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Flight Standardization Board Report

Revision: 5
Date: XX/XX/XXXX

Manufacturer
Embraer S.A.

Type Certificate Data Sheet (TCDS)	TCDS Identifier	Marketing Name	Pilot Type Rating
A59CE	EMB-500	Phenom 100	EMB-500
A59CE	EMB-500	Phenom 100 EV	EMB-500

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1. RECORD OF REVISIONS

Revision Number	Section(s)	Date
Original	All	01/14/2009
1	All	02/16/2010
2	Miscellaneous	09/15/2010
3	All	03/13/2014
4	All	08/06/2018
5	All	XX/XX/XXXX

2. INTRODUCTION

Aircraft Evaluation Groups (AEG) are responsible for working with aircraft manufacturers and modifiers, during the development and Federal Aviation Administration (FAA) certification of new and modified aircraft to determine:

1) The pilot type rating,
2) Flightcrew member training, checking, and currency requirements, and
3) Operational suitability.

This report lists those determinations for use by:

1) FAA employees who approve training programs,
2) FAA employees and designees who certify airmen, and
3) Aircraft operators and training providers, to assist them in developing their flightcrew member training, checking and currency.

3. HIGHLIGHTS OF CHANGE

The purpose of this revision is to add Garmin G3000 Avionics Software versions 3305.00, and 3305.07, Ice Detector (airplanes equipped with G1000 avionics system) and Runway Overrun Awareness and Alerting System (ROAAS). This revision converts this document to the new Flight Standardization Board Report (FSBR) format and complies with Section 508. Change bars are not included in this document because the entire report is revised and updated.

4. BACKGROUND

The Small Aircraft AEG formed a Flight Standardization Board (FSB) that evaluated the EMB-500 as defined in FAA Type Certificate Data Sheet (TCDS) No. #A59CE. The evaluation was conducted during September 2008 using the methods described in FAA Advisory Circular (AC) 120-53, Crew Qualification and Pilot Type Rating Requirements for Transport Category Aircraft Operated under FAR Part 121.

The EMB-500 and EMB-505 were on the same report until Revision 3 when they were separated in order to have a separate report for each pilot type rated airplane.

In November 2016, the FSB conducted flight evaluations of the EMB-500 EV model, which includes the G3000 avionics suite, enhanced engine performance, and advisory ice detector installation. T2 and T3 tests were conducted at the Embraer facilities in Brazil in accordance with AC 120-53B, Guidance for Conducting and Use of Flight Standardization Board Evaluations.

In August 2022, the Small Aircraft Evaluation Group was designated the General Aviation Branch as a part of a reorganization of the Aircraft Evaluation Division.

The General Aviation Branch evaluated the following projects for Revision 5:

- Garmin G3000 Load 2X (System Version 3305.00);
- Garmin G3000 Load 2X++ (System Version 3305.07);
- Ice Detector (airplanes equipped with G1000 avionics system); and
- Runway Overrun Awareness and Alerting System (ROAAS).

5. ACRONYMS

- 14 CFR Title 14 of the Code of Federal Regulations
- AC Advisory Circular
- ACS Airman Certification Standards
- ACFT Aircraft
- AEG Aircraft Evaluation Group
- AFM Airplane Flight Manual
- AMM Airplane Maintenance Manual
- ATP Airline Transport Pilot
- AV Audiovisual Presentation
- CAS Crew Alerting System
- CB Circuit Breaker
- CPT Cockpit Procedures Trainer
- CVDR Cockpit Voice and Data Recorder
- ECL Electronic Checklist
- EV Evolution
- FAA Federal Aviation Administration
- FADEC Full-Authority Digital Engine Control
- FCSOV Flow Control Shutoff Valve
- FFS Full Flight Simulator
- FMS Flight Management System
- FSB Flight Standardization Board
- FSBR Flight Standardization Board Report
- FSTD Flight Simulation Training Device
- FTD Flight Training Device
- GTC Garmin Touch Control
- HO Handout
- ICBI Interactive Computer-Based Instruction

- ILS Instrument Landing System
- ITT Interturbine Temperature
- KIAS Knots Indicated Airspeed
- LOF Line Oriented Flight
- MDR Master Differences Requirements
- MFD Multifunction Display
- MLW Maximum Landing Weight
- MRW Maximum Ramp Weight
- MTOW Maximum Takeoff Weight
- MZFW Maximum Zero Fuel Weight
- NAS National Airspace System'
- OPERA Optimized Performance Analyzer
- PC Personal Computer
- PIC Pilot In Command
- PRSOV Pressure Regulating Shutoff Valve
- PSID Pounds per Square Inch Differential
- PTS Practical Test Standards
- PTT Part Task Trainers
- QRH Quick Reference Handbook
- ROAAS Runway Overrun Awareness and Alerting System
- SIC Second In Command
- SRM Single-Pilot Resource Management
- TAWS Terrain Awareness and Warning System
- TCAS Traffic Alert and Collision Avoidance System
- TCBI Tutorial Computer-Based Instruction
- TCDS Type Certificate Data Sheet
- V_1 Critical Engine Failure Speed
- V_A Maneuvering Speed
- V_{LE} Maximum Landing Gear Extended Speed
- V_{LO} Maximum Landing Gear Operating Speed
- V_{MCG} Minimum Controllable Airspeed (Ground)
- V_{MCA} Minimum Controllable Airspeed (Air)

6. DEFINITIONS

These definitions are for the purposes of this report only.

6.1 Base Aircraft. An aircraft identified for use as a reference to compare differences with another aircraft.

6.2 Current. A crewmember meets all requirements to operate the aircraft under the applicable operating part.

6.3 Differences Tables. Describe the differences between a pair of related aircraft, and the minimum levels operators must use to conduct differences training and checking of flightcrew members. Differences levels range from A to E.

6.4 Master Differences Requirements (MDR). Specifies the minimum levels of training and checking required between a pair of related aircraft, derived from the highest level in the Differences Tables.

6.5 Mixed Fleet Flying (MFF). The operation of a base aircraft and one or more related aircraft for which credit may be taken for training, checking, and currency events.

