

Transportation Safety Board  
of Canada



Bureau de la sécurité des transports  
du Canada

## AVIATION INVESTIGATION REPORT

A09Q0065



### COLLISION WITH CABLE - SINKING IN WATER

AIR RICHELIEU 1990  
CESSNA 150L C-GJAE  
SAINT-LOUIS, QUEBEC  
04 MAY 2009

Canada

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 Investigation Report

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### *Summary*

On 04 May 2009, at approximately 1556 eastern daylight time (EDT), the Air Richelieu Cessna 150L (registration C-GJAE, serial number 150-72055) departed Montréal/Saint-Hubert Airport, Quebec, on a training flight. Two position reports were made by the instructor – one en route and one upon reaching the training area. The flight towards the training area was uneventful. The aircraft, flying at low altitude over the Yamaska River, Quebec, in a north-easterly direction, collided with a telephone cable spanning the river from west to east, impacted the surface of the water, and sank. The instructor was fatally injured. The student pilot was able to exit the aircraft, but subsequently drowned. The aircraft was substantially damaged. The occurrence took place 27 nautical miles northeast of the Montréal/Saint-Hubert Airport at approximately 1637 EDT

*Ce rapport est également disponible en français.*

## *Other Factual Information*

### *History of the Flight*

The student pilot started training on 27 April 2009 with the objective of obtaining a private pilot aeroplane licence. The student pilot had no other previous flying experience, with the exception of a five-month period working as a flight attendant.

From the start of the training to the occurrence date on 04 May 2009, the student pilot had completed 3.0 hours of ground instruction, 1.6 hours in a simulator, and 1.8 hours of flying time. The occurrence flight was the student pilot's third planned flight, which was preceded by the relevant ground instruction and pre-flight briefing. This lesson was to cover straight and level flight, climbs, and descent exercises as described in Air Richelieu's training program.<sup>1</sup> The flight was expected to last approximately 1.3 hours. Weather conditions were ideal for visual flight and are not considered to have contributed to the occurrence.

There were several aircraft in the assigned training areas that day. Radar data showed that C-GJAE first travelled east past Beloeil towards the training area closest to Montréal/Saint-Hubert Airport (CYHU), then north of Saint-Hyacinthe towards another training area located 27 nautical miles (nm) to the northeast of CYHU (see Appendix A – Aircraft Trajectory). This is likely because the closest training area was crowded. While C-GJAE made its way north, the radar data shows the aircraft in level flight, climbs, and descents.

After leaving CYHU tower frequency, the occurrence flight instructor made two position reports – one en route at 1604<sup>2</sup> and the other at 1622 once they reached the training area to the north. No other radio calls were made. The last valid radar position at 1633 shows the aircraft at an altitude of 1340 feet above sea level (asl) on a true track of 341degrees<sup>3</sup> with a ground speed of 90 knots. The last coasting<sup>4</sup> target of the aircraft was captured at 1634. The radar floor<sup>5</sup> is approximately 1000 feet asl in the area of the occurrence. No global positioning system (GPS) information was available because the unit had been turned OFF prior to departing CYHU.

After 1634, while flying below the radar floor, the aircraft flew at low altitude at approximately 200 feet above ground level (agl) towards the village of Saint-Louis, heading in a north-westerly direction. The aircraft then headed northeast at low altitude, descending below 100 feet agl over the Yamaska River. Hundreds of geese on the river bank took flight as the aircraft passed by at low altitude. While heading northeast in level flight, at tree top height, and over the river, the aircraft travelled a total distance of approximately 2.4 km before colliding with the unmarked

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<sup>1</sup> Air Richelieu's training program follows the program outline recommended and described in the Transport Canada *Flight Instructor Guide* (TP 975).

<sup>2</sup> All times are eastern daylight time (Coordinated Universal Time minus four hours).

<sup>3</sup> The track of an aeroplane measured with respect to true north.

<sup>4</sup> The predicted position of a target if the radar return information is missed or ambiguous.

<sup>5</sup> Minimum altitude an aircraft can be detected by radar.

telephone cable that spans the river from west to east, which at this point is located at approximately 60 feet (18 m) asl <sup>6</sup> (see Appendix B – Oblique View of Aircraft Trajectory). The engine sound seemed normal prior to impact with the cable. The aircraft struck the cable with a 30-degree bank angle, struck the surface of the water in a nose-down attitude and sank quickly. The flight instructor, seated in the right seat, was fatally injured. The student pilot, seated in the left seat, successfully evacuated the aircraft after impact with the surface of the water, but drowned. This seating arrangement is typical of an instructor providing flight instruction. The occurrence took place at approximately 1637, after one hour of flight instruction.

