

ACCIDENT

Aircraft Type and Registration:	Piper PA-34-200T Seneca, G-BNEN	
No & Type of Engines:	2 Continental TSIO-360-EB piston engines	
Year of Manufacture:	1980	
Date & Time (UTC):	21 April 2005 at 1205 hrs	
Location:	Oxford Kidlington Airport, Oxfordshire	
Type of Flight:	Training	
Persons on Board:	Crew - 2	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Nose wheel, propellers and engines	
Commander's Licence:	Airline Transport Pilot's Licence	
Commander's Age:	71 years	
Commander's Flying Experience:	16,000 hours (of which 1,979 were on type) Last 90 days - 83 hours Last 28 days - 26 hours	
Information Source:	AAIB Field Investigation	

Synopsis

As a result of the progression of damage from a previous nose landing gear collapse, which remained undetected during subsequent repair, the aircraft suffered another nose landing gear collapse during pre-takeoff power checks.

History of flight

The aircraft was to have operated a training flight from Kidlington Airfield. After taxiing to the runway and receiving clearance to take off, the aircraft entered the runway, lined up and stopped. The throttles were advanced to achieve 2,000 rpm on each engine, whereupon the nose landing gear collapsed, resulting in significant damage to both propellers and the shock loading of both engines. The occupants were uninjured and vacated the aircraft through the forward and rear doors.

Damage to aircraft

This aircraft had previously been involved in a nose landing gear collapse incident on 22 February 2003, the report on this event being published in AAIB Bulletin 11/2005. A review of the aircraft's documentation showed that the aircraft had been repaired in accordance with the relevant manufacturer's requirements and recommendations valid at that time. During an assessment of the aircraft, prior to repair, no damage to any of the landing gear mounts or associated bulkhead was identified. The aircraft was released under 'fitness for flight' documentation by the repair facility prior to an annual inspection being carried out by its normal maintenance organisation.

As a result of the collapse on 21 April 2005, the lower section of the nose landing gear had moved aft, causing damage to the bulkhead and the lower nose landing gear mount located behind the bulkhead. Consequently, in order to gain access to the lower mount, significant disassembly of the lower forward fuselage was required.

The nose landing gear upper and lower drag links together with the landing gear support frame, Figure 1, showed no signs of deformation or damage although the downlock link showed some deformation of its cross-pin

slot. The lower landing gear mount is secured by three rivets at its lower face to the inside of the fuselage skin and, on its upper face, by four rivets to the lower crossplate located between the left and right keel beams, Figure 2. All the rivet heads on the lower mount were found sheared off. The condition of the shank sections of the lower rivets associated with this mount indicated that these had failed during the landing gear collapse but discolouration of the remains of rivet shanks of the upper four rivets indicated that they had failed at some point prior to the collapse.

