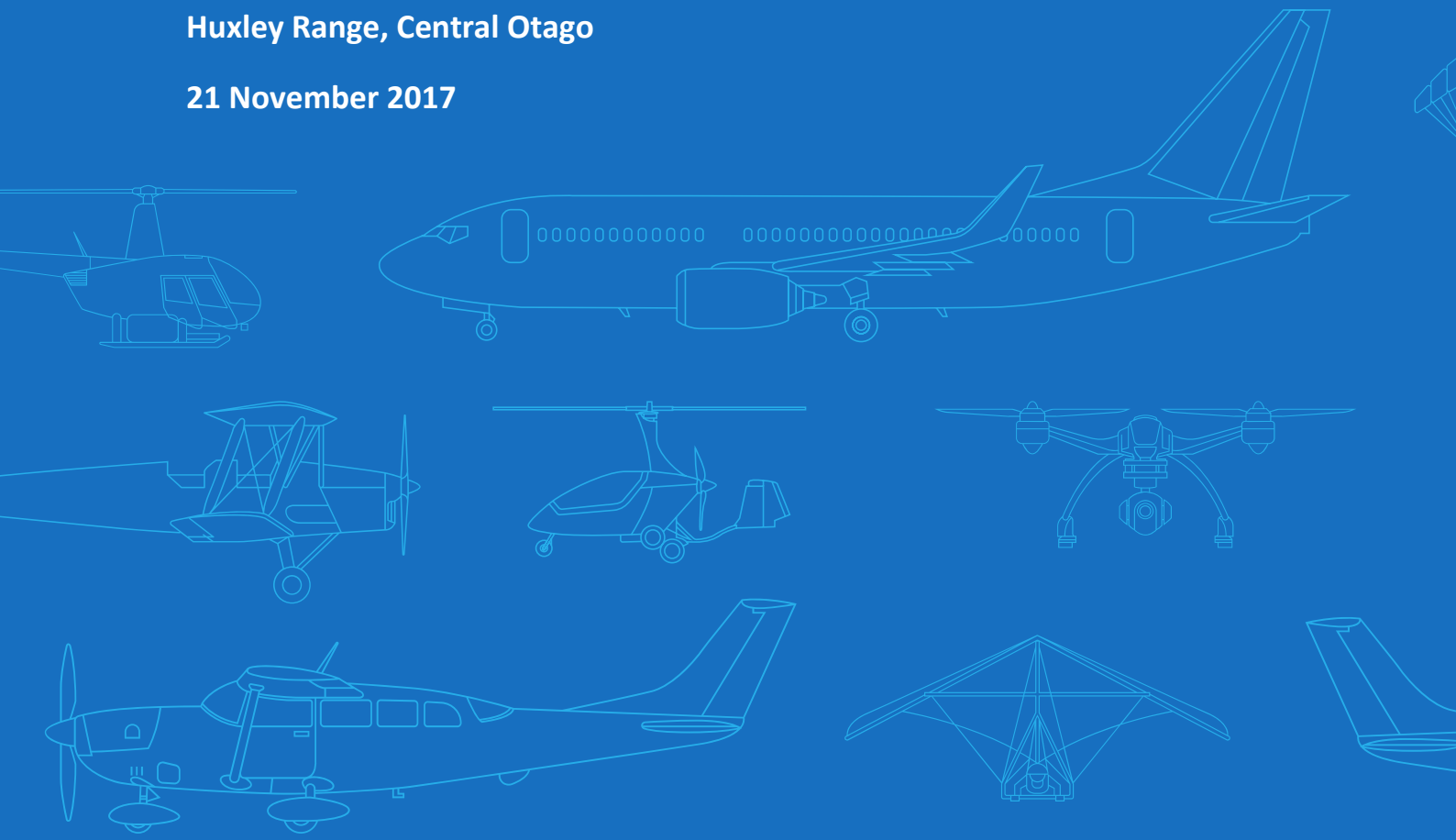
CAA SAFETY INVESTIGATION REPORT

Departure from controlled flight

ZK-GXG, Schempp-Hirth Discus-2C Glider

Huxley Range, Central Otago

21 November 2017



CAA Final Report 17/7309

Date 23 March 2020

Revised 6 April 2021

Contents

Executive summary

A Schempp-Hirth Discus-2c glider was being flown by a visiting overseas pilot as part of the South Island Regional Gliding Championship (the Championship) on the afternoon of 21 November 2017.

The pilot had achieved the first two points of the set racing task and was thermalling[1] close to terrain below the Hunter Ridge in the Huxley Range, Central Otago. Following a series of right hand turns the aircraft made a left turn, the airspeed rapidly reduced, followed by an aerodynamic stall[2]. There was insufficient height to recover from the stall and the glider impacted the terrain.

Competitors in the Championship saw the glider on the hillside and raised the alarm. One of these gliders flew lower and the pilots observed the pilot motionless in the glider.

A search and rescue helicopter arrived on scene and medics confirmed the pilot had received fatal injuries.

The Transport Accident Investigation Commission was notified of the accident and elected not to open an inquiry. Accordingly, a Civil Aviation Authority safety investigation commenced.
The safety investigation identified the following contextual factors:

- Wreckage signatures and track data indicated an unrecovered aerodynamic stall
- Though an experienced glider pilot, he was not experienced at gliding in the South Island mountainous environment
- The pilot made an error in judgement by delaying a decision to stop circling.
- It was possible the pilot's performance had degraded after a period of challenging flying
- Flying in the Championship may have influenced the pilot's decision-making
- The South Island mountainous area is regarded by pilots as one of the world's most challenging gliding environments and the soaring conditions were challenging that day.

[1] Thermalling is the process of circling within columns of rising air to gain lift.

[2] Aerodynamic stall is a condition where the wing's angle of attack increases beyond a certain point such that lift begins to decrease. The angle at which this occurs is called the critical angle of attack.

Safety messages and recommendations

Pilots new to flying in the South Island mountains need to be cognisant of the challenges this environment poses and consider the risks of flying solo.

