

Technical report

A-025/2021

Accident involving a Boeing 737-8AS aircraft,
registration EI-EVE, operated by Ryanair, at
Málaga Airport (Málaga, Spain) on 13 June
2021

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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 (CIAIAC) regarding the circumstances of the accident and its causes and 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 (UE) nº 996/2010, of the European Parliament and 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 civil aviation accidents and incidents by issuing, if necessary, safety recommendations to prevent from their reoccurrence. 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 evidences in a judicial process.

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

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

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ABBREVIATIONS

° ' "	Sexagesimal degrees, minutes and seconds
°C	Degrees Celsius
%	Per cent
AAIB	Air Accidents Investigation Branch of the United Kingdom
AAIU	Air Accidents Investigation Unit of Belgium
AC	Assessment circular
AENOR	The Spanish Association for Standardisation and Certification
AMC	Acceptable Means of Compliance
ARP	Aerospace Recommended Practice
ATPL(A)	Airline transport pilot license (aircraft)
cm	Centimetres
CPL(A)	Commercial pilot license (aircraft)
DAR	Detachable integrated airstairs rail
DUE	University Nursing Diploma
EASA	European Aviation Safety Agency
EBCI	ICAO code for Charleroi Airport
FAA	The United States Federal Aviation Administration
FAR	Federal Aviation Regulations
h	Hours
hPa	Hectopascals
IFR	Instrument flight rules
kg	Kilogrammes
km	Kilometres
kt	Knots
LEMG	ICAO code for Málaga Airport
m	Metres
METAR	Aviation routine weather report (in aeronautical meteorological code)
NTSB	The United States National Transportation Safety Board
ICAO	International Civil Aviation Organisation
QNH	Altimeter setting to obtain elevation above sea level when on the ground
SAE	Society of Automotive Engineers
SAIB	Special Airworthiness Information Bulletin
SB	Service bulletins
UNE	A Spanish standard
UTC	Coordinated universal time

Technical report

A-025/2021

Operator	Ryanair Designated Activity Company
Aircraft:	Boeing 737-8AS, registration EI-EVE (Ireland)
Date and time of accident:	13 June 2021, 23:21 h ¹
Site of accident:	Málaga Airport (Málaga)
Persons on board:	6 (crew members) and 149 (passengers)
Type of flight:	Commercial air transport - Scheduled - International - with Passengers
Phase of flight:	-
Type of operation:	IFR
Date of approval:	29 September 2021

Synopsis

Summary:

On Sunday, 13 June 2021, the Boeing 737-8AS aircraft, with registration EI-EVE, had departed from Belgium's Charleroi Airport (EBCI), landed at Málaga Airport (LEMG), and was parked on stand 48 of the apron. At 23:21 h, one of the passengers fell while disembarking the aircraft via the forward stairs.

According to the testimonies of the aircraft's crew, the passenger fell from the penultimate step and was unable to explain how it had happened. The person travelling with the passenger reported that, sometimes, the medication he takes for a heart condition can cause dizziness, and she believed this caused him to fall.

The airport medical service treated the passenger. Later, they indicated that their examination had neither confirmed nor suggested that the fall was caused by the medication. The passenger was taken by ambulance to a hospital for further care due to his hip was broken.

Recently, there have been three other occurrences of passengers falling while disembarking via the forward stairs of Boeing 737 aircraft operated by Ryanair in Spain. One of them occurred on 12 May 2021 at Alicante Airport and is being investigated by the CIAIAC (reference A-020/2021) due to the severity of the passenger's injuries. The other two both occurred on 16 July 2021, one at Málaga Airport and one at Valencia Airport, but neither met the criteria to be considered an accident or serious incident, under Regulation (EU) 996/2010. It is recommended that

¹ All times used in this report are local time. The UTC is 2 hours less.

this report be read in conjunction with report A-020/2021 for a clearer understanding of the event.

The investigation has not been able to determine the cause of the accident.

Given that safety recommendations have already been issued in relation to the event covered by the A-020/2021 report, no further safety recommendations are issued in relation to the findings of this report.

