

Pierre Robin R1180T, G-ROBN

AAIB Bulletin No: 11/2001	Ref: EW/G2001/08/21	Category: 1.3
Aircraft Type and Registration:	Pierre Robin R1180T, G-ROBN	
No & Type of Engines:	1 Lycoming O-360-A3AD piston engine	
Year of Manufacture:	1978	
Date & Time (UTC):	27 August 2001 at 1845 hrs	
Location:	Boscombe Down	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 1
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Damage to left landing gear and wing	
Commander's Licence:	Private Pilots Licence	
Commander's Age:	29 years	
Commander's Flying Experience:	81 hours (of which 7 were on type)	
	Last 90 days - 10 hours	
	Last 28 days - 4 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot and additional AAIB inquiries	

Sequence of events

Having carried out the normal pre-flight checks the pilot released the parking brake by fully depressing the brake pedals prior to taxi. The aircraft was taxied to the threshold of Runway 05, a distance of nearly 2 nm, which took approximately 10 minutes. During this time the engine was running at 1000-1200 rpm and the brakes were rarely operated. Just before arriving at the holding point the pilot noticed "dust - like" smoke coming from the area of the left wheel, the volume of which rapidly increased as the aircraft was brought to a halt. The passenger was instructed to evacuate the aircraft while the pilot carried out the shut-down procedures. The pilot then left the aircraft, taking a flight bag with her. She considered reaching for the fire extinguisher, but by now the smoke was intense and she was concerned that the fuel tank might catch fire. Since Air Traffic Control was not operating at the time, the pilot retrieved a mobile phone from her flight bag and

called the Airfield Fire Service (AFS) and the police. By now flames were visible around the left landing gear leg. Upon their arrival the AFS quickly extinguished the fire.

Examination of aircraft

The underside of the left wing was severely damaged, and wrinkles in the upper wing skin indicated that the main spar had become distorted. The pattern of damage on the wing underside suggested that the leg fairing had functioned as a chimney. Both the fairing and the wheel spat were made from glass-fibre and these had burned, probably assisted in the latter stages by hydraulic fluid released following a heat - induced failure of the pipe attachment to the calliper. A general view of the damage can be seen in the photograph at Figure 1 (*JPG 104kb*).

Braking system description

The braking system on the aircraft consisted of left and right foot pedal motors which applied hydraulic pressure to the disc brakes via the brake valve, the essential details of which can also be seen in Figure 1 (*JPG 104kb*).

The parking brake handle is connected to a camshaft so that when the handle is pushed down (brake release), the cams push the valves downwards, off their seats, by means of the push rods. The parking brake is set by depressing the foot pedals, thus applying pressure to the brakes, and then lifting the handle. Releasing the foot pedals then leaves pressure trapped in the lines between the valve and the brake callipers. Parking brake release is achieved simply by pushing the handle down; this instruction is contained in the aircraft Flight Manual. However this particular aircraft was fitted with a placard that was located close to the brake handle. Although the instructions for setting the parking brake were as described above, for release the placard stated: 'Apply brakes firmly and push lever'. It is not known when the placard was fitted, but the club members who flew the aircraft followed this practice. In addition it was perceived that a 'clean' brake release was not always achieved unless the toe brakes were applied during the release procedure.

Examination of the braking system

A maintenance engineer subsequently removed the brake valve and noted that the left hand valve seal (item 3B in the exploded view at Figure 1), which was located in a groove in the valve stem, was 'softer' than the others. In his view this presented the possibility of the seal remaining with the valve seat as the valve was pushed open by the cam/push rod, thus preventing pressure in the brake lines from escaping. However, application of toe brake pressure would push the seal off the seat.

It was additionally observed that the push rods had caused grooves to appear on the cams over approximately 90° of arc (the amount by which the camshaft rotates when the park brake handle is operated). Although the servicing instructions contained no advice as to the degree of wear that could be tolerated, it was considered that the groove depths, at 0.07 and 0.06 mm for the left and right brake cams respectively, were insignificant in comparison with the overall valve movement of approximately 2 mm.

Elsewhere in the brake system no defects were found, such as stiff toe brake linkage or a blocked reservoir vent which could have caused residual brake pressure.

Summary

Brake fires in light aircraft are not unknown and are often attributed to taxiing against the brakes, or, in the case of spatted wheels, a build-up of dried grass. However, this aircraft was operated from paved surfaces, although the spat would have tended to inhibit the dissipation of heat caused by a dragging brake. It is considered that in this case the extended taxi played a significant part in that it allowed a considerable time for heat to build up, with an attendant possibility of a fire taking hold after take-off. Furthermore, the pilot reported that although the wind was light it was from the right rear quarter, thus producing a tendency for the aircraft to turn right. This could either have masked a dragging left brake, or caused the pilot sub-consciously to apply light left brake pressure in order to counteract it.