Operational Evaluation Board Report

Embraer
EMB-500 (PHENOM 100)

Report – Draft Revision 2
23 January 2012

European Aviation Safety Agency
Postfach 10 12 53
D-50452 Köln, Germany
EMB-500 (PHENOM 100)

Operational Evaluation Board (OEB)

Revision Record

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<tr>
<td>First Issue</td>
<td>New Evaluation</td>
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<td>Rev 1</td>
<td>Editorial changes to align with EMB-505 OEB Report</td>
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<td>Amendment of Co-pilot license pre-requisite requirements (table at Appendix 5), editorial amendments</td>
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<th>Definition</th>
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<tr>
<td>ADF</td>
<td>Automatic Direction Finder</td>
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<tr>
<td>AFCS</td>
<td>Automatic Flight Control System</td>
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<tr>
<td>AFM</td>
<td>Airplane Flight Manual</td>
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<tr>
<td>AMC</td>
<td>Acceptable Means of Compliance</td>
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<td>AMM</td>
<td>Airport Moving Map</td>
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<td>ANAC</td>
<td>Agência Nacional de Aviação Civil</td>
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<td>AOC</td>
<td>Air Operator Certificate</td>
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<tr>
<td>AP</td>
<td>Autopilot</td>
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<tr>
<td>ATPL</td>
<td>Airline Transport Pilot License</td>
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<tr>
<td>ATR</td>
<td>Automatic Thrust Reserve</td>
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<tr>
<td>BCU</td>
<td>Brake Control Unit</td>
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<td>BCV</td>
<td>Brake Control Valve</td>
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<td>CAS</td>
<td>Central Alert System</td>
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<tr>
<td>CPD</td>
<td>Common Procedures Document for conducting Operational Evaluation Boards, dated 10 June 2004</td>
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<tr>
<td>CPL</td>
<td>Commercial Pilot License</td>
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<tr>
<td>CRE</td>
<td>Class Rating Examiner</td>
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<td>CRM</td>
<td>Crew Resource Management</td>
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<td>DGAC</td>
<td>Direction Générale de l’Aviation Civile (French Civil Aviation Authority)</td>
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<td>DME</td>
<td>Distance Measuring Equipment</td>
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<td>ECL</td>
<td>Electronic Check List</td>
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<td>ECTS</td>
<td>EMBRAER CAE Training Services</td>
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<td>Electronic Flight Bag</td>
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<td>EFIS</td>
<td>Electronic Flight Instrument System</td>
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<td>EICAS</td>
<td>Engine Indicating and Crew Alerting System</td>
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<td>EU-OPS</td>
<td>Annex to COMMISSION REGULATION (EC) No 859/2008</td>
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<td>FAA</td>
<td>Federal Aviation Administration</td>
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<td>FADEC</td>
<td>Full Authority digital Engine Control</td>
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<td>FCL</td>
<td>Flight Crew Licensing</td>
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<td>FD</td>
<td>Flight Director</td>
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<td>FFS</td>
<td>Full Flight Simulator</td>
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<td>FMA</td>
<td>Flight Mode Annunciator</td>
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<td>FMS</td>
<td>Flight Management System</td>
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<td>FSB</td>
<td>Flight Standardization Board</td>
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<td>FSTD</td>
<td>Flight Simulation Training Device</td>
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<td>GPS</td>
<td>Global Positioning System</td>
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<tr>
<td>GPU</td>
<td>Ground Power Unit</td>
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<tr>
<td>IAS</td>
<td>Indicated Air Speed</td>
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<td>IEM</td>
<td>Interpretative and Explanatory Material</td>
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<td>IFR</td>
<td>Instrument Flight Rules</td>
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<td>ILS</td>
<td>Instrument Landing System</td>
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<td>IPT</td>
<td>Integrated Procedures Trainer</td>
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<td>Instrument Rating</td>
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<td>JAR</td>
<td>Joint Aviation Requirements</td>
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<td>LOC</td>
<td>Localizer</td>
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Terminology

Currency means the experience necessary for the safe operation of aircraft, equipment and systems.

Recent experience means the recent experience described in Part-FCL and EU-OPS.
EXECUTIVE SUMMARY

1. Manufacturer Application
EMBRAER made an official application to EASA, Certification Flight Standards to perform an OEB evaluation for the EMB-500 (Phenom100). The application was received by EASA on 7 July 2009.

2. OEB Process
The first part of the operational evaluation was carried out in March and April 2009. This part of the evaluation was performed by a joint EASA/ANAC team of 6 operational experts and concentrated on the proposal for a Single Pilot – In Aircraft Type Rating training course.

As a second part of the evaluation, the EASA OEB assessed a Multi-Crew Type Rating training course, using a qualified and approved full flight simulator. This assessment was performed in August 2009.

An FAA FSB performed an evaluation and completed the FSB report at an earlier stage.

Embraer has initially determined that the EMB-500 should be a new type rating, leading to a T-5 test programme and level E checking. Only a full transition training course will meet the training and checking objectives and the operational evaluation was performed accordingly.

This report specifies the EASA minimum requirements for the initial Type Rating Training Course, Checking and Currency on the EMB-500.

Based on a number of commonalities between the EMB-505 and EMB-500, the OEB evaluated and accepted a reduced training course for the EMB-500, based on credits given for a valid Type Rating on the EMB-505. For details of the evaluated courses refer to Appendix 1.

The report is aimed at assisting private and commercial operators in the development of training programs and at assisting the NAA’s in their approval process. The report is a reflection of the status at the time of writing and provisions in this report are effective until amended, superseded or withdrawn by subsequent operational evaluation determinations.

