AI2017-7

AIRCRAFT SERIOUS INCIDENT INVESTIGATION REPORT

PRIVATELY OWNED

J A 0 1 E P

December 21, 2017

Japan Transport Safety Board

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

OCCURRENCE OF SMOKE IN THE AIRCRAFT PRIVATELY OWNED BEECHCRAFT B200, JA01EP AROUND 10:10 JST, APRIL 6, 2017 OVER KOMATSU CITY, ISHIKAWA PREFECTURE, JAPAN AT AN ALTITUDE OF APPROXIMATELY 20,000 FT

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

1.1 Summary of the Serious Incident	While a privately owned Beechcraft B200, registered JA01EP, was flying from Gifu Airfield via Komatsu VORTAC to Takamatsu Airport for a training flight on Thursday, April 6, 2017, smoke and smell like something were burning appeared in the cockpit. After that, since whole right windshield a cracked, it returned back to Gifu Airfield and landed at 10:41 Japan Standard Time (JST; UTC + 9 hours).
1.2 Outline of the Serious Incident Investigation	The occurrence falls under category of "Occurrence of fire or smoke inside an aircraft and occurrence of fire within an engine fire-prevention area", as stipulated in Clause 10, Article 166-4 of the Civil Aeronautics Regulations of Japan (Ordinance of

	Transportation, No. 56 of 1952), and is classified as a serious incident. On April 6, 2017, the Japan Transport Safety Board (JTSB) designated an investigator-in-charge and one other investigator to investigate this serious incident. An accredited representative and advisor of the United States of America, as the State of Design and Manufacture, participated in the investigation. Comments were invited from the parties relevant to the cause of the serious incident and the relevant State.

2. FACTUAL INFORMATION

2.1 History of the Flight	According to the statements of the captain who was an instructor, the trainee pilot and the mechanic onboard and based on the records of Air Traffic Control communications and Radar Tracks, the history of the flight is summarized below; At 09:51 on April 6, 2017, an aircraft took off from Gifu Airfield via KOMATSU VORTAC to Takamatsu Airport for a training flight in order to obtain an Instrument Flight Certificate. The trainee pilot sat in a left seat and the captain sat in a right seat, the mechanic in charge of the aircraft sat in a right seat of the front-row in the cabin and monitored conversations in the cockpit. After departing Gifu Airfield when the aircraft reaching FL150 around 10:00, the captain and the trainee pilot smelled an odor like electric system burning. Around 10:10, while the aircraft was flying FL200 over Komatsu City, Ishikawa Prefecture, white smoke appeared from the right lower part of a center pillar located at the center of windshield. One minutes later, the white smoke changed to black smoke, then soot flew into air. The captain presummed that the smoke generated from the devices installed at front of the cockpit and started to take actions as following ELECTRCAL SMOKE OR FIRE CHECK LIST. Meanwhile, the mechanic confirmed that the indication in the load-meter (ammeter) looked normal, then the mechanic advised the pilots to turn a windshield heater off since he identified smoke coming from around the center pillar. The captain performed WIND SHIELD ELECTRICAL FAULT

CHECK LIST and after turning off the windshield heater, the smoke was gradually settled. At almost same time with this, a whole right windshield cracked like spider-web.

Even though a fire flame was not observed and smoke was getting settled, there was a crack in the whole right windshield. Therefore, the pilot declared a state of emergency to Air Traffic Control authorities and landed at Gifu Airfield at 10:41.

Regarding the aircraft, multiple pilot had smelled odors like something burning for time to time in the past, on each occasion that the odor occurred, they reported it to the mechanic in charge on the day in any cases. However, the ways to feel odor were different by each individual, and since the odor did not linger, it was difficult to find the cause, therefore it was remained under a follow-up observation. The captain had felt the same odor as before, which he felt from time to time in the past, assumed that the odor was the aircraft-specific odor, so he continued the flight.

The serious incident occurred in the sky over Komatsu City, Ishikawa Prefecture (36°16'38"N, 136°28'47"E), around 10:10 on April 6, 2017.

