Inspectors (POIs) of operators of any of the aircraft from the Ecureuil single engine family.

## **2.5 Cancelation**

This report revokes and replaces the following ANAC issued document:

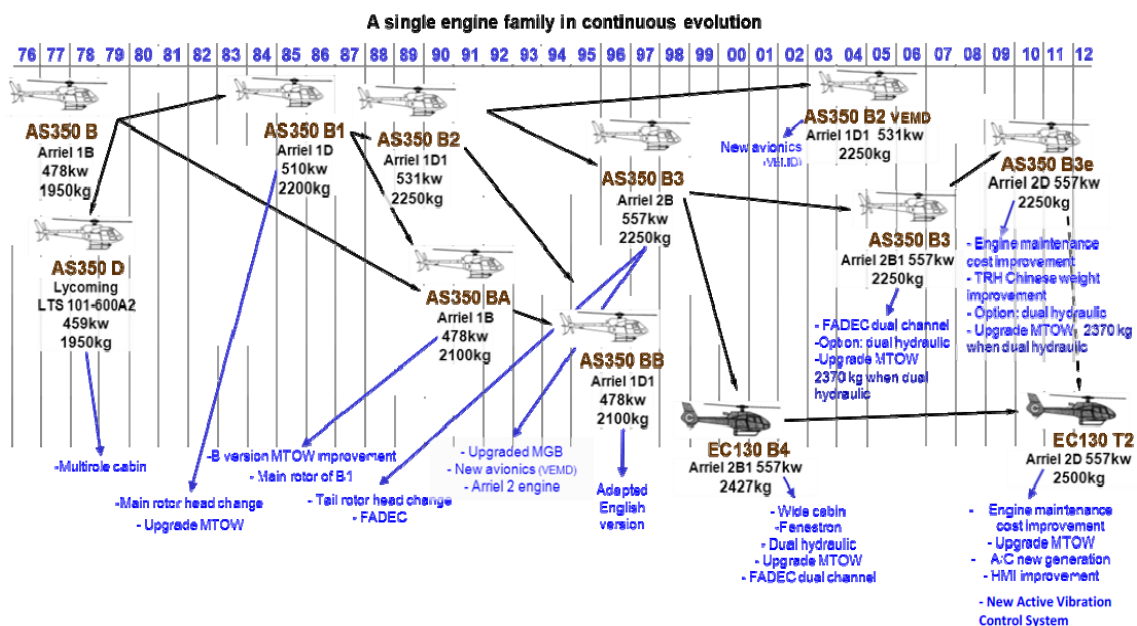
- a. Technical Note 009/2013/GAAS/GGTA/SSO-ANAC, dated 14 Jun. 2013.



### 3 General Description of Ecureuil Single Engine Family

Airbus Helicopters Manufacturer produces the all AS 350 to EC 130 T2 Single Turbine Engine Helicopter in the EASA CS-27 “NORMAL” rotorcraft category.

Here illustrated, the successive improvements of the “*Ecureuil Single Engine*” family.



They are approved under TRANSPORT category B of JAR / FAR PART 27/ EASA-CS 27, for VFR by day and night operation and have been certificated for a minimum crew of one Pilot (refer to concerned Rotorcraft Flight Manual).

AS 350 B is exempt of Brazilian Type Certification. AS 350 D and BB are not certified under RBAC 27.

Note:

- Commercial designation for AS 350 B, D, B1, B2, BA, BB and B3, is Ecureuil (Astar in USA) and (**Esquilo** in Brazil).
- Military versions named “**Fennec**” (AS 550 C, C1, C2, L, L1, L2, and U) are not presented in this document.

PS: When the manufacturer changed its name from Eurocopter Group to Airbus Helicopters in 2014 the trade names of some products were changed (applied

by 1 January 2016) to reflect this. Therefore, the following equivalence must be used in this report:

Previous trade name	New trade name
AS350 B3e	H125
EC130 T2	H130

## General

### **AS 350 Series (including AS 350 B, D, B1, B2, BA, BB variants):**

- B powered by a Turboméca **Arriel 1B** engine (MTOP 478 Kw).
- D powered by a Lycoming **LTS 101-600A2** engine (MTOP 459 Kw).
- B1 powered by a Turboméca **Arriel 1D** engine (MTOP 510 Kw).
- B2 powered by a Turboméca **Arriel 1D1** engine (MTOP 531 Kw),
- BA powered by a Turboméca **Arriel 1B** engine (MTOP 478 Kw).
- BB powered by a Turboméca **Arriel 1D1** engine (MTOP 531 Kw).

All are equipped with:

- a) An engine governing insured by a N2 and N1 hydro-mechanical system;
- b) A Manual fuel throttle is installed on a quadrant panel on the cabin floor (Twist grip is an option);
- c) A Starflex Main Rotor Head three blades design;
- d) Main rotor composite blades;
- e) A single hydraulic system;
- f) A flexible seesaw Tail Rotor type, mainly made of composites;

Recent evolution are equipped with a **Vehicle and Engine Multifunction Display (VEMD)**.

Note: Engine Power Check calculation and recording are not available on those VEMD's.