Pilots without any previous experience with EFIS, FMS and integrated avionics will benefit from additional training, which should be completed before entry into this course.

The EMB-500 is an airplane with a complexity and with capabilities, which can be compared to larger business and transport airplanes and it is operated in the same environment. It is therefore recommended, that private operators follow the recommendations in this report.

The scope of the evaluation was limited to Approach Category I operations and standard take-off minima. If an operator would seek approval for operations below standard take-off minima in the future, further OEB evaluations should be performed.

The EASA /OEB Section Business Jet Manager, French DGAC Flight Inspector and operational and certification experts have participated to evaluate Operational suitability, Operational documentation, including MMEL and 2 actual training courses (single pilot/in-aircraft, multi-crew/FSTD). Other training courses were assessed by evaluating the syllabi (see Appendix 1).

As part of this evaluation process, the Normal, Abnormal, and Emergency procedures were reviewed and recommendations for improvements and/or optimization were made as appropriate.

The OEB recommends this report for approval and adoption by NAAs.

3. Procedures, requirements and associated AMC references
EASA has conducted this evaluation in accordance with EU-OPS, JAR-FCL and JAR-FSTD requirements. This evaluation was based on the OEB Handbook, the Common Procedures Document (CPD), and JAR-FCL 1, including associated appendices, AMC’s and IEMs.
OEB Team Composition – OPS/FCL Subgroup

<table>
<thead>
<tr>
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EMBRAER experts involved in the process

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<tr>
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<tbody>
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Operational Evaluation Report

1. Purpose and applicability

This report is the result of an OEB operational evaluation, which has been conducted during different periods in 2009.

This document provides an overview of the EMB-500 aircraft and recommendations for:
- A number of Type Rating training courses
- Items which are recommended to receive special emphasis during training.
- Operational considerations, specific for this type of aircraft and its operation(s).

Note:

This EMBRAER EMB-500 aeroplane is listed in the ANAC Type Certificate Data Sheet No EA-2008T09, dated 9 December 2008 and in the EASA Type Certificate Data Sheet No IM.A.157 dated 24 April 2009.

2. Description of the EMB-500

2.1 General

The EMB-500 was designed as a new member in the Embraer family.

The program was officially launched in 2005. ANAC and FAA certified the aircraft in December 2008. EASA certification followed in April 2009.

Changes to the AFM and related documents have to be approved by the Aviation Authority of the manufacturer's country, Brazil, as well as by EASA.

The EMB-500 is a low-wing executive aircraft, designed for up to 5 passengers and 1 or 2 cockpit crew. The airplane features a pressurized cabin, 2 jet engines and an integrated avionics suite.

The MTOW of the EMB-500 is 4750 kg (10,450 lbs.). The maximum speeds are 275 KIAS (Vmo) or M 0.70 (Mmo) at a maximum altitude of 41,000 ft. MSL.

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

The minimum use height of the autopilot is 195 ft.

2.2 Landing Gear

The tricycle landing gear is fully retractable, with single tire at each leg and may be operated on paved runways only. The landing gear is operated by a hydraulic system, which also keeps the main landing gear locked in the up position.

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.
2.3 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 BCU. The BCU, which is connected to the EMERGENCYBUS, receives all brake interface signals and controls the Shutoff Valve (SOV) and both Brake Control Valves (BCV’s) 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;
- Touchdown protection;
- Emergency braking.

2.4 Seating

The cabin layout is set up to accommodate 4 passengers, normally in club-seat configuration. A drop-down oxygen mask is available for each passenger.

During Single Pilot operations a fifth passenger may be carried on the right-hand cockpit seat.

The maximum Passenger capacity as stated on the TCDS (IM A.157), item 16 is five.

2.5 Wings

The wings are straight. A de-icing system provides ice protection for the leading edges.

2.6 Flight controls

The 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 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 and can be selected to 4 positions: 0 - 1 - 2 - 3/Full (40 degrees).

2.7 Engines

The aircraft is equipped with two Pratt and Whitney PW617F-E medium by-pass ratio turbofan engines. Normal thrust rating is 1695 lbs. per engine up to 77° F. 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 take-off phase of flight. The thrust reserve is also available on two engines, when the pilot positions the thrust levers beyond the TOGA position.

2.8 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.
2.9 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 manoeuvres and abrupt braking.
Lateral fuel balance is maintained by gravity through the transfer valve in event of asymmetry.
One water drain valve collects water by gravity in each tank.

2.10 Instrument panel and console
The GARMIN PRODIGY 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.

2.11 Electrical system
The electrical power system comprises:
- two Starter Generators (SGs), rated at 325 A and 28 VDC.
- two lead-acid 24 VDC, 27 Ah batteries
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 are also used 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.
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. OEB evaluation specific aspects
3.1 General
The EMB-500 design is a new design by Embraer. From a pilot’s perspective the most important features are the certification for Single Pilot operations and the use of the Garmin PRODIGY (based on the GARMIN 1000) integrated avionics package as standard equipment.
During this evaluation, special attention was given to both Single Pilot and Multi-crew operational aspects, as well as to the similarities and differences between EMB-500 and EMB-505.
While Commercial Air Transport operations (as regulated by EU-OPS) require 2 qualified pilots, non-commercial transport operations are not limited by such requirement.
A single pilot, trained, checked and licensed in an approved manner is qualified to operate this airplane.
The OEB, during this evaluation, took the position that all flights in the same airspace, at the same time must operate at a common, equivalent level of safety.

Based on all considerations, the board concludes that it is possible to safely operate this aircraft in single pilot configuration, but adequate measures must be taken to maintain the overall level of safety at the high level to which we have grown accustomed.

