

Safety Investigation Report

Ref. AAIU-2015-10
Issue date: 22 March 2016
Status: Final

SYNOPSIS

Classification: Accident

Level of investigation: Field investigation

Date and time: 31 July 2015 – 19:25 UTC

Aircraft: Cameron Balloons Ltd, model Z-210, msn 11265. The balloon is registered in Belgium and holds a Certificate of Airworthiness, delivered by BCAA, Belgium and an Airworthiness Review Certificate (ARC), valid until 03 June 2016.

Owner: Private

Accident location: In a field, in Sleidinge, Belgium

Type of flight: Commercial, sightseeing

Phase: Landing

Persons on board: 10 (1 pilot and 9 passengers)

Injuries: Pilot

Abstract:

During landing, the balloon hit the ground hard, and the pilot lost his balance. He fell and got caught under the basket.
The pilot was injured and transported to the hospital, all 9 passengers were uninjured.

Occurrence type:

Abnormal runway contact (ARC)

Cause:

During landing, the pilot had the harness attached to the sides of the basket, instead of having it secured to the bottom of the basket. This caused the pilot to be ejected outside of the basket during a hard landing.

FACTUAL INFORMATION

History of the flight

The flight was initially planned to start from Graauw, in the Netherlands and according to the meteorological condition, to end in the region of Axel, the Netherlands.

During the flight, the wind speed was higher than originally planned and the pilot decided to cross the canal Gent – Terneuzen. After the crossing, the pilot decided to look for a landing area, and decreased the altitude. In Sleidinge, Belgium, the pilot found an area suitable for landing.

The speed was still higher than expected.

The pilot stated “he did not want to miss the chosen landing place and, after crossing an electrical line on the northern side of the field, decreased rapidly the altitude.

The contact with the ground was hard, the pilot lost his balance and fell forward. The basket tilted and the pilot got partially caught under the basket.

He was transported to the hospital.

