# Piper PA-34-200T Seneca II, G-BEAG

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| **Aircraft Type and Registration:** | Piper PA-34-200T Seneca II, G-BEAG | |
| **No & Type of Engines:** | 2 Continental TSIO-360-EB piston engines | |
| **Year of Manufacture:** | 1976 | |
| **Date & Time (UTC):** | 19 August 2003 at 1516 hrs | |
| **Location:** | Oxford (Kidlington) Airport, Oxfordshire | |
| **Type of Flight:** | Training | |
| **Persons on Board:** | Crew - 2 | Passengers - None |
| **Injuries:** | Crew - None | Passengers - N/A |
| **Nature of Damage:** | Both wings, right fuel tank ruptured, nose cone, left gear collapsed | |
| **Commander's Licence:** | Airline Transport Pilot's Licence | |
| **Commander's Age:** | 48 years | |
| **Commander's Flying Experience:** | 5,607 hours (of which 896 were on type) | |
| | Last 90 days - 170 hours | |
| | Last 28 days - 47 hours | |
| **Information Source:** | AAIB Field Investigation | |

**Synopsis**

During the take-off roll, the aircraft accelerated normally to 60 kt but then yawed to the right. This was coupled with a feeling of reduced acceleration and so the commander aborted the takeoff. Application of wheel braking appeared to have little effect and the aircraft departed the runway. In an attempt to avoid a boundary hedge, the commander applied full left differential braking but this did not prevent the aircraft colliding with the hedge at a speed of some 30 kt. The uninjured pilots exited the aircraft and noticed a fire on the left main landing gear. Subsequent examination of both the left and right brakes revealed evidence of severe overheating commensurate with dragging brake pads. No faults were discovered with the engines or the braking system, except for resistance in the master cylinder on releasing of the park brake lever. After cleaning, resealing and bleeding the brake system, it functioned satisfactorily.

**History of Flight**

The intention of the flight was to familiarise another pilot (the student), who held a commercial pilot's licence, with the PA-34 as this would be the first time he had flown this aircraft type. The commander did not identify any problems during the pre-flight inspection and, after starting, taxied the aircraft for the pre-flight engine run up, without incident. He then briefed the student about possible emergencies and informed him to observe the taxi and takeoff, but did not give him instruction to follow through on the flying controls.

After the aircraft was lined up on Runway 19 at the intersection with Runway 29/11, which gave them a take-off run available of 940 metres, ATC gave clearance to takeoff. The wind was 260° at 10 kt. Using the toe brakes, the commander initially kept the aircraft stationary, advanced both engine throttles to achieve 2,000 RPM, and then further increased engine power to a reading of 37 inches of manifold pressure on both, with no abnormal indications. He released the toe brakes and the take-off roll commenced. During the take-off roll, he reported that the engine temperatures and pressures all indicated within normal limits and that he saw an increasing airspeed indication.

The acceleration initially appeared to be normal but as the student called out an indicated airspeed of 60 kt, the aircraft began to yaw to the right. He then heard a strange noise from the right side of the aircraft and both occupants had the feeling that the aircraft was no longer accelerating. The commander also felt a periodic retardation, similar to inadvertent brake application, and so he checked the position of the student's feet and confirmed that they were clear of the brake pedals. The airspeed indication was then seen to stagnate at 65 kt. The commander, assuming that a power loss had occurred and mindful of the reducing length of the runway in which to stop, decided to abort the takeoff and was confidant that he would be able to bring the aircraft to a stop before the end of the runway. He closed both engine throttles and applied the toe brakes, but wheel braking appeared to have little effect in slowing the aircraft.

The occupants became concerned that the aircraft was not going to stop before the end of the runway paved surface and the commander knew that beyond the boundary hedge was a roadway. To avoid the hedge he attempted to steer the aircraft using left nose wheel steering and differential braking. At an estimated airspeed of 40 kt, the aircraft slowly turned to the left and departed the runway. The right wing tip then struck the boundary hedge at a speed estimated to be around 30 kt, causing it to slew round to the right, before coming to rest. The commander shut down the aircraft and, along with the student, exited via the right main door. They were both wearing lap strap and diagonal harnesses and were uninjured in the accident.

Once outside the aircraft they noticed that there was a fire around the left main landing gear but this was extinguished by the airport fire service who attended the scene about a minute after the accident. The right wing had suffered significant damage to its leading edge, due to contact with the hedge, and this had also ruptured the fuel tank and crushed the nose cone. The left main landing gear had collapsed due to the side brace becoming detached from the damaged main wing spar during the crash.

**Aircraft Examination**

Subsequent examination of the brake system by the maintenance organisation for the aircraft, revealed severe overheating of the left brake unit and that the brake pads had welded to the disc. Overheating of the right brake had also occurred with evidence of the pads dragging on the brake disc but, unlike the left side, the right wheel was still free to turn. The examination also revealed that, although the parking brake lever was able to move, when released and at the end of its travel, the brake master cylinder resisted the movement. After cleaning, resealing and bleeding the brake system, a full function test was satisfactory. Examination of the tyres revealed no evidence of unusual abrasion or of any locked wheel condition having occurred.

Initial examination of both the engines, and a further detailed strip inspection of the right engine, did not reveal any pre-existing defects.

**Previous Flight**

On the previous flight, the pilot reported, during the take-off roll, the aircraft wheels had 'skipped' at least four or five times, as though the wheels were being locked on and then momentarily released. The subsequent landing and taxi was without incident but no inspections of the braking system took place.

**Discussion**

The aircraft suffered a loss of performance during the take-off roll that resulted in the commander's decision to reject the takeoff. During the initial stages of the take-off roll, the acceleration was considered normal with the airspeed attaining at least 60 kt, and all the engine indications were normal, with balanced engine power. Post accident inspections of the engines did not reveal any pre-existing defects, and therefore engine failure was considered highly unlikely as a causal factor in the accident. The subsequent failure of the aircraft to decelerate resulted in the runway excursion and collision with the boundary hedge. Dragging, rather than jammed, brakes, due to their possible 'prolonged' application during the take-off roll, would likely lead to both brake fade, as the brake

temperatures increased (resulting in reduced braking capability) and the loss of acceleration as the speed increased during the latter part of the take-off run. This scenario would be consistent with the commander's comments that the aircraft only seemed to slow due to the removal of engine power and that there was little effect from the application of the brakes. However, the brakes must have had some effect as, to avoid the boundary hedge, the commander applied differential braking in an attempt to turn to the left, and this heavy application of left brake would be consistent with the resulting observed overheating, the subsequent fire around the left wheel and the pads being welded to the disc.

Although post accident inspection of the brake system did not reveal any failures, the apparent restriction of the brake master cylinder to full travel of the parking brake lever raised the possibility that, on release, full release of the brake pressure may not have occurred. The maintenance organisation for the aircraft stated that this was unlikely and the fact that a brake problem was not evident during the taxing prior to the attempted takeoff to some extent supported their view. However, the evidence of overheating on both the left and right brake units, the fire in the left unit and the reports from the previous flight, all indicated that the brakes had been partially held on during the take-off run. The commander confirmed that the student did not have his feet on the brakes at that time, and so this would indicate that there had been a problem with the braking system. Despite a full investigation, it was not possible to find a definitive pre-existing failure/defect with the braking system that could have caused dragging brakes.