Pilots are reminded that the South Island mountainous environment is particularly challenging, even for those experienced in the area. Anything that affects their fitness to fly or decision-making will increase the risk of something going wrong. Pilots are advised to:

- gain knowledge and skills from experienced local pilots
- undergo instruction, or at least fly with another experienced local pilot until familiar with the environment
- fly with caution and within their own limitations
- always have an escape route when circling below a ridge and make the decision to turn away early.

A safety recommendation has been made for Gliding New Zealand Incorporated (GNZ) to consider the appropriateness of visiting pilots flying as solo competitors if they are new to the New Zealand South Island mountainous area and have limited recent experience in similar environments. GNZ accepted this recommendation and has provided further guidance in GNZ Advisory Circular 2-13 Mountain & Ridge Soaring Safety Principles, Section 7 *Competitions*. [3]

[3] http://gliding.co.nz/wp-content/uploads/2020/04/AC2-13v4.pdf

Incident timeline

11 Nov 2017	The pilot and a friend arrive at Omarama to attend a week-long mountain soaring course with a gliding training organisation (the organisation), followed by the South Island Regional Glider Championship (the Championship)
12 to 16 Nov	The pilot completes the course and passes a biennial flight review (BFR)[4]
	The pilot decides to enter the Racing Class of the Championship with his friend acting as crew
17 to 18 Nov	Two practice flights are flown by the pilot in a single seat Discus-2c, ZK-GXG, rented from the organisation
19 Nov	First day of the Championship. The pilot completes the Racing Class task, placing 10th
20 Nov	All Championship flying tasks are cancelled due to the weather
21 Nov	
Morning	The pilot attends the morning briefings and conducts pre-flight planning and the daily inspection
By 1300 NZDT[5]	The pilot and his friend are on the grid[6] ready for launch for the Racing Class
1347	ZK-GXG is launched by aero tow
1535	ZK-GXG achieves the first racing point, Stewarts[7], at 7125 feet (ft) [8] and soars to the next task point, Makarora East
1616	ZK-GXG enters the eastern edge of the Makarora East point at 6030 ft then soars across the Hunter Valley towards the Hunter Ridge[9] for the next task point, Morven
1625	ZK-GXG arrives on the western side of the Hunter Ridge at 4500 ft and completes six right turns attempting to gain altitude from thermal uplift (refer to Figure 3). The wind averages 182°Magnetic and 8-10 knots (kt) and

[4] A current BFR flight check is required by GNZ before any pilot can take part in the Gliding Championship.
[5] All times in New Zealand Daylight Time (NZDT) which GMT+13 hours.
[6] The grid is the close positioning of competition gliders on the runway in preparation for launch.
[7] Refer to Figure 1: Racing Class Task A.
[8] All heights given as feet (ft) above mean sea level unless specified as above ground level (agl).
[9] The Hunter Ridge refers to the ridges above the Hunter River and are part of the Huxley Ranges.

	the glider's indicated airspeed (IAS)[10] ranges between 49 and 68 kt in the turns.
1629:11	No lift is gained and ZK-GXG stops circling and tracks close to rising terrain on a north-easterly heading (refer to Figures 3 and 4)
Next 6 seconds	ZK-GXG's IAS progressively reduces (refer to Figure 3 and 4)
1629:17	The IAS reduces to 41kt, ZK-GXG enters a left turn, rapidly loses height, and strikes terrain two seconds later (refer to Figures 4 and 5)
1658	Passing Championship pilots observe the damaged glider below the ridge and see no sign of movement. They make a MAYDAY call "glider down on the Hunter Ridge" to the Championship operations base. Championship emergency response procedures commence
1709	Rescue Coordination Centre of New Zealand (RCCNZ) is alerted and a rescue helicopter is dispatched. RCCNZ notifies the CAA
1725	The tow plane from Omarama flies to the accident site to act as a marker for the helicopter, and relays information to base
1742	Rescue helicopter arrives on site. The pilot is confirmed as deceased
1801	The Transport Accident Investigation Commission elects not to open an inquiry. Accordingly, a CAA safety investigation commences

[10] Indicated airspeed (IAS) data as calculated by the GPS. This may differ slightly from the indicated airspeed that the pilot would have seen on the glider's airspeed indicator.

Incident maps and photographs

Day 2 Racing Class Task A

Task Information *Reg 2017 Day 2 (21/11/17) Racing - Task A*

Type: Assigned area task with 3 areas **Reg 2017 Day 2 (21/11/17) Racing - Task A**

Task distance: 144.3km/314.5km (225.9km)

Style	Code	Points	Latitude	Longitude	Dis.	Crs.
Start		303-Horrible	S44°32.000'	E170°00.000'		
1.Point		099-Stewarts	S43°57.000'	E169°58.000'	64.9km	358°
2.Point		L305 Makarora East	S44°16.400'	E169°12.100'	71.0km	239°
3.Point		064-Morven	S44°38.500'	E169°30.400'	47.6km	149°
Finish		305-OM Finish	S44°28.800'	E169°59.433'	42.4km	65°

Observation zone description:
Start 303-Horrible: Cylinder R=5.0km, Max.alt. is 7999ft
1.Point 099-Stewarts: Cylinder R=15.0km
2.Point L305 Makarora East: Cylinder R=25.0km
3.Point 064-Morven: Cylinder R=15.0km
Finish 305-OM Finish: Cylinder R=3.0km