6.6 Operational Evaluation. The AEG process to determine pilot type rating, minimum flightcrew member training, checking and currency requirements, and unique or special airman certification requirements (e.g., specific flight characteristics, no-flap landing).

6.7 Operational Suitability. The AEG determination that an aircraft or system may be used in the National Airspace System (NAS) and meets the applicable operational regulations (e.g., Title 14 of the Code of the Federal Regulations (14 CFR) parts 91, 121, 133, and 135).

6.8 Qualified. A flightcrew member holds the appropriate airman certificate and ratings as required by the applicable operating part.

6.9 Related Aircraft. Any two or more aircraft of the same make with either the same or different type certificates (TC) that have been demonstrated and determined by the Administrator to have commonality.

6.10 Seat-Dependent Tasks. Maneuvers or procedures using controls that are accessible or operable from only one flightcrew member seat.

6.11 Special Emphasis Area. A training requirement unique to the aircraft, based on a system, procedure, or maneuver, which requires additional highlighting during training. It may also require additional training time, specialized flight simulation training devices (FSTD) or training equipment.

6.12 Specific Flight Characteristics. A maneuver or procedure with unique handling or performance characteristics that the FSB has determined must be checked.

7. PILOT TYPE RATING

7.1 Type Rating. The type rating designation for the Embraer 500 is EMB-500 and may be operated with or without a second in command (SIC) with certain limitations. The Airplane Flight Manual (AFM) lists equipment that must be operative to operate the aircraft single-pilot.

7.2 Common Type Ratings. Not applicable.

7.3 Military Equivalent Designations. Military aircraft that qualify for the EMB-500 type rating can be found at www.faa.gov under "Licenses & Certificates," "Airmen Certification," "Online Services," "Aircraft Type Rating Designators." This webpage is kept up-to-date and can be found at: https://www.faa.gov/licenses_certificates/airmen_certification/.

8. RELATED AIRCRAFT

8.1 Related Aircraft on Same TCDS. Not applicable.

8.2 Related Aircraft on Different TCDS. The Embraer 500 is related to the Embraer 505.

9. PILOT TRAINING

9.1 Airman Experience. Airmen receiving initial EMB-500 training should have, at a minimum, a private pilot certificate with Instrument and Multi-Engine ratings and a logbook showing at least 70 hours total pilot in command (PIC) and 200 hours total flight time. Airmen should have previous training in new generation avionics, high altitude operations, Flight Management System (FMS), and Single-Pilot Resource Management (SRM). Pilots without this experience may require additional training.

9.2 Special Emphasis Areas.

9.2.1 Pilots must receive special emphasis on the following areas during ground training:

a) SRM, Risk Assessment, and Risk Management.

b) Stick Pusher aerodynamics and purpose.

c) Optimized Performance Analyzer (OPERA).

d) Prodigy System Integration Training.

e) Crew Alerting System (CAS) Logic and Abnormal Procedures Training ("Golden" messages).

f) Effect of icing system at high altitudes in regards to airspeed and performance.

g) Three different emergency landing gear handle configurations due to available avionics installations.

9.2.2 Pilots must receive special emphasis on, and perform the following areas during flight training:

a) Stick Pusher System. With an appropriately qualified instructor, all pilots in EMB-500 should practice and demonstrate the Stick Pusher system in a full flight simulator (FFS) or in flight and recognize that an altitude loss in stall can be significant if the stick pusher activates. If this training must be

conducted in the aircraft, the FSB recommends it be conducted during the clean configuration stall maneuver and with ample altitude for recovery.

b) Electronic Checklist (ECL). The ECL is open-loop type as the pilot or crewmember must acknowledge the accomplishment of all checklist items. All Normal, Abnormal, and Emergency Procedures contained in the quick reference handbook (QRH) are included.

c) SafeTaxi. The aircraft symbol moves over the airport diagram as the airplane is taxied.

d) FliteCharts. FliteCharts do not have a moving display. It is an electronic display of the paper chart.

e) ChartView. ChartView is the electronic version of Jeppesen terminal procedures charts.

9.3 Specific Flight Characteristics. Maneuvers or procedures required to be checked as referenced in the Airline Transport Pilot (ATP) and Type Rating for Airplane Airman Certification Standards (ACS) or ATP and Aircraft Type Rating Practical Test Standards (PTS).

9.4 Seat-Dependent Tasks. There are no seat-dependent tasks. However, the minimum crew determination listed in the AFM and the TCDS is one pilot in the left seat. As such, the pilot must occupy the left cockpit seat for all PIC training.

9.5 Regulatory Training Requirements Which Are Not Applicable to the EMB-500.

9.5.1 Part 135

a) Part 135 Ground Training: Propellers.

9.6 Flight Simulation Training Devices (FSTD). There are no specific systems, procedures, or maneuvers that are unique to the EMB-500 that require a specific FSTD for training.

9.7 Training Equipment. There are no specific systems or procedures that are unique to the EMB-500 that require specific training equipment.

9.8 Differences Training Between Related Aircraft. Pilots must receive differences training between EMB-500 aircraft equipped with Garmin Prodigy, G1000 avionics, and the EMB-500 equipped with Garmin Prodigy, G3000 avionics. The level of training is specified in Appendix 3, Differences Tables.

9.8.1 EMB-500 (G1000) to EMB-500 (G3000).

- Minimum training time should be 3 hours ground school consisting of stand-up lecture plus 2 hours per pilot using a Level C systems device as specified in Appendix 1, Differences Legend. Use of the Garmin G3000 Personal Computer (PC) Trainer is highly recommended in order to execute commands

required on the Garmin Touch Control (GTC) units. An airplane may be used, and a Line Oriented Flight (LOF) is recommended.

- Special emphasis areas should include:
  - Cockpit Preparation - Different Flow Pattern and Panels.
  - Loss of Garmin Touchscreens.
  - Electrical and Reversionary Emergency Procedures.
  - Engine Fire.
  - Alternate Gear Extension.

