Australian Government
Australian Transport Safety Bureau

Publication Date: June 2009 ISBN 978-1-921602-72-6

ATSB TRANSPORT SAFETY REPORT
Aviation Occurrence Investigation AO-2008-015
Final

Collision with terrain – Kalumburu, WA 26 February 2008

The Australian Transport Safety Bureau (ATSB) is an operationally independent multi-modal Bureau within the Australian Government Department of Infrastructure, Transport, Regional Development and Local Government.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and, where applicable, relevant international agreements.

ATSB investigations are independent of regulatory, operator or other external bodies. It is not the object of an investigation to determine blame or liability.

© Commonwealth of Australia 2009

This work is copyright. In the interests of enhancing the value of the information contained in this publication you may copy, download, display, print, reproduce and distribute this material in unaltered form (retaining this notice). However, copyright in the material obtained from non-Commonwealth agencies, private individuals or organisations, belongs to those agencies, individuals or organisations. Where you want to use their material you will need to contact them directly.

Subject to the provisions of the *Copyright Act 1968*, you must not make any other use of the material in this publication unless you have the permission of the Australian Transport Safety Bureau.

Please direct requests for further information or authorisation to:

Commonwealth Copyright Administration, Copyright Law Branch
Attorney-General's Department
Robert Garran Offices
National Circuit
BARTON ACT 2600

www.ag.gov.au/cca

Australian Transport Safety Bureau
PO Box 967, Civic Square ACT 2608
Australia
1800 020 616
+61 2 6247 4150 from overseas
www.atsb.gov.au

INFRA-08547

Released in accordance with section 25 of the *Transport Safety Investigation Act 2003*

Abstract

On 26 February 2008, at about 1655 Western Daylight-saving Time, the pilot of a Gippsland Aeronautics Pty Ltd GA-8 Airvan, registered VH-KUZ, with two passengers on board, commenced takeoff at Kalumburu Aerodrome, WA.

Witnesses reported that the aircraft started to drift to the left of the runway prior to becoming briefly airborne. The aircraft settled back onto the runway strip, veering further left across the runway strip. The aircraft subsequently ran up an embankment, through low scrub, and then through small trees beyond the runway strip. The impact with the trees flipped the aircraft onto its back, where it came to rest, facing the opposite way to the direction of takeoff.

The aircraft was seriously damaged and the pilot and two passengers received minor injuries.

FACTUAL INFORMATION

The information presented below, including any analysis of that information, was prepared principally from information supplied to the Bureau.

History of the flight

On 26 February 2008, at about 1655 Western Daylight-saving Time[1], the pilot of a Gippsland Aeronautics Pty Ltd GA-8 Airvan (GA-8 Airvan), registered VH-KUZ, with two passengers on board, commenced takeoff from runway 10 at Kalumburu Aerodrome, WA on a Visual Flight Rules (VFR) charter flight to Kununurra, WA. The pilot had earlier elected to delay the departure from Kalumburu by about 1 hour due to heavy showers from a passing storm.

Prior to taxiing, the pilot and aerodrome reporting officer inspected the entire length of the unpaved runway and determined that the runway surface was suitable for takeoff. The runway was described as being firm, but with some puddles of standing water on the centreline of the runway and along its length. Those puddles were reported to be less than 1 m wide, and less than 1 cm deep. The pilot indicated that he also examined the runway surface as he taxied the aircraft to the threshold of runway 10.

The pilot recalled that, although the runway surface was firm, he decided to employ a 'soft field' technique for the takeoff. That technique could be appropriate in the case of takeoffs from waterlogged, muddy or long/wet grass runway surfaces.

The aim of a soft field takeoff was to reduce any extended ground roll resulting from the increased friction of the soft ground on the aircraft's undercarriage by lifting the aircraft off the ground as soon as practicable. After lift off, the pilot would hold the aircraft in 'ground effect'[2] while accelerating to a speed that was suitable for the climb away.

The pilot stated that the takeoff was commenced with the flaps set to 14° and with a moderate amount of back pressure held on the control

1 The 24-hour clock is used in this report to describe the local time of day, Western Daylight-saving Time as particular events occurred. Western Daylight-saving Time was coordinated Universal Time (UTC) + 9 hours.

2 Ground effect was the increased wing lift produced when an aircraft is flown at low speed in close proximity to the ground.

column. Partial power was applied before releasing the brakes and continuing to open the throttle to full power. The pilot confirmed that the engine was operating normally during the take-off roll and developed take-off power.

