

**INCIDENT**

<b>Aircraft Type and Registration:</b>	Piper PA-23-250 Aztec, G-BATN	
<b>No &amp; Type of Engines:</b>	2 Lycoming IO-540-C4B5 piston engines	
<b>Year of Manufacture:</b>	1973	
<b>Date &amp; Time (UTC):</b>	6 July 2010 at 1259 hrs	
<b>Location:</b>	Cambridge Airport, Cambridgeshire	
<b>Type of Flight:</b>	Training	
<b>Persons on Board:</b>	Crew - 1	Passengers - None
<b>Injuries:</b>	Crew - None	Passengers - N/A
<b>Nature of Damage:</b>	Propellers bent, nose cone and nose landing gear doors abraded	
<b>Commander's Licence:</b>	Airline Transport Pilot's Licence	
<b>Commander's Age:</b>	51 years	
<b>Commander's Flying Experience:</b>	7,146 hours (of which 79 were on type) Last 90 days - 39 hours Last 28 days - 14 hours	
<b>Information Source:</b>	Aircraft Accident Report Form submitted by the pilot and further enquiries by the AAIB	

**Synopsis**

On the third of three planned landings the nose landing gear collapsed and the aircraft slid to a halt on its nose. The investigation revealed that a lack of lubrication on the link plate attachments that secure the downlock actuator to the downlock link is likely to have caused a restriction and prevented the complete engagement of the downlock. The pilot was unaware that the downlock had not engaged completely.

**History of the flight**

The purpose of the flight was for the pilot to perform three landings to maintain currency to fly with passengers. The first two landings were performed

successfully and the pilot confirmed that, on each occasion, all gears were down and locked with three green indicator lights showing. The third circuit was flown as a practice low-level bad weather circuit with the pilot confirming that the gear was down and locked at approximately 200 ft on final approach. The pilot considered the approach and touchdown to be normal but as the nose was lowered, it continued beyond the normal landing pitch attitude and made contact with the runway. The propellers also contacted the runway, the engines stopped and the aircraft slid to a halt.



**Figure 1**  
G-BATN on Runway 23

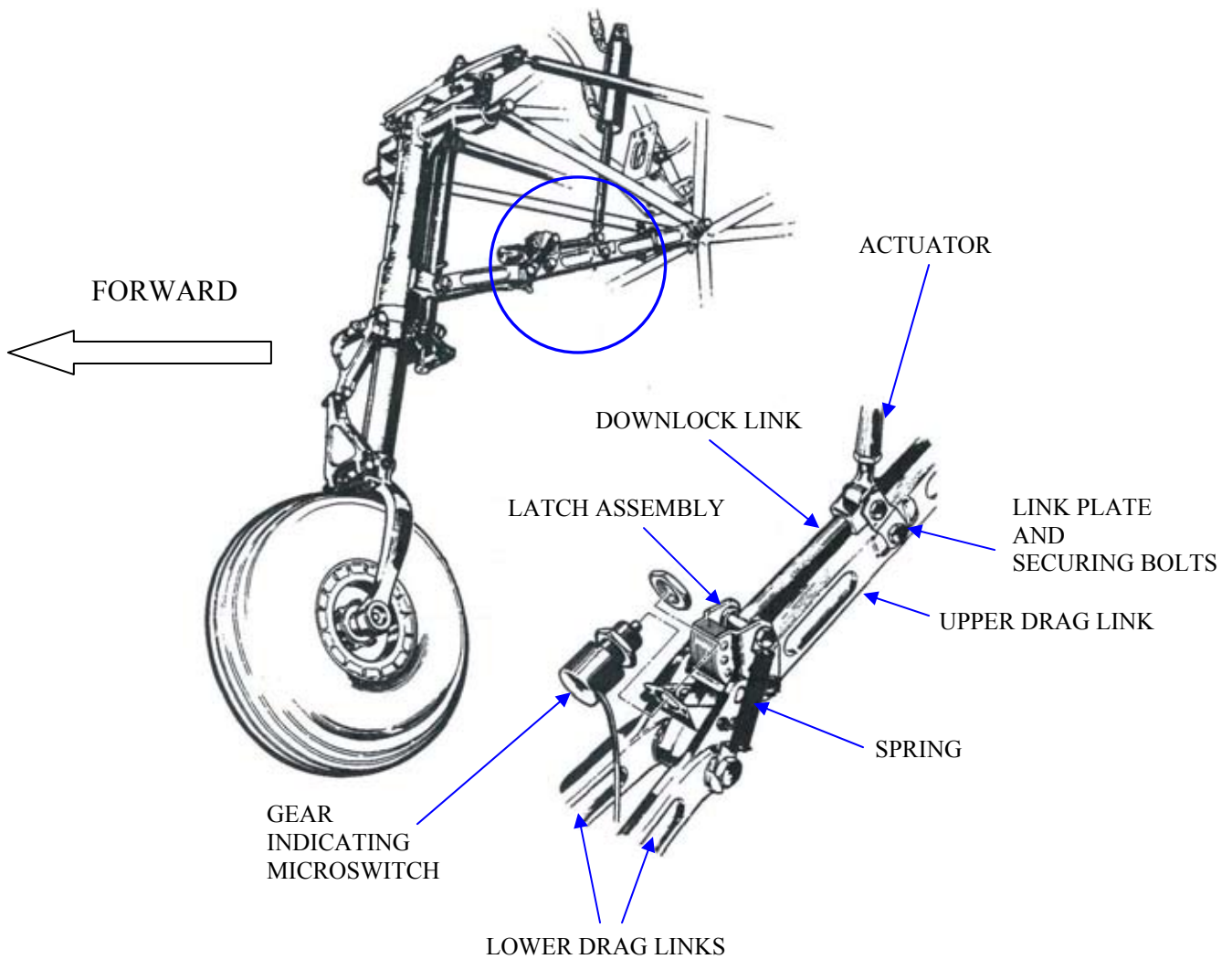
The pilot, who was wearing a lap and diagonal harness, escaped uninjured. The Airport Fire Service attended the scene, reported a small fuel leak from the left wing and laid down foam as a precaution.

