Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

AVIATION INVESTIGATION REPORT A15O0031

IN-FLIGHT BREAKUP
PIPER PA-32RT-300T, C-GDWA
FRENCH RIVER PROVINCIAL PARK, ONTARIO
17 MARCH 2015

Canada

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Piper PA-32RT-300T, C-GDWA
French River Provincial Park, Ontario
17 March 2015

Summary

On 17 March 2015, at 1509 Eastern Daylight Time, a privately registered Piper PA-32RT-300T (registration C-GDWA, serial number 32R-7987047) with 3 people on board departed Sudbury, Ontario, on an instrument flight rules flight to Winston Salem, North Carolina. Approximately 30 nautical miles south of the Sudbury Airport, at an altitude of 10 000 feet above sea level (asl), the pilot advised air traffic control that there was a problem and that the aircraft was returning to Sudbury. Air traffic control cleared the aircraft to a lower altitude, and observed it turning and descending on radar. During the descent, the aircraft disappeared from radar at 8900 feet asl, then reappeared momentarily at 6300 feet asl and 3800 feet asl, after which there were no further radar contacts. Moments later, the aircraft's emergency locator transmitter emitted a brief signal that was detected by the Cospas-Sarsat search and rescue satellite system. A search for the aircraft was initiated, and wreckage was located the following morning. The aircraft had broken up in flight, and debris was found as far as 6500 feet from the main crash site. A post-crash fire had destroyed most of the main wreckage. All 3 people on board were fatally injured. The accident occurred during daylight hours at approximately 1534 Eastern Daylight Time.

Le présent rapport est également disponible en français.

Factual information

History of the flight

The pilot planned to take his wife, who had a medical disability, to Florida to visit family. The pilot had enquired about taking a commercial flight, but the airlines would not accept the pilot's wife as a passenger because of her medical condition. The pilot, intent on making this trip, decided to use his own aircraft, a privately registered Piper PA-32RT-300T (registration C-GDWA, serial number 32R-7987047) for the journey, with his wife and a caregiver as passengers.

On 17 March 2015 (the day of the occurrence flight), a co-owner of the aircraft filed an instrument flight rules (IFR) flight plan for the pilot using an electronic flight-bag application,[1] with a routing from Sudbury Airport (CYSB), Ontario, direct to Winston Salem, North Carolina (630 nautical miles south), at 10 000 feet above sea level (asl), and arranged for customs to meet the aircraft. The aircraft was to be fueled in Winston Salem and then continue on to Florida.

The pilot had originally planned to depart CYSB at 0900,[2] but, because of numerous delays, departure time was postponed until the afternoon.

The pilot contacted the London Flight Information Centre, Ontario, at 1238 and requested a weather briefing for a 1330 departure time. During these communications, the pilot indicated he was concerned about clouds en route and wanted to be sure he would be flying above them.

The departure time was further postponed while the pilot carried out some last-minute tasks. At approximately 1400, the aircraft was moved out of the hangar for fueling. Both passengers were seated in the rear forward-facing seats, and baggage was piled to the ceiling behind them.

At 1439, with the aircraft engine running, the pilot contacted Sudbury Flight Service Station (FSS) to obtain an IFR clearance. He had some difficulty copying the clearance, and it had to be repeated several times.

At 1441, after having read back the clearance properly, the pilot advised Sudbury FSS that he would need 10 minutes to contact customs in Virginia. The pilot shut down the engine and contacted the co-owner of the aircraft by telephone. During the next 26 minutes, the pilot spoke to the co-owner about changing the flight's arrival time in the United States so that customs could meet the aircraft. As well, the co-owner reviewed the operation of the

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1 An electronic system or device that can display a variety of aviation data or perform calculations. (Transport Canada, Commercial and Business Aviation, Advisory Circular No. 700-20, issue 02, Electronic Flight Bags, effective 19 December 2012)

2 All times are Eastern Daylight Time (Coordinated Universal Time minus 4 hours).

navigation equipment and the electronic flight-bag application, because the electronic flight bag was new equipment and the pilot seemed unsure of some of its features and selections.

At 1507, the pilot advised Sudbury FSS that he was ready to taxi. He subsequently taxied for Runway 04.

At 1509, the aircraft departed CYSB and climbed on course to a cruising altitude of 10 000 feet asl. The aircraft's speed and heading were relatively constant, with an average calculated 110 knots indicated airspeed (KIAS).[3]

At 1525, the pilot contacted Toronto Area Control Centre (Toronto Centre), advised that the aircraft was level at 10 000 feet asl, and requested the altimeter setting. The aircraft's speed rose to an average of 130 KIAS, and the heading wandered slightly left and right of course.

At 1527, the aircraft slowly climbed to 10 400 feet asl and then began to descend back to 10 000 feet asl.

At 1528, Toronto Centre advised the pilot to switch frequency; the pilot acknowledged the transmission, but had to ask for the frequency to be repeated. Simultaneously, without clearance from air traffic control (ATC), the aircraft started descending below 10 000 feet asl, and its speed began to increase.