Having been notified by a 911 emergency call, Saint-Hyacinthe firefighters and Sûreté du Québec police divers found the aircraft and the flight instructor, still secured to his seat, on the evening of the occurrence. The student pilot was found the next day. The aircraft wreckage was transported to the TSB Laboratory for examination. The engine cowls and outer two thirds of the right wing leading edge were not recovered.

### *Wreckage and Impact Information*

The cable consists of a telephone cable covered with black protective sheathing lashed to a steel cable (see Photo 1). The cable did not break on impact.

Examination of the impact damage to the aircraft determined that it struck the telephone cable in the area of the lower engine cowl. Either on impact with the cable or the surface of the water, the engine had been displaced laterally to the right, upward, and aft but remained attached to the engine mount. This displacement caused the cowling to contact and score the propeller adaptor outside diameter. The scoring was rotational in nature, which would indicate the propeller was being driven by the engine when the cowlings departed the aircraft. Continuity <sup>7</sup> of the flight controls was confirmed.



**Photo 1.** Cable specimen from occurrence site

<sup>6</sup> Since the river level compared to the sea level varies but is about the same as the sea level, the latter is used as a basic reference.

<sup>7</sup> Continuity of flight control means that cockpit controls are adequately linked to the corresponding control surface and move in the appropriate direction.

Impact marks and material transfer from the telephone cable were noted on the engine crankcase vent line. The impact marks on the vent line had the same spacing and width as the wires of the steel cable that support the telephone cable (see Photo 2). Neither the propeller nor the main nose wheel tire exhibited indications of damage from possible contact with the cable. However, the right steering arm rod end failed in overload, probably as a result of the impact with the cable, but any material transfer from the cable was probably masked by the engine cowling.



**Photo 2.** Cable markings on crankcase vent tube

Examination of the two-way valve inside the carburetor heat box revealed scoring and bending indicative of the valve being in the carburetor heat HOT position at impact. This would be considered normal in the context of the training flight in that it included climbs and descents and that the aircraft descended towards the river just prior to impact with the cable. In order to avoid carburetor icing,<sup>8</sup> carburetor heat will normally be placed in the HOT position for descents as engine power is reduced.

The mufflers with exhaust stacks were examined by using hardness testing and metallurgical analysis and indicate the exhaust stacks were likely crushed while at a temperature above a range of 600 to 800°F and, therefore, indicate that the engine was developing power when it struck the telephone cable. The microscopic examination of the dial face of the oil pressure gauge also indicated that the engine was operating, and the gyro rotor mass from the electrically powered turn coordinator confirm electrical power was available at the time of impact.

The aircraft struck the surface of the water in a nose-low, left-wing-low attitude. The leading edge of the left wing was still attached to the aircraft, and although it showed impact damage, it had no visible indications of cable impact. The leading edge of the right wing had been torn away and there were dark coloured stains on the front surface of the front spar. These stains were examined using ATR-FTIR spectroscopy<sup>9</sup> and it was determined that they were caused by material transfer resulting from contact with the telephone cable. The horizontal stabilizer, vertical stabilizer, and rudder remained attached to the fuselage and were generally undamaged; there were no signs of impact with the cable.

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<sup>8</sup> Cessna 150L Flight Manual procedures, p. 1-5 and 2-15

<sup>9</sup> S.T. Japan Attenuated Total Reflection-Fourier Transform Infrared (ATR-FTIR) Aldrich-Ichem Spectral Database

## *Aircraft Information*

Examination of the aircraft maintenance records indicated that the aircraft was maintained in accordance with the Air Richelieu Maintenance Program No. Q2276 approved by Transport Canada (TC). All airworthiness directives applicable to this model Cessna 150 were recorded as completed. The last scheduled maintenance was dated 24 April 2009. At the time of the accident, the aircraft had accumulated 5565.1 hours total airframe time. The Continental Motors O-200-A engine had accumulated 510.2 hours since overhaul and 4144.1 hours time in service since new. The aircraft's weight and centre of gravity were within prescribed limits at the time of the occurrence.

