Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

AVIATION INVESTIGATION REPORT

A05W0160

LOSS OF CONTROL

LANCAIR IV-P N750F

SUNDRE, ALBERTA 8 NM SE

09 AUGUST 2005

Canada

Aviation Investigation Report

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Summary

On 09 August 2005, the Lancair IV-P (registration N750F, serial number 493) departed Calgary, Alberta, at 1904 mountain daylight time (MDT), on an instrument flight rules flight plan to Grande Prairie, Alberta. The flight originated out of Vance Brand Airport, Longmont, Colorado, with the final destination in Alaska. At 1917 MDT, the aircraft levelled off at flight level 200 as flight planned. Radar data indicated that at 1918 MDT, the aircraft entered a descent. The altitude readout from the radar data was lost at approximately 14 500 feet above sea level; the final radar returns were recorded at 1920 MDT.

The aircraft fuselage and left wing spar were located approximately eight nautical miles (nm) southeast of Sundre, Alberta. The right wing, left wing skins, and pieces of the tail section were located over a 1.3 nm debris field in a line southwest of the main wreckage site. The pilot and passenger were fatally injured. There was no post-impact fire.

Ce rapport est également disponible en français.

Other Factual Information

The pilot held a private pilot licence issued by the United States Department of Transportation Federal Aviation Administration (FAA). The licence indicated the pilot had ratings for single-engine land and sea, and multi-engine land aeroplanes. In addition, the licence was endorsed for instrument flight and aeroplane glider aero tow. The licence was validated by an FAA second-class medical certificate with the limitation that the holder wear lenses that correct for distant vision and possess glasses that correct for near and intermediate vision.

The pilot had been flying for approximately 50 years and had accumulated about 4000 hours flying experience. In the 90 days before the accident, the pilot had accumulated 31 hours in the occurrence aircraft. The passenger also held an FAA-valid private pilot licence. The passenger had flown a total of 19 hours with the pilot in the occurrence aircraft on nine separate occasions before the accident.

The pilot landed at Calgary International Airport at 1553[1] on 09 August 2005 and cleared customs. He then repositioned the aircraft to a fixed-base operator to purchase fuel and to determine the weather for the next leg of the flight. At 1658, the pilot received a weather briefing by telephone from the NAV CANADA Edmonton Flight Information Centre (FIC). The forecast and current conditions for the Grand Prairie and Fort St. John area prompted the pilot to advise the weather briefer that he would stay the night in Calgary and continue the next day. The weather forecasts for the next day would not be available until 1800.

At 1806, the pilot called the Edmonton FIC to obtain a second weather briefing for an instrument flight rules (IFR) flight from Calgary to Grande Prairie, and to file an IFR flight plan. The pilot was briefed on the clouds and weather for the flight at an intended cruising level of flight level (FL) 180 to 200. There was no significant weather forecast except for an area of developing towering cumulus (TCU) 40 nm northwest of Calgary. Cloud tops were expected to be in the range of 18 000 feet above sea level;[2] however, scattered cumulonimbus cloud (CB) was forecast for the area, with tops to 32 000 feet. There was no icing forecast except as associated with the CBs. In the structure of a cumulus cloud, most of the liquid water accumulates in the tops of the cloud due to the rising air currents of the cloud formation. If the outside air temperature is below freezing, airframe icing can be expected. The freezing level was approximately 12 000 feet in the Calgary area. Sunset for the accident location was approximately 2110.

WSI—The aircraft was equipped with a WSI InFlight™ airspace and weather information system. The WSI InFlight™ satellite broadcast system provides a continuous stream of aviation weather information to a portable or panel-mounted display with complete coverage and content for the continental United States at any altitude. Information is updated every five minutes and includes text and graphical weather data, weather radar images, lightning, and pilot reports. Radar images for Canada are available under a separate subscription plan. The system is not a substitute for meeting the requirement for a complete weather briefing before flight.

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1 All times are mountain daylight time (Coordinated Universal Time minus six hours). All locations are in Alberta unless otherwise noted.

2 All altitudes are above sea level.

During the briefing, the pilot expressed some concern about the functionality of his WSI (see text box) in Canada and that if it didn't work, air traffic control (ATC) be able to help him around the weather that was developing northwest of Calgary. The pilot had a current *US Aviator* WSI subscription, which did not include Canadian weather radar images.