3.2 Pilot profiles and training

3.2.1 Multi-crew

For pre-requisite requirements, training, checking and regency, the Board recommends treating Multi-crew operations on this airplane similar to Multi Pilot operations on aeroplanes certified for a minimum of 2 cockpit crew.

3.2.2 Single Pilot

When comparing Single Pilot operations with Multi-crew operations, we have to note, that the single pilot, by himself, will have to perform all tasks of the 2 Multi-crew pilots and still be in control of the situation, during all phases of flight, in normal, as well as in abnormal situations.

The single pilot will be the commander of the airplane, as well as the pilot flying and have no backup of a task-sharing co-pilot. He will also need to perform a monitoring function.

His/her levels of knowledge, skill and experience must be adequate for this situation to maintain the required high level of safety.

These key elements in a pilot’s proficiency relate to much more than just aircraft systems and procedures. They are also applicable to, for instance, in-flight management and failure management.

3.2.2.1 EASA recommendation

The Board, based on the above considerations and supported by the experience of the more experienced test subjects, concluded, that the recommended minimum level of experience, required to safely operate this airplane and manage all aspects of a flight, is far above the basic minimum in JAR-FCL for Type Rating training.

It is the Board’s recommendation to require, for single pilot operations in this airplane, to follow the EASA recommendations specifically addressing pre-requisite and training requirements for this category of airplanes (see Appendix 5).

3.2.3 Type Rating Training

Flight training should be performed in an approved Full Flight Simulator. This is the only way to provide an opportunity to practice all critical emergency procedures, vary the environmental circumstances and provide an opportunity to exercise Crew Coordination Procedures.

If in-aircraft training is used, complementary training in a FSTD is recommended for all abnormal/emergency procedures, which could not be trained on the airplane.

In-aircraft training will also require additional training for Multi-Crew Coordination/Cooperation procedures, when the pilots will operate as Multi-crew.

The complementary training on emergency/abnormal procedures will normally have to be completed as part of the type rating training course.

In exceptional cases (like the start-up of a new type when no simulator is available yet), and under certain conditions of pre-requisite experience, this training may be performed at a later stage, but no later, than within 12 months. In this case, the candidate-Commander should also have a background on high performance, turbine-powered, pressurized aircraft to ensure a basic level of knowledge and experience with specific emergency/abnormal situations.
3.3 Minimum Equipment

3.3.1 EMB-500 airplane

The Maximum Take-Off Weight of this airplane is in the lowest category (< 5700 kg.) and for EU-OPS operations the requirements for installed and serviceable equipment are of a lower level, compared to larger transport airplanes.

For the EMB-500, TCAS is not required and offered only as optional equipment. Operators are encouraged to install such equipment, to enhance flight safety.

3.3.2 Single Pilot operations

Support for the single pilot could be found in a very reliable and simple interface with the aircraft.

While the Garmin PRODIGY integrated avionics package offers many options to the pilot, it requires, on average, twice as many actions to select appropriate pages and procedures and insert the correct references and values, when compared to the "older" technology equipment. For single pilot operations the following equipment is required by EU-OPS:

a. For IFR operations: an autopilot with at least Altitude Hold and Heading modes. 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.

b. A weather radar equipment, whenever operating at night or in Instrument Meteorological Conditions in areas, where thunderstorms or other potentially hazardous conditions, regarded as detectable with airborne weather radar, may be expected to exist long the route.

3.3.2.1 EASA recommendation

EASA recommends that the following equipment is carried:

A head-set and chart holder must be available for “hands free” communication and easy reference to documentation.

3.4 Conditions/Limitations for Single Pilot operations

3.4.1 Maximum Flight Level

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 an altitude restriction should be established for operations without permanently wearing the oxygen mask to minimize the risk of the pilot becoming incapacitated, before correctly donning the mask.

3.4.2 Approach and Landing Minimum

EU-OPS states that, for single pilot operations, and RVR of less than 800 m is not permitted, except when using a suitable autopilot coupled to an ILS or MLS, in which case normal minima apply. The Decision Height applied must not be less than 1,25 x the Minimum Use Height of the Autopilot.

3.5 Embraer EMB-500 abnormal procedures

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

However, for some more complex situations, the board recommends to differentiate between Multi-crew and Single Pilot operations.
Operators should ensure that adequate Standard Operating Procedures (SOP) and realistically achievable Normal, Abnormal and Emergency procedures are available for Single Pilot operations, as well as for Multi-crew operations.

It is recommended to create 2 different QRH’s, one for Single Pilot and one for Multi-Crew operations.

These two versions of the QRH shall both comply with the AFM.

In case of an emergency/abnormal situation, single pilot operations do not allow an excessive increase of the workload and for this reason more situations will have to result in a termination of the flight. This requires an appropriate and clear instruction in the SOP’s.

4. Master Difference Requirement (MDR) Tables

Master Difference Requirements (MDR’s) for the EMB-500 do not apply, as this airplane is considered to be a new type, with a new type-rating endorsement in a license. Paragraph is reserved for possible future variants.

5. Operator Difference Requirement (ODR) Tables

Operator Difference Requirements (ODR’s) for the EMB-500 do not apply, as this airplane is considered to be a new type, with a new type-rating endorsement in a license. Paragraph is reserved for possible future variants.

6. Specific equipment

6.1 Optional equipment

The following equipment is offered, among others, as optional equipment for the EMB-500:

- ADF

For European operators, an ADF is required to be used as the primary reference for NDB-approaches and other NDB related procedures, even if the procedures are executed as GPS procedures.

6.2 QRH and ECL

6.2.1 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.