### **AS 350 B3:**

- Powered by a Turboméca Arriel 2B (MTOP 557 Kw),

- Equipped by an electronic Vehicle and Engine Multifunction Display;
  - a) Engine governing insured by a single channel FADEC;
  - b) Equipped with a manual fuel Twist Grip which is located on the collective lever (first aircrafts were equipped with a manual locking-unlocking device to set the positive range; aircrafts produced after 01-01-2003 are equipped with an electrical automatic unlocking when the red GOV light illuminates on the CWP)
- (c), (d), (e), (f) are identical.

### **AS 350 B3 Ariel 2B1:**

(In production since the AS 350 B3 s/n° 3875 [01-07-2004])

- Powered by a Turboméca **Arriel 2B1** (MTOPI 557 Kw);
- Equipped with an electronic **Vehicle and Engine Multifunction Display:**
  - a) Engine governing insured by a **dual channel FADEC**,
  - b) An emergency Back-up system automatically activated in case of FADEC total failure;
- Automatic variable rotor speed control according to operations conditions (sound level reduction);
- Cockpit breakers panels replace the fuses panels (Since the AS 350 B3 s/n° 4193 [01-01-2008]);
- (c), (d), (e), (f) are identical.
  - A dual hydraulic system for dual-body servo-controls is available in option.

### **AS 350 B3e:**

- Powered by a Turboméca **Arriel 2D** (MTOPI 557 Kw), equipped with the EDR (Engine Data Recorder);
- Equipped with an electronic **Vehicle and Engine Multifunction Display:**
  - a) Engine governing is insured by a **dual channel FADEC**;
  - b) An emergency Back-up system automatically activated in case of FADEC total failure;

- Automatic variable rotor speed control according to operations conditions (sound level reduction);
- Cockpit breakers panels;
- Improvement of the Chin Weight efficiency for Tail Rotor suppressing the Load Compensator;
- (c), (d), (e), (f) are identical.
  - A dual hydraulic system for dual-body servo-controls is available in option.

#### **EC 130 B4:**

- Widening of the AS 350 B3 cabin and modernization of the windshield-screen design;
- Pilot seat on the left side;
- e) Dual hydraulic system, for dual-body servo-controls, installed in base;
- f) Tail Rotor “**Fenestron**” design;

And identical to AS 350 B3 2B1 for:

- Engine **Arriel 2B1** (MTOP 557 Kw);
- Equipped with an electronic **Vehicle and Engine Multifunction Display**;
- Items (a), (b), (c), (d)
- Automatic variable rotor speed control;
- Cockpit breakers panels.

#### **EC 130 T2:**

- Powered by a Turboméca **Arriel 2D** (MTOP 710 Kw), equipped with the EDR (Engine Data Recorder);
- Equipped with an electronic Vehicle and Engine Multifunction Display;
- Main MGB module improved;
- New crashworthy fuel tank;

- New Active Vibration Control System;
- New pedestal control panel;
- Airbus Helicopters new Air Conditioning concept;
- New design of the air intake;

And identical to EC 130 B4 for:

- Wide cabin;
- Pilot seat on the left side;
- Items (a), (b), (c), (d), (e), (f)
- Automatic variable rotor speed.

## 4 Helicopters Main Characteristics

Sum up of main characteristics of Ecureuil “Single Engine Family”

**Table 1 (reading mode column by column from the left to the right side)**

Ecureuil Single engine family			AS 350 B	AS 350 D	AS 350 B1	AS 350 B2	AS 350 BA	AS 350 BB	AS 350 B3	AS 350 B3 <sup>Arriel 2B1</sup>	AS 350 B3e	EC 130 B4	EC 130 T2	
Dimensions	Fuselage	Length	10.93 m	identical	identical	identical	identical	identical	identical	identical	identical	10.68 m	identical	
		Width	1.87 m	identical	identical	identical	identical	identical	identical	identical	identical	2.03 m	identical	
		Height	3.02 m	identical	identical	identical	identical	identical	identical	identical	identical	identical	3.61 m	identical
	Main rotor	Diameter	10.69 m	identical	identical	identical	identical	identical	identical	identical	identical	identical	10.69 m	identical
			Tail rotor	1.86 m	identical	identical	identical	identical	identical	identical	identical	identical	1 m	identical
Engines			Turboméca Arriel 1B	Lycoming LTS 101-600A2	Turboméca Arriel 1D	Turboméca Arriel 1D1	Turboméca Arriel 1B	Turboméca Arriel 1D1	Turboméca Arriel 2B	Turboméca Arriel 2B1	Turboméca Arriel 2D	Turboméca Arriel 2B1	Turboméca Arriel 2D	
Fuel tanks			540 l.	identical	identical	identical	identical	identical	identical	identical	identical	identical	identical	
Air Speed	Power ON	Absolute VNE	147 kt	identical	identical	identical	identical	155 kt	identical	identical	identical	identical	Identical if normal CG <b>Note<sup>1</sup></b>	
	Power OFF		120 kt	identical	identical	identical	identical	125 kt	identical	identical	identical	identical	Identical	
Rotor Speed	Power ON	Autoration	385 rpm +1/-5 rpm	identical	390 rpm +4/-5 rpm	identical	identical	identical	390 rpm +4/-5 rpm	375 to 405 rpm	identical	identical	identical	
			424 to 320 rpm	identical	430 to 320 rpm	identical	identical	identical	identical	430 to 320 rpm	identical	identical	identical	
Maximum Operating		Pressure Altitude	16000 ft	15000 ft	20000 ft	identical	16000 ft	identical	identical	23000 ft	identical	identical	identical	
MTOW with Internal load			1950 Kg	identical	2200 Kg	2250 Kg	2100 Kg	2250 Kg	identical	Identical <b>Note (C)</b>	Identical <b>Note (C)</b>	2427 Kg	2500 Kg	
MTOW with External load			2100 Kg	identical	2450 Kg	2250 Kg	2250 Kg	2500 Kg	2800 Kg	identical	identical	identical	3050 Kg	