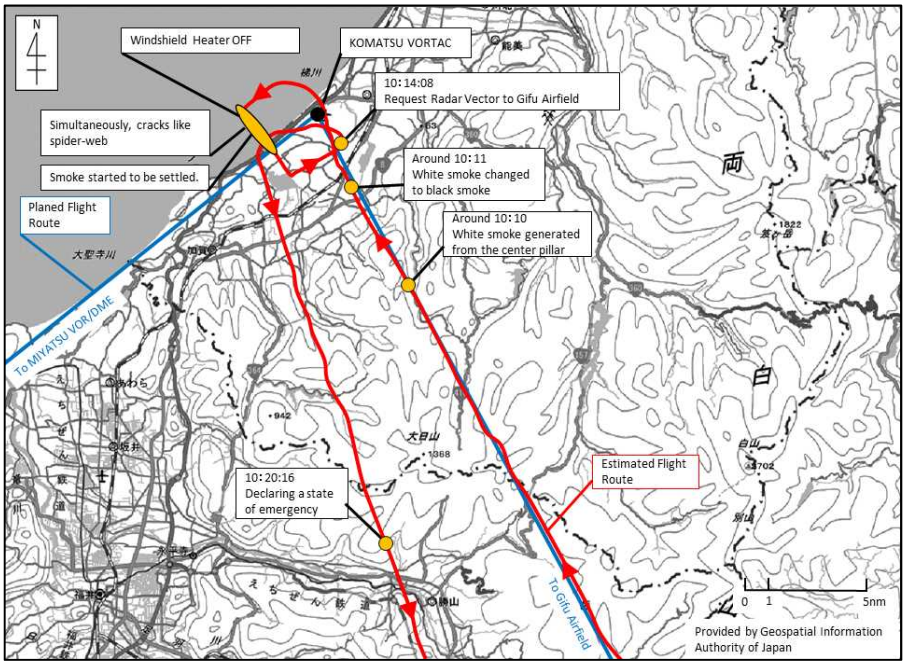

Figure 1 Estimated Flight Route

2.2 Injuries to persons	None
2.3 Damage to Aircraft	・Cracks of the right windshield ・Burnt marks at/around the terminal block of the right windshield  Photo 1 R/H windshield  Photo 2 R/H terminal block
2.4 Personnel information	(1) Captain Male, Age 53 Commercial pilot certificate (Aeroplane) July 27, 1989 Type rating for multi-engine (Land) July 27, 1989 Instrument flight certificate (Aeroplane) August 12, 2002 Class 1 aviation medical certificate, Validity April 1, 2018 Pilot competency Assessment Expiration date of piloting capable period; September 28, 2017 Total flight time 6,933 hours 47 minutes Flight time in the last 30 days 29 hours 15 minutes Total flight time on the type of aircraft 329 hours 30 minutes Flight time in the last 30 days 26 hours 20 minutes (2) Trainee Male, Age 49 Commercial pilot certificate (Aeroplane) October 14, 1992 Type rating for multi-engine (Land) October 14, 1992 Class 1 aviation medical certificate, Validity June 4, 2017 Pilot competency Assessment Expiration date of piloting capable period; December 9, 2017 Total flight time 3,909 hours 10 minutes Flight time in the last 30 days 30 hours 35 minutes Total flight time on the type of aircraft 161 hours 55 minutes Flight time in the last 30 days 22 hours 15 minutes

2.5 Aircraft information	Type: Beechcraft B200 Serial Number: BB-1604 Date of Manufacture: February 7, 1998 Certificate of airworthiness: No. Dai-2016-482 Validity: November 17, 2017 Category of airworthiness: Aircraft Normal N Total flight time: 11,345 hours 50 minutes
2.6 Meteorological information	Aeronautical weather observations at Komatsu Airport and Gifu Airfield around the time of the serious incident were as follows; (1) Komatsu Airport 10:00 Wind direction 190º; Wind velocity 15 kt; Wind direction variable from 150º to 210º; Visibility 10 km or more; Cloud: Amount FEW; Type Altocumulus; Cloud base 12,000 ft; Amount BKN; Type Altocumulus; Cloud base 15,000 ft; Amount BKN; Type Unknown; Cloud base 24,000 ft; Temperature 19ºC; Dew point 4ºC; Altimeter Setting (QNH) 30.12 inHg (2) Gifu Airfield 10:22 Wind direction variable; Wind velocity 6 kt; Visibility 10 km or more; Cloud: Amount SCT; Type Cumulus; Cloud base 3,000 ft; Amount SCT; Type Stratocumulus; Cloud base 4,500 ft; Temperature 20ºC; Dew point 9ºC; Altimeter setting (QNH) 30.22 inHg
2.7 Additional information	(1) Outline of the windshield heater There are two windshield heater systems corresponding to two windshields (L/H and R/H), each heater is controlled by windshield control switch in the cockpit, and heats the heating elements embedded in the windshield to prevent icings on the windshield. Windshield anti-ice controller regulates power supply to the element depending on the temperature of the windshield. Power circuit used for the heating element is protected with 50 amp circuit breaker. (2) Detailed inspection of the windshield heater system JTSB performed following detailed inspections in order to investigate the cause of generating the smoke and the cracks of the windshield;

