Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

# AVIATION INVESTIGATION REPORT

# A03Q0151

## CONTROLLED FLIGHT INTO TERRAIN

## LES AILES DE GASPÉ INC.

## PA-31-310 C-FARL

## GASPÉ, QUEBEC

## 27 SEPTEMBER 2003

Canada

# Aviation Investigation Report

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## *Summary*

The PA-31-310, registration C-FARL, serial number 31306, operated by Les Ailes de Gaspé inc., with one pilot and two passengers on board, was on a visual flight rules flight from Îles-de-la-Madeleine, Quebec to Gaspé, Quebec. While en route to Gaspé, the pilot was informed about weather conditions at his destination, which were a ceiling at 500 feet and visibility of ¾ mile in fog. The pilot requested clearance for an instrument approach, which he received at approximately 1857 eastern daylight time. A few seconds later the pilot switched on the aerodrome lights with his microphone button. That was the last radio transmission received from the aircraft. When the aircraft did not arrive at its destination, emergency procedures were initiated to find it. The wreckage was found the next day at 1028 eastern daylight time on a hilltop 1.2 nautical miles (nm) north-east of the airport. The aircraft was destroyed, but did not catch fire. The three occupants were fatally injured.

*Ce rapport est également disponible en français.*

# *Other Factual Information*

The PA-31 had been chartered to transport one passenger from Gaspé to Îles-de-la-Madeleine, then return to Gaspé with two passengers. Before departing Gaspé, at approximately 1612 eastern daylight time,[1] the pilot visited the NAV CANADA Web site for a weather report. The terminal aerodrome forecast (TAF) for Gaspé issued at 1930 coordinated universal time (UTC) was as follows: between 2000 and 0800 UTC, scattered cloud at 800 feet above ground level (agl), ceiling at 3000 feet agl, visibility over 6 miles; and temporarily between 0000 and 0800 UTC, ceiling 800 feet agl. The cloud and weather chart for the graphic area forecast (GFA), valid from 1800 UTC, indicated the possibility of a ceiling at 200 feet agl and fog patches, reducing visibility to ½ mile along the shores of the Gulf of St. Lawrence.

The pilot arrived at Gaspé airport around 1645. He seemed to be in good condition and ready for the flight. He filed a visual flight rules (VFR) flight plan for the return trip. The aircraft's four fuel tanks were filled, allowing him to complete the flight as planned in accordance with existing regulations. The aircraft took off at approximately 1705 with an anticipated return time of approximately 1845. The flight to Îles-de-la-Madeleine was without incident, and the aircraft landed there at approximately 1800. Twelve minutes later, with two passengers on board, the aircraft took off for Gaspé. While the aircraft was en route, the TAF for Gaspé was revised twice, at 1839 and again at 1849. These two revisions indicated deteriorating weather conditions compared to the TAF received prior to departure; the initial ceiling forecast of 800 feet agl dropped to 300 feet agl, and the forecast for visibility was ½ mile in fog. There is no evidence that the pilot either requested or was advised of these revisions.

At 1849:58, the pilot tried to make initial radio contact with the Flight Service Station (FSS) at Québec. He transmitted twice on 122.3 megahertz (MHz), but received no response. The pilot then tried to make contact on 126.7 MHz. The FSS specialist responded and asked the pilot to switch back to 122.3 MHz. When two-way communication was established on 122.3 MHz at 1853:32, the pilot was advised that the surface winds were favourable for runway 11, and the altimeter setting was 30.25 inches of mercury (in. Hg). The pilot read back the altimeter setting correctly and advised that he would proceed for runway 11.

At 1855:13, the FSS specialist gave the pilot the latest weather observation from Gaspé, which was a special bulletin issued at 2241 UTC. It indicated a ceiling at 500 feet agl and visibility of ¾ mile in fog. Based on this information, the pilot advised that he would proceed for runway 29, but did not specify the type of approach. At approximately 1856:07, when he was about 7 nm south-east of Gaspé, the pilot requested clearance for an instrument approach, which he received less than one minute later. At 1857:20, the pilot pressed his microphone button seven times to switch the aerodrome lights on high. That was the last radio transmission received from the aircraft. According to the information received, all lights were working normally at the time of the occurrence. Except for the call made when 7 nm south-east, the pilot made no reports during the approach.

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[1] All times are eastern daylight time (coordinated universal time (UTC) minus four hours) unless otherwise noted.

When the aircraft did not arrive at its destination, emergency procedures were initiated. The emergency locator transmitter (ELT), model TEL82, serial number 10246, was installed and maintained in accordance with the regulations. It was found with its selector switch in the automatic position, but it did not activate because the battery disconnected on impact. This delayed locating the aircraft until 1028 the next day. Tests in the Transportation Safety Board (TSB) Engineering Laboratory showed that the ELT operated normally when the battery was connected.

