NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, D.C. 20594

June 16, 2015

MAINTENANCE RECORDS REVIEW

A. ACCIDENT: DCA15MA029

LOCATION: Gaithersburg, Maryland

DATE/TIME: December 8, 2014 about 1041 Eastern Standard Time[1]

AIRCRAFT: Embraer EMB-500, N100EQ

B. MAINTENANCE RECORDS

Gregory Borsari
National Transportation Safety Board
Washington, DC

C. SUMMARY

On December 8, 2014, about 1041 Eastern Standard Time (EST), an Embraer EMB-500 Phenom 100, N100EQ, impacted terrain and houses about 0.75 miles short of runway 14 while on approach to Montgomery County Airpark (GAI), Gaithersburg, Maryland. The airline transport rated pilot and two passengers were fatally injured as well as three persons on the ground. The airplane was destroyed during the impact and ensuing fire. Marginal visual meteorological conditions prevailed at the time and the flight was operating on an instrument flight rules (IFR)

[1] All times are Eastern Standard Time (EST) based on a 24-hour clock, unless otherwise noted. Actual time of incident is approximate.

flight plan. The airplane was registered to and operated by Sage Aviation LLC., of Chapel Hill, North Carolina, under the provisions of 14 Code of Federal Regulations Part 91 as a personal flight. The flight originated from Horace Williams Airport (IGX), Chapel Hill, North Carolina, with GAI as its intended destination.

D. DETAILS OF THE INVESTIGATION

1.0 Airworthiness Certificates

The Federal Aviation Administration (FAA) New England Manufacturing Inspection District Office issued a standard Airworthiness Certificate on November 3, 2009 for Embraer EMB-500, serial number 50000082, registration N100EQ.

See Attachment 1 for further information

2.0 Aircraft Information

The airplane was manufactured by Embraer, Brazil in October 2009. The airplane was acquired by Sage Aviation, LLC from a previous owner and a new FAA certificate of registration dated April 23, 2014 was issued. The airplane was equipped with two Pratt & Whitney Canada PW617F-E engines.

3.0 Type Certificate Data Sheet

The Type Certificate Data sheet (A59CE) prescribes conditions and limitations under which the product for which the Type Certificate (TC) was issued meets the airworthiness requirements of the Federal Aviation Regulations. According to the document, Embraer S. A. is the holder of the TC.

See Attachment 2 for further information

4.0 Scheduled Maintenance

The aircraft was being maintained in accordance with the Embraer scheduled maintenance requirements as defined in chapter five of the aircraft maintenance manual (AMM). Embraer developed the maintenance requirements using MSG-3 (revision 2005.1) analysis methodology to assure aircraft continued airworthiness. In addition, the engines were being maintained in accordance with the Pratt & Whitney Canada recommended maintenance requirements.

A review of the work order records provided by Stevens Aviation, Inc. (contract maintenance provider for Sage Aviation, LLC) indicated the most recent manufacturers recommended maintenance and inspection requirements were completed on November 14, 2014. Particular attention was made to maintenance performed that could have affected the stall warning system, the flap control system and the avionics of the accident airplane. The review revealed that no non routine items were generated in these areas as a result of the regularly scheduled tasks.

Table 1 Maintenance History

Date	Flight Hours	Flight Cycles	Description
December 13, 2012	419.4	429	600 FH / 12 Month Package 1800 FH / 36 Month Package
December 19, 2013	527.0	465	600 FH / 12 Month Package 1200 FH / 24 Month Package 3000 FH / 48 Month Package
August 28, 2014	614.6	540	600 FH / 12 Month Package
November 14, 2014	633.8	552	600 FH / 12 Month Package & 60 Month Package

5.0 Major alterations

One major alteration was on file for the installation of a TCAS I system, dated November 25, 2009.

6.0 Airworthiness Directive[2] (AD) Summary

Table 2 below shows AD's that were applicable to the accident airplane. The aircraft logbook was not available for review and presumed to be on board the airplane and destroyed by post-crash fire. To determine AD compliance, records from Sage Aviation, LLC were utilized.

