



EUROPEAN AVIATION SAFETY AGENCY



Operational Evaluation Board Report

**Embraer 170 / Embraer 175 / Embraer 190 /
Embraer 195 / Embraer ECJ Lineage**

Flight Crew Qualifications

Revision 5

01 July 2013

**European Aviation Safety Agency
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**Embraer 170 / Embraer 175 / Embraer 190 /
Embraer 195 / Embraer ECJ Lineage**

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Acronyms

ACFOG	Airplane Changes Flight Operations Guide
AEC	Aircraft Evaluation Commission (former BAEG)
AEG	Aircraft Evaluation Group
AFCS	Automatic Flight Control System
AFM	Airplane Flight Manual
AMC	Acceptable Means of Compliance
ANAC	Agência Nacional de Aviação Civil (Civil Aviation Authority - Brazil)
AOC	Air Operator Certificate
AOM	Airplane Operations Manual
ATC	Air Traffic Control
ATO	Approved Training Organisation
ATPL	Airline Transport Pilot License
ATQP	Alternative Training and Qualification Programme
AWO	All Weather Operations
BAEG	Brazilian Aircraft Evaluation Group
CBT	Computer Based Training
CCD	Cursor Control Device
CPD	Common Procedure Document for conducting Operational Evaluation Boards dated June 10, 2004 signed jointly by JAA, FAA and TCCA
CPT	Cockpit Procedures Trainer
CRM	Crew Resource Management
CTA	Centro Técnico Aeroespacial (Brazilian Aeronautical Certification Authority)
DAC	Departamento de Aviação Civil (former Civil Aviation Authority - Brazil)
Difference Level	a designated level of difference as defined in the CPD for the evaluation of pilot training, checking and currency
EASA	European Aviation Safety Agency
ECL	Electronic Check List
EDS	Electronic Display System
EFB	Electronic Flight Bag
EFIS	Electronic Flight Instrument System
EGPWS	Enhanced Ground Proximity Warning System
EICAS	Engine Indication and Crew Alerting System
ENAC	Ente Nazionale per l'Aviazione Civile (Civil Aviation Authority - Italy)
EU-OPS	Commission Regulation (EC) No 859/2008 of 20 August 2008, amending Council Regulation (EEC) No 3922/91 as regard common technical requirements and administrative procedures applicable to commercial transportation by aeroplane
FAA	Federal Aviation Administration
FCAR	Review Items issued by the Brazilian Civil Aviation Authority

FCL.....	Flight Crew Licensing
FFS.....	Full Flight Simulator
F&R	Function and Reliability
FMA	Flight Mode Annunciator
FMS	Flight Management System
FPA.....	Flight Path Angle
FSB.....	Flight Standardization Board
FSI.....	Flight Safety International
FSTD	Flight Simulation Training Device
GPWS.....	Ground Proximity Warning System
IEM	Interpretative/Explanatory Material
IESS	Integrated Electronic Standby System
ILS	Instrument Landing System
JAA.....	Joint Aviation Authorities
JAR-FCL1	Joint Aviation Requirements Flight Crew Licensing (Aeroplane)
JAR-OPS1	Joint Aviation Requirements Operations 1
JOEB	Joint Operational Evaluation Board
JSET.....	Joint Simulator Evaluation Team
LIFUS	Line Flying Under Supervision
LNAV	Lateral Navigation
LPC.....	Licence Proficiency check
LVO	Low Visibility Operations
MAU.....	Modular Avionics Unit
MCR	Master Common Requirements
MDA.....	Minimum Descent Altitude
MDR	Master Differences Requirements
MFD.....	Multi-function Display
MFF	Mixed Fleet Flying
MMEL	Master Minimum Equipment List
NAV	Navigation
NSP	FAA National Simulation Program
ODR.....	Operator Differences Requirements
OE	Operational Evaluation
OEB.....	Operational Evaluation Board
OTD	Other Training Device
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)
PFD	Primary Flight Display
PM	Pilot Monitoring
QRH.....	Quick Reference Handbook
RBHA.....	Regulamentos Brasileiros de Homologação Aeronáutica (Brazilian Regulations)
SAT.....	Swiss Aviation Training
SOP	Standard Operating Procedures
TCAS	Traffic Alert and Collision Avoidance System
TCCA.....	Transport Canada Civil Aviation
ULC	Urząd Lotnictwa Cywilnego (Civil Aviation Authority - Poland)
VHF	Very High Frequency (Radio equipment)
VNAV	Vertical Navigation Mode
VOR.....	VHF Omni-directional Range
ZFTT.....	Zero Flight Time Training

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 evaluation or 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.

JOEB / OEB EMB170 Flight Crew Qualifications Group Composition

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1) Embraer 170 (Sep/Oct 2003)

2) Embraer 175 (Dec 2004)

3) Embraer 190 (May 2005)

4) ACFOG-2247 Rev. 2 – VNAV (Jul 2005)

5) ACFOG-2247 Rev. 3 – AUTOLAND / AUTOBRAKES (Nov 2005)

6) HGS (Dec 2005)

7) Embraer 195 (Jun 2006)

8) Steep Approach Module / Vertical Guide Path (Mar 2007)

9) ECL (Sep 2007)

10) ERJ190-100 ECJ – Lineage (Jul 2009)

11) Autoland Mode 2 – Cat IIIb (Apr 2010)

12) Dual HGS (Jun 2010)

13) EMB170 Revised Initial Type Rating (Mar/Jun 2013)

Executive Summary

Scope of the evaluations

This report specifies the EASA pilot qualification requirements for the Embraer 170, 175, 190, 195, and ECJ Lineage aircraft.

