EUROPEAN AVIATION SAFETY AGENCY

Operational Evaluation Board Report

EMBRAER

EMB-500 (PHENOM 100) / EMB-505 (PHENOM 300)

Flight Crew Qualifications

17 October 2013

European Aviation Safety Agency
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EMB-500 (PHENOM 100) / EMB-505 (PHENOM 300)

Operational Evaluation Board – Flight Crew Qualifications

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Revision Record

Rev. No.	Content	Date
First Issue	Combined EMB-500/505 OEB report replacing individual OEB Reports EMB-500 and EMB-505; Evaluation of EMB-500 and EMB-505 as variants; EMB-505 Avionics Upgrade; CPDLC & TAWS training; administrative & regulatory updates.	17 Oct 2013

Contents

Acronyms

AFCS ..... Automatic Flight Control System

AFM ..... Airplane Flight Manual

AMC..... Acceptable Means of Compliance

AMM ..... Airport Moving Map

ANAC..... Agência Nacional de Aviação Civil

AP ..... Auto Pilot

ATPL..... Airline Transport Pilot License

ATO ..... Approved Training Organisation

ATR ..... Automatic Thrust Reserve

BCU ..... Brake Control Unit

BCV ..... Brake Control Valve

CAS ..... Central Alert System

CPD ..... Common Procedures Document for conducting Operational Evaluation Boards, dated 10 June 2004

CPL ..... Commercial Pilot License

CRE ..... Class Rating Examiner

CRI ..... Class Rating Instructor

CRM ..... Crew Resource Management

CS-FSTD(A) ..... Certification Specifications for Aeroplane Flight Simulation Training Devices of 4 July 2012

Difference Level..... a designated level of difference as defined in the CPD for the evaluation of pilot training, checking and currency

ECL..... Electronic Check List

ECTS ..... EMBRAER CAE Training Services

EFB ..... Electronic Flight Bag

EFIS ..... Electronic Flight Instrument System

EICAS ..... Engine Indicating and Crew Alerting System

EU-OPS..... Commission Regulation (EC) No 859/2008 of 20 August 2008, amending Council Regulation (EEC) No 3922/91 as regard common technical requirements and administrative procedures applicable to commercial transportation by aeroplane

FAA ..... Federal Aviation Administration

FADEC ..... Full Authority Digital Engine Control

FCL ..... Flight Crew Licensing

FD..... Flight Director

FFS ..... Full Flight Simulator

FMA ..... Flight Mode Annunciator

FMS ..... Flight Management System

FSB .....Flight Standardization Board

FSTD .....Flight Simulation Training Device

GPS .....Global Positioning System

GPU.....Ground Power Unit

HPA .....High Performance Aircraft

IAS .....Indicated Air Speed

IFR.....Instrument Flight Rules

ILS .....Instrument Landing System

IPT .....Integrated Procedures Trainer

IR.....Instrument Rating

JAR .....Joint Aviation Requirements

LOC .....Localizer

LST.....License Skill Test

MCC .....Multi-Crew Coordination

MDR .....Master Difference Requirements

MEL .....Minimum Equipment List

MFD .....Multi-Function Display

MMEL .....Master Minimum Equipment List

MP .....Multi-Pilot

MPA.....Multi Pilot Aircraft

MTOM .....Maximum Take-Off Mass

MZFM .....Maximum Zero Fuel Mass

NAA .....National Aviation Authority

ODR.....Operator Differences Requirements

OEB.....Operational Evaluation Board

OPERA .....Optimized PERformance Analyzer

OTD.....Other Training Device

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

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

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

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

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

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

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

PF ..... Pilot Flying

PFD ..... Primary Flight Display

PNF ..... Pilot Not Flying

POH ..... Pilot's Operating Handbook

QRH ..... Quick Reference Handbook

RVSM ..... Reduced Vertical Separation Minima

SOE ..... Supervised Operating Experience

SOP ..... Standard Operating Procedure

SP ..... Single-Pilot

STD ..... Synthetic Training Device

TAWS ..... Terrain Awareness and Warning System

TCAS ..... Traffic Alert and Collision Avoidance System

VMO ..... Maximum Operating Limit Speed

WBT ..... Web Based Training

WOW ..... Weight on Wheels

Note on references and reference texts:
Where references are made to requirements and where extracts of reference texts are provided, these are at the amendment state at the date of evaluation or publication of the report. Readers should take note that it is impractical to update these references to take account of subsequent amendments to the source documents.

OEB EMB-500/505 Flight Crew Qualifications Group Composition

Name	Capacity	Task
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1) EMB-500 Initial Evaluation (Sep/Oct 2003)

2) EMB-505 Initial Evaluation (Dec 2004)

3) EMB-500/505 Variant Evaluation (Jul 2013)

4) EMB-505 G300 Upgrade (Aug 2013)

5) EMB CPDLC Evaluation (Aug 2013)

6) EMB-500 TAWS B/A (Aug 2013)

EXECUTIVE SUMMARY

Scope of the evaluations

This report specifies the EASA pilot qualification requirements for the Embraer EMB-500 (Phenom 100) and EMB-505 (Phenom 300) aircraft.

In particular, this report addresses:

- Aircraft Type Designation and Pilot License Endorsement for the Embraer EMB-500 (Phenom 100) and EMB-505 (Phenom 300) aircraft;
- Master Differences Requirements (MDR) for the EMB-500 and the EMB-505 aircraft;
- Embraer design and operational concepts and EMB-500 and EMB-505 specifics;
- Operator Difference Requirements (ODR) tables;
- Initial type rating training;
- Differences training;
- Operations on more than one type or variant;
- Pilot checking, currency / recent experience; and
- Additional operational recommendations.

EASA OEB reports are available on the website of the EASA Certification Flight Group at http://easa.europa.eu/certification/experts/flight.php.

Team Composition and Regulatory Framework

Operational evaluations were conducted jointly by integrated teams composed of EASA, ANAC, and FAA members, to simultaneously meet the EASA OEB, FAA FSB, and ANAC requirements. Each Authority uses the results of the evaluation process to produce a report specific to its particular requirements that, while similar in intent, may differ somewhat in detail. This OEB report is applicable to operations under the framework of EASA.

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

Conclusions

The EMB-500 (Phenom 100) and the EMB-505 (Phenom 300) aircraft have been assessed as variants requiring Level D differences training.

The single license endorsement for the EMB-500 (Phenom 100) and the EMB-505 (Phenom 300) aircraft is established as "**EMB-500/505**".

EMB-500 and EMB-505 initial type rating training syllabi have been evaluated on separate occasions. Relevant training footprints evaluated and acceptable to the OEB, including the minimum course duration and training devices used, are shown at Appendix 1, and 2.

EMB-500 and EMB-505 transition training SP to MP and vice versa have been evaluated and are reflected in Appendix 3.

A further evaluation to confirm the EMB-500 and EMB-505 as variants was performed as described in paragraph 2 of the report (Sequence of Operational Evaluations) with details in Appendix 4.

Also evaluated were pilot qualification requirements when transitioning from the EMB-505 GARMIN 1000 equipped aircraft to the EMB-505 equipped with GARMIN 3000.

CPDLC training was evaluated for the EMB-500 and EMB-505, as well as training for TAWS-B to TAWS-A on the EMB-500.

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

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

Operational Evaluation Report – Flight Crew Qualifications

1. Details of Operational Evaluations

1.1 EMB-500 (Phenom 100) Initial Evaluation

An initial operational evaluation for the EMB-500 was performed in March and April 2009 by a joint EASA/ANAC team to assess SP in-aircraft type rating qualification requirements. During a subsequent evaluation in August 2009, the EASA OEB assessed MP type rating qualifications, using a qualified FFS (Level C or D). Additional training courses were assessed by evaluating the proposed training program syllabi, taking into account previous experience during EMB-505 evaluations.

Also evaluated were pilot qualification requirements when transitioning from SP to MP operations and vice versa.

1.2 EMB-505 (Phenom 300) Initial Evaluation

An initial operational evaluation for the EMB-505 was performed in three parts during January, October and December 2010. During the initial evaluation in-aircraft type rating qualification requirements were assessed, based on credit for commonality for pilots qualified and current on the EMB-500. A subsequent evaluation concentrated on the assessment of new features installed on the EMB-505 aircraft, and the third evaluation assessed type rating qualification requirements, using an FFS (Level C or D).

