EUROPEAN AVIATION SAFETY AGENCY

EXPERT DEPARTMENT / CERTIFICATION DIRECTORATE

Operational Evaluation Board Report

Final Report : 05/05/2015

Manufacturer: AgustaWestland

AW189

European Aviation Safety Agency
Postfach 10 12 53
D-50452 Köln, Germany

AW189

Revision Record

Revision No.	Section	Pages No.	Date
Draft Report	All	All	14/01/2014
Rev 1	8,9,10	18-31	26/06/2014
Final report	All	All	05/05/2015

Contents

- Cover 1
- Aircraft Pictures 2
- Revision Record 2
- Contents 3
- Operation Evaluation Board – OPS-FCL 4
- NAA & AgustaWestland experts involved in the process 5
- Executive Summary 6
- Acronyms 7

1. Purpose and applicability 9
2. General Description of AW189 10
3. Aircrafts Main Characteristics 16
4. Operator Differences Requirement (ODR) Tables 17
5. Optional specific equipment 17
6. Master Differences Requirements 18
7. Type Rating List and Licence Endorsement List 18
8. Specification for Training 18
9. Specification for Testing, Checking, Currency & Recent experience 29
10. Specification for Flight Simulator Training Devices (FSTD's) 31
11. Application of OEB report 31
12. Appendices 32

Operational Evaluation Board – OPS / FCL Subgroup

M. Roel Huysmans
OEB Chairman
&
EASA OEB Expert
Operational Suitability Rotorcraft / Balloons / Airships
Experts department- Certification Directorate

M**. Alessandro Celona**
Pilot / OEB Member
ENAC /ITALY Flight Inspector - Helicopters

M. Jean-Marc Sacazes
EASA – Section Manager
Operational Suitability Rotorcraft / Balloons / Airships
Experts department- Certification Directorate

NAA & AgustaWestland experts involved in the process

Name	Position	Office / Branch	Remarks
Igino Coccolini	Technical Inspector	ENAC – Italy Flight Standard Office	
Gianluigi Gino	Head of Airworthiness Office OEB AgustaWestland Focal Point	Agusta Westland Airworthiness	
Giovanni Puricelli	OEB Coordinator	Agusta Westland Airworthiness	
Davide Franchi	OEB Coordinator	AgustaWestland Airworthiness	
Luca Medici	AW189 Chief Project Engineer	AgustaWestland Engineering	
Leonardo Mecca	Head of Training Training Academy	AgustaWestland Training	
Francesco Pasqualetto	Simulator and Training Systems	AgustaWestland THSS	
Alessandro Cella	Quality Manager Training Academy	AgustaWestland Quality System	
Luigi Simoncini	OEB Expert	AgustaWestland Aviation Consultant	

Executive Summary

Manufacturer Application

In June 2012, AgustaWestland has made a formal application to EASA, Certification Directorate - to a full OEB for the evaluation of the new **AW189** helicopter and also and to consider the commonalities between the **AW139** and the **AW189.**

Scope of the evaluations

The OEB report addresses mainly :

- Aircraft Type Designation and Pilot License Endorsement;
- Pilot Initial Type Rating Training “minimum syllabus” (ITR)
- Additional type rating “minimum syllabus” (ATR)
- Commonalities between types : AW 139 & AW189
- Instrument Rating (IR) Extension

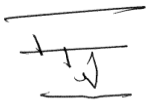
Team Composition and Regulatory Framework

Both, Captain Roel Huysmans (EASA) and Captain Alessandro Celona (ENAC / Italy) have made a Training Program evaluation - Test “T5”. This test leads the full type rating course with no credit for prior experience (new aircraft and new type rating).
In addition the OEB has evaluated the commonalities between AW139 and AW89 to reduced type rating course allowing credit for prior experience on AW139.

EASA /OEB Section Rotorcraft Manager Jean-Marc Sacazes and AgustaWestland experts have participated actively to this Operational Evaluation Board (Refer to the list page 5).

EASA conducted this evaluation in accordance with EASA Air Operations and Air Crew requirements. This evaluation was based on (J)Common procedures Document (CPD).

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.



EASA – Deputy Head of Expert Department
Flight Group-Certification Directorate

Abbreviations / Acronyms

AC Alternating Current

AMC	Acceptable Means of Compliance
ATR	Additional Type Rating
CPD	Common Procedure Document
DAU	Data Acquisition Unit
DC	Direct Current (electrical)
EASA	European Aviation Safety Agency
EDU	Electronic Display Unit
ENAC	Ente Nazionale Aviazione Civile
FADEC	Full Authority Digital Engine Control
FFS	Full Flight Simulator
FSTD	Flight Simulation Training Device
FTO	Flight Training Organisation
GA/TU	Go Around / Transition Up
IEM	Interpretative and Explanatory Material
IFR	Instrument Flight Rules
IR	Instrument Rating
ITR	Initial Type Rating
JAA	Joint Aviation Authorities
JAR-FCL 2	Joint Aviation Requirements Flight Crew Licensing (Helicopter)
JAR-OPS 3	Joint Aviation Requirements Operations 3 (Commercial Air Transportation) (H)
JAR-FSTD	Joint Aviation Requirements -Flight Simulation Training Device
JOEB	Joint Operational Evaluation Board
MDR	Master Difference Requirements
MET-H	Multi Engine Turbine (Helicopter)
MTOM	Maximum Take Off Mass
NAA	National Aviation Authority
N/A	Not Applicable
ODR	Operator Differences Requirements
OEI	One Engine Inoperative
OEB	Operational Evaluation Board
OPS	Flight Operations
OTD	Other Training Device
PIC	Pilot in Command
RFM	Rotorcraft Flight Manual
RPM	Revolution Per Minute
TRI	Type Rating Instructor
TRTC	Type Rating Training Course
TRTO	Type Rating Training Organisation
VFR	Visual Flight Rules
VNE	Velocity Never Exceed
VTOL	Vertical Take Off & Landing

Part-ARA	....Annex VI to Commission Regulation (EU) No 290/2012 of 30 March 2012 amending Regulation (EU) No 1178/2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC)

No 216/2008 of the European Parliament and of the Council (as amended)

Part-ARO ....Annex II to Commission Regulation (EU) No 965/2012 of 05 Oct 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (as amended)

Part-CAT.....Annex IV to Commission Regulation (EU) No 965/2012 of 05 Oct 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (as amended)

Part-FCL.....Annex I to Commission Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (as amended)

Part-ORA.....Annex VII to Commission Regulation (EU) No 290/2012 of 30 March 2012 amending Regulation (EU) No 1178/2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (as amended)

Part-ORO.....Annex III to Commission Regulation (EU) No 965/2012 of 05 Oct 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (as amended)

Part-SPA.....Annex V to Commission Regulation (EU) No 965/2012 of 05 Oct 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (as amended)

I. Purpose and applicability

Data is being submitted by AgustaWestland in support of the OEB process..