6.2.2 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 single pilot operations.

Effective managing of the use of the ECL is mandatory. The use of the ECL should, therefore, be incorporated in the Type Rating training course from the beginning.

6.2.2.1 ECL update process

Embraer has provided documentation to EASA that procedures exist to ensure that the ECL is an exact copy of the Paper Check List, and that the Paper Check List is in compliance with the AFM.

A revision system for the ECL has been established.
6.2.3 OEB recommendation

The OEB recommends that the use of the QRH and the ECL should be trained and checked at regular intervals to maintain a level of proficiency in finding the relevant information and procedure(s) without losing time.

6.2.4 OEB evaluation of ECL

At the time of the evaluation, the ECL was only available for the OEB team in a desk top trainer, hence the possibility to make random checks of the ECL to ensure compliance with the AFM and the QRH, was limited. For this purpose, EMBRAER has a quality system in place.

7. Type Rating List and Licence Endorsement List

7.1 Type Rating List

The Class & Type Rating List has been revised as follows:

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<th>1 Manufacturer</th>
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<th>3 Licence endorsement</th>
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Table 7: Type Rating List (Aeroplane) – Single Pilot – Multi-engine Turbo-jet (land)

8. Specifications for Training

8.1 EASA recommendation

In addition to the requirements of JAR-FCL 1, the OEB recommends that operators follow the recommendation, mentioned in Chapter 3.1.2 of this report (see Appendix 5).

8.2 Training Courses

The assessment of the OEB is based on the actual evaluation of 2 Initial Type Rating Training programs:

- Single Pilot - In-Aircraft flight training.
- Multi-crew - FFS flight training.

A number of additional Training courses were assessed by evaluating the proposed Training program syllabi, taking into account previous experience during EMB-505 OEB evaluations.

The OEB recommends dividing the Initial pilot training syllabus into the following phases for approval in Approved Training Organisations:

- Theoretical knowledge instruction syllabus.
- Flight training program.
- Skill test(s).
- Additional Flight Hours under Supervision, if required.
- Operational Line Check, if required.

When the operator’s conversion course and the Type Rating course required for the issue of Flight Crew Licence are combined according to OPS 1.945 (c) operator specific documentation must be used throughout the course.
8.3 Licensing requirements
The EMBRAER EMB-500 is a Multi-Engine – Turbo Jet – High Performance aeroplane, certified for Single Pilot operations.
In accordance with JAR-FCL 1.220 (b)(2) a valid EMB-500 Type Rating is required to act as Pilot in Command.
For flights under IFR, an Instrument Rating is required (JAR-FCL 1.175).
Commercial Air Transport operations require, according to JAR-FCL 1.150 (a) (3), a CPL as the minimum level of the basic Flight Crew License.

8.4 Theoretical knowledge syllabus and test summary
Appendix 1 to JAR–FCL 1.261(a) / AMC FCL 1.261(a) / AMC FCL 1.261(c)(2):
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 syllabus in AMC FCL 1.261(a), as appropriate.
Assumed is the minimum pre-entry level as required by JAR-FCL 1.250 and 1.255.

8.5 Flight training course summary
AMC FCL 1.261(c)(2) / AMC FCL 1.261(d)
A minimum of 32 hrs. STD training, 16 hrs. of which in Full Flight Simulator (Multi Pilot, no minimum specified for Single Pilot). Other, qualified, training devices may be used.
The specific recommendations for EMB-500 Type Rating training courses may be found in paragraph 17, Appendix 1.

8.6 Skill test
In the outline(s) of syllabi, mentioned in this report, the License Skill Test is always considered separate from the training program schedule(s).

9. Specification for Checking
Whereas this type of airplane is in the class of Single Pilot airplanes and, initially, a License Skill Test schedule as specified in JAR-FCL 1-240, Appendix 3 could be considered, the Board recommends using a License Skill Test schedule, which better matches the complexity and operational capabilities of this type of airplane to assess the knowledge and skill of the candidate pilots.
The LST schedule for multi pilot airplane, as specified in JAR-FCL, Appendix 2 types is considered to be more appropriate.

10. Specification for Flight Simulation Training Devices
Credit(s) for completing part(s) of the practical training in FSTD’s should be based on the use of Training Devices which have been evaluated and approved in accordance with JAR-FSTD-A.

11. Compliance check
Embraer provided a compliance checklist against the equipment requirements in EU-OPS, subparts K and L. A verification of compliance was not performed, due to the fact, that no production airplane was available at the time of the evaluation.
According to the compliance checklist, the aircraft is compliant.

Windshield wipers are not installed. As an equivalent means a rain repellent polymer coating is applied to the windscreen (EU-OPS 1.645). This coating has a limited lifetime, depending on the operational circumstances.

12. **Master Minimum Equipment List**

An evaluation of an EASA Master MEL was performed during this OEB process.

Single pilot operations require specific considerations of some items.

Some examples:

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

13. **Electronic Flight Bag**

Using JAR-OPS Temporary Guidance Leaflet (TGL) 36 as a reference, the EFB portion of the GARMIN PRODIGY 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-shelf” 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.

13.1 **Airport mowing map (AMM)**

Caution must be exercised when using the aircraft’s own position, based on GPS calculations, on 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.

13.2 **EFB features**

The EFB features include:

13.2.1 **Synthetic Visual System**, which 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.

13.2.2 **FliteChart system**, which is provided by GARMIN, but not available outside USA.

13.2.3 **Chartview system**, 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.
13.2.4 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.

13.3 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 EMB-500 AFM Limitations section.

The Board recommends using this Cockpit Reference Guide 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 operations.