Full initial type rating courses for the EMB-505 were evaluated for in-aircraft and FFS training for both SP and MP operations, as well as checking and currency requirements.

A comparison of handling characteristics between the EMB-505 and the EMB-500 aircraft (T-2 test) to support a designation as variants was not performed. However, the OEB reviewed commonality between the EMB-505 and the EMB-500 and established reduced in-aircraft and FFS training for both SP and MP operations for pilots qualified and current in the EMB-500.

Also evaluated were pilot qualification requirements when transitioning from SP to MP operations and vice versa.

1.3 Embraer-500/505 (Phenom 100/300) Evaluation as Variants

In August 2013 a joint ANAC/FAA/EASA operational evaluation was performed to assess the EMB-500 and the EMB-505 aircraft as variants for a single license endorsement. A T-2 test evaluation confirmed that the EMB-500 and EMB-505 aircraft are sufficiently alike in handling characteristics to permit assignment as variants.

An EMB-505 to EMB-500 differences course was evaluated successfully, as well as associated checking and currency requirements. The establishment of pilot qualification requirements for a difference course from the EMB-500 to the EMB-505 has not been concluded.

The OEB also considered the previously established reduced training requirements for the EMB-500 and the EMB-505, for pilots qualified and current in the EMB-505 and EMB-500, respectively. The OEB concluded that these provisions remained applicable under the framework for which these had been assessed, i.e. when operating the EMB-500 and EMB-505 as separate type of aircraft in compliance with applicable regulations.

The OEB also concluded that pilots who had previously completed reduced type rating training (as separate type of aircraft) for the EMB-500 or the EMB-505 could apply any credits established for the operation as variants when operating both the EMB-500 and the EMB-505, after completing one recurrent full license skill test in both the EMB-500 and EMB-505.

Furthermore, pilots who have previously completed full initial type rating training on both the EMB-500 and the EMB-505 could apply any credits established for the operation as variants when operating both the EMB-500 and the EMB-505 aircraft.

1.4 CPDLC Training

A CPDLC training module for pilots current and qualified on the EMB-500 or the EMB-505 was assessed in August 2013 in a joint evaluation by ANAC, FAA and EASA.

Whenever possible, CPDLC training should be integrated into the standard type rating or differences course so that CPDLC procedures are applied with their corresponding actions for aircraft operation (e.g. a CPDLC FL change is executed in the FFS/aircraft).

1.5 EMB-505 Garmin 3000 Upgrade

In August 2013 EASA also evaluated an upgrade of the EMB-505 from the Garmin 1000 to the Garmin 3000 avionics suite as described in this report.

1.6 EMB-500 TAWS

In August 2013 EASA also evaluated TAWS differences training for the EMB-500 as described in this report.

2. Aircraft Classification, Type Designation and Pilot License Endorsement

2.1 High Performance Aircraft (HPA) Classification

The EMB-500 and the EMB-505 are both certificated for SP operation but have similar performances, systems and navigation capabilities to those more usually associated with MP types of aeroplanes, and regularly operate within the same airspace.

With reference to Part-FCL, the EMB-500 and the EMB-505 are designated as High Performance Aircraft (HPA). Additional theoretical knowledge as described in Part-FCL, AMC1 FCL.720.A(b)(2)(i) must be provided to address the relevant aspects of operating at high speeds and altitudes, and the aircraft systems necessary for such operation. HPA training should include training for ACAS procedures, use of CPDLC, and operation in RVSM airspace, as applicable.

Part-FCL, FCL.720.A(c) and Appendix 5 of this report apply regarding experience requirements and prerequisites for type ratings for SP high performance complex aeroplanes.

2.2 Aircraft Type Designation and Pilot License Endorsement

With reference to Part-FCL, FCL.010 ('type of aircraft') and GM1 FCL.700, the EMB-500 and EMB-505 aircraft have been evaluated for aircraft type designation and license endorsement.

The EMB-500 and the EMB-505 aircraft have been assessed as variants, requiring Level D differences training (from the EMB-505 to the EMB-500). The license endorsement is established as "**EMB-500/505**".

Type Ratings List (Aeroplane) – Single Pilot – Multi-Engine Turbo-Jet (Land)

1 Manufacturer	2 Aeroplanes		3	4 Licence Endorsement
	Model	Name		
Embraer	EMB-500 EMB-505	Phenom 100 Phenom 300	(HPA)	EMB-500/505

Notes:

1. Differences training is valid from the EMB-505 to the EMB-500 only. Differences training from the EMB-500 to the EMB-505 has not been concluded.
2. Pilots who have previously completed reduced type rating training (as separate type of aircraft) for the EMB-500 or the EMB-505 may apply any credits established for the operation as variants when operating both the EMB-500 and the EMB-505, after completing one recurrent full license skill test in both the EMB-500 and EMB-505.

3. Description of the EMB-500 and the EMB-505

3.1 General

3.1.1 EMB-500

The EMB-500 was designed as a new member in the Embraer family. The EMB-500 is a low wing jet with a T-tail configuration, powered by two high bypass turbofan engines mounted on aft fuselage pylons. The structure is conventional, with a predominant aluminum-alloy fuselage and wing. The landing gear is retractable tricycle type, and both main and nose landing gear are single wheeled. The airplane features a pressurized cabin, 2 jet engines and an integrated avionics suite. The MTOM of the EMB-500 is 4750 kg (10.472 lbs.).

The minimum flight crew is one pilot (in the left pilot seat) plus additional equipment as specified in the Limitations Section of the EASA Approved Airplane Flight Manual or one pilot and one copilot. Approval for operation with a minimum crew of one pilot (in the left pilot seat) is based upon the cockpit equipment installation and arrangement evaluated during certification testing. No significant changes may be made to the installed cockpit equipment or arrangement (EFIS, autopilot, avionics, etc.), except as permitted by the approved MMEL, without prior approval from the responsible Aircraft Certification Office.

The maximum passenger capacity is seven passengers.

The maximum speeds are 275 KIAS (Vmo) or M 0.7 (Mmo) at a maximum pressure altitude of 41,000 ft.

The EMB-500 is certified in accordance with Part-23 requirements. Consequently, some safety enhancing equipment required on larger aircraft certified in accordance with Part-25, is not installed or only offered as optional equipment (e.g. TCAS). Operators are encouraged to install such equipment to enhance flight safety.

The maximum demonstrated Crosswind Component for a dry runway is 17Kts.

The minimum use height of the autopilot is 195 ft.

3.1.2 EMB-505

The EMB-505 was designed as a further development of the EMB-500, which was a new member in the Embraer family.

The EMB-505 is a low wing jet with a T-tail configuration, powered by two high bypass turbofan engines mounted on aft fuselage pylons. The structure is conventional, with a predominant aluminum-alloy fuselage and wing.

The minimum flight crew is one pilot (in the left pilot seat) plus additional equipment as specified in the Limitations Section of the EASA Approved Airplane Flight Manual or one pilot and one copilot.

Approval for operation with a minimum crew of one pilot (in the left pilot seat) is based upon the cockpit equipment installation and arrangement evaluated during certification testing. No significant changes may be made to the installed cockpit equipment or arrangement (EFIS, autopilot, avionics, etc.), except as permitted by the approved MMEL, without prior approval from the responsible Aircraft Certification Office.

The overall maximum passenger capacity in the passenger compartment is nine passengers. Ten passengers may be carried in single pilot configuration as notified in the AFM.

The airplane features a pressurized cabin, 2 jet engines and an integrated avionics suite.

The MTOM of the EMB-505 is 8150 kg (17.968 lbs.). The maximum speeds are 320 KIAS (Vmo) or M 0.78 (Mmo) at a maximum pressure altitude of 45,000 ft.

The maximum demonstrated Crosswind Component for landing is 28 Kts, for takeoff 25 kts.

Static take-off thrust application on ground is limited to cross-wind components up to 18 kt. Further limitations may apply in case of some malfunctions.

The minimum use height of the autopilot at landing is 195ft for normal ILS approaches and 220ft for single engine ILS approaches.

