

AIRCRAFT ACCIDENT REPORT

OCCURRENCE NUMBER 08/129

PIPER PA28-181

ZK-LJB

NEAR CASS SADDLE

CANTERBURY

16 JANUARY 2008



Glossary of abbreviations used in this report:

ATS	Air Traffic Service
avgas	aviation gasoline
amsl	above mean sea level
CAA	Civil Aviation Authority
CPL	Commercial Pilot Licence
E	east
ELT	emergency locator transmitter
FL	flight level
FIO	Flight Information Officer
GPS	Global Positioning System
IFIS	Internet Flight Information Service
ICAO	International Civil Aviation Organisation
MHz	megahertz
nm	nautical mile
NZDT	New Zealand Daylight Time
NPRM	Notice of Proposed Rule Making
RCCNZ	Rescue Co-ordination Centre New Zealand
RPM	revolutions per minute
S	south
SARTIME	Search and Rescue Time
SSR	Secondary Surveillance Radar
UTC	Coordinated Universal Time
VFR	Visual Flight Rules
VOR	VHF Omni directional Radio range

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Aircraft type, serial number and registration:	Piper PA28-181, 28-8090161 ZK-LJB
Number and type of engines:	1 Lycoming O-360-A4M
Year of manufacture:	1980
Date and time:	16 January 2008, 1220 hours ¹ (approximately)
Location:	Near Cass Saddle, Canterbury Latitude: S 43° 06.8' Longitude: E 171° 40.22' ²
Type of flight:	Flight Training
Persons on board:	Crew: 1 Passengers: 1
Injuries:	Crew: 1 fatal Passengers: 1 fatal
Nature of damage:	Aircraft destroyed
Pilot's licence:	Private Pilot Licence (Aeroplane)
Pilot's age:	21 years
Pilot's total flying experience:	143 hours, 73 on type
Information sources:	Civil Aviation Authority field investigation
Investigator in Charge:	Mr M D Houston

¹ Times are NZDT (UTC + 13 hours)

² WGS 84 co-ordinates

Synopsis

The Civil Aviation Authority was notified of the accident by RCCNZ at 1823 hours on Wednesday 16 January 2008. The Transport Accident Investigation Commission had been notified shortly beforehand, but declined to investigate. A CAA site investigation was commenced early the next day.

The pilot was on a cross-country training flight from Christchurch to Hokitika via Arthur's Pass. The planned return flight path was direct to Christchurch, after refuelling the aircraft at Hokitika.

When the aircraft failed to arrive at Christchurch and became overdue on the SARTIME, a search was initiated by the RCCNZ. At approximately 1730 hours the burnt-out aircraft wreckage was located and the first rescuers found the pilot and passenger were deceased.

1. Factual information

1.1 History of the flight

- 1.1.1 In preparation for his forthcoming Commercial Pilot Licence (CPL) cross-country flight test, the pilot planned to consolidate his cross-country experience with a return flight from Christchurch to Hokitika.
- 1.1.2 Just prior to the flight the pilot completed his pre-flight planning and the aircraft was prepared for flight. A VFR flight plan was filed for a 0900 hours departure, a return at 1200 hours and a 1300 SARTIME³. Carriage of a passenger was also approved by the supervising instructor. The passenger was a commercial pilot trainee from the same flight training organisation and had completed his commercial cross-country flight test the previous week.
- 1.1.3 The aircraft departed from Christchurch at 0910 hours and the flight proceeded on track to Arthurs Pass. The aircraft had a discrete SSR transponder code and from this the SSR plot showed that the flight then departed on track towards the north⁴. Subsequently, the aircraft landed at Hokitika at approximately 1120 hours.
- 1.1.4 The aircraft was refuelled at Hokitika to full tanks with 88 litres of avgas in accordance with the flight training organisation's operational requirements.
- 1.1.5 Sometime after this the aircraft left Hokitika and at 1154 hours the pilot contacted Christchurch FIO and reported "*east of Hokitika at 8000 feet and estimating Christchurch at 2320 UTC*". This gave an estimated elapsed time of 26 minutes to complete the flight from near Hokitika to Christchurch. This was the last recorded voice transmission from ZK-LJB.

³ SARTIME is a pre-agreed time at which there is an active attempt to make contact (alert phase) and, in the event of no contact, the Search and Rescue phase begins.

⁴ SSR radar plotting does not show the exact flight path flown and has coverage limitations for lower level targets due to terrain interference.