Table 2 Airworthiness Directives

Airworthiness Directive Number	Description	Authorizing Document	Date Incorporated
2010-15-09	Air Data Sensor Heat	Airplane Flight Manual Supplement	November 1, 2010
2010-21-15	Aileron Elevator Drain Holes	SB 500-57-0001	June 10, 2010
2010-23-16	Flow Control Shut Off Valve	SB 500-21-0001	February 8, 2010
2011-01-04	Wire Harness W101 Chaffing	SB 500-24-0002	November 1, 2010
2011-17-15	Stall Warning System	SB 500-27-0006	November 1, 2010

[2] Airworthiness Directive (AD) is a regulatory notice sent out by the FAA informing the operator of an action that must be taken for the aircraft to maintain its airworthiness status.

7.0 Aircraft Flight Logs

Aircraft daily flight logs were not available for review from the date Sage Aviation LLC took possession of the airplane. They were presumed to be on board the airplane and destroyed by post-crash fire.

Submitted by: Gregory Borsari
Aviation Accident Investigator
Maintenance

Attachments:

Attachment 1 - Standard Airworthiness Certificate
Attachment 2 - Type Certificate Data Sheet

Attachment 1

Standard Airworthiness Certificate

UNITED STATES OF AMERICA

DEPARTMENT OF TRANSPORTATION-FEDERAL AVIATION ADMINISTRATION

STANDARD AIRWORTHINESS CERTIFICATE

1 NATIONALITY AND REGISTRATION MARKS	2 MANUFACTURER AND MODEL	3 AIRCRAFT SERIAL NUMBER	4 CATEGORY
N100EQ	EMBRAER EMB-500	50000082	NORMAL

5 AUTHORITY AND BASIS FOR ISSUANCE

This airworthiness certificate is issued pursuant to the Federal Aviation Act of 1958 and certifies that, as of the date of issuance, the aircraft to which issued has been inspected and found to conform to the type certificate therefor to be in condition for safe operation, and has been shown to meet the requirements of the applicable comprehensive and detailed airworthiness code as provided by Annex 8 to the Convention on International Civil Aviation, except as noted herein.

Exceptions:

COPY

Exemption No. 9549 14CFR § 23.181(b) relaxed "Dutch Roll" damping criteria

6 TERMS AND CONDITIONS

Unless sooner surrendered, suspended, revoked, or a termination date is otherwise established by the Administrator, this airworthiness certificate is effective as long as the maintenance, preventative maintenance, and alterations are performed in accordance with Parts 21, 43, and 91 of the Federal Aviation Regulations, as appropriate, and the aircraft is registered in the United States.

DATE OF ISSUANCE	FAA REPRESENTATIVE	DESIGNATION NUMBER
NOV - 3 2009	[redacted]	ANE-MIDO-46

Any alteration, reproduction, or misuse of this certificate may be punishable by a fine not exceeding $1,000 or imprisonment not exceeding 3 years or both.
THIS CERTIFICATE MUST BE DISPLAYED IN THE AIRCRAFT IN ACCORDANCE WITH APPLICABLE FEDERAL AVIATION REGULATIONS.

FAA Form 8100-2 (3-08)

Attachment 2

Type Certificate Data Sheet

DEPARTMENT OF TRANSPORATION
FEDERAL AVIATION ADMINISTRATION

A59CE
Revision 5
Embraer S.A.
EMB-500
April 08, 2014

TYPE CERTIFICATE DATA SHEET NO. A59CE

This data sheet which is part of Type Certificate No. A59CE prescribes conditions and limitations under which the product for which the type certificate was issued meets the airworthiness requirements of Title 14 of the Code of Federal Regulations.

Type Certificate Holder	Embraer S.A. Av. Brigadeiro Faria Lima, 2.170 12227-901 -- São José dos Campos -- SP Brazil
Type Certificate Holder Record	Empresa Brasileira de Aeronáutica S.A. (EMBRAER) changed company name to Embraer S.A. effective November 19, 2010.

