ACCIDENT

Aircraft Type and Registration:	Cameron Z-375 hot air balloon, G-VBFO	
No & Type of Engines:	None	
Year of Manufacture:	2008 (Serial no: 11135)	
Date & Time (UTC):	9 October 2017 at 1545 hrs	
Location:	Hyde Hill Farm, Royston, Hertfordshire	
Type of Flight:	Public Transport	
Persons on Board:	Crew - 2	Passengers - 12
Injuries:	Crew - None	Passengers - 1 (Serious)
Nature of Damage:	None	
Commander's Licence:	Commercial Pilot's Licence (Balloons)	
Commander's Age:	44 years	
Commander's Flying Experience:	1,498 hours (of which 400 were on type) Last 90 days - 31 hours Last 28 days - 7 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot and further enquiries by the AAIB	

Synopsis

After an uneventful flight, G-VBFO landed in a field near Royston. The basket landed firmly, bounced several times and was then dragged across the field eventually coming to rest approximately 60 m from the initial impact point. During the first impact, a passenger was ejected from the rear right compartment. Whilst it could not be determined why the passenger came out of the basket, it is likely that he either let go prior to the landing or was unable to hold on tightly enough to keep himself in the landing position.

Post-accident interviews with the passengers confirmed that safety briefings were conducted in accordance with the company operations manual. However, passengers commented that the briefings were difficult to hear and did not prepare them for the dynamic nature of the landing. This may have contributed to the accident. The operator and the CAA state that they have taken action to ensure safety briefings are delivered to a consistent high standard.

History of the flight

G-VBFO was operating its second flight of the day. The flight was originally planned to depart from St Albans, Hertfordshire. However, the wind would have taken the balloon close to Class D Airspace so the flight was relocated to Shuttleworth, Bedfordshire. Four passengers did not arrive for the flight, so one of the ground crew joined the flight to add additional weight. The flight departed Shuttleworth at 1445 hrs with 13 passengers and 1 pilot.

The flight proceeded uneventfully for approximately one hour. The pilot then searched for a landing site, aware that the wind at 100 ft agl had increased to approximately 14 kt. He made an initial approach to a playing field but, deciding this field was not large enough in the wind conditions, made a second approach to a large stubble field near Royston, Hertfordshire.

As the balloon landed the pilot reported that his GPS recorded it was travelling at 13.3 kt with a descent rate of 200-300 ft/min. The basket landed firmly, bounced twice and was then dragged across the field eventually coming to rest approximately 60 m from the initial impact point.

During the first impact, a passenger was ejected from the rear right compartment and travelled forward over the basket, striking one of the other passengers. The pilot managed to reach out and hold onto the passenger before losing his grip when the balloon bounced a second time, at which point the passenger fell in front of the basket and it passed over him. The passenger recalled that he was in the correct landing position prior to landing and holding on to the best of his ability.

As soon as the balloon stopped, the ground crew member, who was travelling in the balloon, went to assist the fallen passenger. Once the balloon was made safe, the pilot joined the crew member and called the emergency service.

The passenger suffered severe injuries.

Passenger briefing

Prior to the flight the pilot gave a pre-flight safety briefing. This was conducted once the balloon was inflated and with all the passengers in the basket. The pilot recalled that the briefing covered: what to expect during the flight; no smoking; where to hold on and what not to touch; expected flight time; the use of cameras and mobile phones and the landing position. All passengers practiced the landing position and the ground crew checked everyone was holding on and in the correct position. The pilot did not recall if he mentioned the basket may bounce and tip on landing.

When interviewed after the flight only three of the passengers remembered this pre-flight briefing. Two of these passengers recalled that they struggled to hear it.

Prior to landing, the pilot reminded the passengers of the landing position and reminded them to hold on and not to let go. The pilot explained that the basket may tip over on landing.

When interviewed after the flight most passengers remember this briefing. However, most commented that it did not prepare them for the dynamic nature of the landing.

On the final approach, as the balloon approached the trees the pilot asked everyone to face backwards, as briefed. Just prior to the landing he told everyone to take their landing positions. The pilot checked everyone was in the correct position prior to the landing.

Aircraft information

G-VBFO is a Cameron Z-375 hot air balloon. The basket has a central area for the pilot and four passenger compartments, two either side of the pilot (Figure 1). The operator's operations manual specifies that G-VBFO may carry a maximum of 18 occupants.

Figure 1

G-VBFO Basket before the flight

The operator's Operations Manual states that pilots should not fly if the wind speed exceeds 15 kt.

The pilot wears a harness throughout the flight to ensure he cannot fall out of the balloon. The harness is a strap which attaches to the floor of the basket and to the pilot's waist, giving the pilot freedom to move around the compartment in flight.

Each passenger compartment contains a foam bench and rope loops to hold during the landing. There is no requirement for harnesses to be fitted for passengers although the manufacturer offers these as an option. The UK Civil Aviation Authority (CAA) stated that no UK balloon operator currently uses passenger harnesses.

During landing, passengers sit on the foam bench with their back towards the direction of travel. They must hold on to the rope loops and place their head back against the padded panels that are mounted on the inside of the basket.

Meteorology

Prior to the flight the pilot obtained a balloon forecast from the Met Office. He used the Knebworth forecast data which showed winds of 4 kt with gusts to 9 kt during the flight period. The pilot described the wind at the departure point as "slightly swirly" but well within normal limitations.

Actual weather reports from Stansted and Cambridge Airports (14 nm SE and 11 nm NE respectively from the accident site) recorded a maximum surface wind of 7 kt during the time of the flight.