9.8.2 EMB-500 (G3000) to EMB-500 (G1000).

- Minimum training time should be 3 hours ground school consisting of stand-up lecture plus 2 hours per pilot using a Level C systems device as specified in Appendix 1. Use of the Garmin G1000 PC Trainer is highly recommended in order to execute commands required on the Garmin G1000 concentric knobs. An airplane may be used, and an LOF is recommended.
- Special emphasis areas should include:
  - Cockpit Preparation - Different Flow Pattern and Panels.
  - Electrical and Reversionary Emergency Procedures.
  - Engine Fire.
  - Alternate Gear Extension.

9.9 Special Considerations for Training in the Actual Aircraft.

The FSB has identified the following special considerations when conducting EMB-500 flight training:

a) Emergency Gear Extension. Activation of the emergency gear system should not be accomplished in the aircraft during training. If the emergency gear system is activated, the aircraft must be landed and inspected in accordance with the EMB-500 Airplane Maintenance Manual (AMM).

b) Engine Shutdown in Flight. For an intentional engine shutdown in flight, the thrust of the selected engine should be at idle for 2 minutes prior to shutdown and prior to selecting the engine Start/Stop knob to OFF. An airspeed allowing for a successful engine air start should be maintained for the weight/altitude/temperature condition as illustrated in the Engine Air Start Envelope in Section 3 of the AFM and the QRH. It is important to emphasize that the full-authority digital engine control (FADEC) limiting protections are not available during an in-flight engine restart so the instructor must monitor all engine restart indications and must be prepared to manually shut down the engine if needed before any limitations are exceeded. After shutdown, the engine Interturbine Temperature (ITT) should be permitted to cool to 100 °C before attempting a restart. The engine should be operated at idle for an additional 2 minutes prior to applying engine thrust.

c) No-FlapApproaches. No-Flap approaches and landings may be trained in the aircraft. If trained in the aircraft, the instructor must be attentive to the flightcrew's airspeed control, the available runway length, and the surface condition. It is important to note that the final approach speed with flaps in the UP position is V_{REF} + 30, and additional runway length, approximately 1.9 times the V_{REF} Full Flap landing distance, is required. Bank angle in the EMB-500 is limited to 20°.

d) Stall Prevention/Stick Pusher. Preferred training for stick pusher is in an FFS. However, if it must be trained in the aircraft, the FSB recommends these maneuvers only be conducted with an appropriately qualified instructor. Instructors and pilots should be prepared for significant altitude loss if the stick pusher activates. Stick pusher activation in the aircraft can result in an altitude loss of 400–500 feet and a secondary stall could occur. The FSB did not evaluate stalls at high altitudes, which may result in much greater loss of altitude than stalls at low altitude.

9.10 Transition Training Between Related Aircraft. As a part of the T-5 test, the FSB evaluated Embraer's proposed transition ground and flight training for applicants for the EMB-500 pilot type rating that already hold the EMB 505 pilot type rating. As a result of that evaluation, the FSB validated a shortened transition training program from the EMB-505 to the EMB-500 if the transition training is accomplished in an avionics package (G1000 or G3000) in which the pilot or crew is already qualified. In such cases, while all FAA required training modules and elements must be covered during transition training, if the airman meets the prerequisites listed in subparagraph 9.10.1 below, the specific G1000 or G3000 avionics training that was already successfully completed need not be fully repeated. Transition training specific to avionics must include items identified in Appendix 4, Transition Training, and any other system functionality that integrates with aircraft systems.

The FSB recommends a pilot meet the following when transitioning from the EMB-505 to the EMB-500:

9.10.1 Prerequisites.

1. Hold, at a minimum, a private pilot certificate with EMB-505 pilot type rating,
2. Meet the instrument recency of experience requirements specified in 14 CFR part 61, § 61.57, and
3. Meets one of the following:
   a) Completed initial EMB-505 training and type rating practical test within the last 12 months, or
   b) Completed a proficiency or competency check in the EMB-505 in accordance with 14 CFR §§ 61.58, 91.1065, or 135.293 within the preceding 12 months, or
   c) Have flown 25 hours in EMB-505 as PIC within the last 6 months.

9.10.2 Ground Training.

The FSB recommends a minimum of 8 hours of transition ground training. Special emphasis should be on the new systems and procedures such as hydraulics, pneumatics, flight controls, anti-ice systems, normal, abnormal, and emergency procedures, system controls and operations, OPERA, and flight planning differences.

To help with transfer of learning between the two aircraft types, a table is included in Appendix 4 of this report.

9.10.3 Flight Training.

The FSB recommends a minimum of three 2-hour training flights when transitioning from the EMB-505 to EMB-500 with emphasis on the following maneuvers:

- Normal Takeoff.
- Stall Prevention (Approaches to Stall/Stall Recovery).
- Engine Failure on Takeoff at V_1.
- Single Engine Instrument Landing System (ILS) Approach.
- Single Engine Missed Approach.
- Two Engine Missed Approach
- Landing or Balked Landing from a Circling Approach.
- No-Flap Balked Landing.
- No-Flap Approach.
- Single Engine Landing from an ILS.

10. PILOT CHECKING

10.1 Landing from a No-Flap or Nonstandard Flap Approach. The probability of flap extension failure on the EMB-500 is not extremely remote due to system design. Therefore, demonstration of a no-flap approach and landing during pilot certification is required. During a §§ 61.58 proficiency check, 91.1065 competency check or 135.293 competency check, this task may be required. Refer to Order 8900.1, Volume 5, Airman Certification, when the test or check is conducted in an aircraft versus an FFS.

10.2 Specific Flight Characteristics. Maneuvers or procedures required to be checked as referenced in the ATP and Type Rating for Airplane ACS.

There are no specific flight characteristics.

10.3 Seat-Dependent Tasks. There are no seat-dependent tasks. However, the minimum crew determination listed in the AFM and the TCDS is one pilot in the left seat. As such, the pilot must occupy the left cockpit seat for all PIC checking.

