Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

AVIATION INVESTIGATION REPORT

A04A0148

COLLISION WITH TERRAIN

ATLANTIC AVIATION ACADEMY INC.

PIPER PA-28-140 CHEROKEE C-FYKS

ST. JOHN'S, NEWFOUNDLAND AND LABRADOR 10 nm SW

05 DECEMBER 2004

Canada

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Summary

The Piper PA-28-140 (registration C-FYKS, serial number 28 25719) with an instructor pilot and student on board, departed St. John's International Airport, Newfoundland and Labrador, at 1338 Newfoundland standard time for a local instructional flight. The aircraft climbed on a southwesterly heading to 2000 feet above sea level (asl). At 1343, the pilot reported leaving the control zone, which was the last radio communication from the aircraft.

Air traffic control radar data showed that the aircraft then descended gradually while executing a series of 90° turns. The aircraft's ground speed during the descent was between 50 and 70 knots. (All radar speeds are ± 5 knots.) After the fourth turn, the aircraft's ground speed increased to 100 knots. The aircraft then disappeared from radar at about 600 feet asl (200 feet above ground level (agl)), reappearing 37 seconds later at 700 feet asl (about 250 feet agl). (All radar altitudes are ± 50 feet.) The aircraft entered a tight left turn then disappeared finally from radar at 1352:10, while on a westerly heading at 70 knots ground speed. The position of the last radar return coincided with the location of the accident site. The student pilot died in the crash. The instructor received serious injuries, including head injuries with post-trauma amnesia, and was not able to provide investigators with information relating to the accident. Shortly after the accident, occupants of a passing vehicle noticed the aircraft wreckage and called the 911 emergency operator at 1359:51. There were no known witnesses to the accident.

Other Factual Information

At the time of departure, 1338 Newfoundland standard time,[1] the weather at the airport was reported as follows: wind from 215° Magnetic at 10 knots; visibility 12 statute miles; a few clouds at 3000 feet above ground level (agl), with an overcast ceiling at 5500 feet agl; temperature 2°C; dew point -3°C; and altimeter setting 29.88.

While transiting out of the control zone, the aircraft would have encountered a lowering ceiling that restricted the maximum altitude of the aircraft to approximately 2000 feet above sea level. After the accident, snow squalls moved through the area; however, personnel in the immediate vicinity of the accident site reported that there was no snow falling in that area prior to the accident.

The instructor had a valid commercial pilot licence, with no restrictions. He had a Class Three Instructor Rating, about 1000 hours of instructional time, and 1300 hours total of flight time. The student pilot had 21.3 hours of flight time. He had made steady progress throughout his training and had made three solo flights, totalling 2.3 hours.

The instructor had not flown with this student before. The chief flying instructor was aware of this, and spoke with both the student and the instructor before they departed to outline the purpose and limitations of the flight, and to assess that they were both ready for the flight. Prior to the flight, the instructor and student completed the necessary pre-flight briefings, checks and calculations.

The purpose of the flight was to instruct the student on engine-out, forced -landing glide techniques, and it appears this is the sequence that was initiated. The normal method of simulating an engine-out glide is to start the procedure at 3000 feet. In cold weather, full carburetor heat is applied, the throttle is retarded to 1500 rpm, two notches of flap are applied, and the aircraft is trimmed for 70 knots (80 mph). During descent the engine is warmed by short throttle increases every 500 feet. The exercise is normally concluded by 500 feet agl; however, instructors may descend lower. To overshoot from the exercise, full throttle is applied, the carburetor heat is set to cold, wing flaps are retracted and a climb is initiated. The engine rpm at full throttle during recovery is normally 2400-2500 rpm. It was not possible to determine if the cold-weather glide technique was used during the accident flight.