During the landing the surface wind was approximately 14 kt. This was stronger than forecast.

Weight and balance

With only 14 occupants the balloon was lighter than normal. After the accident, the pilot observed that this can make the balloon more difficult to control. However, the weight was above the minimum landing mass specified by the manufacture for safe operations.

The compartment from which the passenger fell only had three occupants for this landing. If the balloon was full there would be four occupants in each compartment. Following the accident, the pilot observed that when four people occupy a compartment they are packed together tightly, which may prevent individuals from being thrown out in the event of a hard landing.

Previous similar events

The investigation reviewed previous events in which passengers had been ejected from balloon baskets. The circumstances of some of these events were different to the G-VFBO accident.

June 2017, Cameron Z-275 G-CCNC, Ashfield, Nottinghamshire

One passenger was ejected from the balloon basket during a heavy landing. The ejected passenger was not injured, other passengers reported minor injuries.

June 2017, Sky 220-24 G-SPEL, Bashall Eaves, Lancashire

One passenger was ejected from the basket during a firm landing. It was likely that the passenger was not holding the rope handles tightly enough at the time of the landing. The passenger was seriously injured.

October 2016, Cameron ZS-HAH, Buffelspoort dam, South Africa

In December 2016, the South African Civil Aviation Authority published a preliminary occurrence report into the accident involving ZS-HAH. Three passengers were ejected from the balloon basket whilst landing in strong winds. One passenger was fatally injured.

April 2014, Cameron Z-375 G-VBFR, Corby Glen, Lincolnshire

After an initial landing, several passengers disembarked and the balloon was then repositioned to an adjacent field. During the subsequent landing the basket tipped and one passenger fell out of the basket sustaining minor injuries.

August 2009, Sky 260-24 G-KTKT, Doncaster, South Yorkshire

The pilot was landing the balloon in a field of stubble in which there were a number of large rectangular straw bales. The balloon basket bounced and dragged on landing before stopping against one of the bales. During the landing a female passenger sustained serious injuries.

The following Safety Recommendation was made:

Safety Recommendation 2010-052

Balloon landings can take place at unprepared sites and may occasionally be bumpy for the occupants, especially in higher wind conditions if the basket tips over and drags along the ground. At present, not all commercial balloon operators make passengers aware of this, either at the booking stage or prior to a flight. Therefore, it is recommended that the Civil Aviation Authority require all commercial balloon operators to make prospective passengers aware of the varied nature of balloon landings so that they can make an informed decision as to whether or not to undertake a flight.

The CAA accepted this recommendation and added guidance to CAP611 (full details of the CAA response is available at - https://publicapps.caa.co.uk/docs/33/factor201005V1.pdf).

Passenger harnesses

There is no requirement in the UK for harnesses or seat belts to be fitted for passengers and the CAA stated that no UK balloon operator currently uses passenger harnesses.

The CAA and the operator have considered the introduction of passenger's seat belts, however, they are concerned that these would not improve safety and would not be practical. Seat belts could only be worn during the takeoff and landing whilst seated. Once seated, passengers cannot see out of the basket. Passengers would need to sit down some time prior to the approach to ensure their seat belt is correctly fastened. As balloon landings can involve several approaches they are concerned that passengers would not remain strapped in throughout. The current system allows passengers to remain standing, enjoying the view, until just before the landing.

The pilot is required to wear a harness throughout the flight. The harness is a strap which attaches to the floor of the basket and to the pilot's waist giving the pilot freedom to move around the compartment in flight. This type of harness is not practical when several passengers occupy a single compartment as they are likely to become entangled when moving around the compartment in flight.

Analysis

Weather information available before the flight indicated that the conditions were within the operator's limitations for this balloon.

By the time of the landing the wind had increased to approximately 14 kt. The balloon landed firmly, bounced several times and dragged. Whilst it cannot be definitely determined why the passenger came out of the basket it is likely that he either let go prior to the landing or was not able to hold on tightly enough to keep himself in the landing position.

Passenger briefings were conducted in accordance with the company operations manual. However, interviews with passengers suggest that these briefings were difficult to hear and did not convey the potentially dynamic nature of a balloon landing. The briefing was conducted after the balloon was inflated, rather than prior to inflation when there is less noise and distraction. This could have contributed towards the accident.

The injured passenger may have been ejected more easily because there were only three passengers in one of the compartments.

Safety action

Following this accident the operator indicated that it proposed to take the following safety actions;

1. The operator will explore ways to ensure passengers read and understand the safety information that is given to them before the flight.
2. The operator is considering the introduction of laminated passenger safety cards to be given to passengers to read between check in and boarding the flight to further emphasise the safety briefing.
3. The operator will continue to monitor safety briefings delivered by all pilots to ensure they are as clear as possible and convey the potential dynamic nature of a balloon landing.

The CAA has taken the following Safety Action:

> The CAA will instruct all UK Balloon Flight Examiners and Type Rating Examiners to particularly check the content and quality of delivery of the passenger safety briefing and subsequent passenger landing position checks whilst undertaking LPCs and/or OPCs during the coming 12 months.

Conclusion

It is likely that the passenger either let go prior to the landing or was not able to hold on tightly enough to keep himself in the landing position.

The compartment he fell from only had three occupants. This may have made it easier for him to fall out.

The briefings given did not convey to the passengers the potential dynamic nature of a balloon landing. This may have contributed to the accident.

The operator and the CAA have indicated they propose to take action intended to ensure safety briefings are delivered to a consistent high standard.