

Report

IN-058/2019

Incident involving a BOMBARDIER CL600-2B16 aircraft, registration N227WG, on 10 November 2019, to the north of Adolfo Suárez Madrid-Barajas Airport (Madrid – Spain).

Please note that this report is not presented in its final layout and therefore it could include minor errors or need type corrections, but not related to its content. The final layout with its NIPO included (Identification Number for Official Publications) will substitute the present report when available.

FOREWORD

This report is a technical document that reflects the point of view of the Civil Aviation Accident and Incident Investigation Commission (CIAIAC) regarding the circumstances of the accident object of the investigation, its probable causes and its consequences.

In accordance with the provisions in Article 5.4.1 of Annex 13 of the International Civil Aviation Convention; and with Articles 5.6 of Regulation (EU) n° 996/2010 of the European Parliament and of the Council, of 20 October 2010; Article 15 of Law 21/2003 on Air Safety; and articles 1 and 21.2 of Regulation 389/1998, this investigation is exclusively of a technical nature, and its objective is the prevention of future aviation accidents and incidents by issuing, if necessary, safety recommendations to prevent from their recurrence. The investigation is not pointed to establish blame or liability whatsoever, and it's not prejudging the possible decision taken by the judicial authorities. Therefore, and according to above norms and regulations, the investigation was carried out using procedures not necessarily subject to the guarantees and rights usually used for the evidence in a judicial process.

Consequently, the use of this report for purposes other than that of preventing future accidents may lead to erroneous conclusions and interpretations.

This report was originally issued in Spanish. This English translation is provided for information purposes only.

CONTENTS

FOREWORD	i
ABBREVIATIONS	v
SYNOPSIS	vii
1.- FACTUAL INFORMATION.	1
1.1.- History of the flight.	1
1.2.- Injuries to persons.	1
1.3.- Damage to aircraft.....	1
1.4.- Other damage.....	1
1.5.- Personnel information.	2
1.6.- Aircraft information.....	2
1.7.- Meteorological information.	2
1.8.- Aids to navigation.	2
1.9.- Communications.....	2
1.10.- Aerodrome information.	3
1.11.- Flight recorders.....	3
1.12.- Wreckage and impact information.....	3
1.13.- Medical and pathological information.....	3
1.14.- Fire.	3
1.15.- Survival aspects.....	4
1.16.- Tests and research.	4
1.17.- Organizational and management information.	4
1.18.- Additional information.....	4
1.18.1.- Notification submitted by the pilot-in-command of the aircraft to the SNS.	4
1.18.2.- Other information.	5
1.18.3.- Comments from Bombardier Aviation.	5
1.19.- Useful or effective investigation techniques.	6
2.- ANALYSIS.	7
3.- CONCLUSIONS.	8
3.1.- Findings.....	8
3.2.- Causes/contributing factors.....	8
4.- SAFETY RECOMMENDATIONS.	9

ABBREVIATIONS

00:00	Hours and minutes (period of time)
00.00:00.....	Hours, minutes and seconds (chronological time)
AESA.....	Spain's National Aviation Safety Agency
ATC	Air traffic control
ATP	Airline transport pilot certification (FAA)
CIAIAC.....	Civil Aviation Accident and Incident Investigation Commission
dd/mm/yyyy	Day, month and year (date)
EGNX	Nottingham East Midlands Airport
FAA	United States Federal Aviation Administration
ft	Feet
hPa	Hectopascals
IFR.....	Instrument flight rules
ILS	Instrument landing system
km.....	Kilometres
LECM	Madrid Flight information zone/ Area Control Center
LEMD	Adolfo Suárez Madrid-Barajas Airport
m	Metres
NTSB.....	United States National Transportation Safety Board
TCCA.....	Transport Canada Civil Aviation
TSB.....	Canada Transportation Safety Board
SNS	Occurrence reporting system
UTC	Coordinated universal time

SYNOPSIS

Owner and Operator:	Flying M, LLC
Aircraft:	Bombardier CL600-2B16 (<i>Challenger 601-3A</i>), registration N227WG
Date and time of incident:	10 November 2019, at 12:01 hours ⁽¹⁾
Site of accident:	North of Adolfo Suárez Madrid-Barajas Airport (Madrid – Spain).
Persons on board:	2 crew, uninjured.
Type of operation:	General Aviation – Non-commercial – Private
Flight rules:	Instrument flight rules
Phase of flight:	On route – Climbing to cruise level
Date of approval:	27 April 2022

Summary of the incident.

The Bombardier CL600-2B16 (*Challenger 601-3A*) aircraft, registration N227WG, took off at 11:46 hours (Local Time) from Adolfo Suárez Madrid-Barajas Airport (LEMD – Spain), to Nottingham East Midlands Airport (EGNX – United Kingdom). On board were two crew members, the pilot-in-command and co-pilot.

