

**AAIB Bulletin No:** 2/93

**Ref:** EW/G92/11/11

**Category:** 1c

**Aircraft Type and Registration:** Piper PA-38-112 Tomahawk, G-BSVW

**No & Type of Engines:** 1 Lycoming O-235-L2C piston engine

**Year of Manufacture:** 1979

**Date & Time (UTC):** 13 November 1992 at 1630 hrs

**Location:** Leicester Airport, Leicestershire

**Type of Flight:** Private (training)

**Persons on Board:** Crew - 1                      Passengers - None

**Injuries:** Crew - None                      Passengers - N/A

**Nature of Damage:** Damage to propeller, engine and lower cowling

**Commander's Licence:** Student Pilot

**Commander's Age:** 23 years

**Commander's Flying Experience:** 46 hours (all on type)  
Last 90 days - 26 hours  
Last 28 days - 16 hours

**Information Source:** Aircraft Accident Report Form submitted by the pilot and examination of failed nose leg

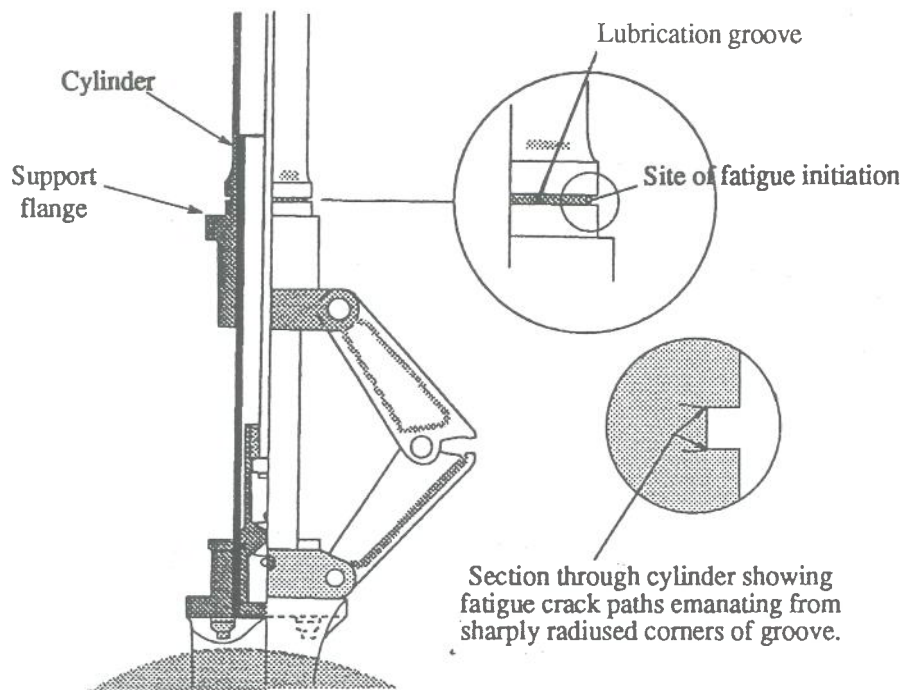
The student pilot, who was on a qualifying cross country flight, made what was described by eyewitnesses as a normal approach and touch-down at Leicester Airport. However, on lowering the nose, the nose landing gear leg detached, allowing the propeller and nose underside to contact the runway. The aircraft slid to a halt and, after shutting off the fuel and electrics, the pilot evacuated without injury.

The aircraft operator disclosed that a damaged engine mount had been found during a 50 hour inspection in September, and that this had been attributed to an undeclared heavy landing. This raised the question of whether the nose leg detachment was connected with this incident. Accordingly, the leg was sent to DRA Farnborough where the Materials and Structures Department carried out a detailed metallurgical examination on the leg.

