

AI2017-7

**AIRCRAFT SERIOUS INCIDENT  
INVESTIGATION REPORT**

**IBEX AIRLINES CO., LTD.**

**J A 0 6 R J**

**December 21, 2017**



The objective of the investigation conducted by the Japan Transport Safety Board in accordance with the Act for Establishment of the Japan Transport Safety Board (and with Annex 13 to the Convention on International Civil Aviation) is to prevent future accidents and incidents. It is not the purpose of the investigation to apportion blame or liability.

Kazuhiro Nakahashi  
Chairman,  
Japan Transport Safety Board

Note:

This report is a translation of the Japanese original investigation report. The text in Japanese shall prevail in the interpretation of the report.

# AIRCRAFT SERIOUS INCIDENT INVESTIGATION REPORT

## MULTIPLE DEFECTS IMPEDING THE SAFE FLIGHT OF AIRCRAFT, BOMBARDIER CL-600-2C10, JA06RJ IBEX AIRLINES CO., LTD. AT AN ALTITUDE ABOUT 38,500FT ABOUT 33NM NORTH-NORTHWEST OF HIROSHIMA AIRPORT AT 09:29 JST, APRIL 17, 2016

December 8, 2017

Adopted by the Japan Transport Safety Board

Chairman Kazuhiro Nakahashi  
Member Toru Miyashita  
Member Toshiyuki Ishikawa  
Member Yuichi Marui  
Member Keiji Tanaka  
Member Miwa Nakanishi

### 1. PROCESS AND PROGRESS OF INVESTIGATION

<b>1.1 Summary of the Serious incident</b>	<p>On Sunday, April 17, 2016, a Bombardier CL-600-2C10, registered JA06RJ, operated by IBEX Airlines Co., Ltd. had flown as scheduled flight 084 of the company from Fukuoka Airport to Komatsu Airport, however, the aircraft returned to Fukuoka Airport because of the bad weather at the destination. During the flight to Fukuoka Airport, because bleed air supply from both right and left systems stopped, it made an emergency descent, continued the flight after descending to an altitude of about 10,000ft and landed at Fukuoka Airport.</p>
<b>1.2 Outline of the Serious Incident Investigation</b>	<p>This event fell under the category of “Multiple defects in one or more systems equipped on aircraft impeding the safe flight of aircraft” as stipulated item (IX), Article 166-4 of Ordinance for Enforcement of Civil Aeronautics Act, which was classified as an aircraft serious incident.</p> <p>On April 18, 2016, the Japan Transport Safety Board (JTSB) designated an investigator-in-charge and two other investigators to investigate this serious incident.</p> <p>An accredited representative of Canada, as the State of Design and Manufacture of the aircraft involved in this serious incident, participated in the investigation.</p>

Comments were invited from the parties relevant to the cause of the serious incident and the relevant State.
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## 2. FACTUAL INFORMATION

### 2.1 History of the Flight

The history of the flight is summarized below, according to the records of the flight data recorder (hereinafter referred to as “the FDR”), the records of the cockpit voice recorder (hereinafter referred to as “the CVR”) and the air traffic control (hereinafter referred to as “ATC”) communication records as well as the statements of the pilot in command (hereinafter referred to as “the PIC”) and the first officer (hereinafter referred to as “the FO”).

On April 17, 2016, a Bombardier CL-600-2C10 registered JA06RJ, operated by IBEX Airlines Co., Ltd., took off from Fukuoka Airport at 07:47 Japan Standard Time (JST, UTC+9hrs, unless otherwise stated all time are indicated in JST based on a 24-hour clock) as scheduled flight 084 of the company and attempted to approach to Komatsu Airport as the destination, however, the PIC decided to return to Fukuoka Airport because of the bad weather at Komatsu. At 09:25 during the flight to Fukuoka Airport at FL400, L BLEED DUCT warning which indicates the left bleed air leak was displayed on the EICAS (Engine Indication and Crew Alerting System) as well as an aural warning was sounded. Because the supply of the left bleed air stopped due to the bleed air leak, the Aircraft commenced the descent following the procedure described in the Aircraft Operation Manual (AOM). At 09:29 right after starting a checklist corresponding to the bleed air leak, R BLEED DUCT warning which indicates the right bleed air leak was displayed on the EICAS as well as the aural warning was sounded, then the supply of the right bleed air also stopped, therefore the supply of both bleed air systems stopped. The Aircraft declared a state of emergency and the flight crew conducted the emergency descent wearing oxygen mask following the emergency descent procedure.