While climbing to 29,000 ft, the crew noticed smoke and the smell of electrical fire coming from behind the instrument panel on the right side of the cockpit. They declared an emergency at 12:03 hours, and the aircraft returned to the departure airport where it landed safely at 12:21 hours on runway 32L. Once on the ground, the aircraft taxied, by its own means, to the assigned stand on the apron. It was accompanied by a vehicle from the airport Fire Extinguishing Service.

On removing the right panel in the presence of firefighters, they found burned wires in the area where the smoke had come from. No damage other than that affecting the wires was identified.

The investigation has determined that the incident, the presence of smoke in the cockpit of the aircraft, forced the crew to declare an emergency and return to the airport from which they had taken off a few minutes earlier.

Loose wiring connections were found on a terminal board assembly, part of the right-hand windshield heating system installation and located behind the instrument panel on the right side of the cockpit, resulting in overheating damage to some wiring, and some burning of the surrounding thermal blanket, which generated the smoke observed in the cockpit.

The available evidence does not appear to indicate that a sustained fire occurred.

No safety recommendations are issued as a result of the investigation.

⁽¹⁾ All times referenced in this report are local time.
UTC can be calculated by subtracting one hour from the local time.

1.- FACTUAL INFORMATION.

1.1.- History of the flight.

The Bombardier CL600-2B16 (*Challenger 601-3A*), registration N227WG, took off at 11:46 hours (Local Time) from Adolfo Suárez Madrid-Barajas Airport (LEMD – Spain), to Nottingham East Midlands Airport (EGNX – United Kingdom). On board were two crew members, the pilot-in-command and co-pilot.

While climbing to 29,000 ft, the crew noticed smoke and the smell of electrical fire coming from behind the instrument panel on the right side of the cockpit. They declared an emergency at 12:03 hours, and the aircraft returned to the departure airport where it landed safely at 12:21 hours on runway 32L. Once on the ground, the aircraft taxied by its own means to the assigned stand on the apron, accompanied by a vehicle from the airport Fire Extinguishing Service.

On removing the right panel in the presence of firefighters, they found burned wires in the area where the smoke had come from. No damage other than that affecting the wires was identified.

1.2.- Injuries to persons.

<i>Injuries</i>	<i>Crew</i>	<i>Passengers</i>	<i>Total in the aircraft</i>	<i>Others</i>
Fatalities				
Serious				
Minor				N/A
None	2		2	N/A
TOTAL	2		2	

1.3.- Damage to aircraft.

The aircraft suffered damage due to overheating and electrical arcing formation in a terminal board assembly, part of the right-hand windshield heating system installation and located behind the instrument panel on the right side of the cockpit. In addition to the terminal board assembly itself, there was damage to some wires and burns to the surrounding thermal blanket, which generated the smoke observed in the cockpit.

1.4.- Other damage.

There was no other damage.

1.5.- Personnel information.

The United States accident investigation authority (NTSB) provided the CIAIAC with a certified copy of the pilot's 'airman file', held in the United States Federal Aviation Authority's (FAA) files.

According to the documentation received, which did not contain any personal information, the pilot-in-command of the aircraft was a US national and had an airline transport pilot certification (ATP– *Airline Transport Pilot*) issued by the United States FAA, with multi-engine land ratings for B-737, B-747, B-777, CL-600 and HS-125 aircraft, and single-engine land private privileges.

The validity of the certificate and ratings on the date of the incident is unknown. The last record included in the document is a Temporary Airman Certificate, issued on 21/11/2014 and valid for 120 days, to which the B-737 type rating is added. There is also a temporary certificate issued on 12/04/2013 with a validity of 120 days, to which the CL-600 type rating is added (this being the type of aircraft involved in the incident).

Whether the pilot had a valid medical certificate, and the total and in-type flight experience is unknown.

No information about the co-pilot was made available.

1.6.- Aircraft information.

According to the information contained in the US FAA aircraft registry the N227WG registration aircraft was a CL-600-2B16 model with serial number 5078, manufactured in 1990 by CANADAIR LTD.

It was equipped with two GENERAL ELECTRIC CF34-3A engines and had a certificate of airworthiness issued on 18/10/2011 and valid until 31/10/2020.

Neither the aircraft's accumulated flight hours and cycles nor its maintenance status are known.

1.7.- Meteorological information.

There were no limiting meteorological conditions for the flight being carried out by the aircraft.

1.8.- Aids to navigation.

All the navigation aids along the route followed by the aircraft and the ILS approach to runway 32L at Madrid–Barajas were operative on the day of the incident.

1.9.- Communications.

