

## ACCIDENT

<b>Aircraft Type and Registration:</b>	Rans S6-ESD XL (Modified), G-MZDA	
<b>No &amp; Type of Engines:</b>	1 Rotax 582 piston engine	
<b>Year of Manufacture:</b>	1995	
<b>Date &amp; Time (UTC):</b>	29 May 2007 at 1348 hrs	
<b>Location:</b>	Carlisle Airport, Cumbria	
<b>Type of Flight:</b>	Private	
<b>Persons on Board:</b>	Crew - 1	Passengers - 1
<b>Injuries:</b>	Crew - None	Passengers - None
<b>Nature of Damage:</b>	Propeller and hub detached from gearbox, superficial damage to nose cowling	
<b>Commander's Licence:</b>	National Private Pilot's Licence	
<b>Commander's Age:</b>	80 years	
<b>Commander's Flying Experience:</b>	602 hours (of which approximately 500 were on type) Last 90 days - 4 hours Last 28 days - 2 hours	
<b>Information Source:</b>	Aircraft Accident Report Form submitted by the pilot and AAIB enquiries	

### Synopsis

At about 400 to 500 ft agl the propeller became detached from the aircraft. The pilot made a 180° turn and was able to land successfully on the reciprocal runway. Two 'half-rings' that retain the propeller shaft inside the gear box were found to have failed and the manufacturer is currently undertaking a detailed examination of these components.

### History of the flight

The aircraft had taken off from Runway 25 without incident and was climbing normally at approximately 500 ft/min. At about 400 to 500 ft agl the propeller, including the hub, spinner and shaft, became detached, and the engine speed rapidly increased.

The pilot lowered the nose, set the speed to 60 mph, and made a 180° turn to the right and headed for the reciprocal runway, Runway 07. He then made a 'MAYDAY' call and the controller advised that the runway was clear for him to land. The aircraft was successfully landed on Runway 07, and the pilot considered that since the wind was 300° at 10 kt, his decision to turn to the right helped to ensure that the aircraft was able to land on the runway.

The propeller and hub fell into a field near a private house. No one was injured in the accident. A student pilot on his way to the airfield and who had seen the propeller become detached, recovered the propeller and hub.

### Aircraft information

The Rotax 582 is a two-stroke engine and this unit was fitted with a reduction gearbox (see Figure 1). The propeller shaft, item 16 on Figure 1, rotates in two bearings

in the gearbox and is retained by two half-rings that sit in an annular groove in the shaft; these half-rings are housed inside an annular collar. The half-rings are known to wear and as a result require replacing during maintenance.

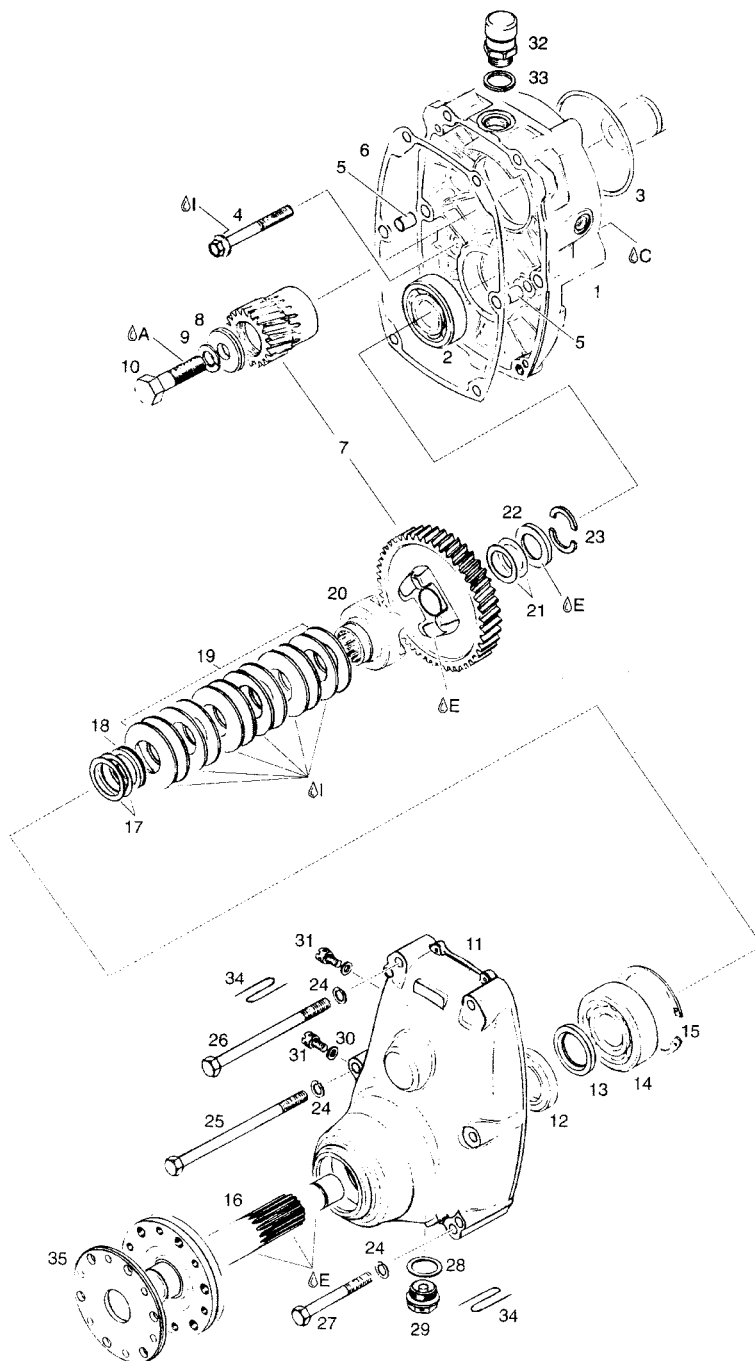


Figure 1

The engine had completed 600 hours and the gearbox had completed 27 hours since being overhauled. During the overhaul, which was undertaken by an engineer experienced with this type of engine, the half rings had been replaced.

### Engineering investigation

The propeller shaft and the gearbox components were sent to the AAIB, and subsequently to a metallurgist for examination. The components that failed are shown in Figures 2 and 3; note that the collar had broken into two pieces, and that each of the half-rings had broken into two pieces.

The metallurgist concluded that there were high cycle fatigue fractures in the collar and both the half-rings. There was, however, no evidence of wear on the half-rings.

The parts were sent to the UK service agent for the engine who reported that, whilst they had seen failures of the split rings before, they had never seen such a failure within 30 hours of gearbox overhaul. Moreover, they had never seen a failure of the annular collar.

The components have been sent to the manufacturer for further examination.

### Discussion

The half-rings had recently been replaced by an experienced engineer and hence incorrect installation would seem unlikely. This would appear to be an unusual failure and hence the components have been sent to the manufacturer for further analysis. This may take some time. Should further significant and relevant information be obtained by AAIB, a supplementary report will be published.



**Figure 2**  
Half rings



**Figure 3**  
Collar