While descending at about FL170, CABIN ALT warning to indicate that the cabin altitude exceeded 10,000ft, was displayed. The PIC did not deploy the oxygen masks for passengers because the climbing rate of the cabin altitude was gradual.

After the descent to an altitude of about 10,000ft, because there was no other abnormality regarding passengers and the Aircraft, the Aircraft continued the flight and landed at Fukuoka Airport at 10:08.

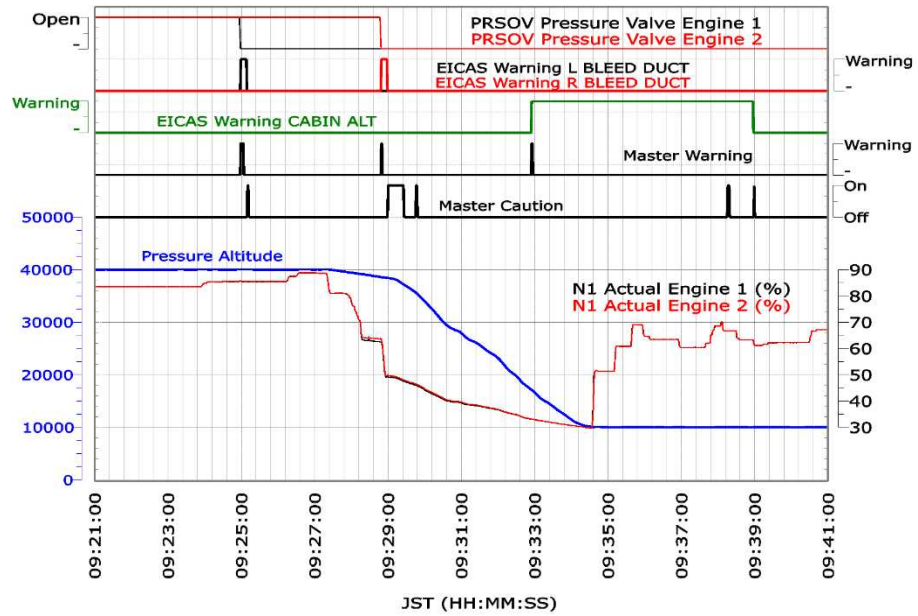


Figure 1 The records of the FDR

This serious incident occurred at 09:29 on April 17, 2016, at an altitude of about 38,500ft about 33 nm north-northwest of Hiroshima Airport (34°54'36"N, 132°34'33"E).

<b>2.2 Injuries to persons</b>	None
<b>2.3 Damage to Aircraft</b>	None
<b>2.4 Personnel information</b>	<p>(1) PIC Male, Age 48          Airline Transport Pilot Certificate (Airplane) June 11, 1999          Type rating for Canadair CL-65 August 17, 2015          Class 1 Aviation Medical Certificate: Validity October 8, 2016          Total Flight Time 11,745 hours 25 minutes          Total flight time on the type of aircraft 267 hours 26 minutes          Flight time in the last 30 days 32 hours 33 minutes</p> <p>(2) First Officer Male, Age 26          Commercial Pilot Certificate (Airplane) June 21, 2012          Type rating for Canadair CL-65 April 14, 2014          Instrument Flight Certificate January 8, 2013          Class 1 Aviation Medical Certificate: Validity October 10, 2016          Total flight time 1,478 hours 03 minutes          Total flight time on the type of aircraft 1,226 hours 34 minutes          Flight time in the last 30 days 65 hours 46 minutes</p>
<b>2.5 Aircraft information</b>	<p>(1) Type: Bombardier CL-600-2C10          Serial Number: 10303, Date of Manufacture: May 13, 2010          Certificate of airworthiness: No. Dai-2015-726 Validity: March 17, 2017          Total flight time 13,614 hours 55 minutes          Flight time since last periodic check (6,000FH check on April 22, 2014) 4,750 hours 18 minutes</p>

(2) At the time of the serious incident, the Aircraft weight and the position of the center of gravity were within the allowable ranges.

**2.6 Additional information**

(1) Bleed Air System

The bleed air system consisting of two systems at right and left, supplies the high-temperature and high-pressure bleed air supplied via PRSOV(Pressure Regulating and Shutoff Valve) from HPC (High Pressure Compressor) to the air conditioning systems, the anti-ice systems and others through the ducts.