- 1.1.6 At 1203 hours a single discrete SSR plot recorded by Airways Corporation at Christchurch Centre showed the aircraft positioned 9 nautical miles to the northwest of Lake Coleridge at 8400 feet.
- 1.1.7 Two witnesses on the ground near the head of Lake Coleridge heard a light aircraft in the area heading east. This was between 1145 and 1215 hours, and one of the witnesses eventually saw the aircraft and described its flight path as “*quite high and heading east*”.
- 1.1.8 Three hunters, further to the east of Lake Coleridge in the Avoca valley area at 2057 feet AMSL, saw a light aircraft fly around Mt. Fitzwilliam and up the Avoca River. It was described as “*below the tops of the surrounding hills which is low for this area*” and its height was estimated to be 800 to 1200 feet above the group.
- 1.1.9 Approximately 5 to 10 minutes later the aircraft was seen by the hunting group as it returned down the Avoca River, flew over the group and was lost to sight as it turned left into the Harper Valley at low level.
- 1.1.10 A westbound Boeing 777 that had departed Christchurch at 1213 hours reported at 1222 hours, an ELT transmission on 121.5 MHz. The B777 aircraft’s position was 35 nautical miles on the Christchurch VOR 285 radial, passing FL170. Contact with this signal was lost at 1227 hours at 60 nautical miles passing FL230. No satellite position was determined and a subsequent satellite pass did not record any ELT transmissions.
- 1.1.11 When the aircraft failed to reach Christchurch and the SARTIME had expired, RCCNZ attempted to contact the occupants by cell phone without success. The level of concern was raised and a search was initiated by RCCNZ at 1359 hours. Following an extensive aerial search, the burnt-out wreckage of the aircraft was found at approximately 1730 hours.
- 1.1.12 The accident occurred in daylight at approximately 1220 hours near the Cass Saddle, Craigieburn Ranges at an elevation of 3,800 feet.

Latitude: S 43° 06.8'
Longitude: E 171° 40.22'

1.2 Injuries to persons

<i>Injuries</i>	<i>Crew</i>	<i>Passengers</i>	<i>Other</i>
Fatal	1	1	0
Serious	0	0	0
Minor/None	0	0	

1.3 Damage to aircraft

- 1.3.1 The aircraft was destroyed.

1.4 Other damage

1.4.1 Nil.

1.5 Personnel information

1.5.1 The pilot-in-command was a Mexican student completing his aviation studies at a Christchurch based flight training organisation. He was 21 years of age and held a valid New Zealand Private Pilot Licence (Aeroplane).

1.5.2 He held a current Class 1 Medical Certificate with a conditional requirement to wear contact lenses and to carry a spare pair of spectacles when flying.

1.5.3 His total flying experience, including the accident flight was 143 hours, all on the Piper PA28 series aircraft. In the previous 30 days he had completed 46 hours, with 13 hours dual flight instruction and 33 hours as pilot-in-command.

1.5.4 The pilot had passed his Private Pilot Licence flight test on 6 November 2007.

1.5.5 The pilot had completed his CPL technical examinations and cross-country training. This flight was a revision exercise as he was scheduled to complete his CPL cross-country flight test the following day.

1.6 Aircraft information

1.6.1 The aircraft, a Piper PA28-181 serial number 28-8090161, registered ZK-LJB, had accrued 13,435.60 hours total time in service. The most recent maintenance check was a 100-hour inspection carried out on 7 January 2008. The aircraft had flown 27 hours since being released to service, after the maintenance check.

1.6.2 The aircraft had a current Airworthiness Certificate and the most recent Annual Review of Airworthiness was certified in the aircraft logbook as having been performed on 25 May 2007.

1.6.3 The Lycoming 0-360-A4M engine, serial number L-32133-36A was installed in ZK-LJB on 15 August 2005 at zero hours since overhaul. The aircraft experienced a propeller strike at 1167 hours since overhaul and as a result the engine was bulk stripped, repaired and released to service. Up to the time of this accident the engine had run 1553.7 hours since overhaul.

1.6.4 The Sensenich 76 EM855-0-62 fixed-pitch propeller, serial number 32253K was damaged in the propeller strike incident and was repaired and released to service at the same time as the engine. At the time of the accident, the propeller had run 386.7 hours since overhaul.

1.7 Meteorological information

1.7.1 The pilot obtained relevant area and route meteorological information from the IFIS briefing available from the flight training organisation. The enroute weather and aerodrome forecasts described conditions that were favourable for VFR flight and met or exceeded the flight training organisations criteria for flight into mountainous terrain.

