

AIRCRAFT ACCIDENT REPORT
CAA OCCURRENCE NUMBER 08/497
WSK "PZL-SWIDNIK" S.A. PW-5
ZK-GJO
WAHAROA
11 FEBRUARY 2008



FOREWORD

Aviation safety investigations are conducted in New Zealand pursuant to New Zealand's international obligations under the Convention on International Civil Aviation 1944 – also known as the Chicago Convention. Pursuant to Articles 26 and 37 of the Chicago Convention, the International Civil Aviation Organisation (“ICAO”) has issued Annex 13 to the Convention setting out International Standards and Recommended Practices in respect of the investigation of aircraft accidents and incidents. Paragraph 3.1 of Annex 13 describes the sole objective for the investigation of such accidents as follows:

3.1 The sole objective of the investigation of an accident or incident shall be the prevention of accidents and incidents. It is not the purpose of this activity to apportion blame or liability.

This philosophy of prevention for the future promotion of aviation safety is reflected in the New Zealand domestic law by virtue of the provisions of the Civil Aviation Act and Part 12 of the Civil Aviation Rules. CAA accident investigations operate under this philosophy.

CAA accident investigations are conducted in accordance with ICAO guidelines. The sole objective of such investigations is the prevention of accidents by determining the contributing factors or causes and then implementing appropriate preventive measures - in other words restoring safety margins to provide an acceptable level of risk.

CAA safety investigations are performed to establish the causes of the accident on the balance of probability. Accident investigations do not always identify one dominant or ‘proximate’ cause. Often, an aviation accident is the last event in a chain of several events or factors, each of which may contribute to a greater or lesser degree, to the final outcome.

Contents		Page Number
Abbreviations		4
Data Summary		5
Synopsis		6
1 Factual information		6
2 Analysis		14
3 Conclusions		16
4 Safety actions		17
 Figure		
Figure 1: ZK-GJO Volkslogger Retrieved Data Recorded Positions ...		7
 Table		
Table 1: ZK-GJO Volkslogger Position and Speed Data		8

Abbreviations used in this report

agl	above ground level
AIP	Aeronautical Information Publication
amsl	above mean sea level
CAA	Civil Aviation Authority
CAR	Civil Aviation Rules
CFI	Chief Flying Instructor
c of g	centre of gravity
FAI	Fédération Aéronautique Internationale
ft/min	feet per minute
GPS	Global Positioning System
G/S	ground speed
hPa	hectopascals
IAS	indicated airspeed
kg	kilogram(s)
mm	millimetre(s)
NZDT	New Zealand Daylight Time
NZMA	Matamata Aerodrome
SSR	Secondary Surveillance Radar
T	true
TAS	true airspeed
UTC	Coordinated Universal Time
VHF	very high frequency
WGS 84	World Geodetic System 1984

AIRCRAFT ACCIDENT REPORT

OCCURRENCE No 08/497

Aircraft type, serial number and registration:	WSK "PZL-SWIDNIK" S.A. PW-5, 17.08.014, ZK-GJO
Number and type of engines:	Not applicable
Year of manufacture:	1997
Date and time:	11 February 2008, 1802 NZDT ¹ (approximately)
Location:	Waharoa Latitude ² : S 37° 45' 07.1" Longitude: E 175° 45' 49.2"
Type of flight:	Private
Persons on board:	Crew: 1
Injuries:	Crew: 1 fatal
Nature of damage:	Aircraft destroyed
Pilot's licence:	Qualified Glider Pilot Certificate
Pilot's age:	51 years
Pilot's total flying experience:	1,283 hours (approximately) 678 on type (approximately)
Information sources:	Civil Aviation Authority field investigation
Investigator in Charge:	Mr A M Moselen

¹ All times in this report are NZDT (UTC + 13 hours)

² WGS 84 co-ordinates.

Synopsis

The Civil Aviation Authority was notified of the accident at 1850 NZDT on Monday 11 February 2008. The Transport Accident Investigation Commission was in turn notified shortly thereafter, but declined to investigate. A CAA field investigation was commenced the next day.