1. THE FACTS OF THE INCIDENT

1.1. Overview of the accident

On Sunday, 13 June 2021, one of the passengers of the Boeing 737-8AS aircraft, with registration EI-EVE, fell from the penultimate step of the aircraft's forward stairs and was injured while disembarking.

The passenger was treated by Málaga Airport's medical service and transferred by ambulance to hospital.

1.2. Injuries to persons

<i>Injuries</i>	Crew	Passengers	Total in the aircraft	Others
Fatal				
Serious		1	1	
Minor				
Unharmed	6	148	154	
TOTAL	6 ²	149	155	

1.3. Damage to the aircraft

The aircraft did not sustain any damage.

1.4. Other damage

There was no additional damage.

1.5. Personnel information

1.5.1. Information about the crew

The 44-year-old captain held an airline transport pilot license for aeroplanes-ATPL (A)-, issued for the first time on 01 December 2008, with a B737 300-900 rating valid until 31 March 2022.

His class 1 medical certificate was valid until 17 June 2022.

He had 10,697 h of experience, of which 2,154 hours were as captain and the remainder as co-pilot. He had 9,402 hours of experience on the Boeing 737-800 aircraft.

The 25-year-old co-pilot had a commercial aircraft pilot license-CPL(A)-, issued for the first time on 28 August 2018, with a B737 300-900 rating valid until 31 March 2022.

² The crew consisted of 2 pilots and 4 flight attendants.

His class 1 medical certificate was valid until 02 September 2022.

He had 1,496 h of experience, all as a co-pilot. He had 871 hours of experience on the Boeing 737-800 aircraft.

1.6. Aircraft information

- Make: Boeing
- Model: 737-8AS
- Year of manufacture: 2012
- Serial number: 35035
- Registration: EI-EVE
- Maximum take-off weight: 66,990 Kg
- Number of engines: 2
- Type of engines: CFM56-7B26E
- Information about the owner and operator: The aircraft has been registered with the Irish Aircraft Registry in the name of Ryanair Designated Activity Company since 06 February 2012.

The aircraft has an Airworthiness Certificate and an Airworthiness Review Certificate valid until 05 February 2022.

1.6.1. Description of the stairs on the Boeing 737 aircraft

Some Boeing 737 series aircraft, including the aircraft involved in this accident, have retractable stairs on the forward left side of the cabin to allow for the boarding and disembarking of passengers without the need for additional ground support equipment. The stairs have a handrail on each side. These types of stairs have narrower steps and thinner and lighter handrails than the external stairs provided by airport handling services³.

The following figure, extracted from Boeing's document on "Airplane Characteristics for Airport Planning", shows the dimensions of the stairs. The height of the stairs on the 800 model ranges from a minimum of 1.85 m to a maximum of 2 m, and the length is 3.53 m. Thus, the slope varies between 69% and 62%, respectively. The width of the stairs is approximately 0.62 m.

³ In Spain, the 15 January 2014 resolution of the Directorate-General for Industry and Small and Medium Enterprises contains the UNE standards approved by AENOR. Among them is standard UNE-EN 12312-1: 2013 entitled "Ground equipment for aircraft. Specific requirements. Part 1: Passenger stairs".