In particular, this report addresses:

- Aircraft Type Designation and Pilot License Endorsement for the Embraer 170, 175, 190, 195 and ECJ Lineage aircraft;
- Master Differences Requirements (MDR) for flight crews transitioning between aircraft variants;
- Embraer design and operational concepts and EMB170 specifics;
- Operator Difference Requirements (ODR) tables;
- Initial type rating training courses;
- Familiarization courses;
- Operations on more than one type or variant;
- Pilot checking, currency / recent experience;
- Additional operational recommendations;
- Operational suitability; and
- Aircraft Regulatory Compliance Checklist (Part-CAT, Subpart D)

This report does not address qualification requirements for the use of equipment or functions such as the Electronic Flight Bag (EFB), Enhanced / Synthetic Vision Systems (E/SVS), or Wake Vortex Categorization, etc.

The JOEB Cabin Crew Subgroup performed an assessment of the Embraer 170, Embraer 175, Embraer 190 and Embraer 195 in August 2005 (revised August 2007). A separate dedicated OEB report has been published for cabin crew requirements.

All relevant reports are available on the EASA OEB website at <http://easa.europa.eu/certification/experts/flight.php>.

Team Composition and Regulatory Framework

Operational evaluations were conducted jointly by integrated teams composed of JAA/EASA, DAC/ANAC, and FAA members, to simultaneously meet the JAA/EASA (J)OEB, FAA FSB, and DAC/ANAC BAEG/AEC requirements. In addition, for the Embraer-190, TCCA joined the evaluation team. Each Authority uses the results of the evaluation process to produce a report specific to its particular requirements that, while similar in intent, may differ somewhat in detail. This OEB report is applicable to operations under the framework of EASA.

The evaluations were performed in compliance with the (J)OEB Handbook and the EASA Terms of Reference for OEBs. Further guidance was found in the Common Procedures for Conducting Operational Evaluations, and the applicable regulations at the time of the relevant evaluations, laying down technical requirements and administrative procedures related to civil aviation aircrew and to air operations.

Conclusions

All Embraer 170, 175, 190 and 195 series aircraft have been assessed as variants requiring Level A familiarization training.

The license endorsement for the Embraer 170, 175, 190 and 195 series aircraft is established as **“EMB170”**.

EMB170 initial type rating training syllabi have been evaluated on two occasions. Relevant training footprints evaluated and acceptable to the OEB, including the minimum course duration and training devices used, are shown at Appendix 1, 2 and 3.

Additional evaluations of individual modifications, devices and procedures, as well as related pilot qualification requirements are described in para. 2 of the report (Sequence of Operational Evaluations).

The report contains Training Areas of Special Emphasis (TASE) and addresses operation on more than one type or variant.

With regard to operational requirements for aircraft instruments and equipment / communication and navigation equipment (Part-CAT, Subpart D), compliance was confirmed against JAR-OPS 1 requirements at the time of the evaluation.

Operational Evaluation Report – Flight Crew Qualifications

1. Purpose and Applicability

This report addresses:

- Aircraft Type Designation and Pilot License Endorsement for the Embraer 170, 175, 190, 195 and ECJ Lineage aircraft;
- Master Differences Requirements (MDR) for flight crews transitioning between aircraft variants;
- Embraer design and operational concepts and EMB170 specifics;
- Operator Difference Requirements (ODR) tables;
- Initial type rating training courses;
- Familiarization courses;
- Operations on more than one type or variant;
- Pilot checking, currency / recent experience;
- Additional operational recommendations;
- Operational suitability; and
- Aircraft Regulatory Compliance Checklist (Part-CAT, Subpart D)

This report does not address qualification requirements for the use of equipment or functions such as the Electronic Flight Bag (EFB), Enhanced / Synthetic Vision Systems (E/SVS), or Wake Vortex Categorization, etc.

The evaluation of EMB170 cabin crew requirements has been performed by a separate OEB in a dedicated report. All relevant reports are available on the EASA OEB website at <http://easa.europa.eu/certification/experts/flight.php>.

2. Sequence of Operational Evaluations

2.1 Embraer 170 Initial Type Rating

The Embraer proposed initial type rating training was evaluated by BAEG, the FAA and the JOEB. During September 2003, the joint team participated in the initial pilot ground school course, provided by Embraer at Embraer Training Centre in São José dos Campos, Brazil. The course consisted of computer based instruction and classroom instruction, supplemented with SOP practice using flat cockpit mock-ups. The practical training was performed in October 2003, consisting of manoeuvres and procedures training, using an Embraer 170 interim level C FFS, qualified by both the FAA National Simulator Program (NSP) and the JAA Joint Simulator Evaluation Team (JSET).

Operational suitability flights were performed as task sharing between the JOEB and the BAEG. The JOEB performed 4 short-range flights and 8 approaches (visual and instrument). The BAEG

evaluators flew 3 short-range flights, and participated on 2 mid-range function and reliability (F&R) flights, totalling approximately 6 flight hours with 4 full-stop landings. These flights were used to determine the Embraer 170 operational suitability. AFM normal, abnormal, and emergency procedures were evaluated during those flights.

2.2 Embraer 175

In December 2004 a joint team of JAA, DAC and FAA pilots flew both the Embraer 170 and the Embraer 175 to assess the operational differences between the two aircraft. In accordance with CPD procedures, Functional Equivalence Test (T1) and Handling Qualities Test (T2) were performed. The evaluators flew a total of approximately 6 hours with 6 full-stop landings on the Embraer 170, and 3 hours with 3 full-stop landings on the Embraer 175. Following an analysis of the differences and proposed training, the OEB concluded that Level A differences for training, checking and currency should be applied between the Embraer 175 and all other EMB170 variants.

