

# Technical report

## IN-018/2022

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Incident on 20 March 2022 involving a Boeing B777-223 aircraft operated by American Airlines, registration N777AN, en route (Zaragoza, Spain)

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## Notice

This report is a technical document that reflects the point of view of the Civil Aviation Accident and Incident Investigation Commission regarding the circumstances of the accident that is the 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) No 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 RD 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 their recurrence. The investigation is not intended to attribute any blame or liability, nor to prejudge any decisions that may be taken by the judicial authorities. Therefore, and according to the laws specified above, the investigation was carried out using procedures not necessarily subject to the guarantees and rights by which evidence should be governed in a judicial process.

As a result, the use of this report for any purpose other than the prevention of future accidents may lead to erroneous conclusions or interpretations.



## CONTENTS

Notice .....	ii
CONTENTS.....	ii
ABBREVIATIONS.....	iii
Synopsis.....	iv
1. THE FACTS OF THE INCIDENT.....	6
1.1. Summary of the incident .....	6
1.2. Injuries to persons .....	6
1.3. Damage to the aircraft .....	6
1.4. Other damage.....	6
1.5. Information about the personnel .....	6
1.6. Information about the aircraft .....	7
1.7. Meteorological information.....	9
1.8. Aids to navigation .....	10
1.9. Communications.....	10
1.10. Information about the aerodrome .....	10
1.11. Flight recorders .....	10
1.12. Aircraft wreckage and impact information.....	10
1.13. Medical and pathological information .....	11
1.14. Fire.....	11
1.15. Survival aspects.....	11
1.16. Tests and research.....	11
1.17. Organisational and management information .....	12
1.18. Additional information.....	12
1.19. Special investigation techniques.....	12
2. ANALYSIS .....	13
3. CONCLUSIONS.....	13
3.1. Findings.....	13
3.2. Causes/contributing factors.....	14
4. OPERATIONAL SAFETY RECOMMENDATIONS .....	15

## ABBREVIATIONS

° ‘ “	Sexagesimal degrees, minutes and seconds
°C	Degrees Celsius
AEMET	Spain's State Meteorological Agency
ATPL	Airline transport pilot licence
BOW	Bill of work
CDL	Configuration deviation list
ETOPS	Extended-range twin-engine operation performance standards
FC	Flight cycles
FL	Flight level
ft	Feet
h	Hours
hPa	Hectopascals
IFR	Instrument flight rules
kg	Kilograms
km	Kilometres
KMIA	ICAO code for Miami Airport
kt	Knots
LEBL	ICAO code for Josep Tarradellas Barcelona-El Prat Airport
m	Metres
MBV	Maintenance base visit
METAR	Aviation routine weather report (in aeronautical meteorological code)
MPD	Maintenance planning documentation
ICAO	International Civil Aviation Organisation
QNH	Altimeter setting to obtain elevation above sea level when on the ground
TAF	Terminal aerodrome forecast
UTC	Coordinated universal time

# Technical report

## IN-018/2022

<b>Operator</b>	American Airlines
<b>Aircraft:</b>	Boeing B777-223, registration N777AN (The United States of America)
<b>Date and time of the incident:</b>	20 March 2022, 10:38 h <sup>1</sup>
<b>Site of incident:</b>	En route (Zaragoza)
<b>Persons on board:</b>	12 (crew members) and 261 (passengers)
<b>Type of flight:</b>	Commercial air transport – Scheduled – International – With passengers
<b>Phase of flight:</b>	En route
<b>Type of operation:</b>	IFR
<b>Date of approval:</b>	30 November 2022

## Synopsis

### Summary:

On Sunday, 20 March 2022, at 10:07 h, the Boeing B777-223 aircraft, registration N777AN, took off from Josep Tarradellas Barcelona - El Prat Airport (LEBL) in Spain, bound for Miami International Airport (KMIA) in the United States of America.

At 10:38 h, when the aircraft was flying over the province of Zaragoza, the commander, who was the pilot flying, noticed a slight and momentary disturbance in the flight controls. Moments later, the flight attendant stationed at the rear of the aircraft informed them that a passenger had seen a part of the aircraft's wing detach, leaving it visibly damaged.

