

**ACCIDENT**

<b>Aircraft Type and Registration:</b>	Cameron Z-350 balloon, G-VBFG	
<b>No &amp; Type of Engines:</b>	None	
<b>Year of Manufacture:</b>	2007	
<b>Date &amp; Time (UTC):</b>	5 March 2011 at 1604 hrs	
<b>Location:</b>	Ulpha, near Broughton-in-Furness, Cumbria	
<b>Type of Flight:</b>	Commercial Air Transport (Passenger)	
<b>Persons on Board:</b>	Crew - 1	Passengers - 16
<b>Injuries:</b>	Crew - None	Passengers - 2 (1 Serious) (1 Minor)
<b>Nature of Damage:</b>	51 panels damaged	
<b>Commander's Licence:</b>	Commercial Pilot's Licence	
<b>Commander's Age:</b>	50 years	
<b>Commander's Flying Experience:</b>	887 hours (of which 139 were on type) Last 90 days - 11 hours Last 28 days - 4 hours	
<b>Information Source:</b>	Aircraft Accident Report Form submitted by the pilot and further enquiries by the AAIB	

**Synopsis**

The pilot aborted the landing while attempting to land in a valley. During the subsequent climb the balloon impacted trees. One passenger was injured by tree branches protruding into the passenger compartment through foot holes in the basket.

**History of the flight**

The pilot planned to fly 16 passengers over the Lake District. He met his ground crew and passengers at the pre-notified launch site at Gilpin Bridge, 4 nm south-west of Kendal, Cumbria. However, a launch site at Kentmere, approximately 5 nm north-east of Windermere was then chosen due to a more favourable wind.

The surface wind at Kentmere was from 040° at 8 kt and from 040° at 12 to 15 kt between 2,000 ft and 3,000 ft amsl. Rigging of the balloon was completed by the ground crew while the pilot gave the passengers a safety briefing. Inflation of the envelope proceeded without incident in a slightly gusty and variable wind. The balloon took off at about 1445 hrs and climbed to 2,000 ft amsl where the winds were found to be from approximately 070° at 12 to 15 kt.

After approximately 45 mins the pilot attempted to land in a field on the western shore of Coniston Water. However, as the balloon descended, its track changed to a more westerly direction taking the balloon away

from the landing site. The pilot aborted the landing and climbed the balloon with the intention of landing near Broughton-in-Furness, 2 nm north of Ulverston.

The wind at 2,000 ft amsl took the balloon in a more westerly direction so the pilot planned a landing in Dunnerdale Valley, 4 nm north of Broughton-in-Furness. After flying over the top of Caw, on the Dunnerdale Fells, the pilot began the descent into the valley. The descent was steady with a small change of track towards the west. The pilot selected a field on the east side of a river and briefed the passengers to adopt the landing position, adding that if they did not land in the selected field he would fly over the river and land on the other side.

During the final part of the descent a gust of wind pushed the balloon down into tree tops, turning the basket. The pilot stated this made the balloon buoyant which, with an increase in wind strength, forced him to abandon the landing and initiate a climb. The air in the envelope had been allowed to cool for descent and it took time, using the balloon's four burners intermittently, to heat it to initiate the climb. The balloon had by this time crossed the field and was heading towards a tree-lined upslope on the western side of the valley. The distance between the first contact with trees and the end of the field was about 150 m. As the balloon climbed the basket "brushed" through the upper branches of deciduous trees for approximately 100 m. The pilot used a mixture of two and four of the burners for up to 5 seconds at a time to avoid setting fire to the branches. He added that there was no impact or jolting, but the basket was dragged through the upper levels of light branches. After clearing the deciduous trees the balloon continued to climb but then contacted some taller coniferous trees further up the slope. Once clear of the trees the balloon climbed to 1,500 ft amsl and

continued west. The balloon landed about 4 mins later, on Birker Fell. As it did so the basket knocked over a barbed wire fence and tipped onto its side as the envelope deflated.