The aircraft was registered for commercial operation and had a valid certificate of airworthiness. Records indicate that it was being maintained and operated in accordance with approved procedures and regulations. It was not equipped with flight data or voice recording devices, nor was it required to be by regulation. The aircraft was equipped with a DEFT 1 emergency locator transmitter (ELT), which was activated by impact forces. The ELT transmission was received by overflying aircraft and the COSPAS search and rescue satellite. The weight and centre of gravity were within the approved limits at take-off.

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[1] All times are Newfoundland standard time (Coordinated Universal Time minus 3.5 hours).

Air passing through a carburetor venturi is cooled. The cooling process can cause moisture in the air to precipitate in the form of ice, which may build up inside the venturi to the extent that a drop in engine power output results. If the ice is allowed to continue to build up, engine stoppage may occur. In an aircraft with a fixed-pitch propeller, indications of carburetor icing are a loss of engine power, indicated by a drop in rpm and engine roughness.

The carburetor heat system directs heated air into the carburetor from a muff around the engine exhaust manifold. The system is more effective as an anti-icing device than as a de-icing device. The application of carburetor heat to remove ice will initially cause a further reduction in rpm and engine power. Depending on the amount of ice build-up in the carburetor, it could take a considerable amount of time to clear all the ice and regain the potential for full engine power.

According to the *A.I.P. Canada*,[2] the temperature and dew point during the accident flight were conducive to serious icing effects at any engine power setting (see Figure 1). Carburetor icing may occur at any power setting, but is more likely at low power settings. It was not possible to determine if the carburetor heat was applied during the practice glide procedure or during the subsequent flight manoeuvres.

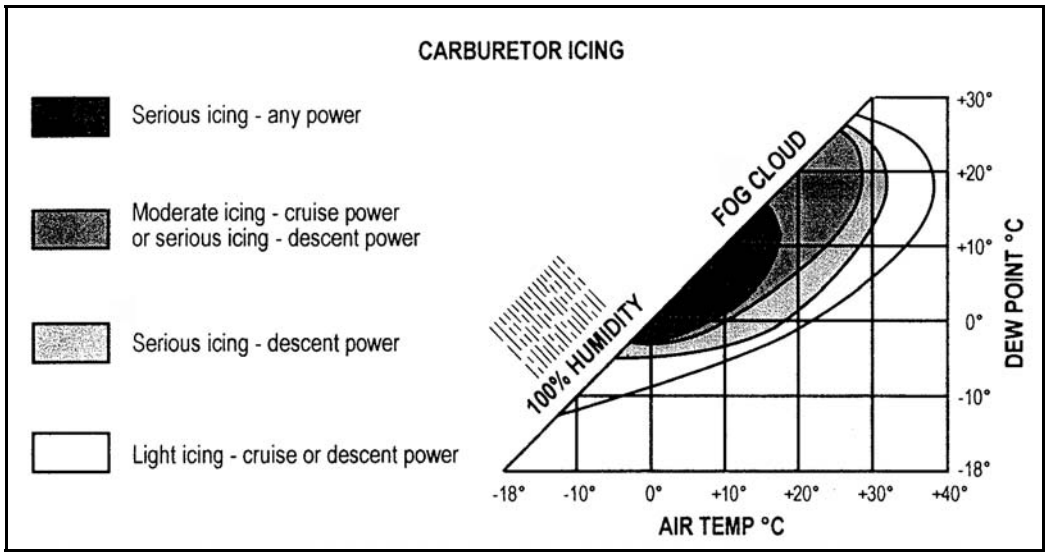

Figure 1. Carburettor icing diagram from A.I.P. Canada , AIR 2.3. Note: This chart is not valid when operating on MOGAS due to its volatility.