Although they were wearing their seat belts at the time of the accident, all three occupants were thrown from the aircraft with their seats due to the force of the impact. There was no chance of survival because of the force of the impact.

The aircraft crashed on the summit of a hill with an elevation of about 300 feet above sea level (asl), 1.2 nm north-east of the threshold of runway 29, and 0.8 nm north of the approach track. The swath cut through the trees by the aircraft extended over a distance of about 100 metres and followed a trajectory leading directly towards the runway. The debris pattern at the crash site indicated a high-speed, low-angle impact. Marks left on one of the speed indicators indicated a speed of 185 miles per hour (mph) on impact, which is far greater than the normal approach speed of 110 mph. All flight control surfaces were retrieved at the site, and all damage to the aircraft was attributed to impact forces. The flaps were retracted, and the landing gear was not in the down and locked position. Several aircraft instruments, including the altimeters, were destroyed on impact and could not be analysed. The aircraft records indicate that both altimeters were calibrated in June 2003, and no deficiencies had been reported since then. Examination of the propeller hubs revealed that the engines were producing power at the time of impact. Engine rpm could not be determined.

Examination of the airworthiness directives, service bulletins, and technical log books of the aircraft indicate that it was certified, equipped, and maintained in accordance with existing regulations and approved procedures. There was no evidence found of any airframe failure or system malfunction prior to or during the flight. The weight and centre of gravity of the air plane were within the limits prescribed by the manufacturer.

The pilot held a valid airline transport pilot licence with an instrument flight (IFR) endorsement. The last entry in his flight log book indicates that as of 16 December 2002 he had 5262 flying hours, of which 3500 hours were instrument flight. He was qualified on the PA-31 and had over 3000 hours on this type of aircraft. The pilot was from the Gaspé region, where he had gained most of his flying experience. He was president of the company, as well as chief pilot and director of operations. According to the autopsy and toxicology testing, there was no indication that physiological factors affected the pilot's performance.

Staffing at the Québec FSS was adequate on the evening of the accident. The FSS specialist in charge of the Gaspé sector had been on duty since 1115, and his workload was considered light. All necessary equipment was in good condition and was being used. To provide a common channel for air-ground communications with aircraft operating in remote areas of Canada, FSS specialists monitor frequency 5680 kHz on the high frequency (HF) band. On the evening of the accident, it was reported that the HF band was producing radio interference. It is recognized that HF bands produce this type of interference. It is possible that this interference prevented the FSS specialist from hearing the first messages transmitted by the pilot on 122.3 MHz.

Since the Gaspé airport is outside controlled airspace, NAV CANADA does not provide radar coverage for aircraft flying at low altitude in this area. The only data obtained came from military radar and covered only a short segment of the flight when the aircraft was in cruise flight about 30 miles south-east of Gaspé. Those data indicate that the aircraft was heading directly for the airport at normal cruise speed and suggest that the pilot was using the global positioning system (GPS) to navigate and report his distance from the airport. The GPS installed on the aircraft, a Garmin GPSMAP 295, was not certified for instrument navigation, but could be used to facilitate visual navigation. The condition of the GPS after the accident did not allow investigators to obtain any information useful for the investigation.

Regulations permit the aircraft to conduct instrument flights with passengers on board without a co-pilot provided that it is equipped with an autopilot. Although using an autopilot reduces the pilot's workload, the presence of a co-pilot allows tasks to be shared and offers a better opportunity to detect deviations from the desired flight profile. Examination of the autopilot control console did not reveal whether or not it was in operation prior to or at the time of impact. It was not required to be in operation. The aircraft was not equipped with a ground proximity warning system (GPWS) or a radio altimeter, nor were they required by regulation.

The published minimum descent altitude (MDA) for the runway 29 back course is established at 440 feet asl and a visibility of one mile. The elevation of the aerodrome is 108 feet asl. Even if the reported visibility was less than the minimum published for an instrument approach, the pilot was not prohibited by regulation from conducting the approach. With regard to the landing, the existing regulations prohibit the pilot of an aircraft on an instrument approach from continuing the descent below the MDA if he does not establish and maintain the visual reference required to land safely. If the pilot loses the required visual references, he must execute a go-around.