14. All Weather Operations

The aeroplane is approved for the following types of operations:

- IFR Day and Night
- RVSM
- Flight into known icing

15 Miscellaneous

15.1 Landing Minimum Category

According to JAR-OPS 1.430 (C), Appendix 2, the EMB-500 is operated as a category B aircraft for all approaches. Vref is 100 KIAS at the maximum gross landing weight of 4430 kg (landing flap setting 3).

15.2 Specific Issues

15.2.1 Single Pilot Operations

15.2.1.1 Abnormal/Emergency procedures

The AFM and QRH contain procedures for normal and abnormal situations. These procedures provide guidance to the operators from the manufacturer. The ultimate responsibility for the safe operation of an airplane is with the operator(s) and EASA recommends operators to clearly and unambiguously define these procedures, based on the recommendations from the manufacturer, with due regard to the operator’s SOP’s, as well as for the difference in available resources for single pilot operations and for multi-crew operations.

15.2.1.2 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.

16. Application of the OEB report

This OEB report applies to commercial operations. However, the OEB also recommends private or corporate operations to follow the recommendations of this report.
Appendix 1 – Initial EMB-500 Type Rating training and transition courses

1.1 Ground School

1.1.1 Full Type Rating training course

The following ground school curriculum is considered to be the minimum for the initial Type Rating training and checking program for the Embraer EMB-500:

Ground School - Web Based Training (16 hrs. continuous)
Consisting of:
- System presentations in CBT format
- Learning module for GARMIN 1000-Prodigy. Computer application and adequate explanation.
- Knowledge level written test, open book, to be performed on-line, pass mark 75 % (on line, open book), before starting ground school.
- May be performed away from the training centre.

Ground School - Class Room (6 days, 48 hrs.).
Consisting of:
- Pre-entry test, closed book, with a pre-determined pass mark, at the start of ground school to verify adequate level of aircraft system knowledge.
- Classroom presentations, instructor-led, of aircraft systems, including normal, abnormal and emergency procedures, including the GARMIN 1000-Prodigy Integrated Avionics System.
- Classroom presentations on aircraft and system limitations.
- Classroom presentations on Weight & Balance and Performance.
- Systems Integration Training in fixed base simulator to support classroom presentations (12 hrs. per pilot)
- Written Test (scheduled on last day), 100 questions, multiple choice answers, pass mark 75%.
- Performed at the training centre
- Should be completed satisfactorily as a gate check for the next phase of training.

1.1.2 Reduced Type Rating training course

For pilots holding a valid type rating for EMB-505 aircraft and who are current on this type a reduced training program may be applied. The following ground school curriculum is considered to be the minimum for the reduced Type Rating training and checking program.

Ground School - Web Based Training (16 hrs. continuous).
Consisting of:
- System presentations in CBT format
- Knowledge level written test, open book, to be performed on-line, pass mark 75 %, before starting ground school.
- Maybe performed away from the training centre.

Ground School - Class Room (1 day, 8 hrs.).
Consisting of:
- Pre-entry test, closed book, with a pre-determined pass-mark, at the start of ground school to verify adequate level of aircraft system knowledge.
- Classroom presentations, instructor-led, highlighting the major differences of aircraft systems, including normal, abnormal and emergency procedures, aircraft and system limitations, Weight & Balance and Performance.
- Written Test (scheduled on last day), 100 questions, multiple choice answers, pass mark 75%.
- Performed at the training centre

The written test should be completed satisfactorily as a gate before flight training.
Notes:
- This aeroplane is certified for single pilot operations. EMBRAER proposes Type Rating training courses for Single Pilot operations, as well as for Multi-crew operations.
- The technical content of the ground school is identical for Single Pilot and Multi-crew operations.
- The technical content of the ground school is also identical for in-aircraft and simulator training.
- For Multi-crew operations the board recommends training courses in which CRM and MCC are incorporated throughout the training program, starting from the first IPT sessions during ground school.
- The Board proposes, for low experienced pilots, a specific and thorough briefing to prepare for the flight training.

This briefing 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.
- 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

1.2 Flight Training

1.2.A Multi-crew operations

1.2. A.1 Full-Flight Simulator (FFS)

1.2. A.1.1 Full training course
As mentioned before, the Board recommends treating Multi-crew operations on this aircraft the same as Multi Pilot Operations on Multi Pilot aircraft.
The flight training program should consist of a minimum of 32 hours, 16 hours of which should be flight training as Pilot Flying in a Full Flight Simulator, while for the remaining hours an FSTD or OTD may be used.
The flight training should take into account the recommendations for special emphasis training of Appendix 2 of this OEB report and consist of:
- Normal Manoeuvres/procedures, aircraft handling, navigation.
- Abnormal/ Emergency manoeuvres/procedures, abnormal/emergency system operation.
- Landings.
- Wind shear training.
- Low visibility ground operations and take-offs, as required.

The training should be concluded with a Skill test, for which 2 hours as Pilot Flying and 2 hours as Pilot Not Flying is recommended.
1.2. **A.1.2 Reduced training course**
For pilots holding a valid type rating for EMB-505 aircraft and who are current on this type a reduced training program may be applied as follows:

The flight training program should consist of a minimum of 4 hours, 2 hours of which should be flight training as Pilot Flying in a Full Flight Simulator, while for the remaining hours an FSTD or OTD may be used.

The flight training should take into account the recommendations for special emphasis training of Appendix 2 of this OEB report and concentrate on the differences between EMB-505 and EMB-500 aircraft. The training should, as a minimum, consist of:

- 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, abnormal/emergency system operations.

The training should be concluded with a Skill test, for which 2 hours as Pilot Flying and 1 hour as Pilot Not Flying is recommended.

