



# **OPERATIONAL SUITABILITY DATA (OSD)**

## **Flight Crew**

### **EMBRAER**

**ERJ 170-100; ERJ 170-200;  
ERJ 190-100; ERJ 190-100 ECJ; ERJ 190-200;  
ERJ 190-300; ERJ 190-400**

**REVISION 14**

**FEBRUARY, 2025**

**REVISION CONTROL**

<b>REVISION NO.</b>	<b>DATE</b>	<b>HIGHLIGHTS OF CHANGES</b>
Original	05/05/2015	-
1	06/27/2016	Inclusion of FANS 2; RNP < 0.3; and FMS NG
2	09/15/2016	Inclusion of EFVS; RAAS; and new HGS symbology
3	03/07/2018	Report translation into English; inclusion of ERJ 190-300 differences training; ERJ 190-100/100 ECJ/200 FADEC software version 10E5.61; Recurent training footprint removal; 2003 Minimum Training Curriculum adjusted; MCR removal; Item 17.1: Inclusion of training/checking/currency levels and two notes; Annexes reorganization: ODR tables removal (former Annex 1); syllabus-related elements removal (former Annex 2), RBHA 91 and RBAC 121 Compliance Checklist removal (current Annex 1) and general adjustments
4	03/21/2018	Envelope Extension from -40°C to -45°C for ERJ 170-100 and ERJ 170-200
5	07/06/2018	1) Load 27.2 2) Advanced Features 3) Load 5.7 for ERJ 190-300
6	17/01/2019	1) ERJ 190-400 differences training. 2) Load 7.0 for E2.
7	28/11/2019	1) RNP AR < 0.3 NM and RF Legs 2) TOLD database for E2 3) ERJ 190-300 Initial Type Rating Training
8	08/12/2020	CAT IIIa Autoland ERJ 190-300
9	01/06/2021	Steep Approach Mode ERJ 190-300
10	30/11/2021	1) CAT IIIa Autoland ERJ 190-400 2) Load Version 25.9 and 27.4 3) GNSS Landing System (GLS) for ERJ 190-300 and ERJ 190-400 4) TOLD Database for E2
11	26/01/2023	1) E2 to E1 differences training. 2) ERJ 190-400 steep approach mode (SAM) 3) Primus Epic Load 9.0
12	01/08/2023	ERJ 190-300/-400 Autonomous Distress Tracking (ADT)

13	26/09/2024	1) ERJ 190-100 Freighter version 2) ERJ 170/190 E1 Ice Speed Reset Function 3) ERJ 190-300/-400 Runway Overrun Awareness and Alerting System (ROAAS)
14	20/02/2025	ERJ 170-100/-200, ERJ 190-100/-200 and ERJ 190-300/-400 Automatic Dependent Surveillance Broadcast (ADS-B) OUT; editorial changes.

## **APPROVAL**

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## PREAMBLE AND SEQUENCE OF OPERATIONAL EVALUATIONS

The operational evaluation tests results depicted in this report have been obtained in observation to the IAC 121-1009 and IS 00-007 and include the initial specifications described in the IAC 121-1012 issued in 02/23/2006 as well as the operational evaluation results obtained thereafter to date, namely:

**1) 2013**

E-Jets new type rating initial training program; RNP-AR; and ERJ 170-200 Enhanced Wing Tip.

**2) February 2016**

FMS NG; RNP<0.3 NM; and FANS 2 for E1.

**3) August 2016**

EFVS; RAAS; and HGS new symbology.

**4) November 2017**

ERJ 190-100 to ERJ 190-300 Differences Training.

**5) December 2017**

ERJ 190-100 / 100 ECJ / 200 FADEC software version 10E5.61.

**6) March 2018**

ERJ 170-100 / 200 Envelope Extension from -40°C to -45°C for ERJ 170-100 and ERJ 170-200.

**7) July 2018**

Load 27.2 for E1, Advanced Features for all E-Jets Family and Load 5.7 for ERJ 190-300.

**8) December 2018**

ERJ 190-300 to ERJ 190-400 differences training and Load 7.0 for E2.

**9) March 2019**

RNP-AR < 0.3 NM and RF Legs Certifications for ERJ 190-300.

**10) April and May 2019**

ERJ 190-300 Initial Type Rating Training.

**11) June 2019**

TOLD Database for E2.

**12)October 2019**

RNP-AR < 0.3 NM and RF Legs Certifications for ERJ 190-400.

**13)August and September 2020**

CAT IIIa Autoland ERJ 190-300.

**14)June 2021**

Steep Approach Mode ERJ 190-300.

**15)November 2021**

GNSS Landing System (GLS) for ERJ 190-300 and ERJ 190-400.

CAT IIIa Autoland ERJ 190-400.

Primus Epic System Software Load Version 25.9 and 27.4.

TOLD Database for E2 (ERJ 190-300 update and ERJ 190-400 initial certification).

**16)January 2023**

E2 to E1 differences training.

ERJ 190-400 steep approach mode (SAM).

Primus Epic Load 9.0.

**17)August 2023**

ERJ 190-300/-400 Autonomous Distress Tracking (ADT).

**18)September 2024**

ERJ 190-100 Freighter version.

ERJ 170/190 E1 Ice Speed Reset Function

ERJ 190-300/-400 Runway Overrun Awareness and Alerting System (ROAAS)

**19)February 2025**

ERJ 170-100/-200, ERJ 190-100/-200 and ERJ 190-300/-400 Automatic Dependent Surveillance Broadcast (ADS-B) OUT

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# 1 ACRONYMS, ABBREVIATIONS AND DEFINITIONS

AC	Advisory Circular
AC	Alternate Current
ACARS	Airborne Communications Addressing and Reporting System
ACMP	Alternate Current Motor Pump
ADS-B IN	Automatic Dependent Surveillance-Broadcast IN
ADS-B OUT	Automatic Dependent Surveillance-Broadcast OUT
ADT	Autonomous Distress Tracking
AEG	Aircraft Evaluation Group
AES	Assisted Engine Start
AFCP	Automatic Flight Control Panel
AFCS	Automatic Flight Control System
AFDS	Automatic Flight Director System
AGL	Above Ground Level
ALAR	Approach and Landing Accident Reduction
ALT	Altitude
ANAC	Agência Nacional de Aviação Civil (Civil Aviation National Agency)
AOM	Airplane Operations Manual
AP	Autopilot
APU	Auxiliary Power Unit
APPR	Approach
AR	Advanced Range
AT	Auto Throttle
ATC	Air Traffic Control
AVNX	Avionics
BARO	Barometric
CAS	Crew Alerting System
CCD	Cursor Control Device
CFIT	Controlled Flight Into Terrain
CHT	Certificate of Technical Qualification / Type Approval Certificate
CLB	Climb
CMD	Command
CNS/ATM	Communication Navigation Surveillance/Air Traffic Management

CPT	Cockpit Procedures Training
CRM	Cockpit Resource Management
CWS	Control Wheel Steering
DA	Decision Altitude
DC	Direct Current
DM	Direct Mode
DAC	Departamento de Aviação Civil (Department of Civil Aviation)
E-Bay	Electronic Bay
E-Jets	E1 and E2 generations
E1	E-Jets first generation (ERJ 170-100/200; ERJ 190-100/100 ECJ/200)
E2	E-Jets second generation (ERJ 190-300, ERJ 190-400)
EDS	Electronic Display System
EFB	Electronic Flight Bag
EICAS	Engine Indication and Crew Alerting System
EFIS	Electronic Flight Instrument System
EFVS	Enhanced Flight Vision System
EGPWF	Enhanced Ground Proximity Warning Function
EGPWS	Enhanced Ground Proximity Warning System
EMERG	Emergency
ERJ 170-100	Embraer 170 E1 (E170 E1)
ERJ 170-200	Embraer 175 E1 (E175 E1)
ERJ 190-100	Embraer 190 E1 (E190 E1)
ERJ 190-100 ECJ	Embraer Lineage 1000 (L1000)
ERJ 190-200	Embraer 195 E1 (E195 E1)
ERJ 190-300	Embraer 190 E2 (E190 E2)
ERJ 190-400	Embraer 195 E2 (E195 E2)
ET	Elapsed Time
ETOPS	Extended Overwater Operations
EVS	Enhanced Vision System
EWT	Enhanced Wing Tip
FANS	Future Air Navigation System
FMS	Flight Management System
FOSA	Flight Operational Safety Assessment
FBW	Fly By Wire
FFBW	Full Fly By Wire

FMS	Flight Management System
FOHE	Fuel-Oil Heat Exchanger
FPA	Flight Path Angle
FPV	Flight Path Vector
FFS	Full Flight Simulator
FSTD	Flight Simulation Training Device
FTD	Flight Training Device
G/S	Glide Slope
GAA	Grupo de Avaliação de Aeronaves (Aircraft Evaluation Group)
GBAS	Ground-Based Augmentation System
GFP	Graphical Flight Plan
GI	Ground Instruction
GLS	GNSS/GBAS-based Landing System
GND	Ground
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GPWS	Ground Proximity Warning System
H-STAB	Horizontal Stabilizer
HF	High Frequency
HGS	Head Up Guidance System
HUD	Head Up Display
IAC	Instrução de Aviação Civil (Civil Aviation Instruction)
IESS	Integrated Electronic Standby System
IFE	In-Flight Entertainment
IFR	Instruments Flight Rules
IFT	In-Flight Training
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
INAV	Interactive Navigation
INFAC	Informativo de Aviação Civil (Civil Aviation Information)
INHIB	Inhibition
IS	Instrução Suplementar (Supplementary Instruction)
LNAV	Lateral Navigation
LG	Landing Gear
LR	Long Range

LOFT	Line Oriented Flight Training
MCC	Multi Crew Course
MCDU	Multifunction Control Display Unit
MDA	Minimum Descend Altitude
MDCD	Main Deck Cargo Door
MDR	Master Differences Requirements
MEL	Minimum Equipment List
MFD	Multi function display
MFF	Mixed Fleet Flying
MFS	Multi-Function Spoiler
MLG	Main Landing Gear
MMEL	Master Minimum Equipment List
MNPS	Minimum Navigation Performance Specification
NAA	National Aviation Authority
NAV	Navigation
NG-FMS	New Generation FMS
NM	Normal Mode
ODR	Operator Differences Requirements
OVRD	Override
PA	Piloto Automático (Autopilot)
PC	Piloto Comercial (Commercial Pilot)
PF	Pilot Flying
PFD	Pilot Flight Display
PIC	Pilot In Command
PLA	Piloto de Linha Aérea (Airline Pilot)
PPC	Partial Proficiency Check
PROX	Proximity
PRKG	Parking
PW	Pratt & Whitney
PM	Pilot Monitoring
QRH	Quick Reference Handbook
RA	Resolution Advisory
RBHA	Regulamento Brasileiro de Homologação Aeronáutica (Brazilian Regulation of Aeronautical Homologation)
RMS	Radio Management System

RMU	Radio Management Unit
RNP	Required Navigation Performance
ROAAS	Runway Overrun Awareness and Alerting System
RVSM	Reduced Vertical Separation Minima
SAM	Steep Approach Mode
SatCom	Satellite-based Communication
SFF	Single Fleet Flying
SIC	Second In Command Pilot
SID	Standard Instrument Departure
SOPM	Standard Operating Procedures Manual
SR	Short Range
STD	Standard
STE	Subdepartamento Técnico-Operacional (Technical-Operational Subdepartament)
SU	Stand-Up instruction
SVS	Synthetic Vision System
SW	Software
SYS	System
TA	Traffic Advisory
TASE	Training Area of Special Emphasis
TCAS	Traffic Alert and Collision Avoidance System
TERR	Terrain
TO	Take Off
TRS	Thrust Rating Selection
USB	Universal Standard Bus
VMC	Visual Meteorological Conditions
VNAV	Vertical Navigation
V1	Decision Speed
WML	Windmilling
WRN	Warning

## 2 PURPOSE AND APPLICABILITY

This report assembles the operational evaluation specifications applicable to the ERJ 170-100; ERJ 170-200; ERJ 190-100; ERJ 190-100 ECJ; ERJ 190-200; ERJ 190-300; and ERJ 190-400 airplane variants and it is based on somehow pulverized documentation, namely the IAC 121-1012, IS 00-007, on activity reports as well as on a number of ANAC official transmittal letters (known as *ofícios*) that comprise the results of several operational evaluations events since the E-Jets initial type certification to present day.

It contains ANAC's recommendations for training (including Type Rating training), proficiency checks and recency of experience (currency) applicable to crewmembers operating the E-Jets family, namely the ERJ 170-100; ERJ 170-200; ERJ 190-100; ERJ 190-100 ECJ; ERJ 190-200; ERJ 190-300 and ERJ 190-400 in accordance to RBHA 91, RBAC 61 and 121.

The variants herein presented are commercially known, in the order as they were listed above as Embraer 170, Embraer 175, Embraer 190, Embraer Lineage 1000, Embraer 195, Embraer 190 E2 and Embraer 195 E2.

The recommendations in this report are based on evaluations of airplane models with specific configurations and corresponding operational functionality. Subsequent changes on any of those or the introduction of a new variant may require the provisions in this report to be updated.

ANAC has the ultimate authority over the contents of this document and as such is the sole responsible for amending it as per changes in the regulatory guidance, OEM product design or operational procedures.

### 3 AIRPLANE GENERAL DESCRIPTION

#### 3.1 General Information

The E-Jets aircraft are a low-wing, swept back airplane type, driven by two turbofan engines installed under the wing. The maximum cruise speed is 0.82 Mach and the maximum altitude is 41,000 feet.

