

INCIDENT

Aircraft Type and Registration:	Piper PA-34-200T Seneca II, G-BSHA	
No & Type of Engines:	2 Continental TSIO-360-EB1 piston engines	
Year of Manufacture:	1976	
Date & Time (UTC):	5 March 1993 at 0701 hrs	
Location:	Blackbushe Airport, Surrey	
Type of Flight:	Aerial Work	
Persons on Board:	Crew - 2	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Both propellers significantly damaged, aircraft boarding step scraped and engines shock-loaded	
Commander's Licence:	Basic Commercial Pilot's Licence with Instrument rating	
Commander's Age:	32 years	
Commander's Flying Experience:	2,200 hours (of which 130 were on type) Last 90 days - 56 hours Last 28 days - 18 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot, together with examination of door mechanism by AAIB engineering Inspector and subsequent discussions with operators and pilot	

The aircraft was being used on this occasion for road traffic observation and reporting for a local radio station. The pilot reported that after carrying out a normal pre-flight inspection, he and the traffic spotter entered the aircraft and the cabin doors were secured. The ground handler connected the external power supply and decided to clean the windshield. To do so, he utilised cleaning materials kept in the forward baggage compartment, closing the compartment door when he had finished. Thereafter, the engines were started normally, the ground handler disconnected the external power supply and the normal sequence of pre-departure activities took place, up to the point at which the aircraft was lined up on Runway 26. A small delay then occurred while the airport manager completed his runway inspection and cleared the runway.

The initial part of the take off was normal, the aircraft was rotated and the landing gear was selected up just as a positive rate of climb was established. Unfortunately, at this moment, the forward baggage

door opened. The door stay broke, permitting the door to continue opening through approximately 180° from the closed position, so that the flat face of the door was positioned approximately vertically.

The aircraft then lost height and the tips of both propellers, together with the boarding step, struck the runway. A climb was nonetheless established, and as soon as possible a left turn was made to enable the aircraft to land downwind on Runway 08. The airspeed was kept as low as possible with one stage of flap to reduce the forces on the open door, two stages of flap being used for landing. The propeller damage was not observed by the pilot until the aircraft was returned to the stand and shut down.

The pilot subsequently recalled that later the same day he experienced considerable aching of the left arm. He attributed this to having applied a very high elevator force in order to prevent the aircraft sinking further or to maintain the desired flight path with the aircraft seriously out of trim as a result of the door open condition.

The forward baggage door latching arrangements on this aircraft type take the form of an over-centring catch mounted on the door and on the same shaft as the door handle. The catch secures the middle of the bottom edge of the door to the lower horizontal edge of the aperture. In addition, a pair of horizontal shoot-bolts are driven by the handle and engage in tubular recesses in the forward and aft vertical edge-members of the door aperture. The door can be rendered fully secure by means of a key operated lock.

The door design incorporates interlocking arrangements to ensure that the key cannot be removed from the lock barrel unless the latter is in the fully locked position. The barrel and key can in turn only be rotated to the locked position after the operating mechanism has also been turned fully clockwise to its safely latched position. Hence it is intended that the key can only be removed with the door either correctly closed and locked or with the latch system in the closed position and locked, but the door still self-evidently open, with the latch and shoot bolts preventing the door from fully entering its aperture. Operators are thus alerted to a 'door -unsafe' condition by the visible presence of the key in the lock, or by the door being clearly out of the aperture.

Examination of the door locking mechanism on this aircraft revealed that the key could be removed from the lock barrel whilst in any rotary position and hence it performed no interlocking function in alerting operators to a door unsafe condition. Further examination of the baggage door latching arrangements showed that when the mechanism was in the fully latched condition, the handle was rotated to such a position that its painted alignment mark was significantly beyond the corresponding painted mark on the door (See Figure 1).

Examination and testing of the latch system revealed that this mechanism was 'on centres' when the handle was positioned as shown in Figure 2. In this condition the door appeared to be latched, but a sharp blow administered by hand to the centre of the door caused it to unlatch and pop open. With the handle positioned any further in the closed direction, such a blow would cause it to rotate to the fully

latched position. Thus, the door appeared to be latched when the handle was out of alignment by only approximately twice the angular distance by which it was in error with the latch fully engaged, albeit in the opposite direction of travel.

Human factors studies have shown that once alignment marks and similar 'door safe' indications lose their accuracy, operators can come to expect a lack of alignment and thus become less alert to the significance of more grossly misaligned markings, particularly in the stress of achieving on-time departures.