The aircraft was in communication with the Madrid Area Control Center (LECM) and the Adolfo Suárez Madrid-Barajas Airport Control Tower.

To summarise, at 12:03 hours, with the aircraft climbing to cruise level, it reported that it was in an emergency due to a fire in the cockpit. While descending to 15,000 ft on a 210 heading, the crew requested direct vectors to Madrid and declared an emergency; vectors with speed at the crew's discretion were immediately provided.

At 12:12 hours, with the aircraft at 10,000 ft and descending to 5,000 ft, the aircraft reported that the smoke had ceased for the time being, and it could taxi by its own means. It also requested the presence of the fire service.

At 12:18 hours, the aircraft confirmed that it was established on the ILS for runway 32L.

Cleared to land, the aircraft touched down without further incident at 12:21 hours and taxied by its own means to the assigned stand on the apron. It was accompanied by a vehicle from the airport Fire Extinguishing Service.

1.10.- Aerodrome information.

Adolfo Suárez Madrid–Barajas Airport (LEMD) is located 13 km to the northeast of the city of Madrid, in the centre of Spain. Its reference point elevation is 609 m/1,998 ft, and it has four asphalt runways on two parallel runway strips with orientations 18/36 and 14/32; runway 32L is 3,988 m-long by 60 m-wide with a displaced threshold at 928 m.

1.11.- Flight recorders.

It is unknown which flight recorders were installed in the aircraft, and no information about what they contained was made available.

1.12.- Wreckage and impact information

Not applicable.

1.13.- Medical and pathological information.

Not applicable.

1.14.- Fire.

The aircraft suffered damage due to overheating and electrical arcing formation in a terminal board assembly, part of the right-hand windshield heating system installation and located behind the instrument panel on the right side of the cockpit.

In addition to the terminal board assembly itself, there was damage due to overheating to some wires and burns to the surrounding thermal blanket, which generated the smoke observed in the cockpit.

The available evidence does not appear to indicate that a sustained fire occurred.

On the other hand, the airport fire service attended the aircraft on landing but did not need to intervene.

1.15.- Survival aspects.

The two occupants of the aircraft were uninjured.

1.16.- Tests and research.

Not applicable.

1.17.- Organizational and management information.

Not applicable.

1.18.- Additional information.

1.18.1.- Notification submitted by the pilot-in-command of the aircraft to the SNS.

The pilot-in-command of the aircraft sent the following report to the SNS (AESA Occurrence reporting system):

While climbing through about 29,000 feet from our departure from LEMD (Barajas-Madrid), smoke started to come out from the forward-right side of the co-pilot side of the cockpit. Once I was able to confirm with the Pilot Flying that it was smoke (with smell from an electric fire), we agreed to declare an emergency, and requested immediate descent and vectors back to LEMD. As the Pilot Monitoring, I declared the MAYDAY with Madrid center and we proceeded to turn back to LEMD and started our descent per ATC's instructions. Smoke kept coming out from behind the panel, at times more intense, and at times it would decrease in intensity. We were able to land the aircraft without any visible fire, and the smoke starting to diminish prior to touchdown. Soon after landing the aircraft engines were shutdown, all electrical power removed from the aircraft systems. Aircraft main ship battery was soon after disconnected. There were no injuries. There were only two (2) souls onboard on this flight: The Pilot Flying (SIC) who was occupying the left seat, and myself, the Pilot Monitoring (PIC) occupying the right seat. Soon after power was removed from the aircraft, and under the watch of firefighters still present at the scene, maintenance personnel removed the panel where the smoke was coming from. It was found that there was an electrical short, or arcing, that caused the fire-smoke. Damage was limited to the affected wires, and no other part of the aircraft was compromised.

I would like to take this opportunity to thank all ATC controllers who helped us during our in-flight emergency, and to the fire rescue personnel for their assistance, even though they did not have to put out any fire, it was a great scene to see them on the edge on the runway ready to come to our rescue.

1.18.2.- Other information.

A few days after the incident, on November 22nd, 2019, the SNS forwarded the notifications it had received from the pilot-in-command of the aircraft, AENA (the airport operator) and ENAIRE (the air navigation service provider), to the CIAIAC. Given the information they contained, the CIAIAC decided to open a formal investigation into the event as a serious incident, on November 25th, 2019.

Initially, attempts were made to contact the operator and the pilot-in-command with no success; an attempt was also made to locate the aircraft and was unsuccessful. As a result, it was not possible to access the information necessary to complete the investigation.

Once the international notification had been made, assistance was requested from the United States accident investigation authority (NTSB), as the state of registry of the aircraft and the operator, in order to obtain information about the operator, the aircraft, the crew, the flight, the damage to the aircraft and subsequent repair. The information about the pilot-in-command of the aircraft (section 1.5) was obtained.