Note (α) = Upgrade MTOW 2370 kg when dual hydraulic on this variant.

Note (\*) = When the zero fuel aircraft gross-mass and longitudinal CG combination is in the Reduced VNE area of the longitudinal CG chart (see Flight Manual chart), the Reduced VNE power-on limit is effective for the entire flight:

Reduced VNE Power-On	Hp (ft)	0	2000	4000	6000	8000	10000	12000	14000	16000	18000	20000	22000	23000
	IAS (kt)	136	133	130	127	124	121	118	113	107	101	95	89	86

## 5 Pilot Rating

According to the RBAC 61 Amendment 06, all the Ecureuil single engine family aircraft (AS 350 B, D, B1, B2, BA, BB, B3 B3 Arriel 2B1, B3e and EC 130 B4, T2) require a single engine turbine helicopter class rating.

## 6 Master Difference Requirements (MDR)

The Master Difference Requirements matrix for the entire Ecureuil Single Engine Family is shown in table 2. These provisions are applied when there are differences between models which affect crew knowledge, skills, or abilities related to flight safety (e.g., Level A or greater differences) for training, checking and currency, respectively, according to IAC 121-1009.

**Table 2 - Master Difference Requirements**

		From helicopter												
		AS 350 B	AS 350 D	AS 350 BA	AS 350 BB	AS 350 B1	AS 350 B2	AS 350 B2 VEMD	AS 350 B3	B3 Arriel 2B1	AS 350 B3e	EC 130 B4	EC 130 T2	
To helicopter	AS 350 B		A/A/A	A/A/A	A/A/A	A/A/A	A/A/A	B/B/B	D/D/D	D/D/D	D/D/D	D/D/D	D/D/D	
	AS 350 D	A/A/A		A/A/A	A/A/A	A/A/A	A/A/A	B/B/B	D/D/D	D/D/D	D/D/D	D/D/D	D/D/D	
	AS 350 BA	A/A/A	A/A/A		A/A/A	A/A/A	A/A/A	B/B/B	D/D/D	D/D/D	D/D/D	D/D/D	D/D/D	
	AS 350 BB	A/A/A	A/A/A	A/A/A		A/A/A	A/A/A	B/B/B	D/D/D	D/D/D	D/D/D	D/D/D	D/D/D	
	AS 350 B1	A/A/A	A/A/A	A/A/A	A/A/A		A/A/A	B/B/B	D/D/D	D/D/D	D/D/D	D/D/D	D/D/D	
	AS 350 B2	A/A/A	A/A/A	A/A/A	A/A/A	A/A/A		B/B/B	D/D/D	D/D/D	D/D/D	D/D/D	D/D/D	
	AS 350 B2 VEMD	B/B/B	B/B/B	B/B/B	B/B/B	B/B/B	B/B/B		D/D/D	D/D/D	D/D/D	D/D/D	D/D/D	
	AS 350 B3	D/D/D	D/D/D	D/D/D	D/D/D	D/D/D	D/D/D	D/D/D		D/D/D	D/D/D	D/D/D	D/D/D	
	AS 350 B3 Arriel 2B1	D/D/D	D/D/D	D/D/D	D/D/D	D/D/D	D/D/D	D/D/D	D/D/D	C/C/C		A/A/A	C/C/C	C/C/C
	AS 350 B3e	D/D/D	D/D/D	D/D/D	D/D/D	D/D/D	D/D/D	D/D/D	D/D/D	C/C/C	A/A/A		C/C/C	C/C/C
	EC 130 B4	D/D/D	D/D/D	D/D/D	D/D/D	D/D/D	D/D/D	D/D/D	D/D/D	C/C/C	C/C/C	C/C/C		A/B/B
	EC 130 T2	D/D/D	D/D/D	D/D/D	D/D/D	D/D/D	D/D/D	D/D/D	D/D/D	C/C/C	C/C/C	C/C/C	A/B/B	

The Operational Evaluation team has considered the AS 350 B, D, B1, B2, BA, BB, B3, B3 Arriel 2B1 & EC 130 B4, and recommends to classify:

- **EC130 B4** as “a variant” of the “Ecureuil Single Engine Family” and not as a different type. (See paragraph 8.3);
- **The AS 350 B3e** as an evolution of the AS 350B3 Arriel 2B1 and recommends a familiarization training with the AS 350 B3 Arriel 2B1;
- **The EC130 T2** as an evolution of the EC 130 B4, and recommends a familiarization training with the EC 130 B4.