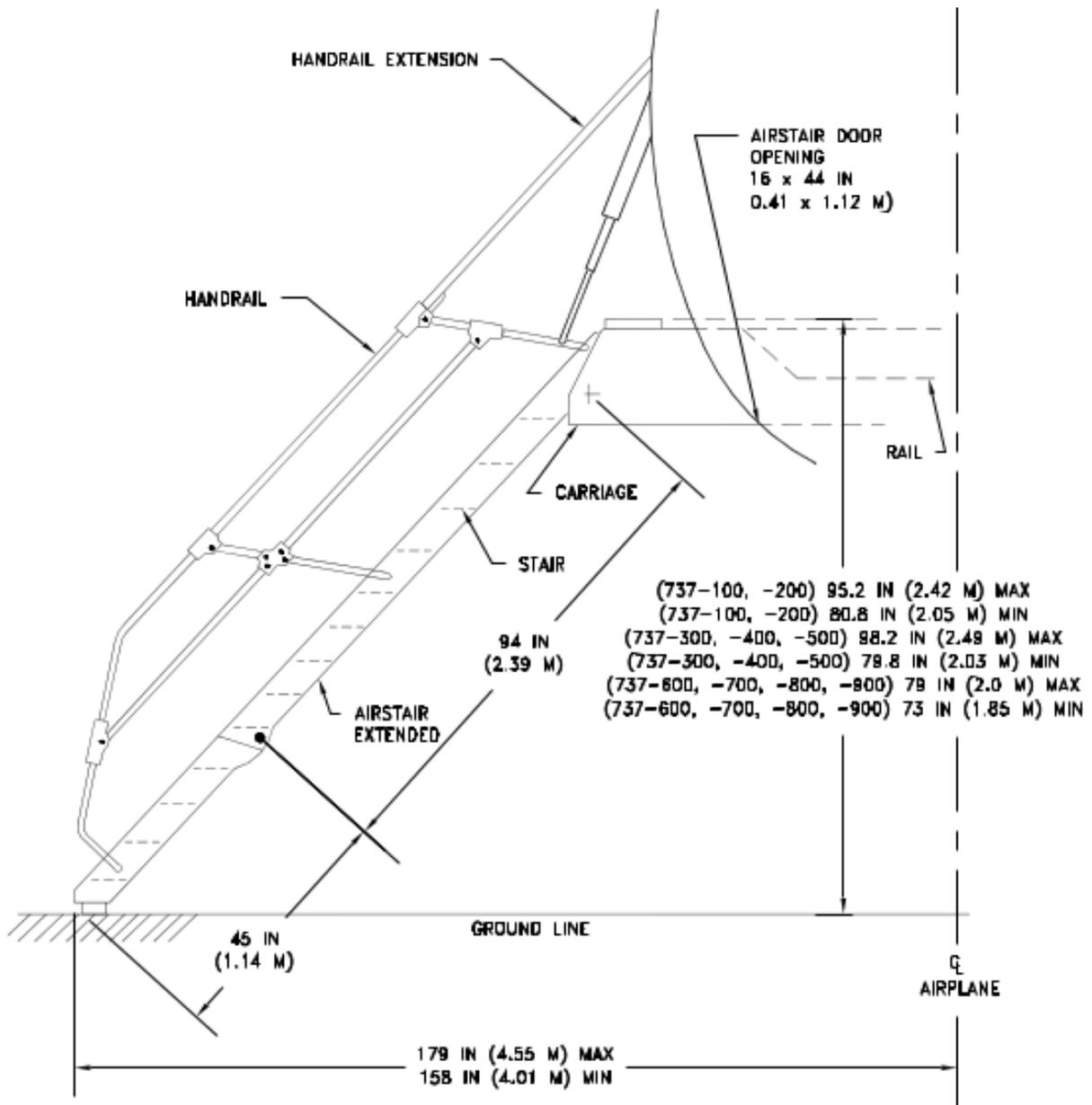
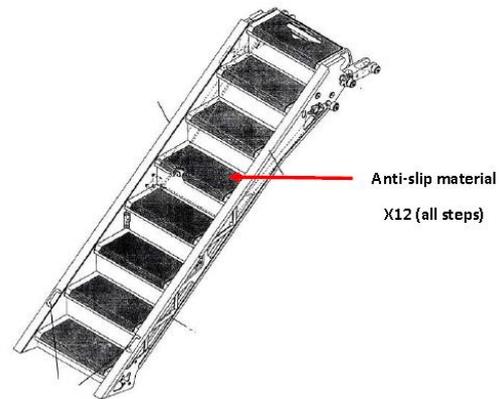


Illustration 1: Dimensions of the stairs on Boeing 737 aircraft

Over the years, Ryanair has installed several additional safety measures on the integrated stairs of its Boeing 737 aircraft to reduce the risk of passengers falling, especially young children:

1.- The stair treads are covered with a non-skid material called 3M Safety Walk 710 - Coarse⁴

Although Ryanair's manuals also allow the use of the 3M Safety Walk 610 - General Purpose⁵ non-skid material, the stairs of the aircraft in question are equipped with the former.