3.2 Landing Gear

The landing gear is retractable tricycle type, both main and nose landing gear are single wheeled. The aircraft may be operated on paved runways only. The EMB-500 landing gear is operated by a hydraulic system, which also keeps the main landing gear locked in the up position. The EMB-505 landing gear is electrically actuated and operated by the hydraulic system. The main landing gear is kept locked in the up position by mechanical locks.

The nose landing gear incorporates a mechanical steering system, which performs the airplane directional control on the ground.

The landing gear and brake system parameters and indications are displayed on both MFD synoptic pages.

The air/ground positioning system is composed by one weight-on-wheel (WOW) proximity switch installed on each main landing gear strut. These proximity switches, actuated by the airplane weight provide information to the other airplane systems whether the airplane is on ground or in flight.

3.3 Brakes

The main brake consists of a brake-by-wire system controlled by either the Pilot or Co-pilot via the rudder pedals. Brake inputs are sent to the Brake Control Unit (BCU). The BCU, which is

connected to the EMERGENCY BUS, receives all brake interface signals and controls the Shut-off Valve (SOV) and both Brake Control Valves (BCVs) for braking capability.

When the hydraulic system fails, the Emergency/Parking brake is available.

The brake system includes:

- Locked wheel protection;
- Antiskid protection;
- Automatic wheel braking (on the EMB-500);
- Touchdown protection;
- Emergency braking (on the EMB-500);
- Gear retract braking, built-in test (on the EMB-505)

3.4 Seating

The EMB-500 maximum passenger capacity is seven passengers.

The EMB-505 overall maximum passenger capacity in the passenger compartment is nine passengers. Ten passengers may be carried in single pilot configuration as notified in the AFM.

3.5 Wings

The EMB-500 has straight wings with a de-icing boots system providing ice protection for the leading edges. The EMB-505 wings are swept back with an anti-icing system, using controlled hot bleed air from the engines which provides ice protection for the leading edges.

3.6 Flight controls

The EMB-500 primary flight controls, elevators, ailerons and rudders are mechanically operated by control cables. Trim systems are installed for rudder, aileron and elevator and operate electrically. The Pitch trim has a backup system, which also operates electrically.

The EMB-505 primary flight controls, elevators, ailerons and rudders are mechanically operated by conventional mechanical means, such as control cables, bell cranks and push-pull rods. Electrical trim systems are installed for trimming in yaw, roll and pitch axes. Pitch trim is accomplished by moving the horizontal stabilizer. The pitch trim has a backup system, which also operates electrically.

The Automatic Flight Control System, a subsystem of the GARMIN PRODIGY (based on the GARMIN 1000 suite) avionics system, is a fully integrated flight control system. It includes a dual channel two-axis autopilot with automatic pitch trim control and a yaw damper.

The trailing edge flaps are electrically operated. There are 4 flap positions in the EMB-500: 0 - 1 - 2 - 3/Full (40 degrees) and 5 flap positions in the EMB-505: 0 - 1 - 2 - 3 - Full (40 degrees).

The EMB-505 is equipped with an electrically controlled and hydraulically operated Multi-Function spoiler system, providing the following functions:

- Roll Spoiler to provide more roll authority;
- Ground Spoiler to increase drag and dump lift during landing and rejected take off;
- In-Flight Speed Brake function to increase drag and dump lift during flight.

3.7 Safe Taxi System

The Safe Taxi system is a standard feature of the Garmin PRODIGY suite, but, at the time of the evaluation, was available for US aerodromes only. It projects the airplane's GPS position on the ground map and allows selection of Track Up.

3.8 Engines

The EMB-500 is equipped with two Pratt and Whitney PW617F-E medium by-pass ratio turbofan engines with a normal thrust rating of 1695 lbs. per engine up to 77° F. The EMB-505 is equipped with two Pratt and Whitney PW535-E medium by-pass ratio turbofan engines with a normal thrust rating of 3360lbs per engine.

An Automatic Thrust Reserve (ATR) system, when armed for take-off, increases the thrust on the operating engine in case of an engine failure in the takeoff phase of flight. The thrust reserve is also available on two engines, when the pilot positions the thrust levers to the MAX position.

3.9 Ignition system

The ignition system provides an electrical spark for fuel combustion during on ground engine starts, in flight starts, in flight auto-relights. The FADEC energizes one igniter for on ground engine starts and both igniters for in flight engine starts. Setting the ignition selector knob to ON position keeps both igniters energized.

3.10 Fuel system

The fuel system comprises two integral fuel tanks, one tank located in each wing.
Each wing tank incorporates:

- one collector tank
- one surge tank
- one main tank.

The collector tank (inboard section) keeps the fuel pumps submerged, ensuring a constant fuel flow to the respective engine.

A vent system is designed to ensure that the differential pressure between the tank and ambient air remains within structural limits and to prevent fuel spillage during flight manoeuvers, abrupt braking (EMB-500), and during an event of fuel overfilling (EMB-505).

Lateral fuel balance in the EMB-500 is maintained by gravity through the transfer valve in event of asymmetry. Lateral fuel balance in the EMB-505 is maintained by a cross feed system through the cross feed valve and electrical wing tank pumps in event of asymmetry.

One water drain valve collects water by gravity in each tank.

3.11 Instrument panel and console

The GARMIN PRODIGY-1000 EFIS and avionics package features one primary flight display and the associated controls on each side of the cockpit, one multi-function display and controls and one FMS control panel in the centre panel. In addition, the EMB-505 also has an optional GARMIN 3000 avionics package.

3.12 Electrical system

The EMB-500 electrical power system comprises:

- two Starter Generators (SGs), rated at 325 A and 28 VDC;
- two lead-acid 24 VDC, 27 Ah batteries

The EMB-505 Electrical Power Generation and Distribution System (EPGDS) comprises:

- two Starter Generators (SGs), rated at 330 A (on the ground), 390 A (in the air) and 28 VDC;
- two lead-acid 24 VDC batteries, #1 battery 34 Ah, #2 battery 42 Ah, allowing 2 extra start attempts

The starter generators are used as a primary source of the DC electrical system supplying power to their respective DC BUS.

The batteries power up the airplane and as a backup for emergency use for a maximum of 45 minutes. In this condition, batteries 1 and 2 are used to provide power to all buses, except the SHED BUS(ES). Battery 2 also supplies the CENTRAL BUS during engines starting.

On ground, a DC ground power unit (DC GPU) can be connected to the airplane supplying power to the CENTRAL BUS.

AC power is available for passenger convenience items.

3.13 Approach Profiles and Speed

The approach profiles are similar for the EMB-500 and EMB-505 aircraft.

Approach speeds are dependent upon aircraft mass. Landing mass for the EMB-505 is greater than for the EMB-505. Nevertheless, critical speeds are presented to the pilot in a standardized manner for both aircraft.

3.14 Aircraft Approach Category

With reference to Part-CAT, CAT.OP.MPA.320(b) the approach category for the EMB-500 and the EMB-505 aircraft is as follows:

Aircraft	Landing Flap	Category
EMB-500	3	B
EMB-505	3	B

The categories are based on the approach speed provided by the manufacturer and need to be reconsidered if operators increase the approach speed. When flight crews are operating both aircraft, the use of the highest approach category for both aircraft should be considered.

3.15 Maximum Altitude for SP Operations

The aircraft volume is very small and a decompression will lead to a fast reduction of pressure in the cabin and cockpit. When pressurization is lost, the time of useful consciousness without additional emergency oxygen decreases rapidly with increasing operating altitudes.

Therefore, operators should establish a maximum altitude for SP operations when not permanently wearing the oxygen mask.

3.16 AFM reference

The AFM makes reference to the GARMIN Cockpit Reference Guide for the EMBRAER PRODIGY equipment. The majority of limitations, found in the Cockpit Reference Guide are also included in the aircraft AFM limitations section.

The Cockpit Reference Guide should be used for specific training and considering this guide and its contents to be an integral part of the Operational Documentation to be used and followed in EMB-500 or EMB-505 operations.

3.17 Abnormal and Emergency Procedures

The Emergency / Abnormal procedures in the manufacturer's QRH and in the POH and AFM, provide guidance to operators and should be followed as closely as possible.