This report is the result of an OEB evaluation on **Pilot Type Rating Training syllabus for the AW189** provided by the AgustaWestland Training Academy.
In addition operator difference tables (ODR) provided by the manufacturer include a comparison between AW 139 and the AW189 in order to evaluate commonalities between those two types.(See Appendix 3).

The OEB recommends for approval by NAAs:

- Aircraft Type Designation and Pilot License Endorsement;
- Pilot Initial Type Rating Training “minimum syllabus” (ITR)
- Additional type rating “minimum syllabus” (ATR)
- Commonalities between types : AW 139 & AW189
- Instrument Rating (IR) Extension
- The standard offered for AW189 which is in compliance with EASA Air Operations. Part CAT Subpart D - INSTRUMENTS, DATA, EQUIPMENT - Section 2 - Helicopters - CAT. IDE.H (See Appendix 2).

2. General Description of the AW189

General

The AW189 is a new medium twin-engine aircraft designed for land and sea operations. The cockpit has pilot and co-pilot crashworthy seats and double commands. The passenger cabin can be used to carry 16 passengers (4 by 4 crashworthy seats configuration). Other passenger cabin configurations are also available allowing up to a maximum of 19 passengers. Powered by two engine turbines, and fitted with a 5 bladed, fully articulated main rotor. The AW189 is a Single pilot day & night VFR/IFR helicopter.

Landing Gear

The L/G Undercarriage System (Landing Gear extension and retraction subsystem) comprises the components that control and actuate landing gear movements. During normal operation, extension and retraction are powered by hydraulic Circuit 2 UTILITY section. In the event of failures of Circuit 2, the landing gear can be extended by the emergency system powered by Circuit 1.

Each main wheel is fitted with a disc brake. They can be operated differentially and progressively by either pilot using toe pedals that actuate the pistons in the master brake cylinders. The pressure generated is then transmitted to the main wheels brakes.

Servo Control System

The servo control system comprises the main rotor servo-actuators and the tail rotor servo-actuator. The servo-actuators are powered from the flight controls hydraulic system.

Dynamic Systems

The dynamic systems of the AW189 comprise two subsystems:

- Drive system
- Rotor system (main and tail).

The drive system consists of a MGB and a Tail Rotor Drive System (TRDS).

Main Gearbox

The MGB, mounted on the upper deck, is driven directly by the two engines. The MGB has three stages of reduction and provides a rear power take-off pad for the TRDS.

Main Rotor

The main rotor system includes the main rotor blades, the main rotor head, the rotating controls, the main rotor indicating system.

The blades are made of composite materials except the metallic erosion shields and some other minor parts while the hub is an hybrid structure made of titanium and composite.

The main rotor is a fully articulated type with 5 blades. It is equipped with elastomeric bearings for the flapping, lead-lag and pitch change articulations.

The lead lag motion is reacted by hydraulic dampers (1 for each blade) that provide also the stops (cushion areas). A separated stop system is provided for the flapping motions. The upper

stop is provided with a support (for the flight position) and a limiter (for ground position) while the lower stop is provided with a sliding ring both for flight and ground conditions.

The rotor head is composed of the hub made of titanium, the composite tension links, the elastomeric bearings, the dampers and the control levers.

The rotating control system is composed of the following parts: the pitch links, the Swashplate, the spherical pivot.

Tail Rotor Drive System

The TRDS consists of:
- Intermediate Gearbox (IGB)
- Tail Rotor Gearbox (TGB).

The function of the IGB is to transmit drive from the top of the tail boom up the leading edge of the vertical stabiliser.
The function of the TGB is to provide the connection and drive for the tail rotor hub itself.
The rotor system consists of the main rotor system and the tail rotor system.
The main rotor system is a five bladed, fully articulated rotor composed of the following major components: main rotor hub, rotating controls and blades.
The tail rotor system is a four bladed, articulated rotor composed of the following major components: tail rotor head, rotating controls and blades.

Flight controls

The rotor flight control system gives positive control of attitude, speed and altitude of the helicopter.

The system includes: the main rotor control system, the tail rotor control system and the rotor flight-controls indicating system.

The main rotor control system controls includes a collective and a cyclic control system. The two Systems are mixed to control the attitude and altitude of the rotorcraft. This is done by changing the angle of the main-rotor blades. The pilot and co-pilot collective-control sticks are connected together to give a common input to the mixing unit. The mixing unit receives collective and cyclic inputs, and gives a common output to three hydraulic actuators. The actuators then transmit a powered output to the main-rotor pitch-change mechanism. An electrical actuator connected to the crew controls can provide an AFCS command input to the collective controls.

The Cyclic control system is a mechanical, dual linkage system, controlled by the crew cyclic control sticks. The cyclic linkage gives the pitch and roll commands to the main-rotor pitch-change mechanism.

The mechanical linkage also gives a connection to two electrical trim actuators, which can give pitch and roll commands. The commands can be made by the crew or provided by the AFCS.

The tail-rotor controls are operated by mechanical linkages that give an input to a dual-channel hydraulic actuator. The actuator adjusts the tail-rotor pitch-change mechanism to give a yaw action. Each crewmember has dual-pedals to operate the mechanical linkages and the main wheel brakes. The linkages are also controlled by electrical actuators for manual and automatic trimming commands.