The Federal Aviation Administration (FAA) has, since 1979 issued and subsequently amended Airworthiness Directives calling for implementation of Piper Aircraft Service Bulletins (SBs) in this area. These cover checks and modifications to ensure satisfactory securing of the baggage door. In particular AD 88-04-05 (item c) requires implementation of SB 872 calling for a check to ensure that the key can only be removed from the lock with the door mechanism in the fully latched state and the lock barrel in the locked position. When examined after the accident, the door clearly did not satisfy the requirements of this inspection. The reason for this failure to comply was clearly wear of the key and/or the lock-barrel.

This AD/SB item is a one-time check and was required to be implemented on, or soon after 9 November 1987. The absence of any requirement for a repetitive inspection has permitted subsequent undetected wear in the key and lock barrel to reach an extent that the requirements of the functional check can no longer be satisfied.

A number of serious accidents (in at least one case fatal) have occurred world-wide over many years, precipitated by in-flight opening of forward baggage doors on small twin engined propeller driven aircraft of various types incorporating nose baggage compartments with external doors of the same general configuration as the PA-34 series.

As a result of this incident, the AAIB has made the following recommendations:-

- 93-45** The CAA should require the implementation of SB 872 on a repetitive basis in order to ensure that the interlocking of the lock and latching arrangements remain effective.
(Issued 21 July 1993)

- 93-46** The CAA should require periodic checks of the latching mechanism to ensure that the external markings align accurately when the door mechanism is correctly latched.
(Issued 21 July 1993)