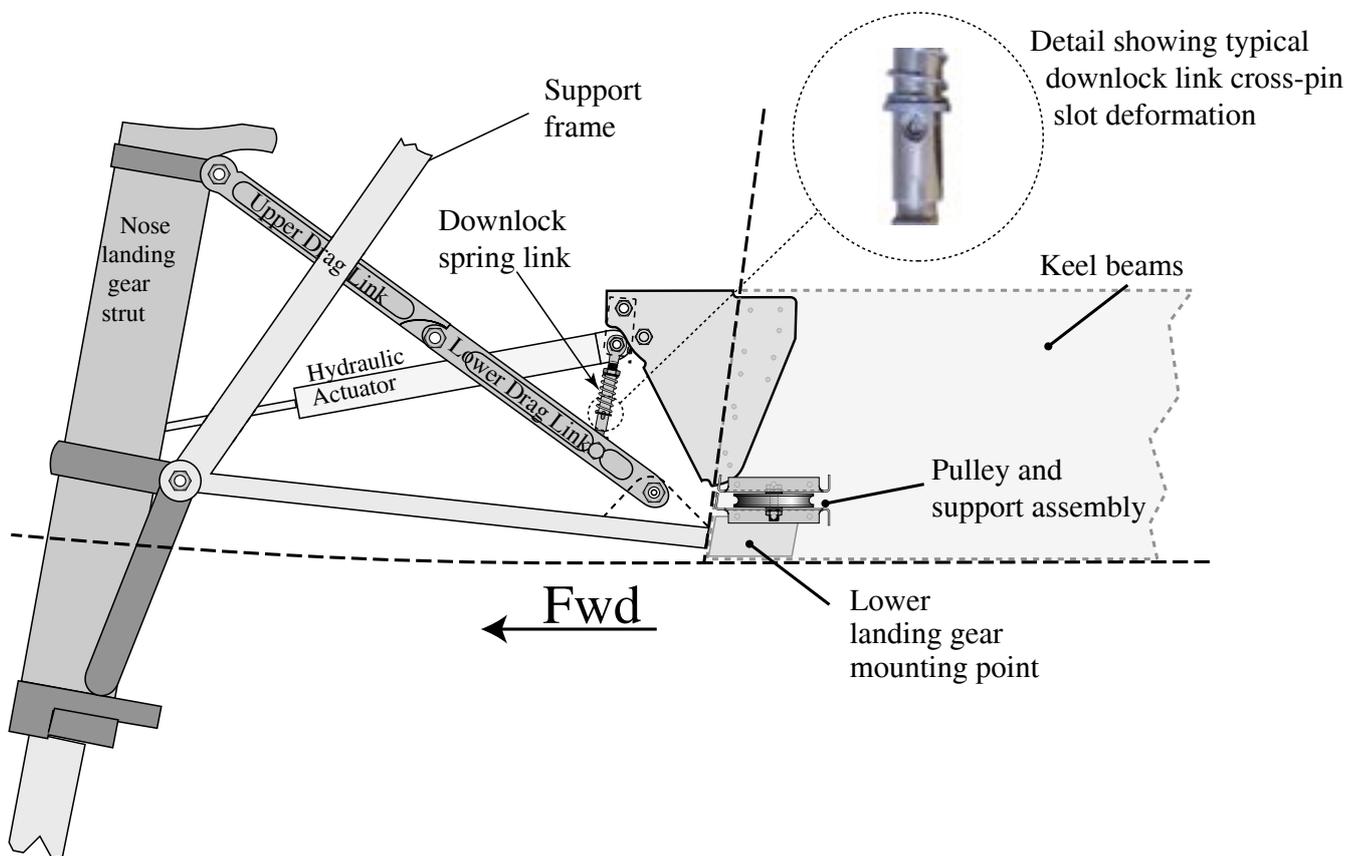


Figure 1

Side view showing general arrangement of the nose landing gear and its support structure in the forward fuselage