The entire “Ecureuil Single Engine Family” is now: AS 350 B, D, B1, B2, BA, BB, B3, B3 Arriel 2B1, B3e and EC 130 B4, T2.



## **7 Operator Difference Requirements (ODR)**

To support the evaluation and the content of proposed minimum difference and familiarization trainings, ODR tables have been developed and they can be directly requested to Airbus Helicopters.

However, these ODR tables are Airbus Helicopters generic and therefore may not include items that are applicable to particular operators.

Each operator of a mixed fleet of aircrafts from the Ecureuil Single Engine family shall produce its own ODR, as required by IAC 121-1009.

## 8 Specifications for Training, Checking and Currency

Specifications for training, checking and currency are detailed on OEB Report mentioned above.

GAA recommends the pilot training syllabi to be divided into the following phases for approval in ATOs' and for operator's specific training, provided the operators specific documentation is used throughout the course.

- Theoretical knowledge instruction and test summary
- Helicopter Flight training courses
- VEMD Computed Trainer or equivalent (Aided instruction), when applicable
- Skill test(s), when applicable

### 8.1 Airmen Minimum Experience for Initial Flight Training

Applicant pilot can take credit on previous single engine turbine (SET) helicopter experience for the initial flight training.

#### 8.1.1 No previous SET experience

Candidates for an Initial AS 350 series, or AS 350 B3, AS 350 B3 Arriel 2B1, AS 350B3e or EC 130 B4 & T2 flight training with no previous experience on SET helicopters must hold:

- A valid Pilot license.

#### 8.1.2 Demonstrated SET experience

Candidates for an Initial AS 350 series, or AS 350 B3, AS 350 B3 Arriel 2B1, AS 350B3e or EC 130 B4 & T2 flight training with demonstrated experience on SET helicopters must hold:

- Hold a valid Pilot license, and
- Hold a Single Engine Turbine helicopter rating.

## 8.2 Differences Training in between variants / models ( $\Delta 1$ to $\Delta 12$ )

From →		AS 350 B, D, BA, BB, B1, B2, B2 VEMD	AS 350 B3	AS 350 B3 Arriel 2B1 & AS 350 B3e	EC 130 B4 & T2
$\Delta 1$	To:	AS 350 B3			
$\Delta 2$	To:	AS 350 B3 Arriel 2B1 & AS 350 B3e			
$\Delta 3$	To:	EC 130 B4 & T2			
$\Delta 4$	To:		AS 350 B3 Arriel 2B1 & AS 350 B3e		
$\Delta 5$	To:		EC 130 B4 & T2		
$\Delta 6$	To:		AS 350 B, D, BA, BB, B1, B2, B2 VEMD		
$\Delta 7$	To:			EC 130 B4 & T2	
$\Delta 8$	To:			AS 350 B3	
$\Delta 9$	To:			AS 350 B, D, BA, BB, B1, B2, B2 VEMD	
$\Delta 10$	To:				AS 350 B3 Arriel 2B1 & AS 350 B3e
$\Delta 11$	To:				AS 350 B3
$\Delta 12$	To:				AS 350 B, D, BA, BB, B1, B2, B2 VEMD

**$\Delta 1$ :** from AS 350 series to the AS 350 B3;

**$\Delta 2$ :** from AS 350 series to the AS 350 B3 Arriel 2B or AS 350 B3e;

**$\Delta 3$ :** from AS 350 series to the EC 130 B4 & T2:

The applicant pilot must:

Have attended the planned theoretical training and proved that he/she has passed a proficiency check on AS 350 series within the twelve months preceding the differences-highlighting course, prior to begin the training.

**Δ 4:** from AS 350 B3 to the AS 350 B3 Arriel 2B1 or AS 350 B3e,

**Δ 5:** from AS 350 B3 to the EC 130 B4 & T2,

**Δ 6:** from AS 350 B3 to the AS 350 series:

The applicant pilot must:

Have attended the planned theoretical training and proved that he/she has passed a proficiency check on AS 350 B3 within the twelve months preceding the differences-highlighting course, prior to begin the training.

**Δ 7:** from AS 350 B3 Arriel 2B1 or AS 350 B3e, to the EC 130 B4 & T2,

**Δ 8:** from AS 350 B3 Arriel 2B1 or AS 350 B3e, to the AS 350 B3,

**Δ 9:** from AS 350 B3 Arriel 2B1 or AS 350 B3e, to the AS 350 series:

The applicant pilot must:

Have attended the planned theoretical training and proved that he/she has passed a proficiency check on AS 350 B3 Arriel 2B1 and AS 350 B3e, within the twelve months preceding the differences-highlighting course, prior to begin the training.

**Δ 10:** from EC 130 B4 & T2 to the AS 350 B3 Arriel 2B1 or AS 350 B3e,

**Δ 11:** from EC 130 B4 & T2 to the AS 350 B3,

**Δ 12:** from EC 130 B4 & T2 to the AS 350 series:

The applicant pilot must:

Have attended the planned theoretical training and proved that he/she has passed a proficiency check on EC 130 B4 & T2 within the twelve months preceding the differences-highlighting course, prior to begin the training.

