Piper PA-46 Malibu, N666LP

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Aircraft Type and Registration:	Piper PA-46 Malibu, N666LP
No & Type of Engines:	1 Lycoming 350 piston engine
Year of Manufacture:	1998
Date & Time (UTC):	28 September 1999 at 1034 hrs
Location:	Southampton Airport, Hampshire
Type of Flight:	Private
Persons on Board:	Crew - 1 - Passengers - 1
Injuries:	Crew - None - Passengers - None
Nature of Damage:	None
Commander's Licence:	Private Pilot's Licence
Commander's Age:	52 years
Commander's Flying Experience:	1,750 hours (of which 200 were on type) Last 90 days - 30 hours Last 28 days - 10 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and AAIB enquiries

Loss of steering after landing

After landing on Runway 20, the aircraft departed from the runway to the right and came to rest on the grass, some 50 metres from a Jetstream aircraft, G-MAJA, which was waiting for departure at holding point B1. The pilot of the Malibu later reported that the landing roll had proceeded normally for several seconds but the aircraft had then veered left. He had immediately applied corective rudder but the aircraft had then veered to the right, before swinging left and right again some five times before leaving the runway at around 30 or 35 kt, with no effective steering available. The commander of the Jetstream reported that while he was stationary at the holding point, the Malibu was seen to touchdown. It had then veered left and then right, before slowing slightly and then veering left and right again, evidently out of control. It had then left the runway and headed directly towards his aircraft. He was about to shutdown both of his engines when the Malibu came to rest some 50 metres away, facing East. The Airport Fire Service quickly attended the scene and the Malibu aircraft later taxied back onto the runway before proceeding to the parking area. The runway was then inspected and the Jetstream departed uneventfully some 20 minutes after the incident.

Inspection of the aircraft

Subsequent inspection of the aircraft revealed a crack in the engine mounting frame where the nose landing gear jack actuator was attached. This had allowed the nose landing gear to move slightly towards the retracted position and in so doing had caused the nosewheel steering to disengage, allowing the nosewheel to castor. The aircraft had experienced previous steering problems, but no associated fault had been identified.

Metallurgical examinations

The engine mounting frame crack was initially examined by a non-destructive testing company (NDT Services Ltd) in the UK which reported that the fracture had partly followed the fusion line of one of the welds and exhibited fatigue characteristics which would require sectioning of the assembly for further detailed examination.

At the request of the New Piper Aircraft company, the fractured assembly was subsequently forwarded to the USA where it was subject to further metallurgical examination by Metallurgical Testing and Consulting Services Inc. The associated report indicated that the fatigue crack had initiated on the inside diameter of the tubing where two sections of tube were welded together, within the area where a flat 'gusset' plate was welded to the outside diameter of two of the tubes, the 'centre post tubing'. The crack had then extended around the third tube section.

The area where the fatigue had initiated on the inner attached support tube had suffered secondary 'smearing' damage which had destroyed the fatigue origin. In this context the report stated ' It is not known if some condition on the inside was present which would cause the failure'. The fatigue was characterised as a high stress/low cycle fatigue mode propagated by high bending and compressive stresses in service. The tube material was satisfactory and confirmed as 4130 low alloy steel; the associated welds were also satisfactory. The weakening of the tubular assembly by the fatigue crack propagation had precipitated final rapid failure due to overstressing.

Safety recommendation

During the investigation, the aircraft maintenance company indicated to the AAIB that the aircraft manufacturer had knowledge of some 10 previous incidents of this type. There are currently no required inspections in this area of the engine/noseleg mounting frame. The mounting frame is not routinely removed in service and the area which fractured is difficult to inspect visually. It is also an area which is frequently dirty from operation in service. In addition, while this type of crack is propagating it appears possible for it to 'open up', allowing the frame to deflect sufficiently to cause steering difficulties, and then to 'close up' again to restore apparently normal steering, with reduced visual indications then available to detect its presence. In view of such difficulties associated with detecting this fatigue induced problem, it is uncertain if a 'one off' inspection of this area of the mounting frame would be sufficient to detect such cracking, or whether repetitive inspections would be required.

Therefore, in view of these findings and the associated potential implications of loss of steering control, the following Safety Recommendation is made:

Recommendation 2000-44

The New Piper Aircraft company, in conjunction with the FAA and the CAA, should introduce a required inspection programme for Piper PA-46 Malibu aircraft to reliably detect fatigue cracking of the mounting frame at the attachment point for the noseleg actuating jack, which can cause sufficient displacement of the leg towards retraction during ground operations to disconnect nosewheel steering; in addition the design of this attachment area of the frame should be reviewed to assess the need for strengthening modification.