

**Aviation Safety Investigation Report
199502193**

**Cessna Aircraft Company
Centurion**

13 July 1995

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Occurrence Number: 199502193 **Occurrence Type:** Accident
Location: 38.8km NE Canberra, Aerodrome
State: NSW **Inv Category:** 3
Date: Thursday 13 July 1995
Time: 1130 hours **Time Zone** EST
Highest Injury Level: Serious
Injuries:

	Fatal	Serious	Minor	None	Total
Crew	0	2	0	0	2
Ground	0	0	0	0	0
Passenger	0	1	0	0	1
Total	0	3	0	0	3

Aircraft Manufacturer: Cessna Aircraft Company
Aircraft Model: P210N
Aircraft Registration: VH-SMA **Serial Number:** P21000473
Type of Operation: Instructional Dual
Damage to Aircraft: Destroyed
Departure Point: Canberra
Departure Time:
Destination: Bankstown

Crew Details:

Role	Class of Licence	Hours on	
		Type	Hours Total
Pilot-In-Command	ATPL	3000.0	14000
Student Pilot	Private	600.0	1000

Approved for Release: Thursday, May 15, 1997

FACTUAL INFORMATION

History of the flight

The aircraft had departed Bankstown for a dual instrument flight rules (IFR) training flight, including aerial work at Goulburn followed by two practice instrument landing system (ILS) approaches at Canberra, before returning to Bankstown.

After completion of the second ILS approach, the pilot was instructed to carry out a missed approach and climb to 7,000 ft.

As the aircraft was levelling in instrument meteorological conditions (IMC), the instructor noticed that engine Manifold Absolute Pressure (MAP) had reduced from 30 inches to 25 inches. He asked the pilot if he had adjusted the power and the pilot replied in the negative. At 1127 EST, the instructor advised Canberra Approach (APP) that the aircraft had experienced a loss of power. He reported that the aircraft was able to maintain 7,000 ft and confirmed that he wished to return to Canberra for landing. Air Traffic Control then instructed the pilot to turn the aircraft onto a southerly heading.

Between 10 and 15 seconds later, the aircraft occupants heard a loud thump that shook the aircraft, and the engine RPM reduced significantly. At 1128 the pilot advised APP that the engine had failed and requested that APP provide headings to the vicinity of Lake George. APP identified the aircraft on radar at a position 17 NM to the north-east of Canberra over the western shores of Lake George. APP then passed information to the pilot about an airfield near Bungendore as a possible landing area.

At 1129, the pilot advised that assistance was still required and confirmed that the aircraft was still in IMC. APP advised the pilot to disregard the previous vectoring instructions, indicated that a landing on the Federal Highway might be possible and instructed the pilot to turn onto a heading of 020 degrees.

At 1131, the pilot advised that the aircraft was descending through 4,200 ft. At 1132, APP requested that the pilot activate his emergency locator transmitter (ELT). The pilot then advised that the aircraft was still in IMC and passing 3,500 ft. APP advised that the aircraft was passing over the northern shores of Lake George and requested the pilot to turn the aircraft right to an easterly heading to avoid high terrain in the area. No reply was received.

Another aircraft, VH-DUP, was in the Goulburn area at this time and the pilot offered to relay a message to VH-SMA. APP requested the pilot of VH-DUP to listen out on 121.5 MHz to determine if an ELT had been activated. The pilot of VH-DUP advised that he was unable to make contact with VH-SMA and confirmed an ELT signal on 121.5 MHz.

The time of the accident was 1133. A rear-seat occupant, who was also a qualified pilot, later stated that he estimated that the aircraft broke through the cloudbase below 300 ft above ground level (AGL).

An army helicopter was dispatched from Canberra at approximately 1155 and proceeded to the area of the last known position of VH-SMA. A second helicopter carrying a medical team was dispatched to the area at 1230.

At 1240, one survivor from the aircraft was located by a search helicopter. Two other survivors were located soon after. All three had suffered severe burns.

