Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

AVIATION INVESTIGATION REPORT
A10O0137

IN-FLIGHT FIRE AND PRECAUTIONARY LANDING

SUNDANCE BALLOONS (2008) LTD.
HOT AIR BALLOON C-GDCG
OTTAWA, ONTARIO
14 JULY 2010

Canada

Aviation Investigation Report

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Synopsis

The hot air balloon (registration C-GDCG, serial number 4319) operated by Sundance Balloons (2008) Ltd., launched at approximately 1925 Eastern Daylight Time from Carleton University, Ottawa, Ontario, for a local flight. On board were the pilot and 12 passengers. While over the city at approximately 700 feet above ground level (agl) the balloon encountered turbulence. The pilot initiated a descent with the intention of executing a precautionary landing. The balloon's rate of descent increased unexpectedly, and the pilot had to light all 3 burners to arrest the descent. During this time the lower portion of the balloon's envelope collapsed into the path of the burner flame. Some of the lower envelope panels caught fire, but self-extinguished once the flame was removed. The balloon's basket struck the tops of some trees, and then the balloon climbed to approximately 1000 feet agl. The pilot then executed another descent to land. The balloon struck trees during the landing, and subsequently came to rest in a residential area of Ottawa at about 2000.

Ce rapport est également disponible en français.

Other Factual Information

History of Flight

On the day of the occurrence flight, the pilot obtained 3 hourly aviation routine weather reports (METAR) [1] for the Ottawa/Macdonald-Cartier International Airport (CYOW) and 3 METARs for Ottawa/Gatineau Airport (CYND), as well as the winds and temperature aloft forecast (FD) for the Ottawa area. All reports indicated that the winds were light from the east for the duration of the evening flight. The last weather received by the pilot was the 1700 [2] METARs, about 2 hours before the flight took place. Just prior to departure, the pilot launched 2 pilot balloons (pi-bal) [3] that indicated the winds were light. The landing destination was planned for a field near the Queensway Carleton Hospital on the west side of Ottawa.

The passengers met at Carleton University, located southwest of downtown Ottawa, and were given a pre-flight briefing by the pilot. The pilot contacted Air Traffic Services (ATS) at 1925 to advise that the balloon was airborne from Carleton University, and the flight was headed in a southwesterly direction. The next communication with ATS was at 1943 when the pilot advised that the balloon was crossing the threshold of Runway 14 at CYOW. The active runway was Runway 07.

Just northwest of the airport, the flight encountered turbulence at about 700 feet above ground level (agl). In an effort to avoid the turbulence, the pilot initiated a precautionary landing. The pilot did not communicate this to ATS. The parachute vent was not utilized to initiate the descent; the pilot let the air cool, and the balloon came down on its own. Subsequently, the pilot lit one burner to control the descent rate, however the rate continued to increase due to a downdraft associated with the turbulence. This required the use of maximum available power, and the pilot lit the remaining 2 burners to arrest the descent, and avert a collision with the ground. There was significant twisting and lateral movement of the balloon such that the lower third of the leading edge deformed as the balloon approached the ground. The deformation caused the lower portion of the envelope to contact the burner flame and ignite, and some of the lower envelope panels caught fire. The passengers crouched in the basket because of the intense heat emitted from the burner.

At approximately 1951, at about 25 feet agl in the final seconds of its descent, the balloon's basket struck the tops of trees before quickly ascending in response to the recently applied burner heat. During the ascent the flame was turned off by the pilot, and the balloon material self-extinguished as designed. The balloon regained its shape during the ascent, and there was a rapid gain in altitude even though the burner was off. The pilot pulled the vent rope to arrest the rate of climb and the balloon levelled off at about 1000 feet agl.

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1 An aviation report, normally taken and disseminated on the hour, describing the actual weather conditions at a specified location and at a specified time as observed from the ground.

2 All times are Eastern Daylight Time (Coordinated Universal Time minus 4 hours).

3 Pilot balloon is a small meteorological balloon used to track air currents.

At about 1954 the pilot advised ATS of the situation and that he was planning a precautionary landing. ATS inquired as to whether the flight required assistance. The pilot declined as he saw fire trucks in the vicinity and believed they were responding to his situation.

The pilot initiated a second precautionary landing attempt due to concerns regarding the turbulence and the condition of the balloon envelope. The balloon was still in turbulent air during this attempt and the pilot had difficulty controlling the descent. The pilot's first choice for this landing was a park; however, the pilot chose to lower the balloon into a residential area instead of extending the flight. The pilot told the passengers to assume the emergency position as briefed before the flight. The passengers crouched down with knees fully bent, facing towards the centre of the balloon. At approximately 2000, the balloon struck 2 trees, slid downwards, and came to rest on a lawn in a residential area. Immediately a passenger, also a balloon pilot, jumped from the basket to help secure the balloon's envelope.

