En-route Engine Malfunction on Airliner on October 15, 2021

Report on Preliminary Investigation L2021-E3

FOREWORD

Pursuant to section 2 of the Safety Investigation Act (525/2011), the Safety Investigation Authority of Finland (SIAF) initiated on October 15, 2021, a preliminary investigation into a malfunction of the right engine of an airliner that had occurred earlier on the same day. The crew had shut down the affected engine and completed the flight on a single engine. After assessing the findings of the preliminary investigation the SIAF saw no need for a full investigation. This report contains essential information obtained in the preliminary investigation. This report was released on December 16, 2021.

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Cover photo: SIAF

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1 EVENTS

1.1 Sequence of Events

Flight BPS692, a scheduled passenger service to Helsinki-Vantaa airport (EFHK), departed Pori airport (EFPO) at 0726 h[1] on Friday, October 15, 2021. The airplane was an Embraer EMB-120ER, registration HA-FAL. It carried two pilots, one cabin attendant and six passengers. The flight was the day's first sector for the airplane and the crew.

At 0748 h, during climb to the cruising altitude, the crew established contact with the area control center and reported passing flight level[2] 84 on climb to flight level 170.

The airplane reached flight level 170 at approximately 0750 h. It encountered light icing and turbulence at this flight level and therefore the pilots requested descent to flight level 150, which was approved.

The captain retarded both power levers to reduce engine power and begin descent. While monitoring the engine instruments during power lever movement, the captain noted that right engine torque and fuel flow had dropped below their normal values with the torque indicator reading nearly zero and fuel flow reduced from 230 kg/h to 70 kg/h. The captain advanced both power levers to increase right engine power, but the engine did not respond to power lever movements.

The engine did not shut down, but failed to produce power, and slight vibration was felt in the cockpit. The captain and the first officer discussed the matter, concluded that they had an engine malfunction to handle, and carried out the applicable memory items[3]. The captain instructed the first officer to declare emergency.

The first officer transmitted mayday at 0751 h and informed air traffic control that the flight would continue to Helsinki. At 0755 h, the pilots shut down the affected engine as a precautionary measure in accordance with the QRH[4] procedure. At 0756 h, they requested descent to a lower flight level. Air traffic control cleared the flight to descend to flight level 100 and subsequently cleared it for runway 15 ILS[5] approach and landing at Helsinki. The airplane landed on runway 15 at 0815 h.

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1 All times herein are Finnish time (UTC +3 h) on the day of the incident.

2 Flight level means the aircraft's altitude in hundreds of feet with the standard atmospheric pressure at sea level (1,013 hPa, 1,013 mbar, or 29.92 inHg) set in the altimeter. Flight level 84 equals 8,400 ft altitude, i.e., approximately 2,600 m.

3 Pilot actions that must be taken in the event of a malfunction without reference to a checklist, specific to each aircraft type.

4 Quick Reference Handbook

5 Instrument landing system

1.2 Technical Examination

Entries in the airplane's log book showed that the right engine was shut down in level flight after a drop in engine parameters.

An examination by a company mechanic revealed that the power loss had resulted from the failure of the P3 line in the right engine.

An HMU[6] mounted on each engine establishes the minimum and maximum limits of fuel flow to the engine as a function of P3[7] and the power lever position. The HMU uses P3 as the primary parameter to establish fuel flow limits. Due to a P3 line failure on the incident flight, the HMU scheduled fuel flow to the right engine to the minimum, and as a result engine power decayed close to idle, but no warning indication was received in the cockpit. After the P3 line failure, movements of the right power lever had no effect on fuel flow to, and the power output of, the right engine.

The aircraft was declared airworthy after the company mechanic had rectified the fault and an engine test run was carried out.