I. Model EMB-500, (Normal Category), Approved December 12, 2008

Engines:

Two Pratt & Whitney Canada PW617F-E turbofans
Engine TC #E00080EN — Certified October 3, 2008

Fuel:

Jet A, Jet A-1, JP-8

Engine Limits:

Static thrust standard day, sea level (see NOTE 7)

	Standard Version	Enhanced Version
Takeoff (5 min.)	1,695 lb.	1,695 lb.
ATR (10 min.)	1,720 lb.	1,820 lb.

Maximum permissible engine rotor operating speeds (Takeoff and Maximum Continuous)

N_1 (fan)	100% (100% = 19,845 rpm)
N_2 (Gas Gen.)	100.4% (100.4% = 40,200 rpm)
N_1 Transient (operation 20 sec.)	101% (101% = 20,043 rpm)
N_2 Transient (operation 20 sec.)	102% (102% = 40,840 rpm)

Maximum permissible interturbine gas temperatures

Takeoff	830 Degrees C
ATR	845 Degrees C
Max. continuous	830 Degrees C
Transient (starting 5 sec.)	892 Degrees C 950 Degrees C (see NOTE 8)
Transient (operation 20 sec.)	862 Degrees C

Airspeed Limitations:

V_{MO} (maximum operating)	
Sea level to 28,000 ft.	275 KIAS
M_{MO} above 28,000 ft.	0.7 Mach
V_{FE} (maximum flap extended)	
10 degrees (takeoff)	200 KIAS
26 degrees (takeoff/landing)	160 KIAS
36 degrees (landing)	145 KIAS
V_{MC} (minimum control speed)	
10 degrees (takeoff)	97 KIAS
26 degrees (takeoff)	92 KIAS
26 degrees (landing)	86 KIAS
36 degrees (landing)	86 KIAS

Note – The values presented above refer to the maximum V_{MC} for the aircraft envelope (the values can change according to the temperature and altitude)

V_{LO} (landing gear operating)	
Gear Retract and Extend	180 KIAS
V_{LE} (landing gear extended)	275 KIAS
Maximum tire ground speed	139 Knots

Center of Gravity Limits (Landing Gear Extended):

Forward Limits:

Takeoff and Landing Conditions

Linear variation from 232.24 in. aft of datum (35% MAC) at 6614 lb. to 223.53 in. aft of datum (21.5% MAC) at 7099 lb.; linear variation from 223.53 in. aft of datum (21.5% MAC) at 7099 to 8885 lb.; linear variation from 223.53 in. aft of datum (21.5% MAC) at 8885 lb. to 224.82 in. aft of datum (23.5% MAC) at 10472 lb.; linear variation from 224.82 in. aft of datum (23.5% MAC) at 10472 to 10516 lb.

Aft Limits:

Landing Conditions

Linear variation from 232.24 in. aft of datum (35.0% MAC) at 6614 lb. to 234.50 in. aft of datum (38.5% MAC) at 7540 lb.; linear variation from 234.50 in. aft of datum (38.5% MAC) at 7540 to 8885 lb.; linear variation from 234.50 in. aft of datum (38.5% MAC) at 8885 lb. to 233.47 in. aft of datum (36.9% MAC) at 10472 lb.; linear variation from 233.47 in. aft of datum (36.9%MAC) at 10472 to 10516 lb.

Landing Gear retracting moment: (-1530.22 in.-lb.)

Datum:

98.82 in. forward of the jig point (nose jack pad location)

Leveling Means:

Located in the main door between frames 9 and 10 (see AMM for further information)

Maximum Weight

Takeoff	10,472 lb.
Landing	9,766 lb.
Zero Fuel	8,444 lb.
	8,775 lb. (see NOTE 9)
Ramp	10,516 lb.

Minimum Crew for all Flights (See NOTE 5 for cockpit equipment/arrangement restrictions):

One pilot (in the left pilot seat) plus additional equipment as specified in the Limitations Section of the FAA Approved Airplane Flight Manual

OR

One pilot and one copilot

No. of Seats:

Maximum of eight occupants. Refer to the Airplane Flight Manual (AFM-2656) section 6 "Weight & Balance" for seat configurations and moment arms.