2.- In 2010, retractable visual safety barriers and removable rails were installed.

3.- The aircraft involved in this event had warning signs advising that passengers travelling with young children should hold their hands when walking up or down the stairs, as per Special Airworthiness Information Bulletin (SAIB) NM-07-47⁶, issued by the FAA in September 2007. The stairs of the aircraft involved in this event are shown in the photos below. The warning signs are visible on the step risers:

⁴ The non-skid *3M Safety Walk Coarse Tapes and Treads - 700 Series* material consists of large abrasive particles bonded by a strong and durable polymer to a dimensionally stable plastic film. The reverse side is coated with a pressure-sensitive adhesive covered by a removable protective liner.

⁵ The non-skid *3M Safety Walk Slip-Resistant General Purpose Tapes and Treads - 600 Series* material consists of large abrasive particles bonded by a strong and durable polymer to a dimensionally stable plastic film. The reverse side is coated with a pressure-sensitive adhesive covered by a removable protective liner.

⁶ [https://rgl.faa.gov/Regulatory_and_Guidance_Library/rgSAIB.nsf/0/cab005ca55f1abd78625734e006eb6b7/\\$FILE/NM-07-47.pdf](https://rgl.faa.gov/Regulatory_and_Guidance_Library/rgSAIB.nsf/0/cab005ca55f1abd78625734e006eb6b7/$FILE/NM-07-47.pdf)



Illustration 2: Stairs of the Boeing 737- 8AS aircraft with registration EI-EVE

These warning signs also advised holding onto the handrail with the other hand.

The aircraft also had warning signs on the door frames:



Illustration 3: Door frame of the Boeing 737-8AS aircraft with registration EI-EVE

In addition, there was another warning sign on the door frame advising passengers to hold

onto the handrail with one hand:



Illustration 4: Door frame of the Boeing 737-8AS aircraft with registration EI-EVE

1.7. Meteorological information

It was not raining or windy at the time of disembarkation.

1.8. Aids to navigation

N/A.

1.9. Communications

N/A.

1.10. Aerodrome information

The aircraft landed at Málaga/Costa del Sol Airport, whose ICAO code is LEMG. The airport is located 8 km to the southwest of the city of Málaga. It has an elevation of 16 metres and two runways. Runway 12/30 is 2,750-metres-long by 45-metres-wide. Runway 13/31 is 3,200-metres-long by 45-metres-wide.

1.11. Flight recorders

N/A.

1.12. Aircraft wreckage and impact information

N/A.

1.13. Medical and pathological information

N/A.

1.14. Fire

N/A.

1.15. Survival aspects

The aircraft has warning signs advising the passengers to hold onto the handrail when descending the stairs. Furthermore, as part of the disembarkation procedure, the operator makes a passenger announcement in English advising that they should use the handrail when walking down the stairs.

According to the statements from the witnesses, the injured passenger, who was a Belgian national, fell from the penultimate step as he was descending the stairs.

After the passenger fell, the airport's medical service was called for assistance. According to the airport management company, it took 4 minutes for the requested medical service to reach the scene.

1.16. Tests and research

1.16.1. FAA regulations applicable to integrated stairs on commercial air transport aircraft

Part 25 of the *Airworthiness Standards: Transport Category Airplanes*, the FARs (Federal Aviation Regulations) prescribed by the FAA (United States Federal Aviation Administration) and applicable to the Boeing 737 aircraft, do not contain any requirements in regard to integrated stairs on commercial air transport aircraft.

However, in September 2007, after four incidents in which small children were injured due to falling down the stairs, the FAA issued Special Airworthiness Information Bulletin (SAIB) NM-07-47 to owners and operators of Boeing 737 aircraft equipped with integrated stairs. It recommended the implementation of the Service Bulletins issued by Boeing, (SB) 737-52-1157, and Monogram System, the stair manufacturer, (SB) 870700-52-2130, which was referred to in the aforementioned Boeing service bulletin. These service bulletins recommend that warning signs advising passengers travelling with young children to hold their hands when climbing or descending the stairs should be placed on the risers of each step and the door frames. They also recommended the installation of non-skid material on the upper platform and side handrails. Boeing also revised the Flight Attendant Manual, advising that special attention be paid to passengers with special

needs or those travelling with young children.