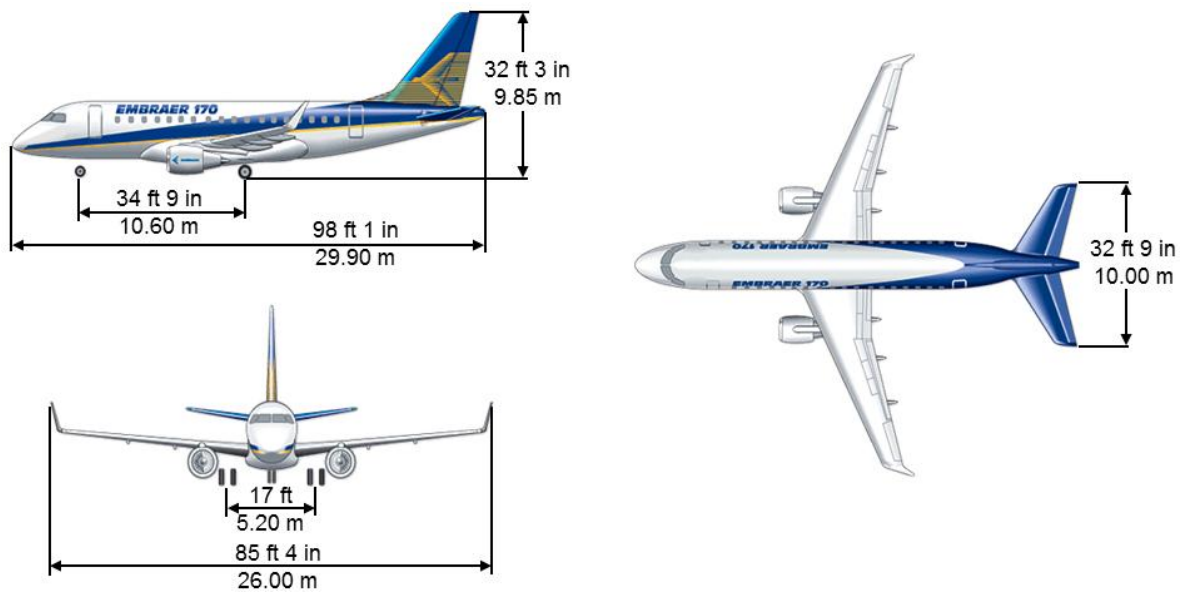
Further information about the airplanes is available on the AFM, AOM and SOPM. Should any discrepancy between the information contained in this report and the manuals exists, the information furnished by the latter should prevail.

Table 1 summarizes the main characteristics of this aircraft family.

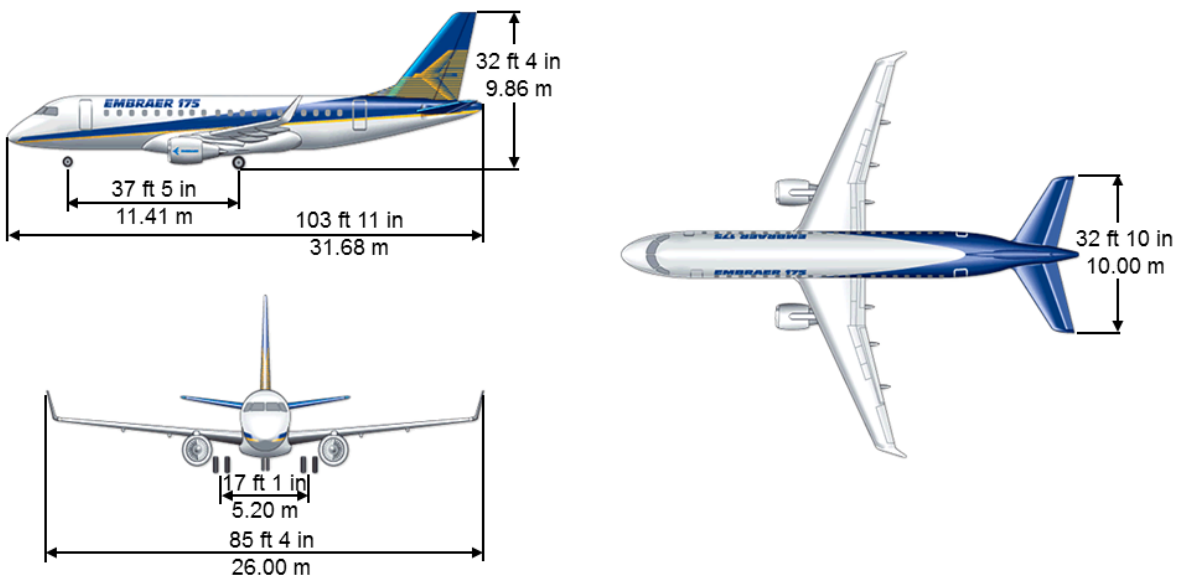
**Table 1: General Characteristics**

Certification Basis	FAR 25, JAA 25, RBAC 25 with amendments according to type specification.
Minimum Crew	Two pilots. Flight attendants according to RBHA 91 or RBAC 121, as per the intended operation.
Number of Seats	Due to differences amongst the models, check the Type design specifications EA-2003T05 (ERJ 170), EA-2005T13 (ERJ 190) or in future revisions.
Weight Limitations	Due to differences amongst the models, check the applicable AFM Limitations section or the Type design specifications EA-2003T05 (ERJ 170), EA-2005T13 (ERJ 190) or in future revisions.
Altitude Limitations	Maximum operating altitude = 41,000 ft Maximum take-off and landing altitude = 14,000 ft (ERJ 190-100, ERJ 190-200, ERJ 190-100 ECJ, ERJ 190-300 and ERJ 190-400) or 10,000 ft (ERJ 170-100 and ERJ 170-200)

### 3.2 External Dimensions

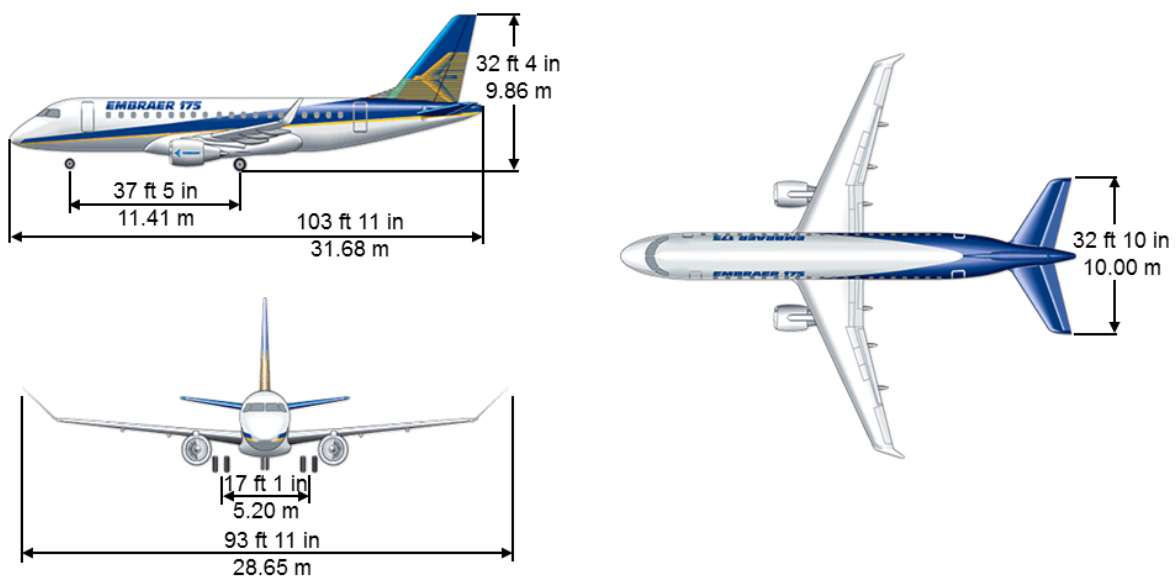


**Figure 1:** Three views of the ERJ 170-100 airplane.

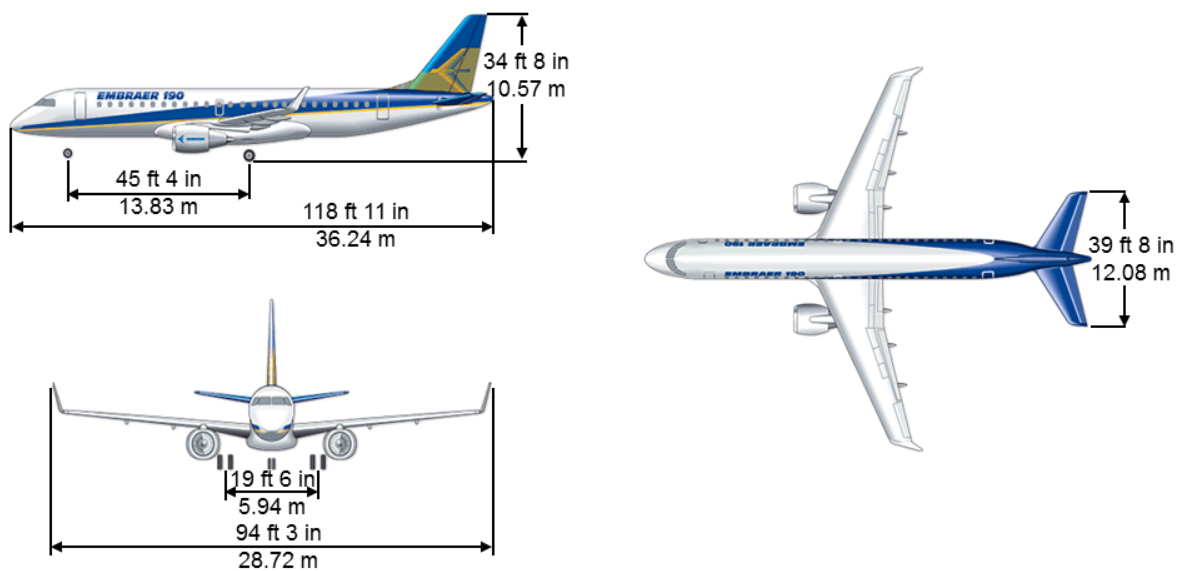


**Figure 2:** Three views of the ERJ 170-200 airplane.

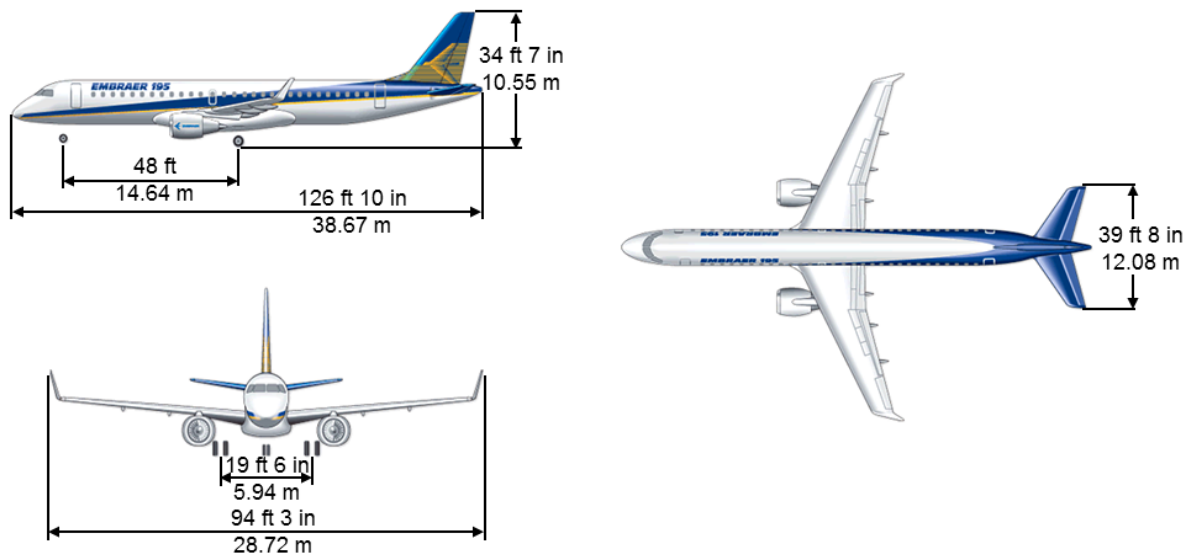




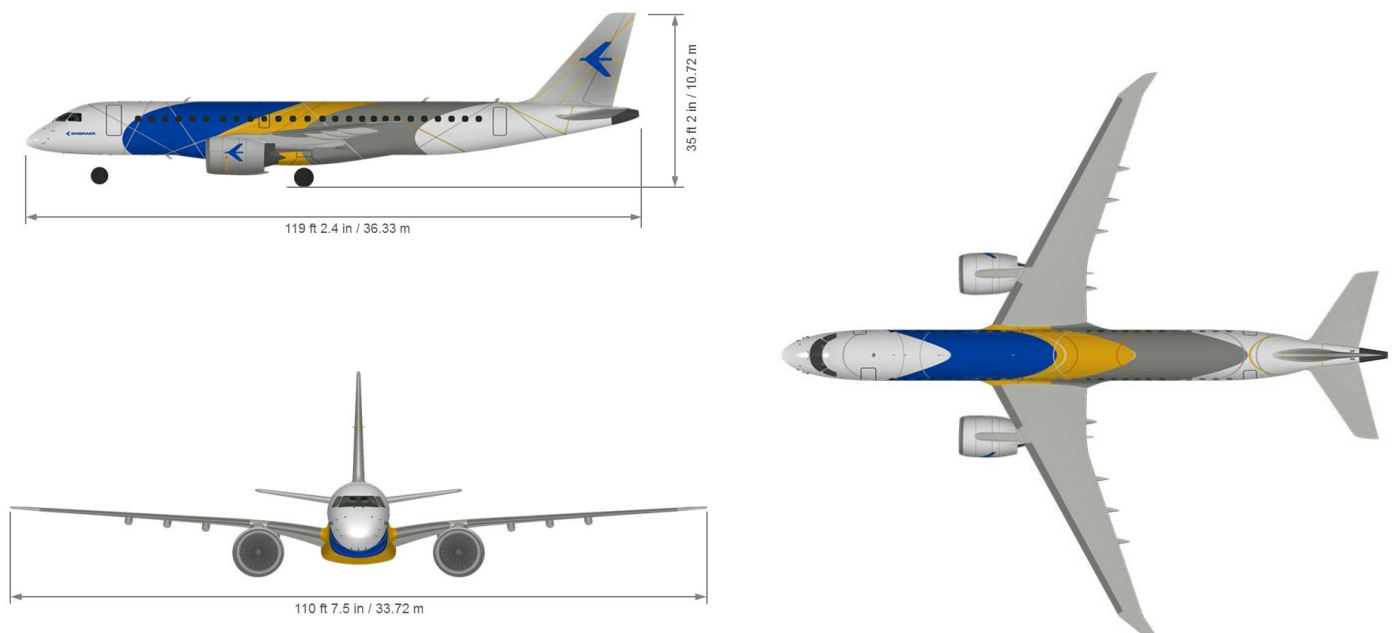
**Figure 3:** Three views of the ERJ 170-200 EWT airplane.