Some more complex situations may require operators to differentiate between SP and MP operations. Two separate QRH's should be developed for SP and MP operations.

Operators should ensure that appropriate Standard Operating Procedures (SOP) and realistically achievable Normal, Abnormal and Emergency procedures are available for SP, as well as for MP operations.

The SOP should include clear instructions on the termination of a flight in case of an emergency / abnormal situation during SP operations, taking into account the increase of workload for the single pilot.

3.18 Multiple EICAS messages.

During some abnormal/emergency situations multiple CAS messages will appear. Especially in those situations where multiple messages, warnings and/or annunciations are present, a single message could be left unnoticed. Training should be enhanced to ensure pilots are aware of this potential problem area.

While the manufacturer provides guidance and assistance, operators are expected to determine optimum procedures for multiple failures and messages.

3.19 QRH

A paper version of the QRH needs to be readily available in the cockpit as the primary reference in emergency and non-normal situations.

3.20 ECL

An ECL is available as back-up reference for the pilot, the display of the ECL uses the same area of the MFD as the MAP, the WX radar and the system synoptic functions. The ECL was found easy to operate and useful in reducing the workload, especially during SP operations.

Effective management of the ECL is crucial. Therefore, the use of the ECL should be incorporated in the type rating training course.

At the time of the evaluation, the ECL was only available in a desk top trainer. The integrity between the ECL and QRH/AFM content could not be verified. However, EMBRAER has shown procedures to insure compliance, as well as a revision system and quality assessment.

3.21 Autopilot

Part-ORO, ORO.FC.202 contains provisions for SP operations under IFR or at night which include pilot experience and currency, conversion and recurrent training, as well as checking requirements.

In accordance with Part-CAT, CAT.IDE.A.135, an autopilot with at least altitude hold and heading mode is required when operating the EMB-500 or the EMB-505 under IFR in SP operations. If, during flight, the autopilot fails and/or is no longer available the flight should be terminated. This requires an appropriate and clear instruction in the SOP’s.

3.22 Airborne Weather Radar

In accordance with Part-CAT, CAT.IDE.A.160 and AMC1 CAT.IDE.A.160, an airborne weather radar is required when operating the EMB-500 or the EMB-505 at night or in IMC in areas where thunderstorms or other potentially hazardous weather conditions, regarded as detectable with airborne weather detecting equipment, may be expected to exist along the route.

3.23 Head-Set & Chart Holder

For SP operations, a head-set and chart holder should be carried for “hands free” communication and easy reference to documentation.

3.24 MMEL

An evaluation of an EASA MMEL was performed during this assessment. SP operations require specific considerations of some items, such as:

- A serviceable auto pilot is mandatory for dispatch of a SP operation
- Automatic pressurization control must be available for SP operations
- Weather radar must be available for IFR flights at night and to and along routes with detectable adverse weather conditions.

4. Master Differences Requirements (MDR)

4.1 MDR Tables

MDR tables for the EMB-500 and the EMB-505 aircraft are shown below. Definitions of the various levels for Training / Checking / Currency are those used in the CPD.

Master Differences Requirements (MDR) Table				
Aircraft Type Designation: EMB-500/505		**FROM AIRPLANE**		
TO AIRPLANE		**EMB-500 (Phenom 100)**	**EMB-505 (Phenom 300) with Garmin 1000**	**EMB-505 (Phenom 300) with Garmin 3000**
	EMB-500 (Phenom 100)	**n/a**	**D / C[2] / C[3]**	4)
	EMB-505 (Phenom 300) with Garmin 1000	**1)**	**n/a**	4)
	EMB-505 (Phenom 300) with Garmin 3000	**1)**	**C / C / C**	**n/a**

1) The EMB-500 to EMB-505 differences training has not been concluded.
2) A partial skill test is required as described in this report.
3) Currency requirements are described in this report.
4) An evaluation of GARMIN 3000 to GARMIN 1000 equipped aircraft has not been performed.

5. Operator Differences Requirements (ODR)

ODR tables are used to show an operator's compliance method. Embraer generic ODR tables concerning differences between the EMB-505 and the EMB-500 aircraft have been evaluated by EASA. These ODR tables are Embraer generic and therefore may not include items that are applicable to particular operators. The ODR tables assume that pilots are current and qualified in operating the base aircraft.

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

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

6. Specifications for Training

6.1 Pilot prerequisites and previous experience

Part-FCL, FCL.720.A(c) and Appendix 5 of this report apply regarding experience requirements and prerequisites for type ratings for SP high performance complex aeroplanes.

SP operations of high-performance complex aircraft is challenging and requires an appropriate level of previous experience, knowledge and skill. Similarly, for the conduct of MP operations, pilots should meet the prerequisite requirements similar to operations on aeroplanes certified for a minimum of 2 pilots.

Consequently, specific pilot prerequisites and training requirements have been established in accordance with Part-FCL, FCL.720.A and are contained in Appendix 5 of this report.

The pilot training referenced in this report assumes familiarity with EFIS, FMS and integrated avionics. Pilots without any previous experience in such systems should receive additional training prior to entry into the training programmes described in this report.

6.2 Observer Pilot

The right-hand seat should be occupied by a candidate pilot when acting as observer during the training, as it provides the best view.

6.3 Practical Training Devices (FSTDs, OTDs, Aircraft)

Flight training should be performed in a qualified FFS (Level C or D) which allows practicing all critical emergency procedures, varying environmental circumstances, and providing an opportunity to exercise MCC procedures.

If in-aircraft training is unavoidable, complementary training in an FSTD should be provided to include any abnormal / emergency procedures which could not be trained on the airplane. The complementary training on emergency / abnormal procedures should be completed as part of the type rating training course. In exceptional cases (e.g. the start-up of a new type when no flight training device is available) this training may be performed at a later stage, but no later, than within 12 months after completion of the initial training. In this case, pilots must meet certain conditions of prerequisite experience, including previous experience of operating high performance, turbine-powered, pressurized aircraft to ensure a basic level of knowledge and experience in handling specific emergency / abnormal situations.

In-aircraft training also requires additional training of MCC procedures for MP operations, if applicable.

FSTD's (such as FFS and FTD), as well as OTD's are defined in CS-FSTD(A) and must be qualified / assessed by the Competent Authority as being suitable for the proposed training.

6.4 EMB-500 and EMB-505 Initial Type Rating Training

Initial type rating training for the EMB-500 and for the EMB-505 was evaluated by EASA and found in compliance with JAR-FCL 1, Subpart F, AMC 1.261 (c) (2).

Training details are shown at Appendix 1.

Pilots who have completed full initial type rating training on both the EMB-500 and on the EMB-505 may operate the EMB-500 and the EMB-505 as variants and may apply the credits established in this report for the operation as variants, when operating both the EMB-500 and the EMB-505.

6.5 EMB-500 Initial Type Rating Training for pilots qualified and current on the EMB-505 and EMB-505 Initial Type Rating Training for pilots qualified and current on the EMB-500

Reduced initial type rating training for the EMB-500 based on credit for commonality with the EMB-505 (with GARMIN 1000) and for the EMB-505 (with GARMIN 1000) based on credit for

commonality with the EMB-500, was evaluated in the context of operating both aircraft as separate types.

Training details are shown at Appendix 2.

Consequently, following the EMB-500 reduced initial type rating training for pilots qualified and current on the EMB-505 or the EMB-505 reduced initial type rating training for pilots qualified and current on the EMB-500, pilots must comply with the applicable regulations for the operation of the EMB-500 and the EMB-505 as separate types (i.e. separate recent experience requirements, separate training and checking, etc.) when operating both aircraft.

After completing one recurrent full license skill test in both the EMB-500 and the EMB-505, pilots may operate the EMB-500 and the EMB-505 as variants and apply the credits established in this report for the operation as variants, when operating both the EMB-500 and the EMB-505.

6.6 EMB-500 and EMB-505 Transition Training MP to SP (and vice versa)

Specific training should be followed when transitioning from MP to SP or from SP to MP operations. The training should consist of theoretical and flight training.

Appendix 3 contains training details for pilots when transitioning from MP to SP or from SP to MP operations on the EMB-500 or the EMB-505.

