



National Transportation Safety Board

Aviation Accident Data Summary

Location:	Phoenix, AZ	Accident Number:	WPR12FA191
Date & Time:	05/02/2012, 1140 MST	Registration:	N380TL
Aircraft:	HUGHES 269C	Injuries:	1 Serious, 1 Minor
Flight Conducted Under:	Part 91: General Aviation - Business		

Analysis

When the pilot was about 2 minutes from his destination at an altitude of about 500 feet above ground level, he sensed a vibration through the back of his seat and in the anti-torque pedals. The vibration was followed by a right yaw that the pilot could not correct with a pedal input. As the pilot attempted to maintain level flight, he heard a "metallic clunking" behind him. He looked back and saw what he described as the tail rotor losing rotor speed. The pilot maintained forward flight by countering the right yaw with left cyclic input while he located a cul-de-sac in a residential neighborhood in which to land. The pilot entered an autorotation, and during the descent, the helicopter impacted the roof of a house and an adjacent brick wall. Witnesses reported that the helicopter didn't "sound right," that the engine was sputtering, and that the engine power appeared to be increasing and decreasing. The helicopter was observed rocking and teetering before nose-diving toward the ground. After the helicopter impacted the ground, the engine continued to run, and the tail rotor continued to spin.

A postaccident investigation revealed that the main transmission pinion had fractured and separated through the threads that retained the aft pinion nut. Because the aft pinion nut maintained the position of the splined sleeve that drove the tail rotor drive shaft, the separation of the pinion allowed the sleeve to wobble as it turned and to move aft, partially disengaging its external splines from the internal splines in the tail rotor drive shaft. The sleeve's splines began to grind against the drive shaft's splines, and the resulting material loss on the splines reduced the engagement between the parts to the point where a loss of tail rotor drive occurred. It is likely that enough residual contact between the damaged splines remained to keep the tail rotor spinning (as observed after impact) but was not sufficient to deliver power to the tail rotor.

Examination of the pinion fracture surfaces determined that the pinion failure was due to a fatigue crack that initiated in a thread root and propagated through about 75 percent of the pinion's cross-section before the remaining material succumbed to overstress conditions. No indication of material deficiencies, such as inclusions, voids, or pits, were found at the crack initiation site. According to the helicopter's maintenance records, the pinion had been in service for 1,584.4 hours, and on the day before the accident, a 100-hour inspection had been performed in accordance with the helicopter manufacturer's instructions. These instructions included a procedure for checking the torque of the aft pinion nut, and a co-owner of the helicopter reported that he observed the mechanic perform the torque check. It is likely that the fatigue crack was not large enough to be detected during the inspection and then propagated to the point of failure during the accident flight.

Flight Events

Enroute-cruise - Sys/Comp malf/fail (non-power)

Maneuvering - Loss of control in flight

Autorotation - Collision with terr/obj (non-CFIT)

Probable Cause

The National Transportation Safety Board determines the probable cause(s) of this accident to be:
A loss of tail rotor drive due to a fatigue failure of the main transmission pinion, which resulted in a loss of directional control during cruise flight.

Findings

Aircraft-Aircraft propeller/rotor-Main rotor drive-(general)-Not specified - C
Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Directional control-Attain/maintain not possible - C
Personnel issues-Task performance-Use of equip/info-Aircraft control-Pilot - C

Pilot Information

Certificate:	Commercial	Age:	40
Airplane Rating(s):	None	Instrument Rating(s):	Helicopter
Other Aircraft Rating(s):	Helicopter	Instructor Rating(s):	Helicopter
Flight Time:	1460 hours (Total, all aircraft), 1030 hours (Total, this make and model), 1410 hours (Pilot In Command, all aircraft), 90 hours (Last 90 days, all aircraft), 30 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	HUGHES	Registration:	N380TL
Model/Series:	269C UNDESIGNAT	Engines:	1 Reciprocating
Operator:	Canyon State Aero	Engine Manufacturer:	Lycoming
Air Carrier Operating Certificate:	None	Engine Model/Series:	HIO-360-DIA
Flight Conducted Under:	Part 91: General Aviation - Business		

Meteorological Information and Flight Plan

Observation Facility, Elevation:	PHX, 1135 ft msl	Weather Information Source:	Weather Observation Facility
Conditions at Accident Site:	Visual Conditions	Lowest Ceiling:	None
Condition of Light:	Day	Wind Speed/Gusts, Direction:	8 knots, 190°
Temperature:	31°C / -1°C	Visibility	10 Miles
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Phoenix, AZ (DVT)	Destination:	Phoenix, AZ (DVT)

Wreckage and Impact Information

Crew Injuries:	1 Serious	Aircraft Damage:	Substantial
Passenger Injuries:	1 Minor	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None

Administrative Information

Investigator In Charge (IIC): Thomas Little

Adopted Date: 01/13/2014

Investigation Docket: <http://dms.nts.gov/pubdms/search/dockList.cfm?mKey=83539>

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