In June 2012, the FAA issued Advisory Circular (AC) 150/5220-21C on boarding equipment used on aircraft. In regard to the stairs, the Circular indicated that they must comply with the requirements of ARP (Aerospace Recommended Practices) 836 issued by the SAE (Society of Automotive Engineers). However, as indicated by Boeing during the investigation, this rule only applies to the external stairs provided by airport handling services and not to the integrated airstairs in Boeing 737 aircraft.

1.16.2. EASA regulations applicable to integrated stairs on commercial air transport aircraft

In its 2009 document, CS-25 Cabin Safety Requirements, EASA addressed the possibility of establishing requirements for integrated airstairs, recommending the following:

Recommendation 48 – Recommendation for incorporating industry standards for general occupant safety (e.g. slip, trip and fall prevention) into AMC
Whilst many of the slip, trip, and fall accidents inside or from the cabin involved non-compliance with standard operating procedures or complacency, there may be aircraft design features that can reduce its risk. This may be particularly relevant to features like staircases within very large twin-deck aircraft such as the A380. Additionally, there are no regulations governing the height, angle or slip resistance of the steps, or the provision of handrails for integrated airstairs. Industry standards (SAE publications) on these subjects are available. It is recommended that further deliberation be given by EASA to investigate the feasibility of the incorporation of (or referral to) such standards into airworthiness requirements.

However, the current European regulations contain no requirements in this regard.

1.16.3. Events involving passengers falling on the stairs while boarding or disembarking. Recommendations and safety measures implemented.

In 2010, the CIAIAC investigated accident A-017-2010. While boarding via the forward stairs of a Boeing 737-800, a young girl who was being held by her father fell from the top of the stairs to the ground through the gap between the handrail and the upper platform. Given that the recommendations previously issued by the UK's Accident Investigation Authority (Air Accidents Investigation Branch or AAIB)⁷ following a similar accident at a London Stansted Airport on 17 July 2009 were considered to be sufficient, the CIAIAC did not issue any further safety recommendations in its report. The AAIB's safety recommendations were:

⁷The report can be downloaded from the following link:

https://www.google.es/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwim_MLu3-nwAhVD-gQKHTqJAUIQFjAAegQIBBAD&url=https%3A%2F%2Fassets.publishing.service.gov.uk%2Fmedia%2F5422ef83ed915d137100026b%2FBoeing_737-800_EI-DLJ_08-10.pdf&usq=AOvVaw2b1zHKzsonPIImov13R1OT

- That Boeing establish a process to inform the operators of all Boeing commercial aircraft of changes to the relevant Flight Attendants Manual⁸.
- That Ryanair review their current passenger boarding and disembarking procedures so that assistance is made available to passengers accompanied by children, and those with special needs.
- That Boeing review the design of the Boeing 737 forward airstairs with the intention of adding a removable barrier to minimise the possibility of a child falling through the gap between the extendable handrail and its upper platform.

Subsequently, several accidents involving passengers falling down the stairs when boarding or disembarking a Boeing 737 aircraft have occurred. The Accident Investigation Authorities did not consider it necessary to issue further safety recommendations for any of them⁹.

1.16.4. Ryanair's disembarkation procedure

Ryanair's procedures stipulate that, before proceeding to disembark the passengers, the following announcement must be made to them:

“Ladies and Gentlemen, you may now disembark the aircraft using both the forward and rear doors. All passengers should use the handrail provided when walking down the stairs. For passengers travelling with children, please hold their hands as you walk down the stairs and until you are inside the terminal building. Walk around the wing and not under the wing. Thank you and good morning/afternoon/evening”

⁸This recommendation was issued because Boeing had added the following warning to its Manual without ensuring all operators were informed of the update:

WARNING: As passengers are boarding or deplaning, pay particular attention to persons with small children or those with special needs. Small children on airstairs should be attended by an adult or responsible person.