10.4 Other Checking Items. Not applicable.

10.5 Flight Simulation Training Devices (FSTD). There are no specific systems, procedures, or maneuvers that are unique to the EMB-500 that require a specific FSTD for checking.

10.6 Equipment. There are no specific systems or procedures that are unique to the EMB-500 that require specific equipment.

10.7 Differences Checking Between Related Aircraft. Pilots must receive differences checking between the EMB-500 equipped with Garmin Prodigy, G1000 avionics and the EMB-500 equipped with Garmin Prodigy, G3000 avionics. The level of checking is specified in Appendix 3. The check should require demonstration of the ability to accomplish normal and abnormal tasks related to the avionics system, including alternate means to accomplish the same task.

10.8 Special Considerations for Checking in the Actual Aircraft.

The FSB has identified the following special considerations when conducting EMB-500 checking inflight:

a) Circuit Breakers (CB). The FSB recommends that examiners not pull CBs during the administration of a practical test since pulling certain CBs may induce the unwanted loss of other equipment due to the complexity of systems integration.

b) Emergency Gear Extension. Activation of the emergency gear system should not be accomplished in the aircraft during checking. If the emergency gear system is activated, the aircraft must be landed and inspected in accordance with the EMB-500 AMM.

c) Engine Shutdown in Flight. For an intentional engine shutdown in flight, the thrust of the selected engine should be at idle for 2 minutes prior to shutdown and prior to selecting the engine Start/Stop knob to OFF. An airspeed allowing for a successful engine air start should be maintained for the weight/altitude/temperature condition as illustrated in the Engine Air Start Envelope in Section 3 of the AFM and the QRH. It is important to emphasize that the FADEC limiting protections are not available during an in-flight engine restart so the examiner must monitor all engine restart indications and must be prepared to manually shut down the engine if needed before any limitations are exceeded. After shutdown, the engine ITT should be permitted to cool to 100 °C before attempting a restart. The engine should be operated at idle for an additional 2 minutes prior to applying engine thrust.

d) No-Flap Approaches and Landings. No-Flap approaches and landings may be checked in the aircraft. If checked in the aircraft, the examiner must be attentive to the flightcrew's airspeed control and available runway length and surface condition. It is important to note that the final approach speed with flaps in the UP position is VREF + 30, and additional runway length, approximately 1.9 times the VREF Full Flap landing distance, is required. Bank angle in the EMB-500 is limited to 20°.

11. PILOT CURRENCY

There are no additional currency requirements for the EMB-500 other than those already specified in parts 61 and 135.

11.1 Differences Currency Between Related Aircraft. Not applicable.

12. OPERATIONAL SUITABILITY

The EMB-500 is operationally suitable for operations under parts 91 and 135. The FSB determined operational compliance by conducting an evaluation of the EMB-500. The list of operating rules evaluated is on file at the General Aviation Branch.

13. MISCELLANEOUS

13.1 Forward Observer Seat. The EMB-500 right cockpit seat as installed by TCDS #A59CE has been evaluated and determined to meet requirements of 135.75(b) for use by the Administrator during enroute inspections and for the administration of flight tests leading to pilot certification or operating privileges.

While the right cockpit seat is the primary seat in the EMB-500 to meet the regulations cited above, if that seat is occupied (i.e., for dual crew operations), the nearest available passenger seat in the cabin is acceptable to perform enroute inspections if communications, oxygen, adequate visibility, lighting, and ventilation are available. Depending upon the cabin configuration, the nearest available passenger seat may also be acceptable for the administration of flight tests leading to pilot certification or operating privileges. Certain limitations to perform specific checks may apply and will be determined by the Administrator for the specific cabin configuration.

13.2 Landing Minima Categories (Reference 14 CFR Part 97, § 97.3). The EMB-500 is considered a Category B aircraft for the purposes of determining the appropriate "straight in landing weather minima."

Straight-in Approaches:

AIRCRAFT SPEED	FLAP POSITION	APPROACH CATEGORY
100 KIAS	Landing Flaps (Full)	Category B

Circling Approaches:

AIRCRAFT SPEED	FLAP POSITION	APPROACH CATEGORY
120 KIAS Minimum	Landing Flaps (Full)	Category determined by speed flown

13.3 Normal Landing Flaps. The EMB-500 normal "final landing flap setting" per § 91.126(c) is Landing Flaps "FULL".

13.4 Aircraft Proving Tests. Proving tests in accordance with § 135.145 are appropriate when the EMB-500 is new to an operator.

APPENDIX 1. DIFFERENCES LEGEND

Training Differences Legend

Differences Level	Type	Training Method Examples	Conditions
A	Self-Instruction	• Operating manual revision (handout (HO)) • Flightcrew operating bulletin (HO)	• Crew has already demonstrated understanding on base aircraft (e.g., updated version of engine). • Minor or no procedural changes required. • No safety impact if information is not reviewed or is forgotten (e.g., different engine vibration damping mount). • Once called to attention of crew, the difference is self-evident.
B	Aided Instruction	• Audiovisual presentation (AV) • Tutorial computer-based instruction (TCBI) • Stand-up instruction (SU)	• Systems are functionally similar. • Crew understanding required. • Issues need emphasis. • Standard methods of presentation required.
C	Systems Devices	• Interactive (full-task) computer-based instruction (ICBI) • Cockpit Procedures Trainers (CPT) • Part task trainers (PTT) • Level 4 or 5 flight training device (FTD 4-5)	• Training can only be accomplished through systems training devices. • Training objectives focus on mastering individual systems, procedures, or tasks versus highly integrated flight operations or “real-time” operations. • Training devices are required to assure attainment or retention of crew skills to accomplish more complex tasks usually related to aircraft systems.
D	Maneuvers Devices	• Level 6 or 7 flight training device (FTD 6-7) • Level A or B full flight simulator (FFS A-B)	• Training can only be accomplished in flight maneuver devices in a real-time environment. • Training requires mastery of interrelated skills versus individual skills. • Motion, visual, control-loading, and specific environmental conditions may be required.
E	Level C/D FFS or Aircraft	• Level C or D full flight simulator (FFS C-D) • Aircraft (ACFT)	• Motion, visual, control-loading, audio, and specific environmental conditions are required. • Significant full-task differences that require a high fidelity environment. • Usually correlates with significant differences in handling qualities.