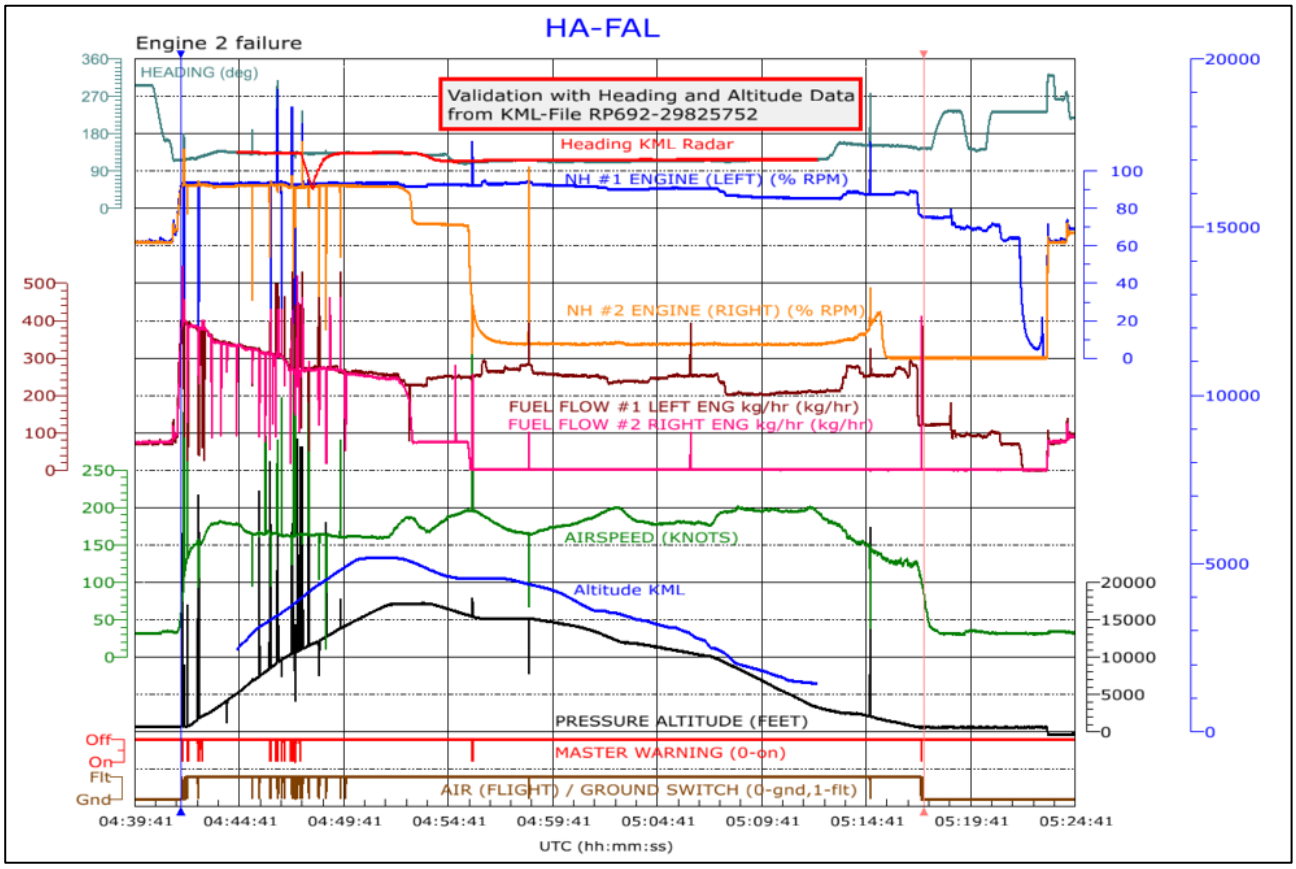

Figure 1. Digital flight data recorder graphs (photo: SIAF)

1.3 Alerting and Rescue Operations

A category B full emergency alert was issued at 0756 h. 13 rescue units and six paramedic units responded. Of these, 10 rescue units and three paramedic units arrived at Helsinki airport.

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6 Hydromechanical metering unit
7 High-pressure compressor discharge pressure

The alert was canceled at 0817 h after the airplane had landed.

1.4 Consequences

The airline canceled other flights scheduled for the airplane and the crew for the day of the incident.

There was no damage to persons, equipment, or environment.

The airplane was ferried to Pori on Saturday, October 16, and resumed scheduled operation on Monday, October 18.

2 BACKGROUND INFORMATION

2.1 Environment, Equipment, and Systems

2.1.1 Aircraft

The aircraft was an Embraer EMB-120ER, registration HA-FAL. It was manufactured in 1990 and owned by Budapest Aircraft Services Ltd. The EMB-120ER is powered by two Pratt & Whitney Canada PW118 turboprop engines driving four-bladed propellers. Its length is 20 m, wing span 19.78 m, and height 6.35 m. The maximum takeoff mass is 11,990 kg. The type is certificated for operation with two pilots and can carry 30 passengers. The airplane was airworthy at the time of the incident.