Rotor brake

The rotor brake system is used to stop the rotation of the rotor during engine power-off. The rotor brake system includes hydraulically operated calliper acting on a disc secured to the tail rotor drive pinion. Hydraulic fluid supplied from the utility hydraulic system operates the calliper.

Power Plant

The power plant system is composed of two General Electrics CT7-2E1 turbo shaft engines and one Auxiliary Power Unit (APU) micro-turbo eAPU60H equipped with a fire detection and extinguishing system. They are installed on the upper deck and covered by cowlings.

Engines

The AW189 is a twin-engine multi-role aircraft equipped with two GE CT7-2E1 free turbine turbo shaft engines in the 2000 shaft horsepower range, and an APU for engine starting and on ground operations.
Engine control is automatically achieved via a Full Authority Digital Electronic Control (FADEC) which is composed of an Electronic Engine Control Unit (EECU), permanent magnet alternator, ignition exciter, electrical sensors, and interfacing cables.

APU

The e-APU 60 is based on a gas turbine that drives a generator.
The system generates the electrical supply (on ground or in flight) to the aircraft's electrical system and can also generate cockpit heating while the main engines are not operating. The e-APU 60 consists of:

- A turbo shaft engine, composed of gas generator and an accessory gearbox
- An electronic Control Unit (ECU).

Fire Detection

The fire detection and warning facilities for each engine bay and the APU bay are supplied via a fire wire detector sensor installed in each bay.

In the event of a fire (either in an extended or localised area) the gas contained in the wire expands and triggers a pressure switch which activates the fire warning indication.

Fuel system

The fuel system provides fuel storage capability and supplies the two engines and APU at the pressure and flow rate requested by the Engine Manufacturer for the A/C operations in all ground and flight conditions.

The fuel system is fully crashworthy type and consists of two independent systems. The flexible bladder type fuel cells are installed behind the passenger cabin. The cells are interconnected, however retain a capacity of fuel below the interconnection to avoid a rupture of one fuel cell draining all fuel from the helicopter.

Each system includes a booster pump, a non-return valve, a pressure switch, a shut-off valve, a pressure transducer and a flow meter.

The APU is supplied by either Booster Pump, through a dedicated line which is connected to the # 2 system; the APU feeding is controlled by the APU FUEL SHUT-OFF VALVE, that is a valve electrically operated and installed on the deck above right main tank.

The total basic fuel capacity is 1340 litres (approx. 1072 kg with average 0.8 kg/litre density fuel) minus 10 litres of unusable fuel (approx. 8 kg) for each main tank.

Two sub floor tanks (RHS and LHS) are installed below passenger compartment. Total capacity is approximately 240 l.

Cockpit Layout

The instrument panel and inter-seat console contain all the control panels and displays governing the systems installed in the aircraft and utilised by the flight crew. The overhead console is installed above the heads of the flight crew and includes the circuit breaker panels and the rotor brake control lever.

The fully integrated avionics system includes four 10” x 8” colour Active Matrix Liquid Crystal Displays (AMLCD), an AW designed four axes Digital Automatic Flight Control System (DAFCS), an integrated redundant air vehicle management and monitoring system with Health and Usage Monitoring System (HUMS).

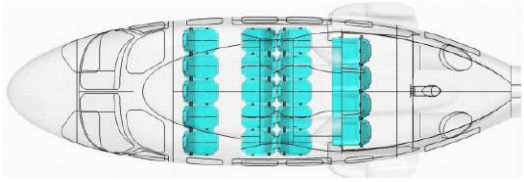
Core Avionic System

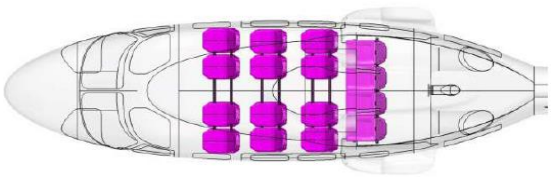
The Core Avionic System is composed by the following main Major Items:

- Cockpit Display System (CDS)
- Automatic Flight Control System (AFCS)
- Aircraft Monitoring and Management System (AMMS)
- Communication equipment
- Navigation and Radio Navigation System
- Identification System
- Flight Management System (FMS) function
- Cockpit Voice & Flight Data Recorder (CVFDR).

Cabin / Seating

The seating arrangements can be changed depending on the configuration:
High density civil transport: 19 passengers
Standard civil transport: 16 passengers





Hydraulic system

The main hydraulic system consists of two separate, independent and redundant hydraulic systems which each provide hydraulic power to the main and tail rotor powered flying controls actuators.

Their design and installation are such that the system's vulnerability to ballistic damage is reduced. Both systems operate at a nominal pump output pressure of 207 bar. In system 1, one mechanical pump and one Electrical Pump, part of the auxiliary, provide pressurised flow to the Power Control Module 1. In system 2, two pumps , part of the auxiliary HPS, provide pressurised flow to the Power Control Module 2. The mechanical hydraulic pumps are driven continuously by the Main Gearbox gears.

The electrical hydraulic pump operates on ground for pre-flight check for a limited period of time.

Electrical Power

The Electrical Power Generation and Distribution System (EPGDS) is designed for 115 Vac, 400 Hz AC power, 28 VDC power and 270 VDC power.

The generation system is an AC and the distribution system includes both AC and DC.

This architecture primarily includes three AC starter alternators, two Starter Converter Units , the corresponding Primary Distribution Units a battery and a Transformer Rectifier Unit .

The combination of the starter generator and the power converter provides engine start torque and then, once started, the engine drives the generator to provide AC power to be converted to DC and feed the aircraft DC buses.
The DC voltage used for the basic distribution system is achieved by an Starter Converter Units from the AC power. This box consists of a series of power conversion stages in order to synthesise the appropriate outputs depending upon the desired functionality. The EPGDS is continuously monitored by Aircraft & Mission Management Computers via Aeronautical Radio Incorporated and discrete signals

Environmental Control System

Heating & Forced Ventilation function; hot air is provided by a HP bleed system through Engine 1, Engine 2 and APU SOV. Fresh air is mixed by the Jet Pump. Through the sub floor diffuser the warmed air is distributed in the passenger cabin and cockpit. At the same time internal air is recirculated through fans mounted on the upper deck and cockpit.