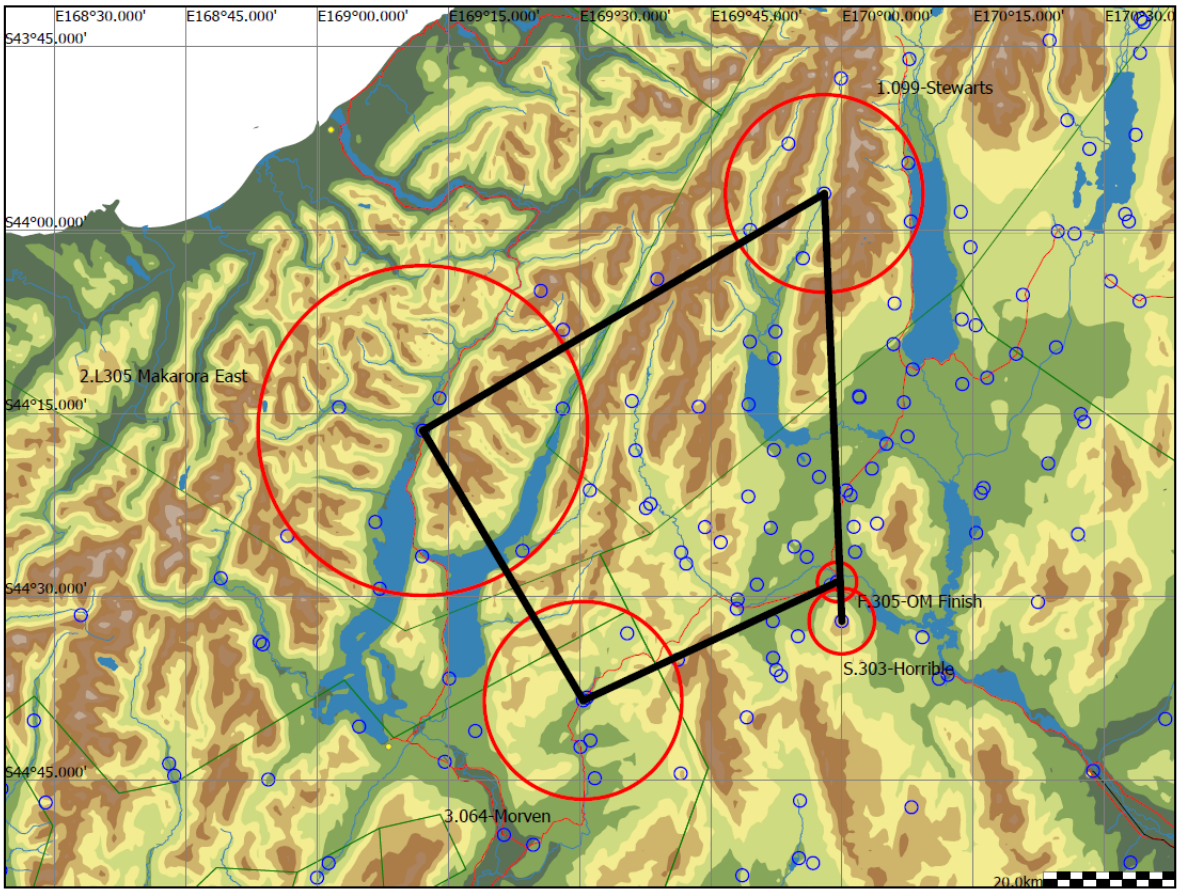


Figure 1: Racing Class Task A as provided to competing pilots. (Source: Gliding New Zealand)

Incident maps

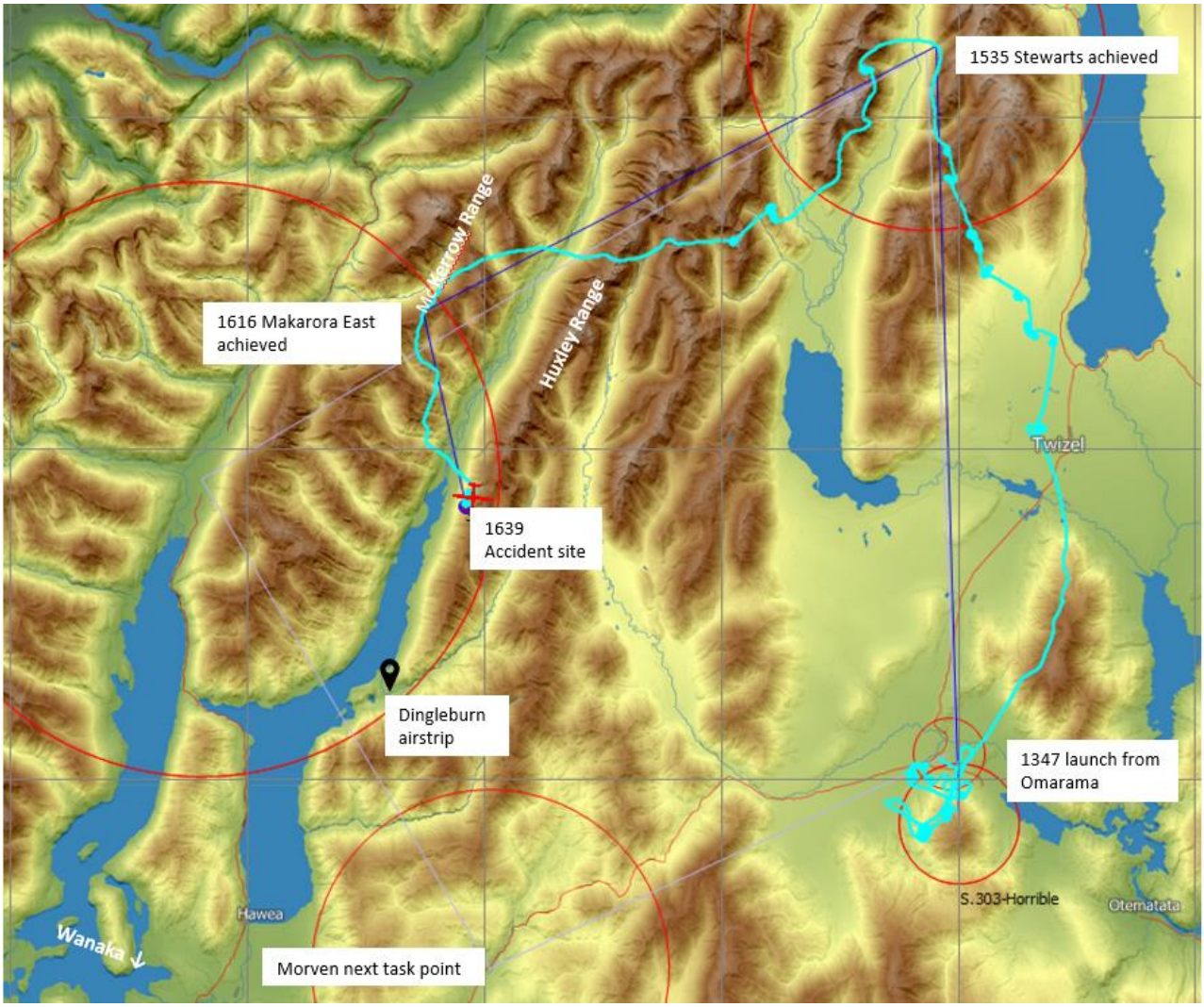


Figure 2: Map of flight path. (Source: Pilot's Oudie GPS)