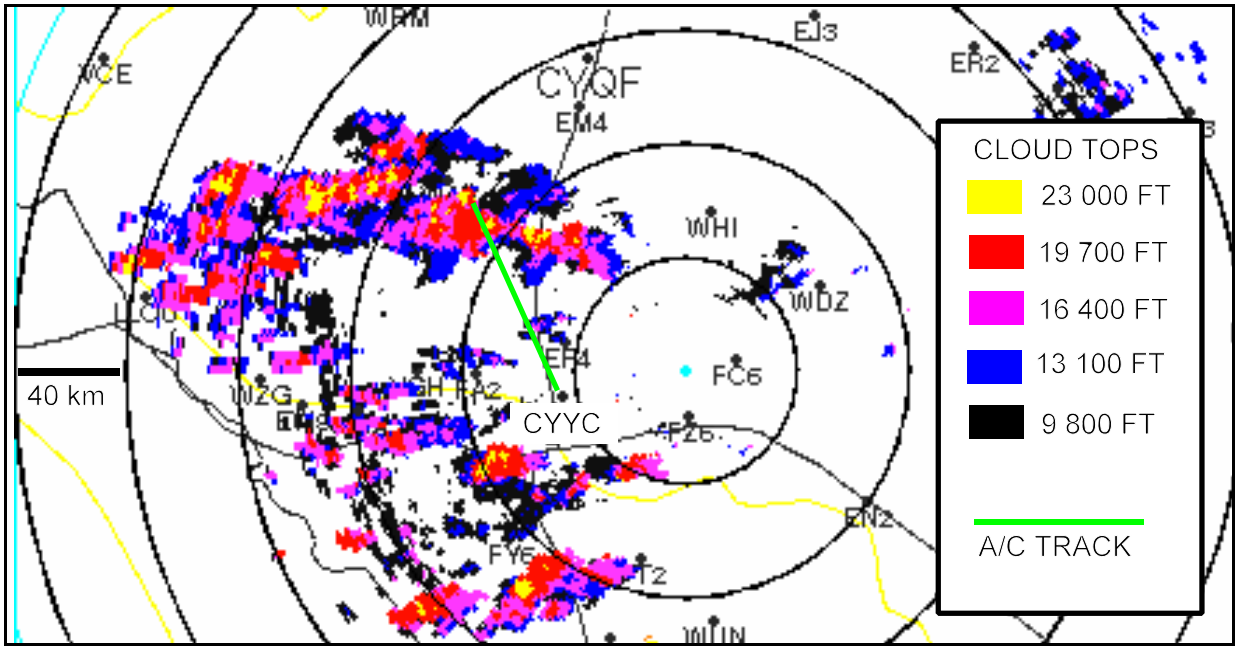

Figure 1. Weather radar image recorded at 1920 with aircraft track

Weather radar, airport weather observation, and a pilot report from an aircraft flying 30 minutes ahead of the occurrence aircraft indicated an overcast cloud condition with tops at about 10 000 feet for most of the Calgary area. The weather radar images of the TCU cloud 40 nm northwest of Calgary Airport showed they were intensifying and moving eastward. The TCUs had variable tops to 23 000 feet. A transmission by the pilot to ATC at 1912 included the remark that he had lost his WSI capability and wanted information about the weather ahead.

The controller advised that the ATC radar was ineffective at that range; however, an aircraft 80 nm ahead on the same route and altitude had not deviated for weather. Also, there had been no indication of lightning on the intended route. The aircraft's track as recorded by NAV CANADA ATC radar showed that the aircraft entered the TCUs at approximately FL 197 and flew through an area with cloud tops at 23 000 feet (see Figure 1). The pilot of an air ambulance helicopter, who participated in locating the wreckage, indicated there were low ceilings and visibilities in rain while flying to the accident site approximately 40 minutes after the accident.

The aircraft was equipped with two Chelton integrated display units. These units are complete flight/navigation instrumentation systems that provide information to the pilot via computer-generated LCD screen displays mounted in the aircraft instrument panel. These units contain memory cards that record many flight, navigation, and engine parameters at one-second intervals. Both units were recovered. The downloaded data and information from NAV CANADA depicted the following significant events:

- 1914:27 – last communication by the pilot to ATC, which acknowledged a frequency change while climbing through 17 700 feet; 140 knots indicated airspeed (KIAS)

- 1917:00 – aircraft entered the TCU cloud tops at approximately FL 197
- 1917:13 – aircraft levelled off at FL 200; 140 KIAS and 182 knots ground speed (GS)
- 1917:16 – aircraft entered an area of TCU with tops at 23 000 feet; KIAS and GS remained relatively constant when normally an increase of one knot/second would occur during acceleration after level off; climb power was still set
- 1917:44 – speed decreased to 105 KIAS and 158 GS; pitch attitude decreased to 5° nose down and aircraft started descent
- 1918:02 – aircraft levelled off after 360 feet of altitude loss; aircraft pitch attitude 8° nose up; speed 101 KIAS
- 1918:13 – aircraft started to descend; pitch attitude 5° nose down and increasing; aircraft bank angle 25° right; speed 85 KIAS and decreasing[3]
- 1918:34 – aircraft descended through 17 330 feet at 12 500 feet per minute; pitch attitude 36° nose down; bank angle 66° right; speed 88 KIAS; climb power was still set
- 1918:48 – aircraft descended through 10 840 feet; speed KIAS 150 (Based on altitude change, time, and ground speed, calculations show that the aircraft reached a peak velocity of 412 knots [Mach 0.62] going through 11 000 feet)
- 1919:12 – last data point recorded at 3870 feet; elevation of accident site 3640 feet