With this information, a draft final report on the incident was drawn up, in which it was concluded that it had not been possible to determine the origin of the short circuit or electric arc, and the subsequent smoke, and it was sent for comments by the parties, in accordance with the provisions of Annex 13 of the ICAO and article 16.4 of Regulation (EU) No. 996/2010 of the European Parliament and of the Council, of October 20, 2010.

The Canadian Accident Investigation Authority (TSB) responded that it and the Canadian Civil Aviation Authority (TCCA) had no substantive comments to make directly to the report and attached comments from Bombardier Aviation for CIAIAC's consideration.

The information provided by Bombardier, which provides information on the damage suffered by the aircraft and the possible causes of the incident, has been included in the final report on the incident.

1.18.3.- Comments from Bombardier Aviation.

Based on the information received from Bombardier Aviation, a maintenance provider contracted by the owner/operator of the aircraft involved in the incident contacted the Bombardier Customer Response Center (CRC) on November 11th, 2019, reporting that the aircraft had made an emergency landing after smoke was noticed in the cockpit following departure from Madrid (LEMD) and requesting guidance on the repairs necessary to return the aircraft to service.

The maintenance provider reported that the smoke appeared to be coming from the instrument panel on the right side of the cockpit. The panel appeared to be in good condition, although upon removal evidence of overheating and arcing was found on a terminal board assembly, corresponding to the installation of the right windshield heating system.

Upon examination of said terminal board, loose wiring connections were found in one of the terminals, and damage was observed on the terminal board itself, on the surrounding thermal blanket, and on part of the wiring.

Bombardier supplied the necessary spare parts for the repair and was informed about the repair carried out.

Finally, the maintenance provider informed the CRC on November 21st, 2019, that the aircraft had been returned to service.

Based on the available information, Bombardier concludes that the loose wiring connections on the terminal board assembly led to electrical arcing on the terminal, damage to some wiring and some burning to the surrounding thermal blanket, which generated the smoke observed in the cockpit. The available evidence does not appear to indicate that a sustained fire occurred.

1.19.- Useful or effective investigation techniques.

None have been used.

2.- ANALYSIS.

In relation to this event, only information provided by the aircraft manufacturer, from the records of its Customer Response Center (CRC) and exposed in 1.18.3, has been available, which has made it possible to determine the immediate causes of the incident.

Given the lack of access to the aircraft and its crew records, it has not been possible to identify and analyze the event as a whole, nor the factors that could have contributed to this incident.

On the other hand, and regarding the notification of the event, as indicated in 1.18.2, it was received at the CIAIAC on November 22nd, 2019, and it was decided to open a formal investigation as a serious incident, on November 25th, 2019.

Regarding the repair of the aircraft, as indicated in 1.18.3, a maintenance provider contracted by its owner/operator contacted the Bombardier Customer Response Center (CRC) on November 11th, 2019, and requested guidance on return to service repairs of the aircraft. This was repaired in a few days and on November 21st, 2019, the maintenance provider informed the CRC that the aircraft had been returned to service.

From what was stated in the two previous paragraphs, it can be deduced that the aircraft was already in service one day before the notification of the event was received at the CIAIAC and four days before the investigation began, and that this was probably the reason because neither the aircraft nor its crew could be located.

3.- CONCLUSIONS.

3.1.- Findings.

In the investigation of this incident:

- No records of the crew have been available.
- No records of the aircraft have been available.
- Information on the event have been available, which has made it possible to determine the immediate causes of the incident.

About the event itself:

- Smoke was noticed in the cockpit of the aircraft which forced the crew to declare an emergency and return to the airport of origin.
- The smoke came from a terminal board assembly located behind the instrument panel on the right side of the cockpit.
- Loose wiring connections were found on the terminal board assembly, leading to arcing, overheating damage to some wires, and some burning to the surrounding thermal blanket.
- The smoke is considered to have been generated by overheating of the wires and some burning in the surrounding thermal blanket.
- The available evidence does not appear to indicate that a sustained fire occurred.

3.2.- Causes/contributing factors.

The investigation has determined that the incident, the presence of smoke in the cockpit of the aircraft, forced the crew to declare an emergency and return to the airport from which they had taken off a few minutes earlier.

Loose wiring connections were found on a terminal board assembly, part of the right-hand windshield heating system installation and located behind the instrument panel on the right side of the cockpit, resulting in overheating damage to some wiring, and some burning of the surrounding thermal blanket, which generated the smoke observed in the cockpit.

The available evidence does not appear to indicate that a sustained fire occurred.

4.- SAFETY RECOMMENDATIONS.

No safety recommendations are issued.