

AAIB Bulletin No: 6/94

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Category: 1.3

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

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

Year of Manufacture: 1975

Date & Time (UTC): 18 January 1994 at 1350 hrs

Location: Bristol (Lulsgate) Airport, Avon

Type of Flight: Private (Training)

Persons on Board: Crew - 2 Passengers - 1

Injuries: Crew - None Passengers - None

Nature of Damage: Damage to left wing, propeller and engine

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

Commander's Age: 26 years

Commander's Flying Experience: 2,193 hours (of which 130 were on type)
Last 90 days - 140 hours
Last 28 days - 69 hours

Information Source: Aircraft Accident Report Form submitted by the pilot

The aircraft was taxiing out with an instructor and two students on board for the purposes of Instrument Rating training. The route to the runway involved several turns and, whilst performing a right turn, the left main landing gear gently collapsed. The left engine stopped on contact with the taxiway and fuel was leaking from the left wing. There was no fire.

Examination showed that the left landing gear had folded because of failure of the swivel pin (referred to as a 'stud' in the Piper Illustrated Parts Catalogue), Part No 95299-02. Referring to the diagram it can be seen that this component attaches the landing gear sidestay to the airframe structure and its failure would thus inevitably lead to gear collapse.

Metallurgical examination revealed that the fracture of the pin occurred due to a high-stress/low-cycle fatigue mechanism in reverse bending. This is an identical mechanism to that involved in three previous PA-34 landing gear collapses occurring in the UK (see paragraph below entitled 'Previous Instances of Failure'). It was also found that the failed pin had partially seized in its bushing and that, although fresh grease was evident in the lubrication passage between the two halves of the bush, it had

not penetrated through to the majority of the contact surfaces. Examination of the same components from the right landing gear showed that the swivel pin, whilst not exhibiting such evidence of seizure, was nevertheless cracked at the same location (see diagram).

Both left and right swivel pins from G-BOSD were the smaller of two types made by Piper, being of $\frac{9}{16}$ in diameter compared with $\frac{5}{8}$ in diameter fitted as standard to later serial numbered aircraft. The larger pin can be physically accommodated in the same size bore in the support bracket because a thinner, one piece bush is used (Part No 67026-12). However, the same support brackets cannot be directly interchanged because the one-piece bush has a chamfer under the flange which would require machining of the lip of the bore in the support bracket to accommodate it. The $\frac{5}{8}$ diameter pin is now the only standard available from Piper and thus modification from the older standard should involve purchase of a matching support bracket as well as the new bush and shim washers.

The operator of G-BOSD also supplied components from other PA-34 aircraft in their fleet which incorporated the $\frac{5}{8}$ in diameter swivel pin. These were examined, although they had evidently considerably lower times in service, and found to be free from cracks.

Previous Instances of Failure

There are three previous recorded failures of the subject swivel pin on British-registered PA-34-200 aircraft known to AAIB:

G-BACB	17 August 1989
G-BOUM	13 May 1992
G-TEST	19 July 1992

All the above accidents were detailed in the appropriate issue of the AAIB Bulletin and involved the smaller ($\frac{9}{16}$) swivel pin. The report covering the accident to G-BACB contained a safety recommendation which was sent to the Civil Aviation Authority (CAA) in November 1989. This recommendation stated:

'It has been recommended to the CAA that consideration be given to requiring a periodic check of the swivel pin.'

In response the CAA undertook to liaise with Piper on the need for issuing a Service Bulletin or, if necessary, to issue a CAA Airworthiness Directive (AD) requiring such an inspection.

At the time of the accident to G-BOUM, no Service Bulletin or AD had been issued to address the problem of cracked swivel pins. AAIB therefore submitted the following safety recommendation, No 92-47, to the CAA in June 1992:

'It has been recommended that the CAA require a periodic check of the swivel pin and assess the need for mandatory replacement of the fitting type with one of more robust design.'

It appears that the CAA then forwarded the above recommendation to the Federal Aviation Authority (FAA) in the USA. In their reply dated 19 November 1992, they stated:

'A service difficulty study was performed using the FAA service difficulty and accident/incident databases. There were no incidents in either database.'

The letter concluded:

'We will continue to monitor this part and feel that no action is required at this time.'

Apparently in response to this latest failure on G-BOSD, the FAA have issued an Advanced Notice of Proposed Rulemaking (ANPRM), Docket No 93-CE-61-AD, which essentially seeks US operator experience with the subject swivel pin. It also points out that a similar mechanism is used on a large number of other aircraft types in the Piper range fitted with retractable landing gears. The response date of 10 May 1994 means that, at the time of preparation of this Bulletin, the AAIB do not know the outcome of the operator survey or any proposed airworthiness actions.

G-BOSD MAIN LANDING GEAR

