Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

AVIATION INVESTIGATION REPORT

A99Q0062

LOSS OF CONTROL

MYRAND AVIATION

CESSNA 335 C-GMZV

GASPÉ, QUEBEC

13 APRIL 1999

Canada

Aviation Investigation Report

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Summary

The Cessna 335, registration C-GMZV, serial number 3350029, was on an instrument flight rules flight between Québec Airport and Gaspé Airport in Quebec with two pilots and two passengers on board. After checking the prevailing weather conditions at destination, the pilot decided to make a back course approach on runway 29. The pilot reported by radio at two miles on final approach. This was the last radio contact with the aircraft. Emergency procedures were initiated, and searches were conducted. The aircraft was found by a search team travelling along a dirt road bordering the runway. The aircraft was found resting about 1000 feet in front of the airport terminal where it crashed and was consumed by a very intense fire. All four occupants received fatal injuries, and the aircraft was destroyed.

Ce rapport est également disponible en français.

Factual Information

The pilot-in-command was certified and qualified for the flight. He had a total of about 1300 hours' flying time, including about 400 hours on multi-engine aircraft and 32 hours on type. He had just been promoted pilot-in-command on the company's two twin-engine Cessna aircraft. He had about 210 instrument hours.

The copilot was certified and qualified for the flight. He had a total of about 2020 hours' flying time, including about 570 hours on multi-engine aircraft and 10 hours on type. He had undergone a pilot proficiency check on the Cessna 335 the previous week. He had about 100 instrument hours.

The autopsies on the pilots' bodies did not reveal any prior medical problem. Multiple injuries were the cause of death. The pilots' toxicological test results for common drugs and alcohol were negative.

The aircraft was certificated, equipped, and maintained in accordance with existing regulations and approved procedures. No indication was found of any airframe failure or system malfunction during the flight or the approach. The aircraft had no known deficiencies before the flight.

At the time of the accident, Myrand Aviation operated a fleet of four aircraft: one Cessna Citation, one Beechcraft King Air 100, one Cessna 401, and one Cessna 335. The company was created to provide charter flights. The company president also served as operations manager. The chief pilot and the maintenance coordinator reported to the president. The operations manager was responsible for day-to-day air operations, and the chief pilot looked after pilot training and procedures. The president had retained control over the company's hiring policies and looked after general supervision of flight dispatch and flight management. A pilot self-dispatch system applied to all flights. Because the president also performed line flights, he was not always on site to oversee the loading of aircraft and the weather conditions accepted by pilots. On the morning of this flight, however, the president was on site while the pilot was preparing for his flight. Upon studying the weather conditions, the president advised the pilot-in-command to proceed to Charlo, New Brunswick, if unable to land at Gaspé because of weather conditions. The passengers had planned the flight with the company some time before. The investigation could not determine whether the passengers or the company had pressured the pilot.

About one hour before the flight, the pilot requested the weather at destination and the forecasts. The weather observations by the Gaspé weather specialist at 1100 Coordinated Universal Time (0600 eastern standard time), were as follows: wind 360 degrees true at two knots, visibility one-half mile in snow, measured ceiling 800 feet, sky overcast in snow. When the pilot filed his flight plan, the Gaspé forecasts did not predict ceilings below 800 feet in snow and visibility less than one-half mile. None of the runways is equipped with runway visual range (RVR) equipment for measuring the horizontal visibility.

During the flight, the weather conditions deteriorated. When the pilot called the flight service station (FSS) specialist as he was over Mont-Joli, he was given the weather conditions taken on

the hour at Gaspé: visibility one-quarter mile in heavy snow and vertical visibility 300 feet. The specialist also offered to give him the most recent weather conditions for the airport at Charlo, his alternate airport. The pilot judged that he did not need that information at that stage of the flight. During the descent to Gaspé Airport, the Québec FSS specialist gave him the latest weather sequence transmitted to him by the weather specialist stationed at Gaspé Airport: measured ceiling 200 feet, sky overcast, heavy snowfall, visibility one-quarter mile.