The aircraft was found over 25 degrees to the right of the localizer track. The design of the approach system at Gaspé, which dates from the 1970s, and the surrounding hilly terrain contribute to signal interference in the area between 25 and 35 degrees from the localizer. This interference causes the course deviation indicator (CDI) to oscillate when an aircraft is in this area, contrary to the standard established by the International Civil Aviation Organization, which states that the signal should allow the CDI to remain stable on the appropriate side. To inform pilots of this signal interference, a note on the approach plate indicates that the Gaspé localizer transmitter is not reliable beyond 25 degrees on either side of the localizer. In-flight tests have shown that despite the oscillation of the CDI inside this area, the indication remains appropriate in relation to the localizer track. After the accident, an in-flight test of the navigation aids at Gaspé was conducted, and it showed that they met operational requirements and that broadcast parameters were within technical tolerances. No navigation aid malfunctions were reported on the day of the accident.

On 16 December 1997, a CL-600-2B19 crashed at the Fredericton (New Brunswick) airport while executing a go-around in reduced visibility and low ceiling conditions. The TSB investigation of this accident (report A97H0011) identified 28 other accidents in Canada between 01 January 1984 and 30 June 1998 involving heavy aircraft landing in reduced visibility conditions where these conditions contributed to the accident. This investigation also identified a safety deficiency

due to the fact that the existing regulations do not provide sufficient protection against the risk of collision with the terrain when instrument approaches are conducted in reduced visibility conditions. In its report, published on 20 May 1999, the TSB recommended that:

> The Department of Transport reassess Category I approach and landing criteria (re-aligning weather minima with operating requirements) to ensure a level of safety consistent with Category II criteria. (A99-05)

Transport Canada responded to the recommendation on 06 August 1999 indicating that a draft regulation amendment to strengthen the standards applicable to instrument approaches in minimal weather conditions would be submitted without delay to the Canadian Aviation Regulation Advisory Council (CARAC) for comment with the objective of applying the changes as soon as possible.

On 12 August 1999, a Raytheon Beech 1900D crashed on approach to the Sept-Îles, Quebec airport, when the reported weather conditions indicated a ceiling of 200 feet and a visibility of ¼ statute mile. The TSB investigation into this accident (report A99Q0151) identified four other accidents that had occurred with reduced visibility as an underlying factor since recommendation A99-05 had been issued. The TSB report on this accident, published 14 March 2002, included a Board recommendation that:

> The Department of Transport expedite the approach ban regulations prohibiting pilots from conducting approaches in visibility conditions that are not adequate for the approach to be conducted safely. (A02-01)

Transport Canada responded to the recommendation on 26 May 2002 indicating that they had prepared 16 notices of proposed amendment (NPA 2000-001, 002, 006, 007, 008, 009, 010, 011, 012, 106, 107, 108, 116, 117, 194, and 195) to address the issue of a regulatory approach ban related to visibility. The response stated that the NPAs were, at the time, under review by the Department of Justice and that the final version should be published in the *Canada Gazette* in June 2002.

Information received recently from Transport Canada revealed, after some delay, that the NPAs are now in the hands of the Minister of Transport for approval. Previously, from 2000 to July 2004, the NPAs were at the Department of Justice (file number 10000-386) for revision of the wording and review of legality. This prolonged delay was apparently due, in part, to the high priority that the CARAC (composed of senior safety and security managers) accorded to the treatment of the draft security regulations following the events of 11 September 2001. Increased demand for the services of the Department of Justice at the time apparently caused additional delays.

Since recommendation A02-01 was issued, TSB has identified another accident, in addition to the one that is the subject of this report (report A03Q0151), where visibility was an underlying factor. On 25 February 2004, at Edmonton International Airport, a B737-200 touched down beside the runway during a landing in which weather conditions were a ceiling at 300 feet and

visibility of ⅛ statute mile in fog, and the runway visual range (RVR) was 1200 feet. The aircraft sustained substantial damage. Fortunately, none of the 36 occupants were injured (TSB occurrence A04W0032; investigation in progress).

## *Analysis*

The condition of the engines, the angle of impact, and the condition of the pilot indicate that the pilot maintained control of the aircraft until impact. Consequently, this accident falls into the category of controlled flight into terrain (CFIT).

The TAF received prior to departure from Gaspé gave the pilot reason to believe that he could complete the return trip under VFR. However, the GFA indicated instead the possibility of IFR conditions. A better analysis of the weather conditions by the pilot would have enabled him to anticipate the possible deterioration of weather conditions and to plan the flight according to instrument flight rules. The absence of weather condition updates while he was en route to Gaspé contributed to the late realization that the weather conditions at his destination were poor. Since the flight was made at night, it must have been difficult to see the poor conditions before flying into them. It was only after he was informed by the FSS specialist that the pilot realized that an instrument approach would be necessary. This situation, combined with the difficulties that the pilot experienced in establishing initial communications with the FSS, delayed the request for and receipt of clearance for the approach and, therefore, preparation for it.