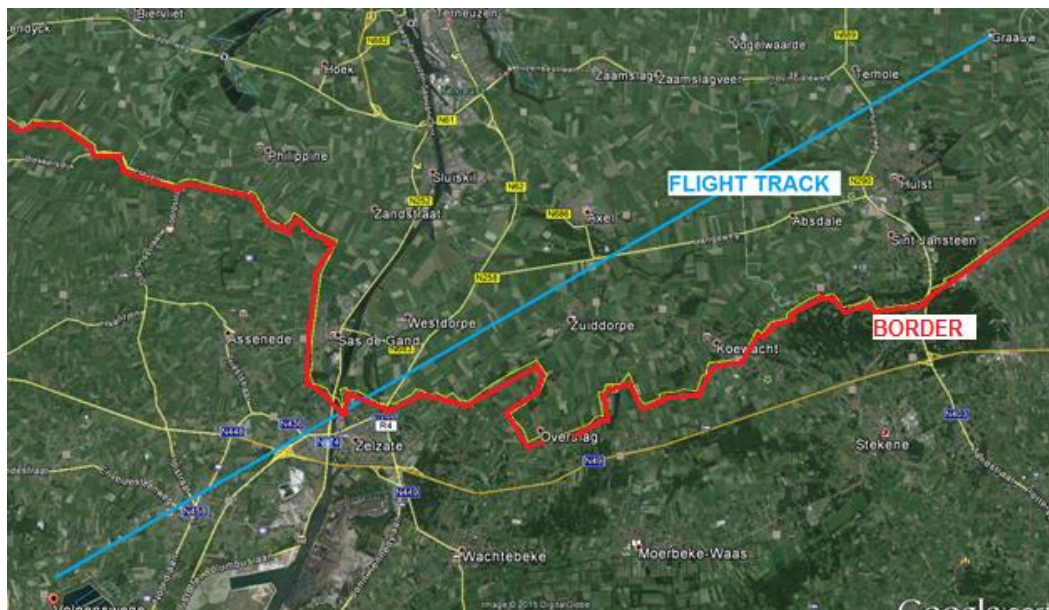


Figure 1: Flighttrack

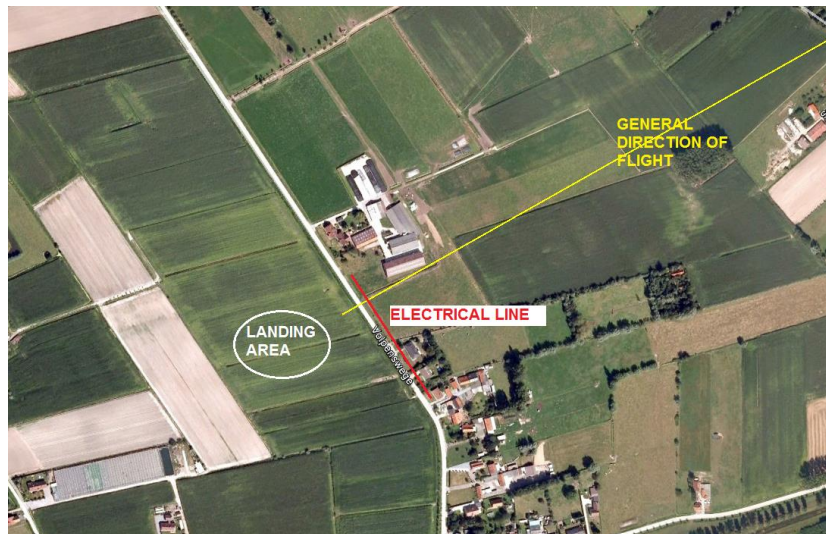


Figure 2: Crash area

Injuries to persons

Injuries	Crew	Passenger	Others	Total
Fatal	0	0	0	0
Serious	1	0	0	1
Minor	0	0	0	0
None	0	9	0	9
Total	1	9	0	10

Aircraft information

The Balloon is a Z-Type Cameron hot air balloon, featuring a Z-210 envelope and a CG 754G basket.

The balloon is defined by the EASA Type Certificate Data Sheet BA.013.

The Z-210 hot air balloon has a natural-shaped envelope of 5947 m³ volume with 24 vertical gores.

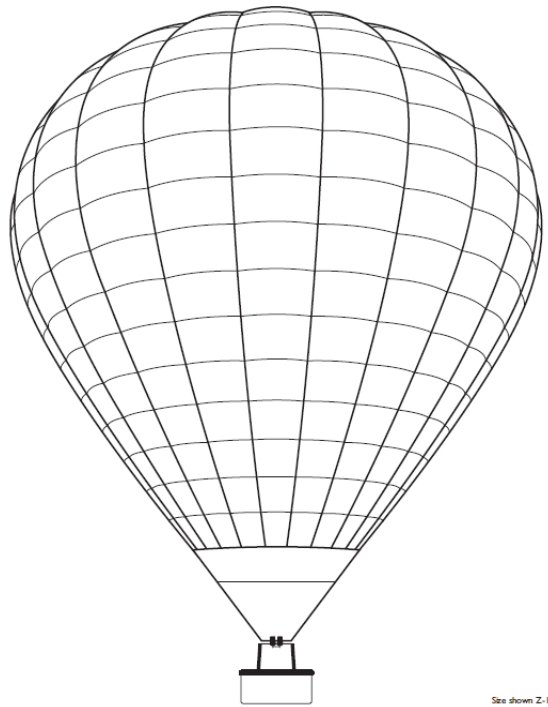


Figure 3: Balloon

Balloon (envelope) data

- **Manufacturer:** Cameron Balloons Ltd
- **Type:** Z-210
- **Serial Number:** 11265
- **Built:** 05/2009
- **Maximum Take-off Weight:** 1905 kg
- **Volume:** 5947 m³
- **Weight:** 235kg

- **Certificate of Registration:** N°10325 issued on May 13, 2009 by the BCAA
- **Certificate of Airworthiness:** N° 11265, issued June 2, 2009 by the BCAA
- **Airworthiness Review Certificate:** last issued on 18 May 2015, valid until 3 June 2016

The basket is a partitioned basket from Cameron, type CB754 G, serial BB 1118.

It consists of 5 compartments; a central section - the pilot's station -, flanked by two compartments on each side for the passengers.



Figure 4: Basket

Personnel information.

Pilot

Male, 40 years-old, Belgian

Holder of a valid Balloon Pilot Licence – Hot Air Balloon Group B, first issued in April 2012

Medical certificate Class 2, issued on 9 February 2015, valid until 13 February 2016

Experience; around 200 FH

Meteorological information

Winds

Forecast

Issued at 14:30 UT

Surface wind (West) 050 - 080 degrees - 05 – 08 kts

At 1000ft 040 - 080 degrees – 05 – 10 kts

At 2000ft: 060 - 090 degrees – 10 – 15 kts

At 3000ft: 070 – 100 degrees – 10 – 15 kts

Issued at 17.10 UT

Surface wind 90 degrees - 05 kts

At 1000ft 90 degrees – 10 kts

At 2000ft: 90 degrees – 10 kts

At 3000ft: 90 degrees – 10 kts

Observations:

EBAW.