The pilot was competing in the New Zealand National Gliding Championships. During the last stage of a competition flight, while one nautical mile from Matamata Aerodrome, the glider was observed to turn steeply to the left and descend out of sight behind a stand of trees. A short time later the glider was found destroyed from impact with terrain and the pilot deceased.

1. Factual information

1.1 History of the flight

- 1.1.1 The pilot was one of six competing in the sports class section on the sixth day of the New Zealand National Gliding Championships at Matamata Aerodrome. Their assigned task required them to reach several turn points along a specified route which covered 132 nautical miles.
- 1.1.2 A total of 29 gliders launched for the various competitions that day, but only six managed to complete the tasks. The remaining 21 had to land out³. In the sports class, two contestants managed to complete their assigned tasks.
- 1.1.3 The co-owner/pilot of ZK-GJO was familiar with Matamata Aerodrome and the surrounding area. He knew the approaches to the aerodrome were over flat farmland that afforded a variety of out-landing sites. The pilot was also familiar with the performance capabilities of his glider to the extent that he was capable of landing it in small fields and had done so on previous occasions.
- 1.1.4 For competition grading purposes, all competing gliders were equipped with data recorders. For ZK-GJO, data capture was by a Volkslogger, timed to record information at ten second intervals and included; position, ground speed (not truly indicative during turns) and altitude. The recorded takeoff time for ZK-GJO was 1331:04 hours and the competition task start time was declared on radio by the pilot at 1427 hours.
- 1.1.5 At 1748:28 hours the glider crossed the final turning point of the flight task at an height of 3268 feet⁴. From the Volkslogger recorded data it was evident that the pilot flew the final stage in a straight line track to Matamata Aerodrome by operating the glider at a range of airspeeds to achieve the best glide ratio relative

³ Landing out - If lift is not found during a cross-country flight, the pilot must choose a field and 'land out'. Landing out (or "out-landing") is considered a routine event in cross-country gliding. The pilot has to choose a field where the glider can be landed safely, without damaging property or livestock.

⁴ All heights are **amsl** except for Table 1.

to the ground. This was accomplished by selecting a head-wind speed to fly and, in addition, decreasing the gliders airspeed when encountering lift and then increasing the gliders airspeed when encountering sink.

- 1.1.6 Five nautical miles from the Matamata Aerodrome the glider had descended to 1900 feet. At three nautical miles, it had further descended to 1315 feet. At 1801:18, recorded data indicated the glider was one nautical mile from Matamata Aerodrome directly in front of a large potato field. At this point the glider was manoeuvred into wind and a climb was commenced from 344 feet. Over the next ten seconds the glider gained 38 feet in height. The glider then completed a 360 degree turn to the left.
- 1.1.7 At the completion of the first orbit, the glider was at the same height and approximately the same groundspeed at the point when the pilot had first turned into wind. During the second orbit, and up until the end of data recording, the glider lost height and groundspeed.
- 1.1.8 The last data was recorded at 1802:08. No speed data was captured at that time but the glider had tracked towards the south and had descended to a height of 315 feet. GPS co-ordinates taken at the accident site indicated that prior to impact the glider had to have turned and continued horizontally a further 296 feet in a north-easterly direction. At the time of the accident it was estimated that the glider had been airborne for approximately 4 hours and 31 minutes. The last seven Volkslogger recordings are displayed in Figure 1. Expanded data in table format is provided in Table 1.
- 1.1.9 An observer, situated at Matamata Aerodrome, heard the pilot call on the radio and had watched the glider approach the aerodrome. The witness then noticed the glider turn steeply to the left, descend and disappear behind a stand of trees.
- 1.1.10 The accident occurred in daylight, at approximately 1802 hours NZDT, near Waharoa, at an elevation of 180 feet. Grid reference: NZMS 260-T14-796537, latitude S 37° 45' 07.1", longitude E 175° 45' 49.2".