Wreckage examination

Wreckage was distributed along a 49 m trail aligned approximately east. The aircraft had entered the timbered area on this track and had partially broken up as it descended through the trees. As the aircraft penetrated the timber, it struck and severed tree branches and trunks over 150 mm in diameter, starting 49.3 m and ending 28.5 m from the main wreckage, before coming to rest on a south-westerly heading against the trunk of a large tree approximately 1 m in diameter.

The main wreckage consisted of the fuselage, the fin, the right horizontal tailplane and most of both wings. The left horizontal tailplane had been torn off during the impact sequence. The empennage showed evidence of oil streaking, indicative of engine oil loss in flight. The fuselage had been almost completely destroyed by post-impact fire.

The engine and propeller remained attached to the fuselage. Inspection of the propeller indicated that the engine was not producing power at impact. The engine was basically intact and unaffected by fire. Both magnetos had separated from the engine. There were two holes in the top of the crankcase aligned with cylinders number 2 and 3. When the engine was turned over for examination, approximately 1 L of oil flowed out of the holes in the crankcase.

Pilot information

The aircraft owner occupied the left control seat. He held a valid private pilot (aeroplane) licence, issued on 1 July 1976, with PERPETUAL status. He had about 1,000 hours total experience, of which almost 600 hours were in VH-SMA. He had held a command instrument rating (single engine), issued 7 December 1987 and expired 31 January 1994, and was practising for renewal of the rating. His medical category was valid to 18 June 1996.

The right control seat was occupied by an instructor who held an air transport pilot licence, issued 1 September 1992 and with PERPETUAL status. He held a Command Instrument Rating issued 28 March 1983 and valid to 30 September 1995. He had almost 14,000 hours total experience of which approximately 3,000 hours were on Cessna 210 aircraft and more than 2,000 hours were in VH-SMA. He had held chief flying instructor and chief pilot approvals since 24 April 1990. His medical category was valid to 12 October 1995.

Weather

An intense low pressure system was centred at 45 degrees south, 133 degrees east. This system was coupled with a low pressure system in the Tasman Sea and a series of cold fronts were embedded in the strong south-westerly airstream associated with these systems.

The Bureau of Meteorology estimated conditions in the Lake George area as:

Wind 330/08

Visibility Less than 1,000 m
Weather Drizzle and rain throughout the area
Cloud Broken stratus, base ground level
Overcast nimbostratus, base 1,000 ft AGL
Freezing level 6,000 ft
Icing Moderate in cloud above freezing level
Surface temperature 8 degrees C
Dew point 8 degrees C
QNH 992 hPa
Upper winds 3,000 ft 310/15
5,000 ft 310/25
7,000 ft 310/30
10,000 ft 270/35

Detailed engine inspection

The engine was removed from the wreckage for detailed inspection. The engine was completely disassembled by Bureau engineers in the presence of representatives from the engine manufacturer and the Civil Aviation Safety Authority. The most significant findings were:

- (a) less than 1 L of oil remained in the engine;
- (b) numbers 2 and 3 connecting rods had failed;
- (c) numbers 2 and 3 big end shell bearings plus their associated column supports, were severely damaged;
- (d) there was significant fretting on the number 2 main bearing column support mating surface to a depth of at least 0.002 inches;
- (e) minor fretting damage was present on the other column supports;
- (f) one connecting rod big end bearing housing bolt had failed earlier than the rest;
- (g) the torques on some cylinder retaining nuts were well below the expected values;
- (h) a number of the through bolts showed evidence of fretting at the crankcase split line location;
- (i) the turbocharger oil reservoir return line was broken;
- (j) there appeared to be no blockage of the main oil galleries;
- (k) the oil pump appeared to be working at the time of impact;

(l) the turbocharger had received no discernible damage; and

(m) there was no evidence of the typical sludging of the engine following the use of Mobil AV-1 synthetic oil.

