

AAIB Bulletin No: 2/94

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Category: 1.3

Aircraft Type and Registration: Piper PA-34-200T Seneca II, G-MAIR

No & Type of Engines: 2 Continental TSIO-360-EB piston engines

Year of Manufacture: 1979

Date & Time (UTC): 1 October 1993 at 1342 hrs

Location: Bristol (Lulsgate) Airport

Type of Flight: Private (Training)

Persons on Board: Crew - 1 Passengers - 1

Injuries: Crew - None Passengers - None

Nature of Damage: Nose landing gear components, both propellers and requirement to carry out shock load inspection/replacement of engines

Commander's Licence: Commercial Pilot's Licence with Instrument, Night and Flying Instructor Ratings

Commander's Age: 32 years

Commander's Flying Experience: Approx 5,200 hours (of which 1,200 were on type)
Last 90 days - 237 hours
Last 28 days - 75 hours

Information Source: Aircraft Accident Report Form submitted by the pilot, subsequent field examination by AAIB Engineering Inspector and metallurgical laboratory examination

The commander/instructor reported that the landing appeared normal and was followed by deceleration to approximately 50 kt at which point it was noticed that the aircraft was adopting a more than usually nose-down attitude. It became clear that the nose leg was no longer in the correctly locked position and on leaving the aircraft the crew noted that the nosewheel was still supporting the aircraft although the leg appeared to be partly retracted. Subsequent examination of the aircraft revealed that the forward bolt securing the drag link assembly to the nose leg had fractured, permitting the latter to rotate on its retraction pivots until part of the incompletely located link had fouled the leg in such a way as to prevent further retraction.

Examination of the failed bolt revealed considerable evidence of fatigue. A large number of fatigue initiation regions were distributed around the circumference of the failure, although the bulk of the failure surface exhibited a low cycle, high stress, reverse bending fatigue mechanism. The fatigue origins took the form of corrosion pitting which was found to have occurred before the bolt was plated.

During an investigation into a similar failure on a PA-34 aircraft in September 1991 (see AAIB Bulletin 3/92) it was established that a bolt in the corresponding position had also suffered fatigue failure. It was clear from markings on that failed bolt and the results of hardness tests, however, that the bolt was not of the correct material specification for that position. The markings on the failed bolt on G-MAIR, together with the results of hardness testing indicated, in contrast, that it was of the correct tensile strength.

During the investigation of the 1991 failure, it was noted that the then UK agents (and most experienced operator) for the type had a practice of changing these bolts at 2,000 hour intervals on their own aircraft, following a failure of such a bolt. It is known that the failed bolt on G-MAIR had completed at least 1,800 hours at the time of this failure.

As a result of the 1991 investigation, the AAIB made a number of recommendations, one of which had particular relevance to the G-MAIR accident. This was 92-12, 'The CAA require that a suitable life be determined for down-lock link / nose landing-gear bolts on Piper aircraft.' The CAA response was that they only partly accepted this recommendation, stating that 'rigorous inspections can achieve at least an equivalent level of safety to that available by introduction of a specific retirement life below the life of the aircraft'. They also stated that they would publish an article in GASIL as a reminder on the inspection requirements for such undercarriage pivot bolts.

Since the G-MAIR accident, however, the FAA have issued an Airworthiness Directive no 93-24-14 which calls for replacement of the relevant bolt at 500 hour intervals, the next replacement to be carried out within 100 hours of the effectivity date of 28 January 1994 unless it has been changed within the last 400 hours.