On 6 March 2005, JAA and DAC pilots flew the Embraer-175 with MAU Epic Load 15.3 in order to evaluate the training proposed by Embraer for pilot familiarisation and operation of the FMS VNAV functionality, among other features described in Embraer Document ACFOG-2247, dated 4 March 2005. As a result of this evaluation, additional training requirements for the new functionality were established on a temporary basis for EMB170 qualified and current pilots.

2.3 Embraer 190

In May 2005 a joint team of JAA, DAC and TCCA pilots flew both the Embraer 170 and the Embraer 190 to assess the operational differences between the two aircraft. In accordance with CPD procedures, a Handling Qualities Test (T2) was performed. The evaluators flew a total of approximately 4 hours with 6 full-stop landings on the Embraer 170, and the same amount on the Embraer 190.

Following an analysis of the differences and proposed training, the OEB concluded that Level A differences for training, checking and currency should be applied between the Embraer 190 and all other EMB170 variants.

2.4 ACFOG-2247 Rev. 2 (VNAV display)

Embraer ACFOG-2247 revision 2, dated July 13, 2005, was evaluated by the OEB. The aircraft changes introduced by revision 2, which included the VNAV indication on PFD, were considered Level A differences, and therefore no additional training requirement was recommended by the JOEB, other than appropriate self-instruction, in accordance with the ACFOG-2247 and the corresponding revision of the Airplane Operations Manual (AOM).

2.5 ACFOG-2247 Rev. 3 (AUTOLAND & AUTOBRAKES)

Embraer ACFOG-2247 revision 3, dated November 17, 2005, was evaluated by the OEB. The major aircraft changes introduced by revision 3 were the AUTOLAND capability for ILS CAT I, CAT II and CAT IIIa, and the auto brakes system. A dedicated training syllabus was jointly evaluated by the DAC and the JAA in December 2005 in a four-hour session on an Embraer 170 FFS operated by Swiss Aviation Training Ltd in Zurich.

The JOEB identified a TASE for the pilot flying for immediate and positive reaction in certain situations (e.g. to react to pitch trim offset, or to counteract yaw in a one-engine-inoperative condition, after A/P disconnecting). It is further recommended to emphasize the “worst case scenario” during training (one engine inoperative, autopilot failure during go-around) after approach for AUTOLAND.

If the AUTOLAND function is installed as an option, the “modular” (additional training session) syllabus for AUTOLAND (Cat I, Cat II & Cat III) should be used in addition to or integrated into the “integrated” type rating training syllabus (including one additional FFS session).

Low Visibility Operations (LVO) recurrent training and checking should be in accordance with AMC1 SPA.LVO.120 (f). In addition, training organisations should consider to include one Cat III approach with a go-around at low altitude caused by a system malfunction, and one Cat III approach with a full-stop landing at maximum crosswind (15kts) during appropriate recurring intervals.

Additionally, consideration should be given to perform one Cat II and one Cat I approach (with special emphasis on switching RA/BARO) during proficiency checks.

With regard to currency, the OEB recommends a minimum of 3 AUTOLAND approaches with landing between operator proficiency checks, for each pilot (during normal line operations, if ATC situation permits “simulated” low visibility approaches).

The JOEB also recommends to integrate AUTOBRAKES training, distributed over several sessions, into the integrated type rating training syllabus.

2.6 Head-up Guidance System (HGS)

In December 2005 the JOEB evaluated the Embraer proposed training for use of the Head-up Guidance System (HGS) at Low Visibility Take-off (LVTO). The evaluation was conducted in a four-hour session on an Embraer 170 FFS operated by Swiss Aviation Training Ltd in Zurich.

The JOEB recommends to use the “modular” syllabus for initial HGS training. For full type rating courses it is recommended to use the “integrated” syllabus with HGS exercises in several different simulator sessions.

For recurrent checking at least 2 LVTOs (low visibility take-offs) should be performed using the HGS. One of which should be a rejected take-off due to HUD failure. Additionally, consideration

should be given to perform one Cat I approach and one circling approach during proficiency checks.

The JOEB recommends that for currency, every pilot should use the HGS whenever deemed useful during normal operations, and should alternate to perform all flight phases using the Head-Down indication systems in order to maintain currency in both indicating systems.

2.7 Embraer 195

In June 2006 JAA pilots flew both the Embraer 170 and the Embraer 195 to assess the operational differences between the two aircraft. In accordance with CPD procedures, a Handling Qualities Test (T2) was performed. The evaluators flew a total of approximately 3 hours with 2 full-stop landings on the Embraer 170, and 3 on the Embraer 195. The JAA findings were accepted by the DAC by analysis and an FAA evaluation was performed in September 2006.

The overall results of the Embraer 195 evaluation indicated that level A differences are applicable between the Embraer 195 and all other EMB170 variants.

A new braking technique was initially established for the Embraer 195 and later extended to all other EMB170 variants. This new technique consisted in applying full brakes as soon as the main landing gear touches the ground, and then safely placing the nose gear on the ground in a timely manner. The technique was evaluated by the JAA pilots on the Embraer 195 and later confirmed by ANAC pilots for the other EMB170 variants.

2.8 Steep Approach Module (SAM) and Vertical Guide Path (VGP)

In March 2007, the OEB further evaluated the Steep Approach Module (SAM) and the Vertical Guide Path (VGP), a feature of EPIC Load 19.2, containing also some other items that were addressed during the evaluation, whereas items of Load 19.3 (i.e. electronic checklist, tail strike avoidance, etc.) were not part of the evaluation. A four-hour simulator session took place in the ERJ-170 FFS operated by Swiss Aviation Training Ltd. in Zurich, Switzerland.