### 8.3 Initial and Differences training minimum syllabus summary

The training tables below summarize the minimum training hours required for the training courses.

Applying on: <b>AS 350 series</b> (AS 350 B, D, BA, BB, B1, B2)	No SET experience	SET experience	Δ 6	Δ 9	Δ 12
			AS 350 B3 → AS 350 series	B3 2B1 or B3e → AS 350 series	B4 or T2 → AS 350 series
Theoretical course program	16h30	14h30	10h00	10h00	12h30
VEMD course (if applicable)	03h00	03h00	N/A	N/A	N/A
+ Theoretical exam	01h30	01h30	01h00	01h00	01h30
In-flight training	05h00	03h00	01h30	01h30	03h00
+ skill test	Required	Required	N/A	N/A	N/A

*Note 1:* When Flight time duration indicates 01h30, two flights have to be performed, including at least two engine starting.

Applying on: <b>AS 350 B3</b>	No SET experience	SET experience	Δ 1	Δ 8	Δ 11
			AS 350 series → B3	B3 2B1 or B3e → B3	B4 or T2 → B3
Theoretical course program	16h30	14h30	08h00	05h00	10h00
VEMD course (if applicable)	03h00	03h00	03h00	N/A	N/A
+ Theoretical exam	01h30	01h30	01h00	N/A	01h00
In-flight training	05h00	03h00	02h00	01h00	02h00
+ skill test	Required	Required	N/A	N/A	N/A

Applying on: <b>AS 350 B3 Arriel 2B1 or AS 350 B3e</b>	No SET experience	SET experience	Δ 2	Δ 4	Δ 10
			AS 350 series → B3 2B1 or B3e	B3 → B3 2B1 or B3e	B4 or T2 → B3 2B1 or B3e
Theoretical course program	16h30	14h30	08h00	05h00	10h00
VEMD course (if applicable)	03h00	03h00	03h00	N/A	N/A
+ Theoretical exam	01h30	01h30	01h00	N/A	01h00
In-flight training	05h00	02h00	01h00	01h00	02h00
+ skill test	Required	Required	N/A	N/A	N/A

Applying on: <b>EC 130 B4 or T2</b>	No SET experience	SET experience	Δ 3	Δ 5	Δ 7
			AS 350 series → B4 or T2	B3 → B4 or T2	B3 2B1 or B3e → B4 or T2
Theoretical course program	16h30	14h30	11h30	11h30	10h00
VEMD course (if applicable)	03h00	03h00	03h00	N/A	N/A
+ Theoretical exam	01h30	01h30	01h00	01h00	01h00
In-flight training	05h00	03h00	03h00	02h00	02h00
+ skill test	Required	Required	N/A	N/A	N/A

## 8.4 Theoretical Knowledge Syllabus

### 8.4.1 Initial theoretical training

The following table presents a summary of the material for an Initial theoretical training program. Whilst based on the AHTS program, training providers should ensure their type specific courses cover the pertinent material.

Theoretical Knowledge Syllabus	No SET experience	SET experience
1. Turbine engine knowledge course (*)	02h00	N/A
2. Helicopter structure, transmissions, rotors and equipment, normal and abnormal operation of the systems (*)	08h00	08h00
3. Limitations	01h00	01h00
4. Performance, flight planning and monitoring	01h30	01h30
5. Weight and balance, servicing	01h00	01h00
6. Emergency procedures	03h00	03h00
7. Additional theoretical knowledge for helicopters equipped with electronic flight instrumentation systems or Vehicle & Engine Multifunction Display (VEMD): When applicable	03h00	03h00
8. Optional equipment	In addition	In addition
<b>Total Theoretical Knowledge Syllabus (including addition VEMD Training)</b>	<b>19h30</b>	<b>17h30</b>
Theoretical exam	01h30	01h30
<b>TOTAL</b>	<b>21h00</b>	<b>19h00</b>

(\*) If the pilot has no SET experience, he or she must first undergo a turbine engine course.

On completion of the theoretical phase, the trainee should be assessed via a multiple-choice questionnaire (a minimum of 50 questions is recommended) covering the entire program. The threshold for passing should be 75% of correct answers in the written examination on a range of multiple-choice or computerized questions.

### 8.4.2 Difference Training in between variants

Theoretical instruction should be provided considering the previous experience of the applicant. The approved training organizations would adapt the minimum training syllabus being in line with paragraph 8.3 here above

## 8.5 Flight Training Course Summary

### 8.5.1 Initial practical training

<b>Flight Training</b>	<b>No SET experience</b>	<b>SET experience</b>
1. Pre-Flight, cockpit, engine start, Basic air work, General Handling	01h15	01h00
2. Circuits and Various touch-downs	01h15	-
3. Systems and Emergency Procedures	01h15	01h00
4. Normal and Emergency Procedures / Advanced autorotation	01h15	01h00
<b>Total Flight Training</b>	<b>05h00</b>	<b>03h00</b>
Skill test	Required	Required

During the flight “1”, the instructor will evaluate the trainee level.