At 1529, the aircraft started a gradual turn to the west while descending. Its airspeed at that point was 150 KIAS, which is the maximum structural cruising speed (V_{NO})[4] and is not to be exceeded unless in smooth air and, in that case, exceeded only with caution.

At 1529:21, the pilot contacted Toronto Centre on the new frequency, and he was given the Wiarton altimeter setting. The pilot informed Toronto Centre that the aircraft was descending and that there was a problem. The aircraft speed at this point had increased to 186 KIAS; the never exceed speed (V_{NE})[5] for the aircraft is 191 KIAS.

At 1529:38, Toronto Centre asked the pilot whether he required assistance. There was no reply, and subsequent radio calls were not answered. The aircraft's speed decreased slightly to 170 KIAS.

At 1531:26, the pilot radioed that the aircraft was returning to CYSB. Toronto Centre acknowledged the transmission, cleared the aircraft to a lower altitude, and asked whether they could be of any assistance. There was no reply from the pilot.

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3 All airspeeds are based on calculations by the TSB Laboratory in report LP067/2015 – Radar Data Analysis.

4 Piper Aircraft Corporation, *Pilot's Operating Handbook and FAA Approved Airplane Flight Manual: Piper Turbo Lance II* (01 May 1978), section 1.19.

5 Ibid. The V_{NE} "is the speed limit that may not be exceeded at any time."

At 1531:32, the aircraft disappeared from primary and secondary radar; its speed was estimated at 170 KIAS, at an altitude of approximately 8900 feet asl.

At 1531:42, there was a brief, chopped radio transmission, but it was not intelligible.

At 1531:52, the aircraft reappeared on primary and secondary radar at an altitude of approximately 6300 feet asl. The secondary radar return following the 20-second gap showed that the aircraft had descended 2600 feet during that time, which is a substantial average descent rate, approaching 8000 feet per minute. The descent rate continued to increase rapidly. By the final secondary radar return at 1532:05, the indicated altitude was dropping through 3800 feet, and the airspeed was estimated at 220 KIAS and increasing; this is 29 KIAS in excess of the V_{NE}. At that time, the aircraft was approximately 3000 feet above ground level.

At 1533:56, a momentary emergency locator transmitter signal from the occurrence aircraft was detected by the Cospas-Sarsat search and rescue satellite system.

A search for the aircraft was initiated, and wreckage was located the following morning. The aircraft had broken up in flight, and debris was found as far as 6500 feet from the main crash site. A post-crash fire had destroyed most of the main wreckage. The pilot and the 2 passengers were fatally injured.

Weather

The 1500 aviation routine weather report (METAR) for CYSB was as follows: wind 320° true at 17 knots gusting to 23 knots, variable between 300° and 010°, visibility 20 statute miles , broken clouds based at 6300 above ground level, temperature −3 °C, dew point −16 °C, and altimeter setting 29.94 inches of mercury; in the remarks section, the METAR noted cumulus cloud cover of 6 octas.[6]

Other flights in the vicinity of the crash site reported a scattered/broken cloud layer between 7500 and 10 000 feet asl. At the time of the occurrence, there was no forecast or reported turbulence in the area.

Pilot

The pilot had a private pilot licence, originally issued in July 1991, which was valid for single-engine landplanes, with a night rating. His group 3 instrument rating, originally issued in February 1992, had previously expired at the end of November 2009, and his category 3 medical certificate had expired at the end of November 2010. The pilot had renewed both of these in November 2011, when he applied for the new aviation booklet.

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6 An octa is a unit of measurement used to describe the amount of cloud cover at any given location. Sky conditions are estimated in terms of how many eighths of the sky are covered in cloud, ranging from 0 octas (completely clear sky) to 8 octas (completely overcast).

However, both of these had expired again at the end of November 2013. There was no indication that the pilot had attempted to renew the instrument rating or had undergone the required medical examination to renew the medical certificate.

Records indicate that, in November 2011, the pilot had 3650 total flight hours, 65 of which had been accumulated in the previous 12 months.

The investigation could not determine exactly how many hours the pilot had flown since November 2011 because his most recent pilot log book and the aircraft journey log book were both destroyed in the post-crash fire. However, aircraft records indicate the pilot flew 33 hours between May 2012 and September 2013, 18 minutes between September 2013 and September 2014, and 1 hour between October 2014 and the time of the crash.

Passenger

The pilot's wife had a progressive, degenerative, terminal medical condition that impairs the body's autonomic nervous system. This system automatically controls or regulates body functions, which include the coronary and pulmonary systems. Her medical condition and health were declining, and she had recently been hospitalized as a result. She was released from hospital 6 weeks before the occurrence. Her condition had deteriorated to the point that she could no longer move, communicate verbally, eat, or function by herself; as a result, she required 24-hour care.

Additionally, she had a tracheostomy to support respiratory function, and occasionally required supplemental oxygen and suctioning of her airway. Empty portable oxygen bottles were found at the hangar where the aircraft was stored, but no oxygen bottles were found at the crash site. An oxygen concentrator was found in the debris, but it was a home unit that required a household electrical supply to function and, therefore, could not be used on the aircraft.