#### **Aircraft description**

The aircraft has a hydraulically-actuated, retractable tricycle landing gear system with the nose landing gear extending forwards. When the landing gear lever is selected DOWN, hydraulic pressure causes the nose gear actuator to extend a drag link until the link reaches an over-centre position. The final movement of the actuator causes the downlock link to pivot about a link plate to engage the downlock pawl and activate a downlock microswitch. Once the full travel of the actuator has

been achieved, hydraulic pressure within the system rises and, at a preset pressure, the selector lever returns to the neutral position. Springs attached to the landing gear downlock pawls hold them in place in the event of loss of hydraulic pressure.

The landing gear status is indicated to the pilot using four lights on the centre pedestal in the cockpit. Engagement of each landing gear downlock microswitch illuminates a green light, indicating that the respective gear is down and locked. Illumination of an amber light indicates all landing gears are up. A gear unsafe warning horn will sound when power from both engines is reduced to below 10-12 inches of manifold pressure and any landing gear is not locked down.



**Figure 2**

Nose gear leg assembly

### Aircraft examination

The aircraft was not examined by the AAIB and the aircraft operator contracted an external assessor to investigate the nose landing gear collapse. Initial tests performed after the incident confirmed that lowering the nose landing gear by hand would not achieve full downlock, and the cockpit nose landing gear green light did not illuminate. In this case, with the throttle levers at idle, the gear unsafe horn also sounded.

Functional tests of the landing gear system were then performed. When the lever was selected to DOWN,

both main landing gears downlocked illuminating their associated green light, but the nose landing gear downlock did not engage fully, and the associated green light remained OFF. Repeated cycling of the landing gear resulted in the same outcome.

The nose landing gear was inspected and the link plate attaching the actuator to the downlock link was found to be damaged. The bolts securing this link plate were removed and were reported to be:

*'dry of lubricant and had visible surface rust on the bolt shank.'*

After straightening the link plate and reinstalling the bolts, using engine oil to lubricate the bolt shanks, further extension and retraction functional tests were performed. These were successful and the nose landing gear downlock pawl engaged successfully each time and the cockpit nose gear green light illuminated.

### **Maintenance activity**

Between 2006 and the incident landing, G-BATN had been inspected on a number of occasions for nose landing gear down indication problems. The service manual landing gear troubleshooting pages state that, in the event of no green light indication with the landing gear down, the cause is likely to be electrical. As the gear remained downlocked for landing in all previously reported cases, the cause was considered to be an intermittent electrical problem and, during the annual inspection in April 2010, the microswitch was replaced. Maintenance action following these reports did not identify a restriction at the link plate that could have prevented complete downlock engagement. All cases of cycling the landing gear during maintenance prior to the incident landing had resulted in successful downlock and indication.

The manual also states that the nose landing gear downlock link plate attachments require lubrication every 100 hours of operation using a general purpose, low temperature lubricating oil to MIL-PRF-7870C

specification. However, it was noted that the lubrication procedure does not require the removal of the downlock link plate bolts. Without removal of the bolts it would not be possible to determine whether or not the lubrication had successfully penetrated through to the bolt shank. The operator confirmed that the correct lubrication schedule had been followed.

### **Discussion**

The nose landing gear retracted on landing because it was not fully locked down. It was considered that a lack of lubrication on the shanks of the downlock link plate bolts caused sufficient restriction to prevent the complete engagement of the downlock. For reasons for which could not be established the pilot was unaware that the gear was not locked down and he stated that it would be “very unlikely” that the green light was not illuminated at touchdown and the gear unsafe horn was sounding but that he had failed to notice.

The aircraft manufacturer commented that since 1995 there had been no reported events with the same symptoms. However, since this event the operator is considering introducing an additional maintenance activity for the periodic removal and inspection of the bolts to ensure that lubrication has successfully penetrated to the bolt shank and that no corrosion has developed.