ACCIDENT

Aircraft Type and Registration:	Cessna F177RG Cardinal RG, G-AYSY	
No & Type of Engines:	1 Lycoming IO-360-A1B6 piston engine	
Year of Manufacture:	1971 (Serial no: 26)	
Date & Time (UTC):	16 June 2019 at 0933 hrs	
Location:	Leicester Airport	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - 1 (Minor)	Passengers - N/A
Nature of Damage:	Damage to propeller and fuselage	
Commander's Licence:	Light Aircraft Pilot's Licence	
Commander's Age:	30 years	
Commander's Flying Experience:	63 hours (of which 28 were on type) Last 90 days - 30 hours Last 28 days - 14 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

The pilot was unable to lock the landing gear in the down position. He landed on the grass runway at Leicester Airport, the landing gear retracted, and the aircraft exhaust and propeller dug into the ground. The pilot suffered minor injuries.

The hydraulic landing gear-up pressure line had become detached at the fitting, allowing the hydraulic fluid to escape.

History of the flight

The aircraft departed from Leicester Airport on a short flight to Sywell Aerodrome. After departure the pilot noticed that it took a much greater time for the landing gear to retract than was normally the case. At Sywell, the pilot positioned for landing and selected the landing gear down. He noticed that neither the green light, which indicated the landing gear was down and locked, nor the red light, which indicated the landing gear was up, was illuminated. He commenced a go-around from his approach and circled near the airfield whilst completing the emergency checklist. The pilot attempted to manually extend the gear using the emergency hand pump, but the pump had no pressure and the pilot felt no resistance to his movements.

The pilot decided that he would return to Leicester because he was more familiar with that airport and was aware that it had a smooth grass strip he could land on. Having returned to

Leicester, he completed a low approach and go around so that people on the ground could confirm the position of the landing gear, which was seen to be hanging down but not locked, as shown in Figure 1.

Figure 1

Photograph showing the landing gear position

The pilot then commenced an approach to land onto grass Runway 16. At approximately 100 ft aal he shut down the engine but the propeller continued to windmill. The touchdown was smooth, but the exhaust and propeller dug into the runway bringing the aircraft to an abrupt stop. The pilot received minor injuries and was taken to hospital as a precaution. Figure 2 shows the final position of the aircraft.

Figure 2

Photograph showing the final position of the aircraft

The aircraft was recovered to a local maintenance facility where an examination revealed that the landing gear-up pressure line had separated from its fixing, as shown in Figure 3. The hydraulic pipework is aluminium and uses flare fittings with flare nuts to attach them to the power pack.

Figure 3

Hydraulic line separated from its fixing

The aircraft itself suffered slight damage to the exhaust and propeller. The engine required an examination for shock loading.

Aircraft information

G-AYSY is fitted with retractable tricycle landing gear. The landing gear is extended and retracted by hydraulic actuators powered by an electrically-driven hydraulic power pack. The main gear is held up by hydraulic pressure whilst the nose gear has a mechanical lock. When the gear is selected down, the hydraulic fluid is returned to the reservoir through the landing gear-up pressure line. When the landing gear locks down the hydraulic pump is switched off by a micro switch on an over-centre lock on the nose landing gear. In the case of G-AYSY, the landing gear did not reach this position, so the pump continued to run and the hydraulic fluid was lost. The aircraft is fitted with an emergency hand pump, located on the cockpit floor between the front seats, which extends the landing gear in the event of a hydraulic pump failure but it requires hydraulic fluid to function. If the fluid is lost, the hand pump cannot extend the gear.

The aircraft had been at a maintenance facility until a few days before the accident due to a problem with the hydraulic pressure in the landing gear system: the landing gear had not been staying retracted because of a loss of system pressure. The fault was traced to an internal leak in the power pack and, following a thorough clean and seal renewal, the power pack was re-installed and tested. Repeated extension and retractions showed that the fault

was fixed, and the landing gear system worked correctly. Between the leak being fixed and the accident flight, the gear extension and retraction had been tested or used without fault at least 18 times.

The aluminium tubing in this system is relatively thin-walled. Using flare fitments with this piping can present problems as the flare joint can be fragile. Overtightening, repeated movement or even age can cause the pipe to fail at the flare joint as in this case.

Analysis

Having had previous issues with the landing gear remaining retracted, the hydraulic system had been examined and an internal leak in the powerpack rectified. Repeated testing of the system showed that the fault had been fixed and the system was working correctly. Aluminium pipes, as used in this system, can be weakened by overtightening, repeated movement or age and at some point, when the gear was selected down, the landing gear-up pressure line failed at the flare. The outcome was the total loss of hydraulic fluid from the system which subsequently prevented the landing gear from locking down.

The pilot assessed the situation and elected to return to an airfield he was familiar with, and that he knew had a smooth grass strip for his landing. Having shut the engine down, he performed a successful landing causing limited damage to the aircraft and only minor injuries to himself.

Aluminium tubing with flare fittings can be vulnerable if the fitting is overtightened. Repeated removal and re-fixing of such fittings with aluminium tubing should be treated with caution to ensure that the tubing is not damaged or weakened in the process.