The OEB recommends to use an additional FFS session (according the syllabus presented to the OEB) for the training of the Steep Approach Module. The training for the usage of the FMS/VGP for non-precision approaches is recommended to be included in the “normal” pilot type rating training syllabus, where non-precision approaches are trained anyway.

2.9 Electronic Checklist (ECL)

In September 2007 the OEB evaluated the ECL features in the FFS operated by Swiss Aviation Training Ltd in Zurich.

The OEB recommends to use the Embraer’s CBT (containing an ECL free play trainer), as well, as the proposed Embraer training syllabus (with the integration of the CBT to the ground course). The practical training is recommended to take place during any recurrent training session for type-rated

pilots, and to be integrated into the different existing sessions of the initial type rating course syllabus for pilots doing initial type rating training. For recurrent training and checking, some ECL training should be implemented in the respective exercises.

A special focus should be put on the problems possibly arising when “changing checklists” (i.e. between abnormal/emergency and normal checklist, or when a certain procedure with its own checklist is included in another abnormal/emergency checklist).

The OEB also recommends to include to the user approval a procedure certified by the competent authority, to load the actual (which could be user modified) ECL into the simulators used for the training and checking. No specific currency requirements have been identified by the OEB.

2.10 ERJ 190-100 ECJ (Lineage)

In July 2009 an evaluation of pilot qualifications for the Embraer 190-100 ECJ (Lineage) was completed. Embraer generic ODR tables and relevant aircraft documentation was reviewed.

The OEB concluded that Level A differences for training, checking and currency should be applied between the ‘Lineage’ and all other EMB170 variants.

The OEB further recommended that special consideration should be given to training:

- where applicable, on the autobrake system as this system is a standard system in the ‘Lineage’, whereas it is optional in other variants; and
- on Extended Range Operations (ETOPS) with the ‘Lineage’, as the existing EMB170 variants have not been evaluated for ETOPS operations.

2.11 AUTOLAND Mode 2 – Cat IIIb (with rollout guidance)

The AUTOLAND Mode 2 - Cat IIIb feature was evaluated by the OEB in April 2010 in a 4-hour session in the ERJ-170 FFS operated by CAE in Hoofddorp.

The OEB confirmed the same recommendations already established for modification ACFOG-2247 Rev. 3 (AUTOLAND & AUTOBRAKES) apply to AUTOLAND Mode 2 (see para. 2.5 above).

2.12 Dual HGS

In June 2010, as an add-on evaluation to the HGS mentioned above, the “Dual HGS” system was evaluated by the OEB, using a 4-hour session in the Embraer 190 simulator operated by Oxford Aviation Academy UK Limited, located at Gatwick UK.

The OEB recommendations for the single HGS system are also applicable to the Dual HGS system. Additionally, emphasis should be placed on crew co-ordination with both HUDs being used at the same time. Specially the duties of the pilot monitoring should be clearly defined, and cover the monitoring of the “ordinary” Display Units and respective indications not covered by the head-up displays.

2.13 EMB170 Revised Initial Type Rating

In March/April 2013 the OEB reviewed a revised training syllabus for the EMB170 initial pilot type rating, at the FSI training facility in Paris, Le Bourget. The course consisted of classroom instruction supported by Desktop Simulation, Cockpit Procedure Training and Full Flight Simulator training on the Embraer 170 FFS.

OEB recommendations on pilot qualifications related to this evaluation are described in para. 7 below.

2.14 CPDLC

Reserved.

2.15 RNP AR

Reserved.

3. Aircraft Type Designation and Pilot License Endorsement

With reference to Part-FCL, FCL.010 ('type of aircraft') and GM1 FCL.700, the Embraer 170, 175, 190 and 195 series have been evaluated for aircraft categorisation and license endorsement.

The Embraer 170, 175, 190 and 195 series aircraft have been assessed as variants requiring Level A familiarization training. The license endorsement is established as "**EMB170**".

Type Ratings List (Aeroplane) – Multi Pilot

1 Manufacturer	2 Aeroplanes		3	4 Licence Endorsement
	Model	Name		
Embraer	ERJ 170-100	Embraer 170		EMB170
	ERJ 170-200	Embraer 175		
	ERJ 190-100	Embraer 190 (incl. Lineage)		
	ERJ 190-200	Embraer 195		

4. Aircraft Specifics

The EMB170 series design ensures similar characteristics between all variants regarding cockpit layout, system operation, and handling characteristics. This level of commonality has a direct and significant impact on the design and construction of the training programmes.

4.1 Minimum Height for use of Autopilot

The minimum height for use of the autopilot is the same for all EMB170 variants, as follows:

- Minimum Engagement Height 400 ft
- Minimum Use Height
 - Cruise and Descent 1000 ft
 - Approach 50 ft

4.2 Normal Final Landing Flap Setting

The normal final landing flap setting is FLAPS FULL for all EMB170 variants.

4.3 Automatic Flight Control System (AFCS)

The AFCS pilot/machine interface is the same for all EMB170 variants.

4.4 Electronic Display System (EDS)

The EDS pilot/machine interface is the same for all EMB170 variants.

4.5 Electronic Indicating and Crew Alerting System (EICAS)

The EICAS philosophy, crew alerting messages and applicable synoptic pages are basically the same in all EMB170 variants.

4.6 Navigation and Communication

All EMB170 variants share the same navigation and communication equipment. Pilot operation of the equipment is the same for all EMB170 variants.

4.7 Primary and Secondary Flight Controls

Pilot operation of the primary and secondary flight controls is same for all EMB170 variants in both normal and direct modes of operation. Handling characteristics and flying techniques are also common to all EMB170 variants.