Because he was about 7 nm from the airport when he received his approach clearance, the pilot had only a brief period of time to perform the various tasks associated with preparing for an instrument approach, such as: deciding on the type of approach, getting out the approach plate, familiarizing himself with the plate, tuning in the ILS (instrument landing system) frequency, activating the ARCAL (aircraft radio control of aerodrome lighting) system, making the reports associated with an instrument approach at an uncontrolled aerodrome, and modifying the aircraft configuration for the approach and landing.

Instrument flying demands a good method of surveying instruments, commonly called "scanning." Although he was qualified for instrument flight, and he had considerable experience in these sorts of conditions, the pilot had to perform several tasks within a short period. His attention may have been absorbed by performing these tasks during the approach, diverting his attention from the CDI, which would explain why he ended up on the right side of the localizer track. Even if the regulations did not require it, the presence of a co-pilot would probably have allowed the pilots to share tasks before and during the approach. The co-pilot could have supervised the approach and promptly advised the pilot of any deviation from the approach profile.

The navigation aids at Gaspé were operating normally, and no malfunctions in the on-board instruments were reported. Since the aircraft was over 25 degrees off the localizer track, the CDI was probably oscillating. However, it is reasonable to believe that the indication was appropriate, indicating to the pilot that he was to the right of the localizer track. Considering that the pilot had acquired most of his flying experience in the Gaspé region, it is highly probable that he knew about the unreliability of the signal outside 25 degrees.

Since the altimeters had been calibrated recently, no malfunctions were reported by the pilot, and he correctly read back the altimeter setting provided by the FSS specialist, it is reasonable to believe that the altimeters were properly set and that they indicated the correct altitude asl. Since the reported visibility was only ¾ mile, it is unlikely that the pilot had the visual reference required to continue the descent below the MDA. Several elements should have induced the pilot to execute a go-around: the aircraft was not in landing configuration nor was it correctly established on the published approach profile, and the required visual reference was probably not established.

Studies and statistics have demonstrated that GPWSs and radio altimeters provide effective protection against CFIT. One or both of these devices could have alerted the pilot to his proximity to the ground, prompting him to execute a go-around.

If the proposed regulatory amendments concerning an approach ban had been in force at the time of these two accidents (A03Q0151 and A04W0032), the pilots involved would not have received clearance for the approach. For A03Q0151, since visibility was at the minimum proposed for a non-precision approach, i.e., ¾ mile, a co-pilot would have been required (in addition to the proposed requirements for training and equipment); as for A04W0032, since visibility was below the minimum proposed for a precision approach, i.e., 1600 feet RVR (but not below 1200 feet RVR), centre-line lights or a head-up display would have been required (in addition to the proposed requirements for training and equipment).

The Board is of the view that the existing regulations do not provide adequate protection against the risk of ground impact when instrument approaches are conducted in reduced visibility conditions.

The following laboratory reports were completed:

LP 102/03 *Instruments, Radios & ELT Examination*
LP 120/03 *Examination of Propeller Hub*
LP 121/03 *Landing Light Examination*
LP 123/03 *Power Pack & Nose Actuator Examination*

# *Findings as to Causes and Contributing Factors*

1. The pilot descended to the minimum descent altitude (MDA) without being established on the localizer track, thereby placing himself in a precarious situation with respect to the approach and to obstruction clearance.

2. On an instrument approach, the pilot continued his descent below the MDA without having the visual references required to continue the landing, and he was a victim of CFIT (controlled flight into terrain).

## *Findings as to Risk*

1. The aircraft was not, nor was it required to be, equipped with a ground proximity warning system (GPWS) or a radio altimeter, either of which would have allowed the pilot to realize how close the aircraft was to the ground.

2. The presence of a co-pilot would have allowed the pilots to share tasks, which undoubtedly would have facilitated identification of deviations from the approach profile.

3. The existing regulations do not provide adequate protection against the risk of ground impact when instrument approaches are conducted in reduced visibility conditions.

## *Other Findings*

1. The emergency locator transmitter (ELT) could not emit a distress signal because the battery disconnected on impact. Location of the aircraft was delayed until the day after the accident, which could have had serious consequences if there had been any survivors.

## *Safety Concern*

Transport Canada's proposed approach ban regulatory initiative should decrease the probability of accidents on instrument approaches in reduced visibility conditions. The Board is nonetheless concerned that, until these proposed regulatory provisions come into force, safety measures will remain inadequate against the risk of controlled flight into terrain resulting in loss of life.

*This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 06 October 2004.*

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