It was apparent that the cylinder had failed at the position of a 2.2mm wide, 1.4mm deep, lubrication groove at its bottom end (see attached diagram). Examination of the fracture surfaces revealed the presence of fatigue cracking emanating from multiple origins in the bottom corner of the groove around

the entire circumference. The main region of the fatigue was at the front of the cylinder, where it had penetrated to a depth of approximately 3.5mm; the penetration around the remainder of the circumference was approximately 0.5mm. In addition, there was evidence of circumferential cracking in the top corner of the groove. There was no evidence of corrosion attack or mechanical damage that could have influenced the failure. Thus the alleged heavy landing resulting in the damaged engine mount is unlikely to have contributed to the failure. It was considered that the absence of any blending radii in the groove would have resulted in high localised stresses, leading to fatigue initiation.

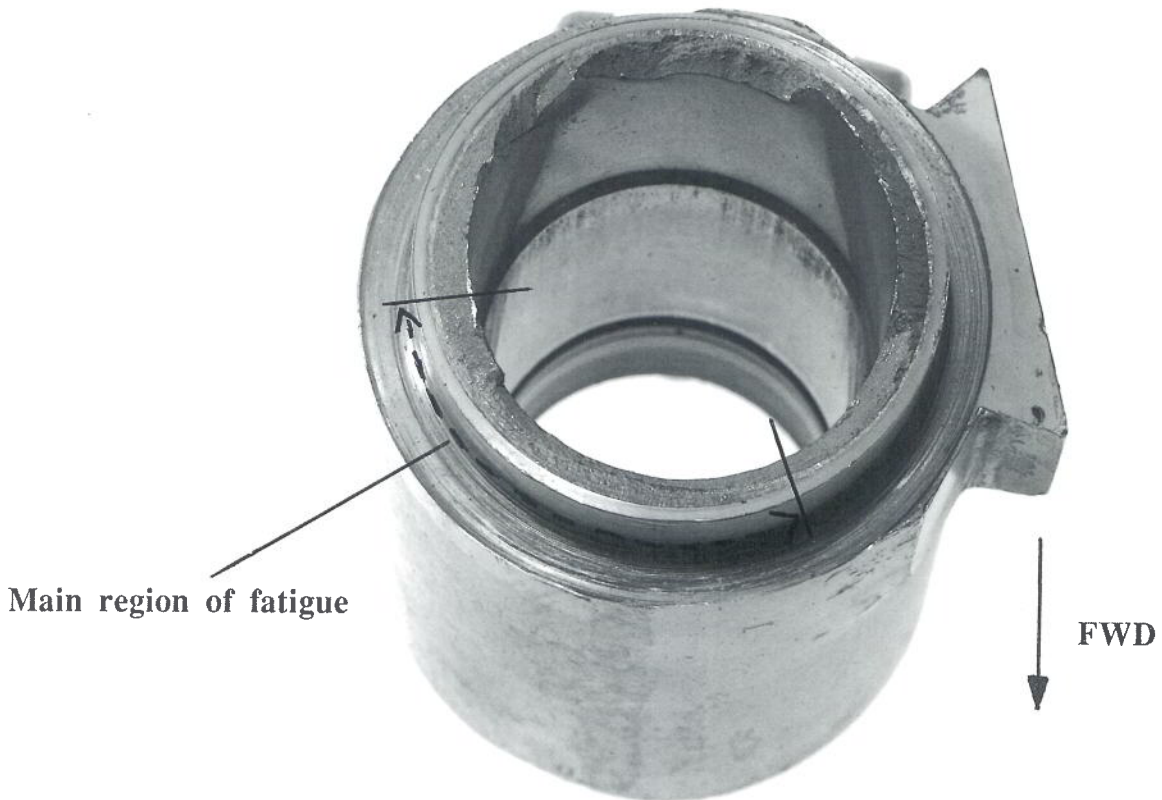
The failure was almost identical to that observed on another PA 38 aircraft, and which was reported in AAIB Bulletin 3/91. That investigation included the examination of intact nose legs, which revealed the presence of fatigue cracking in the grooves. This problem is being pursued with the CAA, and the AAIB will issue a related Safety Recommendation in a future addendum to this bulletin.



**Half Section of PA38  
(Tomahawk) Nose Leg**



General view of fractured nose leg from G-BSVW



View of fracture face on lower portion of the leg