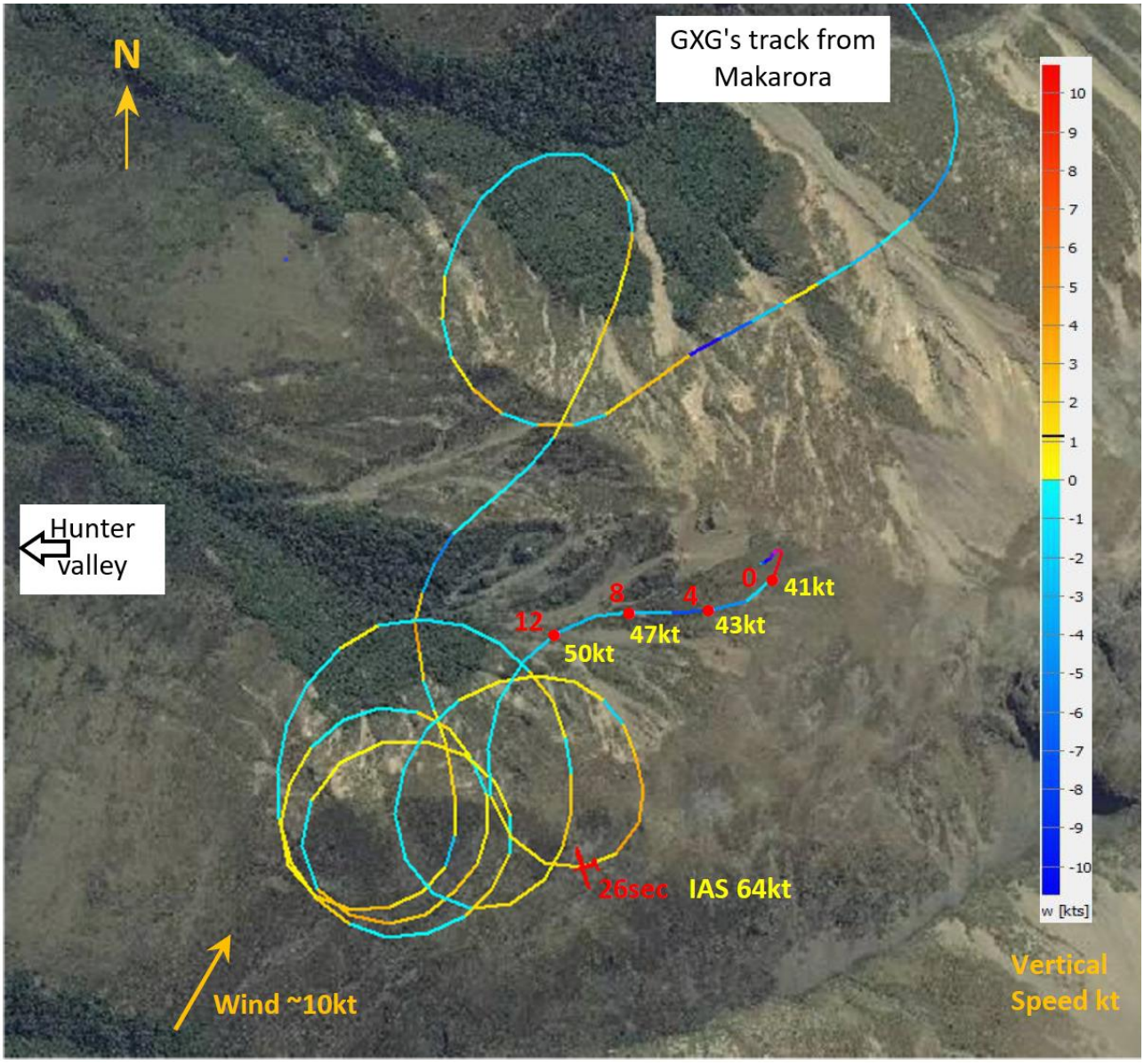


Figure 3: ZK-GXG's track below the Hunter Ridge showing spot speeds up to 26 seconds before the stall. Refer also to Figure 4. (Source: ZK-GXG LX9000)