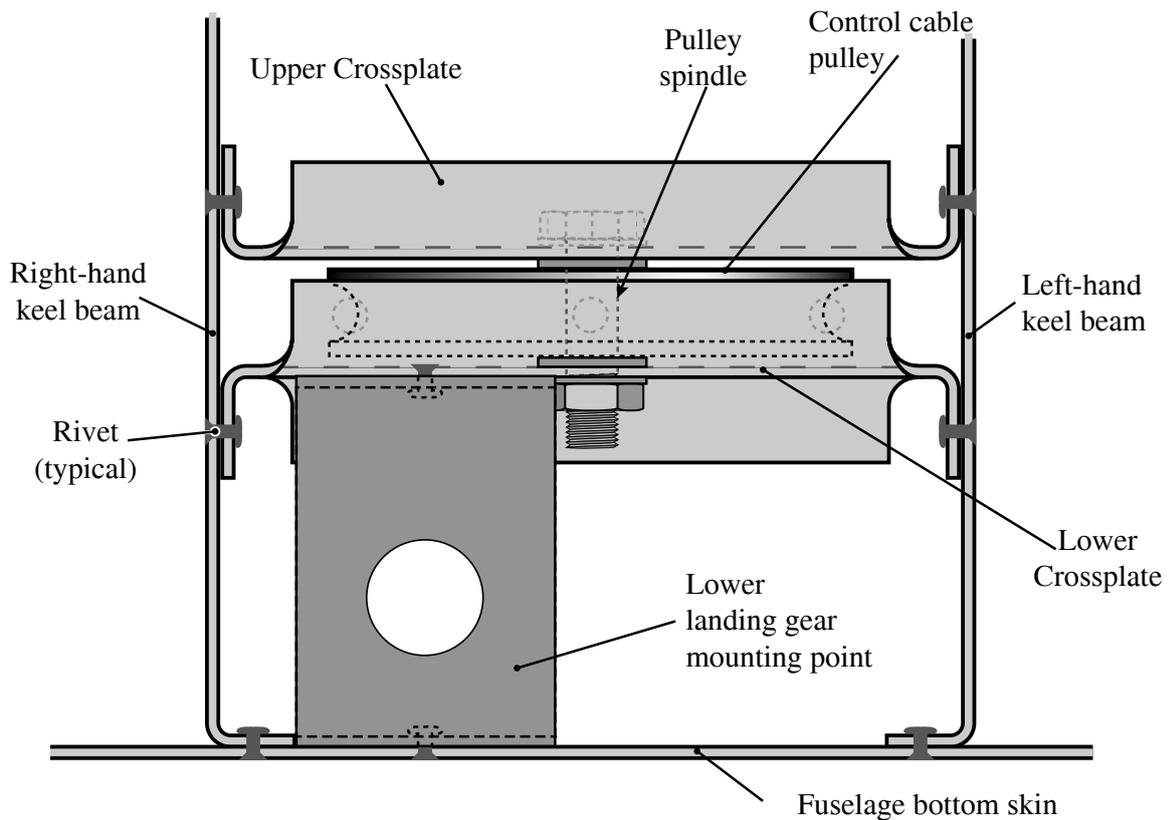


Figure 2

View of keel assembly - looking aft from fuselage front bulkhead

Examination of the upper crossplate revealed the presence of a crack extending through all four rivet holes, with the forward-most rivet holes showing signs of deformation. Also, the right side keel beam had cracked between the web and the lower flange, the crack extending aft from its forward edge over a distance of 18 cm (see Figure 3).

In its normal position, the casting that forms the lower landing gear mount is located immediately behind the bulkhead, sandwiched between the left and right keel beams. The mount is secured to the inside surface of the lower fuselage skin and, on its upper surface, to the lower crossplate positioned between the left and right keel beams. A control cable pulley is mounted on the top of this crossplate which, together with an upper

crossplate, support the pulley spindle, (see Figure 4). A 12 cm diameter access panel, located immediately aft of the pulley and mount assembly, provides access to this area. In order to determine if it would be possible to carry out a visual inspection of the lower mount and its fasteners in an assembled condition, tests were carried out on another aircraft using both standard and specialist inspection equipment. The results of these tests showed that, whilst the conditions of the mount's lower fasteners could be assessed, the upper fasteners could not be readily viewed through the access panel and, therefore, an assessment of their condition could not be made.

