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INVESTIGATION REPORT

Accident to the Cameron Z-90 registered F-HASV

on 29 July 2021
at Saint-Privat-la-Montagne (Moselle)

Time	Around 08:20[1]
Operator	Private
Type of flight	Airshow
Persons on board	Pilot and three passengers
Consequences and damage	One passenger injured

This is a courtesy translation by the BEA of the Final Report on the Safety Investigation published in April 2022. As accurate as the translation may be, the original text in French is the work of reference.

[1] Except where otherwise indicated, times in this report are local.

Bounce, basket upset during landing, at an airshow

1 - HISTORY OF THE FLIGHT

Note: the following information is principally based on statements.

The pilot took part in the *Grand Est Mondial Air Ballons* (GEMAB), a gathering of hot air balloons organised every two years at Chambley aerodrome (Meurthe-et-Moselle). He had planned to take three people[2] among his acquaintances for the morning flight, free of charge.

[2] The flight was not one of those sold by the GEMAB organisation.

On the morning of the event, at around 05:45, he had attended the flight briefing given by the team organising the airshow. The team recommended that pilots land before 09:00.

Before the flight, he briefed the passengers, explaining the functioning of the balloon and its use, as well as the safety instructions.

After a flight lasting about one hour, at around 08:00, noticing that he was approaching a restricted area and that the wind was starting to gust, the pilot decided to land. He reminded the passengers of the safety instructions and informed them that because of the wind, the balloon would drag on the ground and that they would need to hold on tightly. He began an initial approach, but the wind diverted him from the chosen field. He aborted the approach and heated the balloon to pass over a high voltage power line.

At the end of an approach to a second field, he turned off the pilot light and pulled the valve. The balloon bounced and then touched down around 10 m further on. The basket turned onto its side and was dragged for about 10 m. A passenger complained about his ankle. When the basket came to a stop, the pilot authorised the passengers to get out of the basket. The injured passenger got out unaided. The pilot helped him into a safe position, covered him with a survival blanket and called the emergency services.

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2 - ADDITIONAL INFORMATION

2.1 Balloon

The balloon is a Cameron Z-90, equipped with a 2,600 m³ group-A envelope, and a non-partitioned basket for four people. The pilot, owner of the balloon, operates it non-commercially.

The balloon flight manual recommends, in the chapter on limitations, not to undertake a flight if the forecast at the site at the time of landing indicates a high probability of wind exceeding 15 kt. Similarly, the flight should not be undertaken in turbulence causing gusts of more than 10 kt above the average wind speed.

The maximum take-off weight of the Z-90 is 816 kg. Based on the weighing record and an estimate of the weight of the people on board, the take-off weight was about 700 kg (assuming the cylinders were full).

2.2 Meteorological information

As part of the airshow, the organiser conducted a pre-flight briefing during which the weather information was presented. The information for the day of the event had been established at 05:00 and provided a valid forecast from 06:00 to 10:00. It included the summary situation, cloud cover and precipitation information, a forecast wind model and an upper-level wind reading from a "*piball*[(3)]" at 04:30.

[(3)] Abbreviation for pilot balloon. Upper-level winds are measured by means of a pilot balloon and an optical tracking device.

The bulletin provided by the organiser indicated a surface wind from 225° at 8 kt with no tendency to change and forecast the beginning of convection at 09:00.

An analysis by Météo-France estimated that the most likely wind conditions at the accident site were as follows:

- ❒ average southwesterly wind of 10 to 12 kt;
- ❒ maximum southwesterly wind of 16 to 18 kt.

The readings of the meteorological station at Doncourt-lès-Conflans (Meurthe-et-Moselle), located 9 km from the landing site, were consistent with this analysis.

2.3 Pilot's experience and statement

The 52-year-old pilot had been flying balloons since 2010. He held a Balloon Pilot License (BPL) with a Group A hot air balloon rating. At the time of the event, he had logged 181 ascents for 255 flight hours. In 2021, he had made seven ascents between the months of May and July.

He had acquired the balloon registered F-HASV at the beginning of July 2021 and had made four ascents with it. All these flights had been carried out during the week preceding the event, as part of the GEMAB, from Chambley aerodrome.

For the landing, the pilot stated that he had explained to the passengers how to position themselves, how to hold on to the basket, that they must keep their legs bent, keep their arms inside the basket and wait for his order to get out of the basket. With regard to positioning, he always positioned himself at the front of the basket facing the direction of travel to manage the landing, and told the passengers to turn their backs to him or take up a sideways position.