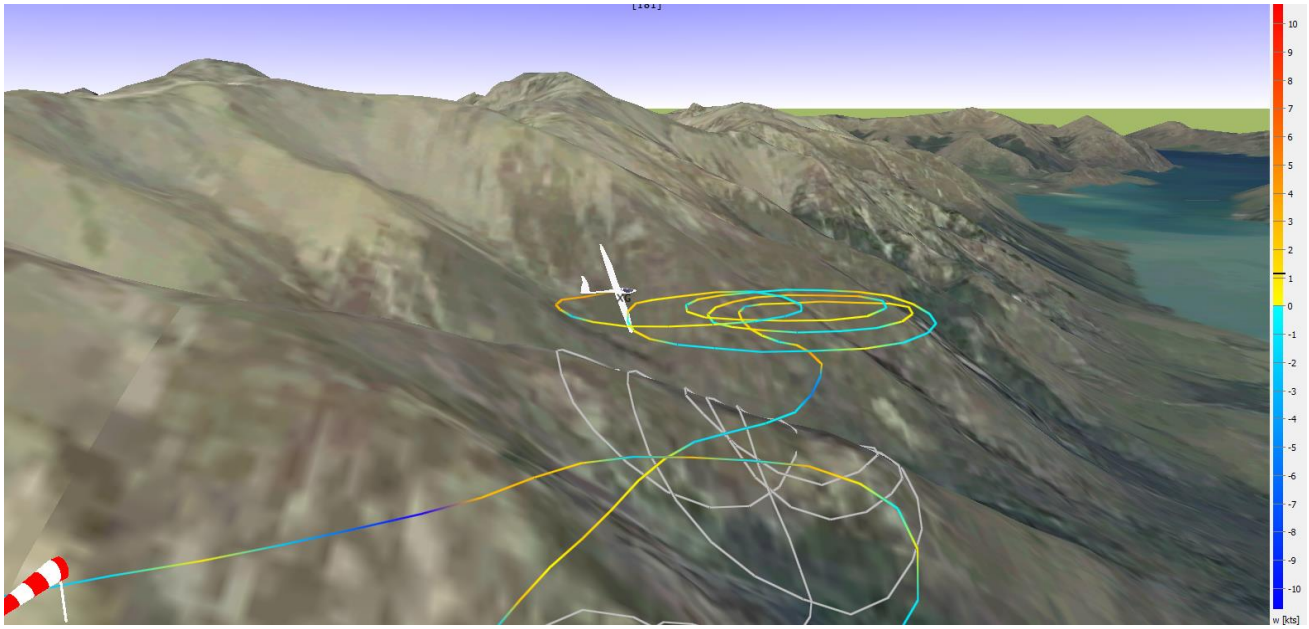
Screenshots for the 26 seconds prior to ZK-GXG stall

On the following page(s), Figure 4 shows a series of See You™ screenshots of the last 26 seconds of ZK-GXG's flight before the aerodynamic stall.

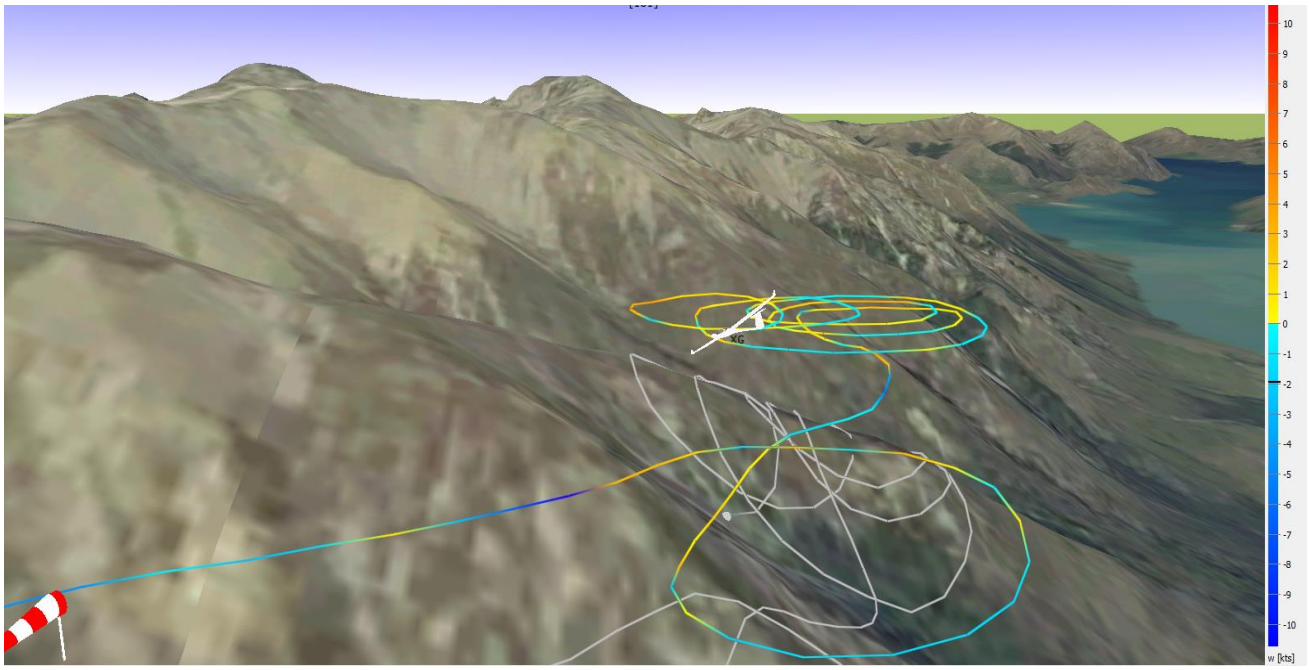
These screenshots were created by GNZ using data from the LX9000 installed on ZK-GXG. Use the mouse scroll wheel, or arrow keys, to animate these eight images.

Note: The white dot at the end of the ground trace in each screenshot indicates the ground clearance directly below the glider.

