OPERATIONAL EVALUATION REPORT

EMBRAER S.A.

EMB-500 (PHENOM 100, 100EV)

EMB-505 (PHENOM 300)

REVISION 14 – MAY, 2023

Revision Record

Revision Nº	Content	Date
Original	Collection of preliminary results for both models	22 NOV 2013
1	Changes on type rating endorsement and privileges concept	28 FEB 2014
2	G1000 Avionics Software Phase 7 training information added, consolidation flight information removed	16 JUN 2015
3	Editorial changes; Information on AFM LP approach (LP+V) limitation	18 MAR 2016
4	Editorial changes; information on G1000 Phase 7 and Phase 8, G3000 Phase 1 and ADS-B Out	15 SEP 2016
5	Information about Phenom 100EV (Garmin G3000, Ice detector and Enhanced Performance).	21 DEZ 2016
6	Information on G1000 Phase 9 (EMB-500)	27 APR 2017
7	Information on G1000 Phase 9 (EMB-505); editorial changes on section 6.3.13	14 JUN 2017
8	Sections 4, 6.4 and appendix 3 were revised to include provisions for the EMB-500 to EMB-505 differences training; section 6.1 and appendix 1 were revised to eliminate information of the candidate to act as an observer pilot on the initial type rating training course	06 JUL 2018
9	EMB-500 Garmin G1000 with ice detector	08 MAR 2019
10	EMB-500/505 G3000 Phase 2	05 NOV 2019
11	EMB-500/505 G3000 Phase 2, additional information related to differences training between Phase 2 and Phase 1	14 NOV 2019
12	EMB-505 G3000 Phase 2+, ROAAS and Enhanced Performance; sections 6.12 and 7 were revised to clarify information related to mixed-fleet operation scenario.	17 MAR 2020
13	Editorial changes and addition of EMB-500 ROAAS and G3000 Phase 2++ and EMB-505 Autothrottle, Current Speed Control, Complementary FCE Recovery System and G3000 Phase 2++.	22 DEC 2022
14	Exclusion of a TASE due to the addition of a new limitation to EMB-505 Autothrottle.	12 MAY 2023

Approval

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1. INTRODUCTION

1.1. Background

On April 2009, ANAC conducted the EMB-500 operational evaluation of type rating training jointly with the European Aviation Safety Agency – EASA. At that time the flight segment was based on the aircraft only, since no EMB-500 full flight simulator was available.

After that Embraer presented the syllabus revision containing the curricula for single pilot and dual pilot training, considering the full flight simulator as the primary flight training device. This operational evaluation was conducted in September 2009.

On November 2009, Embraer presented the EMB-505 differences training course from EMB-500. At that time the flight segment was based on the aircraft only since no EMB-505 full flight simulator was available.

On February 2010, Embraer requested and ANAC conducted an operational evaluation of Garmin G1000 Electronic Checklist – ECL, used on both airplane models.

On August 2010, ANAC conducted the EMB-505 full type rating training operational evaluation, considering the use of full flight simulator. Following the syllabus presented for the EMB-500 Embraer presented the EMB-505 syllabus containing the curricula for single pilot and dual pilot training.

On February 2013, ANAC conducted the Garmin G3000 operational evaluation. At the time, the G3000 was available in EMB-505 only and the pilot qualification is based on the differences training from Garmin G1000.

At that time ANAC had a collection of operational evaluation results establishing different type ratings for models EMB-500 and EMB-505.

However, Embraer has applied for a common type rating assessment for models EMB-500 and EMB-505 and in August 2013 a joint ANAC, FAA and EASA operation evaluation was conducted to assess the aircrafts operation under a single license endorsement.

The result of the evaluation was positive and ANAC has determined a single type rating for the models. However, the reassessment has shown that what was previously established in terms of differences training between the models was not sufficient to support ANAC decision on establishing a single license endorsement. The reason is the credit towards the partial check, the yearly alternate proficiency check and the currency specifications given to a pilot in a mixed fleet operation.

On November 2016, ANAC conducted the Phenom 100EV operational evaluation. Phenom 100EV is the marketing name for the EMB-500 equipped with the Garmin 3000 avionics suite together with the Ice Detector System and the Enhanced Performance. For the purpose of this report, to be consistent with the installation of the Garmin 3000 avionics suite on the EMB-505, the Phenom 100EV can be also referred to as EMB-500 G3000. The pilot qualification is based on the differences training from Garmin G1000.

On April 2018 Embraer requested ANAC the revision of some information related to the initial type rating training and to the differences training from EMB-500 to EMB-505. ANAC validated the proposal.

On February 2019, ANAC conducted an operational evaluation to extend the results for the ice detector installation to the EMB-500 equipped with Garmin G1000 avionics suite.

On September 2019, ANAC conducted an operational evaluation of the Garmin G3000 Phase 2

avionics software.

On March 2020, ANAC conducted an operational evaluation of the Garmin G3000 Phase 2+ avionics software, the Runway Overrun Awareness and Alerting System (ROAAS) and the enhanced performance of model EMB-505.

From March to December 2022, ANAC conducted the following operational evaluations: for the EMB-500, Runway Overrun Awareness and Alerting System (ROAAS) and Garmin G3000 Phase 2++ avionics software. For EMB-505, Complementary FCE Recovery System, Current Speed Control, Autothrottle and Garmin G3000 Phase 2++ as well.

On Abril 2023, Embraer informed about a new limitation prohibiting Autothrottle usage during takeoff, thus a TASE related to this flight phase is no longer applicable, deeming necessary this adjustment in this report.

Results of the above described evaluations will be shown on this report.

1.2. Objective

This report presents ANAC collection of results obtained from the operational evaluations of Embraer aircraft models **EMB-500** and **EMB-505** commercially known as **Phenom 100** and **Phenom 300**, respectively.

1.3. Purpose

The purpose of this report is to:

- Define the Pilot Type Rating assigned for the EMB-500 and EMB-505;
- Recommend the requirements for training, checking and currency applicable to flight crew for the EMB-500 and EMB-505, and functionalities;
- Provide the Master Differences Requirements (MDR) for crews requiring differences qualification for mixed-fleet-flying;
- Provide an acceptable Operator Differences Requirements (ODR); and
- Describe the required Flight Simulation Training Device (FSTD) for crew training and checking.

1.4. Applicability

This report is applicable to:

- Brazilian operators of EMB-500 and EMB-505 under RBAC 91 and RBAC 135 rules;
- Approved Training Organizations certified under RBAC 142 (Training Centers);
- ANAC Inspectors related to safety oversight of EMB-500 and EMB-505;
- ANAC Principal Operations Inspectors (POIs) of EMB-500 and EMB-505 operators.