The emergency locator transmitter (ELT), a Narco Avionics ELT 10C<sup>10</sup>, serial number 81093, had been submerged in water for approximately 24 hours. Once the aircraft was retrieved from the water, the ELT transmitted a signal, which was received by the Search and Rescue Canadian Mission Control Centre. The selector was found in the ARM position, and the unit did not exhibit any damage to the casing or the antenna. The ELT was recovered from the wreckage and forwarded to the TSB Laboratory. The unit had last been certified on 19 September 2008. ELT verifications are done annually. An internal examination of the ELT showed that its circuit board was corroded. Attempts to restore the device were unsuccessful; consequently, a serviceability test could not be performed. The signal transmitted by the submerged ELT was not received; therefore, it could not activate the search and rescue system. The rescue operation was initiated after witnesses of the occurrence took action.

The Cessna 150L was not equipped with a cockpit voice recorder (CVR) or flight data recorder (FDR), nor was either required by regulation.

## *Environment*

Air Richelieu uses three training areas – one to the east, one to the south, and one to the northeast of CYHU. These areas have been used as practice areas for the past 15 years and are shared with three other flight training units; they are known to be congested on good weather days. The dedicated training area near which the occurrence took place is in uncontrolled Class G airspace up to 2200 feet asl and where air traffic control (ATC) has no authority or responsibility to control air traffic. The training flight was conducted under VFR. Frequency 126.7 MHz is used for position reports within uncontrolled airspace and, if used effectively, ensures that aircraft traffic operating in a particular area is aware of other traffic also working in the vicinity. The training area is situated over mainly small wooded areas, farm fields, and small towns. The occurrence took place 1 nm outside the east boundary of the training area. There is no directive or regulatory reason why the instructor could not conduct training in that location.

Had the flight instructor been managing an emergency requiring a precautionary or an emergency landing, the many surrounding fields available would have been suitable. Examination of the aircraft did not identify any anomalies that would have forced the flight instructor to execute a precautionary or emergency landing. No emergency radio call was made.

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<sup>10</sup> The Narco Avionics ELT 10C was a Type F (fixed), applicable airworthiness standard TSO-C91, Industry Canada Certification Number 285473006F.

## *Cable Markings*

Télébec Ltée, a subsidiary of Bell Alliant, is the telephone service provider for many northern and rural areas of Québec. The telephone cable relevant to this occurrence spans the Yamaska River west to east and provides telephone service for residents located on either side of the river. It was installed unmarked by Télébec in 1975 after obtaining an exemption by the Minister of Transport. The exemption under the *Navigable Waters Protection Act* was granted under the grounds that the cable was not deemed a hazard to small craft navigating the river.

The TC aviation Standards for Obstruction Markings<sup>11</sup> specify that an obstruction should be marked or lit if its height and/or location are deemed a threat to aviation safety. In that the telephone cable height was approximately 52 feet (16 m) asl, it would not be deemed a hazard to aviation. Furthermore, the cable is not in proximity to an airport, aerodrome, or water aerodrome.

The unmarked black cable spans from two 40-foot-high telephone poles located on either side of the 300-foot-wide river. The aircraft struck the cable approximately halfway between the east shore and the middle of the river, which is a height of about 60 feet (18 m) asl. Because of the limitations of the human eye, it is difficult to perceive a wire or cable if the background landscape does not provide sufficient contrast. The fact that the cable was not marked likely made it difficult to detect. Pilots are usually taught to look for telephone poles or towers in order to identify the presence of cables or wires. The telephone poles located further inland from the shoreline were not visible while heading northeast along the river in that they were hidden amongst brush and tall trees. It is possible that the flight instructor or the student pilot saw the cable just before striking it.

## *Flight Training Unit*

The flight training school has been in business for over 20 years. With variations of the company name due to acquisitions, changes in structure and size, it now operates under the official name of Air Richelieu 1990<sup>12</sup> and operates 15 aircraft and 2 flight simulators from its main training base located at the Montréal/Saint-Hubert Airport.