The damage to the engine was consistent with oil starvation. The damaged turbocharger oil reservoir was considered as a possible source of oil loss and was examined in a metallurgical laboratory. The examination revealed that, in the past, the welded joint between the outlet fitting and the top cover had cracked and had been repaired by welding. Inside the lower cap were marks matching the position and shape of the outlet pipe; these marks were consistent with the outlet pipe being jammed downwards and rearwards during the impact sequence.

Maintenance history and documentation

The engine logbook showed that in August 1987, the engine had undergone a bulk strip to inspect the crankshaft and crankcase for cracks following a propeller strike. The inspection found the components to be satisfactory and the engine was returned to service. The logbook indicated that this was the last occasion on which the crankcase had been split.

The aircraft was operating with a valid maintenance release (Maintenance Release 209476, dated 4 August 1994). No daily inspections had been written up since 23 April 1995. At the last major servicing the aircraft had flown 2,400 hours and had flown a further 93.3 hours to the last entry on the maintenance release.

Air traffic control

The Canberra Approach controller later stated that the aircraft was to the west of Lake George when the pilot reported the initial engine problem. As the pilot initially stated that he could maintain altitude, the controller vectored the aircraft onto a southerly heading for a return to Canberra.

By the time that the pilot reported the engine failure, a second controller, who was very familiar with the Canberra area, was standing by. The second controller suggested the possibility of a landing on the Federal Highway to the north-east of Lake George. The approach controller then vectored the aircraft onto a northerly heading, but soon concluded that the aircraft would not reach the highway and that it was approaching an area of high terrain. He then turned the aircraft onto an easterly heading to have it fly parallel to the foreshore, where the terrain was lower and, he believed, the weather clearer.

The controller stated that he believed that there was high terrain in the vicinity of the proposed landing site near Bungendore and decided to discontinue his initial plan to vector the aircraft to that area.

ANALYSIS

The accident was the result of an engine failure in weather conditions that precluded a visual forced landing. The cloudbreak below an estimated 300 ft AGL, in poor visibility and over timbered terrain, denied the pilot any effective choice of landing sites.

Detailed examination of the engine established that it failed due to a loss of effective lubrication. The Bureau's technical investigators reviewed the findings from the engine examination with specialists from the engine manufacturer and the Civil Aviation Safety Authority. The condition of, and damage to the engine and other powerplant components pointed to some possible sources of loss of effective lubrication:

- (a) failure of the return line to the turbocharger reservoir, causing oil loss and subsequent oil starvation to the engine;
- (b) fretting of the crankcase mating surfaces and through-bolts, indicating lack of sufficient pre-load on the crankshaft bearings, and consequently allowing the bearing(s) to rotate, blocking the supply of oil to key areas in the engine; or
- (c) a combination of the above.

The exact cause of the loss of effective lubrication could not be established.

Air traffic control

Had the engine failure occurred in visual meteorological conditions (VMC), the pilot would have had more options available for him to have carried out a safe forced landing in the Lake George area. However, the engine failure in IMC meant that the crew was totally dependent upon the Canberra Approach radar controller for positioning. The cloud was estimated to include broken stratus to ground level with an overcast of nimbostratus from 1,000 ft AGL, with drizzle and rain throughout the area. The controller would therefore have been required to vector the aircraft almost to touchdown to be of practical assistance in the final stages of flight.

Although he received advice from another controller who was familiar with the Canberra area, the approach controller was not so familiar. The limitations of the radar display, which depicted Lake George only in general terms (vector lines), prevented the controller from being certain of the aircraft's position with respect to terrain features. As the aircraft descended in IMC, the controller's range of options diminished rapidly and he finally concentrated upon positioning the aircraft as far as possible from known high terrain.

SIGNIFICANT FACTORS

1. The engine failed due to a loss of effective lubrication. The reason for the loss could not be established beyond doubt.
2. The engine failure occurred in weather conditions that did not permit the pilot to carry out a visual forced landing onto favourable terrain.

3. The approach controller was unable to vector the aircraft to an obstruction-free landing site due to equipment and time limitations.