

AVIATION INVESTIGATION REPORT

A9900079

LOSS OF CONTROL / SPIRAL

CANADIAN FLIGHT ACADEMY LTD.

CESSNA 152 C-GGGK

VALENTIA, ONTARIO

06 APRIL 1999

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.

## Aviation Occurrence Report

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### *Summary*

The instructor and student departed the Oshawa airport, Ontario, in a Cessna 152, serial number 15284378, at 1207 eastern daylight saving time (EDT) on a one-hour training flight. The purpose of the flight was to practise climbing, descending, and turning exercises, and they proceeded to the practice area. Nearing the end of the one-hour flight, a witness to the accident heard an aircraft flying overhead, then the engine noise stopped. This caused the witness to look in the direction of the aircraft; it was in a nose-down attitude, and it rotated twice to the right before disappearing behind a tree line located within 1 000 feet of the witness. The aircraft struck trees at high speed and crashed in a swamp south-west of Valentia. The witness estimated that the aircraft was well below 2 000 feet above ground level (agl) when first observed. The instructor and student pilot sustained serious injuries and were transported to separate hospitals where they succumbed to their injuries.

*Ce rapport est également disponible en français.*

## *Other Factual Information*

Visual meteorological conditions prevailed at the time of the occurrence. The reported weather at 1300<sup>1</sup> for Peterborough, Ontario, 19 nautical miles east of the occurrence site, was: wind 120 degrees true at nine knots, visibility 15 statute miles, a few clouds at 7 000 feet above sea level (asl), broken clouds at 10 000 feet asl, overcast clouds at 25 000 feet asl, temperature 11 degrees Celsius, dewpoint zero degree Celsius, and altimeter 29.87 inches of mercury.

A review of the company maintenance records indicated that the aircraft was certified, equipped, and maintained in accordance with the existing regulations. The most recent maintenance was a 50-hour inspection performed on 31 March 1999. The aircraft flew 15 hours after this inspection and had a total airframe time of 8 053 hours.

The engine, an Avco Lycoming, model O-235-L2C, serial number L-12826-15, had accumulated approximately 1 309 hours in service since major overhaul. The engine was disassembled at the TSB regional office with the assistance of the Lycoming air safety investigator. No discrepancies were noted that would have precluded normal engine operation prior to the accident.

The aircraft wreckage was first examined at the crash site, then removed to a salvage facility and re-examined. There were many overload breaks, cuts made by emergency rescue personnel, and salvage cuts in the control cables. None of the fractures or cuts was identified as pre-impact. There were multiple tree-impact imprints on the wings, wing lift struts, and the horizontal stabilizer. The left wing had a 12- to 14-inch diameter impact that collapsed the wing two-thirds of the way to the rear spar; the outer panel was cut off during the salvage operation. The right wing had substantial crushing damage and was torn in half outboard of the flap. The tree impact angle revealed that the aircraft's rate of descent was shallow and that the wings were level at contact. The flaps were in the up position.

There was no indication of pre-impact structural failure, and all aircraft parts were accounted for at the crash site. Because of the severe impact damage and fragmentation of the airframe, it could not be determined if a flight control malfunction had occurred. Both seats were secured to the rails, and both seat belts remained anchored to the floor. The belts had been cut by emergency crews. The student pilot was occupying the left seat and was using the full shoulder harness. The instructor pilot used only the lap belt. The left seat, inboard, seat-back hinge bolt head was broken off, and the hinge was disconnected from the seat. The seat back was free to fall backwards to a horizontal position. Subsequent laboratory examination of the fractured clevis bolt head revealed that one side of the fracture was about 50 per cent fatigue and the other side was about 10 per cent fatigue. The remaining left seat-back hinge bolt (outboard) was secure, but part of the head was broken off to allow removal of the seat back. Examination of this fracture disclosed that fatigue cracking covered 50 per cent of the exposed surface. Optical microscope examination of the remaining side of the head showed a crack at the surface of the radius, at the same location as on the fatigued side. Dye penetrant inspection of the right seat bolts showed a crack indication on the inboard bolt and nothing on the outboard bolt. It could

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<sup>1</sup> All times are EDT (coordinated universal time [UTC] minus four hours).

not be determined if failure of the left seat back was pre- or post-impact. The airspeed indicator (ASI) was forwarded to the TSB Engineering Branch Laboratory for examination. Examination of the ASI did not provide any information with respect to airspeed indication at the time of impact. There was no pre- or post-crash fire.