The pilot recalled rotating the aircraft at about 65 to 70 kts and that the aircraft then began to drift to the left. However, the aircraft's wheel tracks that were left on the damp runway surface indicated that, although the aircraft initially followed the runway centreline, it began to veer to the left from about 200 m into the take-off run. Those wheel tracks also indicated that the nosewheel was not in contact with the runway at that stage.

Witnesses reported that the aircraft started to drift to the left of the runway prior to becoming briefly airborne about 300 m along the runway. The aircraft, however, did not gain height and settled back onto the runway strip[3]. The witnesses indicated that the aircraft became airborne a second time, before contacting a slight embankment, followed by the low scrub and small trees beyond the runway strip. The impact with the trees was reported to have flipped the aircraft onto its back. The aircraft came to rest inverted and facing the opposite way to the direction of takeoff.

The pilot stated that he did not attempt to reject the takeoff, seeking instead to keep the aircraft flying by pulling fully back on the control column immediately prior to contacting the trees. He also recalled that the aircraft's stall warning activated as the aircraft drifted off the runway and across the shrubs towards the trees.

The pilot and two passengers received minor injuries and evacuated the aircraft unaided. The aircraft was seriously damaged.

Pilot information

The pilot held a Commercial Pilot (Aeroplane) Licence and a valid Class 1 medical certificate. His total flying experience was about 330 hours flight time, of which approximateley 85 hours were in the GA-8 Airvan.

The pilot commenced employment with the operator in October 2007. After initial familiarisation training, he underwent 15 hours of supervised line flying in the GA-8 Airvan, before being checked to line. He stated that the training was thorough and that he felt well prepared for operating on wet strips.

In common with most pilots, the pilot reported being taught the soft field take-off technique during his pilot licence training. Soft field takeoffs were also reviewed during the pilot's familiarisation training with the operator. That practice was from sealed runways.

Since that time, the pilot averaged about 25 flying hours per month and had operated regularly from rain-affected, but useable airstrips in the 4 months prior to the occurence.

The pilot reported that he was in good health and adequately rested in the period leading up to the occurrence.

Aircraft information

The aircraft, serial number GA8-07-110, was manufactured in Australia and first registered on 26 July 2007. It was powered by a 300 bhp Lycoming IO-540 fuel-injected engine, and fitted with a Hartzell constant-speed, two-bladed propeller. The aircraft had seating for up to eight persons, was equipped with large low pressure tyres, and a cargo pod was fitted under the fuselage.

Information regarding the aircraft's limitations, procedures, performance and systems information was available in the manufacturer's *Owners and Pilots Information Manual*. That manual described the technique used to establish the performance chart-predicted take-off distance. Normal takeoffs were accomplished with 14° of flap, full throttle, and 2,500 RPM. The aircraft was to be accelerated along the ground with the elevators held neutral, then rotated at 60 kts to commence the climb such that the take-off safety speed (TOSS)[4] of 71 kts was achieved and maintained at or before 50 ft above ground level (AGL).

3 The runway strip was a portion of ground to the side of the runway that ensured minimal damage to an aeroplane should it run off a runway during takeoff or landing.

4 TOSS - the airspeed chosen to ensure that adequate control existed under all conditions, including in turbulence and in the case of a sudden and complete engine failure during the climb after takeoff.

The investigation determined that the occurrence aircraft's weight was about 81 kg below its maximum take-off weight (MTOW), and that the centre of gravity was within, but close to the aircraft's rear limit. Under the prevailing conditions, the predicted take-off distance for the aircraft to reach 50 ft AGL was 600 m; of which the ground roll was predicted as 380 m.

Neither the manufacturer's *Owners and Pilots Information Manual*, nor the operator's *Operations Manual* included any guidance on the conduct of a soft field take-off technique.

Meteorological information

Observations recorded by the Bureau of Meteorology (BoM) indicated that, at the time of the accident, the temperature was about 23 °C, the relative humidity was 92%, and the 10-minute average wind was 6 to 8 kts from the north. Witness statements and the pilot's recollection confirmed that, prior to takeoff, there was a slight north to north-east wind.

Aerodrome information

As a registered aerodrome, Kalumburu complied with the relevant standards prescribed in Civil Aviation Safety Regulation (CASR) 139.265. Those standards included aspects such as the aerodrome's physical characteristics, markings and lighting, and a requirement for a trained reporting officer to monitor the serviceability of the aerodrome.