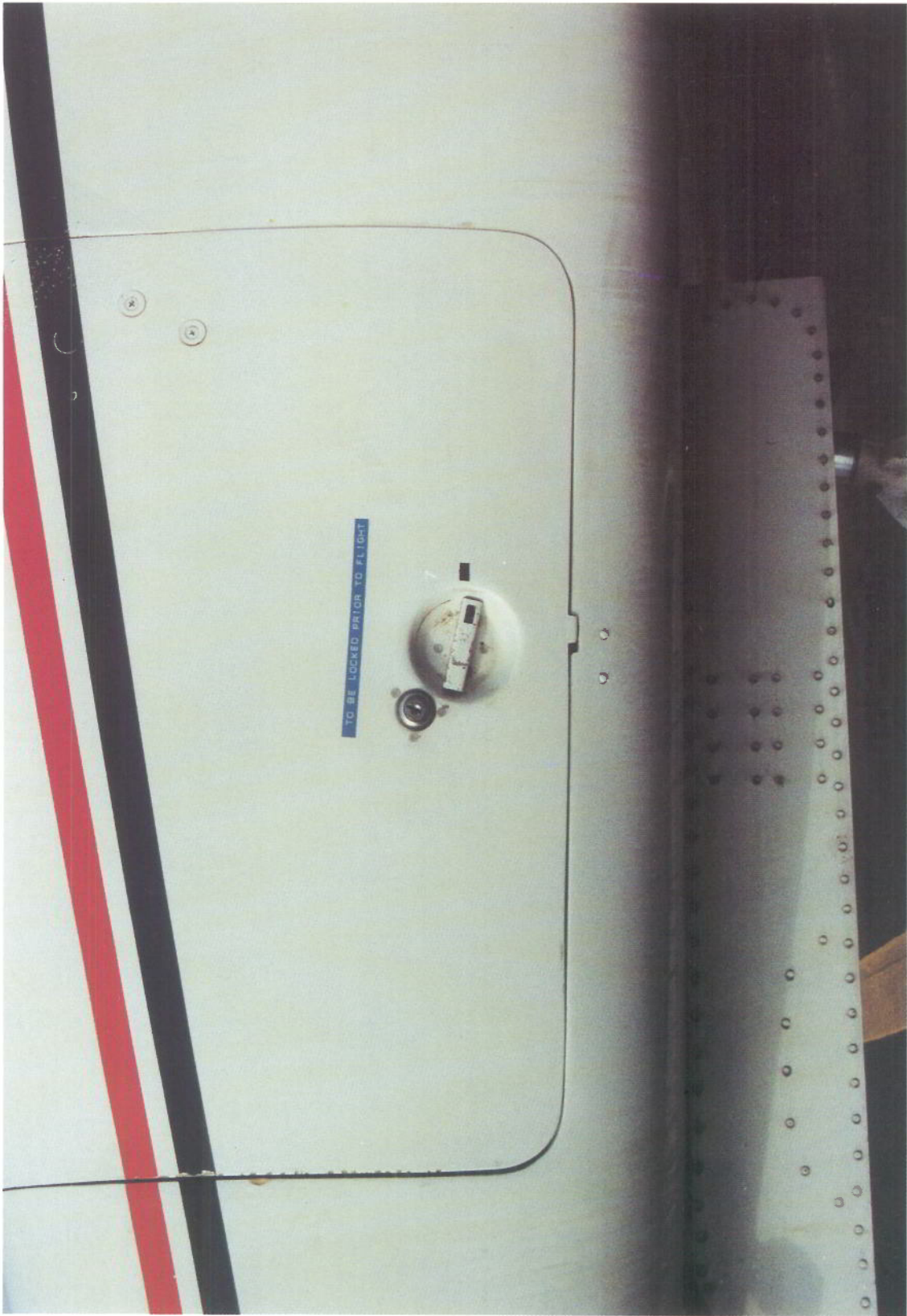


FIGURE 1

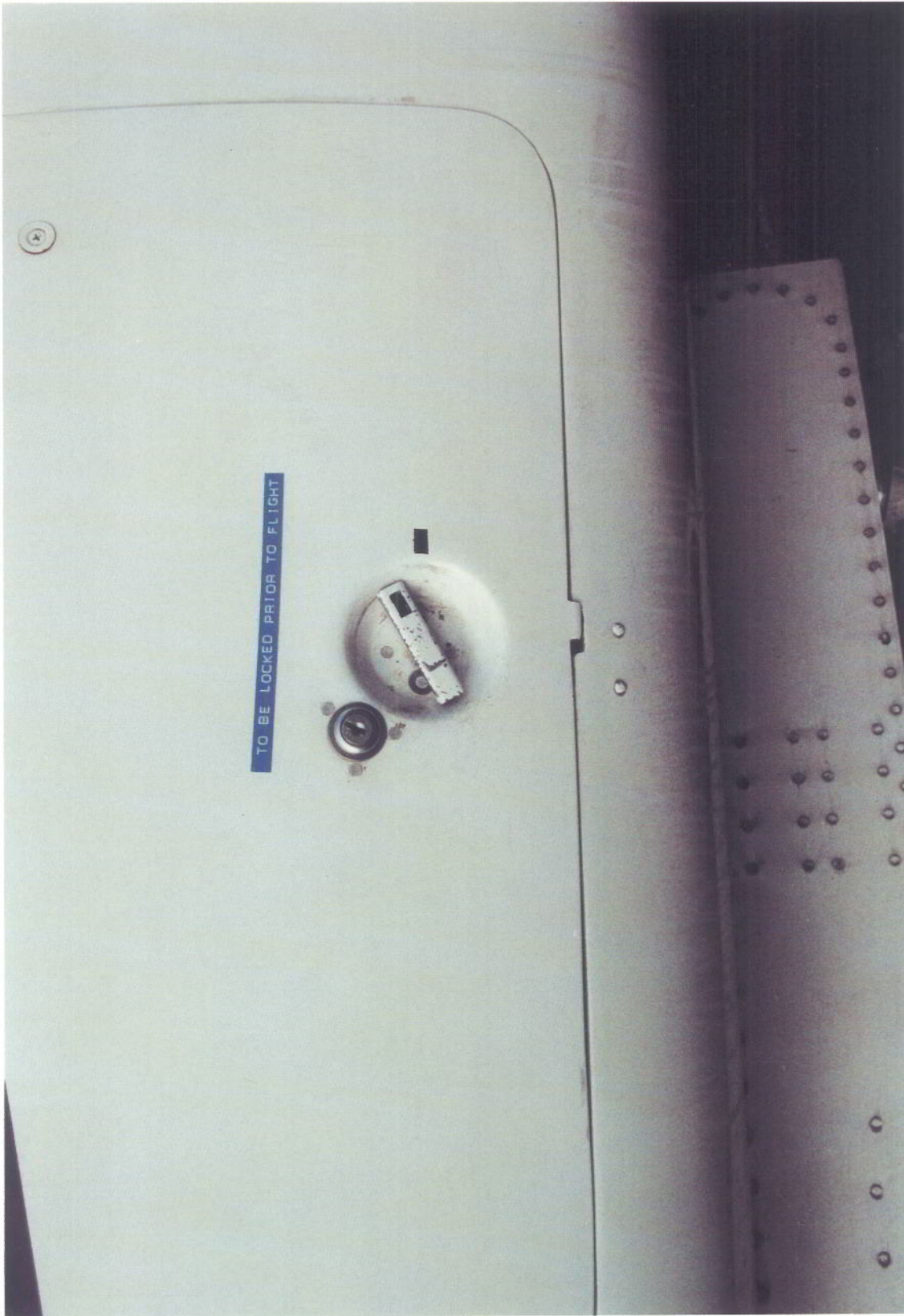


FIGURE 2