Aviation Safety Investigation Report 198900805

Bell 206L-1

30 March 1989

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NOTE: All air safety occurrences reported to the ATSB are categorised and recorded. For a detailed explanation on Category definitions please refer to the ATSB website at www.atsb.gov.au.

Occurrence Number: 198900805 **Occurrence Type:** Accident
Location: 4 Km North Ayers Rock NT
Date: 30 March 1989 **Time:** 1855
Highest Injury Level: Nil
Injuries:

	Fatal	Serious	Minor	None
Crew	0	0	1	1
Ground	0	0	0	-
Passenger	0	0	0	3
Total	**0**	**0**	**0**	**4**

Aircraft Details: Bell 206L-1
Registration: VH-LKU
Serial Number: 45174
Operation Type: Charter
Damage Level: Substantial
Departure Point: Yulara NT
Departure Time: 1828
Destination: Yulara NT

Approved for Release: 12th December 1989

Circumstances:

A descent from 3500 feet had just been commenced when the pilot heard a loud explosion. This was followed by a reported yaw to the right and the activation of several warning lights including the visual and aural engine fail warning. An autorotation was commenced and a Mayday call transmitted to Alice Springs Flight Service. The autorotational landing was accomplished between two sand dunes and on soft sand. During the landing the main rotor blades struck and severed the tail boom. The engine failure was initiated by failure of the first stage turbine wheel. The wheel fragmented when a fatigue crack in the wheel rim propagated to a depth of 4.85 mm (0.191 in.). There was no material deficiency or evidence of overheating in the blade root area. When the turbine wheel was fitted to the engine, cracks were noted in the wheel rim. It was estimated from a plot of fatigue striation spacings that these cracks were within acceptable limits as specified in Allison 250 DIL-190, which allows wheels with cracks in the rim less than 1.65 mm (0.065 in.). However, an inspection is specified after 500 hours or 500 cycles in service. Additionally, the manufacturer had calculated that the critical depth of this type of crack, beyond which failure may be imminent, was 15.4 mm (0.606 in.). The Operator's record keeping was deficient and the above inspection was not made before the wheel failed at 538 hours and 604 cycles. Had the turbine wheel been inspected at the appropriate time it is probable that the accident would have been avoided since the crack depth in the wheel rim must have been greater than that allowed in Allison 250 DIL-190. However, the turbine wheel failed after the fatigue crack had propagated only 4.85 mm which is well below the manufacturer's calculated critical depth of 15.4 mm. It is not known if the failure resulted from unusual circumstances or whether the calculated critical crack depth is in error. However, it is apparent that the critical crack depth for first stage turbine wheels should be re-assessed. The pilot executed an autorotational descent in accordance with the recommendations contained in the Bell 206 Flight Manual. The landing was normal for an autorotation but during the ground slide the pilot moved the cyclic

control back as the helicopter approached some trees. The main rotor blades then severed the tail boom. The rearward movement of the cyclic control was a reflex type action rather than a deliberate control input.

Significant Factors:

The following factors were considered relevant to the development of the accident

1. The engine failed because the first stage turbine wheel fragmented. The fragmentation was initiated by a fatigue crack.

2. The Operator's record keeping was deficient in that the required inspection of the turbine wheel was not made in accordance with the manufacturer's instructions.

3. The pilot moved the cyclic control backward during the helicopter's ground slide.

Reccomendations:

1. It is recommended that the Airworthiness Division of the Civil Aviation Authority approach the engine manufacturer with the objective of having the critical crack size for the first stage turbine re-assessed.