

AVIATION OCCURRENCE REPORT

COLLISION WITH TERRAIN

NELSON MOUNTAIN AIR LIMITED
CESSNA 337D SUPER SKYMASTER C-FYOC
SALMO, BRITISH COLUMBIA 11 NM SE
3 AUGUST 1997

REPORT NUMBER A97P0211

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 Cessna 337 aircraft departed Nelson, British Columbia, at 1313 Pacific daylight saving time (PDT) for a fire-patrol flight over the south-east region of British Columbia. The aircraft was crewed by a pilot and an observer, and they had been tasked by the British Columbia Forest Service to detect and report smoke or forest fires. The flight was uneventful for the first two hours, and at 1511 the pilot reported by radio to the Forest Service Fire Centre dispatcher that they were five nautical miles (nm) east of Salmo, heading north.

Witnesses reported that at about 1518 they saw the aircraft fly at low level up a valley, commence a steep, left turn at the end of the valley, and crash into the mountain side. The aircraft was destroyed at impact, and the two occupants were fatally injured. There was no fire.

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All times are PDT (Coordinated Universal Time minus 7 hours) unless otherwise noted.

Other Factual Information

The accident occurred in a steeply-rising mountain bowl at the end of a rising valley. As the valley rises, it makes a 60-degree bend around a knoll. To a pilot flying up the valley toward the knoll, the valley ahead would appear to continue around the knoll for a long distance; however, around the knoll there is the mountain bowl, which cannot be seen until the turn is completed. The mountain bowl walls rise steeply, and the aircraft struck the side of the mountain at the 5,800-foot level, in a steep, nose-down attitude, and flipped onto its back.

The wreckage trail was short, characteristic of an aircraft that had struck the ground at a steep impact angle. Witnesses reported that the aircraft did not hit any trees prior to impact, and no evidence of a tree-strike was found at the accident site.

The pilot began his flying training in Castlegar in 1989. He had been employed by the company since 1996 as flight instructor and charter pilot. One of his duties as a flight instructor was to teach courses on mountain flying. The pilot had a total flying time of approximately 1,200 hours, with about 34 hours of multi-engine experience, including 21 hours on the Cessna 337 type. He received his ground and flight training on the Cessna 337 in April 1997, and successfully completed his Transport Canada pilot proficiency check (PPC) on 29 April 1997. The pilot was certificated and qualified for the flight in accordance with existing regulations.

The aircraft maintenance documents record that the aircraft, serial number 337-1107, was certificated, equipped, and maintained in accordance with existing regulations and approved procedures. There was nothing found to suggest any airframe failure or system malfunction had occurred either before or during the flight.

According to the aircraft manufacturer's performance data, the stall speed of a Cessna 337 at its maximum gross weight of 4,400 pounds, with the landing gear and flaps retracted and the wings level, is 80 miles per hour (mph) indicated airspeed; in a 60-degree bank turn, it is 114 mph. The maximum rate-of-climb that an aircraft could achieve, in the same environmental conditions that existed at the time of the accident, was calculated to have been about 600 feet-per-minute at 105 mph indicated airspeed.

When the Protection Branch of the BC Ministry of Forests (the Forest Service) requires an aircraft to patrol an area of their interest, it is normal practice for them to submit the flight request to the aircraft company by facsimile. The proposed flight route is assigned by the Forest Service, and is based upon the areas they feel are potentially endangered by fire. The pilots and observers dispatch themselves in accordance with the 'self-dispatch' procedures in the company operations manual. Once the aircraft are airborne, en route flight-following is provided by the South-east Fire Centre of the Forest Service. The crews communicate with the Centre at specific points or times on their route, or when they spot a fire.

The BC Forest Service provided a four-hour training course to the pilots and observers of the aircraft company at the beginning of the fire season to familiarize them with the procedures of detecting and reporting of forest fires. The Forestry Service's manual, *Air Patrol Course*, states that "...rock slides, pollen flights and low hanging wispy clouds can give the illusion of smoke." In such cases, the pilot must check it out. On a previous flight, the pilot of the accident aircraft made several low passes at what initially appeared to be smoke, but was found to have been dissipating cloud. The *Air Patrol Course* manual instructs pilots to fly overhead and conduct a high-level reconnaissance of the smoke or fire prior to any low-level reconnaissance. Furthermore, it states that "...the aircraft must always be in a position to leave the area without climbing, and

up-valley flight toward a dead-end must always allow room for a safe 180-degree turn to downhill."