In addition to the weather information provided by the airshow's organising team, he consulted the tools he typically used to complete his analysis of the situation. He was aware that the wind was going to get stronger and that he had to land before 09:00.

Based on the information from his GNSS receiving system that he consulted during the approach and his assessment of the ground speed in the final phase of the landing, he estimated that the wind at the time of landing was in the order of 20-25 km/h[4] and that it was starting to gust.

[4] 10 to 13 kt.

2.4 Injured passenger's statement

This was the 50-year-old male passenger's first balloon flight. He explained that the pilot had conducted a briefing before the flight and before the landing.

He said the flight had gone well. He was positioned at the rear for landing. He did not consider the landing to have been violent.

The basket had turned onto its side. He did not know exactly when he had broken his ankle.

2.5 Positioning for landing

The Cameron Z-90[5] balloon flight manual includes the following instructions:

[5] 10th edition

> On landing stand sideways to the direction of travel, at the front edge of the basket (where practicable). Knees should be together and slightly bent. Hands must remain inside the basket. Hold on to rope handles or cylinder rims. Watch the progress of the landing and brace for the touchdown. After touchdown the basket may fall on its side and drag along the ground.

The *Manuel du pilote de Montgolfière*'s[6] recommendation when landing in strong wind is to tell passengers that the best position to adopt is to face away from the direction of travel with their body in contact with the wall that will touch the ground, holding tightly onto the handles.

[6] Hot air balloon flight manual published by Montgolfière France Records, 2nd ed. 2016.

The French civil aviation safety directorate (DSAC) published a safety instruction booklet[7] in 2018, written in collaboration with the French Aerostation Federation (FFAé). This booklet includes a figure that shows the guidelines for landing with a non-partitioned basket. It stipulates turning your back to the direction of landing if there is enough room, otherwise to adopt a sideways position, and to look in the direction of travel.

[7] *Mise en œuvre et exploitation de ballons à air chaud Consignes de sécurité* (Implementation and operation of hot air balloons Safety instructions).

The 2006 study[8] [9] by the Civil Aviation Authority of the United Kingdom (CAA-UK) indicates that:

- *"For the passengers in an open basket it is recommended to adopt a sideways landing position at the front side of the basket with the fuel cylinders installed at the back of the basket."*
- *"It is recommended to let the most vulnerable passenger in an open basket in a sideways position be at the front of the row of passengers and the strongest at the back."*

[8] Evaluation of and Possible Improvements to Current Methods for Protecting Hot-Air Balloon Passengers During Landings

[9] The study was carried out on the basis of a basket measuring 122 x 162 cm. The basket equipping F-HASV measured 112 x 147 cm.

When asked about the positioning of passengers in preparation for landing in the case of a non-partitioned basket, an FFAé representative stated that the build of the basket's occupants is an additional factor. The space allocated to passengers may be relatively small and may not allow everyone to adopt the ideal recommended position. The positioning is the result of a compromise between the available space and the necessary protection of the pilot.

2.6 Similar occurrences

A search of the BEA database showed that the BEA has investigated seven events over the last 10 years with similar characteristics to the F-HASV accident: injury of one or more passengers during a dragged landing.

3 - CONCLUSIONS

The conclusions are solely based on the information which came to the knowledge of the BEA during the investigation. They are not intended to apportion blame or liability.

Scenario

While carrying out a free flight with three passengers organised during the GEMAB, the pilot decided to abort the flight because they were approaching a restricted area and the wind was starting to gust.

Before landing, he reminded the passengers of the landing safety recommendations and warned them that, due to the wind conditions, they would have to hold on tight.

Driven by the wind, close to the limit recommended by the manufacturer, the basket turned onto its side and was dragged for about 10 m. One passenger was injured during this manoeuvre. The precise circumstances that led to the passenger's injury could not be established.

Safety lessons

The BEA has underlined on several occasions in its reports the significant recurrence of trauma during balloon landings. Passengers, especially those unfamiliar with this activity, are particularly vulnerable.

In the specific case of a non-partitioned basket, recommendations for passenger positioning on landing vary depending on the information source. Moreover, application of these recommendations remains dependent on the available space, passenger morphology and the imperative to prioritise the safety of the pilot so that they can complete the manoeuvre.