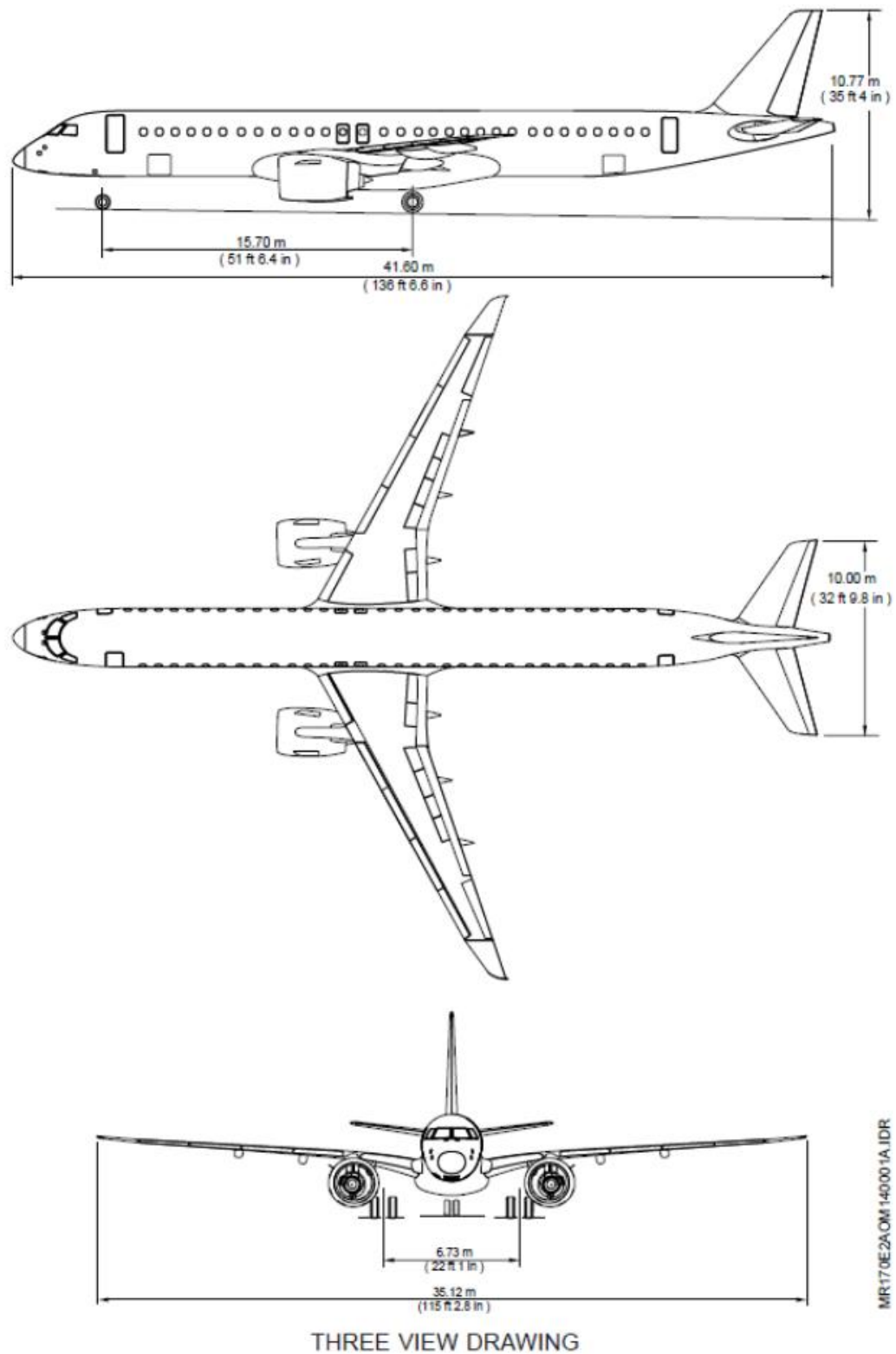
**Figure 4:** Three views of the ERJ 190-100 airplane.



**Figure 5:** Three views of the ERJ 190-200 airplane.



**Figure 6:** Three views of the ERJ 190-300 airplane



**Figure 7:** Three views of the ERJ 190-400 airplane

## 4 TYPE RATINGS

### 4.1 Ratings

#### 4.1.1 Pilots

In the early days when the E1 generation first entered into service, there were two license endorsements applicable to the ERJ 170-100/200 and ERJ 190-100/200 separately, namely **E170** and **E190** respectively.

Later on, in light of the high level of operational commonality amongst the four variants (herein established as A/A/A), the GAA/AEG concluded that there would be no safety degradation in merging the license endorsements into one as requested by the OEM. Therefore the type rating **E179** was then introduced to designate pilots qualified on one or more E1 variants, including the business jet variation of the ERJ 190-100, the ERJ 190-100 ECJ and more recently, the ERJ 190-300 and ERJ 190-400 (Embraer 190 E2 and 195 E2).

Notwithstanding the unified license endorsement, the E179 type rating holder is not exempt from complying with any of the required training outlined in this report when operating in a MFF environment or performing different duties on the flight deck.

As for each crew member commanding prerogatives on board, each pilot shall be qualified as either PIC or SIC depending upon the type of training administered and proficiency check outcome.

Therefore, although the E179 designation applicability to either PIC or SIC on the pilot's license, the commanding/authority privileges shall be distinguished by the type of training administered and certificate issued to crewmen as follows:

- a. **E179** (PIC privileges) – Type rating granted to the pilot who has received approved training as Pilot In Command (PIC) in the E-Jets type of airplane and who has been successfully fulfilled the proficiency check ride standards as such.
- b. **E179** (SIC privileges) – Type rating granted to the pilot who has received approved training as Second In Command Pilot (SIC) in the E-Jets type of airplane and who has been successfully fulfilled the proficiency check ride standards as such.

**Table 2: Pilot Type Rating**

Fabricante (Manufacturer)	Aeronave (Aircraft)		Observações (Remarks)	Designativo (Designative)
	Modelo (Model)	Nome (Name)		
EMBRAER S.A.	ERJ 170-100 (STD, LR, SU, SE)	EMBRAER 170	Documento OSD para pilotos ERJ 170, ERJ 190  ANAC OSD Flight Crew ERJ 170, ERJ 190	E179
	ERJ 170-200 (STD, LR, SU, LL)	EMBRAER 175		
	ERJ 190-100 (STD, LR, IGW, SR)	EMBRAER 190, EMBRAER 190 F		
	ERJ 190-100 ECJ	Lineage 1000		
	ERJ 190-200 (STD, LR, IGW)	EMBRAER 195		
	ERJ 190-300	EMBRAER 190 E2		
	ERJ 190-400	EMBRAER 195 E2		

#### 4.1.2 Mechanics

Not Applicable.

#### 4.1.3 Flight Attendants

Appropriate emergency training should be provided for each crew member in accordance with RBHA 63, RBAC 135 or more specifically RBAC 121.417, depending upon the type of operation intended. The purpose of emergency training is to provide each crew member with the necessary knowledge about the location, function and operation of emergency equipment and procedures to ensure that the correct actions are timely and efficiently performed in the event of an emergency.

Emergency training consists of instructions on the location, function and operation of the cabin emergency equipment that is different in each variant of the E-Jets family under different types of operation. When the elements of the cabin configuration are the same amongst models, training credits (crew qualification) may be extended towards each of those variants. On the other hand, if two or more airplane models happen to feature cabin differences, proper differences training should then be administered. Adequate training records should be maintained to demonstrate that crewmembers meet the requirements of RBAC 121.417 and 121.683 (a).

Emergency training consists of assisted instruction on the procedures assigned to each crew member, including crew coordination and communication, appropriate to control an emergency and other abnormal conditions as well as other procedures pertaining to each specific variant or configuration.

For emergency training of cabin crew, level B is normally established and the crew member is assumed to have practiced the operation of emergency doors and exits on a stationary aircraft or equivalent training device.

The requirements for emergency training mandates and provide guidance for two types of training: general training and type-related training. General training refers to crew qualification training on equipment that are commonly used on all aircraft in a given

operator's fleet, e.g. fire extinguisher. Type-related training consists of crew qualification training aimed at specific aspects or equipment which are particular to the E-Jets, e.g. location of equipment on board.

As part of an approved training program, operators may elect to use any solution when administering either the general or specific training, including but not limited to classroom instruction, operational movies, training devices, simulators, and the airplane itself.

## 5 MASTER DIFFERENCES REQUIREMENTS (MDR)

Requirements for aircraft differences are shown below in the MDR. Provisions apply when there are differences between variants that affect knowledge and skills related to flight safety.

The definition of the differences levels can be found in IS 00-007.

Footnotes define the "required means" or "alternative means" acceptable to meet the requirements.

A footnote indicates a deviation from the requirement for the basic difference level.

**Table 3: MDR**

AIRCRAFT TYPE		FROM AIRCRAFT						
		ERJ 170-100	ERJ 170-200	ERJ 190-100	ERJ 190-200	ERJ 190-100 ECJ	ERJ 190-300	ERJ 190-400
TO AIRCRAFT	ERJ 170-100	Not applicable (4)(5)(7)	A/A/A (1)(2)(3) (4)(5)(6)(7)	A/A/A (1)(2)(3) (4)(5)(7)	A/A/A (1)(2)(3) (4)(5)(7)	A/A/A (1)(2)(3) (4)(5)(7)	Not Evaluated	Not Evaluated
	ERJ 170-200	A/A/A (1)(2)(3) (4)(5)(6)(7)	Not applicable (4)(5)(6)(7)	A/A/A (1)(2)(3) (4)(5)(6)(7)	A/A/A (1)(2)(3) (4)(5)(6)(7)	A/A/A (1)(2)(3) (4)(5)(6)(7)	Not evaluated	Not Evaluated
	ERJ 190-100	A/A/A (1)(2)(3) (4)(5)(7)	A/A/A (1)(2)(3) (4)(5)(6)(7)	Not applicable (4)(5)(7)(12)	A/A/A (1)(2)(3) (4)(5)(7)	A/A/A (1)(2)(3) (4)(5)(7)	D/A/A (11)	Not Evaluated
	ERJ 190-200	A/A/A (1)(2)(3) (4)(5)(7)	A/A/A (1)(2)(3) (4)(5)(6)(7)	A/A/A (1)(2)(3) (4)(5)(7)	Not applicable (4)(5)(7)	A/A/A (1)(2)(3) (4)(5)(7)	Not evaluated	Not Evaluated
	ERJ 190-100 ECJ	A/A/A (1)(2)(3) (4)(5)(7)	A/A/A (1)(2)(3) (4)(5)(6)(7)	A/A/A (1)(2)(3) (4)(5)(7)	A/A/A (1)(2)(3) (4)(5)(7)	Not applicable (4)(5)(7)	Not evaluated	Not Evaluated
	ERJ 190-300	C/B/A (8)	C/B/A (8)	C/B/A (9)	C/B/A (8)	C/B/A (8)	Not applicable	A/A/A
	ERJ 190-400	Not Evaluated (10)	Not Evaluated (10)	Not Evaluated (10)	Not Evaluated (10)	Not Evaluated (10)	A/A/A	Not applicable

### NOTES:

(1) Deleted.

(2) A / A / A is based on the fact that the operation is equivalent in both aircraft. If there is an operational difference, for example, in case only one aircraft operates CAT III or use HUD, then C / A / B levels may be required for specific maneuvers according to the operator's table.

(3) Additional requirements for training / checking / currency may exist (B / A / B) for operation with mixed fleet due to operational differences.

- (4) Installation of data link or other CNS / ATM systems may require additional training / checking / currency requirements to be specified in the operator's table. Training, checking and currency levels B/B/A are established for the CPDLC system.
- (5) Training / checking / currency for "Predictive Windshear (PWS)" and for "Enhanced Ground Proximity Warning (EGPWS)" are established as B / B / B.
- (6) A / A / A levels for training, checking and currency have also been set for operation of variants with and without EWT.
- (7) For training, examination and recent experience concerning the functionalities 'RNP <0.3', 'FANS 2', and 'FMS NG', refer to Annexes 5,7 and 9, respectively.
- (8) ERJ 170-100, ERJ 170-200, ERJ 190-100 ECJ or ERJ 190-200 qualified crews seeking the ERJ 190-300 qualification by means of differences training may do so by firstly undergoing ERJ 190-100 & FMS NG familiarisation and then attending the ERJ 190-100 to ERJ 190-300 differences training which training specifications are depicted in this document. Alternatively training institutions may elect to administer the applicable training level "A" MDR elements, including FMS NG, during E1 to E2 FTD-based differences training curriculums so that the variants' required familiarisation is attained.
- (9) FMS NG familiarization required.
- (10) ERJ 170-100, ERJ 170-200, ERJ 190-100, ERJ 190-100 ECJ and/or ERJ 190-200 qualified crews seeking the ERJ 190-400 qualification by means of differences training may do so by firstly undergoing ERJ 190-100 & FMS NG familiarisation, attending the ERJ 190-100 to ERJ 190-300 differences training which training specifications are depicted in this document and then doing the familiarisation with ERJ 190-400. Alternatively, training institutions may elect to administer the applicable training level "A" MDR elements during E1 to E2 FTD-based differences training curriculums so that the variants' required familiarisation is attained.
- (11) ERJ 190-400 qualified crews seeking qualification on ERJ 190-100/200 (all variants) or ERJ 170-100/200 (all variants) by means of differences training may do so by firstly doing the familiarization (self learning) with ERJ 190-300. Alternatively, training institutions may elect to administer the applicable training level "A" MDR elements during E2 to E1 differences training curriculums.
- (12) Training / checking / currency differences levels related to the ERJ 190-100 Freighter version are established as B/A/A.



## **6 OPERATOR DIFFERENCE REQUIREMENTS (ODR)**

The E-Jets ODR tables developed by the OEM and approved by ANAC are available on <https://www.flyembraer.com.br> and may be used by operators as references to assemble their own customized tables.

## **7 MMEL/MEL UTILIZATION**

Flight dispatch according to what is established in the MEL should be analyzed and eventually will result in a specific training requirement. The operator should specify crew procedures and training that are typical of each aircraft.

For the development of their fleet and operation-applicable MEL, operators should use as reference the ANAC approved E-Jets MMEL.

## **8 TRAINING SPECIFICATIONS**

### **8.1 General**

#### **8.1.1 Assumed previous experience**

The provisions of this section consider that the training program applies to flight crew members who are experienced in operations in accordance with RBAC 121 or RBAC 135 and multi-engined turbo-jet airplanes equipped with EICAS, EFIS and FMS. Additional requirements may be applied to the initial training program for crew members without this type of experience. In these cases ANAC should approve each case individually.

#### **8.1.2 Individual programs for the ERJ 170-100/200, ERJ 190-100/200, ERJ 190-100 ECJ, ERJ 190-300 and ERJ 190-400**

Depending upon the operator's experience, a number of different training programs combinations may be acceptable. Therefore ANAC approvals should be issued on a case-by-case basis.

### **8.2 Pilots**

In this session, recommendations applicable to the EMB 170/190 initial and recurrent type rating training program are presented.