1.8 Aids to navigation

1.8.1 Not applicable.

1.9 Communications

1.9.1 No emergency or distress messages were heard from the pilot of ZK-LJB.

1.10 Aerodrome information

1.10.1 Not applicable.

1.11 Flight recorders

1.11.1 Not applicable.

1.12 Wreckage and impact information

1.12.1 The aircraft collided with a steeply rising shingle slope of approximately 40 degrees, on a heading of 084° magnetic in a narrow valley located adjacent to Hamilton Creek.

1.12.2 There was longitudinal deformation of the airframe including crush damage of the engine mounts and firewall. Impact marks were evident from rocks on the leading edge of both wings. Most of the fuselage and inner portions of both wings had been consumed by fire.

1.12.3 The propeller showed signs of the engine operating at a low power setting at the time of impact, with major rearward bending and significant impact damage on one blade, and lesser rearward bending of the other blade.

1.12.4 Pre-impact flight control integrity was established at the site. Engine control integrity could not be established due to fire damage.

1.13 Medical and pathological information

1.13.1 The post-mortem examination showed that the pilot died of injuries consistent with a high-energy impact.

1.13.2 The toxicological tests showed no indication of any pre-existing condition that could have resulted in incapacitation, or affected the pilot's ability to fly the aircraft. The conditional requirement to wear contact lenses or the carriage of spectacles could not be determined.

1.13.3 The passenger, although critically injured in the impact and subsequent fire, was able to extricate himself from the aircraft and was found near a stream some 25 metres down slope from the crash site having succumbed to his injuries.

1.14 Fire

- 1.14.1 An intense fire started after impact and consumed most of the fuselage and the inboard area (approximately one metre) of each wing. Virtually all of the non-ferrous materials in these areas were melted or reduced to ash.
- 1.14.2 It was calculated that there was sufficient fuel on board (approximately 120 litres) for at least three hours of further flight when the accident occurred. Considering the damage to the wings and fuel tanks it is likely that one or more fuel lines ruptured during the ground impact.
- 1.14.3 The ignition source could not be established although there was enough impact-related disruption to the electrical system to have caused arcing at some point in the impact sequence. The fuel could also have ignited from contact with a heat source on the engine.

1.15 Survival aspects

- 1.15.1 The post-mortem examination indicated that the passenger had been wearing the lap and diagonal seat belt type restraint fitted as standard equipment on the aircraft. Due to the injuries suffered by the pilot, the determination of his restraint could not be established.
- 1.15.2 The ELT was located in the wreckage having sustained severe fire damage.

1.16 Tests and research

- 1.16.1 The engine was removed from the site to a specialist overhaul facility where it was stripped and examined under CAA supervision. This detailed inspection included major engine components, fuel and oil systems, filters and pumps, ignition systems and exhaust. The integrity of the major engine components was established and in the engineer's opinion, the engine was operating normally prior to impact.
- 1.16.2 Measurements of flight control deflections taken at the accident site were compared with another Piper PA28-181 aircraft to determine control positions. These comparable settings indicated that the aircraft stabilator was positioned for a level cruise or slightly nose-up attitude at the time of impact.

1.17 Organisational and management information

Not applicable.

1.18 Additional information

- 1.18.1 A significant area of New Zealand's land mass is mountainous terrain. As such, flight into and around these areas presents a number of challenges for the pilot. The danger of operating light aircraft at low level in these areas cannot be underestimated as the historic accounts of aircraft and lives being lost in this environment demonstrate.

- 1.18.2 There have been at least three examples in the last 15 years of fatal air accidents caused by a lack of mountain flying skills. In 1993 an N22 Nomad aircraft impacted the Franz Josef Glacier killing all on board. In 1997 a Cessna 310 aircraft crashed on take-off from Queenstown airport killing all six on board. And in 2002 a Cessna 207 aircraft was lost at Gertrude Saddle near Milford Sound killing a further six people.
- 1.18.3 The Transport Accident Investigation Commission (TAIC) has made recommendations to the Director of Civil Aviation Authority to address safety issues identified during their investigations into some of these accidents. The CAA has acted on these by recognising the special skills and knowledge needed for mountain flying operations and has provided education and promotional material to help better inform pilots. This material has included the Good Aviation Practices Booklet-‘Mountain Flying’, CAA Vector magazine articles⁵ and ‘AvKiwi’ seminars.
- 1.18.4 A DVD covering mountain flying considerations and techniques is due to be released by the CAA in the near future. This should further help to enhance the CAA’s education and training efforts.
- 1.18.5 Changes in the fixed-wing pilot training syllabus for mountain flying are being prepared by the CAA with the NPRM now in its final drafting stage. Training of Flight Examiners for adoption of the new standards is scheduled to commence in September 2009.

