FINAL REPORT

AAIU Synoptic Report No: 2007-013
AAIU File No: 2007/0017
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In accordance with the provisions of SI 205 of 1997, the Chief Inspector of Air Accidents, on 5 March 2007 appointed Mr Leo Murray as the Investigator-in-Charge to carry out a Field Investigation into this Incident and prepare a Synoptic Report.

Aircraft Type and Registration:	Piper PA 34-200T Seneca II, EI-CMT
No. and Type of Engines:	2 x Continental TSIO-360E
Aircraft Serial Number:	34-7870088
Year of Manufacture:	1978
Date and Time (UTC):	3 March 2007 @ 17.23 hrs
Location:	Runway 25 at Cork Airport
Type of Flight:	Training
Persons on Board:	Crew - 2 Passengers - Nil
Injuries:	Crew - Nil Passengers - Nil
Nature of Damage:	Damage to main tyres and brakes
Commander's Licence:	Commercial Pilot's Licence
Commander's Details:	Male, aged 30 years
Commander's Flying Experience:	1,850 hours, of which 40 were on type
Notification:	Cork Airport Authority
Information Source:	AAIU Incident Report Form submitted by the pilot

SYNOPSIS

Shortly after a deep touchdown on Runway (RWY) 25 at Cork Airport the Instructor (Pilot-in-Command) realised that the braking performance was poor. With the aircraft failing to slow sufficiently the Student pilot applied hard braking, which locked up the main wheels and deflated both main tyres. With little braking capability remaining the aircraft departed the paved area at the end of the runway. There were no injuries.

FINAL REPORT

1. FACTUAL INFORMATION

1.1 History of the flight

Prior to the incident flight, the aircraft had flown a return trip to Abbeyshrule landing back at Cork on RWY 25. Although the aircraft was heavily loaded, the Pilot-in-Command reported no problems with the braking system or the aircraft performance on either runway.

Later that day the aircraft was engaged on a local training detail from Cork Airport and had completed a visual circuit for landing on RWY 25. At this stage the Instructor (occupying the right-hand seat) became the Pilot-Flying (PF). The aircraft was configured on finals with landing gear down and flaps set to 25 degrees. Indicated airspeed was 75 knots. With the low sun obscuring forward visibility, descent was made on final approach with the aid of the Precision Approach Path Indicators (PAPI)[1]. During the landing flare the aircraft floated and touched down at the intersection with Taxiway 'B', approximately 476 metres past the normal touchdown point[2]. The Instructor applied braking but quickly realised the braking performance was poor. Upon harder application of brakes he found the left brake pedal went full down, and the right brake pedal caused the right main wheel to lock-up and skid. The resulting asymmetric braking made directional control difficult. The Instructor stated he was reluctant to execute a go-around at this stage due to directional control difficulty and the non-normal feel of the rudder pedals. In his opinion, there was sufficient runway available to stop the aircraft.

With the aircraft failing to decelerate adequately when well past the intersection of RWY 17/35 the Student pilot (in the left-hand seat) applied hard braking. This decelerated the aircraft but then caused both main wheels to lock up and skid. With both main wheels not rotating the main gear tyres wore through and deflated, resulting in the loss of effective braking capability. Both main tyres left considerable rubber deposits on the runway. The aircraft departed the paved surface of RWY 25 at a speed of approximately 40 knots and proceeded a further 30 metres before coming to rest in the grass area beyond (**Photo 1**). Three units of the Airport Fire Service responded immediately to the scene, two from the main station on the ramp, and one from the Flying Club area adjacent to RWY 35. The two occupants were unhurt, and having secured the aircraft, evacuated.

After the scene was photographed, the AAIU gave permission to move the aircraft to an adjacent paved area to facilitate inspection of the landing gear (**Photo 2**).

1.2 Field Investigation

On Sunday 4 March 2007 an Inspector of Air Accidents travelled to Cork Airport where he inspected the aircraft and interviewed the Instructor (Pilot-in-Command) and Student Pilot. During the interview the Instructor stated that the low elevation of the evening sun made judging the approach and flare difficult.

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[1] **PAPI**: A system of red and white lights adjacent to the runway which indicate the correct descent path angle to the pilot.

[2] **Normal touchdown point**: A point 1,000 feet past the runway threshold.

The aircraft was towed to a hangar adjacent to the Operator's facility for examination of the braking system. The brake bleed fittings on both main wheel brake assemblies were found damaged due to contact with the paved surface after the main tyres deflated. The bleed seat on the left brake assembly was sheared, necessitating replacement of the brake assembly calliper unit. The bleed screw on the right brake assembly was found bent but still essentially intact. The left brake assembly and right bleed screw were replaced and brake functionality tested. Operation of the brakes from the left seat was found satisfactory. Brake function from the right seat was only restored after considerable bleeding of the (left-pedal) brake master cylinder and its associated lines.