Full ECS function; in addition to the previous air conditioning is also provided. Freon circuit is used for cold section of the system. Condensers and Compressors (one for cockpit and one for cabin) are electrically powered.

3. Aircraft main characteristics:

3.1 Sum up of main characteristics of the AW189 at the time of the report

			AW139	AW189
Dimensions	Fuselage	Length (maximum)	13.77 m	17.605 m
		Width	3.50 m	4.00 m
		Height	3.57 m	5.530 m
	Main rotor	Diameter	13.80 m	14.60 m
	Tail rotor		2.70 m	2.90 m
Number of Main Rotor Blades				
Minimum Flight Crew	VFR		1	1
	IFR		1	1
Seating Capacity	Passengers Seats		12 / 15	16 / 19
Engines			2 Pratt & Whitney Canada P&W PT6C-67C	2 General Electric GE CT7-2E1
Fuel tanks	Total		Basic 1270kg	Basic 1200kg
Air Speed	Power ON	Absolute VNE	167 KIAS	169 KIAS
	Power OFF		Vy not indicated, normal 80 KIAS	Vy not indicated, normal 80 KIAS
Rotor Speed	Power ON	100 % / 102 NR	296 / 302	Na / 296
Maximum Operating	Pressure Altitude		20000ft	10000ft
MTOM with Internal load			6400/6800Kg	8300Kg
MTOM with External load				
Category A see RFM Supplement	Density Alt	Clear Heliport	14000 ft	8000ft
		VTOL operations	TBD	TBD

AW189

3.2 Exterior Dimensions

4. Operator Difference Requirement (ODR) Tables

Operator difference requirements are those operator specific requirements necessary to address differences between a base aircraft and one or more variants, when operating in mixed fleet flying, or when seeking credit in transition programs. ODRs include both a description of differences and a corresponding list of training, checking, and currency compliance methods which address pertinent OEB and regulatory requirements

Operator Difference Requirement tables have been produced by AgustaWestland to evaluate commonalities between the **AW139** and the **AW189.** The OEB recommends reduce type rating training for AW139 rated holder.

5. Optional specific equipment

No optional specific equipment is provided requiring specific training at the time of the report.

6. Master Difference Requirement (MDR) Tables

6.1 Difference Level Summary.

The Common Procedures Document (CPD) describes one acceptable method and guidelines for conducting an Operational Evaluation of an aircraft type or a variant certificated. As such the document offers an acceptable method for compliance with the intent of the applicable regulatory requirements.

The methods and guidelines presented in this document are not the only acceptable methods for ensuring compliance with the appropriate regulatory sections. Operators may use other methods if those methods are shown to provide the necessary level of safety and are acceptable to the regulatory authority.

Difference levels are summarised in the following table for training, checking, and currency. This table is an extract only and complete descriptions of difference levels for training, checking and Recent Experience/currency are given in OPS/FCL as Common Procedures for conducting Operational Evaluation Boards.

6.2 Training, Checking, and Recurrent Training difference requirements table

		From Helicopter	
		AW139	**AW189**
To Helicopter	**AW139**	N/A	E/E/E
	AW189	E/E/E	N/A

A detailed analysis analysis has been conducted to evaluate general, systems, handling qualities and cockpit management differences between AW139 and AW189.

OEB has concluded that the Master Differences Requirements are at levels E/E//E, however recommends commonalities between AW139 & AW189 types as proposed in paragraph 8.

7. Type Rating List and Licence Endorsement List

Type Rating List

The proposal of this OEB is to up dated the EASA Type Rating List as following:

- Table 9 / Type Rating List (Helicopters)

1 Manufacturer	2 Helicopter	3	4 Licence endorsement
AgustaWestland			
-ME Turbine-	AW139		AW139
	AW189		AW189

This table 9 matrix contains only Helicopters that have been evaluated through a JOEB, an OEB or a Catch-Up process. Associated reports are published on the EASA –Expert Department / Certification Directorate Website and Pilot Training courses are available from the Manufacturer

8. Specification for Training

8.1.1 General

The Type Rating Training courses proposed by AgustaWestland Training Academy for the AW189, fulfilled the minimum requirements of EASA Air Crew- Part-FCL.
The assessment was based on the AW189, Pilot Initial and Additional, Type Rating Training syllabi, proposed by AgustaWestland Training Academy approved by ENAC ITALY.

In addition, as commonality exists between AW139 and AW189, a reduced Additional Type Rating Training Course may be applied for AW139 type rated pilots.

The OEB recommends pilot type rating training courses are divided into the following phases for approval in Approved Training Organisations (ATO) and also for operator specific training, provided the operator specific documentation is used throughout the course.

- Prerequisites for entry onto the specific course,
- Theoretical knowledge instruction syllabus including training devices (OTD/ VIPT), and test summary,
- FSTD training courses including either FTD or FFS,
- Helicopter flight training courses,
- Skill test.

8.1.2 General Description of the AW189 – VIPT

The Virtual Interactive Procedural Trainer (VIPT) is considered as an “Other Training Device” (OTD), it is a stand-alone structure provided with touch-screen monitors, pilot and co-pilot seats, simplified pilot flight controls and Instructor Operating Station (IOS).
The mechanical structure includes the computers necessary to simulate the helicopter and its systems in ground and flight conditions.

The touch-screen monitor display a graphical interactive and dynamic representation of the cockpit panels, controls, indicators and displays. The layout of the information displayed on the monitors is representative in terms of size, proportion and displacement, of the actual helicopter.

The Virtual Interactive Procedural Trainer (VIPT) is a procedural and familiarization training tool that gives pilots the ability to “learn by doing”. Pilots can train on a range of normal and abnormal procedures in free play simulation.

In particular, the AW189 VIPT provides a complete training environment for system familiarization and operation, normal and emergency procedures, FMS navigation and display symbology, familiarization related to the systems/subsystems of the basic configuration of the helicopter.