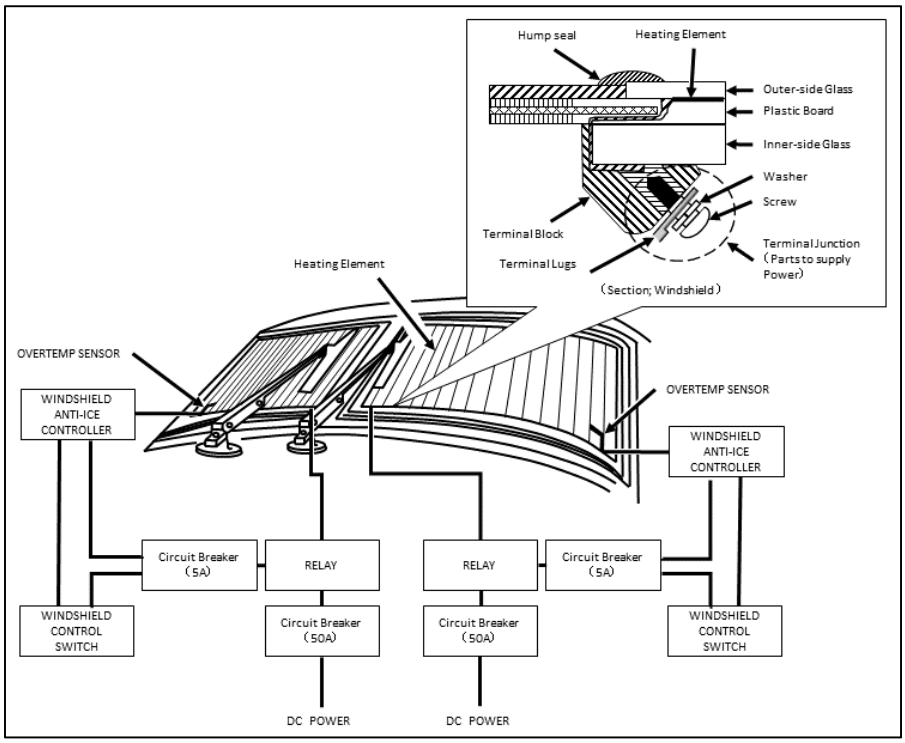

Figure 2 Schematic Diagram of Windshield Heater

① Windshield

Cracks like spider-web were found in a whole of the inner glass of right windshield. Cracks looked spreading radially from the originating point in the vicinity of the terminal block. Hump seals which was pasted to fill gaps of the outer-side windshield had no damage due to deteriorations or others.

② Terminal block

Right windshield terminal lug was loose and there was gap of 0.05mm between the screws and the terminal lugs.

③ Windshield anti-ice controller

The controller worked normally when inspection were conducted in accordance with maintenance manual prescribed by manufacturer.

④ Heating element

Heating elements of windshield worked normally in the same way.