After making the balloon safe the pilot helped the passengers from the basket. Fifteen passengers stated they were uninjured but one complained of a pain around her lower ribs, saying that she thought a branch had come through the footstep in the basket, and "jabbed" her in the ribs. She added that she felt sore on her right side although there was no break to the skin and no sign of abrasion. She told the pilot that as the basket had tilted upon impacting the trees, the three other passengers in her compartment had pushed against her, squashing her against the end of the basket. The pilot asked her if she would like to be taken to hospital by ambulance, but she declined. The ground crew arrived about 10 minutes later and together with the pilot transferred her to their vehicle. A member of the crew stayed with her and ensured that she was comfortable.

Having packed the balloon, envelope and basket onto the trailer everyone left the accident site at about 1800 hrs to return to the original rendezvous point at Gilpin Bridge. En-route the injured passenger requested and was taken to Barrow-in-Furness General Hospital, where she remained for two days.

Another passenger received minor injuries. Others commented that they had suffered back and neck pains for which they did not seek medical treatment.

At 1604 hrs an eyewitness informed police that a hot air balloon was being dragged through trees. The caller went to the landing site to see if he could offer assistance and advised the pilot that he had telephoned the police. Accordingly, the pilot rang the police and

informed them there were no injuries. Emergency services, including an air ambulance, were going to deploy but were subsequently stood down.

### **Local topography**

The gradient of the slope from Corney Fell to the coastal plain is approximately 10%. The gradient of the slope from Dunnerdale Fell into the Dunnerdale Valley is approximately 22%.

The width of land available for landing, ignoring roads, rivers and railways is approximately 2,000 m on the coastal plain and approximately 500 m in the Dunnerdale Valley.

### **Balloon information**

G-VBFG's envelope was fitted with a Rapid Deflation System (RDS) parachute valve. Pulling a red RDS rip line gathers the parachute panel into a column in the centre of the circular opening for final deflation. The action of the red line can be reversed by pulling a red and white venting line.

The balloon was fitted with Stratus quad burners. The burners are fitted with squeeze-action blast valves which are operated by squeezing the control lever towards the hand grip. Each handle has a latch fitted on its underside to allow the valve to be locked on for 'hands free' operation. The blast valve handles are arranged so that pairs of burners can be operated simultaneously with one hand. These should give it the ability to climb away quickly following an aborted approach.

### **Cameron Balloons Hot Air Balloon Flight Manual**

Section 2.12 of the balloon's flight manual states that the RDS rip line is not to be used at heights greater than 6 ft agl, except in an emergency.

Section 3.2.1 states that emergency climbs should be made by operating the main burner valve on each burner unit simultaneously.

Section 4.6.2.3 states that the RDS rip line may be pulled immediately before touchdown.

The basket, which is rectangular in shape, has foot holes in its shorter sides to help people climb into and out of the basket.

### **Video and photographic evidence**

A 41-second video of the first landing impact on the upslope was taken by one of the passengers. It starts with the shorter side of the basket leading, just before it impacted the trees with no burners on. Figure 1 shows a still taken from the video at the moment of impact. The balloon initially impacted trees about 20 ft into the canopy, breaking large branches. Seven seconds into the video the pilot is visible in a position where he is likely to be pulling the red and white venting line in order to close the RDS. Fifteen seconds into the video the pilot can be seen pulling on the red and white venting line for 2 seconds, followed by a burn with two burners for 1 second. He then pulls on the red and white venting line for 4 seconds. There is then a 5 second burn using four burners followed by an 8 second period of inactivity from the pilot as the balloon appears to be deeper into the tree canopy. The final 2 seconds of the video shows the pilot using all four burners for 2 seconds as it clears the trees. The video does not show the pilot using the burners 'hands free'.

In total the pilot can be seen making 12 'pulls' on the red and white venting line, without releasing it, and is likely to have made others not captured in the video.



**Figure 1**

Picture from the video at the moment of impact

### **Pilot's comments**

The pilot commented that he had flown passengers in hot air balloons in the Lake District since April 2008 and that he had landed in the Dunnerdale Valley, at Whistling Green, 1 km south of the accident site, on two previous occasions in 2009.