Each duct has the sensing elements of two wire shape systems in loop installed in order to detect the rise of temperature caused by the bleed air leak. Each system of the sensing elements is connected respectively to the two independent channels of Anti-Ice and Leak Detection Controller (AILC) which monitors the bleed air leak. If both of two channels detect the bleed air leak, it will issue L (/R) BLEED DUCT warning and stop supplying bleed air by closing the PRSOV in the system where the leak would be detected. If only one channel detects the bleed air leak, DUCT MON FAULT message will be issued, which indicates the abnormality would occur in the bleed air leak detection system.

(2) The Records of Maintenance Diagnostic Computer

Maintenance Diagnostic Computer (MDC) had respective records that the bleed air leak was detected in the same area by sensing elements of MT141 and MT142 and that the right bleed air leak was detected for each adjacent area by respective sensing elements of MT145 and MT205.

Furthermore, there was no record of DUCT MON FAULT message during the flight of this serious incident.

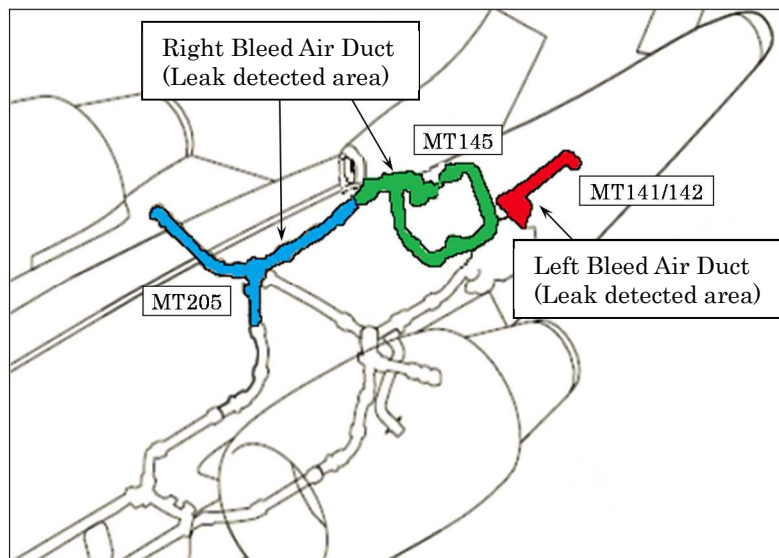


Figure 2 Detected area of bleed air leak

(3) Investigation on the Aircraft

After the occurrence of this serious incident, the following investigations were carried out prior to retrieve the components of the bleed air systems and the sensing elements from the Aircraft.

- i) Confirmation by the self-diagnosis function on the components;

The components relating to the bleed air systems including the AILC were checked, however, no abnormality was found.

ii) Status confirmation of the Bleed Air Systems;

The electrical characteristic of the sensing elements and the mounting status of the ducts were checked, however, no abnormality was found.

iii) Confirmation of reproduction of the Bleed Air leak;

Reproduction of the bleed air leak was attempted on the ground, but it was not possible to reproduce the leak.

(4) Investigations on the AILC and the Sensing Elements

Investigations were carried out at respective manufacturer, as retrieving the AILC and four pieces of sensing elements which had detected the bleed air leak from the Aircraft.

i) AILC

The manufacturer carried out the following investigations on the AILC which were retrieved from the Aircraft, in the presence of Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation Civile (BEA):

a. Checking the memory records;

The built-in memory in the AILC that had detected the bleed air leak saved the following records at the time of this serious incident:

a) At MT141 and MT142 in the left bleed air system, the AILC had detected the bleed air leak.

b) At MT145 and MT205 in the right bleed air system, the AILC had detected the bleed air leak.

These records are the same contents with the MDC records and matched with the FDR records.

b. Functional Checks based on Component Maintenance Manual:

Functional checks based on Component Maintenance Manual (CMM) were carried out twice at room temperature and ten times respectively in each environment of - 20°C and 50°C, but no defect was found.

c. Teardown Investigation:

The AILC was dismantled to check the details, but no abnormality was found.

ii) Sensing Elements:

Regarding four sensing elements retrieved from the Aircraft, the manufacturer implemented the following investigations in the presence of the National Transportation Safety Board (NTSB).

a. Visual Inspection;

Adhesion of oil and fat on two sensing elements were found. Also, a slight bend was found near the connecting parts of other sensing element, however, no abnormality that could cause this serious incident was found.

b. Inspection by using the Acceptance Test Procedure;

An electrical test and a dimensional confirmation were carried out by using the Acceptance Test Procedure (ATP), however, no abnormality was found.

