ACCIDENT

Aircraft Type and Registration:	Rotorsport UK MTO Sport gyroplane, G-CFVG
No & Type of Engines:	1 Rotax 912ULS piston engine
Year of Manufacture:	2009 (Serial no: RSUK/MTOS/007)
Date & Time (UTC):	28 September 2016 at 0947 hrs
Location:	Northrepps (Cromer) Aerodrome, Norfolk
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (Serious) Passengers - N/A
Nature of Damage:	Extensive damage to cockpit pod, rotor blades and propeller
Commander's Licence:	Private Pilot's Licence
Commander's Age:	77 years
Commander's Flying Experience:	16,000 + hours fixed wing, incl ATPL flying (160 hours on gyroplanes, all on type) Last 90 days - 37 hours Last 28 days - 8 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

During what initially appeared to be a normal takeoff, the gyroplane rolled to the left and crashed onto its left side, with the pilot becoming trapped in the cockpit.

History of the flight

Following a pre-flight inspection the pilot started the engine and taxied to the runway, back-tracked along Runway 22 and turned through 180° in preparation for takeoff. The wind was reportedly 8-10 kt, straight down the runway. After conducting the magneto checks, the pilot, in accordance with standard operating procedure, pre-rotated the rotor to 200 rpm[1], trimmed fully forward and, with the control stick fully aft, opened the throttle to achieve 5,000 rpm released the brakes and commenced the takeoff. Initially everything appeared normal although the pilot reported that he experienced an increasing realisation that 'something was not right'. The next thing he remembered was being trapped inside the cockpit with the aircraft lying on its left side. He was able to release his harness and turn off the ignition switch with his right foot but could not move further. The airfield owner, who

Footnote

[1] Pre-rotation involves operating a clutch mechanism that takes drive from a pulley attached to the propeller shaft and powers the rotor via a Bendix gear mounted immediately below the rotor. After the appropriate rotor pm has been achieved, the pilot disengages the clutch and commences the takeoff run by opening the throttle, thus allowing all the engine power to be directed to the propeller.

was in his vehicle nearby, called the emergency services. An ambulance arrived promptly and the crew were able to free the pilot after cutting his clothes. The fire crews then righted the aircraft in order to prevent fuel and oil leaking onto the engine and exhaust.

Additional information

The pilot commented that he had flown a friend's MTO3 gyrocopter (which has essentially the same control and trim system) following his accident and on one occasion encountered what he felt may have been similar symptoms, when he needed to exert considerable forward force on the control stick in order to prevent the nose lifting excessively after takeoff.

Description of trim system

The pilot was at a loss to explain why the accident had occurred other than to suggest a possible intermittent fault in the pitch trim system.

The gyrocopter is equipped with an electrically-operated pneumatic control system that is used to operate the rotor brake and pitch (longitudinal) trim. An electric pump generates compressed air that, after being passed through a filter (in order to dry the air), is fed, via a series of solenoid valves to three cylinders: a double-acting cylinder operating the rotor brake and trim, a single-acting cylinder operating the pre-rotator engagement and an additional cylinder that engages the Bendix gear. The pump has a maximum capability of 10 bar but is limited to 8 bar by means of a pressure relief valve. A rotary knob on the instrument panel changes the system between BRAKE and FLIGHT and a pressure gauge is also provided on the panel that allows the pilot to see the trim position in flight (the higher the pressure, the more nose-up trim). During the takeoff procedure, when the pre-rotator is released, air at a pressure of around 2 bar is ported into the nose-up side of the trim actuating cylinder, causing the stick to move aft slightly. The current training standard (which applied during the period the pilot of G-CFVG was learning) teaches pilots to release the trim pressure by trimming forward after pre-rotator release, although this is not in the flight manual.

The Calidus and Cavalon gyrocopters, which are successor models to the MTO Sport, have modified trim systems that do not apply pneumatic pressure to the trim actuator following pre-rotator release.

Discussion

The gyroplane manufacturer commented that they thought that any pneumatic trim system fault was unlikely to have generated sufficient control forces to cause a problem. However they emphasised the importance of maintaining accurate pitch control during takeoff; aft stick is applied during the takeoff roll in order to maintain the airflow through the rotor disc such that it continues to be driven. After the nose lifts off the ground, it is necessary to check forwards in order to maintain the airspeed and allow the rotor rpm to continue to increase. There is a risk that, if the pitch angle is allowed to increase unchecked, the rotor blades could strike the ground behind the aircraft, slowing or damaging the rotor and causing a loss of lift. This would be predominant on the left side (retreating blade) and

result in a roll to the left. Retreating blade stall was considered unlikely in this case, as such occurrences invariably result in the rotor blades striking the tops of one or more of the three vertical stabilizers; these were found to be intact after the accident.

Other possibilities worthy of consideration is an intermittent fault, such as moisture in one of the solenoid valves, caused the trim actuating cylinder to be subjected to a pressure in excess of 2 bar, or that the pilot omitted to release trim pressure after pre-rotator release.