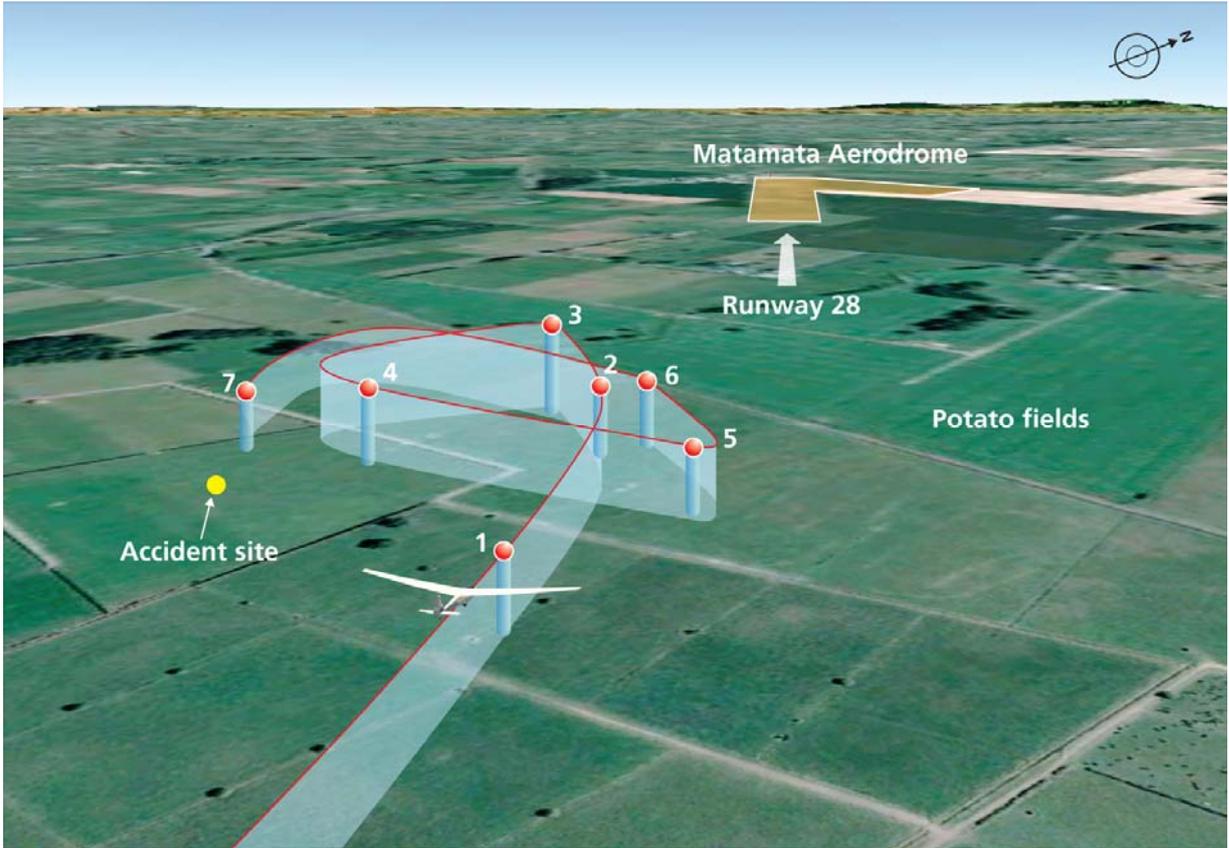


Figure 1

ZK-GJO Volkslogger Retrieved Data Recorded Positions

(Note – Track between points in Figure 1 is for illustrative purposes only)

Reference Point Fixes	Time (NZDT)	Lat/Long	Height (AGL in feet)	Groundspeed (knots)	Distance between fixes (feet)
1	1801:08	S37°45' 04" E175°45' 58"	192	41	840
2	1801:18	S37°45' 01" E175°45' 50"	162	40	570
3	1801:28	S37°44' 59" E175°45' 42"	200	39	645
4	1801:38	S37°45' 04" E175°45' 48"	185	43	690
5	1801:48	S37°45'.00" E175°45' 55"	162	37	415
6	1801:58	S37°44' 59" E175°45' 48"	149	34	775
7	1802.08	S37°45' 04" E175°45' 44"	133	No data	296

