No: 9/87 **Ref: 1c**

Aircraft type and registration:	Cessna FRA 150M (Aerobat) G-BDAU	
No & Type of engines:	1 Continental 0-240-E piston engine	
Year of Manufacture:	1975	
Date and time (UTC):	23 January 1987 at 1440 hrs	
Location:	750 metres south west of threshold of runway 04 at Perth Aerodrome, Scotland	
Type of flight:	Training	
Persons on board:	Crew — 1	Passengers — None
Injuries:	Crew — 1 (fatal)	Passengers — N/A
Nature of damage:	Aircraft destroyed	
Commander's Licence:	Botswana Private Pilot's Licence UK Student Pilot's Licence	
Commander's Age:	21 years	
Commander's Total Flying Experience:	70 hours (all of which were on type)	
Information Source:	AIB Field Investigation	

History of the flight

The aircraft was in use for basic training. The student pilot had already qualified for a Private Pilot's Licence in his own country and had flown 9 hours of a Commercial Pilot's Course at Perth. On the day of the accident the aircraft was used by the same instructor for dual instruction sorties for two separate students. The second one, which was flown with the accident student, lasted for an hour and five minutes and included instruction in practice forced landing, engine failure and fire drills. The student, who had not flown for the previous two weeks, performed the exercises adequately and to the satisfaction of his instructor. He was then briefed by his instructor to fly solo circuits and these were to be his second solo exercise of the course. At about 1400 hrs, the student inspected the aircraft which had been refuelled by the crash/refuelling crew at 1238 hrs, during the lunch break, in accordance with the flying school's normal practice. Shortly afterwards the student sought his instructor to tell him that he was unable to start the aircraft's engine. The instructor diagnosed a slipping starter clutch and was able to start the engine without further difficulty.

The aircraft taxied for runway 22 at 1417 hrs and took off shortly afterwards. It completed one circuit successfully, landed and took off again without coming to a halt on the runway. After a 'downwind' call the pilot next reported 'finals' on the R/T and then added that the landing was to be a 'touch and go'. The aircraft landed and was seen to take off again normally at about 1438 hrs. The aircraft climbed straight ahead to a height of between 200 and 300 feet. It was heard passing close to a house which is situated near to the south west boundary of the airfield

when shortly afterwards the occupant of the house heard a crash and observed fire and smoke in a ploughed field some 200 metres from the house. At the same time a motorist who was travelling along the A 94 from the village of New Scone towards the airfield saw the aircraft crossing from his right to left, steeply banked and in plan view to him. The aircraft descended and, shortly after losing sight of it, the motorist was aware of thick black smoke rising from the area where he judged the aircraft might have crashed.

The aircraft was not observed from the ATC tower since, although the crash site was in view from the tower, the direction of viewing was directly into bright sunlight, the sun being low in the sky and 7° to the right of the runway heading. However, the pall of smoke was observed by an engineer who was near the main hangar and he raised the alarm by alerting the crash crew. The airfied crash Land Rover arrived on the scene within a few minutes followed by the Perth Fire Brigade vehicle at 1450 hrs. The student pilot had been fatally injured in the crash.

Examination of the wreckage
The aircraft had crashed in a field of soft ploughed earth 170 metres to the right of the extended centre line of runway 22. The aircraft had dived almost vertically into the ground, orientated such that its top surfaces faced back towards the airfield. This evidence is consistent with witness reports of the aircraft banking and turning before diving into the ground.

The engine had buried itself in the ground and the fuselage had collapsed longitudinally on top of it. The wings had also suffered severe crushing fore and aft from what had evidently been a relatively high speed impact. A post crash fire had consumed much of the fuselage, particularly the cabin, and the inboard section of the wings. Investigation showed that the airframe and its flying controls had been intact before impact. The flaps had been in the retracted position. The throttle was fully open, the mixture 'rich', carburettor air 'cold' and the fuel primer locked. The magneto key was found selected to 'left' but was free to turn and may well have been moved in the crash.

The airspeed indicator was found with the needle crushed onto the face of the instrument at an indication of 160 knots. Likewise, the engine rpm gauge was found to be indicating 2750 rpm. The propeller showed marked evidence of rotation. When the engine was stripped, it was found to be in good condition with no mechanical defect which could have caused a power failure. The crankshaft extension, projecting from the front bearing housing in the crankcase, had partially failed in bending overload, the crack extending through approximately 80% of the shaft's cross section. This failure had evidently occurred as the nose of the aircraft entered the ground. One blade of the propeller had been bent back under the nose where it had struck an exhaust stub and the noseleg and its tip had been sheared off. However, although the fracture in the crankshaft extension had opened in the bending direction, there was virtually no distortion in the rotational plane. This evidence indicated that, although the engine was rotating freely at a high speed at impact, it was not producing power.

The carburettor was opened for examination when salvage had been completed about 24 hours after the accident. The bowl was found to be empty of fuel. One of the floats (black cellular type) was broken and detached, the other was cracked. The float fractures appeared to have been caused by mechanical loading with no sign of chemical or solvent damage. (Facet Service Bulletin A1-76 warns of possible damage by carburettor cleaning fluids.) Overall, the evidence found in the carburettor was consistent with the float damage having been incurred at impact when a mean 'g' of over 700g had been sustained. This evidence suggests, however, that the bowl was empty of fuel at impact.

The remains of both fuel tanks showed that they had bulged at impact from the inertial effect of a substantial quantity of fluid contents. Some portions of the aircraft fuel system had been destroyed by fire but in what was recovered no evidence of a pre crash blockage or disconnection was found. The fuel clock was found in the 'open' position.

Further investigations produced no conclusive evidence towards an explanation for the accident. A routine fuel sample, taken before the accident, showed a small and insignificant amount of water contamination. The ignition system had been severely damaged by impact and fire. No mechanical failure was apparent in either magneto and the switch was found to operate correctly. Although there had been some service deterioration of the distributor contacts, testing of the magnetos was impossible due to crash damage. The rails and locating pins from the pilot's seat were examined. It was found that, at impact the seat had disengaged from an intermediate point on the rails and there was no evidence that the seat had become unlocked on the rails in flight. It was also determined that the seat back had not collapsed.