FINAL REPORT

AAIU Synoptic Report No: 2007-024
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In accordance with the provisions of SI 205 of 1997, the Chief Inspector of Air Accidents, on 01 September 2007, appointed Mr. Paddy Judge as the Investigator-in-Charge to carry out a Field Investigation into this Incident and prepare a Synoptic Report.

Aircraft Type and Registration:	Urban-Air UFM10 Samba, OK-GUA24
No. and Type of Engines:	1, Jabiru 22A
Aircraft Serial Number:	14/10
Year of Manufacture:	2001
Date and Time (UTC):	01 September 2007 @ 12:10 hrs
Location:	Clonbullogue Airfield, Co. Offaly (EICL)
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - Nil Passengers - Nil
Nature of Damage:	Minor damage to nose gear and propeller
Commander's Licence:	PPL – Microlight
Commander's Details:	Male, aged 48 years
Commander's Flying Experience:	111 hours, of which 64 were on type
Notification:	AAIU Report Form submitted by Pilot
Information Source:	AAIU Field Investigation

SYNOPSIS

The aircraft, following landing, damaged its nose gear and propeller during an off-runway excursion. There was no injury or fire.

FINAL REPORT

1. FACTUAL INFORMATION

1.1 History of the Flight

The aircraft departed Abbeyshrule (EIAB) at 11.35 hrs on a flight to Clonbullogue (EICL). The weather was fine on arrival with the wind estimated at 270º/12 kts or directly down the grass Runway (RWY) 27. The aircraft joined the circuit overhead the runway and, following a right hand base, a normal approach and landing ensued. During the landing roll the aircraft developed a turn to the left and departed the side of the runway at a slow speed. The nose wheel then collapsed. After electrics, magnetos and fuel were shut off, both pilot and passenger left the aircraft. Neither was injured. The aircraft suffered minor damage.

1.2. Damage to Aircraft

The nose wheel leg had separated and the nose wheel spat was damaged. The wooden propeller was destroyed when it contacted the surface. The remaining part of the nose leg together with the projecting exhaust pipes prevented further damage to the nose cowlings when the nose of the aircraft contacted the grass surface.

1.3 Aircraft Information

The Samba is a side-by-side Czech ultra light aircraft that conforms to JAR-VLA (Very Light Aircraft). It is equipped with a tricycle undercarriage where the nose wheel is ahead of the main wheels. It has dual controls and its details are as follows:

Wingspan:	10 metres
Length:	5.9 metres
Height:	1.95 metres
Wing Area:	8.9 square metres
Maximum Take-off Weight (MTOW):	472.5 kg
Max Speed:	140 kts
Stalling Speed:	36 kts
Glide Ratio:	19

The nose wheel is held in a fork unit, similar to that on a bicycle (see **Appendix 1**). The fork tube is attached to the steering tube through an internal 60 mm long sleeve, which is plug welded to the steering tube at three circumferential locations. The fork unit is formed from steel tubes and includes a rubber shock absorber. The steerable nose wheel is connected to the rudder controls. Main wheels are mounted on a spring axle and are equipped with hydraulic brakes. These are operated by a single brake lever mounted on the pilot's control column, thus differential braking is not available.

1.4 Licence Information

The pilot possesses a valid PPL – M. His medical certificate is also current.

1.5 Pilot's Comments

The pilot reported that he crossed the threshold of the runway at 52 kts. The aircraft landed on its main wheels initially and the nose wheel was then lowered. During the landing roll, as the aircraft tracked down the runway, it encountered a muddy patch and commenced a turn to the left that the pilot was unable to control. It departed the runway at a slow speed and, as the aircraft stopped, the nose wheel went into a hole. The nose wheel broke off and the propeller was damaged as it contacted the ground. The pilot immediately switched off the electrics and fuel. The pilot stated that he had initially considered applying power in an attempt to control direction but rejected the idea, as it would increase speed. He further stated that the muddy patch might have been a soft area with ruts from previous landings. He had landed on grass runways previously.

1.6 Witness Comments

A witness stated that he saw the port wing lift as the aircraft turned and departed the runway to the left over half way down its length.

1.7 Runway Inspection

An AAIU Inspector inspected the runway but was unable to positively identify the muddy patch or locate the hole reported by the pilot. However, the ground was not hard and the tracks of two wheels were clearly identifiable curving from the middle of the runway towards and over the left hand edge. These tracks were 33 metres long and were identified as those of the nose wheel and the starboard main wheel. That of the starboard main wheel was quite pronounced. A third track, that of the port main wheel, showed slightly towards the end.

Small white cones marked the runway edge. There was a raised level surface, ½ metre wide, standing proud by about 5 cms, a short distance away from the runway edge. This was a drain that runs alongside and parallel to the runway edge but completely filled with pebbles. 4 metres beyond this point were 8 propeller strike marks. The ground marks terminated 7 metres beyond that point or 13 metres from the edge of the runway.