The flight training course corresponds to the basic aircraft certification, taking into account the type of license held and the experience of the candidate.

Each flight session could be extended or reduced by 15 minutes at the discretion of the instructor; but the total time should remain 5h00 for attending pilots without SET experience and 3h00 for attending pilots with demonstrated SET experience as bare minimum.

Additional flight could be necessary at the discretion of the instructor if the trainee has not successfully demonstrated the ability to perform all maneuvers with a high degree of proficiency.

Depending on the configuration of the helicopter used and on customer's request, additional flights may also be performed to enhance basic initial training (minimum syllabus).

### 8.5.2 Difference training in between variants

Flight instruction should be provided considering the previous experience of the applicant. The approved training organizations would adapt the minimum training syllabus being in line with paragraph 8.3 here above.

After completing the training on the aircraft considered, the accomplishment of which is recorded on the applicant's flight log and signed by the instructor.

## 8.6 Familiarization Training

Familiarization training requires the acquisition of additional knowledge.

### 8.6.1 “As 350” Series variants equipped with a conventional flight instruments panel

The AS 350 series (AS 350 B, D, B1, B2, BA, BB) are basically equipped with conventional flight instruments panel. Familiarization training can adequately be addressed through Self-instruction (Rotorcraft Flight Manual) to convert from one of these aircraft to another. The topics requiring the acquisition of additional knowledge are mentioned in the following table:

Helicopter Variants / Models	Content of theoretical subjects	Recommended Minimum Duration	Training reference manual
AS 350 B AS 350 D AS 350 B1 AS 350 B2 AS 350 BA AS 350 BB	<p>The following topics require the acquisition of knowledge :</p> <ul style="list-style-type: none"> <li>• Presentation of the aircraft, structure, engine, transmission, rotors and equipment, normal and contingency operation of the systems</li> <li>• Limitations</li> <li>• Performance, preparation and flight control</li> <li>• Weight and balance, operation</li> </ul>	4h00	RFM and Pilot Operating Handbook
	<ul style="list-style-type: none"> <li>• Optional equipment</li> </ul>	In addition	



### 8.6.2 Variants Equipped with instruments panel including VEMD

Because aircraft are constantly evolving, latest versions are equipped with a Vehicle and Engine Multifunction Display (VEMD) in addition retrofits allow variants to be fitted with such display.

From a basic variant / model of the AS 350 Series, to another variant equipped with a VEMD, pilots need to get an aided instruction by using devices capable of systems training, like VEMD computed trainer, Cockpit Trainer, computer base trainer before the first flight with this Electronic Instrument system.

Helicopter Variants / Models	Systems training Devices	Recommended Minimum Duration	Training reference manual
VEMD Training extension	VEMD computed Trainer, Cockpit trainer, computer based trainer	3H00	RFM and Pilot Operating Handbook

Note: Additional familiarization training may depend on optional equipment installed on specific variants, and must be completed in accordance with the appropriate level of training.

### 8.6.3 “AS 350 B3 Arriel 2B1 to AS 350 B3e” variants, and conversely

The AS 350 B3e is powered by an Arriel 2D engine at the same power level than the AS 350 B3 Arriel 2B1. The AS 350 B3e performances are similar than AS 350 B3 Arriel 2B1. Familiarization training can adequately be addressed through Self-instruction (Rotorcraft Flight Manual) to convert from one of these aircraft to another. The topics requiring the acquisition of additional knowledge are mentioned in the following table:

Helicopter Variants / Models	Content of theoretical subjects	Recommended Minimum Duration	Training reference manual
AS 350 B3 Arriel 2B1  AS 350 B3e	The following topics require the acquisition of knowledge : <ul style="list-style-type: none"> <li>• Presentation of the aircraft, structure, engine, transmission, rotors and equipment, normal and contingency operation of the systems</li> <li>• Limitations</li> <li>• Performance, preparation and flight control</li> <li>• Weight and balance, operation</li> </ul>	2h00	RFM and Pilot Operating Handbook
	<ul style="list-style-type: none"> <li>• Optional equipment</li> </ul>	In addition	

### 8.6.4 EC 130 B4 to EC 130 T2” variants, and conversely

The EC 130 T2 is powered by an Arriel 2D engine more powerful than the Arriel 2B1 fitted on EC 130 B4. The EC 130 T2 performances are improved compared to EC 130 B4. Familiarization training can adequately be addressed through Self-instruction (Rotorcraft Flight Manual) to convert from one of these aircraft to another. The topics requiring the acquisition of additional knowledge are mentioned in the following table:

Helicopter Variants / Models	Content of theoretical subjects	Recommended Minimum Duration	Training reference manual
EC 130 B4 EC 130 T2	<p>The following topics require the acquisition of knowledge :</p> <ul style="list-style-type: none"> <li>• Presentation of the aircraft, structure, engine, transmission, rotors and equipment, normal and contingency operation of the systems</li> <li>• Limitations</li> <li>• Performance, preparation and flight control</li> <li>• Weight and balance, operation</li> </ul>	3h00	RFM and Pilot Operating Handbook
	<ul style="list-style-type: none"> <li>• Optional equipment</li> </ul>	In addition	

## 8.7 Training Area of Special Emphasis (TASE)

The following procedures for training should receive special attention. Since, although they relate to separate issues, they are inter-connected. Flight instructors should take into account across the whole fleet AS 350 and EC 130, that Pilot Training methodology and demonstration methodology are linked.