There were four witness to the accident. Two of the witnesses were hiking on a ridge about 0.75 nm from the crash site when the sound of the aircraft caught their attention. They saw the aircraft flying up the valley, come around the knoll, continue flying until it reached the bowl, then commence a steep left turn; they described the wings as being nearly vertical during the turn. They reported that the aircraft had almost completed the turn when it hit the side of the mountain bowl. Two other witnesses were in the valley driving motorcycles down a dirt road, when they stopped and turned off their engines. They then saw the aircraft flying up the valley at 300 to 400 feet above the valley floor, proceed overhead up the valley, and crash about 0.25 nm from them. They reported that because the weather was hot and dry, the roads were dusty, and their motorcycles had been raising some dust. All of the witnesses reported that the aircraft was in a climbing attitude, with the wings level, while coming up the valley. They also reported that the engines sounded as if they were at high power, and that the aircraft appeared to be under control, with no indication of any difficulties. They also noted that the landing gear and flaps were retracted.

The witnesses describe the weather conditions at the time of the accident as sunny, clear, and hot. The temperature was possibly as high as 30°C. The wind at the crest of the mountain was estimated to have been about 15 knots and going across the tops of the mountains; however, the wind down in the bowl was calm.

Analysis

Witness information concerning the aircraft immediately before impact indicates that it was operating normally and under control while flying up the valley. As well, because the pilot had called the Fire Centre seven minutes before the occurrence and gave no indication that there was any problem with the flight or the aircraft, it is unlikely that mechanical defect contributed to this accident. After the radio call, however, it is possible that the crew observed the dust being raised by the motor-cycles in the valley and, suspecting that it was smoke from a forest fire, decided to carry out low-level reconnaissance before reporting the fire to the Fire Centre.

In any event, the pilot flew up a valley that would likely have given him the illusion of there being a suitable exit route. Furthermore, because of the high outside air temperature and the high operating altitude above sea level, the aircraft performance was reduced, such that the available rate-of-climb was only sufficient to keep the aircraft at a near-constant height above the rising valley floor.

It is likely that when the aircraft turned around the knoll, the pilot saw the mountain bowl, realized that the aircraft could not out-climb the steep walls of the bowl ahead, and decided to turn around. The combination of the flight path angle, reported by witnesses as being parallel to the rising valley floor, and the steep impact angle is characteristic of an aircraft that has stalled and struck the ground. When the aircraft entered the steep turn reported by the witnesses, the aircraft's stall speed would have increased; this airspeed would have now been higher than the suspected climb speed of about 105 mph, and, as a result, the aircraft would have stalled in the turn. The aircraft was reported to be 300 to 400 feet above the ground, and, in this situation, there would have been insufficient height for the pilot to recover from the stall before the aircraft struck the ground.

Findings

1. The pilot was certificated and qualified for the flight in accordance with existing regulations.
2. There was nothing found to suggest any airframe failure or system malfunction had occurred either before or during the flight.
3. The valley and surrounding terrain created an illusion that a suitable exit route existed at the end of the valley.
4. The combination of high air temperature and altitude reduced aircraft climb performance.
5. When the pilot entered a steep left turn to avoid the rising terrain, the stall speed increased; as a result, the aircraft stalled.
6. When the aircraft stalled, its height above the ground was insufficient for the pilot to recover from the stall.

Causes and Contributing Factors

While the pilot was manoeuvring to avoid rising terrain, the aircraft stalled at a height which was insufficient to allow him to effect a recovery. Contributing to the accident was the reduced aircraft climb performance and the illusion created by the features of the surrounding terrain.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson Benoît Bouchard, and members Maurice Harquail, Charles Simpson and W.A. Tadros, authorized the release of this report on 25 February 1998.