Emergency services had received calls from the general public concerning a balloon being on fire, and local emergency response units were on scene to secure the balloon's landing site. The firefighters commanded, and assisted the passengers to evacuate. The pilot intervened, and told the passengers to stay in the basket as previously briefed until the envelope was sufficiently deflated to the point where there was no risk of the balloon becoming airborne. By this time 3 of the 12 passengers had evacuated the balloon.

The passengers' well-being was confirmed by the paramedics, and they were driven to Carleton University by Sundance Balloons (2008) Ltd. ground crew. There were no injuries, or property damage.

Aircraft Information

Records indicate that the balloon, C-GDCG, was certified, equipped and maintained in accordance with existing regulations and approved procedures. The weight and balance of the balloon was within limits. It was equipped with a variometer and altimeter. The balloon's envelope was constructed of a fire resistant material that is designed to roll in on itself and self-extinguish.

Pilot Information

Records indicate that the pilot was certified and qualified for the flight in accordance with existing regulations. The pilot held a valid Balloon Pilot (BB-Ballo-All) licence for all non-power driven balloons, and a valid Category 3 medical certificate. The pilot had accumulated approximately 456 hours of total flight time in balloons.

Company and Regulatory Information

Sundance Balloons (2008) Ltd. operates over 25 balloons nationwide. The occurrence balloon was registered and operated by Sundance Balloons (2008) Ltd. The company was authorized to carry fare-paying passengers by Transport Canada (TC) by way of a Special Flight Operations Certificate (SFOC).

To obtain an SFOC, the applicant provides basic information including a list of the balloons to be flown, as well as the registration, make, model, and size of each. TC then issues an SFOC that states that the balloon operator is adequately equipped and able to conduct a safe balloon operation for the carriage of fare-paying passengers. TC normally does not inspect the applicant after issuing the SFOC. Such was the case for Sundance Balloons (2008) Ltd.

Although the SFOC states that it certifies that the balloon operator is adequately equipped and able to conduct a safe balloon operation carrying fare-paying passengers, there is no oversight program in place to assure that standards are maintained once the SFOC is issued. Balloon operators are not regulated under Part VII (Commercial Air Services) of the *Canadian Aviation Regulations* (CARs). Unlike most air operators carrying fare-paying passengers in Canada, balloon operators will not be subject to TC's requirement for Safety Management Systems (SMS).

The TSB investigated a non-fatal accident involving a hot air balloon that occurred 11 August 2007 (A07C0151). The TSB found that, while some commercial balloon operators in Canada have fare-paying passenger loads equal to those of commuter and air taxi operators, their passengers are not assured of the same level of safety and oversight by regulations and standards. The Board was concerned that, without adequate standards and regulations for balloon operators, balloon passenger safety will be compromised. As a result, the TSB recommended [4] that: "The Department of Transport ensure that passenger-carrying commercial balloon operations provide a level of safety equivalent to that established for other aircraft of equal passenger-carrying capacity."

TC completed a risk assessment in 2008. The risk assessment stated in part that "the team felt the regulatory structure was adequate but the departmental direction for monitoring the activity, albeit low risk, is somewhat lacking." The risk assessment recommended that the TC oversight program be amended to address passenger-carrying commercial balloon operations as outlined in its report. Fifteen risk control methods were identified to develop a safety oversight program.

In November 2009, TC brought the issue of balloon safety to the Canadian Aviation Regulation Advisory Council (CARAC) Technical Committee. As a result of these discussions, a Balloons with Fare-Paying Passengers Working Group was formed in June 2010. The purpose of this Working Group is to make recommendations on how best to provide an adequate level of safety to the public involved in sightseeing activities. The 2008 risk assessment findings guided the terms of reference for the working group. It is anticipated that the working group will present an interim report in September 2011.

TC's written response to the recommendation indicated that it intends to conduct a risk assessment and determine an appropriate means of addressing the issue of commercial passenger-carrying balloon operations. This study will address both the SFOC process and commercial passenger-carrying balloon operation oversight. Once the review is complete, regulatory changes will be proposed, should they be considered necessary. However, the Board believes that TC's proposed review and regulatory amendment process will not yield any

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4 TSB Recommendation A08-01.

specific course of action that, in the short term, would reduce or eliminate the deficiency identified in the TSB recommendation.

As TC's response indicates that it continues to progress safety action that, if fully implemented, will address the deficiencies underlying the recommendation, the TSB assessed TC's response as demonstrating a Satisfactory Intent.

Although not required in CARs, Sundance Balloons (2008) Ltd.:

- produces and maintains operations and maintenance manuals;
- requires all employees to adhere to them; and
- provides an annual pre-season, 4-day pilot training session and examination.