1.8 Aircraft Inspection

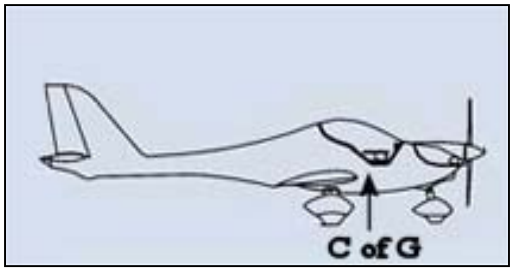
The nose wheel tyre, steering tube and fork assembly was inspected by the AAIU. The tyre shows grass skid marks on its right hand sidewall; the left hand side was clean. The steering tube fracture (see **Photo 1**) occurred at a fail safe point designed into the leg to prevent excessive loads being transferred to the nose structure of the aircraft. There was localised bending in the steering tube adjacent to the fracture in the steering tube, consistent with forward and sideways loading. Examination of the fracture surfaces revealed fracture features typical of a single event overload failure, with no indication of any pre-existing defect.

2. ANALYSIS

The Pilot reported that during the landing roll the aircraft encountered a muddy or rough patch and it then commenced a turn to the left, which he was unable to control. While the Investigation was unable to find this patch it is possible that there were minor wheel tracks hidden by the grass. In the event that the nose wheel enters a rut, during the landing roll, it can cause the aircraft heading to change.

If the resultant heading is different from the aircraft's direction of motion, a side force results. If this force is ahead of the centre of gravity, the resulting moment rotates the aircraft's heading even further and a ground loop can develop. This phenomonen is more closely associated with a tailwheel than a tricycle undercarriage aircraft such as the Samba.

During a normal landing brakes are applied to the main wheels only. In a tricycle aircraft the force of retardation is therefore behind the centre of gravity and the aircraft is stable and controllable in direction while decelerating.



Where the nose wheel alone is retarded the centre of retardation now moves ahead of the centre of gravity. This is a dynamically unstable situation where a divergent oscillation readily develops if the straight-line motion of the aircraft is disturbed and is known as “wheel-barrowing”. A ground loop easily develops in this case, where centrifugal force transfers weight forward and laterally, lifting weight from the other side as observed by the witness. This would have caused both the right wheel and nose wheel to skid leaving the marks observed by the Investigation on the field.

It is probable that the combination of above two affects resulted in the ground loop to the left.

As the aircraft left the runway the nose wheel, while under considerable strain but still skidding on the grass, would have suddenly encountered the hard pebble area causing the nose leg to fracture. The nose leg construction facilitates fracture at this point in order to reduce damage to the front structure and composite skin, in the event of a possible overload.

In severe cases of ground loop, at higher speeds, a wing can lift to such an extent that the down wing digs into the ground and the aircraft can cartwheel. Therefore, to avoid a ground loop, a pilot must immediately respond to any turning tendency on the landing roll while sufficient control authority is still available and avoid a natural tendency to relax immediately after touchdown.

3. CONCLUSIONS

Findings

3.1 The pilot was properly licensed by the Irish Aviation Authority.

3.2 During the landing roll directional control of the aircraft was lost.

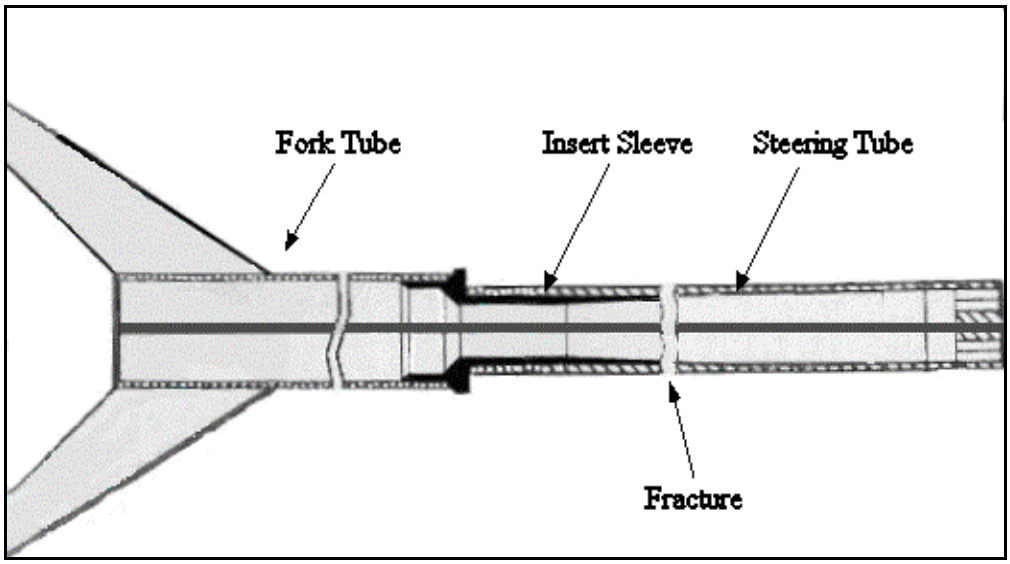
3.3 The aircraft departed the runway in a turn to the left.

3.4 The nose wheel steering tube fractured at its designed weakest point when the nose wheel encountered a hard surface.

4. SAFETY RECOMMENDATIONS

This report does not sustain any Safety Recommendations.

APPENDIX 1



Schematic of steering tube

Photo 1

Photograph of the damaged steering tube

- END -