4.8 Take-off, Climb and Descent Profiles

Take-off, climb and descent profiles are the same for all EMB170 variants.

4.9 Aircraft Approach Category

With reference to Part-CAT, CAT.OP.MPA.320(b) the approach category for the EMB170 variants is as follows:

Aircraft	Category
Embraer 170	C
Embraer 175	
Embraer 190	
Embraer 195	

4.10 Approach Profiles and Speeds

The approach profiles are the same for all EMB170 variants. Approach speeds are dependent upon aircraft weight. Although the Embraer 175, the Embraer 190 and the Embraer 195 operate at heavier weights as compared to the Embraer 170, critical speeds are presented to the pilot in a standardised manner for all EMB170 variants.

4.11 Altitude Callouts during Landings

The use of automatic voice callouts are the same for all EMB170 variants. Consistent with the applicable regulations for civil aviation aircrew and air operations, these callouts may be customized for low visibility operations in accordance with operator requirements. Callouts should be standardized within the applicable aircraft fleet when operating more than one type or variant or conducting mixed fleet flying.

4.12 Abnormal and Emergency Procedures

Abnormal and emergency procedures are identical for all EMB170 variants. However, for selected electrical systems failures, the list of inoperative items varies from the Embraer 170/175 to the Embraer 190/195, as described in the ODR tables.

5. Master Differences Requirements (MDR)

5.1 MDR Tables

MDR tables for the EMB170 variants are shown below. Definitions of the various levels for Training/Checking/Currency are those used in the CPD.

Master Differences Requirements (MDR) Table						
License endorsement: EMB170		FROM AIRPLANE				
TO AIRPLANE		Embraer 170	Embraer 175	Embraer 190	Embraer 195	Embraer 190 ECJ
	Embraer 170	n/a	A/A/A	A/A/A	A/A/A	A/A/A
	Embraer 175	A/A/A	n/a	A/A/A	A/A/A	A/A/A
	Embraer 190	A/A/A	A/A/A	n/a	A/A/A	A/A/A
	Embraer 195	A/A/A	A/A/A	A/A/A	n/a	A/A/A
	Embraer 190 ECJ	A/A/A	A/A/A	A/A/A	A/A/A	n/a

5.2 Excerpts from the CPD

Level A Training. *Level A difference training is applicable to functionally equivalent aircraft with differences that can adequately be addressed through self-instruction. Level A training represents a knowledge requirement such that, once appropriate information is provided, understanding and compliance can be assumed to take place. Compliance with Level A training is typically achieved by methods such as issuance of operating manual page revisions, dissemination of flight crew operating bulletins or differences hand-outs to describe minor differences between aircraft.*

Level A Checking. *Level A checking indicates that no check related to differences is required at the time of differences training. A crew member is, however, responsible for knowledge of each variant flown, and differences items may (and should) be included as an integral part of subsequent recurring proficiency checks.*

Level A Currency. *At Level A currency is considered to be common to each variant. Thus, assessment or tracking of currency for separate variants is not necessary or applicable. Maintenance of currency in any one variant or a combination of variants suffices for any other variant.*

Use of Devices Exceeding Requirements. *Training differences levels represent minimum requirements. Operators may always use a device normally associated with a higher difference level to satisfy a training differences requirement. For example, if Level C differences have been assessed due to installation of a different FMS, operators may train pilots using the FMS installed in a FFS as a system trainer if a dedicated part task FMS training device is not available.*

6. Operator Differences Requirements (ODR)

ODR tables are used to show an operator's compliance method. Embraer generic ODR tables concerning differences between the EMB170 variants are on file with EASA. Copies are available on request. These ODR tables are provided as Embraer generic and therefore may not include items that are applicable to particular operators. The ODR tables assume that pilots are current and qualified in operating the base aircraft.

The Embraer ODR tables have been developed in accordance with EU regulations for civil aviation aircrew and air operations. These ODR tables have been found acceptable by EASA. They represent an acceptable means of compliance with MDR provisions for the aircraft evaluated, based on those differences and compliance methods shown. These tables do not necessarily represent the only means of compliance for operators with aircraft having other differences.

Operators using more than one variant must have approved ODR tables pertinent to their fleet.

7. Specifications for Training

7.1 EMB170 Initial Type Rating Courses

With reference to Part-ORA, AMC2 ORA.ATO.125(b), additional familiarisation training for EMB170 variants may be included in the theoretical knowledge training of the initial type rating course. Flight training should be conducted on a single EMB170 variant.

Consequently, EMB170 initial type rating courses may be based on any of the EMB170 variants.

7.1.1 EMB170 Initial Type Rating Course (OEB Evaluation Sep/Oct 2003)

In 2003, the JOEB evaluated an EMB170 initial type rating course based on the Embraer 170 aircraft. This type rating course was found in compliance with AMC 1.261 (c) (2) of JAR-FCL 1 (A) Subpart F and was found suitable for pilots with previous experience with EFIS/FMS and multi-engine transport turbojet aircraft. For pilots not having this experience, additional training may be appropriate as determined by the competent Authority.

The relevant footprint of this course, including the minimum course duration and training devices used is shown at **Appendix 1**.

7.1.2 EMB170 Initial Type Rating Course (OEB Evaluation Mar/Apr 2013)

In 2013, the OEB evaluated a further EMB170 initial type rating course based on the Embraer 170 aircraft and concluded that it was suitable and compliant with applicable EU regulations for civil aviation aircrew and air operations. Approved training organisations and operators should consider previous knowledge and experience of pilots to assess the need for additional training above minimum requirements.