8.2 Course pre-entry requirements

All candidates must fulfil the requirements of Part-FCL.725 for the issue of class and type rating and those of PART-FCL.720.H (c), specific for the issue of an initial multi-engine, single or multi-pilot helicopter.

The OEB recommends the training organisations to distribute a list of the acronyms of systems of the AW189 and a cockpit layout timely before the start of the course to enable candidates for the AW189 type-rating, to become familiar with those acronyms and the location of systems in the cockpit.

Due to the complexity of the helicopter systems, the OEB also recommends during the theoretical training phase, additional sessions in OTD, like a VIPT or similar devices to get a practical knowledge, so as to better assimilate the complexity of systems more easily in particular FMS, EFIS environment, TCAS and TAWS.

8.3 Initial and Additional Type Rating

AW189 Type Rating Courses are divided into two different training patterns:

- Initial Type Rating Courses (ITR) are aimed to applicants for whom the AW189 is the first Type Rating on a Multi-Engine Turbine (MET) helicopter.

- Additional Type Rating courses (ATR) are aimed to candidates who already have a Type Rating on a Multi-Engine Turbine helicopter or in multi-pilot operations and require the issuance of an additional Type Rating .

8.3.1 Initial Type Rating (ITR)

➢ Candidates for the Initial single-pilot AW189 Type Rating must:

- Hold a valid Helicopter Pilot license,
- Hold a Single-Engine Piston or Turbine Pilot Type Rating
- Comply with the requirements set out in Part –FCL Subpart H – Section 1 & 3
- Have 70 Flight Hours as PIC
- Hold a Multi Engines Turbine pre-entry course.

➢ Candidates for the initial multi pilot AW189 Type Rating shall, before starting flight training:

- have at least 70 hours as PIC on helicopters;
- except when the type rating course is combined with an MCC course:
  - hold a certificate of satisfactory completion of an MCC course in helicopters; or
  - have at least 500 hours as a pilot on multi-pilot aero planes; or
  - have at least 500 hours as a pilot in multi-pilot operations on multi-engine helicopters;
- have passed the ATPL(H) theoretical knowledge examinations.

8.3.2 Additional Type Rating (ATR)

➢ Candidates for an Additional AW189 Type Rating must:

- Hold a valid Pilot license,
- Hold a Multi-Engine Turbine Pilot Type Rating
- Comply with the requirements set out in Part FCL Subpart H – Section 1 & 3.

8.3.3 Credits for training between AW139 and AW189

For AW139 type rated pilots a reduced Additional Type Rating courses may be applied.

8.4 Initial and Additional Type rating training minimum syllabus summary

The tables below summarise the minimum training hours required for VFR and IR for an Initial (ITR) and Additional (ATR) Type rating courses in Single Pilot (SP) and Multi Pilot (MP) crew and also

both tables included the Additional Type Rating based on commonalities between the AW139 and the AW139 helicopters for pilot who already hold an AW139 type rating.

8.4.1 Single Pilot Type Rating training minimum syllabus

Single Pilot Type Rating Training Course							
		Theoretical Instruction	Training in FSTD			Training in Helicopter	Skill Test In addition
			OTD/VIPT	FTD	FFS		
ITR	VFR	62.5 h (including 2.5h theoretical exam) + 3 VIPT(1) sessions	1 session	12h	-	4h	Hel
			1 session	-	12h	2h	FFS or Hel
			1 session	-	-	12h	Helicopter
	IR	-	-	10h	-	2h	FFS or Hel
			-	-	8h	2h	FFS or Hel
			-	-	-	10h	Hel
ATR	VFR	62.5 h (including 2.5h theoretical exam) + 3 VIPT(1) sessions	1 session	8h	-	4h	Hel
			1 session	-	8h	2h	FFS or Hel
			1 session	-	-	8h	Hel
	IR	-	-	6h	-	-	FFS or Hel
			-	-	6h	-	FFS or Hel
			-	-	-	6h	Hel
ATR For AW 139 Type Rating holder	VFR	62.5 h (including 2.5h theoretical exam) + 3 VIPT(1) sessions	1 session	6h	-	2h	Hel
			1 session	-	6h	1h	FFS or Hel
			1 session	-	-	5h	Hel
	IR	-	-	4h	-	-	FFS or Hel
			-	-	4h	-	FFS or Hel
			-	-	-	4h	Hel

Table 1

(1) Each VIPT session will take between 2 to 3 hours.

8.4.2 Multi Pilot Type rating training minimum syllabus

Multi- Pilot Type Rating Training Course							
		Theoretical Instruction	Training in FSTD			Training in Helicopter	Skill Test In addition
			OTD/VIPT	FTD	FFS		
ITR	VFR	62.5 h (including 2.5h theoretical exam) + 3 VIPT(1) sessions	1 session	12h PF + PNF*	-	4h PF	Hel
			1 session	-	12h PF + PNF*	2h PF	FFS or Hel
			1 session	-	-	12h PF	Hel
	IR	-	-	10h PF + PNF*	-	2h PF	Hel
			-	-	8h PF + PNF*	2h PF	FFS or Hel
			-	-	-	10h PF	Hel
ATR	VFR	62.5 h (including 2.5h theoretical exam) + 3 VIPT(1) sessions	1 session	8h PF + PNF*	-	4h PF	Hel
			1 session	-	8h PF + PNF*	2h PF	FFS or Hel
			1 session	-	-	8h PF	Hel
	IR	-	-	6h PF + PNF*	-	-	Hel
			-	-	6h PF + PNF*	-	FFS or Hel
			-	-	-	6h PF	Hel
ATR For AW 139 Type Rating holder	VFR	62.5 h (including 2.5h theoretical exam) + 3 VIPT(1) sessions	1 session	6h PF + PNF*	-	2h PF	Hel
			1 session	-	6h PF + PNF*	1h PF	FFS or Hel
			1 session	-	-	5h PF	Hel
	IR	-	-	4h PF + PNF*	-	-	FFS or Hel
			-	-	4h PF + PNF*	-	FFS or Hel
			-	-	-	4h PF	Hel

Table 2

*The Multi Pilot Training Course training program is designed to be attended by two flight crew members. One flight crew member will operate as PF and the other member as PNF during manoeuvres/procedures of the scheduled sortie in accordance with MCC.