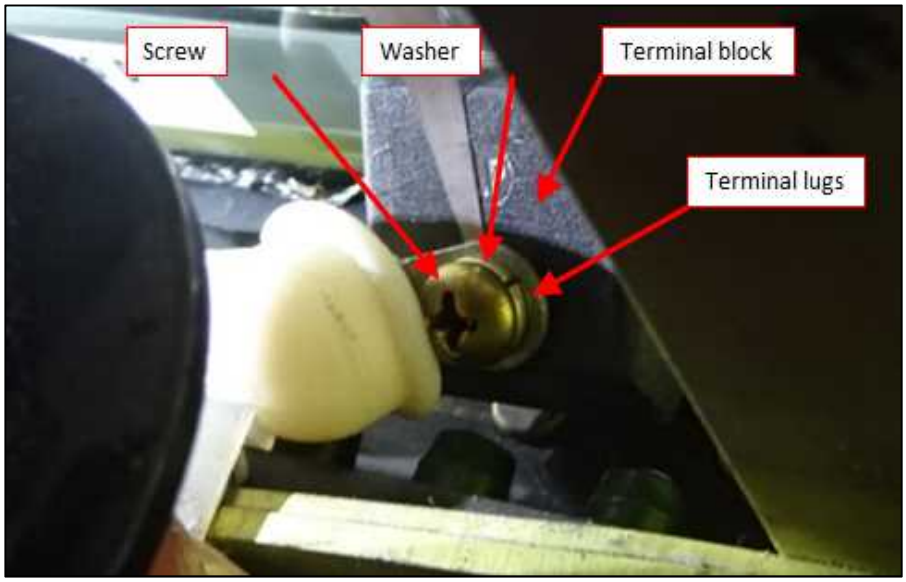

Photo3 Terminal block (L/H)

⑤ Circuit breaker

Testing a unit of 50 amp circuit breaker used for the power circuit, the function was confirmed to be normal.

When the mechanic checked after the aircraft landed it was not tripped.

(3) Information concerning the maintenance of the windshield

According to maintenance records and the statement of the mechanic, due to partial delamination, the windshields were replaced by an outsourcing company in January 2012, the screw and the washer were also replaced to new parts in this works. After replacement, there was no trouble report about the windshield.

The description concerning the replacement of windshield in the maintenance manual do not include any reference to tightening torque for screws of terminal block, therefore, the screws were tightened using standard torque value (20 to 25 in-lbs).

Regarding windshields, the maintenance manual requires periodic inspections of every 200 flight hours, where mechanics inspect any cracks and checked the status of sealant.

However, regarding status check for the connecting part of the terminal block, no inspection had ever performed because there was no description as mandatory items to investigate on the manual.

	Furthermore, because there was no malfunction relating to the windshield since the windshield had replaced in January 2012 till the serious incident occurred, no maintenance actions for the relating matters to the terminal block had been performed. After they replaced windshields related to this incident at the beginning of July, no report about odd burning smell is filed.

3. ANALYSIS

3.1 Involvement of weather	None
3.2 Involvement of pilot	None
3.3 Involvement of equipment	Yes
3.4 Analysis of known items	(1) Occurrence of Smoke Because smoke stopped when turning the windshield heater off and the terminal block and its surrounding parts were burned out, it is highly probable that smoke appeared in the aircraft was generated around the terminal block of the right windshield. In addition, it is probable that the smoke was generated by overheating the terminal block and the surrounding parts and components were burned out, because the electrical resistance at the contact points of the terminal block junction was increased, due to the loosened screws of the terminal block. (2) Loosen screw at the terminal block After the windshields were replaced in January 2012, no maintenance works relating to the power connections of the windshield had been taken until the time of the occurrence of the serious incident. Based on these, it is somewhat likely that the loosening of the screws became large due to the vibration of the aircraft while flying because the tightening torque of the screws was not sufficient when replacing the windshield. As described in 2.1, regarding the odor like something burning, multiple pilots reported to mechanic, however after the replacement of the windshield following the occurrence of the serious incident, odor was not occurred. From these, it is somewhat

	likely that the odor in the past is generated from the windshield heater. It is desirable to take proper maintenance works as required, by finding the causes thoroughly on any indications and symptoms of malfunction which were occurring repeatedly. (3) Cracks in the windshield Crack in the right windshield were spreading radially from the starting point in the vicinity of the terminal block. It is probable that the glass at the lower corner of the windshield was partially expanded due to the heat from the terminal block and cracks were generated, and which spread to the surroundings.

4. PROBABLE CAUSES

In this serious incident, it is probable that because screw of the terminal block at the right windshield had being loosened, the electrical resistance at the contact point increased and the terminal block was overheated, the surrounding combustible parts and components were burned out and the smoke was generated in the aircraft.

Regarding loosening of the screw at the terminal blocks, it is somewhat likely that because the tightening torque was insufficient when replacing the windshield, the loosening grew bigger by the vibration caused in flights.

Furthermore, it is somewhat likely that it was contributed to the generating of the incident that proper measures were not taken to correct indications and symptoms of malfunctions which were occurring repeatedly.