#### **8.2.1 Training Areas of Special Emphasis (TASE) for E1 Aircraft**

Several different systems, procedures, techniques or airplane characteristics should be emphasized during the EMB 170/190 type rating training:

- Use of PFD and MFD. Altitude and airspeed are displayed on vertical tapes in digital and analog formats. Pilots should understand and be able to use this information in this type of presentation. Pilots with experience only in aircraft with traditional analog/mechanical instruments may require additional training to acquire the cross-check skills required for manual flight using PFD.
- Use of the Flight Management System (FMS).
- Automatic Flight Control System (AFCS).
- Flight Director's Guidance based on the Flight Path Angle (FPA).
- Using the Head Up Display (HUD) when installed.
- PFD, MFD and EICAS reversion modes.
- Concepts, functions and messages associated with the Fly By Wire flight control system.
- Cursor Control Device (CCD).

- Windshear escape system based on FPA.
- Enhanced Ground Proximity Warning System/Function (EGPWS/F).
- Traffic Collision and Avoidance System (TCAS).
- Integrated Electronic Standby System (IESS).
- Decoupling of flight controls.
- Characteristics of the propulsion system (engine and its components) and the procedures and techniques for selection and adjustment of the takeoff thrust.
- Crew coordination when operating the AFCP is to be enforced so that the correct AFCS mode is selected.
- The use of EICAS combined with the switches position ~~and~~ as well as with the information contained in the synoptic pages to determine the condition of the systems in case of failures.
- Proficiency in procedures for selection of engine thrust modes and takeoff modes is required, with emphasis on cases where there is prohibition of the use of assumed temperature instead of TO-2 and TO-3 modes.
- Coordination among crew members and adequate distribution of tasks.
- Golden CAS philosophy.
- Vertical navigation.
- Execution of non-precision approaches using FPA to reach MDA.
- FPV guidance utilization on HUD operations.

**NOTE: For E2 Aircraft, refer to the Annex 17.**

### **8.2.2 Initial type rating training**

Applicants to the E179 type rating must undergo initial type rating training.

### **8.2.3 Pilots: RBAC 121.419 – Initial ground school, transition and privileges upgrade**

Initial, transition and upgrade ground school training to obtain the E179 type rating, shall be performed in accordance with the provisions of RBAC 121. When more than one model is to be operated simultaneously, or transition from one model to the other is sought, appropriate instruction for each variant is required according to the Operator Differences Table.

### **8.2.4 Pilots: RBAC 121.424 – Initial flight training, transition and privileges upgrade**

The initial, transition and upgrade flight training applicable to the E179 type rating shall be performed in accordance with the provisions of RBAC 121.424. When initial, transition and upgrade flight training is performed as specified in RBAC 121.424 and several models are operated simultaneously the training in one variant is considered appropriate for all variants, since the flight characteristics of each variant are similar or equivalent. However, if any operation requiring special training is performed (e.g. Cat III) the training for this operation should be performed in the variant in which the operation will be performed.

### **8.2.5 Prerequisites**

The E179 type rating applicants must comply RBAC 61.213 (a) (1). In addition, they should meet the following minimum prerequisites:

**- PIC:**

- Commercial Pilot License;
- Multi-engine land class rating (MLTE);
- Instrument Flight Rules (IFR) rating; and
- Flight Experience: 1500 h - of which at least 100 hours as PIC in the same class of aircraft;

**-SIC:**

- Commercial Pilot License;
- Multi-engine land class rating (MLTE);
- Instrument Flight Rules (IFR) rating; and
- MCC or equivalent course; or experience in aircraft operation with a minimum certified crew of 2 pilots.

### **8.2.6 ACARS**

Crew members operating aircraft equipped with ACARS should receive appropriate training to ensure knowledge, skills and proficiency in the routine operation of the system.

### **8.2.7 Seat dependent tasks**

Since the execution of some tasks, procedures and maneuvers may be dependent on the position of the crew member, the training program should adequately address this design characteristic and its associated procedures. Seat dependent tasks include ground steering (tiller) operation, emergency landing gear operation, and single HUD operation.

### **8.2.8 Special events training**

Upset attitude recovery training should be included in the initial and recurrent training. Prevention of CFIT, accidents during approach and landing (ALA) and runway incursions.

In order to corroborate both ANAC and industry efforts to prevent CFIT, accidents during approach and landing (ALA) as well as runway incursions, special emphasis on these topics during training is appropriate. The emphasis should be on situational awareness, EGPWS/F alerts, coordination between crew members, proper selection of automatic flight control and guidance system modes, charts consultation, taxi procedures and airport familiarization.

### **8.2.9 CNS/ATM**

Crews operating in controlled airspaces where CNS / ATM operations are in effect should be trained for appropriate use of related systems for operations in these areas, routes and procedures to be followed (e.g. RNP, ANP, RVSM, etc). The training shall comprise communication, navigation, surveillance and data link functions to ensure crew proficiency and ability for the normal and abnormal operation of systems.

### **8.2.10 LOFT**

LOFT programs administered by operators should be approved by ANAC / SPO to ensure their effectiveness.

### 8.2.11 Minimum training curriculum – E1

The training consists of two segments: the ground curriculum and the flight curriculum. **Table 4** presents the minimum footprint for each segment, as well as a summary of the main topics that need to be addressed for E1 aircraft.

**Table 4: Initial Training for E1**

Day 1	Day 2	Day 3	Day 4	Day 5
<b>CBT 1</b> (4:00) <b>CBT 2</b> (4:00)	<b>CBT 3</b> (4:00) <b>TR 1</b> (4:00)	<b>CBT 4</b> (8:00)	<b>CBT 5</b> (4:00) <b>TR 2</b> (4:00)	<b>FMS 1</b> (6:00) <b>CBT 6</b> (2:00)
Day 6	Day 7	Day 8	Day 9	Day 10
<b>CBT 7</b> (8:00)	<b>TR 3</b> (4:00) <b>CBT 8</b> (4:00)	<b>CBT 8</b> (8:00)	<b>TR 4</b> (6:00) <b>FMS 2</b> (2:00)	<b>Test</b> (2:00) <b>GI 1</b> (6:00)
Day 11	Day 12	Day 13	Day 14	Day 15
<b>GI 2</b> (4:00) <b>GI 3</b> (4:00)	<b>GI 4</b> (4:00) <b>GI 5</b> (4:00)	<b>CPT 1</b> (8:00)	<b>CPT 2 + FMS</b> (8:00)	<b>CPT 3 + FMS</b> (7:00)
Day 16	Day 17	Day 18	Day 19	Day 20
<b>FFS 1</b> (6:00)	<b>FFS 2</b> (6:00)	<b>FFS 3</b> (6:00)	<b>FFS 4</b> (6:00)	<b>FFS 5</b> (6:00)
Day 21	Day 22	Day 23	Day 24	
<b>FFS 6</b> (6:00)	<b>FFS 7</b> (6:00)	<b>FFS 8</b> (6:00)	<b>Skill Test</b> (6:00)	

**Notes:**

- 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

In March 2013, a new initial training program proposed by Embraer for the E-Jets (E1) was evaluated. It is based on intensive use of technological resources during classes.

Therefore, there are now two different curriculums recommended as minimum training applicable to the E1. The choice of the most appropriate depends, essentially, on the quantity / quality of the instruction aid used during the ground school. Details are available under Annex 2 to this report.

### **8.2.12 Recurrent Training**

Recurrent training should include appropriate training elements to meet RBAC 121.427. When recurrent training includes more than one variant, it should conform to the levels specified in the difference tables.

### **8.2.13 Recurrent ground training**

The recurrent ground training should observe the TASE under 9.2.1.

In accordance with RBAC 121.405 and RBAC 121.427, recurrent ground training may have the required hours reduced.

### **8.2.14 Recurrent flight training**

Recurrent flight training requires that the appropriate maneuvers listed under Appendix E of RBAC 121 are administered, with special attention to special operations. Emphasis should be given to systems and procedures that may not have been or will not be used by the crew until the next training. As permitted by RBAC 121.427 (d) (1) (ii) satisfactory completion of a proficiency check may substitute training itself. Regarding MFF, the completion of recurrent training in one variant is sufficient for the other variants. If the Operator Difference Table identifies differences in procedures and maneuvers such differences should be included in the recurrent training.

### **8.2.15 Differences Training**

#### **8.2.15.1 Differences Training – RBAC 121.418**

For mixed fleet operations, unless a complete training program is performed for each of the variants, differences training, for each E-Jet variant is required as shown in the Differences Table approved in the Operator's Instruction Program.

### **8.2.16 Other training**

#### **8.2.16.1 LOFT program**

Wherever there is a basic difference in the operation of each variant (e.g. domestic and international operation, ETOPS operation that is accomplished by using only one variant, etc), a LOFT training should be established for each variant. Credit is allowed on common aspects of operations.



#### **8.2.16.2 Specific operations (ETOPS, MNPS, RVSM)**

If only one variant performs a specific type of operation, an appropriate specific training should be provided.

#### **8.2.16.3 Qualification and requalification training**

The qualification requirements are specified in Subpart O of RBAC 121. In principle, qualification may be accomplished on any of the E-Jets variants. If the Operator Differences Table identifies differences in procedures or maneuvers, such differences should be specifically addressed in the training or qualification period.

Each operator should prepare and submit a requalification training program for approval. Requalification training is the training required for previously trained and qualified crew members who have lost the qualification because they did not meet, within the required periods, the requirements of recent experience under RBAC 121.439, recurrent training under RBAC 121.427 or the requirements for proficiency check established in RBAC 121.441.

#### **8.2.16.4 Runway Awareness and Advisory System – RAAS**

The RAAS is an optional system that provides improved situational awareness to the crew regarding the airplane position in relation to the runways and taxiways via aural alerts.

The system has no significant operational impact.

Familiarization with the system is established through the levels of A/A/A differences for training, examination and recent experience, respectively. The GAA recommends the use of AFM and AOM as references.

#### **8.2.16.5 Head-up Guidance System – HGS symbology**

The original HUD symbology consists of a repetition of the PDF elements (ADI, HSI, Speed and Altitude Tapes). Embraer implemented some improvements into the system with data originated from the NG-FMS (Load 27.1), ATN-CPDLC, meteorological radar and RAAS, without causing changes to the HGS or its controls. The improvements implemented have no significant operational impact.

Familiarization with the system and its improvements is established through the levels of A/A/A differences for training, checking and currency, respectively. The GAA/AEG recommends the use of AFM and AOM as references.

#### **8.2.16.6 Autonomous Distress Tracking (ADT)**

ICAO has worked to amend Annex 6 requirements and the associated ICAO Global Aeronautical Distress and Safety System (GADSS) Concept of Operations (ConOps), which describes a set of capabilities to enhance locating a downed aircraft or an aircraft in distress. Through the DCA 0190-025-00034-2021 Embraer implements the optional Autonomous Distress Tracking (ADT) system to models ERJ 190-300/-400, in substitution to the conventional Emergency Locator Transmitter (ELT) system (baseline configuration).

The differences levels proposed by Embraer and considered appropriated by ANAC are A/A/A to cover the operational differences related to the ADT system.

The Level A for Training (self-study) can be accomplished by reading the AOM and the QRH, or by other means provided by the operator or approved training organization. Level A for exam means that no exam is needed, or that the differences can be addressed during the subsequent proficiency check. Level A for currency means that no currency requirements are established.

The ODR table proposed by the OEM was considered satisfactory.

### **8.3 Cabin Crew: RBAC 121.421 – Ground Training - Initial, Transition and Recurrent**

The objective of ground training is to provide cabin crew with an understanding of the E-Jets cabin characteristics and operation. This knowledge is required so that crew members can perform their required duties and procedures during normal, abnormal, and emergency situations.

Ground training should include instruction in two distinct areas: General and emergency specific topics for each aircraft variant. Specific topics for emergency training are included in paragraph 5.1.3.

The general subject training includes instruction on the general description of the aircraft, its equipment, systems and interior furniture. Routine communication procedures and coordination procedures, tasks assigned to each crew member in normal, abnormal and emergency operations at each flight phase for each variant. If there are differences in cockpit configuration, flight attendants should then be trained separately on each type of aircraft. Such qualification can be completed simultaneously. Credit is allowed for common items.

As part of an approved training program, an operator may use a variety of methods to conduct ground training, including classroom instruction, photos, video tape, training devices, CBT, and the aircraft itself.

Initial and transition training shall include an exam to assess the competence of the crew member to perform his or her duties. The examination should cover each emergency equipment and procedure that is unique to each variant.

Recurrent training for cabin crew should include reviews and tests to assess their knowledge of procedures and tasks to be performed under normal, abnormal and emergency conditions for each E-Jet variant on the. In addition, the recurrent training for flight attendants should include a check of their competence to perform their abnormal, emergency tasks in each E-Jets variant on the fleet whether these are specific or generic. The competency check should cover each equipment and procedure that are found to be unique on each variant.

### **8.4 Flight Dispatcher: RBAC 121.422 and 121.427**

Flight dispatchers may be qualified concurrently on both aircraft. A/A/A levels apply for training / examination / recent dispatcher experience. The provisions of RBAC 121.422 apply to each variant.

## **9 SPECIFICATIONS FOR PROFICIENCY CHECKS**

### **9.1 Check items**

The knowledge, procedures and maneuvers specified under RBAC 61 and RBAC 121, Appendix F pertaining to multi-engine jet aircraft apply to the E-Jets.

### **9.2 Areas of emphasis**

The following areas should be covered during checks as needed:

- a) Proficiency in manual and automatic flight;
- b) Adequate visual scanning, without prolonged fixation in the FMS, shall be demonstrated by the examined pilot. FMS component failures should be addressed;
- c) Proper selection of map displays, raw data, Flight Director and PFD / MFD shall be demonstrated by the pilot examined, particularly in instrument approaches;
- d) GPS / FMS navigation, if approved for the operator;
- e) Where appropriate demonstration of proficiency in RNP, RVSM, or other specialized equipment or operations;
- f) Proficiency in the use of HUD for VMC and IMC when installed; and
- g) Procedures and techniques for landing and braking.

### **9.3 Flapless landing**

Proficiency demonstration of flapless approach and landing, with or without complete landing, should be performed. An approach flown up to a point from which, in the examiner's opinion, a landing would be safely accomplished is sufficient.

### **9.4 Use of MEL**

The use of MEL should receive an appropriate emphasis as part of the check process to address issues related to workload and safety. For proper use of the MEL it should be confirmed that the training, qualification and experience of the crew is appropriate. Special emphasis should be given to the differences between the MEL variants.

### **9.5 Proficiency checks**

Proficiency checks should be administered as designated by RBAC 61 and RBAC 121 for the E-Jets. Examination on one aircraft should be appropriate for the other aircraft,

not requiring being repeated, except for recommendations and specific differences if any exists. Satisfactory completion of a proficiency check may substitute training as set forth by RBAC 121.433 (c).

## **10 CURRENCY SPECIFICATIONS**

### **10.1 Operational Experience Required – RBAC 121.434**

In terms of cycles and line flights, the operational experience required by RBAC 121.434 should be accomplished for consolidation of knowledge and expertise on the E-Jets. The requirements of RBAC 61.215 shall be met in any of the variants for revalidation of the E179 Type Rating.

