



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

August 9, 2022

Factual Report

Maintenance Records

DCA20IA014

A. ACCIDENT

Location: Atlanta, Georgia
Date: November 6, 2019
Time: 21:15 EST
Airplane: Embraer ERJ170-200LR, N117HQ
Operator: Republic Airways, Inc.

B. FACTUAL INFORMATION

1.0 Airplane Information

Embraer SA manufactured the model ERJ 170-200LR, serial number 17000184 airplane on September 19, 2007. The aircraft was equipped with two General Electric Model CF34-8E5 engines. Republic Airways, Inc. placed the aircraft into service

September 26, 2007. The airplane had accumulated 31,263.01 total hours with 24,416 total cycles at the time of the event.

1.1 Air Carrier Certificates

On August 29, 2005, reissued June 19, 2019, the Federal Aviation Administration (FAA) Flight Standards District Office (FSDO), Indianapolis, Indiana issued Republic Airways Inc. 8909 Purdue Road, Suite 300, Indianapolis, Indiana 46268, Certificate Number R61A758X.

1.2 Operations Specifications (OpSpecs)¹

Republic Airways Inc. has a Part 121 Air Carrier Certificate, which includes the standards, terms, conditions, and limitations contained in the FAA approved Operations Specifications (Parts D and E).

Per section D072 of the OpSpecs, the Continuous Airworthiness Maintenance Program (CAMP), authorized Republic Airways to use the Republic Airways General Maintenance Manual (GMM), Maintenance Time Limits Manual E170/175 Volume 1 (MTLM170V1) and Volume 2 (MTLM170V2) to maintain the Embraer 170/175 fleet.

Per section D074 of the OpSpecs, Republic Airways was authorized to escalate scheduled maintenance intervals, on a short-term basis, for check packages, check package individual line items, or component time-change/task intervals. The basis for a short-term escalation is the emergence of some unforeseen situation. The short-term escalations must be supported solely on technical analysis. Short term escalations must not be used on a large scale or on a repetitive basis to the extent that it results in a fleet interval escalation. Short term escalation procedures do not apply to Two Day and Bi-Weekly checks.

Per section D085 of the OpSpecs, Republic Airways has 8 ERJ-170-100LR, 40 ERJ-170-100SE, 14 ERJ-170-100SU, and 143 ERJ-170-200LR aircraft in its fleet. Fleet total of 205 aircraft.

Per section D091 of the OpSpecs, Republic Airways was authorized to make arrangements with other organizations to perform maintenance, preventive maintenance, or alterations on its fleet of aircraft.

According to section D095 of the OpSpecs, Republic Airways was authorized to use an approved Minimum Equipment List (MEL).

¹ Operations Specifications contains the authorizations, limitations, and certain procedures under which each kind of operation, if applicable, is to be conducted by the certificate holder.

According to section D097 of the OpSpecs, the FAA has approved the Republic Airways maintenance program for the compliance of the Aging Aircraft Program rules. The Maintenance Time Limits Manual, Volume 1 contains the requirements for 14 CFR 121.1109, Supplemental Inspections per Appendix A. 14 CFR 121.1111, Electrical Wiring Interconnection System (EWIS) per Appendix B and 14 CFR 121.1113 Fuel Tank System Maintenance Program, per chapter 8 of the manual.

Per section E096 of the OpSpecs, Republic Airways was authorized for a Weight and Balance Program in accordance with the Weight and Balance Program Manual. Each aircraft to be weighed at a 36-month interval.

1.3 Type Certificate Data Sheet

The Type Certificate Data Sheet A56NM 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 SA is the holder of the TC.

1.4 Maintenance

Republic Airways Inc. is primarily responsible for ensuring that all aircraft operated by the company, including airframes, engines, appliances and installed equipment are maintained in a continuous state of airworthiness by the Company's Maintenance Program.

According to Republic Airways' guidance "all workmanship, procedures and inspections will be of the highest quality and performed in accordance with established airframe, engines, and appliances maintenance procedures".

Republic Airways' maintenance and inspection personnel performing maintenance, preventive maintenance, and alterations in such a manner as to ensure that each aircraft released to service is airworthy and properly maintained for operations under part 121 of the code of federal regulations.

Republic Airways' may not resume operation of an aircraft following its maintenance, preventive maintenance or alterations until an airworthiness release or aircraft log entry is prepared. This must be prepared by company personnel or persons with whom the company arranges for the performance of maintenance, preventive maintenance, or alterations in accordance with the company's maintenance manual and continuous airworthiness maintenance program.

1.5 Minimum Equipment List (MEL)²

Republic Airways was authorized to use an approved MEL on its airplanes per its OpSpecs. At the time of the incident, there were no open MEL items. A review of the MEL items over the previous four months was conducted. The captain's pitch trim system was deferred or re-deferred seven times.