The aircraft was flown later that day with the landing gear in the extended position to Waterford Airport. The braking system was dismantled and examined in detail. The brake master cylinders were inspected and revealed normal wear. The cylinder seals were examined and were found in good condition. The brake system was re-assembled and tested satisfactory.

1.3 Technical Information

The wheel brake assembly on the Seneca II consists of two single-disc, double puck brake assemblies[3], one located on each main landing gear. These are actuated by toe-brake pedals mounted on both the pilot and co-pilot's rudder pedals, that pressurise hydraulic fluid through individual brake master cylinder assemblies. A brake system hydraulic reservoir is located behind a panel in the rear top of the nose baggage compartment (**APPENDIX A**).

1.4 Maintenance

The aircraft was maintained by a facility based at Waterford Airport in accordance with Light Aircraft Maintenance Schedule (LAMS) A/1999/ISSUE 1. A 50-hour inspection on the aircraft, engines and propellers was carried out on 20 February 2007 in accordance with the manufacturer's schedule. The aircraft had flown a total of 6,448 hours and 30 minutes at the time of this inspection.

1.5 Airport Information

Cork Airport is situated 3.5 Nautical Miles South of Cork City at a mean elevation of 502 feet. RWY 25 consists of a paved concrete surface 1,310 metres in length by 45 metres wide on a bearing of 249 degrees magnetic, with a Clearway[4] beyond the paved area of 61 metres long by 150 metres wide. There is a downslope of 1%. The runway is equipped with a Simple Approach Lighting System (SALS) and PAPI to facilitate visual approaches at a descent path angle of 3.7º. As there is no displaced threshold the Landing Distance Available (LDA) is 1,310 metres.

[3] **Double puck brake assembly**: A brake calliper assembly with double brake pads.

[4] **Clearway**: A defined rectangular area on the ground or water under the control of the appropriate authority, selected or prepared as a suitable area over which an aeroplane may make a portion of its initial climb to a specified height. (ICAO Annex 14)

1.6 Landing Distance Required

At the time of the incident the aircraft was loaded as follows: Two pilots occupying the front seats weighing 100 Kg and 60 Kg respectively. No baggage was carried. Fuel on board was estimated to be 80 Kg. An aftercast was obtained from the Meteorological Services at Shannon and confirmed a surface wind of 250 degrees at 4 knots with air temperature 8 degrees Celsius.

The estimated landing weight was calculated as being not more than 1,670 kg. Under these conditions, and accounting for runway slope, the aircraft required a landing distance of 826 metres.

2. ANALYSIS

Weather was not a factor in this incident except for the fact that the low elevation of the evening sun impaired the pilot's visibility during the landing flare. The resultant float increased the landing distance considerably. Although heavy braking decelerated the aircraft initially, once the main tyres deflated braking capability was lost and at that stage an overrun of the paved area became inevitable.

Due to the amount of bleeding required of the braking system it is clear that some air had entered the system between the master cylinder of the left rudder pedal (right seat) and wheel brake assembly on the left main landing gear unit. Any air present in the hydraulic fluid will tend to collect, which becomes compressible upon application of brake. Due to the design of the brake master cylinders, any air that enters the system will tend to collect above the brake cylinders reducing braking effectiveness. As the master cylinders and associated seals were found in good condition when inspected, it is probable that a small amount of air entered the braking system through one or more of the brake assembly seals during normal application of brakes.

3. CONCLUSIONS

(a) Findings

1. The aircraft was correctly maintained.

2. The Landing Distance Available on RWY 25 at Cork was adequate.

3. The low elevation of the sun impaired both pilot's visibility on approach and landing.

4. The aircraft touched down approximately 476 metres past the normal touchdown point.

5. Air in part of the braking system resulted in poor braking performance and, due to braking asymmetry, directional control difficulties.

6. All remaining braking capability was effectively lost when the main tyres deflated after hard braking from the Student pilot occupying the left seat.

(b) Probable Cause

A loss of symmetrical braking due to air in part of the braking system.

(c) Contributory Factors

1. The low elevation of the sun impaired the pilot's visibility during the landing flare resulting in a deeper than intended landing.

2. Hard braking applied to the serviceable (left seat) brakes, and subsequent wheel lock, resulted in deflation of the main tyres and the loss of any remaining braking capability.