The co-pilot, who was the pilot monitoring, entered the passenger cabin and confirmed that the trailing edge of the left wing flap was damaged and the flap actuator fairing was missing.

Using photographs, the flight crew assessed the damage and, after contacting the dispatcher, decided to return to Barcelona Airport. The crew declared MAYDAY.

The aircraft made its approach and landed without incident. The landing was executed with excess weight on runway 07L at 11:18 h.

Once at the parking stand, the passengers disembarked, and the operator's line maintenance provider performed a full external visual inspection and an overweight

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<sup>1</sup> All times referenced in this report are local time. UTC is 1 hour less.

landing inspection. Apart from the obvious loss of the left centre flap fairing and damage to the trailing edge of the flap, there was no other damage to the aircraft.

After replacing the flap and applying configuration deviation CDL57-07<sup>2</sup> for the missing fairing, the aircraft was put back into service on 26 March. Once in the United States, the fairing was repaired.

The investigation has not been able to determine what caused the flap actuator fairing to detach.

Given that it has not been possible to determine the cause of the incident, the issue of safety recommendations has not been deemed necessary.

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<sup>2</sup> CLD 57-07 is a configuration deviation for the wing's exterior fairing that allows the rear fairing segments to be disassembled if the front are missing. The aircraft's weight limits are reduced accordingly.

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## 1. THE FACTS OF THE INCIDENT

### 1.1. Summary of the incident

On Sunday, 20 March 2022, the Boeing B777-223 aircraft, with registration N777AN, departed from Barcelona Airport bound for Miami Airport.

While en route over the province of Zaragoza, the crew became aware that the flap fairing on the left wing had detached. After assessing the damage, they decided to declare MAYDAY and return to Barcelona Airport, where they carried out an overweight landing without further incident.

On being made aware of the facts, the CIAIAC decided to open an investigation on 1 April. As the aircraft had already been put back into service on 26 March after replacing the flap and applying the CDL57-07 configuration deviation for the missing fairing, the CIAIAC was unable to gain immediate post-incident access to the aircraft. It was also unable to examine the detached flap actuator fairing, which had not been located.

### 1.2. Injuries to persons

<i>Injuries</i>	<b>Crew</b>	<b>Passengers</b>	<b>Total in the aircraft</b>	<b>Others</b>
Fatal				
Serious				
Minor				
Unharmmed	12	261	273	
<b>TOTAL</b>	<b>12<sup>3</sup></b>	<b>261</b>	<b>273</b>	

### 1.3. Damage to the aircraft

The aircraft lost the flap fairing on its left wing and incurred damage to the trailing edge of the flap.

### 1.4. Other damage

There was no further damage.

### 1.5. Information about the personnel

#### 1.5.1. Information about the captain

The captain had an airline transport pilot licence -ATPL(A)- and a Class 1 medical certificate, issued on 16 December 2021, both valid and in force at the time of the incident.

He had 19,802 h of flight experience. 3,626 of which were in type.

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<sup>3</sup> The crew consisted of 3 pilots and 9 flight attendants.

### 1.5.2. Information about the co-pilot

The co-pilot had an airline transport pilot licence -ATPL(A)- and a Class 1 medical certificate issued on 23 November 2021, both valid and in force at the time of the incident.

He had 14,733 h of flight experience. 910 of which were in type.

### 1.5.3. Information about the relief pilot

The relief pilot had an airline transport pilot licence -ATPL(A)- and a Class 1 medical certificate, issued on 25 January 2022, both valid and in force at the time of the incident.

He had 13,031 h of flight experience. 2,044 of which were in type.

## 1.6. Information about the aircraft

- Make: Boeing
- Model: B777-223
- Year of manufacture: 1999
- Serial number: 29585
- Registration number: N777AN
- Maximum take-off weight: 545,000 pounds (247,207 kg)
- Number of engines: 2
- Type of engines: Rolls-Royce Trent 892-17
- Information about the owner and operator: The aircraft is registered to American Airlines in the United States of America's Aircraft Registry.