- SUMMARY AIRCRAFT DESCRIPTION

1.5. EMB-500 Phenom 100

The Embraer model EMB-500, commercially known as Phenom 100, is a low wing, T-tail and pressurized airplane, powered by two high by-pass ratio rear mounted turbofan engines. The tricycle landing gear is fully retractable, designed to be operated on paved runways only. The panel has the glass cockpit concept with the Prodigy Avionics System. Initially it was based on the Garmin G1000 avionics system, developed by Embraer and Garmin Corporation for use in the EMB-500. It consists of two primary flight displays (PFD) and one multifunction display (MFD). Each display unit receives information from its Garmin Integrated Avionics unit. It has also the option of the Garmin G3000 avionics system, which comes together with an Enhanced Performance package and Ice Detector, commercially know as Phenom 100EV, consisting of two primary flight displays (PFD) and one multifunction display (MFD) and the main pilot interface with the system is through the GTCs (Garmin Touchscreen Controllers).

The minimum crew is one pilot on the left pilot seat plus additional equipment as specified in the Limitations Section of ANAC approved AFM; or one pilot in command (PIC) and one second in command (SIC). The maximum occupants are eight (two pilots plus six passengers or one pilot plus seven passengers, considering one passenger on the right pilot seat).

The EMB-500 is certified for Day, Night, VFR and IFR flight conditions to a maximum operating altitude of 41.000 feet and is approved for flight into reduced vertical separation minimum (RVSM) airspace if the aircraft meets the minimum equipment requirements contained in the Aircraft Flight Manual, Supplement 1. The EMB-500 is also approved for flight into known icing conditions.

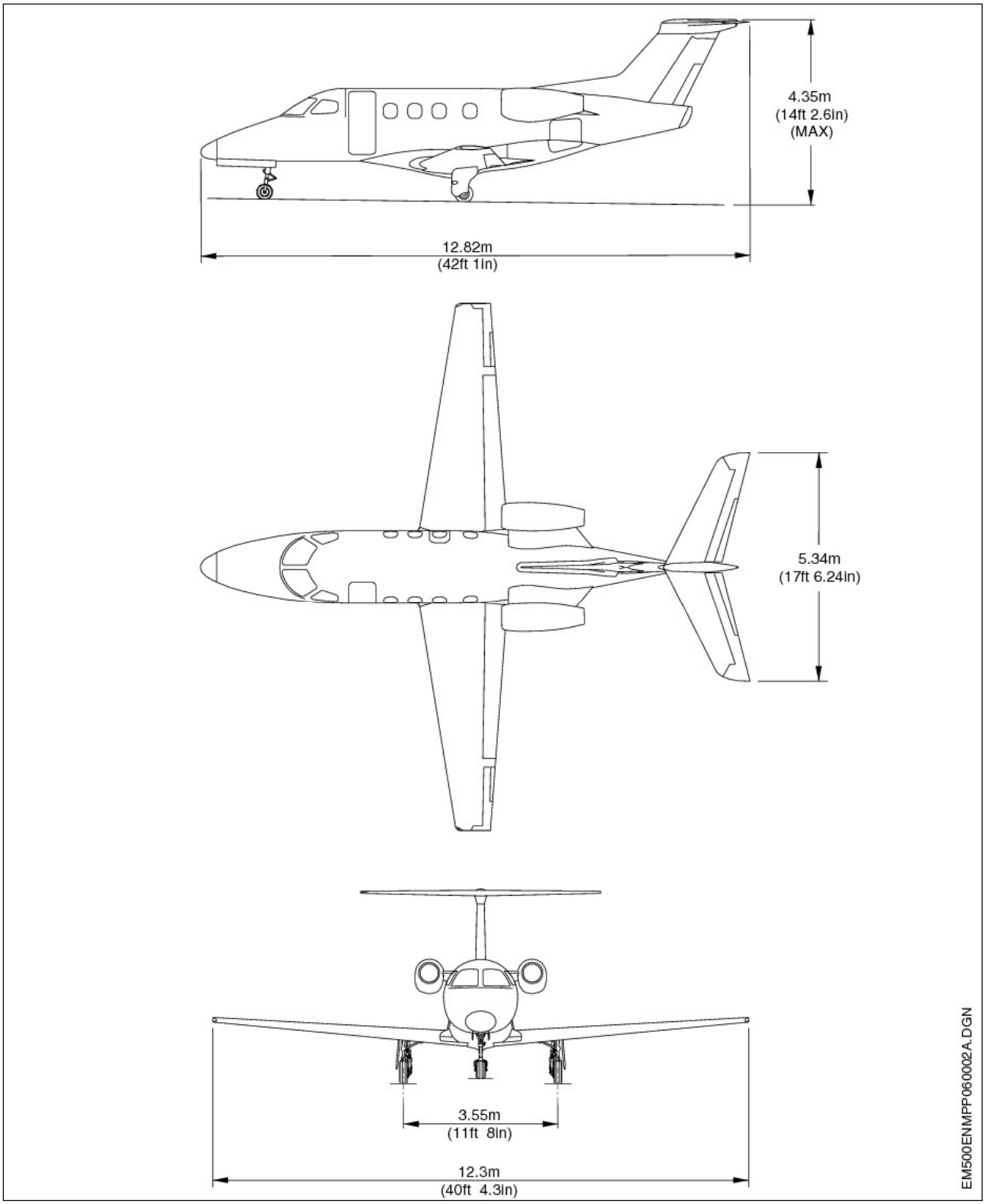
The EMB-500 is certified in accordance with RBAC 23. It is listed on ANAC Type Certificate Data Sheet (TCDS) Number EA-2008T09 as the model EMB-500. Embraer received their ANAC type certificate on 09 Dec. 2008.

A summary of the airplane specification is presented in the table below. For more information, the TCDS issued by ANAC Product Certification Management (Gerência Geral de Certificação de Produto Aeronáutico – GGCP/SAR) may be consulted. In case of information disagreement between the table below and the TCDS, this last source shall prevail.

Table 1 – EMB-500 information

Embraer EMB-500	
Certification Basis	RBAC 23
Engine	Two Pratt & Whitney Canada PW617F-E (Phenom 100) Two Pratt & Whitney Canada PW617F-E/1 (Phenom 100EV)
Minimum Crew	One pilot on the left seat plus additional equipment (see AFM, Limitations); or one pilot in command (PIC) and one second in command (SIC)
Maximum Passengers	Up to 7, depending on the configuration (see AFM Section 2 – Limitations)
Maximum Weights	Maximum Ramp Weight (MRW): 4.770 Kg (Phenom 100) Maximum Ramp Weight (MRW): 4.820 Kg (Phenom 100 post-mod SB 500-00-0009 or equivalent) Maximum Ramp Weight (MRW): 4.875 Kg (Phenom 100EV)
	Maximum Takeoff Weight (MTOW): 4.750 Kg (Phenom 100) Maximum Takeoff Weight (MTOW): 4.800 Kg (Phenom 100 post-mod SB 500-00-0009 or equivalent) Maximum Takeoff Weight (MTOW): 4.855 Kg (Phenom 100EV)
	Maximum Landing Weight (MLW): 4.430 Kg Maximum Landing Weight (MLW): 4.480 Kg (Phenom 100 post-mod SB 500-00-0009 or equivalent) Maximum Landing Weight (MLW): 4.535 Kg (Phenom 100EV)
Speeds	Maximum operating mach (MMO): 0.70 Landing Gear Operation (VLO): 180 kias Landing Gear Extended (VLE) 275 kias.