1.6 Aircraft Flight Logs

Aircraft Flight Logs were reviewed from August 7, 2019, thru November 10, 2019. The review focused on the flight control system. The following items are noted.

Date	Discrepancy	Corrective Action
8/7/2019	Pitch trim switch 1 fail	Performed fault isolation manual (FIM) Task 27-43-00-810-801-A Message cleared, operational check good
8/19/2019	Pitch trim switch 1 fail EICAS message with aural trim	Troubleshoot in accordance with (IAW) FIM task 27-43-00-810-801-A. Removed and replaced captains side pitch trim switch
8/24/2019	Pitch trim switch 1 fail	Troubleshoot per FIM Task 27-43-00-810-801-A and AMM 27-43-01, operational checks okay
9/3/2019	EICAS message en-route while on autopilot pitch trim switch-1 fail. Captain trim switch verified inop	Complied with FIM Task 27-43-00-810-801-A. Message cleared, operational checks good.
9/8/2019	Pitch trim switch 1 fail	Deferred captain's pitch trim switch IAW MEL 27-43-02-1. Cat. C. Removed and replaced captains pitch trim switch IAW AMM 27-43-02, ops checked good
9/8/2019	Backup pitch trim switch has no "TRIM" aural call out at the three second cutout	Reset trim system cutouts IAW FIM 27-43-00-810-809-A. Trim aural warning ops checked okay

² The FAA approved Minimum Equipment List contains a list of equipment and instruments that may be inoperative on a specific aircraft for continuing flight beyond a terminal point.

Date	Discrepancy	Corrective Action
9/25/2019	Pitch trim switch 1 fail EICAS message	Performed RTS IAW AMM 27-00-00 and operational check of pitch trim controls IAW AMM 27-03-04, ops check good, no defects noted
9/27/2019	While replacing parking/emergency brake cable found aileron cable fairlead broken off at frame 22	Replaced fairlead ref SRM 51-40-06
10/12/2019	Pitch trim switch 1 fail	Deferred per MEL 27-43-02-01
10/13/2019	When rolling right to full deflection ailerons feeling like they are binding	Performed aileron operational check IAW AMM 27-10-00 no defects noted. Found aileron autopilot servo cable frayed. Replaced autopilot servo bracket and frayed cable IAW AMM 22-11-07. Ops checked good
10/15/2019	Reentry of MEL 27-43-02-01 Pitch trim switch 1 fail	Removed and replaced pilot pitch control yoke switch IAW AMM 27-43-02. No fix. Removed and replaced horizontal stabilizer actuator control electronics (HS ACE) IAW AMM 27-43-01. Ops checked good at this time
10/23/2019	Pitch trim 1 switch fail message	(Deferred pitch trim 1 switch). 10/25/2019 - Removed and replaced yoke trim switch IAW AMM 27-43-02. Ops checked good
10/30/2019	Pitch trim switch 1 fail EICAS Msg.	Deferred pitch trim switch on yoke
11/2/2019	Pitch trim switch 1 fail. Captain switch on yoke inop	Replaced captain yoke trim switch IAW AMM 27-43-02-01 Checks good. This clears MEL 27-43-02-01
11/2/2019	Pitch trim switch 1 fail EICAS message	Deferred captain yoke pitch trim switch IAW MEL 27-43-02-01
11/3/2019	Re-entry MEL 27-43-02-1 Captain yoke pitch trim switch	Replaced HS-ACE IAW AMM 27-43-02-01 ops check good. This clears MEL 27-43-02-01
11/6/2019	Pitch trim switch 1 fail (EICAS)	Deferred pitch trim switch IAW MEL 27-43-02-01

Date	Discrepancy	Corrective Action
11/8/2019	Accomplish 170EI-27-42-0004 to remove captains yoke pitch trim control inputs to HSACE	170EI-27-42-0004 completed and captains pitch trim control inputs to HSACE was removed
11/8/2019	Perform horizontal stabilizer system operational test per AMM 27-40-00-710-801A and job card 170EI-27-42-0004	Operational check of horizontal stabilizer system captains yoke pitch trim deactivated satisfactory. FO's and backup switch checks good per EMB AMM 27-40-00
11/09/2019	Due to Captains yoke pitch trim inputs to HSACE the removed components need to be placed on a FC DMI to be repaired and reinstalled	Removed pins 46, 51, 38 and 44 from HSACE electrical connector P0481 per 170EI-27-42-0004. Placed removed components on non MEL DMI RS11299/1 to be repaired and reinstalled within one flight cycle.
11/09/2019	Reference log page R51129611 for pitch trim switch 1 un-commanded input and 2 day check expired.	Deactivated pitch trim wires from HSACE per J/C 170EI-27-42-0004-1 ref DMI R511299/1. Aircraft has been inspected and is in safe condition for flight from ATL to IND.
11/09/2019	Aircraft to be flown from ATL to IND due to pitch trim switch un-commanded input	Repaired pitch trim system on log pages R639301/2 and R639301/3. Ops check normal ref AMM 27-40-00. Performed two day inspection on log page R511300/2.
11/09/2019	Re-entry of DMI R511299/1 Removed pins 46, 51, 38, and 44 from HSACE connectors P0481 and P0483 per 170EI-27-42-0004	Re-installed pins 46, 51, 38 and 44 in HSACE connectors P0481 and P0483 IAW EMB-175 SWPM 20-50-10. Unable to CW ops check due to further repairs required. DMI RS11299/1 remains open
11/10/2019	Reentry of MEL 27-43-02-1 CAT C ticket #195191 pitch trim SW fail. Original log page R511295/1	Replaced W251-00057-22, W251-00060-22, W251-00061-22, W251-00059-22 ref WDM 27-43-50 and SWPM 20-41-10. Horizontal trim ops check normal, ref AMM 27-90-00. This clears MEL 27-43-02-1 ticket #195191