As a flight training unit, Air Richelieu must demonstrate<sup>13</sup> the ability to maintain an adequate organizational structure, maintain operational control, comply with maintenance requirements, meet the personnel licensing standards, and conduct the operation safely. Although not required by the *Canadian Aviation Regulations* (CARs), Air Richelieu periodically monitors its instructors' ground instruction classes and conducts supervised flights of student pilots to ensure that student progression is standard. The occurrence flight instructor's ground

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<sup>11</sup> *Commercial Air Service Standards* (CASS), Standard 621.19, Chapter 2, section 2.1 and paragraph 2.2. b) and c)

<sup>12</sup> The flight training unit is owned by 3971830 Canada Inc. but is operated under the name of Air Richelieu 1990.

<sup>13</sup> Subsection 406.11 (1) of the *Canadian Aviation Regulations* (CARs)

instruction class was monitored in February 2009. He was authorized by Air Richelieu to conduct the planned exercises on the day of the occurrence. The occurrence student pilot's progress had not yet been monitored because the training had just begun.

As for all flight training units in Canada, Air Richelieu's operations are overseen by TC. It conducted audits in 2005 and again in 2008; this reflects a normal audit scheduling frequency. The 2008 audit concluded that Air Richelieu was able to conduct business safely and professionally while conforming to the regulatory requirements. Any findings made following the audit were seen as administrative in nature and did not affect the flight training unit's ability to operate safely.

### *Flight Instructor*

The flight instructor obtained a private pilot aeroplane licence in 1996 in France and private and commercial pilot aeroplane licences in the United States in 1998, followed by the multi-engine and instrument ratings. After returning to France, he obtained a private helicopter licence in year 2000, totalling 33 hours of helicopter flying time. From 2007 to 2008 he obtained a Canadian commercial pilot aeroplane, multi-engine and instrument ratings, and a Class 4 Flight Instructor Rating in accordance with CAR 405.21. His aviation medical certificate was valid at the time of the occurrence and he was therefore considered fit to fly. His training in Canada was done entirely with Air Richelieu, where he was then employed as a Class 4 flight instructor upon completion of his flight instructor rating in July 2008. He departed Air Richelieu in November 2008 for a period of one month to instruct abroad and returned to the school in December 2008. His pilot logbook records approximately 700 hours of total flying time, including 228 hours as a flight instructor. He was regarded as a capable, responsible, and professional employee. The flight instructor was certified and qualified in accordance with existing regulations to conduct the training flight. Current regulations state that the Class 4 Flight Instructor Rating is "valid to the first day of the thirteenth month following the month in which the instructor flight test was conducted," which means that the flight instructor had to conduct an instructor flight test in July 2009 to requalify himself as a Class 4 flight instructor. The investigation into this occurrence did not reveal any previous deviations from planned flight exercises or regulations.

### *Instruction*

A student pilot wishing to obtain a student pilot permit must first pass an aviation medical examination and must have successfully completed the TC written examination named the *Student Pilot Permit or Private Pilot Licence for Foreign and Military Applicants, Aviation Regulation Examination* (PSTAR). This preliminary examination covers CARs and ATC procedures, clearances, and instructions as they apply to controlled airports, uncontrolled airports, and aerodromes. It is not necessary for a student to have a student pilot permit prior to commencing ground or flight instruction, but is necessary prior to the candidate's first solo flight. The student pilot involved in this occurrence had completed the medical examination, obtaining a Class 1 medical certificate and had commenced the preparatory ground and flight instruction. Ground school training had not been started, nor had the PSTAR examination been completed. After completing the ground school training, a student pilot is prepared to pass the written private pilot licence examination.



Lesson plans include the time allotted for preparatory ground instruction, simulator, or flight training. Each lesson plan outlines the air exercises that should be taught, reviewed, or practised and also states the expected competency for that stage of the student's training. While it is recommended that a flight instructor follow the lesson plans as outlined in Air Richelieu's flight instruction program, some accommodation and flexibility within the lesson plans may be necessary depending on various factors, such as a student's ability, weather, and aircraft availability. Each training flight is preceded by a pre-flight briefing covering the contents of what will be conducted during the flight instruction and any safety considerations; the student pilot is therefore aware of the exercises to be covered throughout the flight. A post-flight debriefing is conducted at the conclusion of the training flight.