Aircraft

The Piper PA-32RT-300T is a single-engine unpressurized aircraft. It is equipped with 2 baggage areas: 1 located behind the engine and the other located behind the rear seats. Both areas were placarded with a maximum loading capacity of 100 pounds.

The occurrence aircraft was manufactured in 1979 and was equipped with 6 seats: 2 pilot seats, 2 rear-facing seats immediately behind the pilot seats, and 2 forward-facing seats located in the rear. Each pilot seat had an adjustable lap belt with a shoulder strap, and the passenger seats had adjustable lap belts.

The aircraft had a design manoeuvring speed (V_A)[7] of 132 KIAS, with a manufacturer's caution not to make full or abrupt control movements or to operate in rough air above this speed. The aircraft's transponder antennas, required for secondary radar data, were located on the underside of the aircraft fuselage.

The aircraft had been purchased by the pilot in May 2012. The journey logbooks were not recovered, but, according to the technical logbooks, the last recorded maintenance was on 06 March 2015; this maintenance involved fixing several small discrepancies, along with adjusting magneto timing and changing the oil.

According to available records, the aircraft was maintained in accordance with existing regulations.

The aircraft had recently been flown to the Caribbean and had returned without any significant problems.

Wreckage information

The aircraft broke up in flight, and the main part of the fuselage struck the ground near the top of a steep rock face approximately 20 feet above the frozen surface of the French River. It then slid down the rock face and came to rest on the ice surface. A severe post-crash fire consumed most of this wreckage. The engine and propeller, which were damaged by the fire, showed no indication of a pre-existing condition that would have prevented normal operation. The fire also caused some of the ice to melt, creating an area of open water; as a result, some of the smaller pieces of wreckage sank.

Table 1 lists the aircraft parts and baggage items that were recovered, along with their respective distances and bearings from the main wreckage, and Figure 1 shows their distribution.

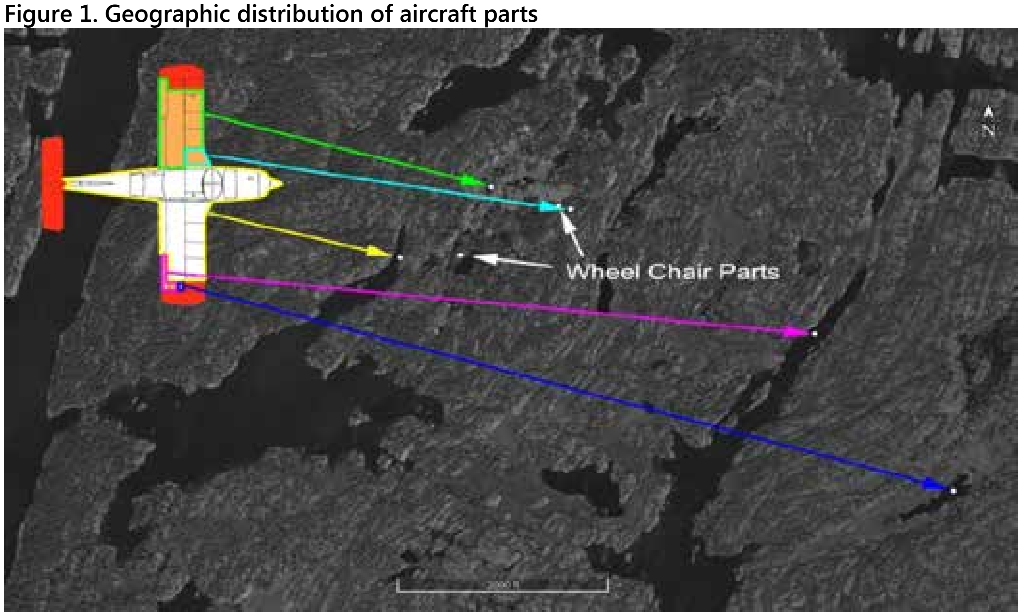
Table 1. Recovered aircraft parts and baggage items, and their proximity to the main wreckage

Aircraft part or baggage item	Distance from main wreckage (feet)	Bearing
Left main wing	1280	48°
Left inboard leading edge wing skin	1880	73°
Right aileron and right outboard upper wing skin section	4460	102°
Right outboard upper wing skin section	6500	116°
Wheelchair	612	89°
Wheelchair footrest and headset	1751	70°

7 V_A "is the maximum speed at which application of full available aerodynamic control will not overstress the airplane." (Piper Aircraft Corporation, *Pilot's Operating Handbook and FAA Approved Airplane Flight Manual: Piper Turbo Lance II* [01 May 1978], sections 1.19 and 2.3.)

Aircraft pieces that the investigators did not locate included the 2 fiberglass wing tips, most of the outboard wing skins, and the horizontal stabilator[8] (Appendix A).

Figure 1. Geographic distribution of aircraft parts



Only 4 seat belt buckle halves were recovered, 2 of which were buckled together. The investigation could not determine on which seats the buckles had been installed.

The emergency locator transmitter had been consumed by the post-crash fire.

