Aviation Safety Investigation Report 199504047

de Havilland Aircraft Tiger Moth

29 November 1995

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Occurrence Number: 199504047 **Occurrence Type:** Accident
Location: 21km SW of Perth, Aerodrome
State: WA **Inv Category:** 4
Date: Wednesday 29 November 1995
Time: 1328 hours **Time Zone** WST
Highest Injury Level: Serious
Injuries:

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

Aircraft Manufacturer: de Havilland Aircraft
Aircraft Model: DH-82A
Aircraft Registration: VH-FAS **Serial Number:** A17-37
Type of Operation: Charter Passenger
Damage to Aircraft: Substantial
Departure Point: Jandakot WA
Departure Time: 1321 WST
Destination: Jandakot WA

Crew Details:

Role	Class of Licence	Hours on Type	Hours Total
Pilot-In-Command	Commercial	198.0	3677

Approved for Release: Tuesday, December 24, 1996

FACTUAL INFORMATION

Sequence of events

The pilot was conducting a visual flight rules scenic flight. These flights were done on a regular basis by the operator and the pilot had flown the DH-82 type on many of these. Commonly, the route flown was from Jandakot to the Fremantle area, north to about Mullaloo Point, then Observation City, Perth City and back to Jandakot. The pilot occupied the rear cockpit seat and the passenger the front cockpit seat.

Shortly after passing the Fremantle Golf Course, at an altitude of 1,000 ft, the engine misfired and commenced to vibrate badly. The pilot transmitted a Mayday call to the Perth Radar Advisory Service (RAS). At this stage the indicated altitude was 900 feet.

The pilot told the RAS controller that he had a partial power failure and said he was going to put the aircraft down in an area near Leeuwin Barracks, on the bank of the Swan River. The pilot was aware of the general details and location of the selected area. He tracked for a left base, while losing altitude, intending to land towards the west. The aircraft was half way through the turn onto final, at a height of about 300 feet and with everything proceeding as planned, when the pilot suddenly saw a set of high-voltage power lines across his track. A large transmission-line tower for these lines was also now directly in front of him.

The pilot decided to complete a 270-300 degree right turn over the water to avoid the tower and pass under the wires, and still land in the selected area. It was a tight, gliding turn and when passing through a heading of about east, at a height of about 150 feet, the aircraft stalled and started to spiral right. The pilot applied left rudder but was unable to prevent the aircraft from diving into the river at a steep angle. After impact, the aircraft floated vertically with the tail out of the water and both cockpits under water. The pilot found himself out of his cockpit swimming on the surface but the passenger was still in the front cockpit.

Shortly afterwards, assistance arrived and the passenger was released from his seat by a water-police diver. Both pilot and passenger were then conveyed to hospital.

Wreckage examination

Inspection of the engine showed that the number one connecting rod had failed. Approximately half the rod, including the big end attachment to the crankshaft, was missing. Inspection of the remaining fracture surfaces showed that the fracture was caused by fatigue crack growth. The crack had propagated along the centre of the connecting rod 'I' beam from the region of the connecting rod/crankshaft bearing housing. The reason for the initiation of the fatigue cracking could not be determined, due to the absence of pieces crucial to the investigation. The other three connecting rods were inspected but no cracks were found in any of these. The investigation was unable to trace the history of the failed connecting rod.

Each shoulder harness was attached to a transverse cable which in turn was attached, via a bracket at each end, to the aircraft structure. One of the attachment brackets for the rear seat shoulder harness had failed, with the bolt pulling out of (tearing) the bracket. The rear seat lap strap also failed. This probably happened because the seat moved during the impact sequence and the strap was cut by the metal edge of the seat. Even with the failures the rear seat harness absorbed considerable impact energy before failing although, the pilot did receive some facial injuries. One of the front seat shoulder harness attachment brackets, which was attached by three bolts, sustained a partial failure when two of the bolt heads separated. The harness however, remained intact.

The aircraft was equipped with leading edge slats on the upper wing. These devices have the facility to be locked closed. When unlocked, they open up when the aircraft approaches stalling speed. The slats have the effect of slightly reducing the stall speed and also provide a warning to the pilot that the aircraft is close to the stall. The flight manual for the aircraft included a statement that slat extension provides acceptable visual warning of approaching stall.

There were two placards in the cockpit that stated that the slats were unserviceable and not to be operated. Also, the operator's handling notes for the type included instructions that the slats were not to be used for take off or landing. The slats were locked closed.

Weather data

The surface wind at Jandakot on departure was from the south-west at about 12 knots.

Forced Landing Options

The power loss occurred over a built-up area. There were very few forced landing areas available within gliding range. The Fremantle Golf Course, which was behind the aircraft when the engine malfunction occurred, was probably one option. Another was the area, near Leeuwin Barracks selected by the pilot. This latter area was aligned approximately east-west and had a set of high tension power lines across the eastern end, aligned approximately north-south. The pilot was not previously aware of the power lines. The power lines and associated tower were not particularly obvious when looking down on them from above, and the restricted visibility from the rear cockpit of the DH-82A was another inhibiting factor.

ANALYSIS

The major reason for the accident was the engine malfunction which forced the pilot to attempt an emergency landing in a built-up area. The location of the engine malfunction meant that the pilot's options were limited. His choices were the golf course, which by then was behind the aircraft and out of sight, or the Leeuwin Barracks area.

To use the golf course the pilot had to execute a 180 degree turn. To reach the Leeuwin Barracks area the pilot only had to make a right turn of about 90 degrees. As a result he opted for the site near the Leeuwin Barracks.

The pilot was satisfied all was going well until late in the approach when he suddenly saw the power lines and tower. This late sighting caused him to rapidly change his plans and attempt to avoid them. The aircraft was in a poor position, at a height of about 300 feet, for the pilot to attempt a large turn. However, this appeared his only option. During this attempted turn through 270-300 degrees, the pilot allowed the airspeed to reduce to stalling speed and he lost control of the aircraft. There was insufficient altitude to recover control before impact.

The fact that the slats were unserviceable and locked closed possibly deprived the pilot of an important stall warning indication. Had they been available and unlocked, they may have assisted in preventing the loss of control.

SIGNIFICANT FACTORS

The following factors were considered relevant to the accident:

1. Fatigue cracking of the engine's number one connecting rod caused it to fail. The factors which led to the fatigue crack could not be determined.

2. The failure of the connecting rod caused significant vibration and loss of power. These led to a forced landing.

3. There was a lack of suitable landing areas.

4. The pilot did not detect a power line and its associated tower until very late in the approach.

5. The pilot's attempt to avoid the power line led to a significant loss of airspeed.

6. The loss of airspeed led to a stall followed by loss of control at a height that was too low to effect recovery before impact.

7. The unserviceable slats may have been a factor in the pilot's failure to recognise the impending stall in time to prevent loss of control.