Checking Differences Legend

Differences Level	Checking Method Examples	Conditions
A	None	None
B	• Oral or written exam • Tutorial computer-based instruction (TCBI) self-test	Individual systems or related groups of systems.
C	• Interactive (full-task) computer-based instruction (ICBI) • Cockpit Procedures Trainers (CPT) • Part task trainers (PTT) • Level 4 or 5 flight training device (FTD 4-5)	• Checking can only be accomplished using systems devices. • Checking objectives focus on mastering individual systems, procedures, or tasks.
D	• Level 6 or 7 flight training device (FTD 6-7) • Level A or B full flight simulator (FFS A-B)	• Checking can only be accomplished in flight maneuver devices in a real-time environment. • Checking requires mastery of interrelated skills versus individual skills. • Motion, visual, control-loading, and specific environmental conditions may be required.
E	• Level C or D full flight simulator (FFS C-D) • Aircraft (ACFT)	Significant full-task differences that require a high fidelity environment.

APPENDIX 2. MASTER DIFFERENCES REQUIREMENTS (MDR) TABLE

These are the minimum levels of training and checking required, derived from the highest level in the Differences Tables in Appendix 3. Differences levels are arranged as training/checking.

To Related Aircraft ↓	From Base Aircraft →	EMB-500 (G1000)	EMB-500 (G3000)
EMB-500 (G1000)		(1) A/A (2) B/B (4) A/A	C/C
EMB-500 (G3000)		(3) C/C	(1) A/A (2) B/B (5) A/A

Notes:

1. Avionics Software upgrades through Load 9X (G1000) and Load 1X (G3000), Speedbrake Function Implementation, ADS-B Out, SVS.
2. CPDLC, TAWS-A, RADALT, TCAS II, TCAS II compatible XPDR.
3. Level A/A for EMB-500 Evolution (EV) Enhanced Performance and Ice Detector.
4. Ice Detector.
5. G3000 Load 2X, and 2X++ software upgrades, ROAAS.

APPENDIX 3. DIFFERENCES TABLES

This Design Differences Table, from the EMB 500 (G1000) to the EMB-500 (G3000), was proposed by Embraer S.A. and validated by the FSB in November 2016. It lists the minimum differences levels operators must use to conduct differences training and checking of flightcrew members.

FROM BASE AIRCRAFT: EMB-500 (G1000) TO RELATED AIRCRAFT: EMB-500 (G3000)	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	Panel Layout	EMB-500 (G3000) panel has two touchscreen controllers instead of audio/FMS control panels. Displays are bigger (14.1” instead of 12”). There are dedicated panels for barometric correction adjustment and display reversion (control changed from pushbutton to toggle). Ice Protection/Heating panel is split in two different panels. Terrain Awareness and Warning System (TAWS) inhibition buttons and Cockpit Voice and Data Recorder (CVDR) Panel replaced by virtual controls. Engine/Fire/Trim control panel is split in two different panels, test controls changed from pushbuttons to knob, and central console increased.	No	Yes	B	B

FROM BASE AIRCRAFT: EMB-500 (G1000) TO RELATED AIRCRAFT: EMB-500 (G3000)	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	ATA 21 Air Conditioning	PRESN/AIR Conditioning Panel EMB-500 (G1000) has independent knobs for cockpit and cabin temperature control. EMB-500 (G3000) has concentric knobs for cockpit and cabin temperature control.	No	No	A	A
	ATA 23 Communications	Frequency tuning and audio control are executed through touchscreen controllers.	No	Yes	C	C
	ATA 26 Fire Protection	The Engine/Fire Control Panel has a different control layout and is installed in the center console, relocated aft of the thrust levers.	No	No	C	B
	ATA 27 Flight Controls	The Trim Control Panel has a different layout and is installed below the touchscreen controllers. Stall Test control is integrated into the Test Panel with different layout and relocated to the pilot left panel.	No	No	B	A

FROM BASE AIRCRAFT: EMB-500 (G1000) TO RELATED AIRCRAFT: EMB-500 (G3000)	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	ATA 30 Ice and Rain Protection	Ice Detector Installation. EMB-500EV (G3000) has an Ice Detector and is to be tested via test panel prior to takeoff.	No	Yes	A	A
	ATA 31 Instruments	Different display units and touchscreen controllers are installed in the cockpit. Display Reversion Control Panel installed on the central console in front of the thrust levers. CVDR panel replaced by a dedicated virtual page in touchscreen controllers.	No	Yes	C	C
	ATA 32 Landing Gear	Landing Gear lever is shorter and repositioned leftward. Emergency Extension access door removal and Landing Gear Free Fall Lever repositioned down and leftward on cockpit center pedestal.	No	Yes	B	B
	ATA 33 Lights	Lighting Control Panel has a new control layout and the addition of inspection light switch.	No	Yes	A	A

FROM BASE AIRCRAFT: EMB-500 (G1000) TO RELATED AIRCRAFT: EMB-500 (G3000)	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	ATA 34 Navigation	Barometric adjustment has dedicated panel, one for each pilot. Frequency tuning, flight plan editing, and transponder configuration are executed through touchscreen controllers. Vertical Navigation is performed through GTC with speed and altitude constraint options instead of knobs. SurfaceWatch and ILS Preview are available with G3000. Change in TAWS symbology, Electronic Document Viewer, and addition of reactive windshear alert, and Vertical Situation Display with flight plan information (waypoints/constraints) available with G3000.	No	Yes	C	C

FROM BASE AIRCRAFT: EMB-500 (G1000) TO RELATED AIRCRAFT: EMB-500 (G3000)	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	ATA 71 Powerplant	Enhanced Performance. EMB-500EV Enhanced Performance: - New CAS message ENG THRUST DISAG. - Performance placard: Engine model PW617F1-E, performance table OPERA Type C. - N2 MAX steady state = 101.6%. - N2 MAX transient = 103.2%. G3000 Changes: - Engine Takeoff Data Setting via Aircraft Systems in GTC. - Powerplant panel in the center pedestal relocated aft of the thrust levers.	No	Yes	C	C

This Maneuver Differences Table, from the EMB 500 (G1000) to the EMB-500 (G3000), was validated by the FSB in November 2016. It lists the minimum differences levels operators must use to conduct differences training and checking of flightcrew members.