Table 1

ZK-GJO Volkslogger Position and Speed Data

1.2 Injuries to persons

<i>Injuries</i>	<i>Crew</i>	<i>Passengers</i>	<i>Other</i>
Fatal	1	0	0
Serious	0	0	0
Minor/None	0	0	

1.3 Damage to aircraft

1.3.1 The aircraft was destroyed.

1.4 Other damage

1.4.1 During the accident sequence, two concrete fence posts and several lengths of fencing wire were destroyed.

1.5 Personnel information

1.5.1 The pilot, aged 51 years, held a Gliding New Zealand Qualified Glider Pilot Certificate (QGP). In addition, he held a B Category instructor rating.

1.5.2 Up until 28 January 2008, the pilot's flying experience consisted of approximately 1283 hours total flight time, including approximately 678 hours on type. His last Biennial Flight Review was completed on 30 December 2006. Over the six day period of flying at the National Gliding Competition, the pilot accumulated approximately 18 hours of flying time.

1.5.3 In addition to the National Gliding Competition, the pilot was competing against one other competitor for the Trans-Tasman Trophy. The contest is determined using the same points system awarded to sport class gliders at the National Gliding Competition.

1.5.4 By the end of the fifth day, the pilot was behind on points but on the sixth day his competitor had out-landed early. After the accident occurred, the Trans Tasman Trophy contest was abandoned and no winner declared.

1.5.5 During the competitions, the pilot was described as being in good health and good spirits. He also used a recently purchased spa pool to help relax in the evenings. During the course of the investigation, information from personnel involved in the competition, and those closely related to the pilot, suggested that he may have been suffering from the effects of fatigue and dehydration during the accident flight.

1.6 Aircraft information

1.6.1 Glider WSK 'PZL-Swidnik'S.A. PW-5, serial number 17.08.014, was manufactured in Poland in 1997 and exported to New Zealand. On 4 November

1997 the glider was issued a non-terminating Airworthiness Certificate in the Standard Category.

1.6.2 The PW-5 is a shoulder-wing, single-seat, medium performance glider with a wingspan of 44 feet. The fuselage structure is made entirely of glass-epoxy composite and the wings have a monospar construction with sandwich shells. Flight controls are conventional, and plate type airbrakes can be extended from the upper wing surfaces. Research into the flying characteristics of the PW-5 established that, whilst the low speed handling is good, the entry to a spin may not be immediately obvious to the pilot.

1.6.3 Performance specifications from the PW-5 Flight Manual provide the following information:

- Best glide ratio 1:32 at 46 kts IAS at max operating weight
- Minimum sink 125 ft/min at 39 kts IAS
- Stall speed The PW-5 Flight Manual specifies that the glider will not stall in straight flight or up to bank angles of 45 degrees with a heavy pilot.
- Maximum weight 300 kg
- Maximum cockpit load 110 kg

1.6.4 The empty weight of ZK-GJO was established as 188.1 kg. The glider had been modified to include 4.3 kg of lead ballast in the tail. The pilot weighed 108 kg and on the day of the accident the all up weight of the glider was estimated to have exceeded the maximum allowable limit. In addition, the combination of the pilot's weight plus parachute placed the glider above the maximum allowable cockpit load of 110 kg. The centre of gravity location (offset by the added weight in the tail) was estimated to have been towards the forward centre of gravity limit.

1.6.5 A review of the Gliding New Zealand Daily Inspection and Technical Log, found that the daily inspection record was completed correctly except no hours had been recorded despite this being a requirement of CAA Rule Part 104.113 (5). The Aircraft Maintenance Logbook was not recovered. The only record of hours was provided in the Annual Review of Airworthiness documents submitted to the CAA on 11 October 2007, and amounted to 706 hours.

1.6.6 The last recorded maintenance performed on ZK-GJO was carried out concurrently with the last Annual Review of Airworthiness inspection. The inspection found no defects.