Therefore, the GAA supports the manufacturer recommendations and training providers should consider the following elements:

### 8.7.1 TASE / Pilot Training Methodology

- **Autorotation / Engine off landing:**

Autorotation training shall be performed with a Trainee and an Instructor only.

Autorotation training as mentioned in the RFM shall be conducted within gliding distance of a running landing suitable area.

The engine reduction to idle position shall be completed when the helicopter is in autorotative descent and established on the glide path for the appropriate suitable area:

- Perform first attempt Power on (Fuel Flow Control Lever or twist grip on flight position), execute the flare then go around then;
- Perform the autorotation training / Engine off landing (FFCL at 67/70 % Ng or twist grip on idle position); and
- Check engine rating.

Notes:

- *On AS 350 Series, equipped with FFCL fitted on the cabin floor: from 67/70 % Ng to the Flight position, the lever must be managed cautiously.*
- *On B3 Arriel 2B1, it needs a maximum of 8 seconds to recover the engine flight rating using the manual twist grip (See RFM Section 8.3).*
- *On B3 Arriel 2B1, B3e and EC 130 B4 & T2, if needed it is possible to quickly switch back to the flight detent of the twist grip, at any time and for any NR value.*

Pay attention to the following:

- Do not lower the nose too abruptly when power is reduced, to avoid a dive.
- Maintain proper NR during the descent.
- Wait to apply the collective pitch at a correct height to avoid hard landing, loss of heading control, and possible damage to the tail rotor and to the main rotor blade stops.
- Use sufficient anti-torque pedal travel when power is reduced, especially on EC130B4 & T2 with Fenestron.
- Keep in mind that a higher All Up Weight increases the risk of NR overspeed and hard landing.

AS 350 Series equipped with FFCL fitted on the cabin floor:

- When FFCL is reduced to 67/70 %Ng, take care to not reduce more, to avoid an engine flame out.
- There is no mechanical idle notch and the Instructor must adjust the FFCL.
- For go-around maneuver, anticipate the decision process.
- A quick repositioning of the FFCL above the flight detent can lead to a rotor and engine overspeed.

AS 350 B3:

- Pilot must check that the Flight stop twist Grip locking device is locked, before turning the twistgrip to the flight position.

### EC 130 B4 & T2:

- Mind the important ground effect of the large fuselage when leveling the helicopter after the flare.

- **Simulated Hydraulic failure**

(Except EC 130 B4 & T2 and AS 350 B3 equipped with the optional dual hydraulic system):

- In steady flight conditions, simulate the hydraulic failure by depressing HYD TEST push button on the System Control Unit (Honeywell or SCU console panel): HYD + Gong sounds while the student adjusts speed to obtain between 40 and 60 Kt.

**CAUTION:** The Instructor must ensure that the trainee adjusts the speed and attitude prior to isolating the hydraulics.

- Once safety speed is set, and prior to activating the hydraulic isolation switch reset HYD TEST pushbutton to restore hydraulic pressure in tail rotor accumulator (except for AS 350 B3e).
- Control loads increase with speed. As control loads increase, be careful not to inadvertently move twist grip out of FLIGHT detent.
- If necessary during the training exercise, hydraulic assistance can be recovered immediately by setting the HYD TEST push button to the UP position or by resetting the hydraulic cut off switch to ON.
- If the HYD TEST pushbutton is not reset on the control panel, no hydraulic assistance can be restored. Before hydraulic isolation with the switch on the collective lever, do not forget to reset the HYD pushbutton on the console.
- Do not let the student attempt hover flight or low speed maneuver, as the intensity and direction of the control feedback force will change rapidly. This will result in a loss of control.

On previous versions of AS350 equipped with a HONEYWELL console control, do not silence the HORN by using the HORN switch.

The HORN will be silenced when the pilot selects the hydraulic cut-off switch to off.

If the pilot uses the HORN switch to silence the HORN before using the hydraulic cut-off switch, this crucial step could be forgotten. This could then

result in significant unbalanced lateral cyclic feedback forces, especially at low speed, if one of the lateral accumulators depletes before the other one.

In addition, de-activating the HORN using the HORN switch, makes it unavailable to warn the pilot of low or high rotor RPM.

Pay attention to the following:

- Hydraulic accumulators gives energy during approximately 20 seconds, in proportion of controls movements, so reduce to safety speed in this time frame.
- Anticipate to perform a shallow approach.
- Perform a running landing.
- Hover flight or any low speed maneuver must be avoided.
- Keep in mind that higher All Up Weight increase the risk of aircraft loss of control at low speed.
- The statistics show that failure to strictly comply with the procedure consequently increases the risk level.