FROM BASE AIRCRAFT: EMB-500 (G1000) **TO RELATED AIRCRAFT: EMB-500 (G3000)**	**MANEUVER**	**REMARKS**	**FLT CHAR**	**PROC CHNG**	**TRAINING**	**CHECKING**
	Cockpit Preparation	Different system panel positions and different flows.	No	Yes	C	C
	Cockpit Preparation	Flight Plan Entry, Weight Planning, Map Configurations, Engine Data, Weather Radar.	No	Yes	C	C
	Before Start	Different flow.	No	Yes	C	C
	Engine Start	Different Engine Control Location.	No	No	A	A
	After Start and Taxi	Different cockpit flow, Surface Watch System.	No	Yes	A	A
	Instrument Approaches	Flight plan and approach selection and activation procedures.	No	Yes	C	C
	Normal Procedures	Aircraft systems and Flight Plan interface via GTC.	No	Yes	C	C

FROM BASE AIRCRAFT: EMB-500 (G1000) TO RELATED AIRCRAFT: EMB-500 (G3000)	MANEUVER	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	Abnormal Procedures	AFM Supplement for Annunciated and Non-Annunciated Procedures Specific to the Reversion and Loss of GTC – Electrical Emergency.	No	Yes	C	C
	Abnormal Procedures	Engine Fire.	No	No	C	B
	Abnormal Procedures	Alternate Gear Extension.	No	Yes	B	B

This Design Differences Table, from the EMB-500 (G3000) to the EMB-500 (G1000), was proposed by Embraer S.A. and validated by the FSB in November 2016. It lists the minimum differences levels operators must use to conduct differences training and checking of flightcrew members.

FROM BASE AIRCRAFT: EMB-500 (G3000) TO RELATED AIRCRAFT: EMB-500 (G1000)	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	Panel Layout	EMB-500 (G1000) panel has two audio panels and an FMS control panel instead of two touchscreen controllers. Display units are smaller (12” instead of 14.1”). Barometric correction adjustment is controlled by knobs on display units. Display reversion is performed using Audio panel pushbuttons. Ice Protection/Heating, TAWS, and CVDR controls are on panels instead of virtual. Engine/Fire and Trim control panels are in one single panel and central console is shorter.	No	Yes	B	B

FROM BASE AIRCRAFT: EMB-500 (G3000) TO RELATED AIRCRAFT: EMB-500 (G1000)	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	ATA 21 Air Conditioning	PRESN/AIR Conditioning Panel. EMB-500 (G3000) has concentric knobs for cockpit and cabin temperature control. EMB-500 (G1000) has independent knobs for cockpit and cabin temperature control.	No	No	A	A
	ATA 23 Communications	Frequency tuning is executed through display knobs or FMS panel. Audio control is executed through audio panels.	No	Yes	C	C
	ATA 26 Fire Protection	Engine/Fire/Trim Control Panel has a different control layout and is installed on the main panel in front of the thrust levers.	No	No	C	B

FROM BASE AIRCRAFT: EMB-500 (G3000) TO RELATED AIRCRAFT: EMB-500 (G1000)	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	ATA 27 Flight Controls	Trim controls are integrated into the Engine/Fire/Trim Control Panel, which has a different layout and is installed in the main panel in front of the thrust levers. Stall Test control is integrated into the Test Panel which has a different control layout and is commanded by a switch that is used to start the test.	No	No	C	B
	ATA 30 Ice and Rain Protection	Ice Detector Installation. EMB-500 (G1000) does not have an Ice Detector.	No	Yes	A	A
	ATA 31 Instruments	Different display units, audio panels, and FMS control panel are installed on the cockpit. Display Reversion controls are installed on Audio Panel next to primary flight displays. EMB-500 (G1000) has a CVDR panel installed in the LH panel console. It is a physical panel with pushbuttons and status lamps.	No	Yes	C	C

FROM BASE AIRCRAFT: EMB-500 (G3000) TO RELATED AIRCRAFT: EMB-500 (G1000)	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	ATA 32 Landing Gear	Landing Gear lever is longer and repositioned rightward. Emergency Extension access door inclusion and Landing Gear Free Fall Lever repositioned up and rightward on cockpit center pedestal.	No	No	B	A
	ATA 32 Landing Gear	Landing Gear Free Fall Lever has different shape and actuation mechanism.	No	Yes	B	B
	ATA 33 Lights	Lighting Control Panel has a different control layout, where the effect light switch is added and inspection light switch moves to Ice Protection/Heating/TAWS Control Panel.	No	Yes	A	A

FROM BASE AIRCRAFT: EMB-500 (G3000) TO RELATED AIRCRAFT: EMB-500 (G1000)	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	ATA 34 Navigation	Barometric adjustment is executed through knobs located on the display bezels. Frequency tuning, flight plan editing, and transponder configuration are executed through display bezel knobs/buttons and FMS panel. Vertical Navigation is performed through FMS knob instead of touchscreen integration. G1000 (pre-load 8x) does not have SurfaceWatch, Electronic document viewer, or ILS Preview. Change in TAWS symbology.	No	Yes	C	C

FROM BASE AIRCRAFT: EMB-500 (G3000) TO RELATED AIRCRAFT: EMB-500 (G1000)	DESIGN	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	ATA 71 Powerplant	Enhanced Performance. EMB-500 Standard Performance and G1000: - Performance placard: Engine model PW617F-E, performance table OPERA Type A or B. - N2 MAX steady state = 100.4%. - N2 MAX transient = 102.0%. G3000 Changes: - Engine Takeoff Data Setting via lower part of the Multifunction Display (MFD). - Powerplant panel in the center pedestal above the thrust lever panel.	No	Yes	C	C

This Maneuver Differences Table, from the EMB 500 (G3000) to the EMB-500 (G1000), was proposed by Embraer S.A. and validated by the FSB in November 2016. It lists the minimum differences levels operators must use to conduct differences training and checking of flightcrew members.