Tree strike marks show that the aircraft first struck the trees in a wings-level, nose-low attitude on a northerly heading. It then travelled about 10 yards through the trees before striking the ground in a left-wing-low, 20° nose-down attitude, coming to rest immediately adjacent to Cochrane Pond Road. The aircraft was torn apart during the accident sequence. All the major components and aerofoil sections were found within the wreckage trail, and all damage resulted from the crash. Flight control continuity was confirmed for all flight controls. Wing flaps were up at impact. There was some bending to one propeller blade; the other blade was unbent. The

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[2] Transport Canada, Civil Aviation, *Aeronautical Information Publication (A.I.P.) Canada*, www.tc.gc.ca/CivilAviation/Regserv/Affairs/AIP/pdf.htm.

cockpit engine controls were damaged and had moved during the crash sequence. Examination of the controls at the engine found that, at impact, the throttle valve was two-thirds open, the mixture was full rich, and the carburetor heat was off.

The aircraft, which had been refuelled with AVGAS the day before the accident flight, contained 33 gallons of fuel prior to departure. There was a strong smell of fuel at the accident site, and fuel was recovered from both tanks and from the line leading to the carburetor. This fuel appeared clear, bright and uncontaminated. The aircraft fuel selector was found in the right fuel tank position. No ice or water was found in the carburetor; however, the temperature was above freezing after the accident and any ice would have melted and drained away before the carburetor could be examined. The carburetor heat system was damaged by the impact but was otherwise intact. The carburetor was examined at the manufacturer's facility with Transportation Safety Board of Canada (TSB) personnel in attendance; no faults were found.

The engine (Lycoming O-320-E2A) was run at a test facility with a replacement carburetor attached; the engine produced rated power. The TSB Engineering Laboratory examined the aircraft's instruments, exhaust system and warning lights. An impact mark from the tachometer needle was found on the face of the engine tachometer at 1900 rpm, which represents a relatively low power setting. This power setting may allow level flight at a reduced airspeed, but it would be insufficient to allow a climb. Metallurgical analysis of crushed areas of the exhaust system indicated that the exhaust stacks were below the normal cruise operating temperature, suggesting that the engine was at low power at the time of impact. Filament stretching indicated that the stall warning light was illuminated at impact.

Analysis

The snow squalls had not started prior to the accident, so it is unlikely that the flight encountered seriously reduced flight visibility or that the pilots lost outside visual reference. The lower ceiling to the southwest of the airport meant that the entry into the practice glide would have been initiated 1000 feet lower than normal, restricting the time available in the glide for instruction. This could have prompted the delay in initiating the climb until well below the normal 500-foot recovery altitude. However, this does not account for the failure of the aircraft to climb after the practice manoeuvre or the subsequent prolonged flight at low level. If normal engine power had been available to climb out after the practice glide manoeuvre, it is unlikely that the instructor would have intentionally flown the aircraft at low airspeed at a low altitude.

The most likely reason for the failure to climb away after the forced landing exercise is insufficient engine power available. Fuel was available and there was no apparent pre-existing mechanical fault with either the carburetor or the engine. Therefore, the most probable reason for the reduced engine power is carburetor icing. Low engine power at impact is supported by the lack of bending to the propeller, the relatively low engine rpm and the cool exhaust stacks. The 20° nose-down attitude at impact and the illumination of the stall warning light suggest that the aircraft wings were stalled at the time of impact.

Carburetor ice would have formed during the glide descent if carburetor heat was not used, or if the engine was not cycled as recommended to produce sufficient exhaust heat for the carburetor heat muff. If carburetor ice had already formed, the application of carburetor heat at low altitude

could have reduced the rpm to the extent that level flight was not possible. It is likely that the reduced power prevented a climb and led to the subsequent low-level flight at reduced airspeed; eventually the aircraft struck the ground, perhaps as the result of a stall.

The following TSB Engineering Laboratory Reports were completed:

LP 169/04 – Instrument Analysis
LP 170/2004 – Exhaust Temperature Analysis
LP 171/04 – Flap Extension Rod

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

Findings as to Causes and Contributing Factors

1. The aircraft was flying in conditions conducive to serious carburetor icing at any engine power setting. It is likely that carburetor ice formed and restricted the engine power available to the point where the aircraft would not maintain level flight.

2. The aircraft subsequently struck the ground, perhaps as the result of a stall.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 06 July 2005.

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