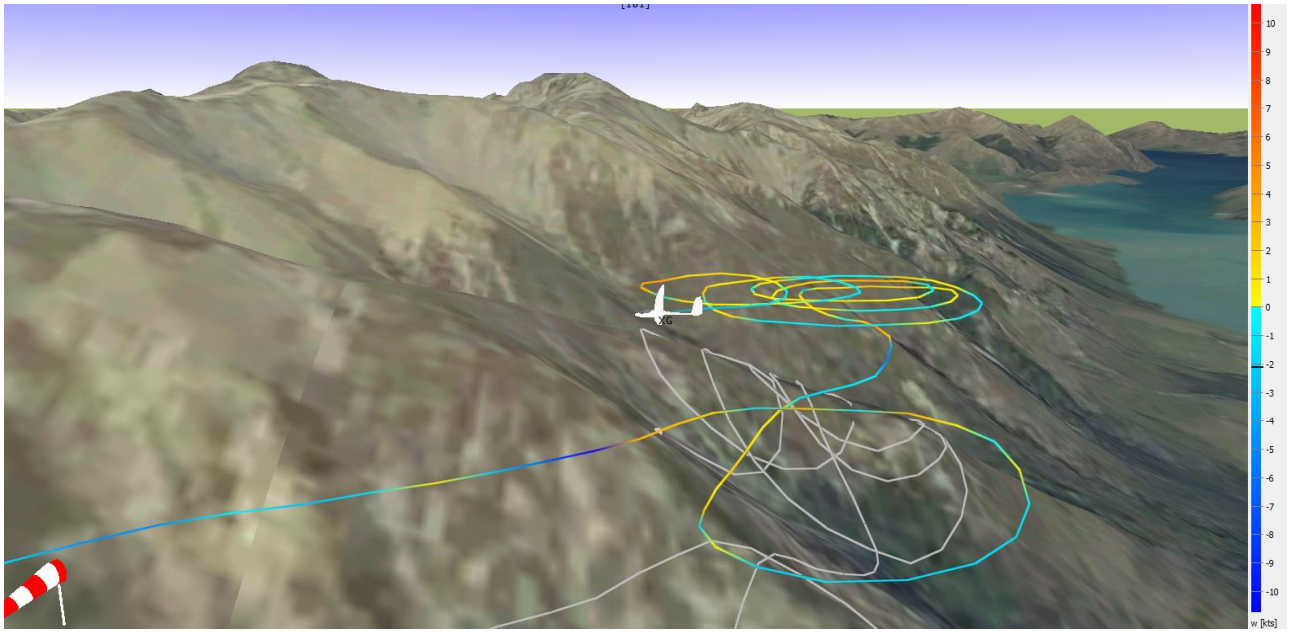
26 sec IAS 64kt



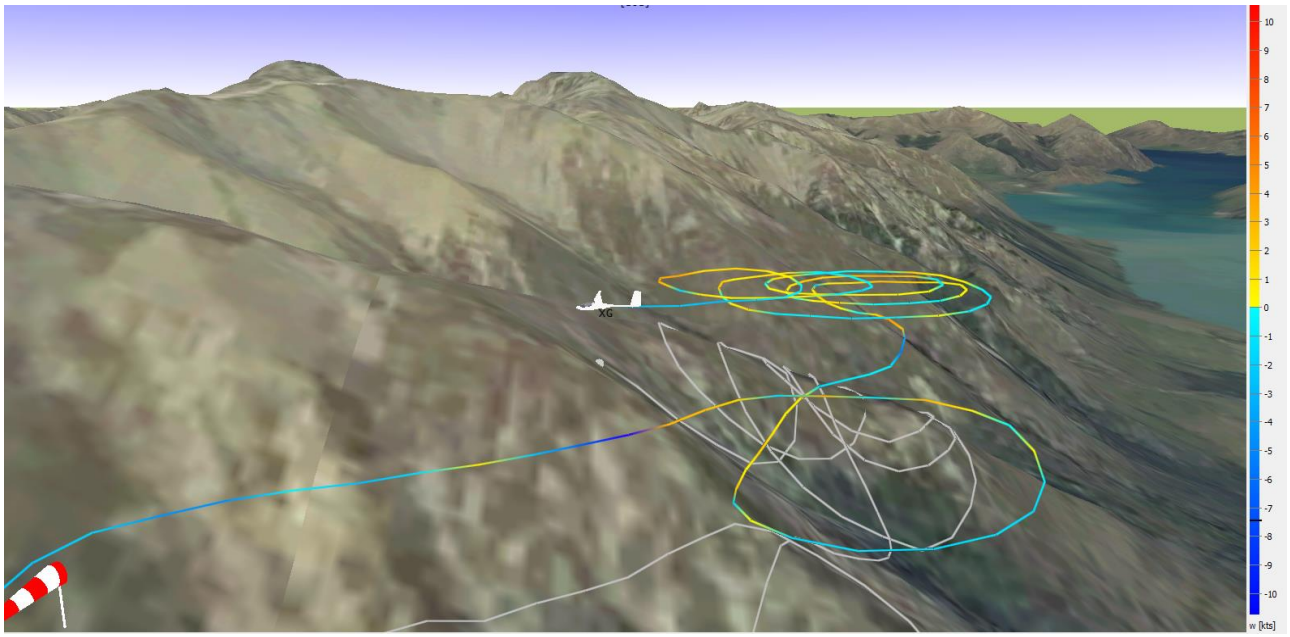
12 sec IAS 50kt



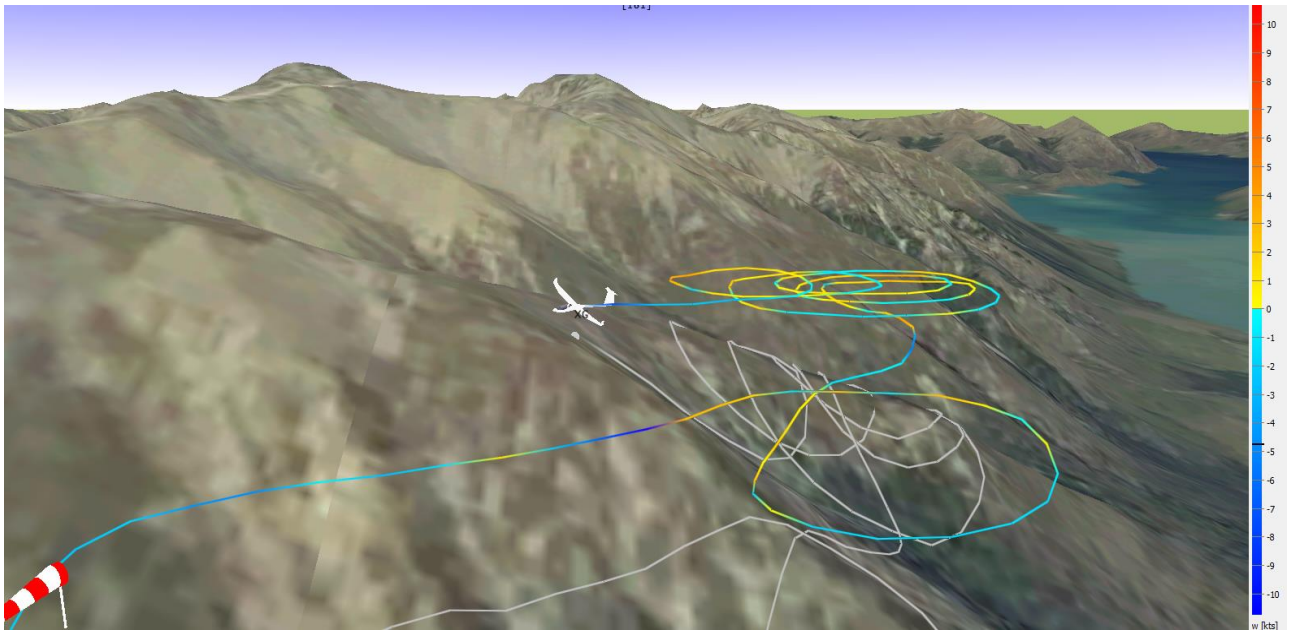
8 sec IAS 47kt



4 sec IAS 43kt



2 sec IAS 39kt



0 sec IAS 41kt

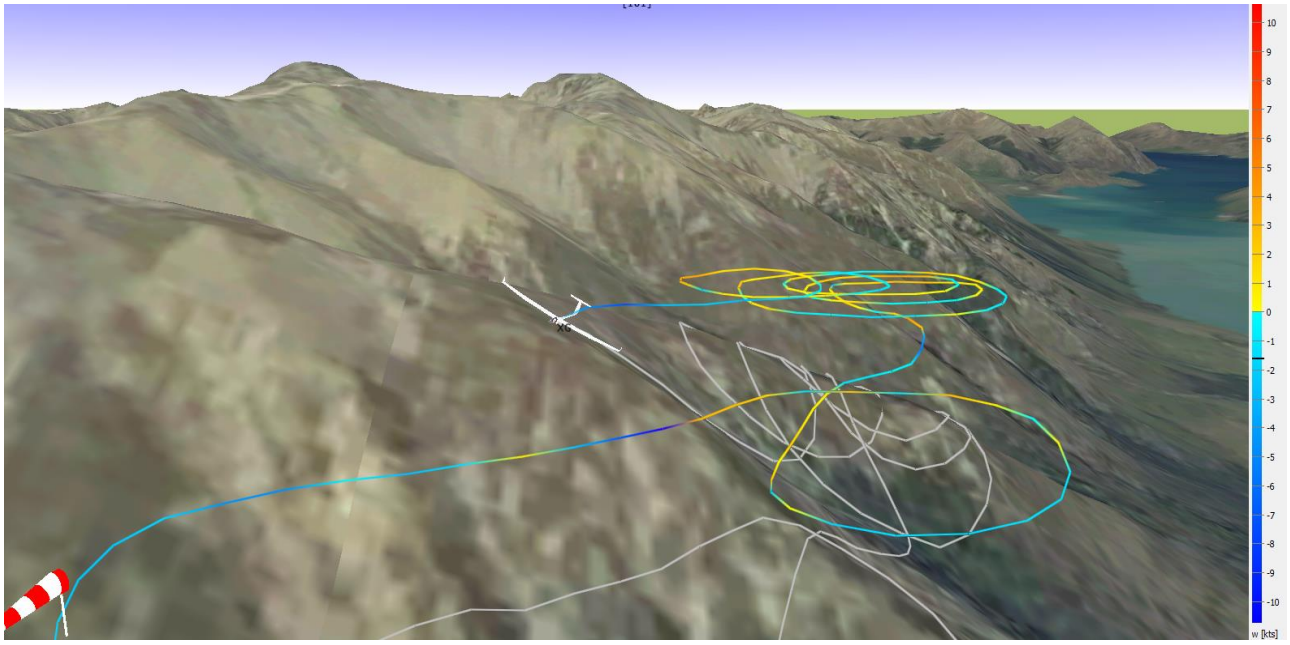


Figure 4: Series of See You™ screenshots of the last 26 seconds of ZK-GXG's flight (Source: GNZ from ZK-GXG LX9000)

Photographs

Figure: 5. ZK-GXG below a spur on the Hunter Ridge. Main fuselage is facing south.
(Source: CAA field investigation 0810 23/11/17 NZDT)