FROM BASE AIRCRAFT: EMB-500 (G3000) TO RELATED AIRCRAFT: EMB-500 (G1000)	MANEUVER	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	Cockpit Preparation	Different system panel positions and different flows.	No	Yes	C	C
	Cockpit Preparation	Flight Plan Entry, Weight Planning, Map Configurations, Engine Data, Weather Radar.	No	Yes	C	C
	Before Start	Different flow.	No	Yes	C	C
	Engine Start	Different Engine Control Location.	No	No	A	A
	After Start and Taxi	Different cockpit flow, No Surface Watch System (before Load 9x).	No	Yes	A	A
	Instrument Approaches	Flight plan and approach selection and activation procedures.	No	Yes	C	C
	Normal Procedures	Aircraft systems and Flight Plan interface via G1000.	No	Yes	C	C
	Abnormal Procedures	Different Annunciated and Non-Annunciated Procedures.	No	Yes	C	C

FROM BASE AIRCRAFT: EMB-500 (G3000) TO RELATED AIRCRAFT: EMB-500 (G1000)	MANEUVER	REMARKS	FLT CHAR	PROC CHNG	TRAINING	CHECKING
	Abnormal Procedures	Engine Fire.	No	No	C	B
	Abnormal Procedures	Alternate Gear Extension.	No	Yes	B	B

APPENDIX 4. TRANSITION TRAINING

The following Design and Maneuver Tables were proposed by Embraer S.A. and validated by the FSB in accordance with AC 120-53B, Appendix 3, paragraph 7. It is included in the FSB report to help with transfer of learning from the EMB-505 to the EMB-500.

TRANSITION FROM: EMB-505 TO: EMB-500	DESIGN	REMARKS	FLT CHAR	PROC CHNG
	Dimensions	Decreased dimensions: - Length = - 9 ft, 3 in (2.82 m). - Height = - 2 ft, 5.8 in (0.75 m). - Wing span = - 11 ft, 9.7 in (3.61 m). **EMB-505:** - Length = 51 ft, 4in (15.64 m). - Height = 16 ft, 9 in (5.10m). - Wing span = 52 ft, 2 in (15.91 m). **EMB-500:** - Length = 42 f,t 1 in (12.82 m). - Height = 14 ft, 3.2 in (4.35 m). - Wing span = 40 ft, 4.3 in (12.30 m).	No	No
	ATA 44 Cabin Systems	Maximum occupants: **EMB-505** = up to 11 seats. **EMB-500** = up to eight seats.	No	No
	ATA 50 Cargo and Accessory Compartments	Cargo capacity decreased by 0.405 cubic meters (m^3). **EMB-505** = 2.11 m^3 (total). **EMB-500** = 1.705 m^3 (total).	No	No

TRANSITION FROM: EMB-505 TO: EMB-500	DESIGN	REMARKS	FLT CHAR	PROC CHNG
	LIMITATIONS Weight	Weight Limitations Decreased. **EMB-505:** - Maximum Ramp Weight (MRW): 8,200 kg. - Maximum Takeoff Weight (MTOW): 8,150 kg. - Maximum Landing Weight (MLW): 7,650 kg. - Maximum Zero Fuel Weight (MZFW): 6,350 kg. **EMB-500:** - MRW: 4,770 kg. - MTOW: 4,750 kg. - MLW: 4,430 kg. - MZFW: 3,803 kg.	No	No
	LIMITATIONS Center of Gravity	Limits for conditions of cruise with flaps and gear ups. **EMB-505:** - 19% to 32% at MTOW. - 22% to 39% at MZFW. **EMB-500:** - 23.5% to 36.9% at MTOW. - 21.5% to 38.5% at MZFW.	No	No
	LIMITATIONS Speeds	Maneuvering Speed (V_A) decreased. Refer to specific model AFM for Minimum Controllable airspeed in the Air (VMCA) and on the Ground (VMCG) values.	No	No
	Noise Levels in EPNdb	**EMB-505:** - 69.9 Flyover. - 88.8 Lateral. - 88.5 Approach. **EMB-500:** - 70.4 Flyover. - 81.4 Lateral. - 86.1 Approach.	No	No

TRANSITION FROM: EMB-505 TO: EMB-500	DESIGN	REMARKS	FLT CHAR	PROC CHNG
	ATA 21 Air Conditioning	**EMB-505:** - max altitude (alt) = 45,000 ft. - max alt cabin 6,640 ft. - delta-p = 9.36 pounds per square inch differential (psid). **EMB-500:** - max alt = 41,000 ft. - max alt cab de 8,000 ft. - delta-p = 8.34 psid. **PRESN/AIR Conditioning Panel** **EMB-505** Switch named "ECS" commands Flow Control Shutoff Valves (FCSOV). **EMB-500** Switch named "BLEED" commands Pressure Regulating Shutoff Valves (PRSOV). **Ground Operation** **EMB-505** Has one cross-bleed valve that allows one bleed valve to work for two FCSOVs. ECS switch controls FCSOVs directly. Additional automated logic and additional CAS message. **EMB-500** If switch "BLEED" is active, FCSOVs appears open in Synoptic.	No	Yes
	ATA 22 Autoflight	EMB-500 does not have Ventral Rudder Control.	No	Yes
	ATA 23 Communications	EMB-500 panel does not allow frequency selection of COM, NAV, or configuration of Transponder.	No	No