Figure 1 – EMB-500 three views



1.6. EMB-505 Phenom 300

The Embraer model EMB-505, commercially known as Phenom 300, is a low wing, T-tail and pressurized airplane, powered by two high by-pass ratio rear mounted turbofan engines. The fuselage cross section is the same as the EMB-500 but is 9 feet 3 inches longer. It also has swept wing with winglets. The EMB-505 utilizes a moveable stabilizer. The tricycle landing gear is fully retractable, designed to be operated on paved runways only.

The panel has the glass cockpit concept with the Prodigy Avionics System. Initially it was based on the Garmin G1000 avionics system only, developed initially by Embraer and Garmin Corporation for use in the EMB-500. It consists of two primary flight displays (PFD) and one multifunction display (MFD). Each display unit receives information from its Garmin Integrated Avionics unit. It has also the option of the Garmin G3000 avionics system, consisting of two primary flight displays (PFD) and one multifunction display (MFD) and the main pilot interface with the system is through the GTCs (Garmin Touchscreen Controllers).

The minimum crew is one pilot on the left pilot seat plus additional equipment as specified in the Limitations Section of ANAC approved AFM; or one pilot in command (PIC) and one second in command (SIC). The maximum occupants are eleven (two pilots plus nine passengers or one pilot plus ten passengers, considering one passenger on the right pilot seat).

The EMB-505 is certified for Day, Night, VFR and IFR flight conditions to a maximum operating altitude of 45.000 feet and is approved for flight into reduced vertical separation minimum (RVSM) airspace if the aircraft meets the minimum equipment requirements contained in the Aircraft Flight Manual, Supplement 1. The EMB-505 is also approved for flight into known icing conditions.

The aircraft is certified in accordance with RBAC 23. It is listed on ANAC Type Certificate Data Sheet (TCDS) Number EA-2009T12 as the model EMB-505. Embraer received their ANAC type certificate on 03 Dec. 2009.

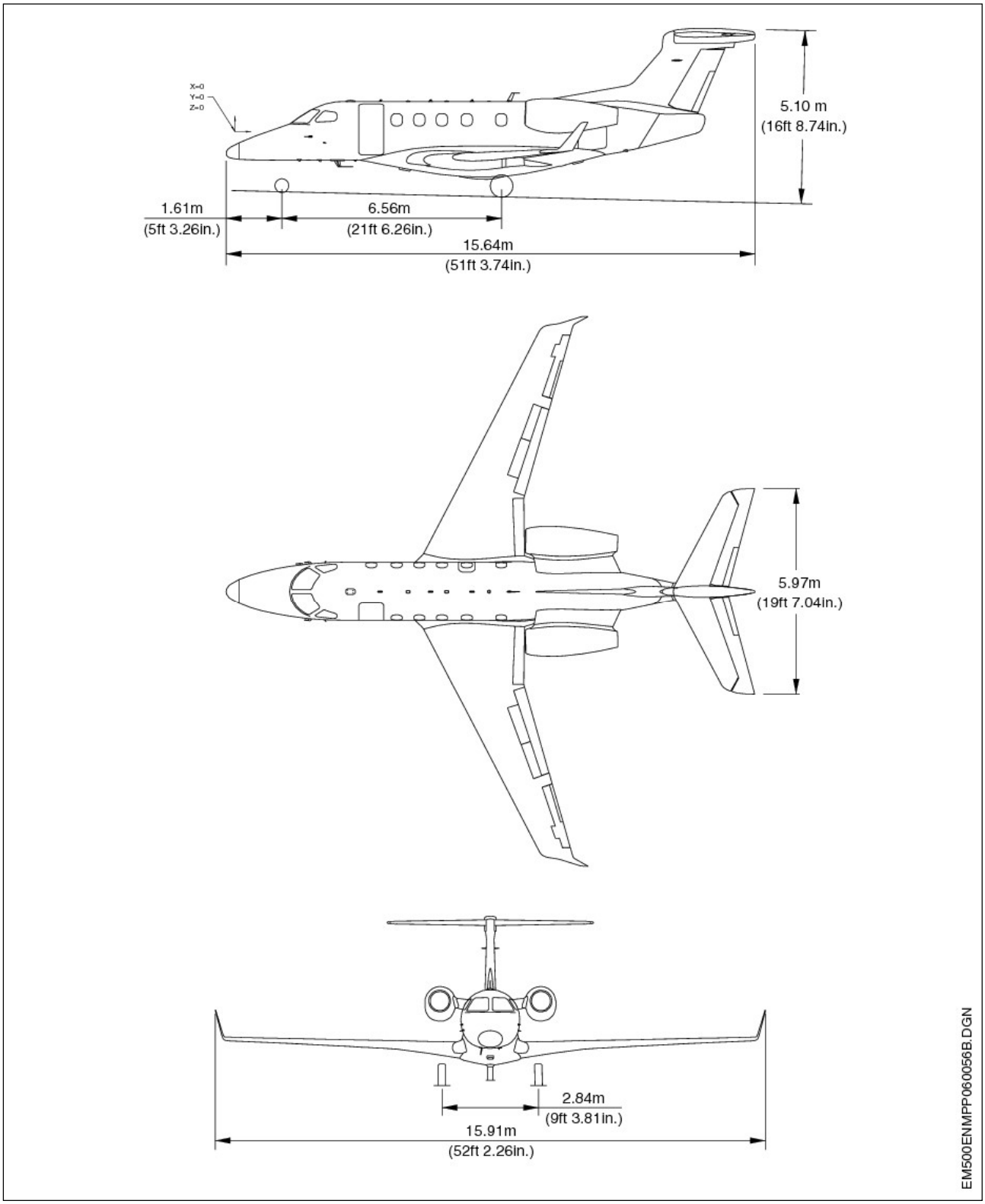
A summary of the airplane specification is presented in the table below. For more information, the TCDS issued by ANAC Product Certification Management (Gerência Geral de Certificação de Produto Aeronáutico – GGCP/SAR) may be consulted. In case of information disagreement between the table below and the TCDS, this last source shall prevail:

Table 2 – EMB-505 information

Embraer EMB-505	
Certification Basis	RBAC 23
Engine	Two Pratt & Whitney Canada PW535E / PW535E1(*)
Minimum Crew	One pilot on the left seat plus additional equipment (see AFM, Limitations); or one pilot in command (PIC) and one second in command (SIC)
Maximum Passengers	Up to 10, depending on the configuration (see AFM Section 2 – Limitations)
Maximum Weights	Maximum Ramp Weight (MRW): 8.200 Kg / 8.445 Kg(*)
	Maximum Takeoff Weight (MTOW): 8.150 Kg / 8.415 Kg(*)
	Maximum Landing Weight (MLW): 7.650 Kg / 7.835 Kg(*)
Speeds	Maximum operating mach (MMO): 0.78 / 0.80(*) Landing Gear Operation (VLO): 250 kias Landing Gear Extended (VLE) 250 kias.

(*) Enhanced performance

Figure 2 – EMB-505 three views



2. PILOT TYPE RATING

Initially the EMB-500 and the EMB-505 were approved for operation with different type ratings which were the “E50P” and the “E55P”, respectively. Both type ratings were endorsed following the kind of operation approved (“/S” for single pilot operations and “/D” for dual pilot operation).