Both wings' spars had failed as a result of instantaneous positive *g*-overload fractures; there was no indication of pre-existing fatigue or mechanical defect.

The pilot and his wife were ejected from the aircraft before impact with the ground. The remaining passenger, the wife's caregiver, was located in the aircraft wreckage. Post-mortem examination of the 3 individuals uncovered no unexpected abnormalities.

Aircraft weight and balance

The aircraft had a certified maximum take-off weight of 3600 pounds and a basic empty weight of 2385 pounds. This gave the aircraft a useful-load capacity of 1215 pounds for fuel, pilot, passengers, and baggage. The maximum fuel capacity of the aircraft is 94 US gallons (564 pounds), leaving 651 pounds for pilot, passengers, and baggage. The aircraft was fueled to maximum capacity before departure from CYSB.

The weight and balance that had been calculated before the occurrence flight were based on the aircraft having a full fuel load, the pilot's wife occupying a rear-facing passenger seat, the caregiver occupying a forward-facing rear seat, and 50 pounds of luggage being stowed in

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[8] The horizontal stabilator is attached to the top of the vertical fin.

each of the baggage areas. Based on those values, the aircraft's weight was 53 pounds under the maximum certified take-off weight, and the balance was within limits.

Taking into consideration the actual locations of the occupants, and using the same occupant and baggage weights, the aircraft's weight and balance would still have been within limits.

Baggage recovered by investigators included

- suitcase (approximately 35 pounds)
- bag (approximately 10 pounds)
- transport wheelchair (24 pounds)
- oxygen concentrator (58 pounds)

Based on the weight of the baggage recovered, the investigation calculated the aircraft weight to be 26 pounds under the maximum certified take-off weight. The baggage recovered weighed 127 pounds, 27 pounds more than accounted for in the weight and balance that had been calculated. One other piece of baggage was identified in the wreckage; however, all that remained was the steel wire frame, the contents having been completely consumed by the post-crash fire. The investigation could not determine exactly how much baggage had been loaded, nor could it determine how the baggage was distributed between the 2 baggage areas.

To fill the aft baggage area completely would require more baggage than was recovered. Considering that one suitcase had been consumed by the fire, investigators concluded that the aircraft was likely overweight and outside balance limitations at takeoff.

Flight reconstruction

The aircraft was not equipped with a flight data recorder or cockpit voice recorder, nor was either required by regulation. However, it was equipped with instruments capable of recording some data, such as engine performance. These, along with the remainder of the flight instruments and radios, were severely damaged by the fire, and no useful information could be recovered. The TSB Laboratory reconstructed the flight using the available radar, ATC radio communications, and weather data. The radar information for this area came from radars located in North Bay, Ontario, east of the accident site. Based on all available data, the information was compiled and a final flight path was reconstructed (Appendix B).

Retention of instrument flight rules skills

A review[9] of the literature on skill retention, including a number of conclusions applicable to the maintenance of pilot proficiency shows that without regular reinforcement, skills

[9] J. Patrick, *Training: Research and Practice* (London: Academic Press, 1992), pp. 96–104.

degrade over time, and the amount of degradation is related to the degree to which the skills are rehearsed.

In essence, skills can be expected to be most effectively maintained when they are well mastered during training, retrained on a regular basis, and rehearsed regularly between training sessions.

As stated in Transport Canada's *Instrument Procedures Manual* (TP 2076), instrument flight "is one of the most skilled tasks a pilot can achieve. Such skill however is not a natural attribute and can only be gained by careful training, constant practice and a methodical approach."[10] Like any other skill, instrument flying skill erodes over time if it is not exercised, making it unreliable among pilots who do not take the necessary steps to maintain instrument flight proficiency.[11]

Spatial disorientation

According to the United States Federal Aviation Administration,[12] all humans are susceptible to spatial disorientation. In aviation, spatial orientation can be defined as our ability to maintain our body orientation in relation to the surrounding environment at rest and during motion. Genetically speaking, humans are designed to maintain spatial orientation on the ground. The three-dimensional environment of flight is unfamiliar to the human body, creating sensory conflicts and illusions that make spatial orientation difficult and sometimes impossible to achieve. Spatial disorientation and loss of situational awareness cause 5% to 10% of fatal general aviation crashes annually; 9 out of 10 spatial disorientation mishaps result in a fatality.[13]

Studies conducted by aviation researchers at the University of Illinois in the 1990s estimated that, on average, it took 178 seconds for pilots to become spatially disoriented after loss of visual reference. An article published in *Flight Safety Australia* states:

> They took 20 VFR [visual flight rules] pilots and got them to fly into instrument meteorological conditions (IMC) in specially programmed flight simulators. All of the pilots in the study went into graveyard spirals that would have ended in uncontrolled flight into terrain or rollercoaster-like

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10 Transport Canada, TP 2076, Instrument Procedures (November 1997), section 1.1.

11 European Helicopter Safety Implementation Team (EHSIT) and European Aviation Safety Agency (EASA) [training leaflet], *Safety Considerations: Methods to Improve Helicopter Pilots' Capabilities* (2010).