With reference to Part-ORA, AMC2 ORA.ATO.125(j), flight training may consist of a minimum of 28 hours in an FFS (operating as a crew) and 6 hours (operating as a crew) in a qualified FSTD device, certified in accordance with CS-FSTD(A) except for the requirements related to manual flight. The relevant footprint of this course, including the minimum course duration and training devices used is shown at **Appendix 2**.

For courses in which the objectives of the first FSTD session (cockpit familiarization, normal scan flows, FMS operation, etc.) are accomplished in a cockpit training device which is not qualified as an FSTD, flight training should consist of a minimum of 32 hours in an FFS (operating as a crew). The relevant footprint of this course, including the minimum course duration and training devices used is shown at **Appendix 3**.

7.1.3 Aeroplane Training (Base Training)

With reference to Part-ORA, AMC2 ORA.ATO.125(k)(1), the number of landings to be completed in an aeroplane may be performed on any EMB170 variant, regardless of which FFS has been used during the training course.

7.2 Training Areas of Special Emphasis (TASE)

Part-FCL, FCL.710(a) and FCL.725(a) address training requirements for type rating, differences and familiarization training to include the relevant elements as defined in the operational evaluation. Part-ORO, ORO.FC.145(b) addresses operator requirements to include the relevant elements as defined in the operational evaluation when establishing the training programmes and syllabi.

7.2.1 TASE for EMB170

The following aircraft systems or procedures should receive special emphasis during EMB170 initial type rating training:

- Flight Management System (FMS);
- Automatic Flight Control System (AFCS);
- Flight Director guidance based on Flight Path Angle (FPA) with acceleration pointer;
- Primary Flight Display (PFD), Multi-function display (MFD), including use of the reversionary modes, and Engine Indications and Crew Alerting System (EICAS);
- Understanding of the Embraer-170/190 family fly-by-wire concept and functions, and associated EICAS messages;
- Cursor Control Devices (CCD);
- Windshear Escape Guidance based on FPA;
- Enhanced Ground Proximity Warning System (EGPWS);
- Traffic Collision and Avoidance System (TCAS);
- Integrated Electronic Standby System (IESS); and
- Ailerons and elevators disconnection mechanism, and Head-up Display (HUD) in visual and instrument flight, as applicable;

In addition, the following characteristics of the EMB170 should be emphasised throughout the training programme:

- Guidance panel selections must be co-ordinated with proper mode engagement recognition on the PFD/FMA (Flight Mode Annunciator) due to potential for incorrect mode selection;
- Pilots must exercise integrated use of EICAS messages, switch positions and synoptic pages information to determine system status, in particular, during systems malfunctions;
- Pilots must exercise crew co-ordination and proper flight management (task sharing and cross-checking) due to the high level of automation;
- Pilots must be trained to handle EICAS cascading messages by proper identification of which malfunction originated thereto-associated failure conditions. Emphasis on this aspect shall be required until the ECL is integrated and certified for use;
- Pilots must be proficient in the characteristics of the propulsion system for proper selection and use of the adequate take-off mode; and

- Pilots must be proficient in the braking application technique upon main landing gear touchdown for achieving AFM performance. Adequate column control must be mastered in order to safely land the nose wheel, in particular on the Embraer-190/195 with forward centre of gravity and heavy weight configurations.

Where the AUTOLAND capability is available:

- Pilots should be made aware of the importance for immediate and positive reaction in certain situations (e.g. to react to pitch trim offset, or to counteract yaw in a one-engine-inoperative condition, after A/P disconnecting)

Furthermore, early exposure to the AFCS and FMS is important, especially for pilots with no previous EFIS or FMS experience. Establishing early confidence in manually flying the aircraft, converting back and forth from manual to FMS controlled flight mode, is equally important due to heavy reliance on the AFCS. In the event of a flight path deviation due to input error or system malfunction, the flight crew must be able to comfortably transition from automatic to manual operation and back, in an orderly fashion.

7.3 Special Events Training

Special events training is recommended to improve basic crew understanding and confidence regarding aircraft handling qualities, options and procedures as these relate to design characteristics and limitations. Examples of this training should include the following:

- recovery from unusual attitudes;
- handling qualities and procedures during recovery from an upset condition (e.g., wake vortex encounter, loss of control incident);
- high altitude high and slow speed buffet margins and flight characteristics;
- Controlled Flight Into Terrain (CFIT), TCAS, EGPWS (emphasis on avoidance and escape manoeuvres, altitude awareness, TCAS / EGPWS warnings, situational awareness and crew co-ordination, as appropriate);
- wind shear and predictive wind shear escape manoeuvres;
- manual flight with minimum use of automation, including flight under degraded levels of automation.

Note: The above special events training applies to flight training (e.g. in a full type rating course).

7.4 Training related to individual modifications, specific devices or special procedures

Additional evaluations of individual modifications, devices and procedures, as well as related pilot qualification requirements are described in para. 2 of the report (Sequence of Operational Evaluations).

7.5 Alternative Training and Qualification Programme (ATQP)

Part-ORO, ORO.FC.A.245 addresses the alternative training and qualification programme. Where an ATQP has been approved by the Competent Authority, the programme should be consistent with the requirements and recommendations of this evaluation, taking into account any training areas of special emphasis and ODR tables, as applicable.

7.6 Recurrent Training

Recurrent training must be compliant with EU regulations for civil aviation aircrew and air operations, as applicable, and include the Training Areas of Special Emphasis as identified in this report. These requirements should be considered as a minimum and expanded, as appropriate, for pilots who have had only limited exposure and/or who do no longer fulfil the currency requirements.

