ACCIDENT

Aircraft Type and Registration:	Slingsby T67M MkII Firefly, G-BNSP
No & Type of Engines:	1 Lycoming AEIO-320-D1B piston engine
Year of Manufacture:	1987 (Serial no: 2044)
Date & Time (UTC):	17 April 2017 at 1225 hrs
Location:	Turweston Aerodrome, Northamptonshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Axle, nosewheel and fittings fell apart, nose landing gear fork bent
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	53 years
Commander's Flying Experience:	9,745 hours (of which 186 were on type) Last 90 days - 126 hours Last 28 days - 47 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and inquiries made by the AAIB

Synopsis

The aircraft had landed at Turweston Aerodrome and had slowed to a walking pace on the runway. The pilot was given permission to backtrack and commenced a 180° turn. Halfway through the turn the pilot suddenly felt the nose drop and the aircraft came to an abrupt stop. He made the aircraft safe, vacated the cockpit and found that the nosewheel axle had migrated out, allowing the wheel to be released from the nose landing gear fork. The retaining nut, meant to hold the axle in place, could not be found. It is not known exactly when or why the nut had detached.

History of the flight

The pilot planned to carry out a local flight with aerobatics and circuits to test, and capture footage on a head-mounted action video camera. He carried out a pre-flight check and noticed nothing unusual with the aircraft or its landing gear. The taxi and takeoff were normal and the pilot carried out his flight as planned. He returned to the airfield, joined the circuit and landed. Just after touchdown he gently applied the brakes and noted a small amount of left and right movement. This he considered normal and put it down to uneven pedal foot pressure during initial application. Otherwise the rollout was unremarkable. The pilot had slowed the aircraft to a walking pace, was given permission to backtrack and started a slow 180° turn. Halfway through the turn, without warning, the nose dropped and

the aircraft came to an abrupt halt. He made the aircraft safe and vacated the cockpit. He then examined the aircraft and found the nosewheel had detached from its fork and was lying close by on the runway.

Engineering investigation

Examination of the nosewheel and fork assembly found that the axle had migrated out and allowed the wheel to be released from its fork. The 'K-nut[1]' meant to secure the axle was not found. The aircraft had recently undergone its annual service which was when the nosewheel was last disturbed. The aircraft had accrued 16 flying hours since that check.

Analysis

The AMM (Aircraft Maintenance Manual) is not specific regarding the fitting of the nosewheel. It merely states the wheel should be offered up to the nosewheel fork, aligned with the bolt holes, the greased bolt and spacers inserted and then secured with a washer and lock nut.

It is possible that the orientation of the axle and the condition of the K-nut may have been contributory factors. In this case the evidence suggests the axle was fitted from the left side of the fork resulting in a tendency, with nosewheel rotation, to apply a slight undoing torque. In addition, if the K-nut is worn, with a reduced run-down torque, its locking ability will be compromised. The presence of grease on the axle bolt may also have been a factor. In combination these factors can lead to an unsafe condition.

Anecdotal evidence suggests that there have been a problems in the past on other T67 aircraft, whereby, for no apparent reason, the K-nut has loosened and detached. However, there is no mandatory occurrence report (MOR) data to support this. In addition, there are no reports to the Type Certificate holder that would indicate any tendency for the nut to detach. However, during this investigation it became apparent that other operators and maintenance organisations had taken action to address this problem and had introduced a safety split pin outboard of the K-nut. An example is shown in Figure 1.

Footnote

[1] K-nut is a hexagonal threaded nut made using the minimum material. It has a flange on its lower face and is purposely distorted on its upper face to create a tightness in the thread in order to self-lock the nut when fitted to a threaded fastener. The locking ability of the nut is assessed by its run-down torque, however this can be affected by thread condition or the presence of a contaminant.

Figure 1

Safety split pin outboard of the K-nut

Research carried out by the Type Certificate holder has found that T67 Firefly aircraft were originally fitted with SAB nose landing gear but later, during production, this was changed to a Fairey Hydraulics landing gear assembly under Slingsby modification (mod) 468. The Fairey landing gear axle was later improved by the introduction of a tab washer to lock the axle nut under an additional modification (mod 646).

Conclusion

Although it is not known exactly why the nut loosened and fell off, the recency of the maintenance activity on the nosewheel and fork assembly, along with the presence of grease or possibly a worn K-nut, are possible causal factors of this incident.

Safety action

The Type Certificate holder has carried out its own assessment of this incident and is considering an additional modification to introduce improved positive locking of the axle assembly. Their intention is to issue a Service Bulletin (SB) and will discuss with the CAA whether it should be mandated by an Airworthiness Directive (AD).