Maximum Baggage:

Forward baggage compartment	66 lb. (+45.47 in. aft of datum)
Aft baggage compartment	353 lb. (+314.27 in. aft of datum)
Wardrobe	66 lb. (+143.46 in. aft of datum)
Lavatory Cabinet	33 lb. (+249.76 in. aft of datum)

Fuel Capacity (usable):

Total usable fuel 2,806 lb.
Two wing tanks with 1,403 lb. usable each; +230.91 in. aft of datum;
(see NOTE 1 for unusable fuel)

Oil Capacity (total):

Tank mounted on each engine: 4.00 U.S. quarts (3.79 liters) total each engine; +302.52 in. aft of datum; (see NOTE 1)

Maximum Operating Altitude:

41,000 ft.

Control Surface Movements:

Elevator	Up	27 +1/-1 degrees
	Down	19 +1/-1 degrees
Elevator Trim Tab	Up	6 +1/-1 degrees
	Down	13 +1/-1 degrees
Rudder	Right	27 +1/-1 degrees
	Left	27 +1/-1 degrees
Rudder Trim Tab	Right	16.5 +1/-1 degrees
	Left	16.5 +1/-1 degrees
Aileron	Up	25 +1/-1 degrees
	Down	15 +1/-1 degrees
Aileron Trim Tab	Up	20 +1/-1 degrees
	Down	20 +1/-1 degrees

Control Surface Movements, Continued:

Wing Flap	TO	10 +1/-1 degrees
	TO/Land	26 +1/-1 degrees
	Land	36 +1.5/-1.5 degrees
Ground Spoilers/ Speed Brake	Up	31.5 +1/-1 degrees (see NOTE 10)

See Airplane Maintenance Manual (AMM) for rigging instructions.

Manufacturer's Serial Numbers:

50000005 and up

Import Requirements:

A U.S. airworthiness certificate may be issued on the basis of a Brazilian Certificate of Airworthiness for Export signed by a representative of the Agência Nacional De Aviação Civil (ANAC) containing the following statement: "The aircraft covered by this certificate has been examined and found to comply with U.S. Type Certificate No. A59CE and to be in a condition for safe operation."

Certification Basis - Model EMB-500:

(1) Part 23 of Title 14 of the Code of Federal Regulations effective February 1, 1965, as amended by Amendments 23-1 through 23-55

(2) Part 36 of Title 14 of the Code of Federal Regulations effective December 1, 1969, as amended by Amendments 36-1 through 36-28

(3) Part 34 of Title 14 of the Code of Federal Regulations effective September 10, 1990, as amended by Amendments 34-1 through 34-3

(4) Special Conditions as follows:

(a) 23-220-SC, High Fuel Temperature
(b) 23-221-SC, Fire Extinguishing for Aft Mounted Engines
(c) 23-228-SC, Full Authority Digital Engine Control (FADEC) System
(d) 23-282-SC, Protection of Systems for High Intensity Radiated Fields, (HIRF)
(e) 23-232-SC, Flight Performance, Flight Characteristics, and Operating Limitations
(f) 23-251-SC, Single-Place Side-Facing Seat Dynamic Test Requirements, issued March 22, 2011
(g) 23-255-SC, Single-Place Side Facing Seat Dynamic Test Requirements, issued October 12, 2011

(5) Equivalent levels of safety as follows:

(a) ACE-08-09: 14 CFR § 23.1555(d)(1), Control Markings - Usable Fuel Capacity
(b) ACE-08-10: 14 CFR §§ 23.1305, 23.1309, 23.1321 and 23.1549; Digital Only Display of N2
(c) ACE-08-14: 14 CFR § 23.807(e)(2): Emergency Egress Provision During Ditching
(d) ACE-08-21: 14 CFR § 23.1553: Digital Fuel Quantity Indication

(6) Exemption as follows:

(a) No. 9549 (amended) granted to use a relaxed “Dutch Roll” damping criteria above 18,000 ft. in lieu of damping criteria of 14 CFR § 23.181(b), issued June 12, 2008, Regulatory Docket No. FAA-2007-28646, ACE-00-388-E

Certification Basis, Continued:

(7) Compliance with ice protection has been demonstrated in accordance with 14 CFR § 23.1416 and 23.1419.

(8) Compliance with the provisions for ditching equipment has been demonstrated in accordance with 14 CFR § 23.1415(a)(b).