1.19 Useful or effective investigation techniques

- 1.19.1 Nil.

2. Analysis

- 2.1 The flight had proceeded in good weather conditions over terrain and a flight planned track that had been flown previously by the pilot and passenger.
- 2.2 The SSR plotting for the early stage of the flight showed the aircraft on or close to track for the first leg from Christchurch to Arthur’s Pass. Radar coverage after this point was not available, however the elapsed time between departure from Christchurch and the refuel at Hokitika, approximately 2.20 hours, was considerably longer than the flight-planned route time and cannot be accounted for. This was not in accordance with the authorised flight plan and it is considered most likely that the pilot deviated from the flight planned track.
- 2.3 Considering the last position report passed to the Christchurch FIO by the pilot at 1154 hours (refer to paragraph 1.1.5), the estimated elapsed time to Christchurch of 26 minutes was not achievable. This leg normally requires approximately 40 minutes to fly. The reason for this miscalculation could not be determined but it is likely the pilot made an error when calculating the flight time for that leg.

⁵ Refer to CAA Vector magazine, July/August 2008.

- 2.4 The subsequent return flight to Christchurch included a significant deviation from the authorised flight-planned route. The last known position of the aircraft confirmed by radar was 9 nm northwest of Lake Coleridge at 8,400 feet which is 13 nm southwest of the planned track.
- 2.5 Given the witness sightings of a light aircraft in this general area, the flight path from this point to the accident site required a significant change of heading and a descent below the minimum safe heights for the authorised flight path.
- 2.6 The area to the east of these witnesses, and in the area the hunters reported a light aircraft, is a relatively open basin where the Harper and Avoca Rivers meet. This area has been used in the past by instructing staff of the flight training organisation for training in lost procedures and diversion techniques as part of the cross-country flight training syllabus. The passenger had completed his CPL cross country flight test in this area on the 11th of January 2008. It is likely that the pilot was familiarising himself with the area where he expected his scheduled flight test would be undertaken the following day.
- 2.7 In continuing to follow the Harper River valley and then eastward up the Hamilton Creek towards the Cass Saddle, the aircraft was heading into rapidly rising terrain. With terrain rising to 7,000 feet on either side of the main valley, the rate of change of elevation and horizon change may not have been readily apparent to the pilot. Common visual illusions when flying in mountainous terrain that may have been encountered include⁶ relative scale, where the size of the terrain makes it difficult to determine scale and distance, and false horizons where the lack of a defined external horizon can create aircraft attitude and airspeed problems. A gradual valley gradient can cause the pilot to subtly raise the aircraft nose resulting in a potentially unnoticeable loss of airspeed and engine RPM until it is too late, and there is insufficient height or space to recover.
- 2.8 The reception of the ELT signal by the B777 aircraft occurred about the estimated time of impact of ZK-LJB.
- 2.9 Considering the time, location and the discrete SSR radar plot obtained at 1203 hours showing ZK-LJB to the northwest near Lake Coleridge, it is considered likely that the ELT signal came from ZK-LJB.
- 2.10 Coincidental to this investigation the flight training organisation that operated ZK-LJB has been conducting trials of GPS based flight following equipment. They have subsequently purchased a number of operational units and deployed them on dual and solo flights. This enables the aircraft's position to be monitored in real time, allowing the identification of anything out of the ordinary as it happens during the flight.

⁶ Refer to CAA Good Aviation Practices Booklet "Mountain Flying".

- 2.11 The flight training organisation has also completed a review of their standard operating procedures to effectively mitigate the recurrence of the circumstances associated with the accident, specifically the removal of the privilege of carrying passengers on certain types of flight. This includes cross-country flights where the pilot-in-command is accruing flight time for a higher qualification.

3. Conclusions

- 3.1 The pilot was appropriately licensed and fit to carry out the planned flight.
- 3.2 The pilot was authorised by his supervising flight instructor to conduct the planned flight and to carry a passenger.
- 3.3 The aircraft had a valid Airworthiness Certificate and had been maintained and released to service in accordance with current CAA requirements.
- 3.4 The pilot had deviated from the authorised flight planned route and minimum route operating heights and had operated the aircraft at low level in mountainous terrain for which he had limited experience.
- 3.5 The addition of GPS flight tracking systems in the training organisation's aircraft should make a big improvement to safety, both in ensuring that flight plans and authorisations are complied with and for any future search and rescue work.
- 3.6 The probable cause of this accident was that the pilot, when flying at low level in a mountainous area, entered a steep narrow valley and in an attempt to manoeuvre the aircraft clear of terrain, collided with the ground.

Report prepared by:



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Date: 10/6/09

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