He added that it would “never be advisable” to plan on landing on the coastal plain, 6 nm further west, as Corney Fell descends from 2,000 ft to sea level “very quickly” approaching the coast. This combined with an easterly wind causes a lot of curlover<sup>1</sup> in the lee of

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### **Footnote**

<sup>1</sup> Curlover is a downdraft and turbulence downwind of hills, trees or buildings.

the Fells when descending. The coastal plain, which averages one mile in width, contains a high voltage power transmission line, a railway line and a main road with an aeronautical Danger Area off the coast.

### **Passengers' comments**

All the passengers made statements after the accident describing their impressions of the impacts with the trees. Several said that broken branches from the trees fell into the basket during the impact and that the basket tilted significantly. Some commented on the lack of attention to their welfare after landing and the relative priority accorded them over the need to pack and recover the balloon and its equipment, despite several of them showing signs of shock.

### First Aid Training

All commercial balloon pilots have annual recurrent training in first aid. In the course of this training they are taught that after administering first aid they should, where it is available, seek expert advice. This could be from an ambulance paramedic or from a hospital.

An injured passenger, who may be in shock, is not necessarily best placed to decide whether or not they need additional treatment.

### Damage assessment

The pilot commented that several of the lower 'Nomex' panels around the base of the balloon were torn and two panels, four or five panels up from the base, were also damaged. The left side corner of the basket was scuffed.

The repair agency found that 51 panels were damaged of which 19 needed replacing. The 'Scoop'<sup>2</sup> was also heavily damaged and required repair.

### Analysis

Having aborted the landing attempt at Coniston Water the only realistic options available to the pilot, given the wind, were to land in the Dunnerdale Valley or on the coastal plain.

The pilot discounted the coastal plain because he felt that the slope was steep and curlover, as a result of the easterly wind, would have been prevalent. However, the gradient of the slope onto the coastal plain is about half that of the slope into the Dunnerdale Valley and

therefore curlover in the Dunnerdale Valley would have been more severe than that onto the coastal plain. It may have been preferable to stay committed to a landing there rather than attempt to climb out of the valley. A more viable plan may have been to land where the balloon subsequently landed or on the coastal plain.

The pilot used the quad-burners intermittently as he started to climb out of the valley. Use of all four burners 'hands free' as soon as he had made the decision to abort the landing may have reduced the severity or number of impacts.

The video begins, at about the moment of impact, with the burners OFF. It is then 18 seconds before the pilot uses two of the burners, as he was closing the RDS/parachute vent. Had the pilot latched all four burners on in the 'hands free mode' as soon as he decided to abort the landing and then closed the RDS, maximum heating would have been achieved, improving climb performance and potentially reducing the chance of impact with the trees. Using four burners may also have prevented the second impact.

The video shows the pilot making 12 'pulls' on the red and white venting line, without releasing it, as he attempts to close the RDS parachute valve. This indicates that the RDS parachute valve was OPEN at the time of impact with the trees. The flight manual states that red RDS rip line is not to be used at heights greater than 6 ft agl and may be pulled immediately before touchdown. Had the pilot kept the RDS closed, until a landing was assured, heating of the air in the envelope would have been more efficient, heat would not have escaped through the open RDS and the climb after the aborted landing may have been expedited making an impact with the trees less likely.

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#### Footnote

<sup>2</sup> The Scoop is a shaped skirt which, narrows to an inch or two on one side and widens to extend all the way from the top of the poles to the base of the envelope proper, forming a tilted mouth. The purpose of the Scoop is to assist in keeping the balloon envelope fully pressurised.

The comment from the passengers that the basket tilted during impact explains why passengers in the injured passenger's compartment pressed her against the basket's side, leaving her no room to avoid any object protruding through the foot holds.

The injured passenger declined the pilot's offer of an ambulance. However, timely examination by a medical expert would have been advantageous and could be given priority over the packing and recovery of the balloon and its equipment.