### *Low Flying*

Several provisions within the CARs apply to low altitude flight:

No person shall operate an aircraft in such a reckless or negligent manner as to endanger or be likely to endanger the life or property of any person.<sup>14</sup>

Because the flight took place over a non-built-up area, "Except where conducting a take-off, approach or landing or where permitted under section 602.15, no person shall operate an aircraft (...) at a distance less than 500 feet from any person, vessel, vehicle or structure."<sup>15</sup>

A person may operate an aircraft, to the extent necessary for the purpose of the operation in which the aircraft is engaged, (...) where the aircraft is operated without creating a hazard to persons or property on the surface and the aircraft is operated for the purpose of (...) flight training conducted by or under the supervision of a qualified flight instructor.<sup>16</sup>

Air Richelieu's operations manual<sup>17</sup> states that VFR dual-instruction flight manoeuvres should not be conducted below 500 feet agl except for the purpose of landing, take-off, or forced landing. The objectives of the lesson did not require flight below 500 feet agl. It is not known why the instructor deviated from the training exercise as well as known regulations, and conducted the last portion of the flight at low altitude over the river. The *Flight Instructor Guide*,<sup>18</sup> Part I, covers the subject of flight safety and stresses the need for the instructor to always use correct safety practices because he or she is a role model to others. It was brought to TSB's attention that other aircraft had been seen overflying the Yamaska River at low level since the accident. This information was shared with TC and Télébec.

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<sup>14</sup> CAR 602.01 - Reckless or Negligent Operation of Aircraft

<sup>15</sup> CAR 602.14 (2) (b) - Minimum Altitudes and Distances

<sup>16</sup> CAR 602.15 (2) (b) (iv), Permissible Low Altitude Flight.

<sup>17</sup> *Manuel d'exploitation de l'entreprise, Air Richelieu 1990* (Air Richelieu 1990 Company Operations Manual), section 10.12, Vol d'entraînement : limitations (Flight Training: Limitations), p. 36

<sup>18</sup> Transport Canada, *Flight Instructor Guide*, TP 975, Part I, p. 41

## *Analysis*

Given the student pilot's limited aviation knowledge and flying experience, it is assumed that the flight instructor was at the controls at the time the aircraft travelled at low level over the river and collided with the telephone cable.

Because there were no survivors and the aircraft did not have a CVR, the reason why the instructor deviated from the training exercise and conducted the last portion of the flight at low altitude over the river is unknown. Although the occurrence took place 1 nm outside the east boundary of the dedicated training area, there is no directive or regulatory reason why the instructor could not conduct the training in that location. Flight at low altitude was not required for the exercises to be taught nor was it acceptable practice as per the CARs or company procedures.

One hour of the 1.3 hours planned for the lesson had been completed when the occurrence took place, leaving 0.3 hours (20 minutes) to return to CYHU. Although hypothetical, it is possible that the instructor meant to take a brief moment before returning to the airport to enjoy the landscape and fly low over the geese on the river shoreline.

Cables may be unmarked if they are determined to be neither an aeronautical nor a navigable waters hazard. The telephone cable traversing the Yamaska River was not considered a hazard to aviation in that it was approximately 52 feet asl, at the approximate height of the river banks, and was not in the vicinity of an airport, aerodrome, or water aerodrome. Since the aircraft struck the cable with a 30-degree bank angle, it is possible that the flight instructor or the student pilot saw the cable but too late to avoid it. The fact that the cable was unmarked made it more difficult to detect. Furthermore, the telephone poles on either side of the river, a primary indicator of the presence of a cable, were hidden by trees and brush. Low flying increases the risk of collision with cables and other structures.

Aircraft electric power, engine power, and flight control continuity were confirmed for the time at which the aircraft collided with the telephone cable. Therefore, it is unlikely that the flight instructor was managing an emergency, giving grounds for the low level flight over the river. The choice of adequate fields surrounding the area were numerous and would have been ideal had the flight instructor needed to execute an emergency or precautionary landing; the river would not have been a primary choice given the other options. The absence of any communication advising of an emergency situation reduces the likelihood that an emergency situation existed.

The following TSB Laboratory reports were completed:

- LP 061/2009 – ELT and GPS Analysis
- LP 062/2009 – Instrument Examination
- LP 063/2009 – Wreckage Examination
- LP 065/2009 – Examination of Exhaust Stack
- LP 066/2009 – Analysis of Transfer Material
- LP 070/2009 – Analysis of Radar Data
- LP 052/2009 – Determination of Flight Attitude

These reports are available from the Transportation Safety Board of Canada upon request.