Notes:

***Left hand collective lever is not equipped with “HYD” switch,***

- *To be well prepared, brief your Trainee for setting the collective lever HYD switch to on, if necessary.*
- *If the Instructor decides to take over the controls, he must plan to continue the flight up to the landing without the hydraulic assistance.*
- *CAUTION: when hydraulic pressure is restored in flight, the forces disappear which can lead to an abrupt left roll movement.*
- *Anticipate the power application to avoid induced increase in nose-up attitude.*

- **Simulated single channel FADEC failures (B3 version only):**

Resetting to AUTO mode after manual fuel flow training may activate the idle switch leading to a loss of power.

Reselection to AUTO should only be made on ground after landing or in a flight condition allowing a landing in autorotation. It is possible to switch back the AUTO / MANU selector to the automatic fuel control mode (AUTO mode) at any time and for any NR value.

In all cases, the NR must be controlled so that the max NR alarm is never activated. At the end of the exercise check that the twist grip is correctly in the FLIGHT position.

Before MOD 07 3222:

The time spent in FADEC failure training configuration, with “AUTO/MANU” governing mode selector set to “MAN”, shall not exceed 15 consecutive minutes.

Wait at least 15 minutes between two operations on “MAN” setting even if it has been selected only for a few seconds.

Before MOD 07 3084:

Reset the switch for twist grip lock in order to re-engage the flight stop locking device.

Pay attention to the following:

- Take care to use twist grip in the correct way.
- Apply slight collective variations on short final.
- After the touchdown, lower the collective pitch after reducing the fuel flow.
- The Instructor has to be prepared to an excessive variation of the Twist Grip when Trainee is in manual governing.
- Practice this single channel FADEC failure training only when in stabilized flight.

- **Twist-grip and FFCL condition of use:**

When in simulated hydraulic failure training on AS 350 B3 Arriel 2B1 or AS 350 B3e:

Control loads increase with speed. As control loads increase, be careful not to inadvertently move twist grip out of FLIGHT detent (Simulated hydraulic failure on AS 350 B3 Arriel 2B1 or AS 350 B3e).

When in simulated Single channel FADEC failure training on AS 350 B3:

- Take care to not use twist grip on the opposite way.
- At the end of the exercise, check that FLIGHT detent stop is reset in back position.

Before MOD 07 3084:

Reset the switch for twist grip lock in order to re-engage the flight stop locking device.

Simulated engine failure on AS 350 B3, AS 350 B3 Arriel 2B1 or AS 350 B3e:

- On the AS 350 B3 Arriel 2B1 or AS 350 B3e, the twist-grip returns to the FLIGHT position with the spring load assistance as soon as the grip is out of the idle notch, and there is no friction.
- On the B3, the twist-grip friction must be fully released before starting the autorotation training and the twist-grip is not fitted with a spring load.

Simulated engine failure on AS 350 B/BA/B1/B2:

- To prevent an engine flame out, when reducing power, make sure to maintain the NG above 67%.
- A quick repositioning of the fuel flow control lever above the flight position can lead to rotor and engine overspeed.

### **8.7.2 TASE / Demonstration methodology for Flight Instructors**

- **Servo-transparency** (called also servo-reversibility):

Except for EC 130 B4 and AS 350 B3 Arriel 2B1 & AS 350 B3e when fitted with dual Hydraulic system.

The servo-transparency training could be performed in the following way:

- Complete procedure should be performed above 1000 ft (AGL);
- Achieve airspeed between 130 and VNE (with a rate of descend);
- Perform a 30° left turn;
- Slowly increase the load factor by a backwards cyclic action;
- When the servo-transparency is achieved, the tendency of the aircraft is to pitch up and turn to the right; and
- As soon as the load decreases, servo-transparency disappears.

Pay attention to the following:

- Due to control loads linked to servo-transparency, the collective pitch tendency is to decrease. The collective pitch decrease and the pitch up may lead to rpm increase.
- The procedure should not be done too aggressively.

- The exercise is easier when high All Up Weight is important and/or high density altitude.

- **Tail-Rotor control failure:**

- Plan to use the entire length of the RWY;

- Landing is made easier by landing with a RH wind component (and light weight) and could be not possible with LH wind component;

- When airspeed is lower than 20 Kt, go-around is impossible due to loss of vertical fin efficiency;

- In a real T/R control failure, using a hard surfaced runway may allow for a light sideslip. Training procedure in such conditions should be performed with protective skid shoes; and

- It is recommended to perform a shallow approach at the end; during the speed reduction close to the ground, remember to slightly push the cyclic forward during sideslip cancelation to maintain current airspeed, taking care to avoid acceleration.

Pay attention to the following:

- Do not flare during parallel part (h/c drops quickly out of GND effect, resulting descent can only be countered by PWR application, which makes h/c yaw to the left).

- Try to be close to the ground during parallel part.

- Do not induce left yaw during parallel part.

- Proceed with a very progressive speed reduction.

- Do not touch down in sideslip position, especially when landing on grass landing area.



## **9 Compliance to RBHA 91 and RBAC 135**

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

## **10 Technical Publications**

### **10.1 Master Minimum Equipment List - MMEL**

Brazilian operators shall use the MMEL approved by EASA as a basis for developing their MEL. This document is available at EASA website, through the link:

<https://easa.europa.eu/document-library/master-minimum-equipment-lists>

### **10.2 Rotorcraft Flight Manual - RFM**

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