1.7 Meteorological information

1.7.1 On the afternoon of 11 February 2008, a shallow trough of low pressure was moving slowly eastwards across New Zealand. During the late afternoon a weak cold front moved eastwards across the North Island.

- 1.7.2 The MetService provided the following weather statement for the Matamata region at the time of the accident-

“There are no wind observations at Matamata, but from the data available in the region a reasonable estimate can be made of the wind conditions that would have been experienced there. The passage of the weak cold front cannot be detected in the available observations of either wind or temperature, and there was no rain recorded. The wind direction was westerly or slightly from the north of west. The wind speed had been about 15 knots in the mid-afternoon and gusting to about 25 knots. Later in the afternoon and evening the wind speed decreased, and at 1800 hours it was 10 knots and possibly as high as 12 knots. The gusts had decreased to about 20 knots and possibly as high as 22 knots”.

- 1.7.3 Glider pilots at Matamata described the weather on the day of the accident as warm and changeable with some good thermals. They also indicated that there was sinking air in the vicinity. Contributing to this was the north-west wave dumping air off the Cambridge Hills.
- 1.7.4 Data from the Volkslogger indicated that on the final section of the assigned task the glider had been subjected, on average, to a westerly wind of 20 knots.

1.8 Aids to navigation

- 1.8.1 A Garmin GPS and a SSR Transponder with Mode C (altitude reporting capability) was fitted to the glider.

1.9 Communications

- 1.9.1 Competitors were required by competition rules to make ‘operations normal’ radio calls at hourly intervals and an additional call to advise if they were anticipating landing out.
- 1.9.2 The aircraft was equipped with a Microair 720 VHF transceiver. The pilot complied with the competition radio transmission requirements and in addition, made the following radio calls:

- “Five nautical miles on finals”
- “Three nautical miles low”

1.10 Aerodrome information

- 1.10.1 Not applicable.

1.11 Flight recorders

- 1.11.1 In addition to providing navigation, the Garmin GPS was connected to a data recording device (Volkslogger). At the end of a flight the data could be downloaded for validation and scoring using proprietary scoring software designed to score International Gliding Commission sanctioned competitions.

1.11.2 Data from the recorder was retrieved and this provided a detailed history of the flight up until the last few seconds. The recorded flight information included both plan and vertical profiles.

1.12 Wreckage and impact information

1.12.1 The accident occurred in a grassed paddock approximately one nautical mile east of State Highway 27 near the township of Waharoa.

1.12.2 The glider initially struck the ground with the left wing tip. Cut marks in the ground indicated that the wing tip had dug in approximately 250 mm and then twisted (flexed and re-straightened) through approximately 80 degrees. From this point, the glider cart-wheeled in a nose down attitude a further 11 metres, struck the ground heavily and then bounced six metres into a fence.

1.12.3 Main impact forces were sustained through the left hand forward fuselage section of the glider to the extent that the entire nose section had canted 45 degrees right of the longitudinal axis. Both wings remained attached, although the left wing trailing edge had all but torn away from the fuselage. The left wing air brake had extended from compression loading. The left aileron had completely detached and there were multiple compression fractures evident to the upper and lower wing surface structure in the left wing root area.

1.12.4 All parts of the glider were accounted for at the accident site. Pre impact control integrity was established, and whilst some disruption to control surfaces and push rod mechanisms had occurred, this was attributed to impact overload failure.

1.12.5 The cockpit area was considerably disrupted. Aside from the successful retrieval of the GPS unit and Volkslogger data recorder, no other instrumentation information was considered to be of any practical use to the investigation.

1.12.6 Attached to the rear bulkhead, a hydration pack containing a small quantity of drinking water was found and a water bottle (contents not ascertained) was also found lying outside of the wreckage.

1.13 Medical and pathological information

1.13.1 Post-mortem examination showed that the pilot received fatal injuries consistent with a high-energy impact.

1.13.2 Toxicological tests disclosed no evidence of alcohol, medicinal or recreational drugs.

1.13.3 A review of the pilot's recent medical history revealed that, other than a stable asthma condition, the pilot had no known other medical issues. The pilot's last Gliding New Zealand medical assessment was dated 19 April 2007. The medical certificate was signed by the pilot and medical examiner essentially declaring that that the pilot did not have any known medical issues which could affect his ability to fly a glider.

