

AVIATION OCCURRENCE REPORT

STALL AND LOSS OF CONTROL DURING INITIAL CLIMB

**CHAMPION/7EAC C-GUHX
SAINTE-MARIE-SALOMÉ, QUEBEC
15 OCTOBER 1994**

REPORT NUMBER A94Q0198

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

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Summary

The passenger and the pilot, who was also the owner of the aircraft and held an instructor rating and night flight endorsement, had planned a pre-dawn local flight. They made a night take-off around 0600 eastern daylight saving time (EDT) from the unmarked runway at Sainte-Marie-Salomé, Quebec. After the take-off, the pilot executed a right turn. The aircraft stalled at low altitude and crashed in a corn field. The two occupants sustained fatal injuries on ground impact.

Ce rapport est également disponible en français.

¹ All times are EDT (Coordinated Universal Time minus four hours) unless otherwise noted.

Other Factual Information

The pilot was qualified in accordance with existing regulations and had accumulated 937 flying hours, including 253 hours in the Champion aircraft, registration C-GUHX. His most recent night flight in this aircraft was on 14 June 1994, four months before the accident. On 05 June 1994, he had also made a night flight in this aircraft from the Sainte-Marie-Salomé aerodrome. He was very familiar with this aerodrome and the surrounding area.

The Champion was certified, equipped, and maintained in accordance with existing regulations and approved procedures. The take-off weight of the aircraft was calculated at 110 pounds over the maximum allowable, and the centre of gravity was slightly beyond the aft limit. Excessive weight and an aft centre of gravity are conducive to stalling. The on-board instruments met the minimum regulatory requirement for night flying. The aircraft was not equipped with a horizon indicator, nor was one required.

The propeller and spinner exhibited no signs of rotation or cone stains, indicating that the engine was producing little or no power and that the propeller was barely turning on impact. A complete examination of the engine of the Champion revealed no anomalies and no foreign matter in the fuel system. Following the impact, the fuel drained out through the broken fuel lines and no samples could be collected. Water or other contaminants could have caused the engine to stop abruptly. The manufacturer authorizes the use of automotive gasoline (MOGAS) in this aircraft. The pilot had topped up with this type of fuel the day before the accident. This fuel is more volatile than other aviation fuels (AVGAS) and more susceptible to carburettor icing, which would have caused a progressive loss of power.

Examination of the airspeed and turn and bank indicators of the aircraft by the TSB Engineering Laboratory yielded no useable information. However, the tachometer indicated that rpm was close to zero at the time of the crash. Also, analysis of the crushed portions of the exhaust stacks adjacent to the cylinders indicated that they were at normal operating temperature at the time of impact.

At 0600 EDT, there were no clouds; the temperature was minus one degree Celsius, the dew point was minus three degrees Celsius, and the winds were light. Nautical twilight, when the outline of objects on the ground is visible, was at 0605 EDT. It was daylight by 0640 EDT, and sunrise was at 0705 EDT. Conditions were conducive to the formation of frost and ice on surfaces and severe carburettor icing. The temperature fell until sunrise, then rose again, creating more severe frost and icing conditions at sunrise. The frost was light around 0600 EDT, and icing was present on the wings of another aircraft at 0800 EDT.

Runway 21 used for the take-off is a dirt and sand road oriented 030/210 degrees magnetic. The runway measures 3,000 feet long by 15 feet wide and is not marked. There are trees about 50 feet in height along both sides of the runway over a distance of about 2,000 feet. The trees located between 30 and 50 degrees on the right side of the runway are considerably farther away, and pilots who use this runway on a regular basis always execute a right turn after take-off.

The Champion crashed 800 feet to the right of the runway 21 centre line and 800 feet past the departure end. The aircraft exhibited all the signs of a low-altitude stall but no evidence of a spin. The first person to arrive at the accident site, around 0845 EDT, indicated there were none of the noises or cracking sounds normally associated with an engine cooling down, and no evidence of ice on the wings.

There were no witnesses to the accident. However, a schedule of activities of the pilot and passenger established their arrival time at the aerodrome at 0540 EDT. As 15 to 20 minutes would be sufficient to prepare for take-off, the Champion would have taken off around 0600 EDT.

The wreckage was discovered around 0830 EDT by another pilot during a take-off from the same runway. Based on the overflight times of the Search and Rescue satellites (SARSAT), it was established that the accident occurred between 0544 and 0718 EDT. Reading of the Montreal surveillance radar tapes (ASR 5), based on primary information, indicated that no air traffic movements originated and terminated within a five nautical mile (nm) radius of Sainte-Marie-Salomé between 0540 and 0718 EDT.