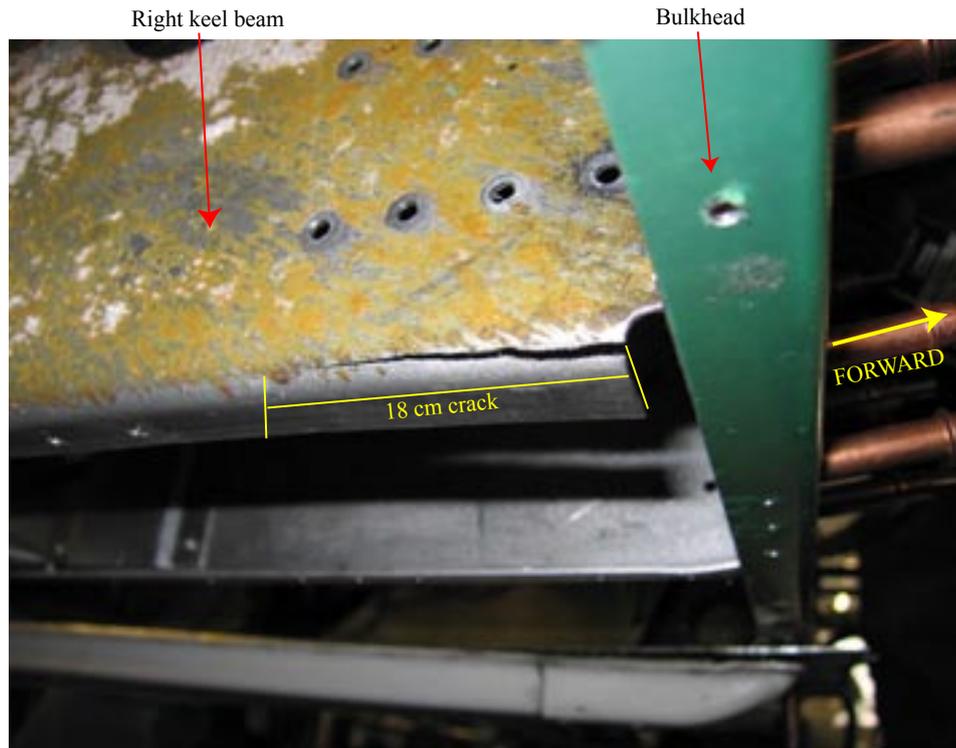


Figure 3
Right keel beam crack

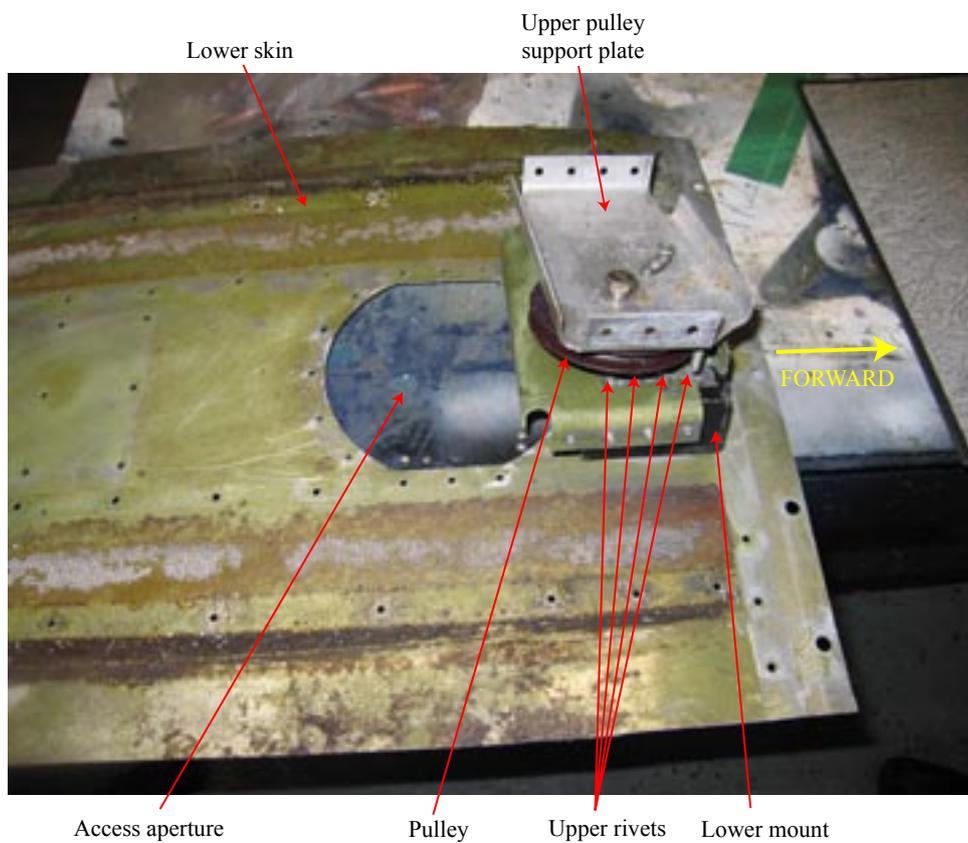


Figure 4
Lower mount with control pulley and support plates in position

Analysis

The cracking of the plate and the discolouration of the sheared rivet shanks at the upper surface of the landing gear lower mount, indicated that the damage to the mount and its supporting structure probably occurred as a result of the aircraft's previous landing gear collapse. Once the aircraft had been returned to service it is likely that the damage progressively increased, resulting in the overloading of further rivets and crack propagation in the upper crossplate and right keel beam lower edge.

The progressive increase in damage to the surrounding structure would have allowed an increase in the flexibility of the lower landing gear mount, which can affect the nose landing gear's downlock mechanism. As described in AAIB Bulletin 11/2005, small decreases in the rigidity of the landing gear downlock mechanism can lead to the drag link moving from the over centre position, resulting in the collapse of the noseleg.

A review of the Maintenance Manuals for the Piper Seneca showed that they contained no data which either highlighted the possibility of damage to structure behind the bulkhead, or which called for an inspection of this area, following a nose gear collapse.

Conclusions

Based on the condition of the nose landing gear lower landing gear mount fasteners and the downlock mechanism, it is likely that the collapse of the nose landing gear resulted from the progression of undetected and undetectable damage to the fasteners securing

the landing gear lower mount. This was precipitated by the aircraft's previous nose landing gear collapse on 22 February 2003. The condition of the aircraft's internal structure after the previous gear collapse, visible through the one access panel in this area, gave no indication that any damage had been caused to the lower landing gear fasteners. In the absence of any specific requirements to dismantle the aircraft's structure in this area, and in consideration of the volume of work that would be required to dismantle the aircraft sufficiently to carry out an inspection of the lower mount, following a nose gear collapse, there was no reason or incentive for a comprehensive inspection to have been carried out.

Therefore, it seems likely that the previous damage remained undetected, and that it had progressed to the point where sufficient play in the downlock mechanism allowed the drag link to move away from the over centre position, which then allowed the nose gear to collapse.

Safety action

In response to the findings of this investigation, New Piper Aircraft Incorporated have confirmed that they will publish amendments to all of the PA-34 Seneca series Aircraft Maintenance Manuals which will introduce in-situ inspection procedures to look for damage to the lower nose landing gear mount, surrounding structure and fasteners, following a nose gear collapse. In view of this response, it is not considered necessary to make any formal safety recommendations.