18.50 UT: 050 degrees – 05kts – max 10kts

19:20 UT: 060 degrees – 07kts.

EBOS

18.50UT: 080 degrees – 9kts

19.20UT: 080 degrees – 8kts

Observation by the crew:

060 degrees during the flight

020 degrees during the landing.

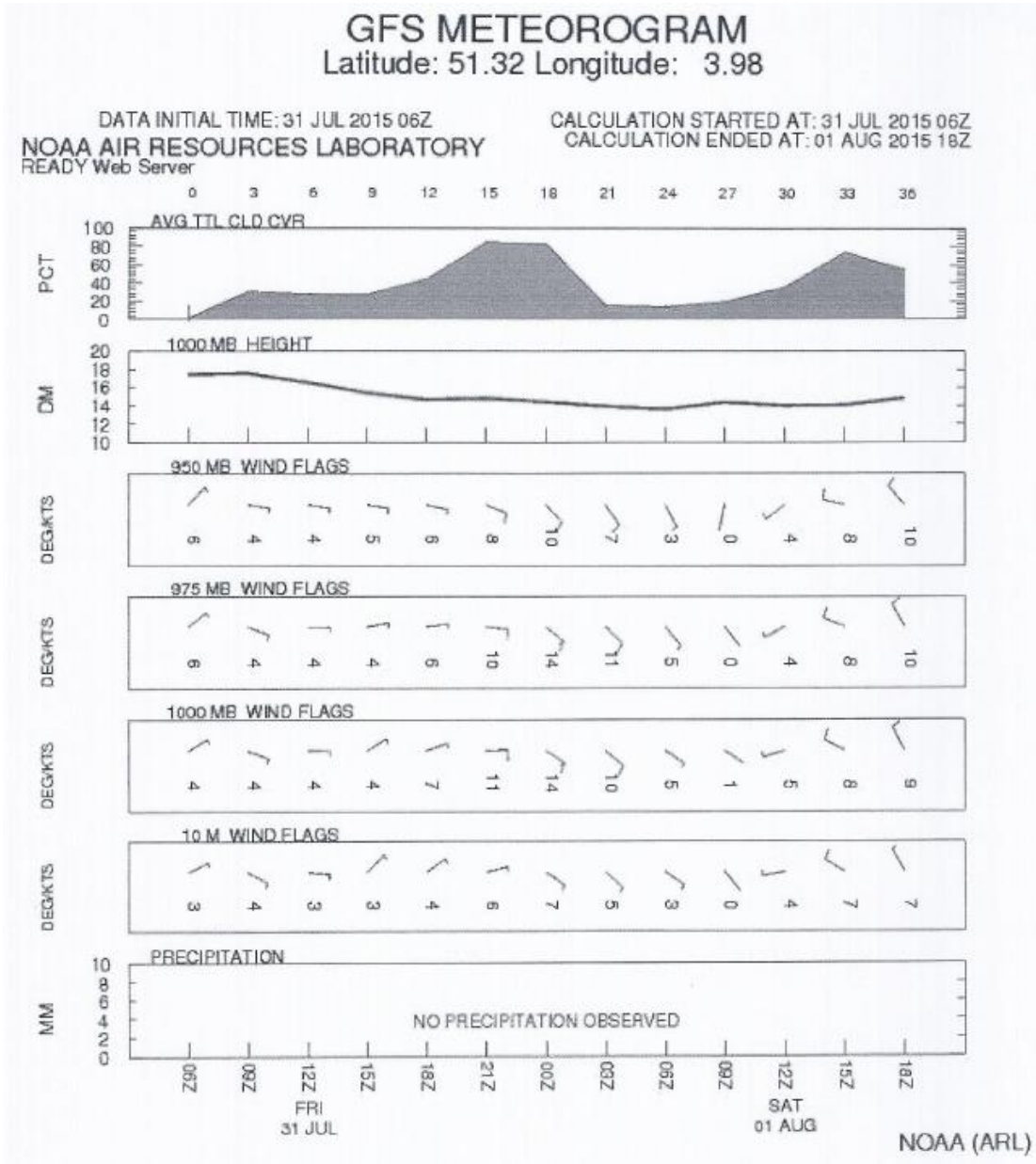


Figure 5: Meteogram

Medical information

The pilot suffered multiple fractures (right arm, collarbone, 8 ribs, left ankle) and graze in various places (belly, thigh, left hand, forehead).