1.14 Fire

1.14.1 Fire did not occur.

1.15 Survival aspects

1.15.1 The accident was not survivable owing to the high-energy impact forces involved. Although the pilot was restrained by a combination lap and shoulder harness, any significant longitudinal impact in this type of aircraft usually results in the destruction of the cockpit area with consequential effects on the pilot.

1.16 Tests and research

1.16.1 Not applicable.

1.17 Organisational and management information

1.17.1 The 2008 New Zealand National Gliding Championships was managed by the Matamata Soaring Centre (MSC). As standard practice, briefings were given prior to each race. It was stated by a MSC committee member that pilots were reminded regularly about the importance of safety first when flying, particularly during competition. A past CFI of another club presented the main safety briefing. The main points being:

- airspace - good look outs,
- tow release - rope breakage and joining procedures,
- radio calls,
- flight in cloud,
- airmanship,
- paddock land outs – avoid late decisions,
- importance of rehydrating the body,
- protection from the sun, and
- adequate rest.

1.17.2 The competition commenced on 4 February 2008. After the third day, and owing to some mistakes being observed by some contestants, the Safety Officer felt it pertinent to give a one-off briefing on 'Human Factors'.

1.17.3 On Saturday 9 February 2008, the competition Safety Officer approached the pilot of ZK-GJO who was keen to get back in the air after he had landed out. The Safety Officer assisted with rigging the glider for another attempt. The Safety Officer's advice and assistance at the time was aimed at relaxing the pilot and to ensure things were not rushed.

1.18 Additional information

1.181 Not applicable.

1.19 Useful or effective investigation techniques

1.19.1 Not applicable.

2. Analysis

- 2.1 From the wreckage and impact evidence, onboard data recordings and an eyewitness account, the pilot appears to have lost control of the glider during a low level steep downwind turn.
- 2.2 Despite the glider getting low in height as it approached Matamata Aerodrome, the pilot did not elect to land out even though this was a viable option. When three miles from the aerodrome, the pilot was aware that he was low and not achieving the range he was hoping for. Instead he continued on toward the aerodrome and made a series of low level turns.
- 2.3 The pilot's decision to continue on may have been influenced by a perceived thermal being in the vicinity or, it may have been made by the pressure of competition and in the context of the assigned task, probably pushing on when the goal was in sight. As it turned out, evidence would suggest no significant thermal transpired yet the pilot continued with the orbits.
- 2.4 What was on offer however, was the opportunity to acquire competition points, and this alone was possibly the primary driver that influenced the pilot's decision making process at that particular time. In terms of human factors, with the attraction of a goal, mountain climbers have been cited as saying that withdrawing shortly before reaching the summit is exceedingly difficult. "A strong motivation puts us inside a mental tunnel from which too often there is no exit"⁵.
- 2.5 The combined effects of fatigue and dehydration on this accident were evaluated as possible contributing factors. It is known that dehydration negatively affects cognitive performance (Grandjean and Grandjean, 2007)⁶. Likewise fatigue can affect task performance - a reduction in alertness, longer reaction times, memory problems, poorer psychometric coordination, and less efficient information processing. However the studies concluded that there is insufficient information available to determine the extent and duration of dehydration that would produce cognitive decrements and cognitive functions that would be most impaired. Furthermore, a major limitation of most studies conducted to date is the inability to determine the effects of dehydration independent of other stressors.

⁵ Briigliadori, L & R. *Competing in Gliders: Winning with your mind*. Missaglia (LC): Bellavite, A.G.

⁶ Ann C. Grandjean, EdD, FACN and Nicole R. Grandjean, PhD, Journal of the American College of Nutrition, Vol. 26, No. 90005, 549S-554S (2007), Published by the American College of Nutrition.

