

ACCIDENT

Aircraft Type and Registration:	Rotorsport UK Cavalon, G-GERN	
No & Type of Engines:	1 Rotax 914UL-01 piston engine	
Year of Manufacture:	2016 (Serial no: RSUK/CVLN/020)	
Date & Time (UTC):	18 June 2017 at 1201 hrs	
Location:	Stoke Microlight Airfield, Kent	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 1
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Substantial	
Commander's Licence:	Private Pilot's Licence (G and M)	
Commander's Age:	48 years	
Commander's Flying Experience:	504 hours (of which 84 were on type) Last 90 days - 28 hours Last 28 days - 13 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

Following a normal takeoff and having reached an estimated height of 120 ft to 150 ft, the pilot noticed a sudden loss of height and airspeed. He made a forced landing onto a nearby mud bank; on touchdown the rotor blades contacted a boat and the gyroplane rolled over. The weather was warm with the potential to adversely affect takeoff performance.

History of the flight

The gyroplane was parked overnight between two polytunnel hangars at Stoke Microlight Airfield, Kent. On the day of the accident the pilot planned a flight with a passenger to Little Gransden Airfield, Bedfordshire. They arrived at the airfield late morning and the pilot prepared the gyroplane for flight. He dipped the fuel tank and confirmed there was 35 litres of fuel on board remaining from a flight the previous day. It was an unusually warm day in southern England with ambient temperatures in excess of 30°C recorded in some areas. During the pre-flight checks the pilot observed the on-board temperature gauge was indicating 35.5°C.

On completion of all of the pre-flight checks the pilot started the engine, checked the radio was working and taxied to the holding area for Runway 24. The pilot and the passenger were both wearing Active Noise Reduction (ANR) headsets.

After waiting at the holding point for other aircraft to depart the pilot lined up, pre-rotated the rotor to 220 rpm, set full power and started the takeoff. Everything appeared normal as the gyroplane lifted off and climbed to a height approaching the end of the runway that he estimated was 120 ft to 150 ft aal.

The pilot then noticed a sudden and rapid loss of height with a decreasing airspeed. He rejected the option of lowering the nose to accelerate, because there was insufficient height and decided to land immediately on an area of tidal mud bank between two mooring jetties.

The gyroplane landed upright but the rotor blades struck a moored boat and the aircraft tipped over into the mud. The pilot and his passenger, who were wearing full four-point harnesses, but not helmets, were able to release themselves from the aircraft and did not sustain any significant injury. The aircraft was recovered before it was covered by the incoming tide.

Airfield information

Stoke Microlight Airfield has a single grass runway orientated 06/24, 475 m in length by 20 m in width. The options for a forced landing immediately after takeoff from Runway 24 are limited. A railway line and overhead power lines run parallel to the runway to the north of the airfield and to the south and west is the River Medway estuary with various obstructions. If the tide is out an area of mud flats is exposed to the south.

Aircraft information

The Rotorsport Cavalon is a closed cockpit gyroplane with two side by side seats. The pilot's seat is on the right hand side; this aircraft was fitted with dual controls. The takeoff technique advised in the Flight Manual requires the nosewheel to be held off the ground until lift off and then acceleration in level flight above the runway until climb speed is attained.

G-GERN was fitted with a Rotax 914 UL engine for which the preferred fuel grades are AvGas UL91, MOGAS EN 228 Super or EN228 Super plus. An alternative fuel is AvGas 100LL. The fuel system comprises twin linked main tanks with a total capacity of 100 litres. Two electrical fuel pumps are situated inside the fuel tanks and supply fuel to a pressure regulator from where any excess fuel is returned into the fuel tanks.

The pitch setting of the propeller was checked after the accident and found to be correctly set in full fine pitch. The engine was fitted with a datalogger which recorded engine rpm once a minute; the last recorded data point in the log indicated 5,714 rpm.

The Maximum Authorised Takeoff Weight for G-GERN is 560 kg. The weight and balance data supplied by the pilot indicated the actual takeoff weight was approximately 535 kg. Performance data for a Cavalon 914 UL at 560 kg under standard atmospheric conditions and at sea level are available in the Flight Manual. At an ambient temperature of 28°C a 21% increment is added to the takeoff distance and a 20% decrement to the climb performance.

The required takeoff distance to reach a height of 15 m (50 ft) at 560 kg at sea level and 28°C was calculated as 714 m.

Other information

CAA publication '*Handling Sense Leaflet 4, Gyroplane Handling and Performance*' identifies three main areas where it is considered that better education of pilots could significantly improve the safety record for gyroplanes. The first of these is:

'Understanding of the take-off performance of the gyroplane in the conditions for the day.'

The publication also notes:

'Bringing the stick back without sufficient airspeed will simply increase the rotor drag and even with 100% engine power the gyroplane will descend, nose high, to the ground.'

Analysis

The pilot in his report suggested several potential reasons for the apparent loss of performance; these included a possible vapour lock in the fuel system or atmospheric conditions causing an area of sinking air.

The weather was warm and the parking position between the two polytunnel hangars would have created a local heating effect and raised the temperature of the fuel. The pilot did not notice a reduction in engine power, although it is possible that an ANR headset could mask a change in engine note. The design of the fuel system should mitigate against vapour lock, even in very warm conditions, so this appeared a less likely scenario.

The ground roll of a gyroplane is relatively short but before a climb can be initiated it must be accelerated in ground effect to attain climb speed. This acceleration phase may use significantly more distance than the takeoff roll. In this case, the calculated takeoff performance for a gyroplane at maximum TOW suggests that the takeoff distance required by G-GERN (which was only 25 kg below MTOW) would have taken the gyroplane well beyond the end of Runway 24.

Gyroplanes are vulnerable to any loss of airspeed in the after-takeoff phase and it is possible that an atmospheric disturbance could have caused a loss of airspeed. However, it seems more probable that the length of Runway 24, and the very warm ambient conditions, meant that there was insufficient distance to accelerate to and maintain an effective climb speed. Any attempt at a premature climb will result in high rotor drag and loss of airspeed.

On recognising the loss of climb performance, the pilot made a rapid decision to land on an area of raised mud flat to his left. The gyroplane was damaged but the occupants were able to escape without serious injury.

Conclusion

The aircraft suffered a loss of climb performance shortly after takeoff probably as a result of a higher air temperature and shorter field length than the pilot was accustomed to. The pilot, with limited options available, decided to make a forced landing onto the shore.