Operators must establish an approved recurrent training and checking programme which is relevant to the aircraft variant flown and its intended operation. The recurrent training programme may vary with several factors which have a significant influence. Some of these factors are: actual exposure of the flight crew member(s), specific routes and aerodromes used by the operator and new developments in technology. These factors and/or a combination thereof will determine the required recurrent training.

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

Recurrent training performed on one EMB170 variant is valid for other EMB170 variants flown, provided that the differences are addressed.

The OEB recommends that special emphasis should be placed on recurrent training of the AUTOLAND capability in association with failures such as one engine inoperative approaches and autopilot failure during go-around (see para. 2.5).

8. Specifications for Checking

License skill tests and operator proficiency checks must be performed in accordance with applicable EU regulations for civil aviation aircrew and air operations.

8.1 Recurrent Checking

Recurrent checking is addressed in Part-ORO, specifically in ORO.FC.130, ORO.FC.220, ORO.FC.230, AMC1 ORO.FC.230, GM1 ORO.FC.230, ORO.FC.240, and AMC1 ORO.FC.240.. A Proficiency Check conducted on one variant is valid for the other variants, provided that differences between variants are covered, as appropriate.

Low Visibility Operations (LVO) recurrent training and checking should be in accordance with AMC1 SPA.LVO.120 (f). In addition, training organisations should consider to include one Cat III

approach with a go-around at low altitude caused by a system malfunction and one Cat III approach with a full-stop landing at maximum crosswind (15kts) during appropriate recurring intervals.

Additionally, consideration should be given to perform one Cat II and one Cat I approach (with special emphasis on switching RA/BARO) during proficiency checks.

Where the HGS is available, a minimum of two low visibility take-offs (LVTO) with the use of the HGS should be demonstrated during recurrent checks, one of which should be a rejected take-off due to a HUD failure. Additionally, consideration should be given to perform one Cat I approach and one circling approach during proficiency checks.

8.2 Line Checks

With reference to Part-ORO, AMC1 ORO.FC.240(a)(4)(vii), the OEB has determined that a line check performed on either EMB170 variant is valid for all variants.

9. Recent Experience and Currency

9.1 Recent Experience

Recent experience requirements are contained in Part-FCL, FCL.060.

With reference to Part-ORO, ORO.FC.140(a), full credit is granted for recent experience requirements when operating EMB170 variants.

9.2 Currency

Where the AUTOLAND capability is available, every pilot should perform a minimum of 3 actual or simulated AUTOLAND approaches with landing between operator proficiency checks (during normal line operations, if ATC situation permits “simulated” low visibility approaches).

Where the HGS is available, every pilot should use the HGS whenever deemed useful during normal operations, and should alternate to perform all flight phases using the Head-Down indication systems in order to maintain currency in both indicating systems.

10. Line Flying Under Supervision (LIFUS) / Familiarization Flights

10.1 LIFUS

LIFUS should be performed in accordance with ORO.FC.220 and AMC1 ORO.FC.220(e). Furthermore, GM1 ORO.FC.220(d) provides guidelines for operators to use when establishing their individual requirements.

In the case of pilots completing the initial type rating for the EMB170, it is recommended that a minimum of 10 flight sectors of LIFUS should be performed, followed by a line check.

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

10.2 Familiarization Flights

No additional familiarization flights are proposed for transitions between EMB170 variants.

11. Specification for operations of more than one type or variant (Mixed Fleet Flying – MFF)

11.1 Prerequisites

Requirements for operations on more than one type or variant (Mixed Fleet Flying – MFF) are contained in Part-ORO, ORO.FC.140, ORO.FC.240 and AMC1 ORO.FC.240. Furthermore, Crewing of inexperienced flight crew members is addressed in ORO.FC.200(a).

11.2 Recurrent Training and Checking

Recurrent training and checking is addressed in Part-ORO, specifically in ORO.FC.130, ORO.FC.220, ORO.FC.230, AMC1 ORO.FC.230, GM1 ORO.FC.230, ORO.FC.240, and AMC1 ORO.FC.240.

11.3 Operation of more than one EMB170 variant

The differences between the EMB170 variants for recurrent training have been assessed as Level A. In accordance with AMC1 ORO.FC.240(a)(4)(vii), the OEB has determined that, when operating more than one EMB170 variant:

- recurrent training and checking on any EMB170 variant is valid for all variants operated, provided that the differences between the variants are covered; and
- recurrent training and checking should be alternated between the variants operated.

12. Aircraft Regulatory Compliance Checklist (Part-CAT, Subpart D)

In October 2003, ANAC performed an evaluation of aircraft instruments and equipment / communication and navigation equipment, on Embraer 170 prototypes 006 and 007 which were representative of the production version. Based on this evaluation, the JOEB confirmed compliance with JAR-OPS 1, Subparts K and L for the Embraer 170.

Operators must demonstrate to the competent Authority, compliance with Part-CAT, Subpart D (Instruments, Data, Equipment) relevant to their aircraft prior to entry into service.

13. Specifications for FSTDs and Training Devices

FSTD qualification requirements are contained in CS-FSTD(A). All other training devices should be assessed on an individual base.

Training and proficiency checks on one EMB170 variant may be conducted on an FFS designed and qualified for a different variant, provided that differences training has been covered and specific aircraft base training has been completed (see para. 7.1.3).

In addition, the syllabus used in the FFS training must conform to the specific FFS variant configuration for a suitable range of weights, centre of gravity and speeds, performance, and other relevant parameters.