## *Findings as to Causes and Contributing Factors*

1. The aircraft was flown at low altitude, causing it to collide with an unmarked telephone cable suspended 60 feet above sea level (asl) over the Yamaska River, Quebec.
2. Flying below 500 feet above ground level (agl) was not required, given the planned exercises to be demonstrated during the training flight; the reason for deviating from the lesson plan and the school's procedures is unknown.

## *Finding as to Risk*

1. Low flying poses additional risks to pilots. Cables and other obstacles may be unmarked if they are determined to be neither an aeronautical nor a navigable waters hazard. Unmarked cables are difficult to detect.

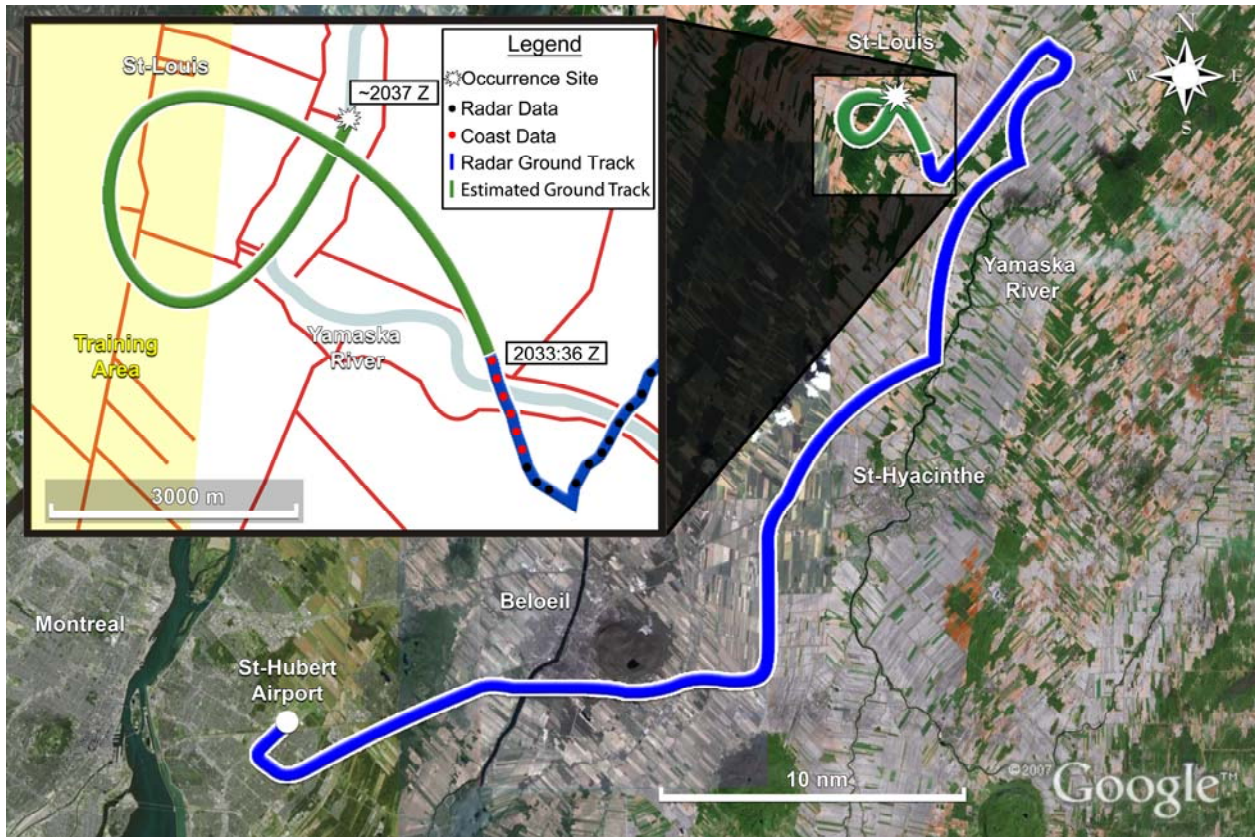
## *Safety Action Taken*

Although not required by regulation, but in light of recently reported low flying over the river since the occurrence, Télébec (Bell Alliant) has installed red and white markers on the telephone cable that spans the Yamaska River, Quebec.

*This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 09 June 2010.*

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# Appendix A – Aircraft Trajectory



# Appendix B – Oblique View of Aircraft Trajectory