However, in August 2013 a joint ANAC, FAA and EASA operation evaluation was conducted to assess the EMB-500 and EMB-505 operation under a single license endorsement (common type rating). ANAC document IAC 121-1009 was used as reference for the activity, which was developed following the guidance for the “T2 test”. The results confirmed Embraer proposal that both models are sufficiently alike in handling qualities and operational characteristics.

After the T2 evaluation, ANAC Aircraft Evaluation Group had a meeting with ANAC personnel licensing (PEL) and Part 135 certification offices representatives and the conclusion was that the single pilot endorsement (“/S”) was **not** necessary under the PEL process perspective since models EMB-500 and EMB-505 Type Certificates Data Sheets – TCDS define one pilot as the minimum crew.

Thus, the single type rating “**EPHN**” for operation of both the EMB-500 and the EMB-505 was determined, as follows:

- **EPHN,** which is issued to a pilot who received training and demonstrated proficiency in the single pilot operation. This pilot will be able to act as the pilot in command (PIC) in both single and dual pilot operations, as described in this report; and
- **EPHN/D**, which is issued to a pilot who received training and demonstrated proficiency in the dual pilot operation. This type rating is issued either with pilot in command (PIC) or second in command (SIC) privileges depending on how the pilot was trained and evaluated.

Table 3 – ANAC Type Rating List revision

Fabricante *(Manufacturer)*	**Aeronave** *(Aircraft)*		**Observações** *(Remarks)*	**Designativo** *(Designative)*
	Modelo *(Model)*	**Nome** *(Name)*		
EMBRAER S.A.	EMB 500	Phenom 100/100EV	Relatório de Avaliação Operacional EMB-500 (Phenom 100), EMB-505 (Phenom 300) *ANAC Operational Evaluation Report EMB-500 (Phenom 100), EMB-505 (Phenom 300)*	EPHN, EPHN/D
	EMB 505	Phenom 300		

3. MASTER DIFFERENCE REQUIREMENT (MDR)

The Master Difference Requirements matrix for EMB-500 and EMB-505 is shown in table 4. These provisions are applied when there are differences between models which affect crew knowledge, skills, or abilities related to flight safety (e.g., Level A or greater differences) for training, checking and currency, respectively, according to IS 00-007.

Table 4 – EMB-500/EMB-505 MDR matrix

		FROM AIRPLANE			
		EMB-500 (G1000)	**EMB-500 (G3000)**	**EMB-505 (G1000)**	**EMB-505 (G3000)**
TO AIRPLANE	**EMB-500 (G1000)**	- - -	C/C/C	D/C/D	C/C/C (1) + D/C/D
	EMB-500 (G3000)	C/C/C	- - -	(2)	(2)
	EMB-505 (G1000)	D/C/D	(2)	- - -	C/C/C
	EMB-505 (G3000)	(2)	(2)	C/C/C	- - -

Notes:

(1) Until a further evaluation is performed, pilots seeking transition from the EMB-505 (G3000) to the EMB-500 will have to perform the differences training from the EMB-505 (G3000) to EMB-505 (G1000), plus the transition from the EMB-505 to the EMB-500.

(2) Not evaluated.

Difference levels:

Level C differences training are accomplished using devices that are capable of system training.

Level D differences training are accomplished using devices that are capable of performing flight maneuvers and addressing full task differences of knowledge, skills, and/or abilities.

Level C checking requires a partial proficiency check using a device suitable for meeting level C (or higher) differences training requirements.

Level C currency is applicable to one or more designated systems or procedures and relates to both skill and knowledge requirements.

Level D currency is related to designated maneuvers, and addresses knowledge and skills required for performing aircraft control tasks in real time, with integrated use of associated systems and procedures.

4. OPERATOR DIFFERENCES REQUIREMENT (ODR)

Each operator of a mixed fleet of EMB-500 and EMB-505 shall produce its own ODR, as required by IS 00-007.

Embraer provided a sample of ODR table, which was considered acceptable by ANAC. This sample ODR may be made available by Embraer on request and may serve as a basis for the operator to develop its own ODR tables to address the differences indicated in the MDR.

The ODR table related to the transition from the G3000 to the G1000 model was evaluated by analysis only. ANAC recommends the same parameters listed in G1000 to G3000 ODR table in the event of development and analysis of a differences training from EMB-505 G3000 to G1000 and from EMB-500 G3000 to G1000.

5. SPECIFICATIONS FOR PILOT TRAINING

5.1. EMB-500 or EMB-505 Initial Type Rating Course

The initial pilot type rating course described in this section was evaluated by ANAC and considered to be compliant with the requirements of RBAC 61. This course is recommended to be used as a baseline for EMB-500 or EMB-505 type rating training.

5.1.1. Prerequisites

The candidate pilot must, at least:

- hold a private pilot license - airplane;
- hold a Multiengine Land Class Rating (MLTE) or a type rating of a multiengine aircraft;
- hold an IFR rating; and
- Have a flight experience of at least 200 hours in airplane, of which at least 70 hours as Pilot in Command (PIC).

5.1.2. Type Rating Base Curriculum

The initial type rating base curriculum is outlined in Appendix 1. The course is comprised of the ground segment and the flight segment.

The ground segment uses a combination of the following resources:

- Web-Based Training (WBT) – 16 hours;
- Classroom (instructor-led) instruction – 33 hours; and
- Integrated Procedures Training (IPT) – 14 hours.

The flight segment is based on the Full Flight Simulator (FFS). The following applies for single pilot (SP) and dual pilot (DP) training:

- SP – 14 hours divided in seven full flight simulator sessions (with a 2 hour time each).
- DP – 28 hours divided in seven full flight simulator sessions (with a 4 hour time each), 2 hours acting as pilot flying and 2 hours acting as pilot monitoring.

More information on the FSTD can be found in section 9 of this report.

Note: In the absence of a Full Flight Simulator the flight training portion may be conducted in the aircraft upon ANAC approval. Complementary training in a FSTD should be provided to include any abnormal/ emergency procedure which could not be trained on the airplane for safety reasons.

5.2. EMB-500 or EMB-505 Single Pilot (SP) Operation to Dual Pilot (DP) Operation Transition Training (and vice versa)

Although it was not required by ANAC, Embraer did present transition training for evaluation destined for pilots previously qualified in one kind of operation to be qualified in the other kind of operation. After the evaluation ANAC concluded that this training can be used as a base line for commercial air transport (RBAC 135) operators training program development, required by RBAC 135.244. In parallel ANAC recommends this training to be used by general aviation (RBAC 91) operators with minimum crew of two pilots.

If a pilot rated with the “EPHN/D” intends to be rated with the “EPHN” for single pilot operations then a new proficiency check ride must be conducted. The opposite case is not applicable, considering the “EPHN” privileges.

5.2.1. Prerequisites

The candidate pilot must, at least:

- hold a valid “EPHN” or “EPHN/D” type rating; and
- be qualified and current on the reference aircraft operation.

5.2.2. Transition Braining Base Curriculum

The base curriculum is outlined in Appendix 2.