12 M. J. Antunano, "Spatial Disorientation," in *Medical Facts for Pilots*, AM-400-03/1 (Federal Aviation Administration, 2005).

13 Ibid.

> oscillations that became so intense that they would have resulted in structural failure of the aircraft.[14]

Instrument-rated pilots are less likely to be affected by spatial disorientation because they have been specifically trained to rely on the aircraft's instruments when visual reference is lost. However, as previously mentioned, a pilot who does not maintain instrument proficiency skills regularly is more likely to lose those skills and to revert to the basic skills of a visual flight rules pilot.

Fatigue

The pilot's wife required 24-hour medical and custodial care. A medical caregiver provided this care during the day while the pilot was at work. Outside of work hours, the pilot became the primary caregiver. The pilot would wake up during the night to attend to her medical and personal needs. The pilot was described as fatigued, run down, and absent-minded at times.

Fatigue can affect cognitive function, problem solving, decision making, memory, attention, vigilance, and reaction time.[15] One source of fatigue is chronic sleep disruption, which occurs when shortfalls in sleep quantity or disruptions to sleep are sustained for periods longer than 3 consecutive days.

Effects of chronic stress on performance

Stress can be defined as a "mismatch between how an individual perceives the demands of a situation, and how he perceives his ability to meet these demands"[16] and can be acute (related to a short-term situation) or chronic (related to ongoing life events).

Stress has been shown to negatively impact human performance in the areas of working memory (increased difficulty retaining and assimilating information), attention (increased channelized attention), and communication (decreased verbal communication).[17]

The effects of stressors are cumulative;[18] as a result, life events that contribute to chronic stress reduce an individual's capacity to manage acute stressors encountered in the

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14 P. Cummins and staff writers, "178 Seconds to Live—VFR into IMC," *Flight Safety Australia* (January–February 2006), reissued 22 January 2016, available at: http://www.flightsafetyaustralia.com/2016/01/178-seconds-to-live-vfr-into-imc/ (last accessed 22 September 2016).

15 J.F. Duffy, K.-M. Zitting, and C.A. Czeisler, "The case for addressing operator fatigue," in S.M. Popkin (ed), *Reviews of Human Factors and Ergonomics*, Volume 10: Worker Fatigue and Transportation Safety (Sage, 2015).

16 A. Stokes and K. Kite, "Grace under fire: the nature of stress and coping in general aviation," in D. O'Hare (ed), *Human Performance in General Aviation* (Ashgate, 1999).

17 Ibid.

performance of their day-to-day tasks. Early recognition and intervention to manage stress are critical to reducing the potential impact of stressors on performance in safety-critical positions.[19]

Aviation medical considerations

As aircraft ascend, the increasing altitude results in decreasing barometric pressure. Even pressurized aircraft are pressurized to only 5000 to 8000 feet (1524 to 2438 metres) asl. The resulting decrease in barometric pressure results in a decreased partial pressure of oxygen (PO_2). At sea level, the barometric pressure is about 760 mm mercury (Hg), with typical corresponding arterial (blood) oxygen pressure (PaO_2) of 98 mm Hg in humans. At 8000 feet, the barometric pressure drops to 565 mm Hg and the PaO_2 drops to 55 mm Hg.

This drop in PaO_2 results in a decreased blood oxygen saturation to 90% for most individuals (compared with 96% to 98% at sea level). Most healthy individuals can function adequately up to 10 000 feet. They compensate for this hypoxemia by changes in respiration and cardiac functions (such as increased respiration and heart rate). However, individuals with coronary, pulmonary, cerebrovascular, or anemic diseases may have more difficulty.

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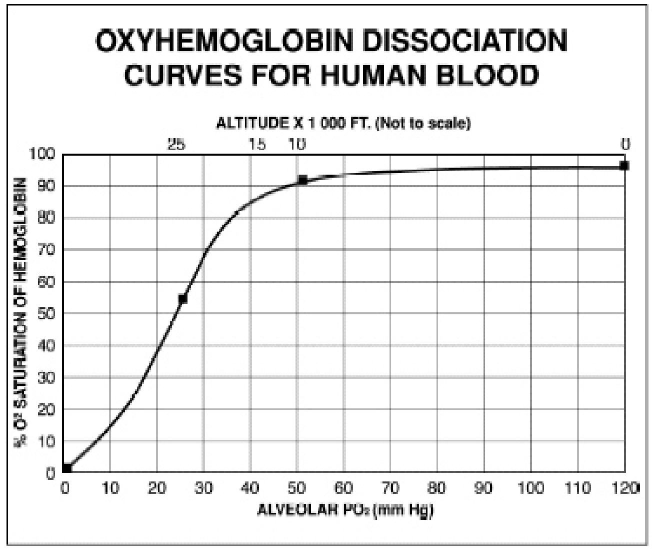
18 R.D. Campbell and M. Bagshaw, *Human Performance and Limitations in Aviation*, Third edition, (Blackwell Science, 2002), p. 164.