The runway at Kalumburu, runway 10/28, was aligned 100/280 degrees magnetic. Its unpaved, natural gravel surface was 1,147 m long and 18 m wide. The runway slope was 0.7% down toward the east.

Effects of propellers

The GA-8 Airvan, in common with all single-engine aircraft, had an imbalance of forces that was caused by the rotation of the propeller. That imbalance was most pronounced during high power conditions, such as during takeoff. In the case of the GA-8 Airvan, having a clockwise-rotating propeller (as seen from the cockpit), those forces pushed the tail to the right and yawed the nose to the left. In order to counteract those yawing forces during takeoff, a pilot would apply corrective or opposite rudder movement to maintain the aircraft aligned with the runway centreline.

ANALYSIS

The evidence from the pilot did not support the likelihood of any technical or any other failure of the aircraft prior to the contact with the trees. Equally, there was no indication that the weather at the time of takeoff had any adverse effect on the aircraft's performance. However, neither a technical fault, nor a weather-related event could be ruled out entirely.

The pilot approached the departure from Kalumburu conservatively, waiting for the storm to pass, inspecting the runway and making a conscious decision to carry out the soft field take-off technique. Although the runway length was more than adequate for a normal takeoff, the decision to carry out a soft field takeoff was not unreasonable; the runway was damp, and parts were still affected by standing water.

Although no soft field takeoff guidance was given in the manufacturer's *Owners and Pilots Information Manual*, or in the operator's *Operations Manual*, the technique was commonly used in light aircraft and was generally taught at the Private Pilot (Aeroplane) Licence level. The review of that take-off techinque during the pilot's familiarisation training would have increased his confidence in the application of that technique in conditions such as those on the day of the accident. However, the long-term retention of complex motor skills, such as the short field takeoff, also depends upon experience and regular practice. The pilot had limited overall flying experience; possibly limiting his proficiency in the aircraft's handling characteristics.

The pilot's recollection and the runway ground marks, confirmed that the aircraft tracked parallel to the centreline until rotation at about 200 m along the runway. It was possible that the nosewheel left the ground before the aircraft's directional fin became fully effective in counteracting the pronounced movement of the aircraft's nose to the left that was associated with the aircraft's clockwise-rotating propeller. Alternatively, the pilot may have focussed on achieving the early rotation, to the detriment of countering that movement of the aircraft's nose. In either case, the aircraft veered to the left and off the runway.

The intention with the early rotation in the soft field technique was for the aircraft to become airborne at a lower-than-normal speed, before accelerating close to the ground and climbing away. In this case, the wheel tracks suggested that the early rotation only succeeded in placing the aircraft in an attitude that increased the

overall aerodynamic drag on the aircraft. That would have reduced its ability to accelerate, and prolonged the overriding yawing effect of the propeller's rotation.

The point at which the aircraft first became airborne was significantly less than the calculated ground roll required for the takeoff. In addition, the pilot recollected that the stall warning was sounding for most of the time between leaving the runway edge until the contact with the trees. In combination, this suggested that the aircraft became airborne at a speed that was insufficient to climb away safely. The limited time available to the pilot between the rotation and when the aircraft drifted beyond the runway edge, might have suggested to the pilot that a rejected takeoff was not an option.

FINDINGS

From the evidence available, the following findings are made with respect to the collision with terrain at Kalumburu Aerodrome, WA, on 26 February 2008 involving Gippsland Aeronautics Pty Ltd GA-8 Airvan, registered VH-KUZ, and should not be read as apportioning blame or liability to any particular organisation or individual.

Contributing Safety Factors

- The aircraft veered to the left during the take-off roll.
- The aircraft departed the side of the runway.
- The aircraft became airborne at a speed that was insufficient to climb away safely.

Other key findings

- The pilot's level of flying experience was relatively low.

SOURCES AND SUBMISSIONS

Sources

The sources of information for this investigation were the pilot, the passengers, the Kalumburu Aerodrome reporting officer, the operator and the aircraft manufacturer.

Submissions

Under Part 4, Division 2 (Investigation Reports), Section 26 of the Transport Safety Investigation Act 2003, the Executive Director may provide a draft report, on a confidential basis, to any person whom the Executive Director considers appropriate. Section 26 (1) (a) of the Act allows a person receiving a draft report to make submissions to the Executive Director about the draft report.

A draft of this report was provided to the pilot, the operator, the aircraft manufacturer and the Civil Aviation Safety Authority (CASA).

Submissions were received from operator and the aircraft manufacturer. The submissions were reviewed and, where considered appropriate, the text of the report was amended accordingly.