6.7 EMB-505 to EMB-500 Differences Training

EMBRAER differences training from the EMB-505 to the EMB-500 for the operation as variants was evaluated for pilots who are qualified and current in the EMB-505 with GARMIN 1000. Difference levels for training / checking / currency are described in the MDR tables of this report.

Training details are shown at Appendix 4.

Pilots who have completed EMB-505 to EMB-500 Differences Training may operate the EMB-500 and the EMB-505 as variants and may apply the credits established in this report for the operation as variants, when operating both the EMB-500 and the EMB-505.

6.8 EMB-500 to EMB-505 Differences Training

Differences training from the EMB-500 to the EMB-505 for pilots qualified and current in the EMB-500 has not been concluded.

6.9 CPDLC Training

A CPDLC training module for pilots current and qualified on the EMB-500 or the EMB-505 was assessed in August 2013 in a joint evaluation by ANAC, FAA and EASA.

With reference to the CPD difference levels were identified as B / B / A for training, checking and currency.

Whenever possible, CPDLC training should be integrated into the standard type rating or differences course so that CPDLC procedures are applied with their corresponding actions for aircraft operation (e.g. a CPDLC FL change is executed in the FFS / aircraft).

EASA further considers that pilots should use CPDLC functionalities either during normal operations, training or checking within a 12 month period.

6.10 EMB-505 Garmin 1000 to GARMIN 3000 Differences Training

The training from the EMB-505 equipped with Garmin 1000 to the EMB-505 equipped with GARMIN 3000 was assessed at Level C / C / C for training, checking and currency.

The training should consist of a minimum of 3 hours instructor-led theoretical training, followed by 4 hours practical training of GARMIN 3000 systems in normal and abnormal situations. The practical training requires the use of a system device, such as a part-task trainer or similar.

A systems check is required after completion of the differences training which must consist of a written test and practical demonstration of competence. The practical demonstration of competence may be performed during the LIFUS / SOE flights.

Following differences training, LIFUS / SOE consisting of a minimum of 2 sectors on the EMB-505 GARMIN 3000 equipped aircraft is required.

With regard to currency, pilots operating both the EMB-505 GARMIN 3000 equipped aircraft and any other EMB-500/505 GARMIN 1000 equipped variant must perform a minimum of 1 sector within 90 days on either GARMIN version aircraft.

6.11 EMB-500 TAWS-B to TAWS-A Training

EMB-500 TAWS-B to TAWS-A training has been evaluated as Level B / B / A for training, checking and currency. This differences training consists of a one hour instructor-led theoretical training followed by a 20 question knowledge exam.

6.12 Low Visibility Operations

The operational evaluations were limited to Approach Category I operations and standard take-off minima. Operations to lower take-off or approach minima require further assessment.

Part-CAT, AMC5 CAT.OP.MPA.110(8) contains aerodrome operating minima for SP operations.

6.13 Training Areas of Special Emphasis (TASE)

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

The theoretical and practical training must include the relevant TASE as contained in this report.

6.13.1 TASE for EMB-500 and for EMB-505 initial type rating training

The following aircraft systems or procedures have been identified as training areas of special emphasis for EMB-500 and for EMB-505 initial type rating training for SP and MP operations, as applicable.

Theoretical training:

- High altitude physiology and use of oxygen mask
- High Altitude flight domain
- SP / MP resource management, as applicable
- Operation, limitations and failures of the GARMIN Integrated Avionics System
- Performance calculations, including wet / contaminated runways – OPERA
- Operations to / from High Altitude airports
- mass & balance calculations, including use of balance sheet, based on Index
- Brake system, brake system controller, and emergency brake system
- Operations in icing conditions
- Use of the QRH and the ECL

Practical training:

- Use and setup of GARMIN integrated avionics, PFD and MFD, including display selections and (multiple) overlays of System Synoptic, Map, Weather Radar, NAV and ECL
- Moving Map displays
- Use of Flight Director and Autopilot, monitoring of modes
- MCC procedures, if applicable
- Operation of TCAS, if applicable;
- “Golden” failures, which cause secondary failures and CAS messages
- Loss of cabin pressure control, use of oxygen masks and Emergency Descent procedures
- Unreliable airspeed indication
- ILS approaches, including intercepting the Localizer from a GPS lateral path (not from vectors, flown in the HDG mode), switching from GPS to LOC, availability of Glide Slope information

- Instrument flying on standby instruments
- Use of Backup trim system
- Operation of ventral rudder system (EMB-505);
- Simultaneous Pitch Trim NML and BKP failure
- Fuel leaks
- Fuel X feed, including X feed failure
- Smoke procedures, including smoke removal
- L/G WOW system failure and relation to other systems
- Emergency Gear system
- Brake and Emergency Brake system (incl. system controller, artificial feedback)
- Stall Warning and Stick Pusher system, close to stall speed and in relation with de-icing system
- Approach and Landing with reduced flap settings
- Engine Fire on the ground
- Emergency Evacuation
- Use of the QRH and the ECL

Establishing early confidence in manually flying the aircraft, converting from manual to automatic flight mode and back is equally important due to heavy reliance on the Automatic Flight Control System (AFCS).

In the event of a flight path deviation due to input error or system malfunction, the flight crew must be able to comfortably transition from automatic to manual mode and back in an orderly fashion.

6.13.2 TASE for EMB-500 Initial Type Rating Training for pilots qualified and current on the EMB-505, for EMB-505 Initial Type Rating Training for pilots qualified and current on the EMB-500, and for EMB-505 to EMB-500 Differences Training

The following aircraft systems or procedures have been identified as training areas of special emphasis for EMB-500 Initial Type Rating Training for pilots qualified and current on the EMB-505 (with GARMIN 1000), for EMB-505 (with GARMIN 1000) Initial Type Rating Training for pilots qualified and current on the EMB-500, and for EMB-505 to EMB-500 Differences Training, for both SP and MP operations, as applicable.

Theoretical training:

- High altitude physiology and use of oxygen mask
- High Altitude flight domain
- SP / MP resource management, as applicable
- Operation, limitations and failures of the GARMIN Integrated Avionics System
- Performance calculations, including wet / contaminated runways – OPERA

- Operations to / from High Altitude airports
- mass & balance calculations, including use of balance sheet, based on Index
- Brake system, brake system controller, and emergency brake system
- Operations in icing conditions
- Use of the QRH and the ECL

Practical training:

- Use and setup of GARMIN integrated avionics, PFD and MFD, including display selections and (multiple) overlays of System Synoptic, Map, Weather Radar, NAV and ECL
- Moving Map displays
- Use of Flight Director and Autopilot, monitoring of modes
- MCC procedures, if applicable
- Operation of TCAS, if applicable;
- “Golden” failures, which cause secondary failures and CAS messages
- Loss of cabin pressure control, use of oxygen masks and Emergency Descent procedures
- Unreliable airspeed indication
- ILS approaches, including intercepting the Localizer from a GPS lateral path (not from vectors, flown in the HDG mode), switching from GPS to LOC, availability of Glide Slope information
- Instrument flying on standby instruments
- Use of Backup trim system
- Operation of ventral rudder system (EMB-505);
- Simultaneous Pitch Trim NML and BKP failure
- Fuel leaks
- Fuel X feed, including X feed failure
- Smoke procedures, including smoke removal
- L/G WOW system failure and relation to other systems
- Emergency Gear system
- Brake and Emergency Brake system (incl. system controller, artificial feedback)
- Stall Warning and Stick Pusher system, close to stall speed and in relation with de-icing system
- Approach and Landing with reduced flap settings
- Engine Fire on the ground
- Emergency Evacuation
- Use of the QRH and the ECL

6.13.3 TASE for EMB-505 GARMIN 1000 to EMB-505 GARMIN 3000 differences training

The following items have been identified as training areas of special emphasis for training from the EMB-505 equipped with Garmin 1000 to the EMB-505 equipped with GARMIN 3000:

- Cockpit preparation, flow pattern and panels;
- Loss of Garmin Touch Screens;
- Electrical and Reversionary Emergency Procedures;
- Engine Fire;
- Alternate Gear Extension.