(5) Operating Records of the AILC and the Sensing Elements of the Aircraft:

	<p>The operating record of the AILC equipped on the Aircraft was 11,496 flight hours in total operating hours. Also, the sensing elements are the ones installed to the aircraft at the time of manufacturing.</p> <p>(6) Past Defect on Bleed Air System;</p> <p>(i) Defects of the system on the Aircraft</p> <p>For six months before the serious incident on the Aircraft, the defects of the bleed air systems were that the DUCT MON FAULT message was displayed multiple times to inform that one of the sensing elements in the left bleed air system had open loop.</p> <p>(ii) Defect Information from the Aircraft Manufacturer</p> <p>According to the information from the manufacturer, regarding the similar cases of the bleed air leaks in the past, the occurrences of the DUCT MON FAULT message which was caused by narrowness of the separation Between a duct and a sensing element were reported.</p>
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### 3. ANALYSIS

<b>3.1 Involvement of Weather</b>	None
<b>3.2 Involvement of Pilot</b>	None
<b>3.3 Involvement of Equipment</b>	Unknown
<b>3.4 Analysis of known items</b>	<p>(1) Stop of the Bleed Air Supply from Both Systems:</p> <p>According to the records of the MDC and the AILC, the respective bleed air leak on both systems was detected as an individual phenomenon. It is highly probable that because the AILC had detected the left bleed air leak first, the AILC closed the left PRSOV and stopped the left bleed air supply. It is highly probable that because the AILC had detected the right bleed air leak four minutes later, the AILC closed the right PRSOV and stopped the right bleed air supply. It is highly probable that because the bleed air supply of both systems had stopped for these reasons, the cabin altitude rose.</p> <p>(2) Detection of the Left Bleed Air leak:</p> <p>Since the area that the AILC detected the bleed air leak from the left system was in the same area, it is somewhat likely that the bleed air was actually leaked from the ducts or that the sensing elements caused malfunctions due to the heat radiation from the ducts. However, at the reproductive confirmation on the investigations regarding the ducts and the Aircraft, defects and abnormalities were not confirmed.</p> <p>Since the common part to monitor the bleed air leaks is AILC, it is somewhat likely that AILC caused malfunctions, but defects and abnormalities were not confirmed on this investigation.</p> <p>Since any defect and abnormality were not confirmed on the investigations of the Aircraft, the sensing elements and the AILC, it was not possible to determine why the AILC has detected the bleed air leak.</p>



(3) Detection of the Right Bleed Air leak:

Since the area that the AILC detected the bleed air leak from the right system was in the different area on both channels, it is somewhat likely that the AILC had malfunctioned. However, any defect and any abnormality could not be confirmed on the investigations regarding the AILC. Furthermore, since on the investigations of the Aircraft and the sensing elements, any defect, any abnormality and the reproduction of the leak were not confirmed, it was not possible to determine why the AILC detected the bleed air leak.

#### 4. PROBABLE CAUSES

In this serious incident, it is highly probable that both bleed air systems stopped supplying the bleed air and the cabin altitude rose, because the AILC had detected the air leaks on both bleed air systems.

It was not possible to determine why the AILC detected the bleed air leaks, although it was somewhat likely that there was any malfunction in the AILC, the bleed air leaked actually, or the sensing elements had any malfunction.

#### 5. SAFETY ACTION

The company had implemented following safety measures related to the possible factors for the same type of aircraft. Furthermore, it has planned to continuously implement the measures to prevent the defects on the sensing elements at the time of the periodic inspection.

- i) To confirm the soundness of the bleed air system, it has been checked the clearances among ducts, accessories and sensing elements at the time of heavy maintenance as well as confirming regarding the electrical characteristic of sensing elements every two or three months.
- ii) As a preventive measure of defect occurred in sensing elements, grease-up has been carried out in order to prevent to have water mix in due to lack of grease at the connecting parts of sensing elements.
- iii) AILC software has been upgraded to the latest version.