The take-off from the unmarked runway 21 and the initial climb were executed in a southwesterly direction toward unlit fields which offered little contrast with the sky and made the horizon hard to distinguish at night. Also, when the nose of the aircraft is pitched up to establish a climb attitude, the pilot loses his references with the ground ahead of him.

To orient themselves in flight and determine their position in relation to the ground, pilots use their senses of sight, hearing, and touch, and their kinaesthetic (muscle-bone-joint) sense. In visual flight by day, the information needed to maintain control of the aircraft is provided by visual reference to the ground or horizon. In visual flight by night, pilots must also refer to the horizon, if it is visible, as well as outside lights. They must also refer to a few essential instruments to maintain the aircraft in the correct attitude. These instruments were on board the Champion. Without sufficient visual references, pilots can become disoriented and may not realize the actual position of the aircraft in relation to the ground. Disorientation is defined as the false perception and/or interpretation of aircraft attitude with regard to horizontal and gravitational references.

Analysis

The sequence of events could not be determined. However, the factual information established that there was a stall and loss of control at low altitude, that the engine was producing little or no power, and that the propeller was barely rotating at the time of the crash. In addition, the normal exhaust temperature indicates that power decreased rapidly shortly before impact.

The cause of the rapid power decrease could not be determined. There was no evidence that the decreased power on impact was caused by engine component failure. It is unlikely that the pilot throttled back to idle to reduce impact deceleration forces because, based on the marks and the tachometer reading near zero, the propeller was barely turning. However, the decrease in power could have been the result of a power loss due to fuel system contamination or carburettor icing. Although it could not be determined that the fuel was contaminated, the rapidity of the power decrease suggests that it is more likely that a power loss was caused by fuel contamination than by carburettor icing.

The cause of the stall and loss of control at low altitude could not be determined. Meteorological conditions do not appear to have been conducive to icing on the surfaces before or during the flight, and probably did not contribute to the loss of control. However, the aft centre of gravity and excessive weight of the aircraft were conducive to stalling.

If a power loss occurred during the initial climb, the pilot would have had to react to this emergency while very close to the ground, and with obstacles in his path. Dealing with this problem could have diverted his attention from his primary task of flying the aircraft, or caused spatial disorientation, resulting in a stall and loss of control.

The exact time of the accident could not be determined. However, based on the pilot and passenger's schedule and the 15 to 20 minutes of preparation normally required, the take-off probably occurred in night VFR conditions around 0600 EDT. The location of the crash site, near the airport and along the usual take-off path, indicates that the accident occurred during the initial climb after take-off, which was corroborated by the absence of radar returns in the immediate area during the relevant period. In addition, the absence of the cracking sounds that are associated with engine cool-down indicates that the crash occurred well before the first person arrived at the site.

Outside visual references were probably limited because: 1- the take-off was executed during the hours of darkness from an unmarked runway; 2- the horizon was difficult to see in the dark; 3- poor outside light conditions existed along the take-off path over unlit fields; 4- the pitched-up attitude obscured the view of the ground below and ahead of the aircraft during the initial climb. Lack of external visual references during the initial climb may have resulted in a stall and loss of control following spatial disorientation.

The stall and loss of control occurred at low altitude, and the available external visual references, which were probably limited, did not allow the pilot to effect recovery before the crash.

The following laboratory reports were completed:

LP 174/94 - Instrument Analysis; and
LP 175/94 - Exhaust Pipe Analysis.

Findings

1. The engine was developing little or no power and the propeller was barely turning at the time of the crash.
2. The cause of the rapid decrease in engine power shortly before the crash could not be determined.
3. It could not be determined whether the rapid decrease in power occurred before or after the aircraft stalled at low altitude.
4. The aircraft was 110 pounds overweight and its centre of gravity was beyond the aft limit, contributing to the possibility of a stall.
5. The low altitude and the available external visual references, which were probably limited, did not allow the pilot to effect a recovery after the stall and loss of control.

Causes and Contributing Factors

The cause of the stall and loss of control at low altitude could not be determined. The rapid decrease in engine power, the overloaded state of the aircraft, and the aft centre of gravity were contributing factors in the accident.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson John W. Stants, and members Zita Brunet and Hugh MacNeil, authorized the release of this report on 21 April 1995.