Survival aspects

The emergency services were called immediately and arrived quickly on the incident scene, providing first aid on site, before transporting the pilot to the hospital.

None of the passengers were wounded. They all assumed the required safety landing position in the basket during landing.

The pilot wore the restraint harness, as prescribed by Cameron (combination of CB-0929-5001 strap and CB-0929-5002 belt) but not secured at the correct place. The harness was clipped to an anchor point located upwards (instead of an anchor point fitted on or near the floor of the basket).

Extract from the flight manual:

4.7 PILOT RESTRAINT HARNESS

The pilot restraint harness (if required) should be worn during any period of low level flight and may be worn throughout the flight.

The harness is a simple waist belt fitted with either a parachute buckle or a seat belt type buckle - either of which will allow rapid release in an emergency. A strap of adjustable length is clipped between a metal D-ring on the belt and an anchor point fitted on or near the floor of the basket.

A pouch is fitted to the wall of the basket to store the belt and strap when not in use.

During the landing approach the pilot should take up a secure landing position in the basket, then tighten the strap by pulling on the sewn handle. It is vital that the strap is pulled sufficiently short to prevent the pilot from falling over the side of the basket.

The pilot restraint harness should be used in addition to, not instead of, good pilot positioning and holding on to handles or cylinder rims during the landing.

Regulation

Belgium

There are currently no requirements in Belgium pertaining to the mandatory use of safety harness.

Other countries

On the use of a Pilot restraint harness, the UK CAA mandates

The CAA publication CAP 611 'Air Operators' Certificate: Operation of Balloons' states that in order to operate public transport balloons, an operator must include instruction on:

'The use of pilot restraint harnesses that are fitted to all company balloons. Instructions must state that such harnesses must be worn and attached before the balloon quick release restraint is released, worn throughout the flight, and not released until the end of the flight when the balloon has come to a complete and final standstill.'

Future Regulation

CAT.IDE.B.120 Restraint systems, (applicable for Commercial operations in 2016, non-commercial operations in 2017.)

Balloons with a separate compartment for the commander shall be equipped with a restraint system for the commander.

As part of the General Aviation road map : EASA Opinion 2016/1:

965/2012 will be amended by adding "part-BOP" (balloon air operations)

Restraint system: According to Regulation (EU) No 965/2012, a balloon must be equipped with a restraint system only, when the balloon is equipped with a separate compartment for the pilot-in-command and CAT operations are conducted. As a result of the consultation, the requirements on restraint systems have been expanded as follows:

- A restraint system is prescribed for all operations, when the balloon is either equipped with a separate compartment for the pilot-in-command or when it is equipped with turning vents.
- For such balloons the pilot-in-command must wear the restraint system at least during landing.

EASA work group RMT0674 drafted the regulation, to be made applicable – end of opt-out period – in April 2018, for Commercial and non-commercial activities:

BOP.BAS.175 Use of restraint system

When a restraint system is required in accordance with BOP.BAS.320, the pilot-in-command shall wear the system at least during landing.

BOP.BAS.320 Restraint systems

Balloons shall be equipped with a restraint system for the pilot-in-command when equipped with:

- (a) a separate compartment for the pilot-in-command; or
- (b) turning vent(s).

GM1 BOP.BAS.320 Restraint systems

Equipment Requirements

A pilot restraint harness mounted to the basket is considered to meet the requirements of CS-31HB/CS-31GB for a restraint system.

Lessons from Accidents

Further to an accident in the UK, (one of the 2 cases out of the 60 accidents reports reviewed for which the pilot got ejected from the basket - 2006), both AAIB and the Balloon federation recommended the use of a safety harness for the pilot.

The British Balloon and Airship Club (BBAC) training manual section 15.3 states that:

'A pilot restraint, as used in public transport balloons, could be very useful.'

The organisation involved in the above-mentioned accident stated:

Follow-up action

This incident was discussed at a meeting of the private balloon club committee on 8 October 2006. The minutes of the meeting recorded the following:

'We have learned a lot from the recent accident and the following procedure will be put into place. A harness will be bought for the pilot to be worn by him on all flights and clipped onto a secure

fastening on the basket when coming into land. All crew will have special emergency training to include: pulling the parachute out, making sure the gas is off and safe, emergency radio procedures. We will have practical sessions ... and draw up some written reminders.