TRANSITION FROM: EMB-505 TO: EMB-500	DESIGN	REMARKS	FLT CHAR	PROC CHNG
	ATA 24 Electrical Power	**EMB-505:** One additional Shed Bus. Additional CB Panel behind pilot seat. Generator: Two 400A, Limited to 350A when on ground. Battery: One 34 Amp Hour and one 36 Amp Hour (engine start). **EMB-500:** Generator: Two 325A. Battery: Two Valve-Regulated Lead Acid, 27 Amp Hour.	No	No
	ATA 26 Fire Protection	EMB-500 does not have Engine Fire Test switch. It has only a dedicated button for engine fire test. EMB-500 does not have baggage compartment smoke detection system.	No	Yes
	ATA 27 Flight Controls	**EMB-505** has: - Two additional flap panels. - Pusher is hydraulic (EMB-500 is electrical). **EMB-500** does not have: - Hydraulically operated spoilers. - Rudder Booster System. - Ventral Fin and Ventral Rudder.	Yes	Yes
	ATA 28 Fuel	Decreased max usable quantity per wing-tank. Fuel LO LEVEL message trigger point changed. EMB-500 does not have pressurized refuelling. Imbalance message trigger changed. Imbalance procedure different.	No	Yes

TRANSITION FROM: EMB-505 TO: EMB-500	DESIGN	REMARKS	FLT CHAR	PROC CHNG
	ATA 29 Hydraulic Power	EMB-500 has one Motor Pump in Power pack concept, with just one Shutoff Valve, while EMB-505 has Two engine driven pumps with one Shutoff Valve before each. Hydraulic Pump Panel has different operation.	No	Yes
	ATA 30 Ice and Rain Protection	EMB-500 does not have thermal anti-ice system for wings and leading edges surfaces (Horizontal Stabilizer).	No	Yes

TRANSITION FROM: EMB-505 TO: EMB-500	DESIGN	REMARKS	FLT CHAR	PROC CHNG
	ATA 32 Landing Gear	EMB-500 Landing Gear Free Fall Lever has different position and shape. EMB-500 Brake System has different pedal to brake pressure transfer function. Different Landing Gear Speeds (KIAS): **EMB-505:** - Maximum Landing gear Extended (V_{LE}): 250. - Maximum Landing gear Operating (V_{LO}) (Extend): 250. - V_{LO} (Retract): 250. **EMB-500:** - V_{LE}: 275. - V_{LO} (Extend): 180. - V_{LO} (Retract): 180. - Different Brake Component Construction. **EMB-505:** - Brake Assembly: Carbon Heat Sink. - Emergency/Parking Brake Accumulator: Bellow type, maintenance free. - Shutoff Valve: Open once after landing gear extension. **EMB-500:** - Brake Assembly: Steel Heat Sink. - Emergency/Parking Brake Accumulator: Piston type, requires nitrogen recharge. - Shutoff Valve: Cycles every pedal actuation.	No	Yes
	ATA 33 Lights	EMB-500 does not have a refuelling panel light.	No	No

TRANSITION FROM: EMB-505 TO: EMB-500	DESIGN	REMARKS	FLT CHAR	PROC CHNG
	ATA 34 Navigation	EMB-500 does not have radio altimeter or Traffic Alert and Collision Avoidance System (TCAS) II. EMB-500 has Minimum Descent Altitude (MDA)/Decision Height (DH) alerting based only on the barometric altitude (referred the landing field elevation) whereas for EMB-505 the MDA/DH alerting may be based either on the barometric altitude or on the radar altimeter height.	No	Yes
	ATA 35 Oxygen	The EMB-500 oxygen cylinder has reduced capacity of 27 cu ft. - EMB-500 - 50 cu ft. - EMB-505 - 77 cu ft.	No	No
	ATA 36 Pneumatic	EMB-500 does not have a panel in the cockpit dedicated to the Pneumatic System. Even though BLEED 1(2) FAIL and BLEED 1(2) LEAK exist on both aircraft, the pilot's procedures are different.	No	Yes

TRANSITION FROM: EMB-505 TO: EMB-500	DESIGN	REMARKS	FLT CHAR	PROC CHNG
	ATA 71 Powerplant	**EMB-505 - P&W 535-E:** - PW535E Thrust: 3,360 lbs. - High bypass ratio 3.0. - Low speed spool (Single-stage fan, Single-stage booster, Two-stage low pressure turbine). - High speed spool (Three-stage high pressure compressor, Single-stage high pressure turbine). Parameters for the following are different: N_1, N_2, START ITT, NORMAL T/O ITT, Max T/O ITT, MAX. CONTINUOUS ITT. **EMB-500 - P&W 617F-E:** - Thrust: 1,695 lbs. - (EMB-500EV-P&W 617F1-E with Thrust of 1,728 lbs.). - Dual-Channel FADEC - Airframe mounted. - High bypass ratio 2.7. - Low speed spool (Single-stage direct drive low pressure compressor, single-stage low pressure turbine). - High speed spool (Two-stage high pressure compressor, Single-stage high pressure turbine).	Yes	No
	ATA 79 Engine Oil	EMB-500 does not have the CAS message (OIL IMP BYPASS). The pilot must inspect one mechanic popup on the engine.	No	Yes
	ATA 80 Engine Start	EMB-500 does not have windmill start.	No	Yes

TRANSITION FROM: EMB-505 TO: EMB-500	MANEUVER	REMARKS	FLT CHAR	PROC CHNG
	Preparation	Different systems panels positions and systems operation.	No	Yes
	Preparation	Different external inspection.	No	Yes
	Start	Different engines, different limitations with similar procedures.	No	No
	Normal Takeoff	Different takeoff angles due to different performance: **EMB-505:** - Flap 1: 10.5° Pitch Angle. - Flap 2: 8° Pitch Angle. **EMB-500:** - Flap 1: 9.5º Pitch Angle. - Flap 2: 9° Pitch Angle.	Yes	No
	Climb	Different performance.	Yes	No
	Cruise	Different performance.	Yes	No
	Approach	Maneuverability at low speed.	Yes	No
	Non-Normal Maneuvers	Different systems with different procedures.	Yes	Yes
	Non-Normal Maneuvers	Engine airstart with no wind milling capability.	No	Yes
	Non-Normal Maneuvers	Landing with one engine inoperative with different flap position.	No	Yes
	Non-Normal Maneuvers	Engine fail, less pronounced rolling moment.	Yes	No