On the morning of the accident, one of the two companies providing scheduled service between Québec, Mont-Joli, Gaspé, and the Magdalen Islands abandoned the approach to Gaspé because of the adverse weather conditions.

The last communication between the FSS specialist and the pilot took place at 2.2 miles on final. The aircraft suffered substantial damage during the initial impact with the ground. The aircraft wreckage was spread from the initial point of impact to where the aircraft came to rest. The aircraft was flying on a heading of about 230 degrees magnetic with an approximately 60-degree left bank when it struct the ground. The impact site was relatively flat. Along the aircraft's path were trees some 10 metres tall, spaced five to six metres apart. An intense fuel-fed fire, which consumed a large part of the aircraft, broke out after the impact.

The landing gear selector was found in the up position. The flaps were at 15 degrees, and the aircraft was in overshoot configuration. Examination of the engines at the accident site showed that they were producing power at impact and that the damage was caused by the impact. The propellers were sent to the manufacturer for analysis. Dismantling the propellers confirmed that the marks left by the impact corresponded to a fine pitch angle. Further, the marks on the pinions caused by the impact were identical for both propellers, indicating that they were at the same pitch and engine speed at the time of the accident.

Several instruments, including the automatic pilot, were recovered and sent to the TSB Engineering Branch Laboratory for examination. The results indicate that all the instruments were functioning normally and that the automatic pilot was not engaged at the time of the accident.

The accident was not survivable because of the high deceleration forces and the severity of the fuel-fed fire. The emergency locator transmitter (ELT) activated on impact. It was found buried in the snow a few metres from the point of impact. The antenna was torn off at impact, considerably reducing the signal range. An airport employee travelling near the area picked up the weak ELT signal on a detector and located the wreckage of the aircraft in the snowstorm.

Runway 11/29 is equipped with an aircraft radio control of aerodrome lighting system (ARCAL) operating on the 122.3 megahertz frequency. The aerodrome lighting is activated for about 15 minutes by keying the microphone button seven times for high intensity. The system was serviceable on the day of the accident. The pilot did not activate the ARCAL system during the approach.

According to the instrument approach chart LOC(BC)/DME RWY 29, the minimum altitude is 440 feet above sea level (asl), 336 feet above ground level, and the minimum horizontal visibility must be 1 nautical mile (nm). The pilot advised the Québec FSS specialist that he was going to make a back course (BC) approach on runway 29 at Gaspé. This approach brings the aircraft

successively to an altitude of 2300 feet asl on the 14 nm DME (distance-measuring equipment) arc and to 440 feet asl, the decision height that must be maintained until 2.7 nm DME, the threshold of runway 29. If the crew has not established visual contact with the runway or the runway lights at this height and distance, they must make a missed approach. A missed approach involves climbing to 3500 feet asl on a magnetic heading of 303 degrees and then making a left turn to the Gaspé VOR (very high frequency omnidirectional radio range). (See Appendix A.) All the navigation systems required for the approach were serviceable on the day of the accident.

The most accurate sensory input available to pilots on the attitude and motion of the aircraft comes from the visual clues provided by the land horizon and/or the aircraft's flight instruments. When such input is not available—for example, when gloom or weather conditions mask the horizon or when the pilots' attention is briefly diverted from the instruments showing the aircraft's attitude—the pilots' sense of spatial orientation may be taken over by the inner ear, a very unreliable source of sensory information in flight. Spatial disorientation occurs when pilots' sense or "perception of the orientation" of the position, motion, or attitude of their aircraft or of themselves with respect to the earth's surface and the gravitational vertical is based on inaccurate or misinterpreted sensory input. The technical term used to describe this false illusion is "somatogravic illusion." Pilots with limited instrument flight time are most susceptible to spatial disorientation.

The false-climb illusion is one form of spatial disorientation. Such an illusion is likely to occur during acceleration, when pilots lose or are no longer very sure of their visual references and rely on their inner ear rather than the aircraft instruments. Because the inner ear cannot distinguish gravitational acceleration from horizontal acceleration, forward acceleration may give the same impression as backward tilt, in other words, a perception of a climbing aircraft. This illusion occurs in pilots using low- or high-performance aircraft.