The aircraft fuselage and engine impacted on their right side in an alfalfa field. Fragmented pieces of the horizontal stabilizer, vertical stabilizer, rudder, and elevator were found over a 1.3 nm debris field in a line southwest of the fuselage impact site. The left wing was fragmented and associated wing skins, aileron, and flap were also scattered along the debris field. The right wing was found in its entirety 0.46 nm from the accident site along the debris field. The Sundre Volunteer Search and Rescue Team provided 25 people to search for the aircraft parts. The search took place over a six-hour period on 10 August 2005, with 95 per cent of the aircraft recovered.

The Lancair IV-P is an amateur-built, kit aircraft constructed mainly of composite materials. It is a four-seat, pressurized aircraft with retractable tricycle landing gear and traditional flight control surfaces. N750F was further modified with a Walter 601E turboprop engine. In the United States, the Lancair IV-P met the definition of a high-performance, complex aircraft. The aircraft was registered in the United States and received a special airworthiness certificate in the experimental category for the purposes of being operated as an amateur-built aircraft.

The pilot started construction of the aircraft in 2000 and completed the aircraft in spring 2003. A total of 193 hours were on the aircraft at the time of the accident. The aircraft had no known or outstanding mechanical deficiencies at the time of the accident.

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[3] From this point on, the recorded IAS (indicated airspeed) is suspect. The aircraft nose is 5° down and going lower and the engine is at climb power, yet the IAS is low and decreasing. Also, data show that the speed increased from 85 knots to 150 knots in two seconds.

N750F was equipped with an autopilot that controlled the aircraft about the roll and pitch axes. It could not be determined whether the autopilot was engaged at any time during the flight.

The Lancair-recommended gross take-off weight (GTOW) for a Lancair IV-P with the turboprop engine and winglets was 3550 pounds. FAA regulations governing amateur-built aircraft identify the builder as the manufacturer of that individual aircraft and, as such, the builder is allowed to set the weight limits, including GTOW, at any desired value. In the case of N750F, the owner/builder of the aircraft set the GTOW at 4000 pounds.

Because each aircraft is unique in its construction, the builder must determine the stall speeds for that particular aircraft. Documents relating to the stall speeds specific for the occurrence aircraft were not found during the investigation. Lancair provided estimated stall speeds for the Lancair IV-P with winglets. In the flaps up, gear up configuration at the recommended GTOW of 3550 pounds, the stall speed (Vs) is expected to be 72 knots calibrated airspeed (KCAS). The aircraft's weight at the time of the accident was estimated to be 3800 to 3900 pounds, using the most recent weight and balance of the aircraft (12 April 2004), the fuel uplifted in Calgary, the weight of the persons on board, and the weight of personal items recovered at the accident site. The Vs for this weight range was 89 knots equivalent airspeed (KEAS).[4]

The flight manual stated that the aircraft was prohibited from flight into known icing, and that flight into inadvertent icing was not to be treated lightly. The manual further states that the high performance of the Lancair

> … is the result of both a clean design aerodynamically and a laminar aerofoil which provides lift with less drag penalty than conventional aerofoils. While bugs on the leading edge will reduce your performance, ice has the potential to reduce its lifting capability, but also will significantly increase drag and stall speeds and more importantly change your stall characteristics.

Discussions with Lancair IV-P owner/operators who have encountered airframe icing in flight indicated that a significant reduction in performance takes place in a relatively short time under those conditions.

The Lancair IV design was subjected to computer analysis and static load testing, and a full flutter test program was conducted. These tests showed that the tail section would fail first due to flutter at Mach 0.57 followed by failure of the wing flap assemblies at Mach 0.6. During the descent the aircraft reached a calculated speed of 412 knots or Mach 0.62.

Findings as to Causes and Contributing Factors

1. The aircraft entered the tops of towering cumulus clouds and most likely accumulated enough airframe ice to prevent the aircraft from accelerating in cruise flight, with the reduction in performance eventually leading to an aerodynamic stall.

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[4] Equivalent airspeed is calibrated airspeed corrected for compressibility. Below 100 knots compressibility is extremely small; therefore it can be assumed to be equal to calibrated airspeed.

2. For unknown reasons, the pilot was unable to recover the aircraft from the aerodynamic stall and ensuing dive, and the airframe broke up due to the excessive speed reached in the dive.

Finding as to Risk

1. At the time of the accident, the aircraft was 250 to 350 pounds over the recommended gross take-off weight, which increased the stall speed by approximately 17 knots.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 01 Febrauary 2006.

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