The instructor pilot was certified and qualified in accordance with existing regulations to conduct the training flight. The commercial licensed pilot received his Class 4 Instructor rating in August 1998. He had accumulated over 600 hours of logged flight time as of April 1999, of which approximately 400 hours were attributed to flight instruction.

The student pilot had a familiarization flight in May 1998. She began her flight training in October 1998 and accumulated less than 10 hours by the end of the year. The accident flight was her first flight in 1999. Her training record indicated that the last training exercise involved climbs, descents, and turns. As of the accident date, the student had not obtained a pilot medical; therefore, there was no pilot file for review at Transport Canada.

The flight training curriculum requires that, during the turning exercise, the instructor demonstrate a steep turn (45 degrees of bank or greater) and the student practise these turns. It is important during a steep turn to effectively monitor the aircraft attitude to avoid inadvertent entry into a spiral manoeuvre. Should a spiral manoeuvre be recognized, the correct recovery procedure is to close the throttle, level the wings using coordinated control inputs, and ease out of the dive.

The *Canadian Aviation Regulations* (CARs) define an aerobatic manoeuvre as one in which a change in the attitude of an aircraft results in a bank angle greater than 60 degrees, an abnormal attitude, or an abnormal acceleration not incidental to normal flying. A spiral is thus an aerobatic manoeuvre. CAR 602.27, Aerobatic Manoeuvres—Prohibited Areas and Flight Conditions, states that no person shall conduct aerobatic manoeuvres below 2 000 feet agl without a special flight operations certificate. To conform with this regulation, pilots operating in the CYA 520(T) area would have to terminate aerobatic manoeuvres at or above approximately 2 900 feet asl.

Radar data were retrieved from the Toronto Area Control Centre in an attempt to identify the aircraft's movements. The aircraft was equipped with a transponder, and the squawk code of 1200 was selected; however, the function switch was broken, and it was not determined if the transponder interrogation mode was functioning at the time of the occurrence. The aircraft's altitude at the time of the spiral manoeuvre was below radar coverage and, therefore, was not indicated.

The post-mortem medical examination did not identify any medical condition that could have resulted in in-flight incapacitation of either pilot.

## *Analysis*

The weather conditions at the time of the occurrence were ideal for the flight training exercises and were not a factor in the accident.

Flight instructors are aware of the dangers of allowing a spiral to develop at low altitude and especially of continuing below 2 000 feet agl. It could not be determined why a spiral was continued to an altitude from which a safe recovery could not be performed. The wing impact damage indicates that the aircraft was probably entering a recovery attitude prior to striking the trees.

It was not determined whether the failure of the left seat back occurred in-flight or as a result of impact forces. Control of the aircraft would likely have been maintained by the instructor seated in the right seat had the left seat back failed in-flight.

The severity of the impact damage and fragmentation of the airframe made it impossible to determine if a flight control malfunction had occurred; however, the impact evidence indicates that the aircraft was probably entering a recovery attitude prior to impact. The sudden absence of engine noise that captured the witness's attention likely resulted from the pilot initiating the spiral recovery procedure. It was evident that the engine was capable of producing power.

The following Engineering Branch report was completed:

LP40/99—Airspeed Indicator Examination

*This report is available upon request from the Transportation Safety Board of Canada.*

### *Findings as to Causes and Contributing Factors*

1. For undetermined reasons, the aircraft entered a spiral manoeuvre that continued below the CARs minimum aerobatic recovery altitude.
2. The aircraft was probably entering a recovery attitude at the time of impact with the trees.

### *Other Findings*

1. The instructor pilot was certified and qualified in accordance with existing regulations to conduct the flight training lesson.
2. The company maintenance records indicate that the aircraft was certified, equipped, and maintained for flight in accordance with existing regulations.
3. There was no evidence of airframe failure or engine malfunction prior to or during the flight.
4. The aircraft engine was capable of producing power at the time of the accident.
5. Weather was not a factor in the accident.

*This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 13 July 2000.*