

**Aviation Safety Investigation Report
199601330**

**Hughes Helicopters
Hughes 300**

26 April 1996

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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: 199601330 **Occurrence Type:** Accident
Location: Fitzroy Crossing, Aerodrome
State: WA **Inv Category:** 4
Date: Friday 26 April 1996
Time: 0930 hours **Time Zone** WST
Highest Injury Level: Minor
Injuries:

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

Aircraft Manufacturer: Hughes Helicopters
Aircraft Model: 269C
Aircraft Registration: VH-AUQ **Serial Number:** 820155
Type of Operation: Non-commercial Practice
Damage to Aircraft: Substantial
Departure Point: Fitzroy Crossing WA
Departure Time: 0930 WST
Destination: Fitzroy Crossing WA

Crew Details:

Role	Class of Licence	Hours on	
		Type	Hours Total
Pilot-In-Command	Commercial	30.0	280

Approved for Release: Thursday, August 8, 1996

Helicopter VH-AUQ was substantially damaged in a ground resonance occurrence in November 1995. It was rebuilt and released, as serviceable, on 13 April 1996. The helicopter was immediately flown from Australia's east coast to Fitzroy Crossing, arriving there on 24 April 1996. During the flight to Fitzroy Crossing, which took 24 flying hours, the pilot/owner reported that, on one occasion, there had been some vibration in the rotor system. The vibration occurred after touchdown and immediately prior to shutdown at Mt Isa, it was minor and had only lasted for a short period.



The helicopter was fitted with a single set of controls. On the day of the accident another pilot attempted to fly the helicopter, whilst the pilot/owner sat in the passenger's seat. After start up, and prior to lift off, it began to vibrate. The helicopter was shutdown and inspected. No reason for the vibration was found. After some discussion it was decided that the vibration had been caused by incorrect positioning of the cyclic control stick during start up. The pilot/owner re-phased the main rotor blades, ie. positioned the blades evenly around the rotor head, before attempting another start. The pilots then switched seats and strapped in. The pilot/owner started the engine and completed a power check. He reported that there was no vibration and everything appeared normal.


The pilot flew the helicopter to a 1 m hover and commenced a turn to the left. As the helicopter started to yaw a severe vibration started. The vibration was so bad the pilot was unable to maintain a reasonable degree of control and he reduced power and allowed the helicopter to touch down. The vibration continued, increasing in amplitude. This made it difficult for the pilot to reach the mixture control lever. However, he was finally able to shut the engine down. During the vibration after touchdown, the bubble fractured across the top and bottom frames and fell forward. The pilot/passenger's seat belt came undone and she was ejected forward of the helicopter, falling onto a grass area. By the time all movement had stopped, in addition to the bubble damage, the tail boom had been cut off, most of the airframe structure had been fractured or severely distorted and the main and tail rotor blades destroyed. The pilot/owner was assisted from the wreckage by an observer.

The investigation found that lockwire and spacing washers were missing from the torque-nuts on all three main rotor blade dampers. Each of the torque-nuts was found in a different position on its shaft. None of the nuts were positioned near where they were expected to be on a newly overhauled blade damper. Evidence indicated that all three dampers were overhauled prior to being fitted during the rebuild. Two of the blade dampers were severely damaged and their torque setting could not be checked. The third damper was undamaged and its torque was found to be 140 inch pounds counter-clockwise and 135 inch pounds clockwise. The manufacturer's minimum torque requirement is 230 inch pounds, in both directions on installation and 200 inch pounds in service. The internal bearings and friction plates, in all three dampers, were in good condition. All three damper arm uni-ball bearings, which had been replaced during the overhaul, were found to have excessive play. Two of three bolts, which were used to secure linkages between the trailing edge of the main rotor blades and their respective dampers, were found to be badly worn, as were their corresponding lower bolt holes. Whilst the play in the uni-ball bearings was probably the result of wear during the accident-flight vibration, the extent and condition of the wear on the bolts indicates that it had been there for some time.

The lack of torque and the wear on the bolts and holes probably led to partial and uneven damping of lead and lag in the main rotor blades. This, in turn, led to the vibration which caused the accident.

The organisation which overhauled the blade dampers reported that it had been completed in accordance with the manufacturer's requirements. The dampers had been delivered to the rebuild-organisation with spacers and lockwire fitted and torqued to the correct setting. The rebuild-organisation reported that they had fitted the dampers, as delivered, and had not had to make any adjustments to them prior to releasing the helicopter to the owner. The pilot/owner reported that the lockwire had been removed during adjustment and ground testing, after the dampers had been fitted to the helicopter and before it was released to him. He had assisted whilst adjustments were made to the dampers by maintenance personnel. The spacers and lockwire were not refitted.

It could not be determined how worn bolts came to be fitted to the damper linkages. Neither the overhaul- or the rebuild-organisation believed it had fitted the bolts.



It is possible that the dampers were correctly torqued when the helicopter was released to the owner. Although no evidence of a similar occurrence is available, it is possible that the absence of lockwire allowed the torque-nuts to back off gradually, whilst the helicopter was being flown to Fitzroy Crossing. The reducing damper torque went unnoticed by the pilot/owner, probably because of his inexperience. The different positions of the torque nuts, at the time of the accident, indicates that, if the nuts had backed off, they had done so unevenly. The alternative explanation is that the blade damper torque-nuts were incorrectly set during adjustments made before the helicopter was released to the pilot/owner. However, had this been the case any significant variation in damper torque would have been evident as vibration in the rotor system, much earlier than reported. Therefore, the first alternative is considered the more probable explanation and the uneven and reducing damper torque probably reached a point, on the last two flights, where the vibration became excessive.

An inspection of the pilot/passenger's seat belt tongue and buckle indicated there was a significant amount of movement between the tongue and the buckle when the tongue had been pushed into the locked position. This made it possible, at some angles, for the tongue to be pulled out again, even though the belt appeared to be locked.

