

ACCIDENT

Aircraft Type and Registration:	Quad City Challenger II, G-MYIX	
No & Type of Engines:	1 Rotax 503 piston engine	
Year of Manufacture:	1993 (Serial no: PFA 177-12260)	
Date & Time (UTC):	2 May 2014 at 1517 hrs	
Location:	Louth, Lincolnshire	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 1
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Damage to nosewheel, left main wheel, nose cone and underside of floor pan	
Commander's Licence:	National Private Pilot's Licence	
Commander's Age:	69 years	
Commander's Flying Experience:	280 hours (of which 26 were on type) Last 90 days - 2 hours Last 28 days - 1 hour	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

During a check flight the pilot applied full power prior to conducting a timed climb. However, the engine rpm suddenly increased and it became apparent that the drive to the propeller had become disconnected. The aircraft was damaged in the subsequent forced landing, although the occupants were uninjured. It was found that the drive belt that connected the engine driveshaft to the propeller shaft, located immediately above the engine driveshaft, had migrated out of the groove in the lower pulley. This may have been the result of a degree of misalignment between the engine driveshaft and propeller shaft.

History of the flight

The aircraft had been inspected for revalidation of its Permit to Fly on 29 April 2014, three days prior to the accident; the intention on 2 May was to conduct a check flight. The aircraft took off from North Coates Airfield and, having reached 1,000 ft over an open area, the pilot prepared to conduct a timed climb to 2,000 ft. He increased the power to an indicated 6,700 rpm and raised the nose to allow the aircraft to achieve its maximum rate of climb at around 60-65 mph. However, at around 1,200 -1,300 ft the engine rpm suddenly "ran away". The pilot immediately throttled back and lowered the nose so that the aircraft settled into a glide at approximately 55 mph. He then checked with his passenger what he had heard and, as a check, opened the throttle once more. The engine rpm increased rapidly and thus suggested to the pilot that the drive to the propeller had been lost.

The pilot selected an arable field for a landing, which he approached from the southwest. The field was bisected by a meandering drainage ditch running approximately north-south and the pilot intended to land on the eastern side of the ditch, with the aiming point some 10 m beyond it. The approach proceeded smoothly until shortly before touchdown, when it suddenly became apparent that the ground on the far side of the ditch was 2-3 m higher than on the approach side. This prompted the pilot to pull back sharply on the stick, causing the aircraft to stall and land heavily on top of the embankment on the eastern side of the ditch. Neither of the occupants of the aircraft was injured, although considerable damage had occurred to the landing gear and fuselage underside.

Examination of the aircraft

The Quad City Challenger is a tandem two-seat, high-wing, ‘pusher-configuration’ aircraft in which the engine is located behind the pilot. A belt drive system connects the engine driveshaft to the propeller shaft, located immediately above it.

Examination of the aircraft immediately after the accident indicated that the propeller shaft drive belt had come off the engine pulley; this accounted for the loss of drive to the propeller and the rpm ‘runaway’ of the engine.

Subsequent detailed examination of the propeller drive components revealed that the lower pulley (on the engine driveshaft) was rotating in an elliptical orbit. On removing it from the shaft it was apparent that there had been excessive wear on the internal surface of the pulley, with a corresponding build-up of aluminium alloy material on the shaft. It was concluded that, although the bolt that secured the pulley to the shaft had been tight, there had been periodic slippage between the two components. The pilot later commented that he had been aware of occasional “blips” in the engine rpm, but had attributed these to carburettor icing. He now considers that this may have been a symptom of the drive successively slipping and locking.

The Light Aircraft Association (LAA), which provides airworthiness services to the operators of this class of aircraft under delegation from the United Kingdom Civil Aviation Authority, were consulted on this accident. They noted that the aircraft log book indicated that the lower pulley had been replaced in 2010, some 19 flying hours previously, although the work had not been signed off by means of a Permit Maintenance Release, as would normally be required. The LAA also noted that their experience with this type of aircraft indicated that premature failure of the propeller drive system was usually the result of the upper and lower drive pulleys not being properly aligned. Thus, although it was not positively established in this case, it is considered possible that a degree of misalignment occurred between the two driveshafts during the maintenance conducted 19 flight hours prior to the accident. The increasingly elliptical orbit of the lower pulley would eventually result in the drive belt migrating out of the pulley groove.

This type of propeller drive system has largely been superseded by the use of gearboxes, which have generally proved more reliable and avoid the potential problem of slippage between the pulley and driveshaft. It is important, in pulley-driveshaft designs, to ensure

contact over the entire mating surfaces of the components. In the event of incomplete contact, engine vibration and torque spikes can cause localised surface damage, rapidly progressing to severe damage.