Appendix 1**Initial Type Rating Training****(syllabus evaluated in 2003, see para 7.1.1)**

Day 1	Day 2	Day 3	Day 4	Day 5
CBT 1 (4:00) CBT 2 (4:00)	CBT 3 (4:00) TR 1 (4:00)	CBT 4 (8:00)	CBT 5 (4:00) TR 2 (4:00)	FMS 1 (6:00) CBT 6 (2:00)
Day 6	Day 7	Day 8	Day 9	Day 10
CBT 7 (8:00)	TR 3 (4:00) CBT 8 (4:00)	CBT 8 (8:00)	TR 4 (6:00) FMS 2 (2:00)	Test (2:00) GI 1 (6:00)
Day 11	Day 12	Day 13	Day 14	Day 15
GI 2 (4:00) GI 3 (4:00)	GI 4 (4:00) GI 5 (4:00)	CPT 1 (8:00)	CPT 2 + FMS (8:00)	CPT 3 + FMS (7:00)
Day 16	Day 17	Day 18	Day 19	Day 20
FFS 1 (6:00)	FFS 2 (6:00)	FFS 3 (6:00)	FFS 4 (6:00)	FFS 5 (6:00)
Day 21	Day 22	Day 23	Day 24	
FFS 6 (6:00)	FFS 7 (6:00)	FFS 8 (6:00)	Skill Test (6:00)	
Notes: <ul style="list-style-type: none"> – CBT = Computer Based Training – TR = Technical Review – GI = Ground Instruction – FMS = Flight Management System exercise – Times for CPT (Cockpit Procedure Training) do not include briefing or debriefing – Times for FFS (Full Flight Simulator) include 1.5 Hour briefing and 0.5 Hour debriefing 				

This table reflects the Full Type Rating course analysed by EASA, which was found to be compliant with applicable requirements. Any variations to this course should be evaluated by the Competent Authority or through an OEB evaluation. This serves to ensure that an equivalent level of training and safety are reached, and may lead to variations to the table above.

Appendix 2**Initial Type Rating Training**

(revised syllabus evaluated 2013, CPT qualified as FSTD, see para 7.1.2)

Day 1	Day 2	Day 3	Day 4	Day 5
GI 1 (7:00)	GI 2 (7:00)	GI 3 (7:00)	GI 4 (4:00) FMS 1 (3:00)	GI 5 (4:00) FMS 2 (3:00)
Day 6	Day 7	Day 8	Day 9	Day 10
GI 6 (5:00) FMS 3 (2:00)	GI 7 (5:00) FMS 4 (2:00)	GI 8 (4:00) FMS 5 (3:00)	GI 9 (4:00) FMS 6 (3:00)	GI 10 (4:00) FMS 7 (3:00)
Day 11	Day 12	Day 13	Day 14	Day 15
GI 11 (7:00)	Written Test (3:00)	CPT 1* (4:00)	CPT 2* (4:00)	CPT 3* (4:00)
Day 16	Day 17	Day 18	Day 19	Day 20
FFS 1 (6:00)	FFS 2 (6:00)	FFS 3 (6:00)	FFS 4 (6:00)	FFS 5 (6:00)
Day 21	Day 22	Day 23		
FFS 6 (6:00)	FFS 7 (6:00)	Skill Test (6:00)		
<p>*CPT qualified as FSTD</p> <p>Notes:</p> <ul style="list-style-type: none"> – GI = Ground Instruction – FMS = FMS lab exercise – Times for CPT (Cockpit Procedure Training) do not include briefing or debriefing – Times for FFS (Full Flight Simulator) include 1.5 Hour briefing and 0.5 Hour debriefing 				

This table reflects the Full Type Rating course analysed by EASA, which was found to be compliant with applicable requirements. Any variations to this course should be evaluated by the Competent Authority or through an OEB evaluation. This serves to ensure that an equivalent level of training and safety are reached, and may lead to variations to the table above.

Appendix 3**Initial Type Rating Training**(revised syllabus evaluated 2013, CPT NOT qualified as FSTD, see para 7.1.2)

Day 1	Day 2	Day 3	Day 4	Day 5
GI 1 (7:00)	GI 2 (7:00)	GI 3 (7:00)	GI 4 (4:00) FMS 1 (3:00)	GI 5 (4:00) FMS 2 (3:00)
Day 6	Day 7	Day 8	Day 9	Day 10
GI 6 (5:00) FMS 3 (2:00)	GI 7 (5:00) FMS 4 (2:00)	GI 8 (4:00) FMS 5 (3:00)	GI 9 (4:00) FMS 6 (3:00)	GI 10 (4:00) FMS 7 (3:00)
Day 11	Day 12	Day 13	Day 14	Day 15
GI 11 (7:00)	Written Test (3:00)	CPT 1* (4:00)	CPT 2* (4:00)	CPT 3* (4:00)
Day 16	Day 17	Day 18	Day 19	Day 20
FFS 1 (6:00)	FFS 2 (6:00)	FFS 3 (6:00)	FFS 4 (6:00)	FFS 5 (6:00)
Day 21	Day 22	Day 23	Day 24	
FFS 6 (6:00)	FFS 7 (6:00)	FFS 8 (6:00)	Skill Test (6:00)	

*CPT not qualified as FSTD

Notes:

- GI = Ground Instruction
- FMS = FMS lab exercise
- Times for CPT (Cockpit Procedure Training) do not include briefing or debriefing
- Times for FFS (Full Flight Simulator) include 1.5 Hour briefing and 0.5 Hour debriefing

This table reflects the Full Type Rating course analysed by EASA, which was found to be compliant with applicable requirements. Any variations to this course should be evaluated by the Competent Authority or through an OEB evaluation. This serves to ensure that an equivalent level of training and safety are reached, and may lead to variations to the table above.