19 Ibid.

The oxyhemoglobin dissociation curve (Figure 2) reveals that the saturation of hemoglobin with oxygen drops significantly and rapidly above 10 000 feet (3000 metres) asl. Individuals who have a reduced PaO_2 even when on the ground due to illness and are then exposed to a further reduction in aircraft cabin pressure at altitude may be brought to the steep part of the oxyhemoglobin dissociation curve. As a result, they may have very low hemoglobin oxygen saturation, which would cause them to experience distress and exacerbation of their underlying illness.[21]

Figure 2. Oxyhemoglobin dissociation curves for human blood (Source: Transport Canada, TP 13312, *Handbook for Civil Aviation Medical Examiners*[20]



Data recorders

The aircraft was not equipped with a flight data recorder or a cockpit voice recorder, nor was either required by regulation. Numerous TSB aviation investigation reports have referred to investigators being unable to determine the reasons for an accident because of the absence of on-board recording devices.[22] Several affordable, stand-alone, lightweight flight recording systems that can record combined cockpit image and audio, aircraft parametric data, and/or data-link messages, and that require minimal modification to the aircraft to install, are currently manufactured. If cockpit and data recordings are not available to an investigation, this may preclude the identification and communication of safety deficiencies to advance transportation safety.

TSB laboratory reports

The TSB completed the following laboratory reports in support of this investigation:

- LP067/2015 – Radar Data Analysis

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20 Transport Canada, TP 13312, *Handbook for Civil Aviation Medical Examiners* (March 2004), Section 2, Hypoxia and Hyperventilation, Figure 6.[21] C. Thibeault and A.D. Evans, "AsMA medical guidelines for air travel: stresses of flight," *Aerospace Medical Human Performance*, Vol. 86, No. 5 (May 2015), pp. 486–487.

21 C. Thibeault and A.D. Evans, "AsMA medical guidelines for air travel: stresses of flight," *Aerospace Medical Human Performance*, Vol. 86, No. 5 (May 2015), pp. 486–487.

22 TSB aviation investigation reports A01W0261, A02W0173, A03H0002, A05W0137, A05C0187, A06W0139, A07Q0063, A07W0150, A09A0036, A09P0187, and A10P0244.

- LP106/2015 – Non-Volatile Memory Recovery

Analysis

The aircraft was established in cruise flight at 10 000 feet above sea level (asl) when the pilot informed air traffic control (ATC) that the aircraft was returning to Sudbury, Ontario. The aircraft then began a descending right turn, during which the pilot lost control. The aircraft entered a spiral dive, accelerating until it broke apart. The investigation did not find any anomalies that would explain either the need to return to the Sudbury Airport (CYSB) or the subsequent loss of control. As a result, the analysis will focus on the pilot's pre-flight planning, flying skills and abilities, and decision making.

Weather

When the pilot departed from CYSB, the broken cloud ceiling was approximately 6000 feet asl. Approximately 20 minutes after the accident, the cloud tops in the area were reported at approximately 10 000 feet asl. Although there may have been some local differences, the cloud cover for the entire area was similar. As soon as the aircraft began to descend, it likely entered cloud.

Weight and balance

The weight and balance document that was prepared for the pilot in advance of the flight indicated that the aircraft was under its maximum gross weight and within the centre-of-gravity limits. The investigation determined that the aircraft was not loaded according to the weight and balance document. In particular, it was determined that the aircraft was likely heavier and the centre of gravity outside of the aft centre-of-gravity limit. If aircraft are loaded outside of approved operating limits, there is increased risk that pilots will experience difficulties maintaining control of the aircraft during flight.

Pilot information

The pilot obtained his private pilot licence in 1991; his first instrument flight test was less than a year later. Initially, the pilot flew on a regular basis, keeping up his medical certificate and his instrument rating. In recent years, his flying became less frequent, to the point that, when the pilot licence format changed to a booklet in 2009, the pilot did not apply for his booklet for 2 years. When he did apply in 2011, he renewed both his medical certificate and his instrument rating. That was the last recorded action to maintain his licence, and both his medical certificate and instrument rating subsequently expired at the end of November 2013. As a result, the pilot did not have a valid medical certificate or instrument flight rules (IFR) rating at the time of the accident.

Pilot fitness to fly

The pilot was motivated to undertake the flight by the desire to bring his very ill wife to Florida. The option of taking a commercial flight was not available, as the airlines would not accept the pilot's wife as a passenger because of her medical condition.

Flying an aircraft is a task that requires regular practice and considerable cognitive resources to carry out safely, particularly when conducting a single-pilot IFR flight. In this occurrence, the pilot's medical certificate and instrument rating had expired, and he was not qualified for the flight. Additionally, in the 16 months before the occurrence, the pilot had accumulated less than 1.5 hours of recorded flying time. Therefore, he was out of practice, having flown very little in the period leading up to the accident.

The pilot was experiencing significant stress as the primary caregiver for his ailing wife, whose health had recently deteriorated, and he was not obtaining adequate rest as a result of the need to care for her at night. People who knew the pilot described him as fatigued, rundown, and absent-minded in the days preceding the occurrence.

Given the pilot's expired qualifications, lack of recent experience, and levels of chronic stress and fatigue, he was neither qualified nor fit to undertake the flight on the day of the occurrence.