(1) Each VIPT session will take between 2 to 3 hours.

8.5 Theoretical knowledge syllabus and test summary

8.5.1 Initial and Additional Type Rating

Theoretical instruction should be provided in accordance with Part – FCL Subpar8.7t H – Section 1 –FCL.710.
The following sections present a summary of the material for an Initial and additional Type Rating training program should consider. Whilst based on the AgustaWestland programs. Training providers should ensure their type specific courses cover the pertinent material.

Note : If an initial type rating for a turbine powered aircraft is required, the candidate must first undergo a turbine engine course).

Initial and Additional Type Rating theoretical knowledge syllabus	**AW189**
Helicopter structure, transmissions, rotors and equipment, normal and abnormal operation of the systems	26h00
Limitations (*)	2h00
Performance, flight planning and monitoring(*)	2h00
Weight and balance, servicing	3h00
Emergency procedures(*)	5h00
Special requirements for helicopters fitted with electronic flight instrument systems or equivalent equipment, Systems Integration and Display, Navigation, Communication, FMS.	22h00
Optional equipment	In addition
TOTAL THEORETICAL KNOWLEDGE SYLLABUS	60h00
Theoretical examination session	2h30
TOTAL	62h30
In addition 3 VIPT Sessions to consolidate the theoretical knowledge.	3 sessions

Table 3

(*) *Theoretical instruction elements can be covered during the ground training course and/or during flight training briefing phase*

On completion of the theoretical phase, the trainee is assessed via a multiple-choice questionnaire and *a* minimum of 100 questions is recommended covering the entire program either for Single or Multi pilot Training Course. To obtain the type rating, the threshold for passing is 75% of correct answers in the written examination on a range of multiple-choice or computerized questions.

The OEB recommends due to the complexity of the systems of the AW189, especially displays and systems integration, to better understand their function, to integrate a training device (OTD) into the theoretical course. Those OTDs can be a VIPT, CBT, emulator and if those are not available, upper level devices like FTD, FNPT, FFS or an equivalent way of cockpit training proposed by the training organizations, it could be also the aircraft. No credit towards flight training is given hereby.

As there is a strong evolution towards paperless courses, the applicant has to be well informed timely before the start of the course about the options on how to store, use and make notes on an electronic device. The options of either being offered a system, at least for the duration of the course by the training provider or that the applicant uses his own system as long as the system is easy to use, accessible and reliable.

The use of acronyms has become standard in system description and type-rating candidates have to be familiar with their meanings and use accordingly preferably before the start of the theoretical course.

8.6 Flight training course summary (VFR)

8.6.1 Initial & Additional Type Rating

VFR Training Course	Initial Type Rating					Additional Type Rating				
Flight Simulation Training Device & Helicopter	**FFS + Hel**		**FTD + Hel**		**Hel only**	**FFS + Hel**		**FTD + Hel**		**Hel. only**
Pre-flight, cockpit (when applicable),, engine start, Shut down, Basic air work, General Handling, Various touch-downs	2h30	-	2h30	-	1h15	1h15	-	1h15	-	1h15
Circuits and Various touch-downs.	-	1h00	-	1h00	1h15	-	1h00	-	1h15	1h15
Automatic Flight Control System, Flight Management Computing System, Integration and Display System, Navigation, FMS, System Malfunction, Emergency procedures.	2h00	-	2h00	-	2h00	1h30	-	1h30	-	1h15
Automatic Flight Control System, Flight Management Computing System, Integration and Display System, Navigation, FMS, System Malfunction, Emergency procedures.	2h00	-	2h00	-	1h30	1h30	-	1h30	-	1h15
Abnormal and Emergency Procedures.	1h30	-	1h30	-	2h00	1h15	-	1h15	-	1h30
OEI failure, Hydraulic failure, Manual Control of engine power, Auto-rotations	2h00	-	2h00	1h00	1h30	1h15	-	1h15	1h15	-
Clear Area CAT “A” take-off and landing AEO and OEI training procedures, CAT “B” profiles	2h00	1h00	2h00	1h00	1h30	1h15	1h00	1h15	1h30	1h30
Clear Area CAT “A” take-off and landing AEO and OEI training procedures, CAT “B” profiles	-	-	-	1h00	1h00	-	-	-	-	-
Total Flight Simulation Training Device	**12h00**	**-**	**12h00**		**-**	**8h00**	**-**	**8h00**	**-**	-
Total Helicopter	**-**	**2h00**	**-**	**4h00**	**12h00**	**-**	**2h00**	**-**	**4h00**	**8h00**
Total Flight Training	**14h00**		**16h00**		**12h00**	**10h00**		**12h00**		**8h00**
Skill Test *In accordance with Part FCL Appendix 9*	Required		Required		Required	Required		Required		Required

Table 4

8.6.2 Additional Type Rating for AW139 Type Rating holder

VFR Training Course	Additional Type Rating for AW139 Type Rating holder				
Flight Simulation Training Device & Helicopter	**FFS + Hel**		**FTD + Hel**		**Hel. only**
Pre-flight, cockpit (when applicable),, engine start, Shut down, Basic air work, General Handling, Various touch-downs	1h00	-	1h00	-	1h00
Circuits and Various touch-downs.	-	-	-	1h00	1h00
Automatic Flight Control System, Flight Management Computing System, Integration and Display System, Navigation, FMS, System Malfunction, Emergency procedures.	1h30	-	1h30	-	1h00
Automatic Flight Control System, Flight Management Computing System, Integration and Display System, Navigation, FMS, System Malfunction, Emergency procedures.	1h30	-	1h30	-	-
Abnormal and Emergency Procedures.	1h00	-	1h00	-	1h00
OEI failure, Hydraulic failure, Manual Control of engine power, Autorotations	-	-	-	-	-
Clear Area CAT “A” take-off and landing AEO and OEI training procedures, CAT “B” profiles	1h00	1h00	1h00	1h00	1h00
Clear Area CAT “A” take-off and landing AEO and OEI training procedures, CAT “B” profiles	-	-	-	-	-
Total Flight Simulation Training Device	**6h00**	**-**	**6h00**	**-**	-
Total Helicopter	**-**	**1h00**	**-**	**2h00**	**5h00**
Total Flight Training	**7h00**		**8h00**		**5h00**
Skill Test *In accordance with Part FCL Appendix 9*	Required		Required		Required

Table 5

Note :
In table 4 and 5:
During the flight “1”, the Type Rating Instructor will evaluate the trainee level.

