No: 6/86 Ref: 1b

Aircraft type Piper and registration:

Piper PA44-180D G-BGJB

No & Type of Engines

Two Lycoming 0-360-E1A6D piston engines

Year of Manufacture:

1978

Date and time (GMT):

17 April 1986 at 1722 hrs

Location:

Biggin Hill Airport

Type of flight:

Training

Persons on board:

Crew - 2

Passengers — None

Injuries:

Crew - None

Passengers — N/A

Nature of damage:

Damage to propellers, nose underside, engines shockloaded

Commander's Licence:

Airline Transport Pilot's Licence (Aeroplanes)

Commander's Age:

34 years

Commander's total

flying experience:

9336 hours (of which 62 were on type)

Information Source:

Aircraft Accident Report Form submitted by the pilot and

examination of aircraft by AIB.

During a training flight a normal approach and touchdown on the main wheels was carried out, the crew previously having confirmed that the undercarriage down and locked lights were illuminated. As the nosewheel was lowered onto the runway, the nose undercarriage retracted and the nose cowling and propellers struck the ground. After the aircraft had come to rest, the crew carried out the emergency shut-down drills and vacated the aircraft without difficulty.

Examination revealed that the casting comprising the downlock hook had broken, the portion that had fallen away not being recovered. The remaining portion of the casting was able to contact the gear down limit switch in the usual way, thus giving the normal gear down and locked indication. Examination of the casting revealed a typical brittle fracture with no unusual features. The downlock hook engages with a peg mounted on the sidewall in the wheel well. It was noted that the peg was free to rotate and had bent on its mounting such that it was pointing rearwards. Mounted thus the loads would not have been distributed uniformly across the width of the hook.

Other observations included considerable play between the two arms of the drag brace, and in the nose leg trunnion bearings.

The undercarriage is rigged such that the downlock hook engages at the same time as the two arms of the drag brace reach an over centre postion. The linkage is spring loaded to this position such that further movement in the over centre direction is resisted by abutting flanges on the drag brace arms. Whilst the precise failure mechanism is not clear, it is likely that in the absence of the downlock hook there would have been a tendency for the mechanism to over travel due to the rearward forces on the leg when the nose wheel contacted the ground. This would have placed excessive bending loads in the drag brace linkages, and the resulting strain energy would

have pushed the leg forward again following nosewheel spin-up, and followed through into an "under centre" position, with consequent leg retraction. It is probable that the free play between the two drag brace arms resulted in a less positive over centring action and this may have been a contributory factor. Disassembly of the drag linkage revealed that the bolt that joins the upper and lower links together had failed at its mid point. Furthermore, considerable wear and elongation of the bushed holes in the two links had occurred, although sufficient friction had evidently existed to prevent the two bolt halves from falling out. Examination of the fracture faces revealed that failure had occurred as a result of fatigue in bending, and the degree of corrosion indicated that this condition had existed for some time.

The broken bolt was identified as a standard AN4-20 aircraft bolt. Similar bolts have featured in a number of reports relating to the collapse of landing gear after touchdown. (In these cases, the bolt fragments fell away, allowing separation of the drag links and consequent leg collapse.) This type of bolt was most recently specified in the 1979 revision of the Piper Illustrated Parts Catalogue (Piper P/N 402 940). A production change has since revised the bolt to a close tolerance NAS464P4-27.