Sundance Balloons (2008) Ltd. company operations manual does not include a section for specific emergencies and procedures. Rather, the operator relies on the pilot's experience to operate the balloon in a safe manner. The company operations manual directs pilots to advise passengers to prepare themselves for all landings by bracing themselves and by bending their knees. There was no guidance available in the company operations manual or balloon manual for a landing into trees. [5]

Passenger Safety Information

Some balloon manufacturers supply burner frames with aluminum heat shields for passenger comfort and protection. There is no mandated requirement for equipment to protect passengers against high temperatures and heat in the event of a balloon envelope fire. Excessive heat can develop over passenger areas if the envelope is deformed and the hot air is forced towards the passengers.

Weather Information

Routine hourly weather reporting services are available at CYOW and CYND approximately 5 minutes after each hour. They are available to pilots by telephone or Internet.

The pilot checked the CYOW and CYND weather prior to the flight, and the 1500 to 1700 hourly reports were as follows: wind from the east at less than 8 knots, visibility 15 statute miles (sm) with few clouds based at 4500 feet agl. The graphical area forecast did not indicate any turbulence in the vicinity of CYOW.

The CYOW weather report issued at 1900 was as follows: winds 090° true (T) at 4 knots, visibility 15 sm, with few towering cumulus based at 5000 feet agl, temperature 27°C and dew point 20°C, altimeter setting of 30.02 inches of mercury.

Prior to take-off, the occurrence pilot discussed the cloud conditions with another pilot and determined that the clouds appeared to be dissipating.

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[5] For example, the Federal Aviation Administration Balloon Flying Handbook (U.S.) states that for landing into trees occupants should turn around and face the rear to protect their faces and eyes from branches and twigs.

Analysis

Records indicate that the hot air balloon was certified, equipped, and maintained in accordance with existing regulations and approved procedures. The analysis focuses on the weather, the pilot's decision making, and company procedures and regulations.

The forecast obtained by the pilot that afternoon indicated suitable weather for the planned flight. Prior to take-off, the pilot discussed the cloud conditions with another pilot and was satisfied that the flight would be conducted in favourable weather conditions. The 1900 hourly weather indicated towering cumulus in the vicinity. It is likely that the turbulence that prompted the pilot to initiate a precautionary landing was associated with these clouds.

A high sink rate developed during the initial landing attempt, requiring the pilot to use maximum available power to arrest the descent. During this descent, the bottom of the balloon envelope came into contact with the burner flame, igniting some of the panels. The balloon contacted trees just as the influx of hot air took effect and the balloon rapidly ascended. The pilot turned the burners off during the ascent and the balloon material self-extinguished.

During the second landing attempt, the pilot was concerned about controlling the balloon in the turbulence as well as the condition of the balloon envelope. This influenced the decision to land in the residential area rather than prolong the flight to a more suitable site.

As the balloon was in its second descent for landing, the passengers were advised to assume the position described during the pre-flight briefing. This position was consistent with the company operations manual (COM); however, it was not suited for this specific landing emergency. There is no current requirement under CARs for balloon operators to produce a COM; if the operator chooses to provide one as a best practice, such a COM would benefit from specific procedures for emergency landings. There is a risk that passengers may be injured because they are not properly prepared.

It was only during the second landing attempt that the pilot advised ATS of his situation and intentions. The pilot declined emergency assistance when it was offered by ATS because he saw the emergency response vehicles on the ground following the balloon. Had these vehicles been dispatched for another event, then the emergency response to the balloon would have been delayed.

After the balloon landed on a lawn in a residential area, a conflict arose between local emergency services and the pilot as to the procedure and time to evacuate the passengers. Without adequate information, emergency response units may not take appropriate steps to safeguard passengers, the public and property.

Although TC is currently working to address the issue of balloon operations with fare-paying customers, until TC changes the current regulatory framework, there remains a shortfall in the safety oversight for balloon operations as compared to other aircraft of equal passenger-carrying capacity.

Findings as to Causes and Contributing Factors

1. The flight encountered localized turbulence that prompted the pilot to initiate a precautionary landing. A high sink rate developed during this initial landing attempt requiring the pilot to use maximum available power to arrest the sink rate.

2. During this descent, the bottom of the balloon envelope came into contact with the burner flame, igniting some of the panels. As the balloon climbed in response to the influx of hot air, the pilot turned the burners off which allowed the balloon envelope material to self-extinguish.

3. During the second landing attempt, the pilot was concerned about controlling the balloon in the turbulence and the condition of the balloon envelope. This influenced the decision to land in the residential area rather than prolong the flight to a more suitable site.

Findings as to Risk

1. Without the same degree of regulatory oversight as other aircraft of equal passenger-carrying capacity, there may not be an equivalent level of safety for balloon operations.

2. The pilot did not define the emergency nature of the precautionary landing to ATS and declined emergency assistance. This could have delayed emergency response.

3. Without adequate information on balloon operations, emergency response units may not take appropriate steps to safeguard passengers, the public and property.

4. With the absence of specific emergency procedures for balloon landings, there is a risk that passengers may be injured because they were not properly prepared for landing.

Other Finding

1. The balloon envelope material self-extinguished, as designed, when no longer in the direct influence of the burner flame.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 14 July 2011.