Aviation Safety Investigation Report 199800660

Hughes Helicopters
Hughes 300

26 February 1998

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Occurrence Number: 199800660 **Occurrence Type:** Accident
Location: Kalgoorlie/Boulder, Aerodrome
State: WA **Inv Category:** 4
Date: Thursday 26 February 1998
Time: 1200 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	0	1	0	1
Total	**0**	**1**	**1**	**0**	**2**

Aircraft Manufacturer: Hughes Helicopters
Aircraft Model: 269C
Aircraft Registration: VH-LBQ **Serial Number:** S-1415
Type of Operation: Miscellaneous Test
Damage to Aircraft: Destroyed
Departure Point: Kalgoorlie WA
Departure Time: 1200 WST
Destination: Kalgoorlie WA

Crew Details:

Role	Class of Licence	Hours on Type	Hours Total
Pilot-In-Command	Commercial	450.0	450

Approved for Release: Monday, July 20, 1998

The Hughes 269 helicopter had completed a 100 hourly servicing during which, the main rotor abrasion strips were replaced, main rotor damper hydraulic fluid levels replenished and the landing gear oleos checked to ensure that they were within limits.

Ground and hover flight checks were then conducted to adjust blade weights and damper settings. The pilot and licensed aircraft maintenance engineer (LAME) reported that the wind was strong and gusting to about 30 kts. All the landings were made either crosswind or into-wind onto a hard bitumen surface. The LAME reported that, on each occasion, he made only small adjustments to the main rotor damper setting and blade track. The pilot reported that on each of the flights prior to the accident flight, the helicopter had a significant vibration. At the end of each flight, the pilot would land the helicopter and disconnect the main rotor from the engine so that the LAME could make adjustments to the rotor head and blades.

During the flights, the pilot occupied the right seat and the LAME operated the vibration and tracking equipment from the left seat. The LAME reported that during the accident flight, the helicopter's vibration levels and main rotor track had been adjusted to being well within limits, but soon after the pilot had made a very light and gentle landing, the helicopter entered ground resonance. The pilot reported that after he landed the helicopter and as the engine speed decayed through approximately 2,500 to 2,300 RPM, the helicopter entered severe ground resonance. He forced the collective fully down and wound back the throttle setting. He also attempted to operate the rotor disengage switch but his attempts were hampered by the helicopter's severe vibration experienced during the ground resonance. A witness reported that about 5 seconds after landing, the helicopter rocked three times alternately on each of the two skids. It then spun through 360 degrees before disintegrating.

Ground resonance occurs when unbalanced forces in the rotor system cause the helicopter to rock on the landing gear at or near its natural frequency. Unless corrective action is taken, the amplitude of the vibration increases until the helicopter disintegrates. Corrective actions include immediately becoming airborne as ground resonance can only occur when the helicopter is in contact with the ground or stopping the main rotor as quickly as possible to remove the vibration source.

After the helicopter had come to rest, the crew was unable to shut down the engine which continued to operate. A bystander reached into the cockpit to secure the engine and electrical equipment before he and others assisted the crew from the wreckage. There was no fire but the pilot was seriously injured. The LAME received minor injuries. No bystanders were injured.

An examination of the wreckage revealed that there appeared to be no pre-existing mechanical faults. The main rotor system vibration level and blade track were well within limits and the landing gear oleos had been checked during the servicing in accordance with the servicing manual.The landing gear oleos were checked after the accident and were found to be serviceable. Therefore it was unlikely that a mechanical fault caused the helicopter to enter ground resonance.

When the pilot reduced the main rotor speed prior to shutdown, the centrifugal force acting on the main rotor blades also reduced. The main rotor blades would then have had a potential to excessively flap in response to the gusty wind. The helicopter may then have rocked on its landing gear oleos and subsequently entered ground resonance. Because the helicopter had no apparent mechanical faults, the prevailing wind conditions may have been a factor in the accident.

The decision to perform the main rotor track and balance in strong and gusty wind conditions would appear questionable considering that the rotor system would have been experiencing varying degrees of translational lift. Therefore, stable blade tracking and vibration readings from the equipment would have been difficult to obtain.

Because the main rotor RPM was decreasing, the pilot was unlikely to have recovered the helicopter from ground resonance because both the recovery techniques were unavailable to him. He was unable to disconnect the main rotor from the engine due to the helicopter's vibration and, the quick development of the ground resonance meant that it was also unlikely that the pilot had sufficient time to re-accelerate the main rotor and take-off.