1.2. **A.1.3 Skill test** (2 hrs. as Pilot Flying, 2 hrs. or 1 hr. as Pilot Not Flying).

The aeroplane is certified for single pilot operations. However, the Skill Test schedule in appendix 3 to JAR-FCL 1.240 is considered by the Board to not sufficiently cover the airplane’s complex systems and its capability to operate IFR in all sorts of weather at high altitude. The Board recommends therefore using a Skill Test schedule, based on Appendix 2 to JAR-FCL 1.240 (the schedule currently designated for MPA).

1.2. **A.2 In-Aircraft**
Abnormal procedures, which cannot be safely performed during in-aircraft training, must be trained to proficiency in addition to the in-aircraft flight training program. Such training must be performed in a qualified and approved FSTD or OTD, recommended for this purpose by the OEB.

The board recommends considering in aircraft flight training for exceptional situations only.

1.2. **A.2.1 Full training course**
The Type Rating training program should be a minimum of 12 hrs. flight time, taking into account, as far as possible, the recommendations Appendix 2 of this OEB report for special emphasis training and consisting of:

- Normal Take offs
- 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, abnormal/emergency system operation as much as safely possible during in-aircraft training.
- Landings
In addition to the in-aircraft flight training a minimum of 4 hrs. FSTD or OTD training are recommended to train selected Emergency/Abnormal procedures, which cannot be safely performed during In-Aircraft training.

1.2. **A.2.2 Reduced training course**

For pilots holding a valid type rating for EMB-505 aircraft and who are current on this type a reduced training program may be applied as follows:

The in-aircraft flight training program should consist of a minimum of 2 hours, which should be flight training as Pilot Flying. In addition to the in-aircraft flight training 2 hours training in an FSTD or OTD is recommended to cover abnormal/emergency procedures, which are specific to the EMB-500 and which cannot be safely performed in the airplane.

The flight training should take into account the recommendations for special emphasis training of Appendix 2 of this OEB report and concentrate on the differences between EMB-505 and EMB-500 aircraft. The training should, as a minimum, consist of:

- 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, abnormal/emergency system operations, as far as possible during in-aircraft training.

1.2. **A.2.3 Skill test** (2 hrs. as Pilot Flying, a minimum of 1 hr. as Pilot Not Flying).

The aeroplane is certified for single pilot operations. However, the Skill Test schedule in appendix 3 to JAR-FCL 1.240 is considered by the Board to not sufficiently cover the airplane’s complex systems and its capability to operate IFR in all sorts of weather at high altitude. The Board recommends therefore to use a Skill Test schedule, based on Appendix 2 to JAR-FCL 1.240 (the schedule currently designated for MPA).

1.2. **B Single Pilot operations**

1.2. **B.1 Full-Flight Simulator (FFS)**

1.2. **B.1.1 Full training course**

The flight training program should consist of a minimum of 16 hours as Pilot Flying in a Full Flight Simulator. This minimum is in accordance with the recommendations from EASA Flight Standards, published on the EASA website.

The flight training should take into account the recommendations for special emphasis training of Appendix 2 of this OEB report and consist of:

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

The training should be concluded with a Skill test, for which 2 hours as Pilot Flying.

1.2. **B.1.2 Reduced training course**

The flight training program should consist of a minimum 2 hours training as Pilot Flying in a Full Flight Simulator.
The flight training should take into account the recommendations for special emphasis training of Appendix 2 of this OEB report and concentrate on the differences between EMB-505 and EMB-500 aircraft. The training should, as a minimum, consist of:

- 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, abnormal/emergency system operations.

The training should be concluded with a Skill test, for which 2 hours as Pilot Flying is recommended.

1.2. **B.1.3 Skill test** (2 hrs.).

The aeroplane is certified for single pilot operations. However, the Skill Test schedule in appendix 3 to JAR-FCL 1.240 is considered by the Board to not sufficiently cover the airplane’s complex systems and its capability to operate IFR in all sorts of weather at high altitude. The Board recommends therefore to use a Skill Test schedule, based on Appendix 2 to JAR-FCL 1.240 (the schedule currently designated for MPA).

1.2. **B.1.4 Supervised Operating Experience (SOE)** (0, 25 or 50 hrs. depending on previous total experience)

The Board recommends to follow the guidelines in the EASA recommendation (published on the EASA website as a OEB supporting document OPS/FCL) for flight hours under supervision, as part of the training for pilots with no previous experience on Single Pilot / Turbine Jet / High Performance Aeroplanes (See appendix 5).

1.2. **B.2 In Aircraft**

Abnormal procedures, which cannot be safely performed during in-aircraft training, must be trained to proficiency in addition to the in-aircraft flight training program. Such training must be performed in a qualified and approved FSTD or OTD, recommended for this purpose by the OEB. The OEB recommends considering in aircraft flight training for exceptional situations only.

1.2. **B.2.1 Full training course**

The Type Rating training program should be a minimum of 6 x 2 hrs. flight time, taking into account, as far as possible, the recommendations Appendix 2 of this OEB report for special emphasis training and consisting of:

- Normal Take offs
- 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, abnormal/emergency system operation as much as safely possible during in-aircraft training
- Landings
In addition to the In-Aircraft flight training, 4 hrs. of FSTD or OTD training are recommended to train selected Emergency/Abnormal procedures.

1.2. B.2.2 Reduced training course
For pilots holding a valid type rating for EMB-505 aircraft and who are current on this type a reduced training program may be applied as follows:

The in-aircraft flight training program should consist of a minimum of 2 hours, which should be flight training as Pilot Flying. In addition to the in-aircraft flight training 2 hours training in an FSTD or OTD is recommended to cover abnormal/emergency procedures, which are specific to the EMB-500 and which cannot be performed in the airplane.