Figure 2. Cockpit of EMB-120ER involved in incident. (Photo: SIAF)

2.2 Conditions

Pori weather[8] at the time of the flight's departure was wind from 160° at approximately 10 kt (5 m/s). Cloud base was at 1,100 ft (330 m), and temperature was +10 °C.

Helsinki weather[9] at the time of the flight's landing was wind from 170° at approximately 13 kt (6 m/s). Cloud base was at 700 ft (210 m), and temperature was +8 °C.

Weather was not a factor in the incident.

2.3 Recordings

Aircraft recorders, air traffic control radar data, and recorded radio communications were used to determine the events during the flight.

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8 METAR EFPO 150420Z AUTO 16010KT 9999 BKN011 OVC034 10/08 Q0992=
TAF AMD EFPO 150357Z 1503/1512 18012G24KT 9999 BKN015 BECMG 1504/1506 BKN012

9 METAR EFHK 150450Z 17014KT 5000 -RA BKN006 08/07 Q0998 TEMPO 4000=
METAR EFHK 150420Z 17013KT 9999 BKN007 08/07 Q0999 TEMPO 7000=

Flight parameters downloaded from the aircraft's DFDR[10] were consistent with the radar data.

Most of the aircraft's CVR[11] recording consisted of noise and was therefore unusable for investigation purposes. The CVR records data for a period of two hours and then overwrites this data unless it is appropriately secured.

2.4 Personnel, Organizations, and Safety Management

2.4.1 Airline

The airplane was operated by Budapest Aircraft Services Ltd (BASe Airlines), which has three EMB-120ERs in its fleet and is headquartered in Budapest, Hungary. The company has operated three daily services between Pori and Helsinki since 2019. Previously, it flew scheduled services between Savonlinna and Helsinki. In Finland, it does business as Karhu Aero.

2.4.2 Cockpit Crew

The airplane was operated by two pilots, both of whom held valid medical certificates.

The 43-year-old captain held an ATPL(A) licence. He had recorded a total of 2,492 h including 1,557 h of multi-crew time. During the past month he had logged a total of 86 h, of which 31 h had been during the past two weeks.

The 48-year-old first officer held a CPL(A) licence. He had recorded a total of 2,066 h including 273 h of multi-crew time. During the past month he had logged a total of 40 h, of which 28 h had been during the past two weeks.

10 Digital flight data recorder
11 Cockpit voice recorder

3 CONCLUSIONS

Conclusions encompass the causes of an accident or a serious incident. Cause means the different factors leading to an occurrence as well as relevant direct and indirect circumstances.

1. The engine power loss resulted from a P3 line failure.

   Conclusion: *An engine-mounted HMU establishes the minimum and maximum limits of fuel flow to the engine as a function of P3 and the power lever position. After the loss of P3 supply, power lever movements have no effect on fuel flow to, and the power output of, an engine.*

2. The pilots shut down the affected engine and completed the flight on a single engine.

   Conclusion: *Twin-engined passenger airplanes are certified for safe operation in the event of the failure of one engine. The performance of one engine is sufficient during all phases of the flight.*

3. The CVR did not retain the pilots' conversations during the flight because the CVR was not appropriately secured after the incident.

   Conclusion: *Because CVR data provides essential information for safety investigation, a CVR should be secured after an incident to prevent overwriting.*

4 SAFETY RECOMMENDATIONS

The preliminary investigation did not lead to any new recommendations.

4.1 Proposed Improvements

Securing of CVR and flight data recorder after an incident should be an inherent part of normal operating procedures. To this end, the SIAF has issued the following safety recommendation in its investigation report L2021-02:

> *2021-S38: The Finnish Transport and Communications Agency Traficom ensures that securing of flight recorders is included in airlines' operating procedures.*

The probability of similar events could be reduced by appropriate maintenance checks of the P3 lines and by proactive maintenance actions.

4.2 REFERENCES

Written Material

Fintraffic ANS (2021) *AIP Finland, GEN 2.2 Abbreviations. https://www.ais.fi/aip/ge/EF_GEN_2_2_EN.pdf* Accessed November 22, 2021.

Investigation Material

1) Photographs and other material
2) Interviews
3) Weather information
4) Traficom, flight safety report
5) Air traffic control SSR radar data
6) Radio communications between air traffic control and pilots
7) Aircraft DFDR and CVR data
8) Pilots' licence, medical, and training data
9) Aircraft technical log and official documentation
10) Kerava Emergency Response Center alert log
11) Central Uusimaa Rescue Department incident report