### **10.2 Recent Experience Required – RBAC 121.439**

The recent experience preservation is applicable to the E-Jets and should abide by RBAC 121.439. For pilots operating in a MFF environment, recency of experience can be obtained on any of the E-Jets variants according to RBAC 121.439 and observing the provisions of the approved Operator Differences Tables.

### **10.3 HUD recent experience**

Recent experience for HUD operation should be determined on a case-by-case basis, depending on the intended HUD operational use.

## **11 SPECIFICATIONS FOR FLIGHT TRAINING DEVICES AND FULL FLIGHT SIMULATORS**

### **11.1 Flight Training Devices and Simulators Standards**

The standards applicable to the E-Jets flight training devices and full flight simulators must meet the requirements set forth by RBAC 121.

Concerning MFF operations, the combination of flight training devices and full flight simulators shall adequately address the training requirements that may result from differences in skills required for different operations depending on the equipment (e.g. when there are different specific operations such as RNP, ETOPS, CAT III and etc).

Recurrent training and checks may be performed on any E-Jet full flight simulator or combination of simulators and flight training devices, as appropriate for a particular operator, depending on the fleet configuration and approved training based on the Operator Differences Table.

## 12 GENERAL DISCUSSIONS

### 12.1 Emergency Evacuation (RBAC 121.291)

During the E-Jets certification campaign a number of simulated emergency evacuations successfully demonstrated that the number of passengers and flight attendants presented on table 5 can be timely and safely deplaned in an emergency situation according to RBAC 25.803 and RBAC 121.291. A demonstration of partial emergency evacuation is required for any new operator. The partial demonstration performed by an operator on any E-Jet variant is valid for the other variants.

**Table 5: PAX Capacity/Flight Attendants**

Aircraft	Passengers	Flight Attendants
ERJ 170-100	78	2
ERJ 170-200	86	2
ERJ 190-100	108	3
ERJ 190-200	118	3
ERJ 190-300	114	3
ERJ 190-400	146	3

### 12.2 Operational evaluation flights (RBAC 121.163)

Each operator shall perform the operational evaluation flights in accordance with RBAC 121.163 and as approved by ANAC on a case-by-case basis. A new operational evaluation flight is not required for each new variant included in the Operator Operational Specifications, unless an operational evaluation is required due to other specific aspects (e.g. special route and / or aerodrome).



## **13 SPECIAL TRAINING**

### **13.1 GENERAL**

Special training is defined as the one that should be prepared by an operator to qualify its crews to conduct certain operations. Special training is typically used in operations that require specific authorizations, for example, Cat III, ETOPS, alternative CG etc. Special training programs should be submitted to ANAC for custom approval. For MFF operators, the validity of the training for each variant is also subject to individual approval.

## **14 COMPLIANCE WITH RBHA 91 AND RBAC 121**

Annex 1 shows the declaration of compliance with the requirements of RBHA 91 and RBAC 121.

## **15 SPECIAL OPERATIONS**

The operational evaluation of the RNP-AR functionality was carried out in 2013. Its results are shown in Annex 3.

## 16 SPECIFIC OPERATIONAL SUBJECTS

From the Brazilian TCDS: The ERJ 190-100 ECJ is approved for 0 (zero) passengers if the interior is not installed or up to 19 (nineteen) passengers if the interior is approved by STC / CHST or by equivalent modification incorporated in the factory.

The ERJ 190-100 ECJ is configured for private operation unless SB-190LIN-00-005 Service Bulletin is installed which includes modification of the internal door to support commercial operation.

### 16.1 Operation in Brazil

The E-Jets aircraft series, including all models listed on the Type Certificate Data Sheet, meet the applicable operational requirements set forth by RBAC 91 and RBAC 121 and are therefore authorized to carry passengers on Brazilian territory.

**IMPORTANT: The following features are already approved for the E-Jets aircraft series:**

Features	Training/ Checking / Currency Levels
Autoland	D/D/D
Autobrakes	D/D/D
* HGS (Single and Dual Systems)	D/D/D
Steep Approach	D/A/A
Vertical Glide Path	D/D/D
Electronic Check List	C/C/A
RNP AR	D/D/D
**EFVS	D/D/D

**Notes:**

- 1) The features accompanied by the asterisk (\*) are not applicable to the ERJ 190-300 and ERJ 190-400 variants.
- 2) For detailed training footprint, please refer to Embraer recommended syllabus in report 170MSO093.
- 3) (\*\*) The EFVS is applicable only to Lineage 1000.

## **ANNEX 1 – RBHA 91 AND RBAC 121 COMPLIANCE CHECKLIST**

The compliance checklist may be supplied by Embraer upon request.

## **ANNEX 2 – NEW TYPE TRAINING PROGRAM BASED ON COMPETENCES AND WITH INTENSIVE USE OF TECHNOLOGICAL RESOURCES (E1)**

1. The Aircraft Evaluation Group (GAA) concluded in 2013 the operational evaluation of the new initial training program for ERJ 170/190 (E1);
2. According to the present report, there is already a training program approved by ANAC as a minimum curriculum for training providers;
3. The evaluation of the new training program was carried out by ANAC and EASA from March 5 to April 5, 2013. Two pilots were used as test subjects, one from each authority. The main differences between the already approved training as a minimum and the new one are:
  - 3.1 - Decrease in the number of simulator sessions. 7 FFS sessions instead of 8;
  - 3.2 - 3 sessions of CPT instead of 4 already approved;
  - 3.3 - Intensive use of electronic devices during the ground school, for example, DTS (Desktop Flight Simulator) for FMS training and GFS (Graphical Flight Simulator) during the CPT (Cockpit Procedure Training);
  - 3.4 - The new training program does not use Web Based Training (WBT); and
  - 3.5 - The Ground School lasts 92 hours (3 hours written test included). It's 36 hours less than the first approved training
4. The training program evaluated was based on the ERJ 170/100 (E-170) and is applicable to other models of this family: ERJ 170/200 (E-175), ERJ 190-100 (E-190), ERJ 190 -200 (E195) and ERJ 190 ECJ (Lineage 1000). The levels of difference between them are A / A / A and all differences are addressed during training;
5. The evaluated flight training has been completed in FFS, however the aircraft / FFS combination can be used provided all topics listed in the training program are performed in accordance with Brazilian aeronautical regulations;
6. The proposed 3-hour training credit for each hour of CBT use was not approved as this device was not assessed during the activity and was removed from the training program;
7. During the Ground School, students should have access to the Aircraft Flight Manual (AFM), MMEL (Master Minimum Equipment List), OB (Operational Bulletin), ACFOG (Airplane Changes Flight Operations Guide) GP (General

Publications), AFM (Airplane Flight Manual), AOM (Airplane Operations Manual) and QRH (Quick Reference Handbook).

8. The external inspection of the aircraft should be demonstrated to the students. One video may be sufficient, but for operators under RBAC 121 a real aircraft is required (RBAC 121 Appendix E).
9. The recommended footprint is presented as follows:

Day 1	Day 2	Day 3	Day 4	Day 5
<b>GOS</b> (01:30) <b>GS</b> (04:30) <b>LAB</b> (1:00)	<b>GS</b> (7:00)	<b>GS</b> (6:00) <b>LAB</b> (1:00)	<b>GS</b> (4:00) <b>LAB</b> (3:00)	<b>GS</b> (4:00) <b>LAB</b> (3:00)
Day 6	Day 7	Day 8	Day 9	Day 10
<b>GS</b> (5:00) <b>LAB</b> (2:00)	<b>GS</b> (5:00) <b>LAB</b> (2:00)	<b>GS</b> (4:00) <b>LAB</b> (3:00)	<b>GS</b> (4:00) <b>LAB</b> (3:00)	<b>GS</b> (3:00) <b>GOS</b> (1:00) <b>LAB</b> (3:00)
Day 11	Day 12	Day 13	Day 14	Day 15
<b>GOS</b> (07:00)	<b>Written test</b> (3:00)	<b>CPT Session 1</b> (4:00)	<b>CPT Session 2</b> (4:00)	<b>CPT Session 3</b> (4:00)
Day 16	Day 17	Day 18	Day 19	Day 20
<b>FFS Session 1</b> (Briefing 1:30) (FFS 4:00) (Debriefing 0:30)	<b>FFS Session 2</b> (Briefing 1:30) (FFS 4:00) (Debriefing 0:30)	<b>FFS Session 3</b> (Briefing 1:30) (FFS 4:00) (Debriefing 0:30)	<b>FFS Session 4</b> (Briefing 1:30) (FFS 4:00) (Debriefing 0:30)	<b>FFS Session 5</b> (Briefing 1:30) (FFS 4:00) (Debriefing 0:30)
Day 21	Day 22	Day 23		
<b>FFS Session 6</b> (Briefing 1:30) (FFS 4:00) (Debriefing 0:30)	<b>FFS Session 7</b> (Briefing 1:30) (FFS 4:00) (Debriefing 0:30)	<b>Simulator proficiency check</b> (Briefing 1:30) (Skill Test 4:00) (Debriefing 0:30)		

**Key:**

**CPT** = Cockpit Procedure Training  
**FFS** = Full Flight Simulator  
**GS** = Ground School  
**GOS** = General Operating Subjects  
**LAB** = Flight management System Laboratory

**Notes:**

1. The FFS sessions for PIC and SIC training are the same. For two pilots training as PIC, after 2 hours they switch seats. If a crew is training, all sessions are performed with the PIC in the left seat and the SIC in the right seat, and after 2 hours they switch from pilot flying to pilot not flying (monitoring).
2. CPT Sessions - The training provider should include time for briefing and debriefing.

10. The course was considered efficient and adequate to train pilots as PIC and SIC on the E-Jets (E1);
11. There are now two approved syllabi that can be used as basis for the approval of operator training programs for E1 aircraft: the one already approved and

listed on the Embraer 170/190 Type Rating Course and the other is now evaluated and already included in the proposed amendments and should appear in a document called ERJ 170/190 Series Pilot Training Program;

12. For an operator to be able to use this new OEM's training program as a basis for approval of its own training, he should provide students with all training devices (or equivalents) used here: DTS, suitable CPT devices GFS, FFS with motion off, etc.) and FFS. In this case, the syllabus evaluated is the minimum recommended in terms of content and duration workload.



## **ANNEX 3 – RNP-AR & RNP-AR < 0.3 NM for E1**

### **RNP-AR**

1. The Aircraft Assessment Group (GAA) has completed the operational evaluation of the RNP-AR functionality for the E1 generation of aircraft.
2. On June 3, 2013, ANAC evaluated the training program proposed by Embraer of RNP-AR for pilots of the E1 generation of aircraft and one pilot was used as a test subject;
3. The training program evaluated was based on an ERJ 190/100 FFS (E-190) qualified as Level D according to JAR-FSTD A and is also applicable to other variants of the family: ERJ 170/200 (E -175), ERJ 190-100 (E-190), ERJ 190-200 (E195) and ERJ 190 ECJ (Lineage 1000); Since there is no difference in the operation of this functionality in each one of these aircraft;
4. The evaluated flight training has been completely performed on an FFS and any combination aircraft / FFS or aircraft only can not be used to train this functionality;
5. The software load installed on FFS was 21.4 and does not support the optional Auto LNAV (only available from Load 23);
6. During the Ground School, students should have access to GP-3801 "RNP AR Operation", AFM Supplement 2 (FMS), QRH normal checklist and Training Guide, containing the topics covered during the ground school and the detailed flight profiles ;
7. The ground school was based on the contents of General Publication (GP) - 3801, from 09 of April 09 of 2010 and lasts 2 hours.
8. The minimum flight time is 4 hours (at least 2 hours as pilot flying (PF) and 2 hours as pilot monitoring (PM)). The pilot should make at least two approaches as PF and two as PM;
9. The proposed course was considered efficient and adequate for pilot training in the RNP-AR functionality of the ERJ 170/190 Series aircraft;
10. The Recommended Training Guide to be used at a minimum by the ERJ 170/190 Series aircraft operators is the "ERJ 170/190 Series Pilot Training Program - RNP-AR, Revision 0, April, 2013;
11. Few airports currently have RNP-AR procedures, so the need to perform such an operation is not routine. Moreover the RNP-AR check list evaluated is not detailed, for example, to the extent of showing the location of the MCDU pages

required to deactivate sensors. Therefore it is possible that the pilot does not proceed correctly in a high workload phase of the flight. Therefore, special emphasis should be placed on pilot training regarding the location of all MCDU pages necessary for the safe execution of an RNP-AR procedure.

## **RNP-AR < 0.3 NM**

**NOTE:** POI's, Managers, Inspectors or other ANAC associates that will be somehow involved with the RNP-AR operations <0.3 in Brazil, must observe and apply all the items comprised by IS No. 91-001 before any authorization is granted for this functionality. In particular, we point out the development of FOSA. FOSA should be developed taking into account the specific characteristics of the aircraft, operational procedures, characteristics and profiles of approach charts, etc. Moreover, in case of system degradation (e.g. GNSS failure) should be observed, and properly trained, that the navigation system updates via VOR signals are not accepted.

The training program evaluated for RNP-AR <0.3 was performed on a level D full flight simulator. The pilots who will undergo this program should be familiar with the FMS NG (FMS Load 27.1-based).

Only the 'RNP-AR approach and go-around procedures' were evaluated. Thus, the 'RNP-AR departure' procedures are not covered by this Annex.

The operational evaluation of the functionality was carried out in five hours out of which, one hour was used during briefing and four hours spent on the practical part on a level simulator D. In the simulator, each pilot shot four approaches, two as PF and two as PM.

We recommend that POI's as well as ANAC associates involved with the issuance of authorizations within the agency be mindful of the following FFS training aspects:

- That the first training approach be a normal one (without failures);
- That the need of shooting a approach without AP and AT be assessed;
- That a engine failure during the RF leg is administered;
- That the procedure be developed for the case of 'Dual FMS Failure'; and
- That the pilots' knowledge concerning temperature compensation and correct use of GPS NOTAMs be evaluated.

In light of the aforementioned and the applicable elements pertaining this report, the GAA considers that the D / D / D levels related to training, examination and recency of experience respectively are adequate for RNP-AR <0.3.

## **ANNEX 4 – ENHANCED WINGTIP (EWT) - ERJ 170-200**

An operational impact assessment of the installation of the new wing tip (EWT) on ERJ 170-200 aircraft was carried out.

In accordance with the manufacturer's proposal, the methodology used was documental evaluation, without any aircraft flight or even on-site evaluation of a training program.

There was no review of Embraer's proposed AOM containing the update of performance information. Operators should therefore use the AFM and / or other approved platform for performance calculations and flight planning as a reference.