The flight training should take into account the recommendations for special emphasis training of Appendix 2 of this OEB report and concentrate on the differences between EMB-505 and EMB-500 aircraft. The training should, as a minimum, consist of:

- 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, abnormal/emergency system operations, as far as possible during in-aircraft training.

1.2. B.2.3 Skill test (2 hrs.).
The aeroplane is certified for single pilot operations. However, the Skill Test schedule in appendix 3 to JAR-FCL 1.240 is considered by the Board to not sufficiently cover the airplane’s complex systems and its capability to operate IFR in all sorts of weather at high altitude. The Board recommends therefore to use a Skill Test schedule, based on Appendix 2 to JAR-FCL 1.240 (the schedule currently designated for MPA).

1.2. B.2.4 Supervised Operating Experience (0, 25 or 50 hrs., depending on previous total experience)
The Board recommends to follow the guidelines in the EASA recommendation (published on the EASA website as a OEB supporting document OPS/FCL) for flight hours under supervision, as part of the training for pilots with no previous experience on Single Pilot / Turbine Jet / High Performance Aeroplanes (see Appendix5).

1.3 Supervised Operating Experience (SOE).
For Pilots, who are first time candidates for Single Pilot Operations on this category of airplanes and who do not hold an ATPL, EASA recommends Supervised Operating Experience, based on the total number of Flight hours of the candidate pilot. This additional experience must be seen as part of the qualification process, which needs to be successfully completed, before the pilot can exercise his privileges.

1.4 Hours as observer
When a candidate pilot, during the FFS Type Rating training, acts as observer, the Board recommends occupying the right-hand seat as this provides the best view.
1.5 Transition courses

1.5.0 General
The Board recommends following a specific training course when transitioning from MultiCrew to Single Pilot or from Single Pilot to Multi-Crew operations. The training should consist of a ground school training part and a flight training part. The transition training should be concluded by a specific skill test (see 1.5.1.3 and 1.5.2.3).

For Multi-Crew operations in Commercial Air Transport operations a set of Crew Co-ordination Procedures should be defined in the Operations Manual of the AOC holder. For non-commercial operations the manufacturer or training provider should recommend CCP’s to be used in MultiCrew operations, which will be introduced and practiced during the Transition Course.

1.5.1 Multi-Crew to Single Pilot transition course

1.5.1.1 Ground School (4 hrs)
It is recommended to start the transition course with a theoretical part in ground school. Subjects to cover are:
- 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 Multi-Crew and Single Pilot Abnormal and Emergency procedures.
- Emergency Phraseology.
- Single Pilot operations in icing conditions.

1.5.1.2 Flight training, normally using a Full Flight Simulator (4 hrs):
- 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 takeoff.
- 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

1.5.1.3 Skill test (2 hrs);
It is recommended to perform a skill test similar to the skill test at the end of a full Single Pilot Type Rating training course.
1.5.2 Single Pilot to Multi-Crew Transition Course.

1.5.2.1 Ground School (4 hrs):
- Multi-Crew psychology, decision making, communications and limitations.
- Multi-Crew task, resource and workload management and organization, CCP’s.
- Multi-Crew operation and management of GARMIN, including ECL and Charts.
- Differences between Single Pilot and Multi-Crew Abnormal and Emergency procedures.
- Emergency Phraseology.
- Multi-Crew operations in icing conditions.

1.5.2.2 Flight training, normally using a Full Flight Simulator (2 hrs. Pilot Flying and 2 hrs. Pilot not Flying):
- 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.
- Multi-crew Coordination/Cooperation 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

1.5.2.3 Skill test (2 hrs, PF and 2 hrs, PNF);
It is recommended to perform a skill test similar to the skill test at the end of a full MultiCrew Type Rating training course.
Appendix 2. Special Emphasis during training

Special emphasis during training is recommended for those systems and/or procedures which are unique to the aircraft or class of aircraft and its operation, in this particular case, the single pilot configuration. The OEB has identified several aircraft systems and/or procedures (listed below) that should receive special emphasis in an approved EMB-500 Training Program:

1 Single Pilot Operation

Ground School:
- High altitude physiology
- High Altitude flight domain
- Single Pilot resource management
- Operation/Limitations/Failures of the GARMIN Integrated Avionics System.
- Performance calculations, including wet/contaminated runways – OPERA
- Operations to/from High Altitude airports.
- Weight & Balance calculations, including use of Balance sheet, based on Index
- Operations in icing conditions

Flight training:
- Use and setup of GARMIN integrated avionics, PFD and MFD, including selection of display (System Synoptic, Map, Weather Radar and Electronic Check List).
- Moving Map displays
- Use of Flight Director and Autopilot, monitoring of modes.
- Operation of TCAS (if installed)
- “Golden” failures, which cause secondary failures and CAS messages.
- Loss of cabin pressure control and Emergency Descent procedures.
- Unreliable airspeed indication
- Instrument flying on standby instruments.
- Use of Backup trim system
- 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.
- Stick pusher system, relation with de-icing system.
- Approaches/Landings with reduced flap settings.
- Engine Fire on the ground
- Emergency Evacuation
- Use of the ECL.