Each helicopter flight session could be extended or reduced by 15 minutes at the discretion of the instructor. 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 aircraft used and on customer's request, additional flights may also be performed to enhance basic initial type rating training (minimum syllabus).

Those Initial & Additional VFR Training Courses are recommended for both Single Pilot (SP) and Multi pilot (MP)Type Rating, however the Multi pilot is designed to be attended by two flight crew members. One flight crew member will operate as PF and the other member as PNF during manoeuvres/procedures of the scheduled sortie in accordance with MCC (See also Paragraph 8.4.2 Multi Pilot Type rating training minimum syllabus).

8.6.3 CAT A Training procedures

For Operations in hostile and congested environment (ref. Air Operations- CAT.POL) CAT A profiles have to be thought. Based on previous experience of the applicant these CAT A sessions can either be included in the standard training or in addition as followed:

Initial and Additional VFR Type Rating - Cat A profiles		
Flight Simulation Training Device & Helicopter	**FFS**	**Helicopter only**
All CAT A take-off and landing AEO and OEI training procedures.	3h00	3h00
Total Flight Training	**3h00**	**3h00**
Skill Test *In accordance with Part FCL Appendix 9*	As Required	As Required

Table 6

8.6.4 Instrument Rating Extension

IR Extension Courses to :									
	Initial Type Rating (ITR)			**Additional Type Rating (ATR)**			**Additional Type Rating for AW139 Type Rating holder**		
FSTD and Helicopter	**FFS + Hel**	**FTD + Hel**	**Hel only**	**FFS+ Hel**	**FTD + Hel**	**Hel only**	**FFS + Hel**	**FTD + Hel**	**Hel only**
FTD	-	10h00	-	-	6h00	-	-	4h00	-
FFS	8h00	-	-	6h00	-	-	4h00	-	-
Helicopter	2h00	2h00	10h00	-	-	6h00	-	-	4h00
Total	**10h00**	**12h00**	**10h00**	**6h00**	**6h00**	**6h00**	**4h00**	**4h00**	**4h00**
+ Skill test	Required	Required	Required	Required	Required	Required	Required	Required	Required

Table 7

This Initial & Additional IR extension Training Course is recommended for both Single Pilot (SP) and Multi pilot (MP)Type Rating however the Multi pilot is designed to be attended by two flight crew members. One flight crew member will operate as PF and the other member as PNF during manoeuvres/procedures of the scheduled sortie in accordance with MCC (See also Paragraph 8.4.2 Multi Pilot Type rating training minimum syllabus).

8.7 Training Area of Special Emphasis (TASE)

At the time of the initial OEB evaluation (1) the RFM, QRH, operating limitations, performance charts, weight and balance were not fully available to the OEB crew.
Only limited functions of the FMS in the VIPT and the FTD were available.
During FTD training the operating weight was comparable to the MAUW, while during helicopter training flight the operating weight was around 6,4.

The OEB crew of EASA were shown CAT A profiles under development, SAR hover mode and a limited demonstration of the OEI training mode.

The training areas of special emphasis and findings listed in this OEB report are based on a basic configuration of the AW189 model at the time of the report. The installation and use of future optional equipment and modifications may require additional evaluations and consequently introduce new findings and training areas of special emphasis. Cat A procedures and SAR modes were not available and will be part of the future optional equipment and/or procedures.

The following procedures for training should receive special attention. Since, although they relate to separate issues, they are inter-connected.
The TASE is a continuous process which is subject to updates throughout the helicopters further development for optional equipment and procedures and operational experience.

The OEB has identified several helicopter systems and/or procedures should receive specific attention in the AW189 type rating courses and recommends the ATOs to put particular emphasis on the following and listed randomly and not as per importance:

- The OEB recommend a review of all major aspects of CRM and CFIT prior or at least before the end of a training course is recommended by the OEB due to the highly integrated cockpit components. Selection and/or use of various systems such as TCAS, WX Radar, FMS, maps, reconfiguration options, future SAR modes might need extra attention inside the cockpit and the reduced attention in flying the aircraft has to be coordinated.
- The use of acronyms has become standard in system description and type-rating and candidates have to be familiar with their meanings and use accordingly preferably before the start of the theoretical course.
- PFD attitude pitch markings and layout are larger than similar or previous types of helicopter PFD`s. Overcorrections could occur and special attention is needed during training to familiarise crews with those new pitch attitude indications.
- PFD positions are not similar placed on PFD 1 and PFD 2.
- VOR/FMS DME ranges are in different positions comparing PFD 1 and PFD 2;
- Double/Single function keys on the ECDU need special attention and training focus.

- Fuel system page has to be selected for visual queue., and fuel level and consumption should be monitored per operational task as fuel level indication is not obvious on the PFD.

- Not all CAS messages do refer to similar CAS messages in the QRH. Important is to well understand the relationship between the CAS messages and the references made in the QRH.
- Management of Electronic Control & Display Units(ECDU), including solid state breakers;
- Basel Key functionalities on PFD/MFD Active Matrix Liquid Crystal Displays (AMLCD).
- System Integration and Display.

- VFR/IFR approach and limitations.
- Terrain Awareness & Warning System (TAWS).