In-flight breakup

Although it was impossible to determine with certainty, the pilot's decision to descend and return to CYSB was likely due to complications with his wife's medical condition. When the pilot commenced a descending turn back toward CYSB, it would have required the aircraft to descend through clouds topped at 10 000 feet asl. However, the pilot, who was no longer proficient at flying in instrument meteorological conditions, likely became spatially disoriented after entering cloud in a descending turn, and lost control of the aircraft. During the descent, the aircraft entered a spiral dive that resulted in the aircraft speed significantly exceeding the never exceed speed (V_{NE}). While in a spiral dive, the structural limits of the wings were exceeded, causing an in-flight breakup of the aircraft.

Findings

Findings as to causes and contributing factors

1. Given the pilot's expired qualifications, lack of recent experience, and levels of chronic stress and fatigue, he was neither qualified nor fit to undertake the flight on the day of the occurrence.

2. The pilot's decision to descend and return to Sudbury Airport (CYSB), Ontario, was likely due to complications with his wife's medical condition.

3. The pilot, who was no longer proficient at flying in instrument meteorological conditions, likely became spatially disoriented after entering cloud in a descending turn, and lost control of the aircraft.

4. While in a spiral dive, the structural limits of the wings were exceeded, causing an in-flight breakup of the aircraft.

Findings as to risk

1. If aircraft are loaded outside of approved operating limits, there is increased risk that pilots will experience difficulties maintaining control of the aircraft during flight.

2. If cockpit and data recordings are not available to an investigation, this may preclude the identification and communication of safety deficiencies to advance transportation safety.

Other findings

1. The pilot did not have a valid medical certificate or instrument flight rules rating at the time of the accident.

This report concludes the Transportation Safety Board's investigation into this occurrence. The Board authorized the release of this report on 10 August 2016. It was officially released on 03 October 2016.

Visit the Transportation Safety Board's website (www.tsb.gc.ca) for information about the TSB and its products and services. You will also find the Watchlist, which identifies the transportation safety issues that pose the greatest risk to Canadians. In each case, the TSB has found that actions taken to date are inadequate, and that industry and regulators need to take additional concrete measures to eliminate the risks.

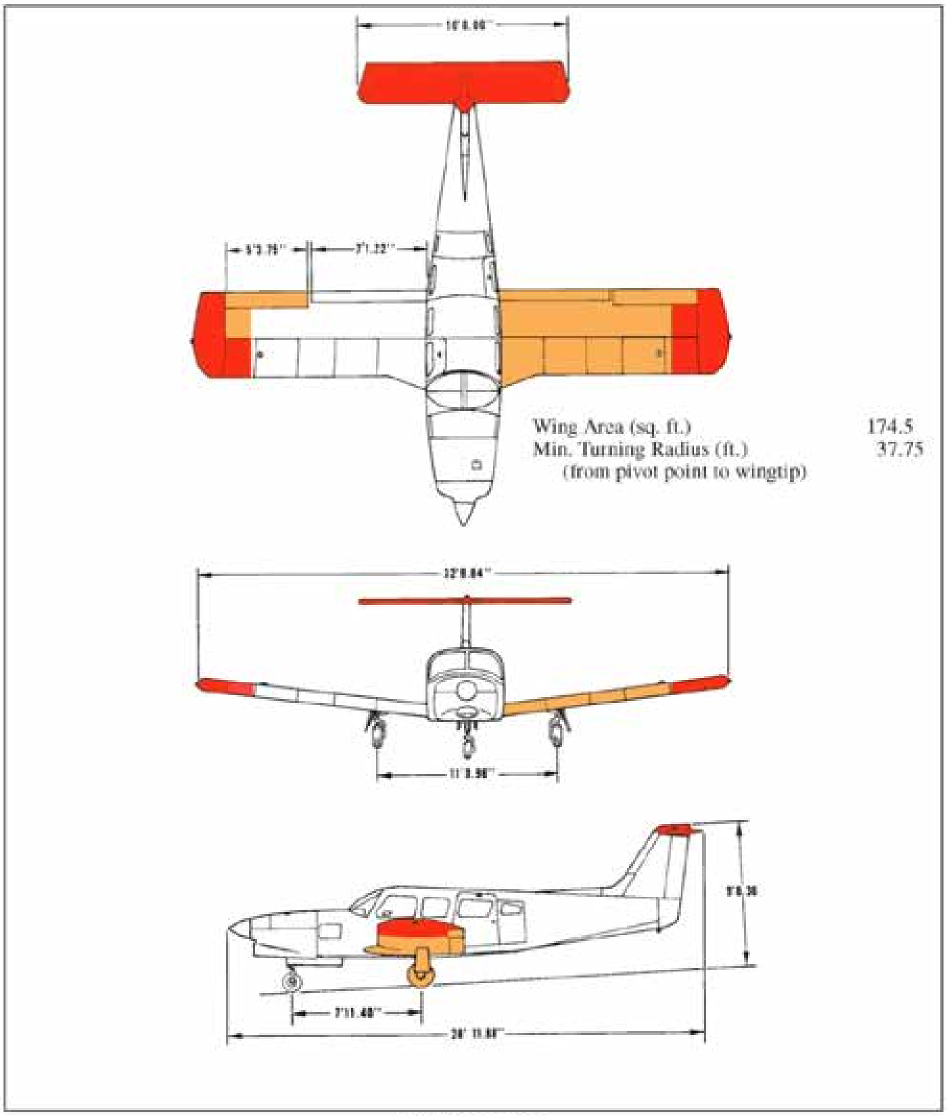
Appendices

Appendix A – In-flight breakup

The aircraft sections shown in orange are those that broke off in flight and were recovered. The sections shown in red are those that broke off in flight but were not recovered.

