COMMONWEALTH OF AUSTRALIA-BUREAU OF AIR SAFETY INVESTIGATION

AIRCRAFT ACCIDENT INVESTIGATION SUMMARY REPORT

REFERENCE NO. SI/791/1023

1. LOCATION OF OCCURRENCE

35km east of Jundah, Qld		Elevation: 600 feet
Date: 17.6.79	Time: 0750 hours (approx)	Zone: EST

2. THE AIRCRAFT

Make and Model: Bell 47G-2	Registration: VH-PSL
Certificate of Airworthiness: Valid from 12.7.77	
Certificate of Registration Issued to:	Operator:
Degree of Damage to Aircraft: Destroyed	Other Property Damaged: Nil

Defects discovered:
1. Fatigue cracking in one tail rotor blade grip (Part No. 47-642-102)
2. Tail rotor hinge assembly incorrectly assembled.

3. THE FLIGHT

Departure Point: Jedburgh Station	Time of departure: 0715 hours
Destination: Jedburgh Station	
Purpose of flight: Cattle mustering	Class of Operation: Aerial Work

4. THE CREW

Name	Status	Age	Class of Licence	Hours on Type	Total Hours	Degree of Injury
	Pilot	31	Commercial Helicopter	230	5754	Fatal

5. OTHER PERSONS (ALL PASSENGERS AND PERSONS INJURED ON GROUND)

Name	Status	Degree of Injury
	Passenger	Fatal

6. RELEVANT EVENTS

The helicopter departed from cattle yards on Jedburgh Station to locate and muster approximately 50 head of cattle believed to be in the vicinity. The passenger was carried to assist in spotting the cattle. The initial search plan was to circle the cattle yards at a radius of about 5km. After take-off the helicopter proceeded to the east and completed one circuit of the yards, in a clockwise direction, at a radius of about 3km. It then commenced a second circuit of a slightly greater radius. Persons at the cattle yards could not see the helicopter but they could hear the sound of its engine. The helicopter had nearly completed the second circuit and was to the northeast of the yards when the sound of the engine ceased. The time was noted as about 0750 hours.

When the helicopter had not returned by 1130 hours, the police at Jundah were notified. Advice was passed to the Department of Transport and Search and Rescue procedures were implemented. The wreckage of VH-PSL was found by a searching aircraft at approximately 0900 hours on 18.6.79, some 4km northeast of the cattle yards.

The helicopter had struck the ground in an approximately 45 degree nose-down attitude, whilst travelling forward but yawed to the right. A post-impact fire had consumed much of the wreckage. Components of the tail rotor were found at distances up to 172 metres from the main wreckage, consistent with in-flight separation prior to ground impact.

Subsequent examination established the following probable sequence of failure. One tail rotor blade separated under normal operating loads after its structural integrity had been reduced by fatigue cracking. The resultant out-of-balance forces caused the tail rotor gearbox attachments to fail and it also separated from the helicopter. The other tail rotor blade then also failed in overload and broke away from the gearbox.

The fatigue cracking of the tail rotor blade grip originated internally and had progressed to the outer surface of the blade. There was no evidence found of metallurgical or machining fault and the reason for the onset of fatigue could not be determined. It was also not possible to establish when cracking commenced or the rate at which it subsequently propagated.

As maintenance and operating records for VH-PSL had not been correctly maintained it was not possible to establish how many hours the helicopter had been operated prior to the accident. However, from the pilot's personal log book it was determined that the tail rotor blades were at least 45½ operating hours overdue for a mandatory internal inspection for fatigue cracking.

In the absence of evidence as to the age of fatigue, it could not be determined whether the cracking would have been present and discovered in the event that the required inspection had been carried out on schedule.

6. RELEVANT EVENTS

In addition, an external inspection of the tail rotor blades for cracking was required to be carried out at each daily inspection and subsequent to each refuelling of the helicopter. Again, in the absence of evidence as to the rate of crack propagation, it could not be determined whether external evidence of cracking had been present for some time or if the crack had only progressed to the outer surface of the blade subsequent to the last daily inspection.

The incorrectly assembled tail rotor hinge assembly was not considered to have caused the onset of fatigue or otherwise have contributed to the accident.

The high rotational and nose-down pitching forces that would be generated by separation of the tail rotor components would have placed the helicopter temporarily out of control. To regain control it would have been necessary for the pilot to transition to autorotational flight and achieve a high airspeed. This could not have been done without descending the helicopter from a considerable height.

The operating configuration of the helicopter at the time of tail rotor failure could not be precisely determined but, being engaged in cattle spotting, it was probably being flown slowly and at a low height above the ground.

7. RELEVANT FACTORS

1. The development and propagation of a fatigue crack in one tail rotor blade grip.

2. The subsequent inflight failure of one tail rotor blade, with consequent separation of major tail rotor components under the out of balance forces generated.

3. There was a loss of directional control and a substantial nose-down pitch change.

4. The helicopter was probably being operated at a low height and at low speed, a configuration which would have prevented the pilot from regaining control prior to impact with the ground.

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