

Airheart Paramotor XL 100

AAIB Bulletin No:	3/2000	Ref:	EW/C99/10/4	Category:	3
Aircraft Type and Registration:	Airheart Paramotor XL 100				
No & Type of Engines:	1 120cc 2 stroke piston engine				
Year of Manufacture:	1998				
Date & Time (UTC):	12 October 1999 at 1700 hrs				
Location:	In Flight				
Type of Flight:	Private				
Persons on Board:	Crew - 1 - Passengers - Nil				
Injuries:	Crew - None - Passengers - N/A				
Nature of Damage:	Loss of propeller and mounting				
Commander's Licence:	Not applicable				
Commander's Age:	Not known				
Commander's Flying Experience:	Not known				
Information Source:	AAIB Field Investigation				

The paramotor was involved in an accident in the spring of 1999, causing considerable damage to the machine, including bending of the main propeller shaft. The main propeller shaft was replaced, and the propeller was repaired and rebalanced by a commercial organisation. The machine functioned without fault and to the satisfaction of the owner for a further five hours flying, until this accident.

On the day of the accident the paramotor was flown for approximately 45 minutes. The flight had been continuing at a constant throttle setting for about 20 minutes when, without warning, the main propeller shaft failed immediately adjacent to the pulley. The propeller and the attached pulley fell to the ground and were not recovered. The paramotor, with the remaining components from the propeller shaft mounting assembly were sent to the AAIB for investigation.

The propeller shaft comprised a 12 mm bolt, located within a tube mounted on two crossmembers on the underside of the engine. The bolt, which did not rotate, carried two bearings on which a drive pulley and the propeller were located (Figure 1). The pulley was driven by a belt from another pulley mounted on the engine crankshaft. Belt tensioning was achieved by tightening two Allen bolts in one of the crossmembers which, via a steel 'spacer' mounted between them and in contact with the propeller shaft, could be used to pull the propeller shaft away from the crankshaft.

Metallurgical examination showed that the fracture in the propeller shaft had resulted from cyclic elastic bending of the shaft in service (Figure 2). There were two initiation regions, suggesting that the shaft had turned, or been turned, through about 70° at approximately half its life. These initiation positions were oxidised, some of which had occurred as a result of fretting damage. 'Event limit markers' were present on the fracture faces, approximately 30 being visible on each of the initiation regions. The relationship between these events and the shaft usage was not established.

The shaft was at the limit of belt tension adjustment and maximum possible belt tension was exerting a static elastic bending stress on the shaft. The protruding ends of the 5mm diameter Allen bolts in the belt tensioning assembly were toed out as a result of plastic bending in the 'spacer' (Figures 1, 3 and 4). The 'spacer', which had been made by the owner during the repair in the Spring, had been plastically deformed by tightening of the Allen bolts (Figure 4). It was noted that the holes drilled in the cross member for the Allen bolts were not on the centreline as shown on a drawing supplied by the manufacturer (Figure 3).

It was considered that the shaft failed in fatigue as a result of cyclic elastic, simple bending stresses superimposed on a high static bending stress introduced by overtensioning the propeller drive belt.