5.3. EMB-505 to EMB-500 Differences Training

The differences training from EMB-505 to EMB-500 is required for a pilot previously qualified for the EMB-505 operation who intends to be qualified in the EMB-500. Differences levels for training, checking and currency are described in the “Table 4 – EMB-500/ EMB-505 MDR matrix” of this report.

5.3.1. Prerequisites

The candidate pilot must, at least:

- hold a valid “EPHN” or “EPHN/D” type rating; and
- be qualified and current on the EMB-505 operation.

5.3.2. Transition Training Base Curriculum

The base curriculum is outlined in Appendix 3.

5.4. EMB-500 to EMB-505 Differences Training

The differences training from EMB-500 to EMB-505 is required for a pilot previously qualified for the EMB-500 operation who intends to be qualified in the EMB-505. Differences levels for training, checking and currency are described in the “Table 4 – EMB-500/ EMB-505 MDR matrix” of this report.

5.4.1. Prerequisites

The candidate pilot must, at least:

- hold a valid “EPHN” or “EPHN/D” type rating; and
- be qualified and current on the EMB-500 operation.

5.4.2. Transition Training Base Curriculum

The base curriculum is outlined in Appendix 3.

5.5. EMB-500 or EMB-505 Garmin G1000 to G3000 Differences Training

The G1000 to G3000 differences training is required for an EMB-500 or EMB-505 pilot who intends to be qualified in the new avionics suite.

No EMB-500 or EMB-505 with G3000 initial type rating training has been evaluated. A G3000 to G1000 differences training evaluation has been performed based on documental analysis and on the G1000 to G3000 evaluation. Differences levels for training, checking and currency based on EMB-500 and EMB-505 with G1000 are described in the “Table 4 – EMB-500/EMB-505 MDR matrix” of this report.

5.5.1. Prerequisites

The candidate pilot must, at least:

- hold a valid “EPHN” or “EPHN/D” type rating; and
- be qualified and current on the EMB-500 or EMB-505 operation.

5.5.2. Type Rating Base Curriculum

The base curriculum is outlined in Appendix 4. The course is comprised of the theoretical and practical ground segments, as follows:

- Classroom (instructor-led) instruction – 3 hours; and
- Practical (OTD – other training device) instruction – 2 hours.

Although no EMB-500 or EMB-505 with G3000 initial type rating training was evaluated at this moment the base curriculum outlined in Appendix 4 of this report can be used as a reference for future G3000 to G1000 differences training.

More information on the OTD can be found in section 9 of this report.

This section also applies for transition training from the Garmin G3000 to the Garmin G1000 since prerequisites and curriculum are similar. For this case, the only difference is the OTD that should represent the Garmin G1000 avionics suite.

5.6. EMB-500 Ice Detector System

On November 2016, ANAC evaluated the differences from the EMB-500 without the Ice Detector System to the EMB-500 with the Ice Detector System. At that time the Ice Detector was available only for aircraft equipped with Garmin G3000 avionics suite. On February 2019 Embraer requested

ANAC to evaluate the extend of the Ice Detector installation to EMB-500 equipped with Garmin G1000 avionics suite.

The conclusion is that difference levels A/A/A for training, checking and currency are applicable.

A pilot current and qualified on the EMB-500 without Ice Detector should be provided with a description of the system and the operation of the Ice Detector System in order to be able to operate the EMB-500 equipped with this feature. The training method considers the use of the AFM, the POH and the QRH.

5.7. EMB-500 Enhanced Performance

On November 2016, ANAC evaluated the differences from the EMB-500 without the Enhanced Performance to the EMB-500 with the Enhanced Performance. The conclusion is that difference levels A/A/A for training, checking and currency are applicable.

A pilot current and qualified on the EMB-500 should be provided with appropriate enhanced performance data in order to be able to operate the EMB 500 equipped with this feature.

Although the airplane performance is enhanced, it does not change flight procedures or handling qualities.

5.8. Controller–Pilot Data Link Communications (CPDLC)

A CPDLC training module for pilots qualified and current on EMB-500 or EMB-505 was evaluated in August 2013 during the common type rating joint evaluation by ANAC, FAA and EASA. This training consists in an instructor-led theoretical training.

Differences levels for training, checking and currency were established as B/B/A, respectively. ANAC recommends that CPDLC training should be integrated to the initial or differences type rating training whenever it is possible.

5.9. EMB-500 TAWS-B to TAWS-A Training

A TAWS-B to TAWS-A training module for EMB-500 was evaluated in February 2013 during the EMB-505 Garmin G1000 to G3000 joint evaluation by ANAC and FAA. This training consists in an instructor-led theoretical training.

Differences levels for training, checking and currency were established as B/B/A, respectively. ANAC recommends that EMB-500 TAWS-B to TAWS-A training should be integrated to the initial or differences type rating training whenever it is possible.

5.10. Electronic Checklist (ECL)

The Garmin Prodigy G1000 ECL evaluation was based on AC 120-64 (FAA) requirements and consisted in a demonstration of the system functionality and one flight.

It was found a very simple system without link with other systems of the aircraft. It is provided on EMB-505 Type Certification. For EMB-500 Embraer applied for a DCA (Design Change Application). For both models the ECL is optional.

Embraer proposal was the ECL training to be addressed in pilot training during the WBT and ground school, besides the use of an ECL free play. ANAC recommends that ECL training should be integrated to the initial or differences type rating training whenever it is possible.

5.11. Training Areas of Special Emphasis (TASE)

Special emphasis training includes systems or procedures training elements that are unique to the aircraft and should be given a higher degree of emphasis than regular training. ANAC has identified the following training items that are either unique to the EMB-500 or EMB-505, based on installed systems and equipment, or are important because of operational aspects associated with a single pilot crew, or flight crews with a low level of prior operating experience.

5.11.1. TASE for EMB-500 and for EMB-505 Initial Type Rating Training and EMB-505 to EMB-500 Differences Training.

The following aircraft systems or procedures have been identified as training areas of special emphasis for EMB-500 and for EMB-505 initial type rating training and for the EMB-505 to EMB-500 differences training:

5.11.1.1. Ground training:

- High Altitude Physiology
- Single/ Dual Pilot Resource Management (as applicable)
- Stick Pusher System
- Emergency Gear System
- Performance calculations, including wet/contaminated runways – OPERA
- Weight & Balance calculations, including use of Balance sheet, based on Index
- CAS Logic and Abnormal Procedures Training

5.11.1.2. Flight Training:

- High Altitude Single Pilot Operations (as applicable)
- Loss of cabin pressure control and Emergency Descent procedures
- Use of Emergency Gear System
- Stick Pusher System
- Use of Alternate Trim
- Operations in Icing Conditions including Handling Qualities
- High Speed Approaches at high density operation airports
- Instrument flying on standby instruments
- Fuel X feed, including X feed failure
- Smoke procedures, including smoke removal

5.11.2. TASE for EMB-500 or EMB-505 Single Pilot (SP) Operation to Dual Pilot (DP) Operation Transition Training (and vice versa).

