ACCIDENT

Aircraft Type and Registration:	Cameron Z-315 Hot Air Balloon, G-KNIX
No & Type of burners:	3 Thunder & Colt Triple Stratus burners
Year of Manufacture:	2005
Date & Time (UTC):	29 October 2006 at 1550 hrs
Location:	Wivelrod, near Alton, Hampshire
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 1 Passengers - 16
Injuries:	Crew - None Passengers - 1 (Minor)
Nature of Damage:	Balloon envelope panels torn
Commander's Licence:	Commercial Pilot's Licence
Commander's Age:	33 years
Commander's Flying Experience:	401 hours (of which 230 were on type) Last 90 days - 42 hours Last 28 days - 10 hours
Information Source:	Balloon Safety Report Form submitted to the BBAC by the pilot and further enquiries by the AAIB

Synopsis

The hot air balloon carried a pilot and 16 passengers on an evening pleasure flight. After an aborted attempt to land, the balloon was climbing out of a field when it collided with a tree. As a result, seven balloon panels were torn and one passenger was injured by a branch. The balloon pilot carried out a controlled landing in an adjacent field without further incident.

History of the flight

The hot air balloon was being operated by a company which specialised in balloon pleasure flights. On this occasion 16 passengers were being flown from a site on the north-eastern edge of Alton. The balloon took off at 1505 hrs for a flight planned to last for approximately one hour. The pilot intended to land near Medstead, about 4 nm south-west of the launch site. The balloon was followed by two vehicles that carried the support crew. One vehicle was to transport the passengers and the other to transport the balloon and its basket after the flight. During the flight the pilot communicated to the support crew, when required, using a hand-held radio.

The pilot reported that the surface wind was from 065º at 4 kt, and at 2,000 ft amsl, it was light and variable. The visibility was in excess of 10 km, the surface air temperature was 14ºC and there was no cloud. After an uneventful takeoff and climb to approximately 1,800 ft amsl, during the initial part of the flight the

balloon reached a maximum ground speed of 5 kt, measured on the pilot's hand-held GPS. After about 40 minutes the pilot looked for a suitable field in which to land. Having noticed a "fairly large" stubble field ahead, he asked the support crew to obtain permission to land from the land owners. This field had trees approximately 15 m high around its southern edge and one beech tree, which was about 20 m high, in the south-western corner.

The pilot added that having instructed the passengers to take their landing positions, he made an approach to the field while travelling at 2 to 3 kt. When the balloon was over the middle of the field, at about 25 ft agl, he pulled the main deflation line. At this point the balloon was subjected to a gust of wind that increased its speed to 8 kt. Realising he would not be able to stop the balloon by the end of the field, he ignited the burners to climb out of the field. Due to the design of the burner controls he was not able to leave all three burners on whilst he closed the partially open parachute valve. Consequently, he initially closed the parachute valve with one hand while operating two burners with the other, before lighting the third burner.

As the balloon was climbing it collided with the large beech tree at about 15 m agl, snagging and tearing several panels of the envelope. One passenger, who was in the front right compartment, was hit on the head by a branch and received two cuts to her head. Several branches, with a diameter of approximately 10 to 15 cm, ended up in the basket; these were later discarded over the side. The pilot continued the climb out of the tree, with the burners on, before carrying out a controlled landing in an adjacent field without further incident.

Passenger assistance

After landing the pilot asked the injured passenger if she would like an ambulance called, but she declined saying she "just shaken."

Due to limited access to the landing field, the support crew did not reach the landing site for approximately 45 minutes.

Balloon description

Balloon envelopes are of a sewn construction and made of high tenacity nylon fabric. The fabric is coated to make it airtight and to protect it from the effects of sunlight. All the main loads on the envelopes are carried by nylon or polyester load tapes. Horizontal tapes act as rip stoppers so that any damage to the envelope will be limited in extent. The base panels of the balloon are made from "Nomex" heat resistant fabric so that the nylon is kept at a sufficient distance from the flame to prevent heat damage. The lower ends of the load tapes are formed into rigging loops to which flying cables are attached.

The Cameron Z-315 envelope has closely spaced load tapes and narrow gores of horizontally cut panels to give a near-smooth surface. It is fitted with a Rapid Deflation System which allows for the controlled release of hot air (venting) and complete deflation of the envelope. It takes the form of a circular parachute-style panel sealing a circular opening in the top of the envelope. This panel is held in position by the hot air and by centralising lines which join its edge to the inside surface of the balloon. The parachute valve is opened by pulling a single length of line running through pulleys. For in-flight venting the parachute panel is opened for a few seconds, whereas for deflation it is held open until the envelope deflates.

The basket was of a traditional wickerwork construction with a solid plywood floor. The structural load was taken by stainless steel wires forming a continuous sling

from the burner frame underneath the basket floor. The top of the basket was padded with foam trimmed with leather. The bottom edge was covered with rawhide which protected the basket during landings and transit.

G-KNIX was fitted with a partitioned basket. This type of basket had internal partitions woven into the walls and floor. The partitions provided greater structural integrity and separation between groups of passengers. The pilot and fuel cylinders occupied a compartment separate from the passengers.

Balloon manufacturer's Flight Manual

If the envelope is damaged in flight, Section 3 of the manufacture's Flight Manual entitled 'Emergency Procedures' states the following procedure:

> *Heat [air] to replace lost lift while maintaining a steady rate of descent.*
>
> *Remain at very low altitude and land as soon as possible.*

Passengers' comments

The majority of the passengers were contacted after the accident. Most remembered the conversation the pilot had with the one of the support crew whom they saw at a house close to the field where the pilot planned to land. The passengers reported that the pilot initially asked the crew member to obtain permission to land from the land owner. As the balloon reached the middle of the field, at about 20 to 30 ft agl, permission had not been obtained and the pilot said that he needed a decision, either way, quickly. At this instant, as the balloon was drifting across the field, most of the passengers could see the approaching tree from a "reasonable distance." They soon appreciated that they were going to collide with the tree and instinctively ducked inside the basket.

The passengers added that after the support crew arrived in their vehicles, they appeared to be more concerned with packing up the balloon than transporting the passengers.

As a result of a head injury, the injured passenger was unable to return to work for seven weeks. Other passengers reported that they too were hit by tree branches but were not injured.

Damage assessment

The envelope was returned to its manufacturer for damage assessment and repair. The manufacturer found that seven panels had been damaged; of these three were completely replaced, three were partially replaced and one was patched.

Operating company's operations manual

The balloon operating company's Operations Manual stated that the maximum number of occupants for G-KNIX, including the pilot, was 16. Because there were 17 occupants in the balloon at the time of the accident the flight appears to have been operating outside the terms of the company's Air Operator's Certificate. The company reported that this was a result of an oversight in the compilation of their operations manual. The balloon was insured to carry 16 passengers which, together with a pilot, makes 17 persons in total but the insured number of passengers had been inadvertently carried into the Operations Manual as the maximum number of occupants. Also, the weight computation with 17 people on board indicated that the balloon was 726 lb lighter than the maximum lift weight permitted.

Discussion

It appears from the passengers' comments that the pilot may have had enough time to abort the attempted landing safely. Thus there is a possibility that the

pilot failed to prioritise his actions, to the detriment of the safety of the balloon and its passengers, and was distracted by trying to obtain permission to land.

The adverse effect of a gust of wind cannot be discounted. However, had the pilot kept the balloon at a height above that of the surrounding trees while awaiting a decision, the probability of colliding with a tree would have been much reduced.