6.14 Special Events Training

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

- recovery from unusual attitudes;
- handling qualities and procedures during recovery from an upset condition (e.g. wake vortex encounter, loss of control incident);
- high altitude high and slow speed buffet margins and flight characteristics;
- Controlled Flight Into Terrain (CFIT), TCAS, EGPWS (emphasis on avoidance and escape manoeuvres, altitude awareness, TCAS / EGPWS warnings, situational awareness and crew co-ordination, as appropriate);
- wind shear and predictive wind shear escape manoeuvres;
- operation of aircraft in icing environments including super cooled liquid droplet (SLD) events (depending on FFS software); and
- manual flight with minimum use of automation (e.g. raw data, without FD).

6.15 Alternative Training and Qualification Programme (ATQP)

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

6.16 Recurrent Training

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

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

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

The use of the QRH and the ECL should be trained at regular intervals to maintain a level of proficiency in finding the relevant information and procedure(s) in a timely manner.

Recurrent training should be alternated between the EMB-500 and the EMB-505, when operated as variants. Recurrent training performed on the EMB-500 or the EMB-505 aircraft is valid for the both aircraft when operated as variants, provided that the differences are addressed.

7. Specifications for Checking

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

The training programmes outlined in this report do not include the time needed for checking.

If the training and skill test have been performed in MP operation only, the type rating should be restricted to MP operations. Pilots not meeting the prerequisites for operations as PIC as described in Appendix 5, should receive a license endorsement “Co-pilot only”.

7.1 Skill Test following EMB-500 or EMB-505 initial type rating training (SP or MP)

A two-hour skill test as PF is required following any initial type rating training on either the EMB-500 or the EMB-505.

In the case of MP operations, the skill test must also include 2 hours as PNF which may be reduced to 1 hour as PNF for pilots previously qualified and current in the EMB-500 or the EMB-505.

The skill test provisions for MP aircraft as contained in Part-FCL, Appendix 9 should be used as far as practicable, to address the aircraft complexity, capabilities and characteristics of the EMB-500 or the EMB-505, respectively.

7.2 Skill test following EMB-505 to EMB-500 Differences Training

In accordance with Part-FCL, Appendix 9, A. 5. credit is given for skill test items common to the EMB-500 and EMB-505 aircraft, following EMB-505 to EMB-500 Differences Training.

As a minimum, competence must be demonstrated in the following items during a partial skill test, following EMB-505 to EMB-500 differences training:

- Normal take-off;
- Stalls;
- Engine failure at or close to V1;
- One engine inoperative instrument approach;
- One engine inoperative missed approach;
- Missed approach on 2 engines;
- Circling approach;
- No flap approach and landing.

7.3 EMB-500 Skill Test following transition training (SP to MP and vice versa)

The skill test following transition training should be based on the skill test requirements for the initial type rating training as described in paragraph 7.1 with emphasis on the SP or MP tasks, as applicable.

7.4 Recurrent Checking

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

Low Visibility Operations (LVO) recurrent training and checking should be in accordance with AMC1 SPA.LVO.120 (f).

The use of the QRH and the ECL should be checked at regular intervals to maintain a level of proficiency in finding the relevant information and procedure(s) in a timely manner.

When operating the EMB-500 and the EMB-505 as variants, a proficiency check conducted on one variant is valid for both variants, provided that the differences are addressed. Recurrent checking should be alternated between the EMB-500 and the EMB-505 when operating both aircraft as variants.

7.5 Line Checks

With reference to Part-ORO, AMC1 ORO.FC.240(a)(4)(vii), a line check performed on either the EMB-500 or the EMB-505 is valid for both when operated as variants.

8. Recent Experience and Currency

8.1 Recent Experience

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

In accordance with Part FCL, FCL.060(b)(4) and with Part-ORO, ORO.FC.140(a), the following credits are defined for recent experience requirements when operating both the EMB-500 and the EMB-505 aircraft.

Recent experience requirements for operation on the EMB-500 and EMB-505				
	EMB-500 and EMB-505 operated as separate aircraft types [1)]		**EMB-500 and EMB-505 operated as variants [2)]**	
	EMB-500 (Phenom 100)	**EMB-505 (Phenom 300)**	**EMB-500 (Phenom 100)**	**EMB-505 (Phenom 300)**
EMB-500 (Phenom 100)	---	no credit	---	credit of 2 take-offs and landings
EMB-505 (Phenom 300)	no credit	---	credit of 2 take-offs and landings	---

[1)] Applicable to pilots who have completed reduced type rating training (as separate type of aircraft) for the EMB-500 or the EMB-505, prior to completing one recurrent full license skill test in both the EMB-500 and EMB-505.

[2)] Applicable to pilots which have completed either:

- differences training (as variants) from the EMB-505 to the EMB-500; or
- full initial type rating training on both aircraft; or
- reduced type rating training (as separate type of aircraft) for the EMB-500 or the EMB-505, after completing one recurrent full license skill test in both the EMB-500 and EMB-505.

8.2 Currency

Flight crews operating both the EMB-500 and the EMB-505 aircraft as variants must complete two sectors (as PF) on each variant within the previous 90 days.

Pilots operating both the EMB-505 GARMIN 3000 equipped aircraft and any other EMB-500/505 GARMIN 1000 equipped variant must perform a minimum of 1 sector within 180 days on either GARMIN version aircraft.

9. Line Flying Under Supervision (LIFUS) / Supervised Operating Experience (SOE) / Familiarization Flights

LIFUS should be performed in accordance with Part-ORO, ORO.FC.220 and AMC1 ORO.FC.220(e). Furthermore, GM1 ORO.FC.220(d) provides guidelines for operators to use when establishing their individual requirements. Where there is a change of operating conditions or route structure this should be taken into account and may need the addition of sectors to cover these elements.

Supervised Operating Experience (SOE) may be established in accordance with Part-FCL, FCL.720.A (g) through the operational suitability evaluation. SOE is performed under the supervision of a Class Rating Instructor (CRI). The flight hours under supervision shall be entered in the pilot's logbook or equivalent record and signed by the instructor. The limitation shall be removed when the pilot demonstrates that the required hours of flight under supervision have been completed.

9.1 EMB-500 Supervised Operating Experience (SOE)

In accordance with Part-FCL, FCL.720.A (g) the exercise of the privileges of the EMB-500 or the EMB-505 type rating is initially limited to flight under the supervision of a Class Rating Instructor (CRI). The flight hours under supervision shall be entered in the pilot's logbook or equivalent record and signed by the instructor. The limitation shall be removed when the pilot demonstrates that the hours of flight under supervision which are contained in Appendix 5 of this report have been completed.

9.2 EMB-500 Line Flying under Supervision (LIFUS)

SOE may be replaced by an equal number of flight hours of LIFUS (as PF) when engaged in commercial air transport operations.

9.3 LIFUS / SOE following differences training from the EMB-505 to the EMB-500 for the operation as variants

In the case of pilots transitioning from the EMB-505 the EMB-500 a minimum of 4 sectors LIFUS / SOE is required.

9.4 LIFUS / SOE following differences training from the EMB-505 GARMIN 1000 equipped aircraft to the EMB-505 GARMIN 3000 equipped variant

LIFUS / SOE consisting of a minimum of 2 sectors flown on the EMB-505 GARMIN 3000 equipped aircraft is required, following differences training from the EMB-505 GARMIN 1000 equipped aircraft to the EMB-505 GARMIN 3000 equipped variant.

10. Specification for operations on more than one type or variant

10.1 Prerequisites

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

10.2 Recurrent Training and Checking

Recurrent training and checking is addressed in Part-ORO, specifically in ORO.FC.130, ORO.FC.220, ORO.FC.230, AMC1 ORO.FC.230, GM1 ORO.FC.230, ORO.FC.240, and AMC1 ORO.FC.240. Operators should consider additional training for pilots who have had only limited exposure and/or who do not any longer fulfil the currency requirements.

10.3 Operation of the EMB-500 and EMB-505 as variants

In accordance with AMC1 ORO.FC.240(a)(4)(vii), the OEB has determined that, when operating the EMB-500 and the EMB-505 as variants:

- recurrent training and checking on either aircraft is valid for both variants operated, provided that the differences between the variants are addressed; and
- recurrent training and proficiency checking should be alternated between the EMB-500 and the EMB-505, as applicable.