Given the degree of similarity of the variants (A / A / A), although only the case of the pilots originating from the ERJ 170-200 with the original wing tip migrating to the ERJ 170-200 with modified wing tip was evaluated, the GAA considers that the level of differences is also **A / A / A** between any aircraft of the ERJ 170/190 family and the ERJ 170-200 with modified wingtip and vice versa.

## ANNEX 5 – FANS 2

An evaluation of the operational impact introduced by the FANS 2 in the fleet of the current E-Jets was carried out.

The levels of differences proposed by Embraer for FANS were **B / B / A**. For training, the use of a tablet-based device as a learning tool for this new functionality was found suited for training. The use of an iPad provided by FlightSafety, a training provider chosen by Embraer, proved to be appropriate for the proposed level.

The training had a theoretical part, followed by a test and finished with a practice.

The GAA considers that the levels of difference proposed above are adequate for FANS 2.

## ANNEX 6 – FMS NG

The FMS NG is part of the LOAD 27.1 that was implemented in the E1 fleet.

The levels of differences proposed by Embraer for FMS NG were **A / A / A**. Training (self-review) can be accomplished by reading the 'TRANSITION GUIDE-TG 6093-FMS NG' developed by the OEM. This guide should be properly studied and understood by all pilots before carrying out any type of operation involving this new FMS.

The GAA considers that the difference levels proposed above are appropriate for the FMS NG.

Note: A / A / A levels are the minimum recommended by GAA. The ANAC POIs as well as the aircraft operators should, according to their operational profile, experience and background of their pilots, implement, if necessary, a complementary training according to their operational reality.

## ANNEX 7 – ENHANCED FLIGHT VISION SYSTEM - EFVS

The Embraer model ERJ 190-100 ECJ (Lineage 1000) has the Enhanced Flight Vision System - EFVS as an optional feature. The purpose of this annex is to present the recommendations of the Aircraft Assessment Group - ANAC for training, examination and recent experience for the operation with EFVS.

The GAA recommends the following minimum training:

- Heads-up Guidance System – HGS:
  - Both pilots should receive 4: 00h of theoretical training (classroom), including system description, symbols of the Head-Up Display - HUD, operation and typical flight profile; and
  - For practical training, in case of installation only a one HUD, the pilot should receive 2:00h flight training as pilot flying - PF. In case of dual HUD installation, each pilot should receive 2:00 flight training as pilot flying - PF and 2:00 flight training as pilot monitoring - PM. Flight training should include pre-flight, taxi, airwork, 3 (three) visual approaches, and 5 (five) instrument approaches, where two of the instrument approaches shall result in a go around procedure.

Note: HGS training was established to familiarize pilots with the system. This training can be treated as optional if the pilots are already familiar with the equipment.

- Enhanced Flight Vision System – EFVS:
  - Both pilots should receive theoretical training (classroom) including EFVS technology, infrared theory and imaging features, visual effects and anomalies, operational requirements, system limitations and requirements for dispatch, system components, controls (operational) (briefings, callouts, responsibilities and coordination), operational credit and Authorization Requirement (AR), specific approach procedures for EFVS (if applicable), abnormal EVS procedures and elements of human factors; and
  - For practical training, each pilot should receive 2:00 flight training as pilot flying - PF and 2:00 flight training as pilot monitoring - PM. Flight training should include EFVS configuration and adjustments, taxi with reduced visibility, takeoff / RTO under conditions of minimum RVR, precision and non-precision approach procedures (day and night), various cloud base heights and visibility conditions, different airport configurations and approach lights, airports in mountainous regions, cross-wind conditions, low temperatures (snow) with temperature compensation, night VFR approach into a dark / isolated airport, missed approaches at and after the MAP (Missed Approach Point), and 100 ft above TDZE (Touch Down Zone Elevation), EFVS reference transition to natural vision, EFVS failure warning during approach (before transition to natural vision), cabin coordination and callouts, pre-flight, taxi, airwork, three (3) visual approaches and five (5) instrument approaches out of which two of the instrument approaches should result in a go-around procedure.

Note: ANAC inspectors involved in EFVS Operational Approvals should be aware that Brazilian air traffic rules do not authorize flight below decision altitude (DA) or minimum descent altitude (MDA) established in a Instrument Approach Chart (IFR) without natural visual references. This aspect should be clearly addressed during the theoretical training and properly trained during the flight training.

(Training Areas of Special Emphasis - TASE):

The GAA recommends special emphasis on some aspects of training:

- Proper use of the "EVS LIGHTS" callout should be emphasized, especially during parallel runway approaches and non-precision approaches. This callout should only be used when the runway lights in use are visible;
- In relation to approaches with parallel runways, the importance of appropriate recognition of the runway in use should be emphasized during the landing procedure briefing.

It is recommended to perform HGS and EFVS operations as regularly as possible during normal operations, especially during the takeoff, approach and landing phases.

The GAA considers that the levels of D / D / D differences for training, examination and recency of experience, respectively, are adequate for the EFVS operation. Specific recommendations for each level of differences are listed below:

**Training Specifications** – An ANAC qualified, FFS level "C" or "D" or EFVS equipped aircraft shall be used for EFVS flight training.

**Exam Specifications** – A partial proficiency check conducted on a "C" or "D" FFS qualified by ANAC or aircraft is recommended. The partial proficiency check shall include at least one instrument approach up to the published meteorological minima and landing using EFVS. This examination can be done concurrently with the initial or recurrent proficiency check.

**Specifications for recency of experience** – It is recommended that each pilot shoots 3 (three) approximations using EFVS within 90 (ninety) days. Recent experience can be maintained with the use of a "C" or "D" level flight simulator qualified by ANAC or aircraft.

## **ANNEX 8 – E1 - E2 DIFFERENCES TRAINING**

### **INTRODUCTION**

Most NAAs allow credits for training and qualification of pilots operating related aircraft from the same manufacturer. These are usually reflected in differences training and qualification requirements between a base aircraft and an aircraft that is a variant of the base aircraft.

In that sense, the E2 generation was designed so that E-Jets E1 operators can take advantage of these credits and benefit from a reduced differences training curricula to qualify its E1 pilots on the E2.

#### **A) ERJ 190-100 (E190-E1) to ERJ 190-300 (E190-E2) differences training**

The Embraer training program addresses the basic operational differences between the E190 E1 and E190 E2 models that are relevant for current E190 E1 pilots who seek qualification on the E190 E2. It has been evaluated by ANAC through an Operational Evaluation process in accordance with IAC 121-1009 and constitutes the recommended minimum training syllabus for the ERJ 190-100 to the ERJ 190-300 differences course.

Under the approval of their applicable ANAC office branch, operators or training centers may adjust their training programs to their particular training needs using Embraer syllabus as reference, as long as the minimum standards therein set are met.

### **OPERATIONAL EVALUATION PROPOSAL**

In October / November 2017 the Embraer 190 E2 model (ERJ 190-300) was operationally evaluated by ANAC GAA in accordance with IAC 121-1009 as a variant under the existing E179 type rating.

A joint team comprising ANAC, EASA and FAA pilots flew both the ERJ 190-100 and the ERJ 190-300 to assess the handling differences and flight characteristics between the two aircraft in a T2 test in accordance with IAC 121-1009. The evaluators flew a total of approximately 4 hours which included 2 go-arounds, 1 touch-and-go and 2 full-stop landings on the ERJ 190-100, and the same amount on the ERJ 190-300.

Upon T2 successful conclusion, the same team assessed the ERJ 190-100 to ERJ 190-300 differences training syllabus at Flight Safety International training facilities in Saint Louis, USA through a T3 test. The evaluated training program comprised 12 hours of stand-up lecture instruction followed by a 8 hours, FTD-based practical training segment.



## OPERATIONAL EVALUATION RESULTS

### Baseline Differences Training

ANAC GAA confirmed the high level of operational commonality between the E-Jets generations during the T2 test and by means of a T3 test, found the differences training program proposed by Embraer suited to qualify ERJ 190-100 current pilots on the ERJ 190-300 under the existing type rating E179 as another same type rating, E-Jet variant. Therefore, the pilot's license endorsement E179 is applicable to both generations of E-Jets, the E1 and E2.

The levels for training, checking and currency have been established as C/B/A. Level C training requires the use of a Flight Training Device that features the characteristics described in the differences training program. The level B check is to be accomplished via written test or similar method upon conclusion of theoretical training. Level A for currency implies that recency of experience may be attained on any airplane variant or approved training device.

ERJ 170-100, ERJ 170-200, ERJ 190-100 ECJ or ERJ 190-200 qualified crews seeking the ERJ 190-300 qualification by means of differences training may do so by firstly undergoing ERJ 190-100 & FMS NG familiarisation and then attending the ERJ 190-100 to ERJ 190-300 differences training which training specifications are depicted in this document. Alternatively training institutions may elect to administer the applicable training level "A" MDR elements, FMS NG included, during E1 to E2 FTD-based differences training curriculums so that the variants' required familiarisation is attained. Refer to table 3 under section 7 for the E-Jets Master Differences Requirements complete data.

Embraer generic ODR tables specifying differences between the ERJ 190-100 to the ERJ 190-300 were evaluated and accepted by ANAC GAA. These ODR tables are Embraer generic and therefore may not include items that are applicable to particular operators. Operators using more than one variant shall have approved ODR tables pertinent to their fleet.

Base and variant airplanes have been established as follows:

- Base Aircraft: ERJ 190-100 STD/LR/AR/SR BASELINE CONFIG AVNX LOAD SW VERSION 27.1 BASIC FMS NG
- Difference Aircraft: ERJ 190-300 BASELINE CONFIG AVNX LOAD SW VERSION 5.0 BASIC FMS NG

## ERJ 190-300 Optional Features

Training, checking and currency levels A/A/A have been established for pilots' familiarization with the following features:

- Charts & Maps;
- Interactive Navigation (INAV);
- Synthetic Vision System (SVS);
- Volumetric 3D Weather Radar (RDR-4000).

**Note:** The evaluation process for the optional features is described in Appendix 11.

## Flight Training Device

The minimum FTD configuration found suited to support the Differences Training program has been established as a full-size touch-screen graphical replication of the airplane instruments, panels and controls in an open flight deck area, including the assembly of computer software programs necessary to represent the airplane in ground and flight conditions to the extent of the systems installed in the device. It does not require a force cueing motion or visual system.

## ERJ 190-100 to ERJ 190-300 Differences Training Footprint

### Training hours:

A total of 20 hours of training normally distributed along a 2,5 days period has been demonstrated to be adequate to complete the Theoretical and Practical portions of training. The figure below illustrates the recommended distribution of the training activities during this period.

ERJ 190-100 to ERJ 190-300 Differences Training Footprint

Day 1	Day 2	Day 3
GI 1 (8:00)	GI 2 (4:00)	FTD 2 (4:00)
	FTD 1 (4:00)	
<p>Notes:</p> <p>GI = Ground Instruction</p> <p>FTD = Flight Training Device</p> <p>FTD time does not include time for briefing/de-briefing</p> <p>The following operational publications should be referenced during training:</p> <ul style="list-style-type: none"><li>• ERJ 190-300 AOM</li><li>• E-Jets SOPM</li><li>• ERJ 190-300 QRH</li></ul>		

The training footprint presented above may not be the only adequate mean, duration and structure-wise, to comply with the training minima described in this document. As such, operators or training organizations may adjust it in accordance with their particular training needs, provided that the content of the training detailed in the following sessions is properly addressed.

The Differences Training is generally conducted as a crew where both pilots are expected to be trained on all of the Practical Training elements both as PF and PM.

A pilot training alone may complete the course with another qualified pilot acting as second crew member provided that he/she receives training both as PF and PM.

### **Training Areas of Special Emphasis**

The following areas of emphasis should be addressed during Theoretical or Practical Training:

- Flight Control System
  - Full Fly-By-Wire closed loop architecture and characteristics
    - Flight control laws, protections and flight optimization functions (Best Beta)
    - Absence of rudder pedals and control wheel back drive upon utilization of trim
- Automatic Flight System
  - Architecture integration into Full Fly-By-Wire system
    - No control column/wheel back drive during autopilot operation
    - Autopilot coupling logic
    - Automatic flight guidance & display controller panels design
- Engines
  - System characteristics and limitations

### **Single or Mixed-Fleet Flying Operations**

**IMPORTANT:** The Differences Training described in the Embraer training syllabus when properly administered by an approved training organization constitutes the recommended minimum crew qualification to operate both E1 190 and E190 E2 in a MFF environment. However, with regards to commercial operations approval, each operator is solely responsible for it and as such should be mindful of possible operational regulatory requirements set forth by ANAC that may need to be complied with prior to commencing either SFF or MFF operations with newly qualified pilots trained on the E1 to E2 Differences Training.

## **Recurrent Training**

Operators and training institutions are subject to ANAC's recurrent training regulatory requirements and the provisions of this report when developing and seeking approval of their differences-based recurrent training programs. Operators shall establish an approved recurrent training 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 or a combination thereof will ultimately determine the required recurrent training.

Generally speaking, recurrent training is valid for all E-Jets variants provided that the applicable differences are addressed. The ERJ 190-300 recurrent training, when based on E1 approved curricula shall include the TASE specified for the ERJ 190-300 differences training program. ERJ 190-300 current crews are not required to undergo ERJ 190-300 FTD-based recurrent training (level C training) when the recurrent training curriculum is administered under RBAC 121.

## **Checking**

The pilot-in-training is required to have completed all of the theoretical and practical training curricula per the programmed hours herein specified and have passed a knowledge test on the differences which may be accomplished by a written test or similar method. The knowledge test may be administered upon conclusion of the theoretical segment or at the training institution discretion.

## **Recurrent Checking**

Full credit is granted for recurrent checking requirements when operating multiple E-Jets variants, provided that differences between them are covered, as appropriate.

## **Currency**

Currency has been found to be obtained and maintained across all of the E-Jets airplanes. Therefore full credit is granted for recent experience requirements when operating any of the E-Jets variants.

## **B) ERJ 190-300 (E190-E2) to ERJ 190-100 (E190-E1) differences training**

The Embraer training program addresses the basic operational differences between the E190-E2 and E190-E1 models that are relevant for current E190-E2 pilots who seek qualification on the E190-E1. It has been evaluated by ANAC through an operational evaluation process in accordance with IS 00-007 and constitutes the recommended minimum training syllabus for the ERJ 190-300 to the ERJ 190-100 differences course.

Under the approval of their applicable ANAC branch, operators or training centers may adjust their training programs to their particular training needs using Embraer syllabus as reference, as long as the minimum standards therein set are met.

### **OPERATIONAL EVALUATION PROPOSAL**

In June/July 2022 the differences training from the ERJ 190-300 to ERJ 190-100 was evaluated by ANAC in accordance with IS 00-007 through a T3 test. It is worth to mention that operational communality between the models was already determined through a T2 test back in 2017, when ANAC determined the same pilot type rating.