The following aircraft systems or procedures have been identified as training areas of special emphasis for EMB-500 and for EMB-505 initial type rating training and for the EMB-505 to EMB-500 differences training:

5.11.2.1. Flight Training:

- Loss of cabin pressure control and Emergency Descent procedures
- High density airports operation
- Smoke procedures, including smoke removal
- Dual pilot resource management/ multi crew coordination
- Use of Flight Director and Autopilot, monitoring modes

5.11.3. TASE for EMB-500 and EMB-505 Garmin G1000 to G3000 Differences Training.

The following aircraft systems or procedures have been identified as training areas of special emphasis for EMB-500 and EMB-505 Garmin G1000 to G3000 differences training:

5.11.3.1. Ground training:

- G3000 operations concept
- Use of Surface Watch as a new situational awareness feature.

5.11.3.2. Flight Training:

- Use and setup of Garmin Prodigy G1000 or G3000 integrated avionics (as applicable), including selection of display (System Synoptic, Map, Weather Radar and Electronic Check List)
- Sequence of operation. Eg.: active window should be checked **before** choosing what to appear on screen.
- G3000 different location of panels and knobs, including Engine/Fire Control, Trim, Air conditioner and Lights
- Loss of Garmin Touchscreen Controller (GTC)
- Alternate gear extension (for EMB-505 only);
- Profile modes when using VNAV.

5.11.4. TASE for EMB-505 Autothrottle Differences Training.

The following aircraft systems or procedures have been identified as training areas of special emphasis for EMB-505 Autothrottle differences training:

5.11.4.1. Flight Training:

-
- One Engine Inoperative go around.

5.12. Recurrent Training

No recurrent training was evaluated by ANAC. The recurrent training must be developed by the operator or RBAC 142 Training Organization in accordance to the requirements of RBAC 61 and RBAC 135, including the training areas of special emphasis described in this report.

When operating in a mixed fleet it is recommended that the recurrent training is performed alternating yearly the model of the FFS used: EMB-500 FFS in one year and EMB-505 FFS in the

subsequent year, provided that the differences for the other model are addressed in each recurrent training event.

5.13. Flight Management System (FMS) and Avionics Software version

EMB-500 and EMB-505 aircraft are equipped with Garmin G1000 and G3000 flight management systems and several avionics software versions are available. Some of them were operationally evaluated by ANAC and the results are presented below.

5.13.1. G1000 Avionics Software Phase 7

The G1000 avionics software upgrade referenced as Phase 7 (also, “Load 7X” or “Load 72.1 [0734.7A]”) implements some new features for crew awareness, which are:

- Vertical Situation Display
- Display Weather Radar information on Navigation Map
- Addition of new aural message for low speed indication (EMB-500/ Phenom 100 only)
- Revert to GPS Track for the HSI when heading is not available
- Advisory vertical guidance for LP approaches (LP+V)
- Display of TAWS-A terrain on Navigation Map
- Inclusion of Excessive Vertical Deviation bars for LNAV/VNAV approaches

Familiarization with the new features implemented by the G1000 Phase 7 software upgrade is established as levels A/A/A for training, checking and currency, respectively. ANAC recommends the use of the AFM and POH as references.

It is important to emphasize that Localizer Performance (LP) approach procedures are not allowed for Brazilian-registered aircraft, according to a limitation on ANAC approved AFM.

ANAC recommends G1000 Avionics Software Phase 7 familiarization training to be integrated into standard type rating or differences training, whenever possible.

5.13.2. G1000 Avionics Software Phase 8

The G1000 avionics software upgrade referenced as Phase 8 (also, “Load 8X” or “Load 83.25 [0734.8C]”) implements some corrections and improvements. In addition, Phase 8 introduces the use of barometric altitude for approach guidance as the source for vertical deviation (Baro-VNAV).

Familiarization with the new features implemented by the G1000 Phase 8 software upgrade is established as levels A/A/A for training, checking and currency, respectively. ANAC recommends the use of the AFM and POH as references.

ANAC recommends G1000 Avionics Software Phase 8 familiarization training to be integrated into standard type rating or differences training, whenever possible.

5.13.3. G1000 Avionics Software Phase 9

The G1000 avionics software upgrade referenced as Phase 9 (also, “Load 9X” or “Load 92.00 [0734.92]”) implements some new features, which are:

- EDM – Emergency Descent Mode
- New CAS message – ENG THRUST DISAG (EMB-500 only)

- Weather radar Altitude Compensate Tilt, Ground Clutter Suppression and Turbulence Detection.

Familiarization with the new features implemented by the G1000 Phase 9 software upgrade is established as levels A/A/A for training, checking and currency, respectively. ANAC recommends the use of the AFM and POH as references.

ANAC recommends G1000 Avionics Software Phase 9 familiarization training to be integrated into standard type rating or differences training, whenever possible.

5.13.4. G3000 Avionics Software Phase 1

The G3000 avionics software upgrade referenced as Phase 1 (also “Load 1X” or “G3000 System Version 1633.13”) implements some corrections and improvements. In addition, Phase 1 introduces the advisory vertical guidance for LP approaches (LP+V).

Familiarization with the new features implemented by the G3000 Phase 1 software upgrade is established as levels A/A/A for training, checking and currency, respectively. ANAC recommends the use of the AFM and POH as references.

It is important to emphasize that Localizer Performance (LP) approach procedures are not allowed for Brazilian-registered aircraft, according to a limitation on ANAC approved AFM.

ANAC recommends G3000 Avionics Software Phase 1 familiarization training to be integrated into standard type rating or differences training, whenever possible.

5.13.5. G3000 Avionics Software Phase 2

The G3000 avionics software upgrade referenced as Phase 2 (also “Load 2X” or “G3000 System Version 3305.00”) implements some improvements and new functionalities when compared to Phase 1 (Load 1X).

Familiarization from EMB-500/505 equipped with G3000 Phase 1 to aircraft equipped with G3000 Phase 2 software upgrade is established as levels A/A/A for training, checking and currency, respectively.

Familiarization from EMB-500/505 equipped with G3000 Phase 2 to aircraft equipped with G3000 Phase 1 software upgrade is established as levels A/A/A for training, checking and currency, respectively.

ANAC recommends the use of the AFM, QRH, POH, SOP, and TG as references.

ANAC recommends G3000 Avionics Software Phase 2 familiarization training to be integrated into standard type rating or differences training, whenever possible.

5.13.6. G3000 Avionics Software Phase 2+ (for EMB-505 only)

The G3000 avionics software upgrade referenced as Phase 2+ (also “Load 2X+”, “Load 26.01” or “G3000 System Version 3305.02”) implements new features, improvements and corrections for the EMB-505 (Phenom 300) aircraft when compared to Phase 2 (Load 2X).

Familiarization from EMB-505 equipped with G3000 Phase 2 to EMB-505 equipped with G3000 Phase 2+ software upgrade is established as levels A/A/A for training, checking and currency, respectively.

Familiarization from EMB-505 equipped with G3000 Phase 2+ to EMB-505 equipped with G3000 Phase 2 software is established as levels A/A/A for training, checking and currency, respectively.

ANAC recommends the use of the AFM, QRH, POH and SOP as references.

ANAC recommends G3000 Avionics Software Phase 2+ familiarization training to be integrated into standard type rating or differences training, whenever possible.