- 2.6 Whilst the effects of fatigue and dehydration cannot be entirely dismissed, there was evidence that would suggest the pilot had not reached a state of mind that would result in a complete loss of situational awareness, or indeed, loss of control of the glider at any time during the flight. The reason for this conclusion was:
- The pilot was reminded in the briefings to rehydrate, rest and ensure protection from the sun's effects.
 - The pilot carried a hydration pack, an extra water bottle and would appear to have availed himself of the majority of contents of at least the hydration pack.
 - On the final stage toward Matamata aerodrome, the flying was not haphazard - it was optimised for range using well known gliding techniques.
 - The pilot's communications on the final stage were correct, clear, concise and not slurred.
 - Data recordings indicate that one nautical mile from the aerodrome the pilot altered course directly into wind and then proceeded to orbit in a series of left turns. This act would appear deliberate and was probably for the single purpose of gaining additional height for reaching the airfield. The decision was unlikely to be influenced by someone that may have lost cognitive function.
 - Finally, and aside from suggestions of dehydration from other sources, there was no actual evidence found that would substantiate fatigue and or dehydration had contributed directly towards the cause of the accident.
- 2.7 There have been many accidents involving aircraft losing control while travelling at low speed and turning downwind at low level. One of the factors which can give rise to the loss of control, in this situation, can be attributed to illusory ground reference clues. In this illusion, while the aircraft is turning cross wind to downwind, the pilot mistakenly believes they are slipping into the turn. They also can mistakenly believe their airspeed has increased due to the apparent increase in ground speed.⁷ The pilot then makes uncoordinated control inputs to counter the illusion.
- 2.8 Another situation is where the pilot might "hurry" the turn. This is achieved by applying excess rudder into the turn. Both examples have the same outcome – being that uncoordinated control inputs that can lead to a loss of control.
- 2.9 The glider struck the ground rotating about the left wing tip. A combination of the effects explained above could have led to a spin entry and subsequent impact, or the pilot may have encountered significant sink during the last downwind turn.

⁷ Refer to Fly Light , Ground School – Theory of Flight:
www.auf.asn.au/groundschool/turn_speed.html

In the latter case, low airspeed, a forward centre of gravity and higher than allowable aircraft weight may well have presented a situation where the pilot did not have sufficient pitch control to arrest descent.

2.10 Recent accidents involving gliders in competitions and investigated by CAA have indicated that human factors played a predominant part. In each case, safety briefings were given to the pilots involved and all were experienced, but the influence of competition can lead to unsafe decision making or un-necessary risk taking by the pilots. The following are examples:

- Occurrence No. [07/4533](#) D2929 Turret Peaks, 21 December 2007
- Occurrence No. [06/4214](#) G-OJTA Mount Prospect, Central Otago, 15 November 2006

3. Conclusions

- 3.1 The pilot was appropriately qualified, experienced and briefed for the flight.
- 3.2 The pilot had been assessed as medically fit to fly.
- 3.3 The glider had a valid Airworthiness Certificate and no pre-accident defect(s) were found.
- 3.4 The glider's maximum allowable weight, and maximum allowable cockpit weight, exceeded those stated in the Flight Manual. This may have made the glider less stable and responsive, particularly during steep turns at low airspeed.
- 3.5 During a downwind, low level turn the pilot lost control of the glider with insufficient height remaining to recover the situation.
- 3.6 The decision to carry out a series of low level turns and the eventual loss of control was likely to have been influenced by competition and human error rather than any overriding degree of human under-performance caused by fatigue and or dehydration.
- 3.7 The glider's impact with the ground was not survivable.

4. Safety action

- 4.1 A CAA safety action (No. 10A722) has been raised to increase the awareness of glider pilots that they can lose control of gliders during low level manoeuvres as a result of illusory ground reference clues.
- 4.2 A CAA safety action (No. 10A723) has been raised to increase awareness amongst glider pilots as to the influence competition flying can have on decision making and risk taking.
- 4.3 A CAA safety action (No. 10A724) has been raised to increase awareness amongst glider pilots as to the importance of ensuring that the glider is operated within the Flight Manual weight and balance limits.

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