Date	Discrepancy	Corrective Action
11/10/2019	Reentry of DMI R511299/1 Removed pins 46, 51, 38 and 44 from HSACE connectors P0981 and P0983 per 1705I-27-42-0004	Horizontal stab trim ops check normal ref AMM 27-40-00 after repairs made on log page R511300/1 and R639301/2. This clears DMI R511299/1

1.7 Service Difficulty Reports (SDR)³ and Mechanical Interruption Summary Report (MISR)⁴

A review of the FAA SDR database from May 1, 2019 to November 5, 2019 was conducted. There were no Service Difficulty Reports on file for aircraft N117HQ for the period reviewed. Republic Airways had submitted two Service Difficulty Reports in 2018 for door entry threshold beam corrosion.

From May 1, 2019, to November 5, 2019, Republic Airways reported 15 Mechanical Interruption Summary Reports which included the trim switch items to the FAA for aircraft N117HQ.

1.8 Major Repairs and Alterations

The FAA Airworthiness file was reviewed for major repairs and major alterations. No major repairs or major alterations were on file with the FAA at the time of the event.

1.9 Fleet Health Monitoring Program

Republic Airways Fleet Health Monitoring Program is a process to monitor and mitigate safety, reliability, and performance issues before they become systemic. Maintenance control reviews both pilot and maintenance entries to identify aircraft and component trends as well as utilizing the Aircraft Health, Analysis, Diagnostics, and Prognostics (AHEAD-PRO) program for early detection of real time faults.

³ As required under 14 CFR 121.703, each scheduled operator is to report the occurrence or detection of each failure, malfunction or defect concerning (a) fires during flight, (b) false fire warning during flight, (c) engine exhaust system that causes damage during flight, (e) an aircraft component that causes accumulation or circulation of smoke, vapor, or toxic or noxious fumes during flight, (f) engine shutdown during flight, (g) a propeller feathering, (h) aircraft structure requiring major repairs, (i) cracks, corrosion, (j) other safety critical issues as stated in the FAR part. These occurrences must be reported within 72 hours of the event.

⁴ Each scheduled operator is required under 14 CFR Part 121.705 to submit a summary of any (a) interruption to flight, (b) unscheduled change of aircraft en route, or unscheduled stop or diversion from a route caused by known or suspected mechanical difficulties or malfunctions that are not required to be reported as service difficulty reports.

The Aircraft Fault History Database (FHDB) is for troubleshooting and isolation of discrepancies and repeat activity. The maintenance control department with maintenance stations and/or maintenance planning schedule FHDB downloads as needed.

Daily delay reporting and current fleet activity coordination with the manager is conducted for early detection of issues that may become systemic.

Engineering coordination to ensure delegation of action items and leveraging resources.

Three levels of tracking are utilized, green (level 1), yellow (level 2) and red (level 3) based on number of repeats and/or level of risk.

1.10 Continuing Analysis and Surveillance System (CASS)

To comply with requirements of 14 CFR Part 121.373, Republic Airways Inc., has a CASS data collection system from all aspects of the company's daily maintenance operations. Data is stored in the maintenance software database and Sabre computer tracking systems. There are two primary reports utilized for the distribution of data.

- Daily Maintenance Report distributed to Maintenance and Quality Assurance staff.
- Monthly CASS report distributed throughout the company, FAA Principal Maintenance Inspector and to airframe and/or powerplant manufacturer representatives.

Data is collected from PIREPS, Delays and Cancellations, MIS/SDR, MEL items, Engine removals, Premature Component Removals, Airworthiness Directives, Fleet Monthly utilization data, Audit findings, Non-routine Work Cards, Heavy Check Findings, and Component Teardown Reports. The pitch trim items were reported on the MIS report.

Submitted by:
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