The aircraft had an Airworthiness Certificate, with the last airworthiness review conducted on 18 March 2022, in accordance with the American Airlines General Procedures Manual (GPM). At the time of the incident, it had 88,031.16 flight hours and 10,730 cycles.

### 1.6.1. Description of the aircraft's flaps

The figure below shows the position of the left wing's outboard flap:

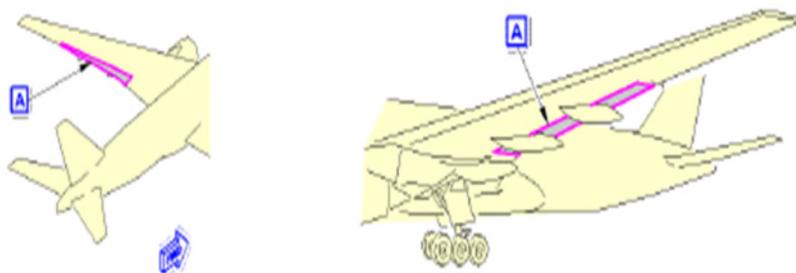


Image 1: Location of the outboard flap on the left wing

The number 2 outboard flap fairing, which came off during the incident, is the innermost flap fairing. The fairing covers the flap support mechanism:

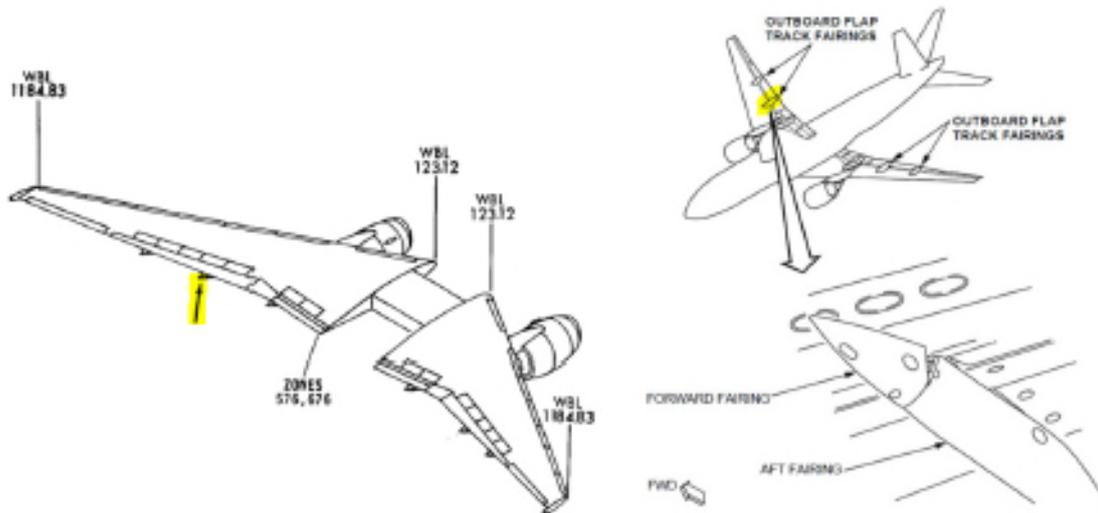


Image 2: Position and assembly of the number 2 outboard flap fairing

The fairing of outboard flap number 2 is connected to the wing by a flap support mechanism:

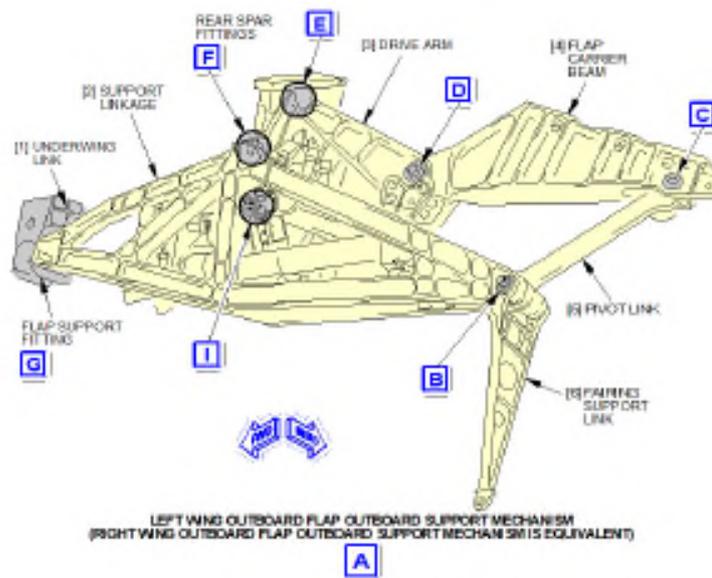


Image 3: Outboard flap support mechanism on the left wing

### 1.6.2. Last maintenance tasks performed prior to the event

The last maintenance task to be performed on the aircraft was carried out before take-off from Barcelona Airport on 20 March 2022. It consisted of an ETOPS Pre-departure Check (PDC), which included a ground-based general visual inspection of the aircraft's exterior with the electric hydraulic pumps in operation. Specifically, all areas, including the fuselage and wings, are checked for damage, fluid leaks or other discrepancies.

The last Bill of Work (BOW) issued for the aircraft was dated 19 March 2022. It only involved a data upload for the in-flight entertainment system, which was carried out at Miami Airport.

The last time the number 2 outboard flap fairing was removed was on 5 February 2019 in Mobile, Alabama, to facilitate the Maintenance Base Visit (MBV<sup>4</sup>). Subsequent maintenance work to lubricate the fairing (which did not require its removal) was carried out on 28 October 2020 and 15 October 2021.

### 1.6.3. Information from Boeing

During the investigation, CIAIAC contacted the aircraft manufacturer, Boeing, to clarify certain matters:

Since the last maintenance task performed on the flap fairing consisted of lubricating the area, CIAIAC asked Boeing about the complexity or difficulty of this task. Boeing replied that it had not received any reports from the maintenance engineers regarding difficulties in lubricating the number 2 outboard flap fairing. Access is not an issue for flaps 1, 2, 7 and 8. However, the manufacturer was aware of the difficulties involved in lubricating flaps 3 and 6. They added that Section 1 12-050 of the MPD stipulates that lubrication should be carried out every 1,000 FC or 240 days, whichever comes first.

As regards to similar incidents, Boeing reported that an operator had experienced a similar event involving the number 1 flap fairing in 2001. As in this incident, the forward joint showed no signs of damage, but two bolts were missing, and all three rear joints were damaged. Boeing did not know what could have caused the loss of the bolts.

### 1.7. Meteorological information

The State Meteorological Agency (AEMET) has a meteorological station in Zaragoza and two others less than 30 km away. The data collected by these stations showed that the maximum surface wind speed was about 15 kt and the wind direction was from the southeast. There was no precipitation.

The METAR for Zaragoza Airport at 9:00 UTC reported the following:

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METAR LEZG 200900Z 11011KT 9999 BKN050 12/07 Q1025=
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Therefore, the QNH was 1025 hPa and the sky was broken (largely cloud coverage) with the cloud base at 5,000 feet.

