

## ACCIDENT

<b>Aircraft Type and Registration:</b>	Socata TB20 Trinidad GT, G-SCIP	
<b>No &amp; Type of Engines:</b>	1 Lycoming IO-540-C4D5D piston engine	
<b>Year of Manufacture:</b>	2000 (Serial no: 2014)	
<b>Date &amp; Time (UTC):</b>	19 July 2016 at 1535 hrs	
<b>Location:</b>	Sleap Airfield, Shropshire	
<b>Type of Flight:</b>	Private	
<b>Persons on Board:</b>	Crew - 1	Passengers - None
<b>Injuries:</b>	Crew - None	Passengers - N/A
<b>Nature of Damage:</b>	Propeller blades damaged, nose underside abraded and engine presumed shock loaded	
<b>Commander's Licence:</b>	Private Pilot's Licence	
<b>Commander's Age:</b>	61 years	
<b>Commander's Flying Experience:</b>	2,642 hours (of which 1,651 were on type) Last 90 days - 26 hours Last 28 days - 13 hours	
<b>Information Source:</b>	AAIB Field Investigation	

### Synopsis

When the landing gear was retracted after takeoff, the pilot found that the nose gear 'down and locked' green light remained on. During repeated gear extensions in preparation for landing, the pilot established that the nose leg had not locked down, despite the indicator light remaining on. The aircraft subsequently landed and the nose leg collapsed during the latter part of the landing roll.

It was found that the internal components of the nose gear downlock microswitch assembly were disrupted to the extent that the electrical outputs were random. A possible reason was that the switch was damaged during a previous accident.

### History of the flight

The aircraft was returning to Welshpool following an uneventful flight to Goodwood. After taking off for the return flight the nose gear 'down and locked' green light remained illuminated, the 'in-transit' light was extinguished. Although the pilot was concerned, he assumed that there was an issue with a sticking microswitch and decided to continue the flight to his Welshpool base. While still some distance south of his destination, the pilot informed Welshpool Radio that he wished to conduct a low pass over the runway so that someone could confirm that all three gears were retracted. On passing low (200 ft) the radio operator confirmed that all the gears appeared to be retracted; however the nose gear green light was still illuminated. The pilot turned the aircraft onto the downwind leg

and selected the gear DOWN. The indication changed to three greens although the pilot did not “feel”, through the rudder pedals, the nose gear lock into position, as he usually did. During the subsequent low pass over the runway, the radio operator confirmed that the nose gear did not appear to be in the locked position and was being pushed rearwards by the airflow. The pilot then conducted two further circuits, during which he continued to cycle the landing gear, but the nose gear would still not lock down. He then decided that he would divert to Sleaf airfield, approximately 10 minutes away, where there were two runway options plus the maintenance company where the aircraft was usually maintained.

The pilot asked the Welshpool Radio operator to contact Sleaf to inform them of the aircraft’s circumstances and its imminent arrival. During the short flight, the pilot continued to cycle the gear and to pull ‘g’ in order to encourage the nose gear into its downlock. As the aircraft approached Sleaf, the pilot spoke on the radio to an engineer from the maintenance company and asked him to observe the landing gear during a series of passes 200 ft above Runway 18, which was the one in use. The nose gear failed to lock into position despite the green indicator light being illuminated.

On the third approach, this one to land, the pilot selected half flap and reduced speed to 65 kt, into a southerly wind of 10 kt. At around 50 ft he cut the mixture and throttle with the intention of avoiding propeller damage by stopping the engine. The aircraft sank onto the main wheels but the nose gear collapsed as soon as it contacted the ground and the nose dropped onto the runway. The aircraft slowed rapidly and came to a halt after approximately 100 m. After turning off the fuel and electrics, the pilot exited the aircraft quickly, mindful of the 200 litres of fuel in the wings. The airfield Rescue Truck and another vehicle arrived within 2 to 4 minutes.

After some discussion the aircraft nose was lifted up and an engineer attempted to pull the nose leg into its locked position. However, this could not be achieved until he had disconnected a hose, which dissipated the hydraulic pressure. The aircraft was then towed to a hangar.

### **Other information**

The same aircraft was involved in a similar accident on 21 January 2016, approximately 25 flight hours before the subject accident, and a report was published in AAIB Bulletin 5/2016. On that occasion, after selecting the gear down the nose gear green light remained unlit but the red ‘gear-in-transit’ light illuminated. The pilot was aware of the electrically-driven hydraulic pump operating. After conducting a number of low passes over the airfield, the aircraft landed, with the nose leg collapsing as it contacted the ground. The subsequent investigation failed to find any fault, although a hydraulic lock was suspected. After a number of components were changed as a precaution, the aircraft was repaired and returned to service.