Type Certificate A59CE issued December 12, 2008.

Application for type certificate dated October 5, 2005.

RVSM Approval: S/N 50000005 and on: All airplanes are equipped with Garmin G1000 dual RVSM capable Air Data Computers and pilot's and copilot's Primary Flight Displays as standard equipment. Each operator must obtain RVSM operating approval directly from the FAA.

Production Basis:

Production Certificate No. 346CE

The manufacturer Embraer Executive Aircraft Inc. located in Melbourne, Florida, is licensed by Embraer S.A. to manufacture the Model Aircraft listed in this Type Certificate Data Sheet. S/N 50000255 and subsequent may be produced either by Embraer Executive Aircraft Inc. in Melbourne, Florida or Embraer S.A. in Brazil. The manufacturer can be confirmed by the aircraft data plate. Aircraft produced by Embraer Executive Aircraft Inc. in Melbourne, Florida with a S/N from 50000255 to 50000269 were produced under the Type Certificate**.**

Equipment:

The basic required equipment as prescribed in the applicable airworthiness regulations (see Certification Basis) must be installed in the airplane for certification.

Service Information:

Service bulletins, structural repair manuals, vendor manuals, AFMs, and overhaul and maintenance manuals, which contain a statement that the document is approved by ANAC are accepted by the FAA and are considered FAA approved. (These approvals pertain to the design data only).

NOTES:

NOTE 1. A current weight and balance report, including a list of equipment included in the certificated empty weight, and loading instructions when necessary must be provided for each aircraft at the time of original certification.

The certificated empty weight and corresponding center of gravity location must include:

Unusable fuel	44 lb.	at +228.90 in. aft of datum
Full oil	17.64 lb.	at +302.52 in. aft of datum; includes the oil from the engine installation (filters and lines)
Hydraulic Fluid	3.09 lb.	at +34.17 in. aft of datum
	13.86 lb.	at +51.18 in. aft of datum (See NOTE 11)

NOTE 2. Airplanes must be operated according to the FAA Approved Airplane Flight Manual (AFM), part number AFM-2656 dated December 12, 2008 or later approved revision. Required placards and markings are listed in Chapter Eleven (11) of the Aircraft Illustrated Parts Catalog (AIPC) and Airplane Maintenance Manual (AMM).

NOTES, Continued:

NOTE 3. See Maintenance Manual, Chapter Four (4), "Airworthiness Limitations" for Systems Airworthiness Limitations, Structure Airworthiness Limitations (ALI) and Life-Limited Items (LLI). The life limit for rotating parts on the PW617F-E engine is in the Airworthiness Limitations Manual, Pratt & Whitney Canada P/N 3072699, latest revision.

NOTE 4. All replacement seats (crew and passenger), although they may comply with TSO C127, must also be demonstrated to comply with installation requirements into the aircraft listed in 14 CFR §§23.2, 23.561, 23.562, and 23.785.

The foam cushion buildup of all seats (crew and passenger) may not be altered. Any deviations in the foam construction or stiffness must be demonstrated by test or analysis to comply with the 14 CFR 23.562 paragraph.

NOTE 5. Approval for operation with a minimum crew of one pilot is based upon the cockpit equipment installation and arrangement evaluated during FAA certification testing. No significant changes may be made to the installed cockpit equipment or arrangement (EFIS, autopilot, avionics, etc.), except as permitted by the approved MMEL, without prior approval from the responsible Aircraft Certification Office.

NOTE 6: The EMB-500 is often referred to in Embraer marketing literature as the “PHENOM 100”. This name is strictly marketing designation and is not part of the official model designation.

NOTE 7: Aircraft serial numbers 50000005 thru 50000217 are considered the Enhanced Version. For aircraft serial numbers 50000218 and up, the placard in the cockpit must be checked to determine the correct version.

NOTE 8: Post SB 500-73-0001 incorporation.

NOTE 9: Post SB 500-00-0005 incorporation or with an equivalent factory-incorporated mod.

NOTE 10: Post SB 500-27-0008 incorporation.

NOTE 11: Post SB 500-00-0009 incorporation or with an equivalent factory-incorporated mod.

END