4. SAFETY RECOMMENDATIONS

This Report does not sustain any Safety Recommendations.

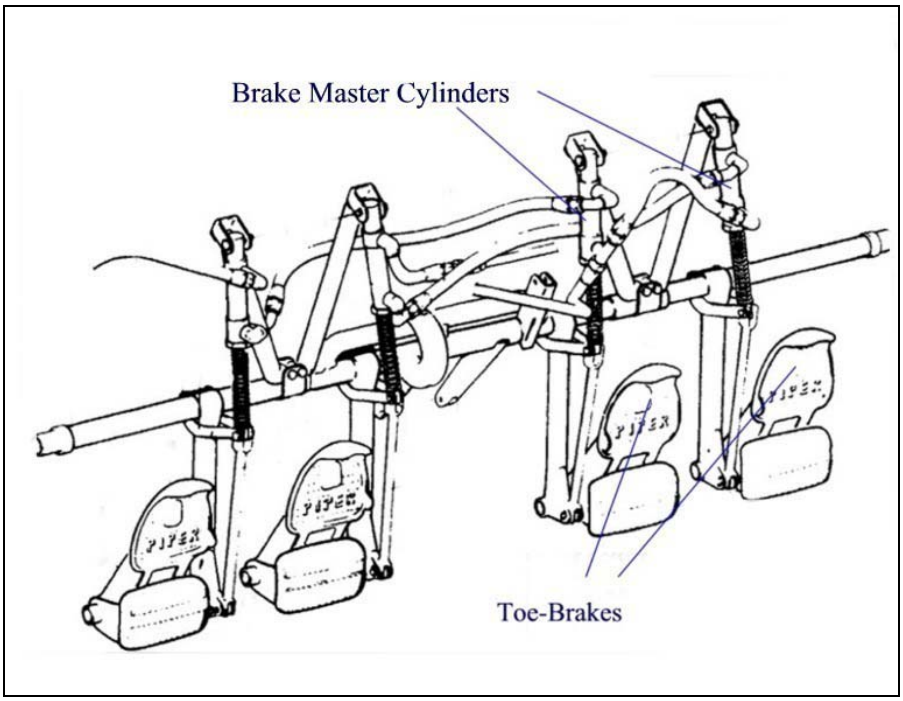
Photo 1

Overrun marks (aircraft recovered to paved area)

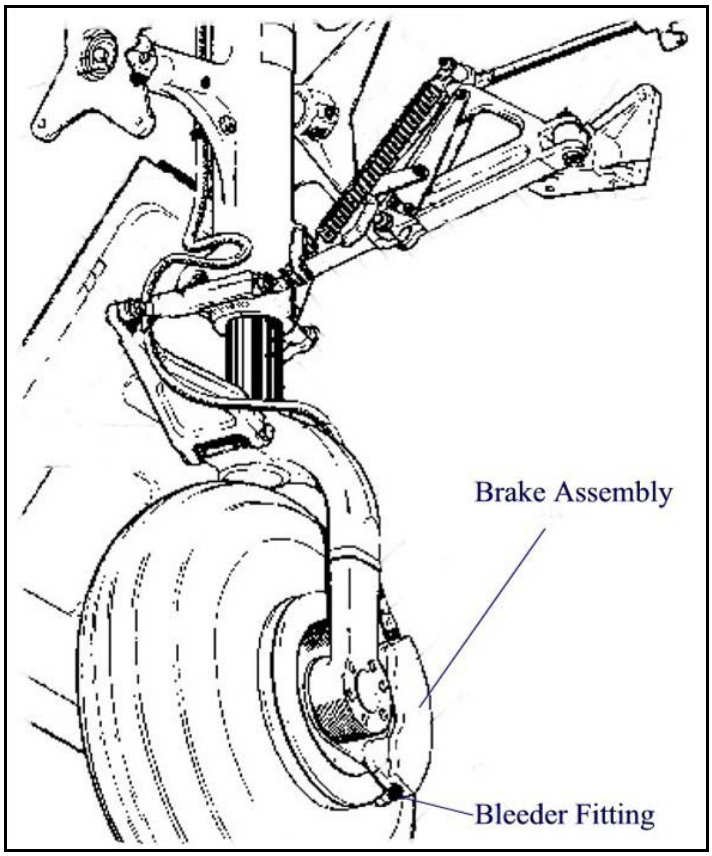
Photo 2

Right main landing gear brake assembly

APPENDIX A



Toe-Brakes and Master Cylinder Assemblies (*Piper Aircraft Corp*)



Left Main Landing Gear Unit (*Piper Aircraft Corp*)

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