## Aircraft examination

Following the second event, the nose gear downlock microswitch, Part Number TB2061032005, was removed from the aircraft and sent to the AAIB. Figure 1 shows the switch after removal.



**Figure 1**

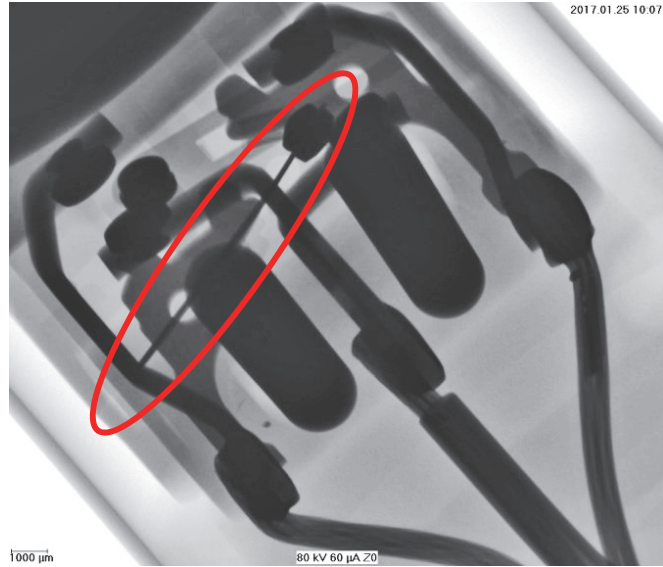
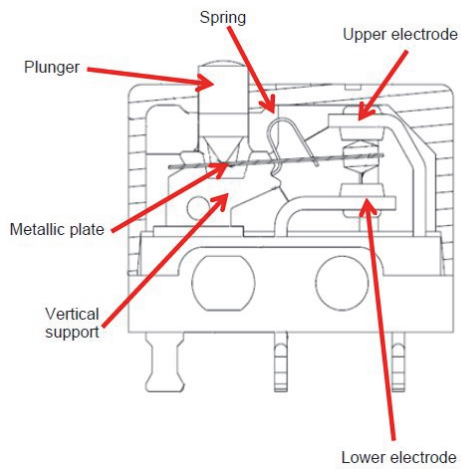
Downlock microswitch and connector after removal from the aircraft

The component was initially tested by assessing the continuity between the pins on the connecting plug, with and without the switch plunger being pressed. The results were inconsistent and it was decided to send the switch for testing at the aircraft manufacturer's facility in France. This was supervised by the Bureau d'Enquêtes et d'Analyses (BEA), who are the French air safety investigation authority.

The test confirmed the AAIB results and additionally confirmed that the state of the microswitch changed randomly when lightly tapped with a finger. The unit was then X-rayed and subsequently disassembled by the BEA.

The switch assembly comprised a spring-loaded plunger acting on two (for redundancy) integral microswitches. These in turn contained a metal plate with a rounded contact, or electrode, at the end. Figure 2 shows a sketch of the cross section and one of the X-ray images.

It was found that moving or tapping the switch would cause the metal plates to move relative to the surrounding components. Cutting the switch assembly open confirmed that the components of one of the microswitches were loose. In the other, the spring had become jammed under the plate. The aircraft manufacturer stated that they had not received any reports of similar failures and, having checked their stock of switch assemblies, confirmed that all of them functioned correctly. The manufacturer additionally stated that they considered that a possible reason for the internal components being found in this condition was the switch may have been subjected to a severe impact.



Courtesy BEA

**Figure 2**

Cross section of assembly and (right) a sample X-Ray image.  
The metal plate was loose

## Conclusion

Despite some similarities to the January 2016 accident, it was concluded that they occurred as a result of different causes. In the earlier accident, which remains unresolved, the pilot stated that he was aware that the hydraulic pump was operating despite the intermediate position of the nose landing gear. In the latter case, the failure of the switch mechanism resulted in the random illumination of the green indicator light, together with the associated cessation of hydraulic pump operation, regardless of the nose gear position.

The aircraft manufacturer was unaware of any similar occurrences regarding the switch assembly and considered that the extent of disruption of the internal components may have been the result of a severe impact. It is possible that such an impact occurred in the earlier accident, although the switch had operated normally during the 25 flight hours leading up to this accident on 19 July 2016.