It was also discussed that there should always be a trained crew member in the basket with a new passenger to help the pilot and take charge in an emergency. Crew briefing from now on will always include reminders of the emergency procedures.'

Safety Recommendation

As a result of this accident, the following Safety Recommendation is made:

Safety Recommendation 2007-47

It is recommended that the CAA, in conjunction with the BBAC, encourages pilots on all private balloon flights to wear suitable harnesses with the means to fasten themselves securely into the basket when required.

The Belgian operator of the balloon involved in this accident (Atlantic Ballooning) stated:

“After this accident, I recommended to all our pilots to use the pilot restraint harness, and to secure it to an anchor point at the bottom of the basket. This would indeed restrict the movement of the pilots and lower the risk to have him ejected from the basket”

ANALYSIS

The pilot did not expect a very difficult/hard landing and was caught by surprise. When the pilot is aware of the dangers, as in the case of landing with high winds, he would be prepared, position himself low in the basket, etc.

Although he was wearing a restraint system, it was not secured at the correct place. The harness was clipped to an anchor point located upwards (instead of an anchor point fitted on or near the floor of the basket. This didn't prevent him to be thrown outside the basket.

The only efficient and correct way to secure the harness is to have it clipped to an anchor point at the bottom of the basket, and adjust the length of the belt adequately.

The causes and circumstances of 60 balloon accidents (data from the French BEA and British AAIB) were analysed. Only in two cases, the pilot was ejected while not wearing a restraint system.

These accidents show that the most critical part of the flight is the landing and accidents occur due to the conjunction of high winds (meteo), presence of electrical wires and obstacles. Most of these landings are "hard landings" when the basket may bounce, tip over and be dragged onto the ground. Generally speaking, the passengers are safe when they apply the prescribed "landing position" (bent knees, back to the flight direction, as low as possible, and holding the retaining handles).

The pilot, for obvious reasons, needs to stand, in order to be able to operate the control ropes, the burner and the fuel valves and to look around for possible dangers, etc.. Therefore, he is most susceptible to be thrown out of the basket; this is why he should be restrained during the landing phase.

CONCLUSIONS

Cause

During landing, the pilot had the harness attached to the sides of the basket, instead of having it secured to the bottom of the basket. This caused the pilot to be ejected outside of the basket during a hard landing.

SAFETY ACTIONS AND RECOMMENDATIONS

Safety action by the balloon operator

The balloon operator took immediate corrective action recommending to all their pilots to use the pilot restraint harness and to secure it to an anchor point at the bottom of the basket. This in order to restrict the vertical movement of the pilots and lower the risk to have him ejected from the basket during landing.

Recommendation: BE-2016-0004

It is recommended that the Balloon Federation of Belgium addresses a note to all Balloon pilots to advise them of the good practice to use the pilot restraint harness correctly during flight and in particular during landing, securing the harness to an anchor point at the bottom of the basket. This in order to restrict the movement of the pilots and lower the risk to have him ejected from the basket during landing.

REMARKS

The manufacturer made the following remarks:

I agree completely with the report. The harness should have been attached at floor level. Attaching it at the side of the basket could be worse than not wearing a harness at all, because a pilot who falls out of the basket could be dragged along with it until it stops.

It is best to leave this as a recommendation. If anyone is considering a regulation, it should be noted that this is only necessary for the larger balloons designed for eight or more passengers.

There are several reasons:

- 1) In these large balloons, the loads in the control lines are greater; some lighter pilots have described themselves as almost lifting themselves up while pulling the deflation system.*
- 2) In the small sport balloons, the consequences of being struck by the basket are less severe, compared to the heavy multi-passenger basket.*
- 3) In small sport balloons, it is possible to hold onto the upwind burner supports, whereas, in the larger balloons, this is not within reach.*

About this report

As per Annex 13 and EU regulation EU 996/2010, each safety investigation shall be concluded with a report in a form appropriate to the type and seriousness of the accident and serious incident. For this occurrence, a limited-scope, fact-gathering investigation and analysis was conducted in order to produce a short summary report.

It is not the purpose of the Air Accident Investigation Unit to apportion blame or liability. The sole objective of the investigation and the reports produced is the determination of the causes, and, where appropriate define recommendations in order to prevent future accidents and incidents.