

**SERIOUS INCIDENT**

<b>Aircraft Type and Registration:</b>	Airbus A320-214, G-EZOI
<b>No &amp; Type of Engines:</b>	2 CFM56-5B4/3 turbofan engines
<b>Year of Manufacture:</b>	2015 (Serial no: 6562)
<b>Date &amp; Time (UTC):</b>	25 February 2019 at 1700 hrs
<b>Location:</b>	En route from Edinburgh Airport to Bristol Airport
<b>Type of Flight:</b>	Commercial Air Transport (Passenger)
<b>Persons on Board:</b>	Crew - 6                      Passengers - 178
<b>Injuries:</b>	Crew - None                      Passengers - None
<b>Nature of Damage:</b>	None
<b>Commander's Licence:</b>	Airline Transport Pilot's Licence
<b>Commander's Age:</b>	39 years
<b>Commander's Flying Experience:</b>	4,200 hours (of which 4,050 were on type) Last 90 days - 149 hours Last 28 days - 32 hours
<b>Information Source:</b>	Operator's internal report and Aircraft Accident Report Form submitted by the pilot

**Synopsis**

A louder than usual noise was observed from an avionics vent fan before flight. During flight the noise increased and vibration became apparent. The crew then noticed a strong burning smell so they donned their oxygen masks and diverted the flight. An ECAM<sup>1</sup> message, associated with an avionics ventilation system fault, was generated and the crew performed the associated actions.

A subsequent investigation revealed the cause of the event to be worn bearings in the avionics extract fan. The fan manufacturer and the aircraft manufacturer both took safety action to prevent similar incidents in future.

**History of the flight**

On the ground at Edinburgh the flight crew were advised by the cabin manager of a louder than usual fan noise in the aircraft cabin. The commander identified the noise as being from an Avionics Vent Fan. There were no other indications and, following a discussion with the co-pilot and the cabin manager, the commander, who considered that the noise was not so unusual, decided to continue the flight and to monitor for any change in the noise.

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**Footnote**

<sup>1</sup> Electronic Centralised Aircraft Monitoring.

Later, while in cruise flight, the noise increased and vibration became apparent. The commander sent a message to the company Maintenance Operations Control (MOC) requesting engineering assistance on arrival at Bristol. The flight crew also reviewed their required actions in the event of a fan overheat or fire/smoke indication.

Shortly after starting the initial descent, with the aircraft in the vicinity of Birmingham, “a very strong burning smell” filled the flight deck. The flight crew donned their oxygen masks and initiated a diversion to Birmingham Airport. The commander alerted the cabin crew to the situation and gave the cabin manager a NITS<sup>2</sup> brief. The fan noise was then heard to wind down and, soon after, the Electronic Centralised Aircraft Monitoring (ECAM) message VENT EXTRACT FAULT was displayed. The ECAM actions were carried out, after which the smell of smoke appeared to lessen.

The crew declared a PAN to ATC and an uneventful approach and landing was made at Birmingham Airport.

### **Aircraft information**

The first steps of the procedure when a crew suspects that smoke is coming from the avionics and/or the air conditioning systems is to don an oxygen mask and establish communication between themselves. Switch selections are then made to ensure that avionics ventilation air is directed overboard and further smoke is prevented from entering the cockpit and cabin.

The avionics blower and extract fans form part of the avionics ventilation system. The system is fully automatic and a VENT EXTRACT FAULT alert triggers on the ECAM when the extract pressure is low. The associated crew action is to select the EXTRACT fan switch, located on the overhead panel, to OVRD (override).

### **Aircraft examination**

The avionics blower and extract fans were removed from the aircraft and sent to the workshop for examination. The extract fan was found to be seized with the rear flange worn. Its rotor was damaged and the front bearing worn. No significant anomalies were found with the blower fan which was fully functional.

The avionics blower and extract fans were replaced and the aircraft was returned to service.

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#### **Footnote**

<sup>2</sup> NITS emergency briefing protocol; Nature, Intention, Time, Special instructions

## Other information

### *Previous similar event*

The AAIB reported on a similar in-flight fumes event which occurred in July 2015.<sup>3</sup> The report advised on safety action taken by the aircraft manufacturer:

*'In March 2005 the fan manufacturer issued a Vendor Service Bulletin, 3454-21-108, to replace the original steel ball bearings with an improved ceramic bearing. The aircraft manufacturer issued a corresponding Service Information Letter, SIL 21-141, to notify operators. SIL 21-141 was replaced by In Service Information (ISI) 21.26.00027, published in November 2013. The introduction of ceramic bearings has reduced the in-service arising rate, but the aircraft manufacturer reported that fan failure still causes between five and 10 aircraft diversions per year.*

*In August 2013 the fan manufacturer issued a Service Information Letter, 3454HC-21-250, to inform operators that a new overhaul task had been added to the fan Component Maintenance Manual. The task periodically replaces the bearings and other components subject to wear, with a recommended periodicity of 10,000 Flying Hours. However, the fan manufacturer acknowledged that operators may wish to set their own avionics blower fan maintenance plan and recommended that operators avoid exceeding 12,000 flying hours between fan overhauls.'*

Additional information was included:

*'The aircraft manufacturer advised that, in the longer term, fan vibration monitoring will be the subject of an in-service evaluation aimed at reducing similar events in the future.'*

The fan manufacturer subsequently developed an optional modification to introduce a ball bearing health monitoring function on the avionics fan. This would stop the fan before a failure occurred and fumes were released.

## Analysis

The flight crew were aware of a possibly noisy fan before departure from Edinburgh but in the absence of any other indication decided to continue the flight. The problem worsened in flight and the commander advised the company MOC that assistance would be required at their destination. The next indication to the crew was a strong burning smell and they donned their oxygen masks at once and initiated a diversion. Subsequently, an ECAM VENT EXTRACT FAULT alert was triggered and the crew performed the associated actions.

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### Footnote

<sup>3</sup> AAIB investigation to Airbus A320-232, G-EUYE, In-flight fumes event, 90 nm south-east of London Heathrow Airport, 27 July 2015. Available at: <https://www.gov.uk/aaib-reports/aaib-investigation-to-airbus-a320-232-g-euye> [Accessed 14 May 2019].

The source of the smoke was traced to the avionics extract fan. The aircraft manufacturer had previously acted to reduce the number of avionics fan related smoke events. Subsequently, additional action was taken to introduce an optional modification which would stop a fan before smoke was released.

### Conclusion

The avionics extract fan failed during flight and released smoke/fumes into the flight deck. The flight crew, already alerted to a possible problem by an unusual noise and vibration, initiated a diversion. Similar events have occurred in the past and the aircraft manufacturer, fan manufacturer and operator took action to reduce the number of occurrences.

### Safety action

#### *Fan manufacturer*

The fan manufacturer issued service bulletin 3454HC-21-101 on 18 April 2018, which provided details of an optional modification which introduced a ball bearing health monitoring (BBHM) function to continuously monitor the condition of the ball bearings and preventively stop the fan before its failure.

#### *Operator*

Following the fan manufacturer's original service bulletin and information letters between 2005 and 2013, the operator introduced a soft-life campaign to incorporate the recommendations to reduce the inflight failure rate of these fans. This commenced in 2016.

In November 2018 the operator commenced a soft-life campaign to install the BBHM function and at the date of this report 23 modified fans had been installed.