⁹ In 2019, a boy fell from the stairs while disembarking from a Boeing 737 plane at London Stansted Airport. The accident was investigated by the AAIB. The report can be downloaded from the following link: https://www.google.es/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwi4o4enwAhXD26QKHVR5CI8QFjAAegQIBhAD&url=https%3A%2F%2Fassets.publishing.service.gov.uk%2Fgovernment%2Fuploads%2Fsystem%2Fuploads%2Fattachment_data%2Ffile%2F919999%2FAAIB_Bulletin_2-2020_Hi_res.pdf&usg=AOvVaw3lIzi63Xe4J3owSN2mz3cy

In its report, the AAIB indicated that it had identified eight events in Europe since 2009, six of them involving children of various ages falling from the stairs of a Boeing 737 aircraft.

In 2020, an accident at Charleroi airport was investigated by the Belgian Accident Investigation Authority (Air Accident Investigation Unit or AAIU). In this case, it was an adult who fell down the stairs while disembarking. The report can be downloaded from the following link: <http://www.aaiu.ie/node/1491>

During the investigation, Ryanair indicated that this announcement is made in English.

1.17. Organisational and management information

N/A.

1.18. Additional information

N/A.

1.19. Special investigation techniques

N/A

2. ANALYSIS

Various aspects of the accident were analysed, including the safety of the integrated airstairs, Ryanair's disembarkation procedure and the passenger's actions while disembarking.

2.1. Analysis of the safety of the aircraft's integrated airstairs

The FAA's airworthiness standards applicable to air transport aircraft and, therefore, to the Boeing 737 aircraft do not contain any requirements related to integrated airstairs on commercial air transport aircraft. Nor has EASA deemed it necessary to regulate these types of stairs in its standards.

However, in September 2007, the FAA issued a Special Airworthiness Information Bulletin (SAIB), recommending, among other things, that non-skid material be installed on the upper platform and side handrails of the stairs. The measures recommended by the FAA had been implemented on the aircraft involved in this accident. Furthermore, the stair treads of the aircraft involved in the accident are also covered with a non-skid material, specifically, 3M Safety Walk 710 - Coarse.

In 2010, the aircraft's operator decided to install retractable visual safety barriers and removable rails on their aircraft to improve the safety of the stairs.

Therefore, we have concluded that the aircraft's operator implemented all the available measures to improve the safety of the integrated stairs installed on its aircraft.

2.2. Analysis of Ryanair's disembarkation procedure

Ryanair's procedures stipulate that, before proceeding to disembark the passengers, the following, among other things, must be communicated to them: *"All passengers should use the handrail provided when walking down the stairs"*. This announcement is made in English only. Although the English language is an international language commonly used in aviation, a previous CIAIAC investigation found that safety could be improved by also making the announcement in the official language of the departure and destination countries. Therefore, a recommendation along these lines was issued to Ryanair in report A-020-2021.

2.3. Analysis of the passenger's actions while disembarking

The passenger lost his balance and fell on the penultimate step. The investigation was unable to determine whether the passenger was holding onto the handrail because the fall was not witnessed by any crew members, and, despite several attempts, all efforts to contact the passenger for his statement failed. However, given that holding onto the handrail could have been prevented the passenger from falling, it seems likely that he wasn't.

Nor has it been possible to determine why the passenger lost his balance. Although the

passenger's companion informed the aircraft crew that he suffered from a heart condition and, on occasions, the medications made him dizzy, the airport medical service indicated that their examination of the passenger found no evidence to suggest that the fall was caused by the medication.

3. CONCLUSIONS

3.1. Findings

- the aircraft's operator implemented all the available measures to improve the safety of the integrated stairs installed on its aircraft.
- The passenger fell from the penultimate step of the aircraft's integrated airstairs.

3.2. Causes/contributing factors

The investigation has not been able to determine the cause of the accident.

4. OPERATIONAL SAFETY RECOMMENDATIONS

Given that those issued in technical report A-020/2021 are considered sufficient to prevent this type of event, no further safety recommendations are issued.