In low visibility, pilots may try to counteract this perception of climbing by dropping the aircraft's nose until the dive counterbalances the apparent backward tilt caused by the acceleration, often ending in impact with the ground. Further, if this false-climb illusion is reinforced by the presence of a false visible horizon (such as a shoreline or a string of lights with the ocean or unlit background terrain), the pilots' tendency to want to push the stick may become uncontrollable.

Knowledge and experience are the key determinants to pilots' susceptibility to spatial disorientation. Inexperienced pilots with little instrument time are particularly susceptible to spatial disorientation when they are confronted with few external visual attitude references. Pilots wishing to protect themselves from spatial disorientation must free themselves from their natural vestibular reactions by training and practice in not relying on vestibular perceptions. They must always use input from their instruments to maintain spatial orientation and, thus, situational awareness.

No aviation regulation in Canada prevents pilots from making instrument flight rules (IFR) approaches where weather conditions are below the approach minima (ceiling and visibility) and no RVR is available at the airport, as was the situation at Gaspé.

Analysis

The aircraft was certificated and maintained in accordance with existing regulations. All the aircraft's systems were functioning normally. There was no indication found of any airframe failure or system malfunction during the flight. Examination of the engines did not reveal any sign of failure. The engines were producing power, and all damage was caused by the impact. Further, the internal marks left by the impact confirm that the angle of the blades corresponded to fine pitch. All the indications tend to confirm that the aircraft was in overshoot configuration.

The crew was qualified for the flight, but had limited experience in IFR conditions. When they planned the flight, the weather information led them to believe that the ceiling would stay at an acceptable height. Over Mont-Joli, however, the crew was informed that the weather conditions had deteriorated to the point where it was difficult to land safely. They nevertheless decided to continue the flight, hoping that the visibility and ceiling conditions would improve. During the approach, they received a new weather sequence indicating that the bad weather was persisting. Despite this information, they chose to continue the approach, and nothing in the regulations prevented them from doing so.

On the day of the accident, the environmental conditions and scarce visual ground references near Gaspé Airport were conducive to spatial disorientation. Given the prevailing weather conditions at the time of the approach, the runway was covered with a layer of snow, making it difficult to see. Use of the aerodrome lighting system would perhaps have helped the crew to better orient themselves. During the overshoot, false-horizon and false-climb illusions were both possible. In reaction to a false-horizon illusion, pilots can be led not to act correctly on the flight controls. The false-climb illusion, for its part, can lead pilots to push on the stick and put the aircraft in a nose-down attitude. At low altitude, pilots have very little time to recognize an illusion and take appropriate corrective action. The information gathered at the accident site showed that the aircraft was flying on a heading of approximately 230 degrees magnetic in a 60-degree banked left turn when it struck the ground. The aircraft's angle of impact appears to be more consistent with the nose-down attitude associated with the false-climb illusion.

Only instrument-flight training, experience, and practice can enable pilots to acquire the skills needed to recognize and counter the effects of spatial disorientation. The pilots of the occurrence aircraft were certified for the flight but had little instrument-flight experience. The pilots had therefore not had the opportunity to fully acquire the essential skills to react immediately to spatial disorientation. It is likely that the pilot flying became disoriented and was unable to regain control of the situation, and thus he flew the aircraft towards the ground after losing situational awareness.

Findings as to Causes and Contributing Factors

1. The environmental conditions and scarce visual ground references near Gaspé Airport were conducive to spatial disorientation. The pilot became disoriented during the overshoot and was unable to regain control of the situation.

2. During the approach, the crew did not activate the aerodrome lighting system, thereby contributing to worsening the pilot's spatial disorientation.

Findings as to Risks

1. No aviation regulation in Canada prevents pilots from making an IFR approach where there is no RVR available for the selected runway and weather conditions are below the minimum descent altitude or the decision height and below the visibility advisory on the instrument approach chart.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 13 June 2001.

Appendix A—LOC(BC)/DME Approach Chart for Runway 29 at Gaspé Airport