ACCIDENT

Aircraft Type and Registration:	Hughes 369D, G-CCUO
No & Type of Engines:	1 Allison 250-C20B turboshaft engine
Year of Manufacture:	1980 (Serial no: 400711D)
Date & Time (UTC):	27 January 2014 at 1300 hrs
Location:	Near Stonebridge Cross Business Park, Droitwich, Worcestershire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (Minor) Passengers - N/A
Nature of Damage:	Substantial
Commander's Licence:	Private Pilot's Licence
Commander's Age:	62 years
Commander's Flying Experience:	18,000 hours (of which 40 were on type) Last 90 days - 3 hours Last 28 days - 1 hour
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

Shortly after takeoff the pilot experienced yaw control difficulties, resulting in the loss of control of the helicopter and a subsequent crash landing. The pilot escaped with minor injuries. In the absence of any mechanical abnormalities, the most likely cause of the accident is a loss of tail rotor effectiveness.

History of the flight

The pilot arrived to position the helicopter back to its normal operating base following its annual maintenance inspection. He reported that the weather was good and the surface wind was from 250° at 15 kt. After a short delay, whilst some outstanding items from the maintenance were resolved, the flight was commenced. The helicopter was facing into wind and after takeoff, lifted into a high hover. The pilot reported that he did not appear to have directional control with the yaw pedals and after a few seconds, the helicopter "started spinning". As the spin accelerated, the pilot became disorientated and he lowered the collective lever to land. The helicopter drifted to the right into a wooded area beside the apron and it collided with trees. It came to rest on its side, partly submerged in a pond. The pilot was briefly rendered unconscious and woke to find that he was immersed in water. He was able to unfasten his harness and escape through the shattered windscreen. Witnesses to the accident arrived to offer assistance.

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Background information

During the annual inspection the only work affecting the yaw control system was the routine replacement of the tail rotor gearbox oil. A post-accident inspection of the yaw control system confirmed continuity between the yaw pedals and the tail rotor blades, with no defects apparent. The damage to the helicopter indicated that it had been turning to the right.

Loss of tail rotor effectiveness

Loss of tail rotor effectiveness (LTE) is a critical low-speed aerodynamic flight characteristic that can result in rapid, uncommanded yaw. If not corrected promptly, this can result in a loss of control. It is not related to a technical malfunction and may occur to varying degrees in all conventional single main rotor helicopters at airspeeds below 30 kt.

LTE occurs when the airflow through the tail rotor is altered or disturbed, rapidly altering the thrust produced by the tail rotor. The disturbance to the airflow can be caused by the downdraft from the main rotor, the main rotor blade tip vortices, or by naturally occurring turbulence or wind.

Flight conditions more likely to induce LTE include: high power settings and/or slow forward airspeeds, typically where translational lift is in the process of change[1] and where the relative airflow is within plus or minus 15° from the 10 o'clock position for helicopters with anti-clockwise main rotors. For these types there is a greater susceptibility to LTE during turns to the right. (Helicopters with clockwise main rotors are more susceptible to LTE when the relative airflow is within plus or minus 15° from the 2 o'clock position and during turns to the left.)

Discussion

In order to climb vertically into a high hover, a relatively high power setting would have been required. The windspeed of 15 kt was sufficient to cause the onset of translational lift whilst in the hover and any shift in the relative wind direction towards the 10 o'clock position could have caused the vortices from the main rotor blade tips to impinge on the tail rotor airflow. With the presence of these adverse conditions and in the absence of any mechanical abnormalities, it seems most likely that a loss of tail rotor effectiveness led to the loss of control. The pilot candidly commented that he was not aware of the LTE condition and when he gained his PPL (H) in 1984 and during subsequent training, which included practical and written tests, he did not recall it being covered in the training syllabus.

Following a fatal accident in 2003 attributed to LTE, the AAIB made Safety Recommendation 2003-126 to the CAA. It recommended that the CAA should publish, as widely as possible within the UK, information on the loss of tail rotor effectiveness. The CAA published this information and included it in training material for helicopter instructors and examiners. An article was also published in GASIL 1 of 2004 and FODCOM 1/2004 was issued.

Footnote

[1] Translational lift occurs when the vertical airflow induced by the main rotor is affected by horizontal airflow across it. It is most noticeable when the horizontal airflow, due to helicopter movement or wind, is around 15 to 25 kt.

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Current education and training on LTE

The CAA advised that the current education and training that addresses LTE as a subject includes:

- The relevant EASA Part-FCL training syllabus; PPL(H) Ex 18(d) and the Theoretical Knowledge requirements.
- AIC Pink 066/2013 strongly recommends flight and theoretical knowledge awareness training for all light helicopter pilots and lists LTE as a subject that should be covered. (http://www.nats-uk.ead-it.com/public/index.php%3Foption=com_content&task=blogcategory&id=161&Itemid=58.html)
- Type-rating training covers individual LTE characteristics which depend on the type of anti-torque rotor design. The flight manual usually gives recommendations or limitations related to the type.
- The European Helicopter Safety Team (EHEST) has ongoing work to raise safety awareness and education. EHEST provides a number of downloadable high-quality training materials; their current HE1 Training Leaflet – 'Safety Considerations' has a section dedicated to LTE. (http://easa.europa.eu/essi/ehest/2010/10/leaflet-safety-considerations/)

Safety action

The CAA intends to review and expand Safety Sense Leaflet 17, '*Helicopter Airmanship'*, to include information about loss of tail rotor effectiveness and how to avoid and recover from the condition.

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