5.13.7. G3000 Avionics Software Phase 2++

The G3000 avionics software upgrade referenced as Phase 2++ (also “Load 2++”, “Load 2X++”, “Load 29.04” or “G3000 System Version 3305.07”) implements new features, improvements and corrections for both aircrafts, the EMB-500 (Phenom 100) and EMB-505 (Phenom 300).

Familiarization from an aircraft equipped with G3000 Phase 2 (EMB-500) or G3000 Phase 2+ (EMB-505) to one with G3000 Phase 2++ is established as levels A/A/A for training, checking and currency, respectively.

On the same manner, the familiarization from an aircraft equipped with G3000 Phase 2++ to one with G3000 Phase 2 (EMB-500) or G3000 Phase 2+ (EMB-505) is also established as levels A/A/A for training, checking and currency, respectively.

ANAC recommends the use of the AFM, QRH, POH and SOP as references.

ANAC recommends G3000 Avionics Software Phase 2++ familiarization training to be integrated into standard type rating or differences training, whenever possible.

5.14. Automatic Dependent Surveillance – Broadcast (ADS-B) Out

The optional installation of ACSS NXT-600 mode S/ADS-B Out transponder complies with both the European Surveillance Performance and Interoperability Implementing Rule (SPI IR), and the FAA Final Rule for Automatic Dependent Surveillance – Broadcast (ADS-B) Out. It requires aircraft equipped with Garmin G1000 Load 8X or G3000 Load 1X and on.

It has the same pilot interface and indications as the previous certified ACSS RCZ-852 transponder. The XPDR Mode A code, IDENT, and emergency status parameters set on the GTC controllers are also transmitted by the ADS-B Out, providing a single point of data entry to the flight crew.

Familiarization with the ADS-B Out is established as levels A/A/A for training, checking and currency, respectively. ANAC recommends the use of the AFM and POH as references.

ANAC recommends ADS-B Out familiarization training to be integrated into standard type rating or differences training, whenever possible.

5.15. EMB-505 Enhanced Performance

On March 2020, ANAC evaluated the differences related to the EMB-505 with the enhanced performance, consisted by the improvement of maximum payload, MMO, climb and cruise performance by the increase of design weights and engine thrust. Although the airplane performance is enhanced, it does not change flight procedures or handling qualities.

The conclusion is that difference levels A/A/A for training, checking and currency are applicable.

A pilot current and qualified on the EMB-505 should be provided with appropriate enhanced performance data in order to be able to operate the EMB-505 equipped with this feature. ANAC recommends the use of the AFM and POH as references.

5.16. Runway Overrun Awareness and Alerting System – ROAAS

On March 2020, ANAC evaluated the optional ROAAS feature applicable to the EMB-505. Later, on September 2022, ANAC conducted the same evaluation on EMB-500.

The ROAAS is an alerting system, intended to reduce risk of overrun during the landing phase of flight by calculating the total landing distance, being able to account for operational deviations.

The conclusion is that difference levels A/A/A for training, checking and currency are applicable.

ANAC recommends the use of the AFM, QRH, POH and SOP as references.

5.17. EMB-505 Complementary Flight Control Electronic (FCE) Recovery System

On September 2022, ANAC evaluated the optional Complementary FCE Recovery System applicable to the EMB-505. Such system allows to manually reset the Flight Control Electronics (FCE) units during abnormal conditions.

The conclusion is that difference levels A/A/A for training, checking and currency are applicable. ANAC recommends the use of the AFM, QRH, POH and SOP as references.

5.18. EMB-505 Current Speed Control (CSC)

On September 2022, ANAC evaluated the optional Current Speed Control (CSC) feature applicable to the EMB-505.

The CSC is a functionality used to keep aircraft's current speed during specific flight phases.

The conclusion is that difference levels A/A/A for training, checking and currency are applicable.

ANAC recommends the use of the QRH, POH and SOP as references.

5.19. EMB-505 Autothrottle

On September 2022, ANAC evaluated the optional autothrottle system applicable to the EMB-505.

The conclusion is that difference levels D/A/A for training, checking and currency are applicable.

EMB-505 G3000 qualified and current pilots may attain autothrottle qualification through a difference training before commencing autothrottle operations. Furthermore, non-EMB-505 G3000 qualified pilots may obtain autothrottle qualification as part of their EMB-505 G3000 (with autothrottle) Initial Type Rating course thus granting them autothrottle and non-autothrottle mixed-fleet operation privileges.

The base curriculum of the evaluated training is outlined in Appendix 5.

ANAC recommends the use of the AFM, QRH, POH and SOP as references.

6. SPECIFICATIONS FOR CHECKING

The initial proficiency check shall be performed in accordance with RBAC 61. In addition, ANAC strongly recommends the use of ANAC High Performance Airplane Checkride Profile in the conduct of the proficiency check flight. This reference document is available at ANAC website, through the link https://www.gov.br/anac/pt-br/assuntos/regulados/aeronaves/avaliacao-operacional/ANACProfile_Revisao5.pdf.

A partial check should be performed after accomplishment of EMB-505 to EMB-500 differences training, and vice-versa.

When operating in a mixed fleet it is recommended that the recurrent check is performed alternating yearly the EMB-500 and the EMB-505 FFS, in line with the device used to accomplish the recurrent training described in section 6.12. It should be guaranteed that at least one recurrent check in both models EMB-500 and EMB-505 is performed within the period of 24 months.

If recurrent checking is not alternated, Difference Level C is applicable for recurrent checking (including a partial check of the differences), using a device suitable for meeting Level C (or higher) checking requirements, when operating both models. The partial check must include maneuvers and system differences on a rotational basis.

7. SPECIFICATIONS FOR CURRENCY

Currency will be maintained or reestablished in accordance with the requirements of RBAC 61.

Pilots operating both the EMB-500 and the EMB-505 aircrafts in a mixed fleet must complete two sectors on each variant within the previous 90 days.

A sector as defined in this report shall be accomplished between two different airports and shall include all phases of flight: Take off, climb, cruise, descent, approach and landing.

8. FLIGHT SIMULATION TRAINING DEVICES (FSTD) AND OTHER TRAINING DEVICES (OTD)

The Full Flight Simulator – FFS and/or Flight Training Device – FTD used for the flight training, checking and currency must be qualified according to the technical requirements established by ANAC. FFS used for flight training, checking and/or currency, must be qualified as level C or D.

The Integrated Procedures Training (IPT) used in ground segment as described in section 6 does not need to be qualified by ANAC.

Other Training Devices used in practical transition training (both from G1000 to G3000 and from G3000 to G1000) described in section 6.5 must:

- Consist of actual Avionics System panels, instruments, switches and controls in the correct positions;
- Represent the same interface with the operator (touchscreen / knobs / switches);
- Simulate ground and flight operations including all phases of flight (takeoff and landing can be automatic);
- allow the pilot to operate it through its multiple pages, icons and menus exactly like the real airplane;
- Simulate airplane systems fully integrated to ensure correct interaction, especially among the FMS, AFCS, ECL and flight instrument displays;
- Simulate avionics failures.