The airport TAF at 5:00 UTC was as follows:

```
TAF LEZG 200500Z 2006/2106 11005KT 9999 FEW030 SCT040 TX15/2014Z  
TN06/2006Z PROB30 2006/2010 BKN014 BECMG 2010/2012 11015KT TEMPO  
2104/2106 RA BKN010=
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<sup>4</sup> The MBV takes place every 3 years.

According to this forecast no significant relevant phenomena were expected at the airport at 9:00 UTC.

At flight level FL100 (10,000 ft of air pressure altitude), an 11-knot wind from the southeast and a temperature of  $-7^{\circ}\text{C}$  was forecast for 6:00 UTC. At 12:00 UTC, the wind forecast for the same flight level was 14 knots from the southeast with a temperature of  $-7^{\circ}\text{C}$ . For flight level FL150, the forecast for 6:00 UTC was for a 9-knot wind from the south and a temperature of  $-14^{\circ}\text{C}$ . At 12:00 UTC, the forecast was for a 10-knot wind from the southwest, with a temperature of  $-14^{\circ}\text{C}$ . Given the lack of any significant variations in the forecast wind and temperature patterns, the values for the aircraft's altitude at the time of the incident (12,000 ft) would have been within a similar range.

Therefore, the meteorological conditions in Zaragoza were mostly light southeasterly winds with overcast skies and a cloud base at 5,000 ft. The forecast at altitude above Zaragoza was also for light southeasterly winds, shifting to the southwest with increased height.

### **1.8. Aids to navigation**

N/A.

### **1.9. Communications**

Not relevant to the investigation.

### **1.10. Information about the aerodrome**

The aircraft landed at Josep Tarradellas Barcelona-El Prat Airport, whose ICAO code is LEBL. The airport is located 10 km to the south-west of the city. Its elevation is 4 m, and it has three runways: 02/20, 06L/24R and 06R/24L.

At the time of the incident, the airport was operating under its daytime non-preferential configuration. The aircraft had taken off on 06R at 9:07 UTC and landed on 06L at 10:18 UTC.

### **1.11. Flight recorders**

The aircraft was equipped with a flight data recorder and a cockpit voice recorder, but by the time the investigation into the incident was opened, the incident flight data had been deleted and replaced by data from subsequent flights.

### **1.12. Aircraft wreckage and impact information**

The following photos show the missing left centre flap fairing and damage to the flap's trailing edge, which was presumably caused by the fairing when it detached<sup>5</sup>:

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<sup>5</sup> During the investigation, the operator was asked if any impact to the aircraft had been reported prior to take-off while parked at Barcelona Airport. The operator had no record of any such impact.



**1.13. Medical and pathological information**

Not relevant to the investigation.

**1.14. Fire**

N/A.

**1.15. Survival aspects**

Not relevant to the investigation.

**1.16. Tests and research**

N/A.

**1.17. Organisational and management information**

Not relevant to the investigation.

**1.18. Additional information**

N/A.

**1.19. Special investigation techniques**

N/A

## 2. ANALYSIS

On Sunday, 20 March 2022, the Boeing B777-223 aircraft, with registration N777AN, departed from Barcelona Airport bound for Miami Airport.

While en route over the province of Zaragoza, the crew became aware that the flap fairing on the left wing had detached. After assessing the damage, they decided to declare MAYDAY and return to Barcelona Airport, where they carried out an overweight landing without further incident.

According to the information provided by the aircraft operator, once at its parking stand, the aircraft was inspected by the operator's line maintenance provider. As the damage was confined to the loss of the left centre flap fairing and defects to the trailing edge of the flap, the aircraft was put back into service on 26 March after replacing the flap and applying the CDL57-07 configuration deviation for the fairing.

On being made aware of the facts, the CIAIAC decided to open an investigation on 1 April. As the aircraft had already been put back into service, the CIAIAC was unable to access the aircraft after the incident.

By the time the investigation was opened, the data from the flight data recorder and cockpit voice recorder had been deleted and replaced by recordings from subsequent flights.

The investigators were also unable to examine the detached flap actuator fairing because it had not been located.

During the investigation, the CIAIAC asked the aircraft operator to contact the American Airlines maintenance engineers that inspected the aircraft at Barcelona Airport, but it refused to cooperate further with the investigation.

The aircraft's manufacturer, Boeing, was also consulted during the investigation to clarify certain aspects. Boeing stated that it was only aware of one similar event that occurred in 2001. According to Boeing, in both the 2001 event and the incident under investigation, the forward connection was undamaged, but two bolts were missing, and there was damage to all three aft connections. Boeing maintained that it did know what could have caused the loss of the bolts.

As a result, the investigation has not been able to determine what caused the flap actuator fairing to detach. However, the theory that it was caused by the aircraft sustaining some kind of impact before take-off while parked at Barcelona Airport can probably be ruled out, as the operator had no record of anything in this regard.

## 3. CONCLUSIONS

### 3.1. Findings

- The flap actuator fairing detached in flight.

- Two bolts were missing from the front connection.
- All three rear connections were damaged.

### **3.2. Causes/contributing factors**

The investigation has not been able to determine what caused the flap actuator fairing to detach.

#### **4. OPERATIONAL SAFETY RECOMMENDATIONS**

Given that it has not been possible to determine the cause of the incident, the issue of safety recommendations has not been deemed necessary.