A joint board comprising ANAC and EASA teams evaluated Embraer proposed differences training from the ERJ 190-300 (base aircraft) to the ERJ 190-100 (candidate aircraft) using FlightSafety International training facilities in Le Bourget, France.

### **OPERATIONAL EVALUATION RESULTS**

#### **Baseline Differences Training**

ANAC found the differences training program proposed by Embraer suited to qualify ERJ 190-300 current pilots on the ERJ 190-100.

The levels for training, checking and currency have been established as D/A/A. Level D differences training requires the use of a training device that has accurate, high-fidelity integration of systems and controls, and realistic instrument indications. The level A check indicates that no check is required at the time of training. Level A for currency implies that recency of experience may be attained on any airplane variant or approved training device.

Embraer generic ODR tables specifying differences between the ERJ 190-300 to the ERJ 190-100 were evaluated and accepted by ANAC. These ODR tables are Embraer generic and therefore may not include items that are applicable to particular operators. Operators using more than one variant shall have approved ODR tables pertinent to their fleet.

## Flight Simulation Training Devices (FSTDs)

For the practical portion of the training, the minimum FTD configuration found suited to support the differences training has been established as a full-size touch-screen graphical replication of the airplane instruments, panels and controls in an open flight deck area, including the assembly of computer software programs necessary to represent the airplane in ground and flight conditions to the extent of the systems installed in the device. It does not require a force cueing motion or visual system.

To address the “pitch trim runaway” scenario, a maneuvers device (FTD 6 or a FFS) must be used.

## ERJ 190-300 to ERJ 190-100 Differences Training Footprint

### Training hours:

A total of 21 hours of training normally distributed along a 3 day-period has been demonstrated to be adequate to complete the Theoretical and Practical portions of training. The figure below illustrates the recommended distribution of the training activities during this period.

ERJ 190-300 to ERJ 190-100 Differences Training Footprint

Day 1	Day 2	Day 3
GI 1 (8:00)	GI 2 (4:00)	FTD 2 (4:00)
	FTD 1 (4:00)	FFS 1 (1:00)
Notes:  GI = Ground Instruction  FTD = Flight Training Device  FFS = Full Flight Simulator  FTD and FFS times do not include time for briefing/de-briefing		

The training footprint presented above may not be the only adequate mean, duration and structure-wise, to comply with the training minima described in this document. As such, operators or training organizations may adjust it in accordance with their particular training needs, provided that the content of the training detailed in the following sessions is properly addressed.

The Differences Training is generally conducted as a crew where both pilots are expected to be trained on all of the Practical Training elements both as PF and PM.

A pilot training alone may complete the course with another qualified pilot acting as second crew member provided that he/she receives training both as PF and PM.

### **Training Areas of Special Emphasis**

The following areas of emphasis must be addressed during training:

- **Flight Control System:**
  - Independent Normal or Direct mode operation on each axis.
  - Yaw and roll trim back drive upon trim utilization.
  - Trim disconnect function.
- **Automatic Flight Control System:**
  - Control wheel and column back drive during autopilot operation.
  - Guidance & Display Controller Panels.
- **Engines:**
  - Engine start characteristics.

### **Single or Mixed-Fleet Flying Operations**

**IMPORTANT:** The Differences Training described in the Embraer training syllabus when properly administered by an approved training organization constitutes the recommended minimum crew qualification to operate both E190-E1 and E190-E2 in a MFF environment. However, with regards to commercial operations approval, each operator is solely responsible for it and as such should be mindful of possible operational regulatory requirements set forth by ANAC that may need to be complied with prior to commencing either SFF or MFF operations with newly qualified pilots trained on the E2 to E1 Differences Training.

### **Recurrent Training**

Operators and training organizations are subject to ANAC's recurrent training regulatory requirements and the provisions of this report when developing and seeking approval of their differences-based recurrent training programs. Operators shall establish an approved recurrent training 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 or a combination thereof will ultimately determine the required recurrent training.

Generally speaking, recurrent training is valid for all E-Jets variants provided that the applicable differences are addressed. The ERJ 190-100 recurrent training, when based on E2 approved curricula shall include the TASE specified for the ERJ 190-100 differences training program. ERJ 190-100 current crews are not required to undergo ERJ 190-100 FTD-based (level C training) and FFS/FTD 6-based (level D training) recurrent training when it is administered under RBAC 121.

## **Checking**

No specifications for checking after the ERJ 190-300 to ERJ 190-100 differences training is determined.

## **Recurrent Checking**

Full credit is granted for recurrent checking requirements when operating multiple E-Jets variants, provided that differences between them are covered, as appropriate.

## **Currency**

Currency has been found to obtained and maintained across all of the E-Jets airplanes. Therefore full credit is granted for recent experience requirements when operating any of the E-Jets variants.



## ANNEX 9 – FADEC SOFTWARE VERSION 10E5.61 IN ERJ190

An operational evaluation of the new FADEC software, version 10E5.61 in ERJ 190-100 and ERJ 190-200 aircraft was carried out by **document evaluation** following the T1 – Functional Equivalence Test – according to the item 3.3.2.1 from IAC 121-1009.

The levels of differences proposed by Embraer and considered appropriated by ANAC are **A/A/A**.

The **Level A for Training** (self-study) can be accomplished by reading the sections 2-40, 3-11, 14-06-20 and 14-06-30 from AOM and 2-17 from SOPM. This sections should be properly studied and understood by all pilots before carrying out any type of operation involving this FADEC software version.

The modifications on the software only insert new features for a more efficient operation and don't limit nor modify the existent procedures and techniques. Therefore, in case of the pilot doesn't read the material recommended by the manufacturer, no adverse consequence in terms of flight safety is expected.

The original ODR was modified by the OEM in order to address this software update and was considered satisfactory.

The differences do not affect the MDR.

## ANNEX 10 – ENVELOPE EXTENSION FROM -40°C TO -45°C FOR ERJ 170-100 AND ERJ 170-200

An operational evaluation of the Envelope Extension from -40°C to -45°C for takeoff and landing in ERJ 170-100 and ERJ 170-200 aircraft was carried out following the *Type Rating Determination Through Analysis* according to the item B.2.1 from IS 00-007.

The levels of differences proposed by Embraer and considered appropriated by ANAC are **A/A/A**.

The **Level A for Training** (self-study) can be accomplished by reading the AFM, AOM or another means provided by the operator or training center. This material should be properly studied and understood by all pilots before carrying out any type of operation involving this envelope extension.

The original ODR was modified by the OEM in order to address this envelope extension and was considered satisfactory.

The differences do not affect the MDR.

## ANNEX 11 – E1 LOAD 27.2 AND ADVANCED FEATURES FOR E1 AND E2

An operational evaluation of the **Load 27.2 for E1** aircraft as well as **Advanced Features for all E-Jet family (including E2)** was carried out following the *Type Rating Determination Through Analysis* according to the item B.2.1 from IS 00-007.

The corrections and fixes pertaining **Load 27.2** constitute product improvements only and do not require additional pilot training. Nevertheless, the operators shall be notified about the improvements introduced by the Load 27.2 and the affected operational manuals shall be updated.

The *advanced features* are:

- **Synthetic Vision System (SVS) – Smartview<sup>(1)</sup>**;
- **Interactive Navigation (INAV)**;
- **Charts and Maps**; and
- **RDR-4000**.

In order to allow the operators not interested in having the SVS and INAV but just the RDR-4000 system, it was developed the **new classic MFD**, which is an INAV without presentation, in general, of terrain texturing, airways, airspace boundaries, pan, zoom, graphical radio/navaid tuning, designator, secondary and offset flight plan on the lateral map.

Regarding the **advanced features**, the levels of differences proposed by Embraer and considered appropriated by ANAC are **A/A/A**.

The **Level A for Training** (self-study) can be accomplished by reading the E175 E190 AOM, or another means provided by the operator or training center. This material should be properly studied and understood by all pilots before carrying out any type of operation involving the new features.

The original ODR was modified by the OEM in order to address the *advanced features* and was considered satisfactory.

The differences do not affect the MDR.

<sup>(1)</sup> The SVS was evaluated in the Load 27.2. However, it will be certified only with the DCA for Load 27.3 (DCA 0170-000-00034-2018 and DCA 0190-000-00035-2018).

## ANNEX 12 – LOAD 5.7

An operational evaluation of the **Load 5.7 for ERJ 190-300** was carried out following the *Type Rating Determination Through Analysis* according to the item B.2.1 from IS 00-007.

The levels of differences proposed by Embraer and considered appropriated by ANAC are **A/A/A**.

The **Level A for Training** (self-study) can be accomplished by reading the AFM, AOM or another means provided by the operator or training center

The original ODR was modified by the OEM in order to address this update and was considered satisfactory.

The differences do not affect the MDR.

## ANNEX 13 – ERJ 190-400 Load 7.0

An operational evaluation of the **ERJ 190-400 equipped with load 7.0** was carried out through a T1 – Functional Equivalence Test – according to the item B.2.1 from IS 00-007. The ERJ 190-300 equipped with Load 5.7 was considered the base aircraft. A flight profile was performed on both ERJ 190-300 and ERJ 190-400 to demonstrate the similarity between models.

The levels of differences proposed by Embraer and considered appropriated by ANAC are **A/A/A** for transitioning from ERJ 190-300 to ERJ 190-400 as well as transitioning from Load 5.7 to Load 7.0.

The **Level A for Training** (self-study) can be accomplished by reading the AFM, AOM or another means provided by the operator or training center

The original ODR was modified by the OEM in order to address this update and was considered satisfactory.

The differences affect the MDR (ERJ 190-400 was included).

A pilot seeking differences training from any of the E1 models to the ERJ 190-400 model should undergo the 190-100 to 190-300 differences training and then accomplish the self study transition from the ERJ 190-300 to the ERJ 190-400.

## ANNEX 14 – RNP AR < 0.3NM and RF Legs Certifications for ERJ 190-300/190-400

An operational evaluation of the RNP AR < 0.3NM and RF Legs Certification for **ERJ 190-300/190-400** was carried out following the *Type Rating Determination Through Analysis* according to the item B.2.1 from IS 00-007.

The differences levels proposed by Embraer and considered appropriate by ANAC are:

- **A/A/A:** For pilots already qualified on RNP AR<0.3 for E-Jets E1 seeking qualification on RNP AR<0.3 for E-Jets E2, provided E1/E2 differences training is addressed.

Similarly, level A/A/A is applicable for pilots already qualified on RNP AR<0.3 for E-Jets E2 seeking qualification on RNP AR<0.3 for E-Jets E1, provided E2/E1 differences training is addressed;

The **Level A for Training** (self-study) can be accomplished by reading the AFM, AOM and QRH or another means provided by the operator or training center.

- **D/D/D:** For pilots already qualified on E-Jets E2 seeking qualification on RNP AR<0.3.

The original ODR was modified by the OEM in order to address this update and was considered satisfactory.

The differences do not affect the MDR.

**Note:** This evaluation was based on E-Jets E1 RNP AR operational evaluation results, for which only the 'RNP-AR approach and go-around procedures' were evaluated. Thus, the 'RNP-AR departure' procedures are not covered.

## ANNEX 15 – GNSS Landing System (GLS) for ERJ 190-300 and ERJ 190-400

An operational evaluation of the GNSS Landing System for **ERJ 190-300** and **ERJ 190-400** was carried out following the *Type Rating Determination Through Analysis* according to the item B.2.1 from IS 00-007.

The levels of differences proposed by Embraer and considered appropriated by ANAC are **A/A/A**.

The **Level A for Training** (self-study) can be accomplished by reading the AFM, AOM, QRH and SOPM or another means provided by the operator or training center. Level A for checking means that an exam is not required or can be integrated with the next proficiency check. Level A for currency means that currency requirements are not applicable.

The original ODR was modified by the OEM in order to address this update and was considered satisfactory.

The differences do not affect the MDR.

## ANNEX 16 – TOLD Database for E-Jets E2

Operational evaluations of the TOLD Database for **ERJ 190-300 and ERJ 190-400** were carried out following the *Type Rating Determination Through Analysis* according to the item B.2.1 from IS 00-007.

The levels of differences proposed by Embraer and considered appropriated by ANAC are **A/A/A**.

The **Level A for Training** (self-study) can be accomplished by reading the AFM and AOM or another means provided by the operator or training center.

The original ODR was modified by the OEM in order to address this update and was considered satisfactory.

The differences do not affect the MDR.



## ANNEX 17 – E-Jets E2 Initial Type Rating Training Program

The Brazilian Aircraft Evaluation Group (GAA) concluded in May 2019 the operational evaluation of the initial type rating training program for the new generation of E-Jets (E2) through a T5 test (as per IS 00-007A), jointly with FAA and EASA.

The ERJ 190-300 and ERJ 190-400 had already been determined as the same type rating (E179) as the ERJ 190-100.

The evaluation was performed on the ERJ 190-300 variant. However, the same initial type rating training is also applicable to ERJ 190-400 variant, considering the level of differences (level A) between the two variants.

### Training Area of Special Emphasis:

The following subject matters should be emphasized during the course:

- Flight Management System (FMS);
- Automatic Flight Control System (AFCS) including system architecture, autopilot coupling logic;
- Automatic flight guidance and display controller panels design;
- 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 E-Jets E2 fly-by-wire concept and functions;
- Cursor Control Devices (CCD);
- Windshear Escape Guidance;
- Ailerons and elevators disconnection mechanism;
- Power Plant system and proper use of take-off modes;

Note: System characteristics, limitations, normal and abnormal procedures and operation in cold weather should be emphasized during training;

During the Ground School, students should have access to the Aircraft Flight Manual (AFM), MMEL (Master Minimum Equipment List), OB (Operational Bulletin), ACFOG (Airplane Changes Flight Operations Guide) GP (General Publications), AFM (Airplane Flight Manual), AOM (Airplane Operations Manual) and QRH (Quick Reference Handbook) at least.

The course was considered efficient and adequate to train pilots as PIC and SIC on the new generation of E-Jets (E2).