The FSTD, IPT and OTD must be approved for training by ANAC.

9. COMPLIANCE TO RBAC 91 AND RBAC 135

Embraer has submitted both EMB-500 and EMB-505 operational requirements (RBAC 91 and RBAC 135) compliance checklists. Both documents were considered satisfactory.

The Automatic Direction Finder – ADF is offered as optional equipment for both models. For Brazilian operators, an ADF is required to be used as the primary reference for NDB-based approaches and other NDB related procedures, even if the procedures are executed with the use of GNSS.

10. TECHNICAL PUBLICATIONS

10.1. Master Minimum Equipment List - MMEL

EMB-500 and EMB-505 MMEL approved by GGCP/SAR shall be used by Brazilian operators as a basis for developing their MEL. It is available at ANAC website, through the link https://sistemas.anac.gov.br/certificacao/MMEL/MMEL.asp

10.2. Airplane Flight Manual - AFM

Both EMB-500 and EMB-505 AFM approved by GGCP/SAR shall be used by Brazilian operators as a basis for developing their Operator Airplane Operation Manual (AOM).

Localizer Performance (LP) approach procedures are not allowed for Brazilian-registered EMB-500/505 aircraft, according to a limitation on ANAC's approved AFMs.

APPENDIX 1

EMB-500 OR EMB-505 TYPE RATING TRAINING FOOTPRINT

Day 1	Day 2	Day 3	Day 4	Day 5
Introduction (00:30) **Pre-Entry Test** (00:50) **Paperwork review** (00:30) **GS** (05:10) **IPT Session 1** (1:00)	**GS** (7:00) **IPT Session 2** (1:00)	**GS** (5:00) **IPT Session 3** (3:00)	**GS** (5:00) **IPT Session 4** (3:00)	**GS** (5:00) **IPT Session 5** (3:00)
Day 6	**Day 7**	**Day 8**	**Day 9**	**Day 10**
GS (5:30) **IPT Session 6** (3:00)	**FFS session 1** (single pilot 2:00) (dual pilot 4:00)	**FFS session 2** (single pilot 2:00) (dual pilot 4:00)	**FFS session 3** (single pilot 2:00) (dual pilot 4:00)	**FFS session 4** (single pilot 2:00) (dual pilot 4:00)
Day 11	**Day 12**	**Day 13**	**Day 14**	
FFS session 5 (single pilot 2:00) (dual pilot 4:00)	**FFS session 6** (single pilot 2:00) (dual pilot 4:00)	**FFS session 7** (single pilot 2:00) (dual pilot 4:00)	**Proficiency check** (single pilot 2:00) (dual pilot 4:00)	

Legend:

FFS = Full Flight Simulator

GS = Ground School

IPT = Integrated Procedures Training

Note:
FFS and IPT sessions DO NOT INCLUDE time for briefing and debriefing.

The training outlined above reflects the training evaluated by ANAC and considered acceptable for EMB-500 and EMB-505 type rating training of Brazilian pilots. An operator or a training center may develop a variation of this training, provided it is proven that it maintains an equivalent level of safety. Depending on the level of the modification, ANAC may judge necessary an operational evaluation of the proposed training.

APPENDIX 2

EMB-500 OR EMB-505 TRANSITION TRAINING FOOTPRINT

EMB-500 or EMB-505 Single Pilot (SP) Operation to Dual Pilot (DP) Operation Transition Training
EMB-500 or EMB-505 Dual Pilot (DP) Operation to Single Pilot (SP) Operation Transition Training

Day 1	Day 2
FFS session 1 (2:00)	**Proficiency check** (2:00)
Legend: **FFS** = Full Flight Simulator	
Note: FFS session DOES NOT INCLUDE time for briefing and debriefing.	

The transition training outlined above reflects the training evaluated by ANAC and considered acceptable for the transitions between models EMB-500 and EMB-505. An operator or a training center may develop a variation of this training provided it is proven that it maintains an equivalent level of safety. Depending on the level of the modification, ANAC may judge necessary an operational evaluation of the proposed training.

This training can be used as a base line for commercial air transport (RBAC 135) operators training program development, required by RBAC 135.244.

APPENDIX 3

A) EMB-500 TO EMB-505 DIFFERENCES TRAINING FOOTPRINT

Day 1	Day 2	Day 3	Day 4
GS (8:00)	**FFS session 1** (single pilot 2:00) (dual pilot 4:00)	**FFS session 2** (single pilot 2:00) (dual pilot 4:00)	**Partial check** (single pilot 2:00) (dual pilot 4:00)
Legend: **FFS** = Full Flight Simulator **GS** = Ground School			
Note: FFS session DOES NOT INCLUDE time for briefing and debriefing.			

The differences training outlined above reflects the training evaluated by ANAC and considered acceptable for a pilot previously qualified on EMB-500 to be qualified on model EMB-505. An operator or a training center may develop a variation of this training provided it is proven that it maintains an equivalent level of safety. Depending on the level of the modification, ANAC may judge necessary an operational evaluation of the proposed training.

B) EMB-505 TO EMB-500 DIFFERENCES TRAINING FOOTPRINT

Day 1	Day 2	Day 3
GS (8:00)	**FFS session 1** (single pilot 2:00) (dual pilot 4:00)	**Partial check** (single pilot 2:00) (dual pilot 4:00)
Legend: **FFS** = Full Flight Simulator **GS** = Ground School		
Note: FFS session DOES NOT INCLUDE time for briefing and debriefing.		

The differences training outlined above reflects the training evaluated by ANAC and considered acceptable for a pilot previously qualified on EMB-505 to be qualified on model EMB-500. An operator or a training center may develop a variation of this training provided it is proven that it maintains an equivalent level of safety. Depending on the level of the modification, ANAC may judge necessary an operational evaluation of the proposed training.

APPENDIX 4

EMB-500 / EMB-505 GARMIN G1000 TO G3000 DIFFERENCES TRAINING FOOTPRINT

Day 1
GS (3:00) **OTD** (2:00) **Partial Check** (1:00)
Legend: **OTD** = Other Training Device **GS** = Ground School
Note: OTD session DOES NOT INCLUDE time for briefing and debriefing.

The differences training outlined above reflect the trainings evaluated by ANAC and considered acceptable for the differences from G1000 to G3000 and vice versa. An operator or a training center may develop a variation of this training, provided it is proven that it maintains an equivalent level of safety. Depending on the level of the modification, ANAC may judge necessary an operational evaluation of the proposed training.

APPENDIX 5

EMB-505 AUTOTHROTTLE DIFFERENCES TRAINING FOOTPRINT

Day 1
GS (1:30) **FFS or ACFT** (1:30)
Legend: **GS** = Ground School **FFS** = Full Flight Simulator **ACFT =** Aircraft
Note: FFS session DOES NOT INCLUDE time for briefing and debriefing.

The differences training outlined above reflect the training evaluated by ANAC and considered acceptable for the differences from an aircraft not equipped to one equipped with autothrottle functionality. An operator or a training center may develop a variation of this training, provided it is proven that it maintains an equivalent level of safety. Depending on the level of the modification, ANAC may judge necessary an operational evaluation of the proposed training.