2 Multi-crew Operations

Ground School:
- High altitude physiology.
- High Altitude flight domain
- Multi-crew resource management.
- Operation/Limitations/Failures of the GARMIN Integrated Avionics System.
- Performance calculations, including wet/contaminated runways – OPERA
- Operations to/from High Altitude airports.
- Weight & Balance calculations, including use of Balance sheet, based on Index.
- Operations in icing conditions
Flight training:
- Use and setup of the GARMIN integrated avionics, PFD and MFD, including selection of display (System Synoptic, Map, Weather Radar and Electronic Check List).
- Moving Map displays
- Use of Flight Director and Autopilot, monitoring of modes.
- Multi-crew Coordination/Cooperation Procedures.
- Operation of TCAS (if installed)
- “Golden” failures, which cause secondary failures and CAS messages.
- Loss of cabin pressure control and Emergency Descent procedures.
- Unreliable airspeed indication
- Instrument flying on standby instruments.
- Use of Backup trim system.
- 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.
- Stick pusher system, relation with de-icing system.
- Approaches/Landings with reduced flap settings.
- Engine Fire on the Ground
- Emergency Evacuation

The OEB found that early exposure to the GARMIN PRODIGY, Flight Director and Auto Pilot is important, especially for pilots with no previous EFIS and/or FMS experience. 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.

The Garmin integrated avionics system makes extensive use of GPS. ADF and VOR DME procedures are flown as GPS overlay procedures. Display of the primary source upon which a procedure is based is required.

VOR/DME and ADF can be selected manually and displayed on the HIS.

3 Special Flight Characteristics
The OEB found a number of special flight characteristics:
- The operation of the Stall Warning and Stick Pusher systems at speeds close to the stall speed, as well as with de-ice selected on.
- The Weather Radar Display, overlaying the main NAV display.
- The use of the ECL, overlaying both NAV display, as well as Weather Radar display
- The brake system, operating through a brake system controller, which provides an artificial feedback, as well as the Emergency brake system.
- During ILS approaches, when intercepting the Localizer from a GPS lateral path (i.e. not from vectors, flown in the HDG mode), the switch from GPS to LOC is only made when the Localizer is actually intercepted. Glide Slope information is not available until this time.
Appendix 3 – Recurrent training

Recurrent training and maintaining of currency serve to maintain a pilot’s continued competency for the operational tasks to be performed. During proficiency checks this competency is established.

It is every operator’s responsibility to establish a recurrent training and proficiency checking program, approved by the National Authority, which is relevant to the type of aeroplane.

The requirements for a recurrent training program may vary with several factors which have a significant influence. Some of these factors are: 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 how much recurrent training will actually be required.

It is recommended to follow the requirements of EU-OPS, subpart N, paragraph 1.965 as a minimum and to consider expansion, as appropriate, of these requirements for pilots, who have had only limited exposure and/or who do not any longer fulfil the currency requirements.

Appendix 4 – Recent experience

There are no specific currency requirements applicable to the EMB-500, beyond those of EU-OPS, Subpart N, paragraph 1.970 for AOC holders or JAR-FCL 1.026 and 1.245 for private operators.
Appendix 5 – EASA Recommendation

EASA have issued the following recommendation for pre-requisites and training for initial type rating on Turbo Jet, Pressurised Turbo prop and multi engine Turbo prop (HPA) - Single pilot aeroplanes:

Prerequisites according to JAR-FCL 1 regulation:
- 200hrs hours total experience
- 70hrs hours Pilot in Command (PIC)
- HPA certificate according to JAR-FCL 1.251 (a) (3)

Note 1. The course syllabus content stated in Appendix 1 to JAR-FCL 1.251 (HPA training) should include procedures for ACAS operation and operation in RVSM airspace, as applicable.

Note 2. For Multi-crew operation a completion of Multi-crew co-operation training according to JAR-FCL 1.261(d) is recommended.

Note 3. OTD according to JAR–FSTD A.005(f) – Other Training Device (OTD).
“A training aid other than FFS, FTD, FNPT or BITD which provides for training where a complete flight deck environment is not necessary.” The applicable training aids will be assessed and recommended by EASA as being suitable for the proposed training.

Note 4. Supervised Operating Experience (SOE) means operating as pilot in command under the supervision of a Class Rating Instructor (CRI). The CRI should sign the applicants log book to document the SOE achieved.

Note 5. If the training course and skill test have been performed in multi-crew operation, the rating should be restricted to multi-crew operations only.

<table>
<thead>
<tr>
<th>License and experience to start training</th>
<th>Combined aircraft / OTD training</th>
<th>Combined FSTD / OTD training</th>
<th>Testing</th>
<th>Supervised Operating Experience (SOE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Pilot-In-Command (PIC) should undertake training in either combined aircraft / OTD or combined FSTD / OTD as follows:</td>
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<tr>
<td>ATPL(A) + any previous turbo-jet aircraft type rating</td>
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<tr>
<td>ME** Rating + IR Rating Min. 1000 hrs.</td>
<td>12 hrs + 4 hrs FSTD or OTD*</td>
<td>16 hrs FFS + 16 hrs FSTD or OTD</td>
<td>Skill Test</td>
<td>0 hrs</td>
</tr>
<tr>
<td>ME** Rating + IR Rating Min. 500 hrs.</td>
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<tr>
<td>A Co-Pilot should undertake training in either combined aircraft / OTD or combined FSTD / OTD as follows:</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPL + IR Rating Min. 200 hrs Min. 70 hrs PIC</td>
<td>12 hrs + 4 hrs FSTD or OTD*</td>
<td>16 hrs FFS + 16 hrs FSTD or OTD</td>
<td>Skill Test Licence endorsement: “Co-pilot only”</td>
<td>0 hrs</td>
</tr>
</tbody>
</table>

* 4 hrs in FSTD or OTD to train selected emergency procedures.
** ME rating not applicable for single-engine aeroplanes.