The recommended footprint is presented as follows:

- General Operational Subjects (GOS).....8.0
  - Operational Publications
  - Flight Planning Performance
  - Performance
  - Weight & Balance
  - Windshear
  - Stall Recognition and Recovery
  - CRM
- Aircraft Systems.....56.0
  - Systems
  - Lab
- Cockpit Procedures Training (CPT).....12.0

Total 76.0 hours

Day 1	Day 2	Day 3	Day 4	Day 5
GI 1 (8:00)	GI 2 (8:00)	GI 3 (8:00)	GI 4 (8:00)	GI 5 (8:00)
Day 6	Day 7	Day 8	Day 9	Day 10
GI 6 (6:00) FMS (2:00)	GI 7 (6:00) FMS (2:00)	GI 8 (2:00) FMS (3:00) Written Test (3:00)	CPT 1 (4:00)	CPT 2 (4:00)
Day 11	Day 12	Day 13	Day 14	Day 15
CPT 3 (4:00)	FT 1 (5:30) FTD*	FT 2 (5:30) FFS**	FT 3 (5:30) FFS**	FT 4 (5:30) FFS**
Day 16	Day 17	Day 18	Day 19	
FT 5 (5:30) FFS**	FT 6 (5:30) FFS**	FT 7 (5:30) FFS**	Skill Test (5h30)	

**Key:**

**CPT** = Cockpit Procedure Training (It does not require qualification)

**FT** = Flight Training

**FFS** = Full Flight Simulator

**GI** = Ground Instruction

**FMS** = FMS Lab Exercise

\* FTD qualified as FAA level 4 or EASA level 1 (minimum)

\*\* FFS qualified as ILC or level D (or equivalent device)

**Notes:**

- The FFS sessions for PIC and SIC training are the same. For two pilots training as PIC, after 2 hours they switch seats. If a crew is training, all sessions are performed with the PIC in the left seat and the SIC in the right seat, and after 2 hours they switch from pilot flying to pilot not flying (monitoring).
- CPT hours do not include briefing and debriefing. The training provider should include time for them.
- FT hours include 1.0 hour briefing and 0.5 hour debriefing.
- Hours noted do not include lunch period.

The first session of flight training (FT 1) only contains tasks that don't require maneuver training, so it can also be performed in an FTD, not impairing the lesson.

The training footprint presented above may not be the only adequate mean, duration and structure-wise, to comply with the training minima described in this document.

Under the approval of their applicable ANAC office branch, operators or training centers may adjust their training programs to their particular training needs using Embraer syllabus as reference, as long as the minimum standards therein set are met.

## ANNEX 18 – ERJ 190-300 and ERJ 190-400 CAT I, CAT II, and CAT IIIa with Autoland

The modification introduced by DCA 0190-022-00085-2018 and DCA 190-022-00077-2020 implements the fail-passive Autoland system for the E190-E2 model in order to provide ILS CAT I, CAT II, and CAT IIIa minima low visibility approach operations without rollout guidance.

The Autoland system provides Autoland operation with a Decision Height (DH) not less than 50 of Height Above Threshold (HAT) and not less than 200 m (ANAC/EASA) or 600 ft (FAA) of Runway Visual Range (RVR).

When the operational conditions to arm and engage the Autoland system are met, the system will engage performing the final approach track (LOC/GS), runway alignment (ALIGN), and flare (FLARE) to touchdown. After touchdown, the system will remain engaged tracking the runway centerline (RLOUT) and performing the De-Rotation (D-ROT) until autopilot (AP) disengagement.

An operational evaluation of the CAT IIIa Autoland for **ERJ 190-300 and ERJ 190-400** was carried out following the Type Rating Determination Through Analysis according to the item B.2.1 from IS 00-007.

Moreover, Embraer offered a demonstration flight on ERJ 190-100 as well as on ERJ 190-300 so ANAC could get more familiar with the Autoland functionality. The flights have occurred at Embraer facilities in São Jose dos Campos on July 15th (E1), 16th (E2), and 17th (E1).

The differences levels proposed by Embraer for this functionality and considered appropriate by ANAC are:

- **A/A/A:** For pilots already qualified on Autoland 1 or Autoland 2 systems for E-Jets E1 seeking qualification on Autoland 1 system for E-Jets E2, provided E1/E2 differences training is addressed.

Similarly, level A/A/A is applicable for pilots already qualified on Autoland 1 for E-Jets E2 seeking qualification on Autoland 1 system for E-Jets E1, provided E2/E1 differences training is addressed;

The **Level A for Training** (self-study) can be accomplished by reading the AFM, AOM, QRH, SOPM, or another means provided by the operator or training center.

- **D/D/D:** For pilots already qualified on ERJ 190-300 or ERJ 190-400 seeking qualification on Autoland 1 and with no previous qualification on Autoland for any of E-Jets E1 or E-Jets E2 models.

The original ODR was modified by the OEM in order to address this update and was considered satisfactory.

The differences do not affect the MDR related to the E-Jets Family.

The following table summarizes the transition between ERJ 190-100 / ERJ 190-300 / ERJ 190-400 (and the other related variants) equipped with Autoland 1 system for ILS CAT I, CAT II, and CAT IIIa approach minima:

		FROM AIRPLANE	
		ERJ 190-100 <sup>1)</sup> (E190-E1) Autoland	ERJ 190-300/-400 (E190-E2/E195-E2) Autoland
TO AIRPLANE	ERJ 190-300/-400 (E190-E2/E195-E2) Autoland	A/A/A <sup>2)</sup>	Not Applicable
	ERJ 190-100 <sup>1)</sup> (E190-E1) Autoland	Not Applicable	A/A/A <sup>3)</sup>

**Notes:**

1) It is also applicable for ERJ 170-100 (equipped with Autoland 1 system or Autoland 2 system), ERJ 170-200, ERJ 190-100, ERJ 190-100 ECJ and ERJ 190-200 certified for Autoland system.

2) Pilot qualified on E190-E1 Autoland 1 system or Autoland 2 system seeking transition to E190-E2 / E195-E2 models equipped with Autoland 1 system must perform a transition / familiarization training (self-learning).

3) Pilot qualified on E190-E2 / E195-E2 Autoland 1 system seeking transition to E190-E1 models equipped with Autoland 1 system only must perform a transition / familiarization training (self-learning).

4) E190-E2 / E195-E2 pilot qualified on Autoland 1 system seeking transition to E190- E1 model equipped with Autoland 2 system shall comply with a transition qualification training as per FAA AC 120-118 or abbreviate training as per EASA AMC1 SPA.LVO.120 (refer to item 8.2.7 of this report).

5) According to MDR (Section 6), when transitioning between E190-E1 and E190-E2 / E195-E2 models, pilots should comply with the established differences training.

## ANNEX 19 – Steep Approach Mode (SAM) - ERJ 190-300, 190-400

The modification introduced by DCA-190-000-00136-2018 (ERJ 190-300) and DCA-0190-000-00016-2021 (ERJ 190-400) implements the fly-by-wire Steep Approach Mode (SAM) for the E2 aircraft, allowing steep approaches with an enhanced flight path control and flare in order to perform manual or Autopilot (AP) and (or) Auto throttle (AT) coupled approaches with glide path angles up to 5.5°.

The SAM pilot's interface for the E2 aircraft Steep Approach operations uses the same control, indications, alerts and procedures as the ERJ 190-100, presenting a high level of communality between the E-Jets generations.

In summary, the main differences between the E2 aircraft not equipped and equipped with SAM are:

- New Steep Approach Mode (STEEP).
- Steep Approach indications and alerts.
- Steep Approach control laws implemented in the FCC software.

ANAC conducted an operational evaluation through a T3 test of the Steep Approach for the ERJ-190-300, and by documental analysis for the ERJ 190-400.

The differences levels proposed by Embraer for this functionality and considered appropriate by ANAC are:

- **A/A/A:** For pilots already qualified on Steep Approach for E-Jets E1 seeking qualification on Steep Approach for E-Jets E2, provided E1/E2 differences training is addressed.
- **A/A/A:** For pilots already qualified on Steep Approach for E-Jets E2 seeking qualification on Steep Approach for E-Jets E1, provided E2/E1 differences training is addressed;

The **Level A for Training** (self-study) can be accomplished by reading the AFM, AOM, QRH, SOPM or another means provided by the operator or training center.

- **D/A/A:** For pilots already qualified on E-Jets E2 seeking qualification on Steep Approach.

The E-Jets E1 Steep Approach was reevaluated and updated as follows:

- **D/A/A:** For pilots already qualified on E-Jets E1 seeking qualification on Steep Approach.

The original ODR was modified by the OEM in order to address this update and was considered satisfactory.

The differences do not affect the MDR related to the E-Jets Family. The following table summarizes the transition between ERJ 190-100 / ERJ-190-300 (and the other related variants) equipped with Steep Approach system:

		FROM AIRPLANE	
		ERJ 190-100 <sup>1)</sup> (E190-E1) - SAM	ERJ 190-300/-400 (E190-E1/E195-E2) - SAM
TO AIRPLANE	ERJ 190-300/-400 (E190-E1/E195-E2) - SAM	A/A/A <sup>2) 3)</sup>	Not Applicable
	ERJ 190-100 <sup>1)</sup> (E190-E1) - SAM	Not Applicable	A/A/A <sup>2) 3)</sup>

Transition Table – Steep Approach Mode (SAM)

**Notes:**

- 1)** Level A/A/A is also applicable for ERJ 170-100 certified for SAM.
- 2)** Pilot qualified on SAM on either E190-E1 or E190-E2 / E195-E2 models seeking transition between the E190-E1 and E190-E2 / E195-E2 models equipped with SAM must perform a familiarization training (self-learning).
- 3)** When transitioning between E190-E1 and E190-E2 / E195-E2 models, pilots should comply with the established differences training as per MDR table.

## **ANNEX 20 – Primus Epic System Software Load Version 25.9 and 27.4**

An operational evaluation of the Load Version 25.9 and 27.4 for ERJ 170/190 Series was carried out following the Type Rating Determination Through Analysis according to the item B.2.1 from IS 00-007.

It is applicable to the ERJ 170/190 Series aircraft: ERJ 170-100 (E170-E1) Series (LR / SE / STD / SU), ERJ 170-200 (E175-E1) Series (LL / LR / STD / SU), ERJ 190-100 (E190-E1) Series (ECJ / IGW / LR / SR / STD) and ERJ 190-200 (E195-E1) Series (IGW / LR / STD) aircraft.

The levels of differences proposed by Embraer and considered appropriated by ANAC are A/A/A.

The Level A for Training (self-study) can be accomplished by reading the AFM, AOM, QRH or another means provided by the operator or training center. Level A for checking means that an exam is not required or can be integrated with the next proficiency check. Level A for currency means that currency requirements are not applicable.

The ODR presented by the OEM to address these Load versions was considered satisfactory.

The differences do not affect the MDR.



## ANNEX 21 – E2 Primus Epic Load 9.0

An operational evaluation of the **ERJ 190-300/-400 equipped with Primus Epic Load 9.0** was carried out according to the item B.2 of IS 00-007. The ERJ 190-300/-400 equipped with Load 7.5 was considered the base aircraft.

The differences levels proposed by Embraer and considered appropriated by ANAC are **A/A/A** for transitioning from E2 Primus Epic Load 7.5 to Load 9.0.

The **Level A for Training** (self-study) can be accomplished by reading the AFM, AOM or other means provided by the operator or training center.

The original ODR was modified by the OEM in order to address this update and was considered satisfactory.

## ANNEX 22 – ERJ 190-100 Freighter version

The modification introduced by Embraer Service Bulletin (SB) nº SB190-25-0270 implements the ERJ 190-100 IGW conversion from passenger version to full cargo aircraft (Freighter) version. The main design modifications are the following:

- Class E main deck cargo compartment implementation.
- Metallic plug installation on passenger windows.
- Supernumerary Area implementation.
- Rigid Cargo Barrier installation.
- Main Deck Cargo Door (MDCD) installation
- Air Management System changes.
- Fire Protection System changes.

ANAC conducted an assessment (documental analysis) of the modifications under the operational perspective. Coordination between ANAC, EASA, and FAA was established on a joint operational evaluation board (JOEB)-like approach. In addition, a T3 test was conducted by the FAA in coordination with the other abovementioned authorities to validate the differences training related to the additional main deck cargo compartment smoke (CRG MAIN SMOKE) procedure.

Embraer proposal considered the ERJ 190-100 passenger version as the base aircraft and the ERJ 190-100 Freighter version as the candidate aircraft. The differences levels proposed by Embraer and considered appropriate by ANAC are **B/A/A** for training, checking and currency, respectively.

- Level B training (aided instruction) can be accomplished by reading the AFM, AOM, QRH, SOPM, and through CBT instruction, stand up lecture or other equivalent means.
- Level A checking indicates that no check is required at the time of training.
- Level A currency is common to each aircraft and does not require separate tracking.

**Note:** Pilots must hold a valid ERJ 190-100 type rating and be current on the type to be eligible to the pax to freighter differences training.

ANAC identified the following items to be considered as Training Areas of Special Emphasis (TASE):

- Air Management System: Main Deck Cargo isolation.
- Main Deck Cargo Door (MDCD) operations: Latch and Locked Indications.
- Additional QRH Cargo Main Smoke (CRG MAIN SMOKE) procedure.

The differences do not affect significantly the MDR related to the E-Jets Family. A note was added to the MDR table to reflect the differences levels.

The ODR table presented by the OEM was considered satisfactory.

## ANNEX 23 – ERJ 170/190 E1 Ice Speed Reset Function

Operational evaluation of the Ice Speed Reset modification for **ERJ 170/190 E1 Series** was carried out following the *Type Rating Determination Through Analysis* according to the item B.2.1 from IS 00-007.

The levels of differences proposed by Embraer and considered appropriated by ANAC are **A/A/A**.

The **Level A for Training** (self-study) can be accomplished by reading the AFM, AOM, QRH and SOPM or another means provided by the operator or training center.

The original ODR was modified by the OEM in order to address this update and was considered satisfactory.

The differences do not affect the MDR.

## **ANNEX 24 – ERJ 190-300/-400 Runway Overrun Awareness and Alerting System (ROAAS)**

Operational evaluation of the ROAAS modification for ERJ 190-300/-400 was carried out following the Type Rating Determination Through Analysis according to the item B.2.1 from IS 00-007.

The levels of differences proposed by Embraer and considered appropriated by ANAC are A/A/A.

The Level A for Training (self-study) can be accomplished by reading the AFM, AOM, QRH and SOPM or another means provided by the operator or training center.

There is no specific Training Areas of Special Emphasis for this modification.

The original ODR was modified by the OEM in order to address this update and was considered satisfactory.

The differences do not affect the MDR.

## **ANNEX 25 – ERJ 170-100/-200, ERJ 190-100/-200 and ERJ 190-300/-400 Automatic Dependent Surveillance Broadcast (ADS-B) OUT**

Operational evaluation of the ADS-B OUT Modification for **ERJ 170/190 Series** was carried out following the *Type Rating Determination Through Analysis* according to the item B.2.1 from IS 00-007.

The levels of differences proposed by Embraer and considered appropriate by ANAC are **A/A/A**.

The **Level A for Training** (self-study) can be accomplished by reading the AFM, AOM and QRH or another means provided by the operator or training center.

There is no **Training Area of Special Emphasis** for this modification.

The original **ODR** was modified by the OEM in order to address this update and was considered satisfactory.

The differences do not affect the **MDR**.