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

Embraer provided a compliance checklist against the equipment requirements in EU-OPS, Subparts K and L for the EMB-500 and the EMB-505. As no production aircraft were available at the time of the evaluation, a verification of compliance was not performed.

CAT.IDE.A.120 requires equipment to clear a portion of the windshield. As windshield wipers are not installed in the EMB-500 and the EMB-505, as an equivalent means a rain repellent polymer coating is applied to the windscreen to meet AMC1 CAT.IDE.A.120. This coating has a limited lifetime, depending on the operational circumstances.

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

12. Electronic Flight Bag

The EFB elements of the GARMIN 1000 were evaluated on the EMB-500 and the EMB-505 using JAR-OPS Temporary Guidance Leaflet (TGL) 36 as the applicable reference at the time of the evaluation. Under that framework, the GARMIN 1000 suite may be considered to be a Class 3 EFB. The installed software applications qualify as Type B, as well as Type C.

The EFB features, most of them offered as “off-the-shelve” additions to the basic GARMIN suite, were certified on a “No Credit - No Hazard” basis. The evaluation during the OEB process was performed with a similar notion.

12.1 Airport Moving Map (AMM)

Caution must be exercised when using the aircraft’s own position, based on GPS calculations, on the AMM (i.e. during taxi). Due to charting inaccuracy issues, the own-ship position displayed on the ground can be significantly incorrect and the risks associated with the use of the own-ship position on the ground during Low Visibility Operations should be emphasised during pilot training.

The published paper maps must be readily available for use at all times.

12.2 Synthetic Visual System

A synthetic visual system combines underlying terrain data, shared with the TAWS, with the airplane’s own position from the GPS. A 3D picture of the underlying terrain, including obstacles, runways and large bodies of water is presented on the PFD.

This system is a valuable tool for situational awareness, but should not be used for navigational purposes. The limitations of this system must be especially emphasized during training.

12.3 FliteChart System

A FliteChart system is provided by GARMIN, but not available outside the USA.

12.4 Chartview System

The Chartview system is an electronic version of Jeppesen Departure, Arrival, Approach and Ground charts which includes a projection of the aircraft’s position. Charts are fixed in North Up, which is not always the best option.

Appendix 1

EMB-500 Initial Type Rating Training

or

EMB-505 Initial Type Rating Training

The following syllabus is considered to be the minimum for the initial type rating training for the EMB-500 or the EMB-505, respectively.

For MP operations CRM and MCC aspects should be incorporated throughout the training program, starting from the first IPT sessions during ground school.

The theoretical and practical training must include the relevant TASE as contained in this report.

1. Theoretical Training

1.1 Ground School – Web Based Training (16 hrs. total):

The web-based training may be performed outside an ATO and should address:

- system presentations in CBT format;
- learning module for GARMIN 1000. Computer application and adequate explanation;
- knowledge level written test (open book) to be performed on-line, pass mark 75%, before starting ground school.

1.2 Ground School - Class Room (6 days / 48 hrs. total)

The ground school is performed at an ATO and should include:

- Pre-entry test, closed book, with a pre-determined pass mark, at the start of the ground school to verify adequate level of aircraft system knowledge;
- Instructor-led classroom presentations of aircraft systems, including normal, abnormal and emergency procedures, as well as the GARMIN 1000 Integrated Avionics System;
- Classroom presentations on aircraft and system limitations;
- Classroom presentations on mass & balance and performance;
- systems integration training in fixed base simulator to support classroom presentations (12 hrs. per pilot);
- written test, scheduled on the last day of ground school, consisting of 100 questions (multiple choice answers) and a pass mark of 75%, to be completed prior to flight training.

1.3 Pilots with low experience

Furthermore, pilots with low experience should receive specific and detailed briefings to prepare for practical training. These briefings should include a description of the:

- FD symbols (single cue, cross bars);
- AP/FD modes, emphasizing the role and importance of FMA monitoring;
- map displays (including range selection and north up or track up);
- NAV set up and the use of primary source information;
- differences between European and training (USA - Brazil) operational theatre(s), including common R/T practices, as applicable;
- limitations of the use of non-certified equipment/features;
- standardization of before take-off and before approach briefings;
- expected normal and emergency communications during the type rating training.

2. Practical Training

2.1 Training in FFS (Level C or D)

The flight training should include:

- Normal Manoeuvres / procedures, aircraft handling, and navigation;
- Abnormal / Emergency manoeuvres / procedures, abnormal / emergency system operation;
- Landings;
- Wind shear training;
- Low visibility ground operations and take-offs, as required.

For MP operations, the flight training program should consist of a minimum of 32 hours, 16 hours of which should be flight training as PF in an FFS (Level C or D), while for the remaining hours an FTD or OTD may be used.

For SP operations, the flight training program should consist of a minimum of 16 hours as PF in an FFS (Level C or D)

2.1.2 Training in-aircraft

In-aircraft flight training should be performed in exceptional circumstances only. The flight training program should include:

- Normal take-off;
- Stalls;
- Engine failure at or close to V1;
- One engine inoperative instrument approach;
- One engine inoperative missed approach;
- Missed approach on 2 engines;
- Circling approach;
- No flap approach and landing;
- One engine inoperative landing;
- Normal landing;
- Abnormal / Emergency manoeuvres / procedures, and abnormal / emergency system operation, as far as safely possible during in-aircraft training.

For MP operations, the flight training program should consist of a minimum of 12 hours flight time in the aircraft.

For SP operations, the flight training program should consist of a minimum of 6 x 2 hours flight time as PF in the aircraft.

In-aircraft training should be complemented by a minimum of 4 hours FSTD training to proficiency, to include selected Emergency / Abnormal procedures, which cannot be safely performed in the aircraft.

Appendix 2

EMB-500 Initial Type Rating Training for pilots qualified and current on the EMB-505

or

EMB-505 Initial Type Rating Training for pilots qualified and current on the EMB-500

The following syllabus is considered to be the minimum for the initial type rating training on the EMB-500 for pilots current and qualified on the EMB-505, or for the initial type rating training on the EMB-505 for pilots current and qualified on the EMB-500.

For MP operations CRM and MCC aspects should be incorporated throughout the training program, starting from the first IPT sessions during ground school.

The theoretical and practical training must include the relevant TASE as contained in this report.

1. Theoretical Training

1.1 Ground School – Web Based Training (16 hrs. total):

The web-based training may be performed outside an ATO and should address:

- system presentations in CBT format;
- knowledge level written test (open book) to be performed on-line, pass mark 75%, before starting ground school.

1.2 Ground School - Class Room (1 day / 8 hrs. total)

The ground school is performed at an ATO and should include:

- pre-entry test, closed book, with a pre-determined pass mark, at the start of the ground school to verify adequate level of aircraft system knowledge;
- instructor-led classroom presentations of differences in
  - aircraft systems, including normal, abnormal and emergency procedures;
  - aircraft and system limitations;
  - mass & balance and performance;
- Written Test (scheduled on last day), 100 questions, multiple choice answers, pass mark 75%, to be completed prior to flight training.

2. Practical Training

For pilots qualified and current on the EMB-500 or the EMB-505, respectively a reduced practical training programme may be applied as follows.

2.1 Training in FFS (Level C or D)

The flight training should concentrate on the differences between the EMB-500 and the EMB-505 aircraft and should include:

- Normal Take off;
- Stalls;
- Engine failure at or close to V1;
- One engine inoperative instrument approaches;
- One engine inoperative missed approach;
- Missed approach on 2 engines;
- Circling approach;
- No flap approach and landing;
- One engine inoperative landing;
- Abnormal / Emergency manoeuvres / procedures, and abnormal / emergency system operations.

For MP operations, the flight training program should consist of a minimum of 4 hours, 2 hours of which should be flight training as PF in an FFS (level C or D), while for the remaining hours an FTD or OTD may be used.

For SP operations, the flight training program should consist of a minimum of 2 hours as PF in an FFS (Level C or D).