SECTION 1
GENERAL

PIPER AIRCRAFT CORPORATION
PA-32RT-300T, TURBO LANCE II



THREE VIEW

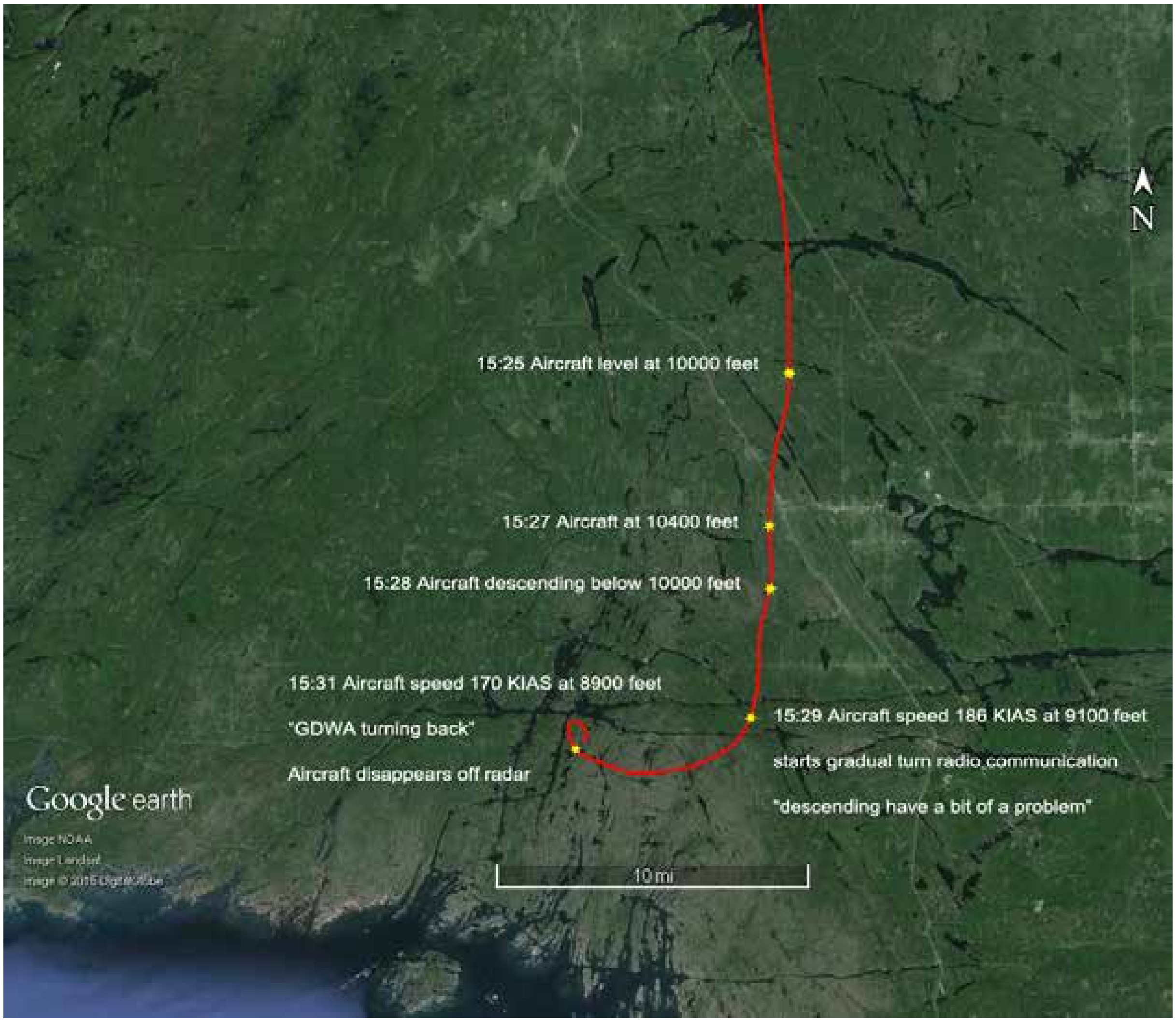
Figure 1-1

REPORT: VB-900
1-2

ISSUED: MAY 1, 1978

Source: Piper Aircraft Corporation, *Pilot's Operating Handbook and FAA Approved Airplane Flight Manual: Piper Turbo Lance II* (01 May 1978), section 1.

Appendix B – Flight path



Source: Google Earth, with TSB annotations