

Piper PA31-350, G-GRAM, 20 May 1996

AAIB Bulletin No: 8/96 Ref: EW/C96/5/7 Category: 1.2

Aircraft Type and Registration: Piper PA31-350, G-GRAM

No & Type of Engines: 2 Lycoming LT10-540-J2BD piston engines

Year of Manufacture: 1973

Date & Time (UTC): 20 May 1996 at 1322 hrs

Location: Plymouth Airport

Type of Flight: Public Transport

Persons on Board: Crew - 1 Passengers - 6

Injuries: Crew - None Passengers - None

Nature of Damage: Left wing-tip, engine and some minor damage to the undercarriage

Commander's Licence: Airline Transport Pilot's Licence

Commander's Age: 35 years

Commander's Flying Experience: 2642 hours (of which 550 hours were on type)

Last 90 days - 228 hours

Last 28 days - 84 hours

Information Source: AAIB Field Investigation

The accident occurred on landing at Plymouth at the conclusion of a flight from Dublin. The same pilot had previously operated the aircraft from Plymouth to Dublin, from Dublin to Blackpool and then back to Dublin. The weather for the landing was a wind of 230°/15 kt with gusts to 20 kt, broken cloud at 2000 feet and visibility 30 km. Runway 13 was in use and was dry. The pilot made a visual approach to the runway and the aircraft touched down before the intersection with runway 06/24. A flap setting of 15° was used for the landing due to the strong crosswind.

The initial braking action was normal and as the aircraft decelerated, the pilot released the brakes to allow the aircraft to roll to the end of the runway. His intention was to turn the aircraft in the designated turning circle at the end of the runway and then to back-track and park in the terminal area. At approximately 65 kt, the pilot reapplied the brakes, but found that the brake pedals went fully forward with no resistance and no braking effect. As there is no emergency braking system on this aircraft, the pilot was unable to prevent the aircraft over-running the runway.

The aircraft ran down a grass bank at the end of the runway and was brought to rest by a barbed wire fence marking the airfield perimeter. The pilot shut down the engines and ordered the passengers to evacuate the aircraft. The Airport Fire Service had been practising emergency procedures close to the accident site at the time and they attended the aircraft within a minute or so of it coming to a standstill. No one was injured in the accident and there was no fire.

Previous brake failure incidents

This aircraft had previously had two similar brake failure incidents. The first had occurred on the 8 March 1996 while taxiing prior to the commencement of the final sector of the day. The second incident happened on the 22 March 1996 while taxiing to the parking area at the conclusion of the final sector of the day. On this second occasion, the aircraft had run off the taxiway close to the runway and caused the airport to be closed until the aircraft could be recovered. Both of these previous incidents occurred at Exeter Airport.

Examination of the aircraft and runway

The maintenance organisation recovered the aircraft to a hangar for examination. During the recovery the brakes were used with caution, but were found to operate normally. AAIB examination of the departure end of the runway, for evidence of braking as the aircraft overran, found no tyre marks. There were also no indications of distress on the wheels, brakes or tyres. Where the aircraft had run down the grass bank the wheel tracks were apparent, but there was no evidence of skidding or sliding. At impact with the fence the aircraft had been moving slowly. The damage to the aircraft was limited to the left wing tip and aileron, slight damage to the left propeller and cowling caused by the fencing wire, with some minor damage to the nose landing gear and an accumulation of mud and debris around the wheels. It was observed that the flaps were at the 15° setting.

The brakes were examined and it was observed that the brake pads and disks were in good condition and had apparently been changed recently. The records confirmed that this work had been carried out on 15 May, five days earlier, and that 14 sectors had been flown since that time. The brake linings appeared to be well 'bedded-in', and there was no evidence of excessive heating. The brakes fitted were the standard type for the PA31; higher capacity brakes are fitted to many PA31 aircraft. Brake pedals were fitted for the left and right seat positions on this particular aircraft. The brake hydraulic system contents were correct and numerous tests indicated correct operation and an absence of any air in the system.

Brake fluid analysis

The contents of the brake system were drained and sent for analysis, along with a sample from the dispenser last used to replenish the system. The maintenance records showed that, following the incident on 8 March, the brakes had been 'blued' due to the high temperatures attained and the pads had been changed. In addition, the fluid seals had been damaged by high temperatures and had also been renewed. The brake system had been refilled at that time, and no subsequent uplift of brake system fluid was recorded. The brake fluid analysis showed that the sample from the supply was fit for use, however the sample from the aircraft contained 6,900 parts per million (0.69%) of water, over 40 times the typical rejection level for the associated fluid specification. The sample was 'cloudy' in appearance, with free water settling out after standing.

It was not possible to determine the source of the contamination. Following the incident on 8 March, the maintenance organisation filed a Mandatory Occurrence Report (MOR) which stated "probable cause was brake fluid 'boiling' due to hard braking". No report was raised after the second incident and no associated work had been carried out, since the event had not been recorded in the Technical Log.