2.2 Training in-aircraft

In-aircraft flight training should be performed in exceptional circumstances only. The flight training should consist of a minimum of 2 hours flight time (as PF) in the aircraft, concentrating on the differences between the EMB-500 and the EMB-505, and should include:

- Normal take-off;
- Stalls;
- Engine failure at or close to V1;
- One engine inoperative instrument approach;
- One engine inoperative missed approach;
- Missed approach on 2 engines;
- Circling approach;
- No flap approach and landing;

- One engine inoperative landing;
- Normal landing;
- Abnormal / Emergency manoeuvres / procedures, abnormal / emergency system operations, as far as safely possible during in-aircraft training.

In-aircraft training should be complemented by a minimum of 2 hours FSTD training to proficiency, to include selected Emergency / Abnormal procedures, which are specific to the EMB-500 or EMB-505, as applicable, and which cannot be safely performed in the aircraft.

Appendix 3

EMB-500 or EMB-505 Transition Training: MP to SP (and vice versa)

The following syllabus contains a minimum training for pilots when transitioning from MP to SP or from SP to MP operations on the EMB-500 or on the EMB-505.

1. MP to SP Transition

The theoretical knowledge instruction shall be conducted by an authorized instructor holding the appropriate type / class rating or any instructor having appropriate experience in aviation and knowledge of the aircraft concerned, e.g. flight engineer, maintenance engineer or flight operations officer and shall cover the applicable syllabus, as appropriate.

1.1 Theoretical Training (4 hours)

The transition course should start with theoretical training to address the following subjects:

- Single Pilot psychology, decision making, communications and limitations
- Single Pilot task, resource and workload management and personal organization
- Single Pilot operation and management of GARMIN, including ECL and Charts
- Differences between MP and SP Abnormal and Emergency procedures
- Emergency Phraseology
- SP operations in icing conditions

1.2 Flight training, normally using an FFS (4 hours)

The flight training should include the following subjects:

- Use and setup of GARMIN integrated avionics, PFD and MFD, including selection of display (System Synoptic, Map, Weather Radar and Electronic Check List)
- Use of Flight Director and Autopilot, monitoring of modes
- Engine failure after take-off
- In flight restart of failed engine
- Operation of TCAS (if installed)
- “Golden” failures, which cause secondary failures and CAS messages
- Loss of cabin pressure control and Emergency Descent procedures
- Instrument flying on standby instruments
- Use of Backup trim system
- Simultaneous Pitch Trim NML and BKP failure
- Smoke procedures, including smoke removal
- Stick pusher system, relation with de-icing system
- Approaches/Landing with reduced flap setting

- Approaches/Landing with failed engine
- Engine Fire on the Ground
- Emergency Evacuation
- Use of the ECL, if applicable.

2. SP to MP Transition

MCC procedures should be defined in the operations manual and be introduced during the transition training.

2.1 Theoretical Training (4 hours)

The transition course should start with theoretical training to address the following subjects:

- Multi Crew psychology, decision making, communications and limitations;
- Multi Crew task, resource and workload management and organization, MCC procedures;
- MP operation and management of GARMIN, including ECL and Charts;
- Differences between SP and MP Abnormal and Emergency procedures;
- Emergency Phraseology;
- MP operations in icing conditions.

2.2 Flight training, normally using an FFS (2 hours as PF and 2 hours as PNF)

The flight training should address the following subjects:

- Use and setup of GARMIN integrated avionics, PFD and MFD, including selection of display (System Synoptic, Map, Weather Radar and Electronic Check List)
- Use of FD and AP, monitoring of modes
- MCC Procedures
- Operation of TCAS (if installed)
- “Golden” failures, which cause secondary failures and CAS messages
- Loss of cabin pressure control and Emergency descent procedures
- Instrument flying on standby instruments
- Use of Backup trim system
- Simultaneous Pitch Trim NML and BKP failure
- Smoke procedures, including smoke removal
- Stick pusher system, relation with de-icing system
- Engine Fire on the Ground
- Emergency Evacuation
- Use of ECL, if applicable

Appendix 4

EMB-505 to EMB-500 Differences Training

The following syllabus is considered to be the minimum for differences training on the EMB-500 for pilots current and qualified on the EMB-505.

For MP operations CRM and MCC aspects should be incorporated throughout the training program, starting from the first IPT sessions during ground school.

The theoretical and practical training must include the relevant TASE as contained in this report.

1. Theoretical Training

1.1 Ground School – Web Based Training (16 hrs. total):

The web-based training may be performed outside an ATO and should address:

- system presentations in CBT format;
- knowledge level written test (open book) to be performed on-line, pass mark 75%, before starting ground school.

1.2 Ground School - Class Room (1 day / 8 hrs. total)

The ground school is performed at an ATO and should include:

- pre-entry test, closed book, with a pre-determined pass mark, at the start of the ground school to verify adequate level of aircraft system knowledge;
- instructor-led classroom presentations of differences in
  - aircraft systems, including normal, abnormal and emergency procedures;
  - aircraft and system limitations;
  - mass & balance and performance;
- Written Test (scheduled on last day), 100 questions, multiple choice answers, pass mark 75%, to be completed prior to flight training.

2. Practical Training (in FFS level C or D)

The flight training should concentrate on the differences between the EMB-500 and the EMB-505 aircraft and should include:

- Normal Take off;
- Stalls;
- Engine failure at or close to V1;
- One engine inoperative instrument approaches;
- One engine inoperative missed approach;

- Missed approach on 2 engines;
- Circling approach;
- No flap approach and landing;
- One engine inoperative landing;
- Abnormal / Emergency manoeuvres / procedures, and abnormal / emergency system operations.

3. Partial Skill Test

With reference to Part-FCL, Appendix 9 para 5.aA partial skill test shall be performed to include the training elements of para. 2 above.

4. Training Footprint

Day 1	Day 2	Day 3	Day 4
WBT (8:00)	**WBT** **Knowledge Test** (8:00)	**Pre-Entry Test** **GI** **Knowledge Exam** (8:00)	**FFS** (4:00 / 2:00 [1)]) **FFS Partial Skill Test** (4:00 / 2:00 [1)])
Notes: **GI = Ground Instructor** **WBT = Web Based Training** **FFS session DOES NOT INCLUDE time for briefing and de-briefing** **1) 2 hours as PF and 2 hours as PNF For MP operations. 2 hours as PF for SP operations.**			

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

Appendix 5

Pre-requisites and training for an initial type rating on the EMB-500 or the EMB-505

Part-FCL, FCL.720.A (b) and (c) applies regarding experience requirements and prerequisites for type ratings for SP high performance complex aeroplanes.

Pilots seeking the privilege to operate the aeroplane in MP operations shall meet the requirements of FCL.720.A (d) (4).

In addition, the license and experience prerequisites, as well as SOE/LIFUS requirements contained in the table below shall be met.

If the training course and skill test have been performed in MP operation, the type rating should be restricted to "MP operations only".

<table>
<tr><th></th><th>License and experience prerequisites to start training</th><th>Combined aircraft and FTD/OTD training</th><th>Combined FFS and FTD/OTD training</th><th>Testing</th><th>SOE or LIFUS (as PF)</th></tr>
<tr><td rowspan="3">SP OPERATIONS OR MP OPERATIONS AS PILOT IN COMMAND (PIC)</td><td>ATPL(A) + any previous turbo-jet aircraft type rating</td><td rowspan="3">12 hrs +

4 hrs FTD or OTD *</td><td rowspan="3">16 hrs FFS +

16 hrs FTD or OTD</td><td rowspan="3">Partial Skill Test</td><td>0 hrs</td></tr>
<tr><td>ME Rating + IR Rating
Min. 1000 hrs.</td><td>25 hrs</td></tr>
<tr><td>ME Rating + IR Rating
Min. 500 hrs.</td><td>50 hrs</td></tr>
<tr><td>MP OPERATIONS AS CO-PILOT</td><td>CPL + IR Rating
Min. 200 hrs
Min. 70 hrs PIC</td><td>12 hrs +

4 hrs FTD or OTD *</td><td>16 Hrs FFS +

16 Hrs FTD or OTD</td><td>Skill Test

Licence endorsement: "Co-pilot only"</td><td>0 hrs</td></tr>
</table>

*** Training of selected emergency procedures.**