- Forward vertical visibility is reduced during landing and/or flare manoeuvres. A technique has to be acquired to re-establish vertical visibility by looking sideways or downwards via the side windows.
- During final stages of the landing manoeuvre increased pitch attitudes have to be monitored sharply versus limiting pitch attitudes to avoid tail strikes. For both single pilot and multi crew cockpit operations inside-outsides attitude crosschecks have to be accomplished.
- Technique to precisely control yaw movement has to be briefed and trained. Evaluation of the rudder pedals was announced by the trainers and test pilots as a small to medium pressure on one pedal at the time would not release the heading reference to yaw the helicopter. Increased pressure gives instantaneous but relative abrupt and no precise movement in yaw.
- Several techniques are available for CAT B take-off procedures.. Special attention was given to pitch attitudes and power selection during the manoeuvre. Sideways movement of the helicopter during initial take-off segment seemed to be a consequence of lateral instability and has to be corrected positively during the take-off trajectory.
  Techniques are meant to be: Using trim release, trimming the attitude with the cyclic trim.
- Thorough knowledge of the AFCS and FMS system is highly recommended. Well trained crews can interact fast and easily with this integrated system for the selection of radio and navigation frequencies ,performance management, GPS functions, waypoint databases and flight planning. Contrarily, insufficient knowledge and/or improper use of its hard- and software might lead to confusion, preoccupation and loss of situational awareness..
- F/D upper modes and limitations; Guidelines and recommended best practises should be determinate and listed by manufacturer and operator . A thorough understanding of the various lateral and vertical modes and the ability to select and arm the modes during different phases of flight is essential. Knowledge of the integrated use of AFCS and FMS system is herein critical during AOE as well as during OEI operations.
- Crews converting from large or similar helicopters as well as crews new to this helicopter have to realise well the overall dimensions of the AW189.
- The pilots seat station is in a low position and the dimensions might seem to be smaller than they actually are as well as compared to other types of helicopter. Finally the advanced stabilisation system of the AW189 doesn`t give the feeling to the flight crew on the real dimensions of the helicopter

The high level of automation in this helicopter should be emphasized.. Also due to the fact, that this aircraft can be operated either in single pilot or in multi pilot operations, crew coordination and proper flight management (CRM) should be reinforced to cover both operational issues.

8.8 Training Area of Special Emphasis (TASE) between AW139 and AW189.

The following procedures for difference training between AW139 and AW189 Types should receive special attention:

- PFD attitude pitch markings and layout are larger than similar on AW139. Overcorrections could occur and special care is needed during training to familiarise crews with those new pitch attitude indications.
- Management of Electronic Control & Display Units (ECDU) and related systems (fuel, hydraulic, electrical, radios, etc) and in particular the functionality of solid state breakers;
- Fuel system procedure in normal /abnormal condition;
- Electrical system procedure in normal and abnormal condition;
- Double/Single function keys on the ECDU need special consideration and training emphasis.
- Basel Key functionalities on PFD/MFD Active Matrix Liquid Crystal Displays (AMLCD).
- Integrated SVS System in PFD.
- System Integration and Display.
- Use of APU System, in normal /abnormal condition, limitations and malfunctions.
- Flight Director (F/D) upper modes and limitations needs a particular emphasis in the proper use of collective modes and related safety functions, mainly for those pilots flying AW139 Phase 4.
- Philosophy in using of AEO and OEI switches and related engine(s) limitations.
- Rotor droop threshold on PI scale.

9.Specification for Testing, Checking, & Recent experience

9.1 Skill test

As required by Part-FCL.725 (c).
Where the aircraft is to be operated in the either in Multi-pilot and Single Pilot, VFR and IFR role, it is recommended that the skill test required by Part-FCL.725 (c) and Appendix 9 to Part-FCL is carried out. In addition a skill test scenario will take into account the level of automation functions of the aircraft .

9.2 Proficiency Checks

As required by Part-FCL.725 (c).
Where the aircraft is to be operated in the Multi pilot, IFR role, it is recommended that the skill test required by Part-FCL.725 (c) and Appendix 9 to Part-FCL is carried out. In addition a scenario will take into account the level of automation functions of the aircraft during the proficiency checks based on the current operations.

9.3 Specification for Currency / recent experience

Recurrent training must be performed as specified in Part-FCL and Part-ORO.

9.3.1 Post Absence Pilot Training Requirements

In case of a period during which the pilot didn`t fly the AW189, the OEB recommends the following activities before acting as a Pilot in Command:

If a flight crew member has not flown the AW189 in excess of 3 months the flowing refresher training shall be undertaken:

- A supervised review of the RFM to include:
  - a. Aircraft limitations
  - b. Normal, malfunction and emergency procedures
  - c. Cat A and B performance as applicable
- Re-familiarisation with MCDU and ECDU functions,
- Re-familiarisation of MFD and PFD display functionality making full use of emulators

In addition, the following flight re-familiarisation/training must be undertaken:

For a period of absence between 3 and 6 months, if the pilot :

Has flown the AW139,

- one hour acting as a co-pilot

Hasn’t flown as a flight crew member in neither AW139 nor AW189,

- two hours acting as a co-pilot

For a period of absence extended for more of 6 months, if the pilot:

Has flown the AW139,

- A refresher sortie of at least 1 hour with a TRI/SFI in the aircraft or FSTD.

Hasn’t flown as a flight crew member neither AW139 nor AW189:

- A refresher sortie of at least 2 hours with a TRI/SFI in the aircraft or FSTD.

10. Specification for Flight Simulation Training Devices

When this report has been finalized AW189 Flight Training Device (FTD) was available and qualified as an FTD Level 2 and as a Full Flight Simulator (FFS) Level D, in accordance with CS-FSTD (H) compliant with EASA requirements. The training courses proposed in this report take into account these devices

11. Application of OEB report

This OEB report applies to commercial operations. However, the OEB also recommends private or corporate operations to follow the findings of this report.

12. Appendices

Appendix 0 : Cover.
Appendix 1 : EASA TCDS.
Appendix 2 : Operator Difference Requirement (ODR)Tables.
Appendix 3 : AW189 Pilot Training Syllabi from AgustaWestland Training Academy.

Notes:
Appendices are available for NAA's by request to EASA Expert Department / Certification Directorate or to AgustaWestland Manufacturer