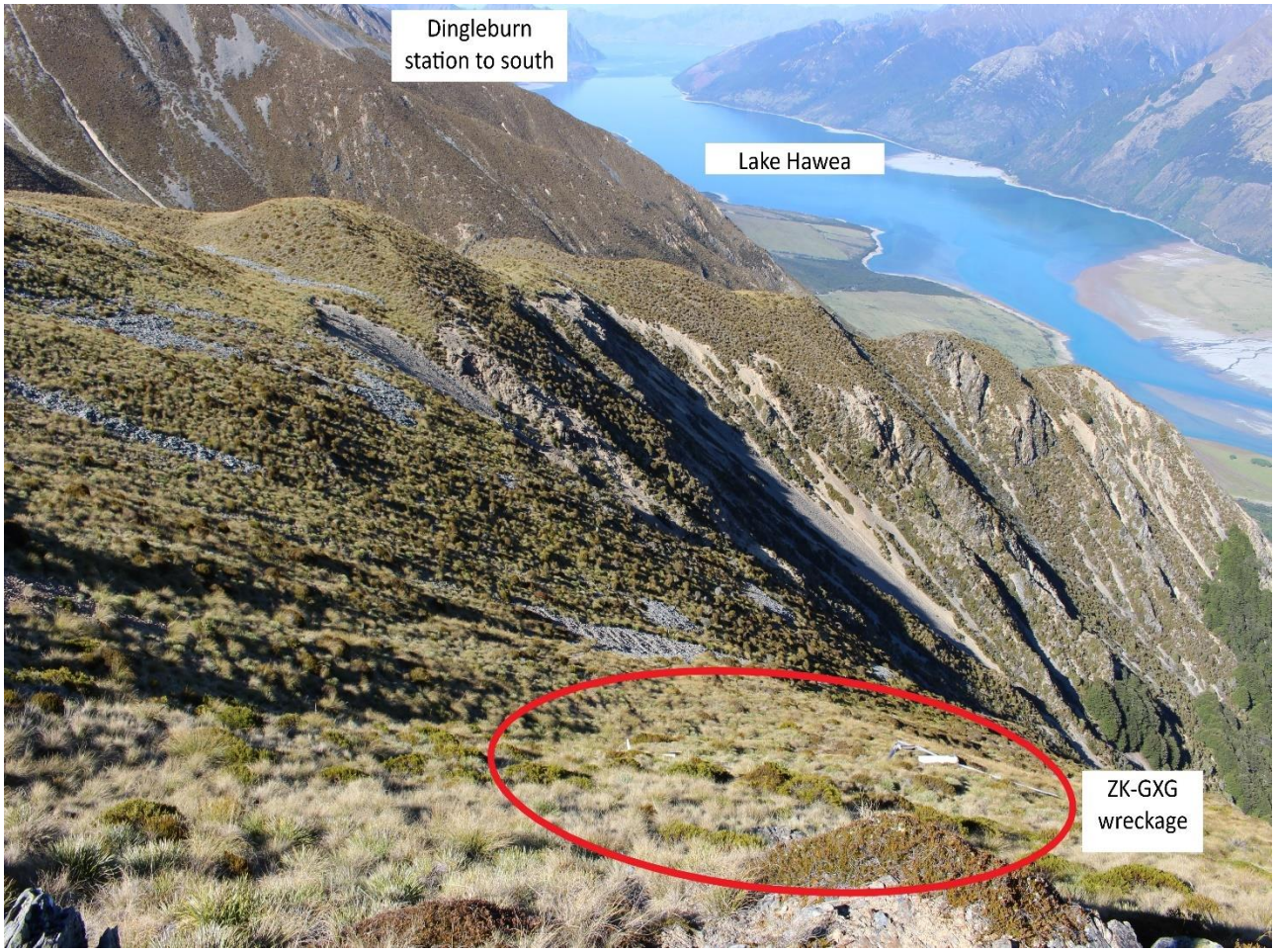


Figure 6: ZK-GXG on a 30° slope facing south. The Hunter River valley is to the right and Dingleburn Station airstrip is further south. (Source: CAA field investigation 0839 23/11/17 NZDT)

Findings and conclusions from the investigation

The safety investigation covered human factors, equipment factors, and environmental factors. The key findings are listed below and are then described in more detail.

Equipment factors	• No pre-accident defects were found with the glider • Wreckage signatures and track data indicated an unrecovered aerodynamic stall
Human factors	• Though an experienced glider pilot, he was not experienced at gliding in the South Island mountainous environment • The pilot made an error in judgement by delaying a decision to stop circling • It was possible the pilot's performance had degraded after a period of challenging flying • Flying in the Championship may have influenced the pilot's decision-making.
Environmental factors	• The soaring conditions were challenging that day • The South Island mountainous area is regarded as one of the world's most challenging gliding environments • The Championship operated in accordance with Gliding New Zealand procedures and Civil Aviation Rules.

Equipment factors

Aircraft information

ZK-GXG was a Discus-2c, single seat, high-performance glider constructed from fibre-reinforced plastic. It had a swept-back wing with winglets and airbrakes on the upper surface and was flown in the 18-metre configuration for the Championship. It was fitted with an LxNav LX9000 Vario Navigation system (LX9000) from which Global Positioning System (GPS) data pertaining to the flight was accessed. The pilot's portable NavITer Oudie Navigation system also tracked the flight.

Figure: 7. Example of Discus-2c (Schempp-Hirth brochure)

No pre-accident defects were found with the glider

ZK-GXG was built in Germany in October 2007 and registered as D-6111. It was imported into New Zealand in November 2009 and a certificate of airworthiness in the standard category was issued by the CAA. The annual review of airworthiness was completed on 11 October 2017 with no defects or discrepancies. There was no recorded maintenance carried out on the glider after that. At the time of the accident the glider had accrued 1840 hours total flight time.

On the day of the accident, the organisation's ground crew and the pilot both completed the daily inspection. Thirty litres of water ballast were added to each wing and approximately five litres to the tail.[11] Other Championship competitors reported dumping some of their water in flight. The safety investigation was unable to determine if ZK-GXG's pilot did the same, or by how much, as any remaining water was lost during the accident sequence.

It was calculated that the glider was within weight and balance limitations. During the site examination, no mechanical defects which may have contributed to the accident were identified.

Wreckage signatures and track data[12] indicated an unrecovered aerodynamic stall

Following what appears to be an uneventful flight, ZK-GXG achieved the Makarora East point and soared towards the Huxley Range and the next task point, Morven (refer to Figures 1 and 2).

Near the accident location, six right turns were completed close to the Hunter Ridge at between 300 to 1200 ft agl at an average IAS of 54 kt. After rolling out of the last right-hand turn, the glider progressively slowed as a left turn was initiated at around 4500 ft. The IAS reduced to 41 kt followed by a 30° bank left turn away from the ridge at 100 ft agl (refer to Figures 3 and 4). The glider descended rapidly, and the left wing impacted the terrain, followed shortly by the fuselage and right wing. After the initial impact, the glider slid forward on a westerly heading then rotated

[11] The pilot's friend could not recall exactly how much water was in the fin and no records of water uplift are required.
[12] Data from aircraft and pilot's GPS navigation devices.

left to slide down the slope and come to rest approximately 25 metres from the initial impact point (refer to Figures 5 and 6).

The wreckage signatures and the track data indicated that the glider's critical angle of attack[13] was exceeded, with a loss of lift, typical of an aerodynamic stall. There was insufficient height above terrain for the pilot to recover control.

Human factors

Though an experienced glider pilot, he was not experienced at gliding in the South Island mountainous environment

The pilot was considered an experienced pilot and instructor, having accrued 4682 hours of flight time in gliders (refer to Appendix 1: Pilot information). He met the GNZ requirements for entry into the Championship which included completing the mountain soaring course and passing the GNZ BFR.

The pilot had limited gliding experience in New Zealand prior to this visit. He was reported to have had considerable (hundreds of hours) flying and instructing in the Australian mountains of Victoria where he was based. He had gained some[14] mountain soaring experience in the USA and more recently in the French Alps in 2012. Pilots experienced in both the South Island and Australian environments reported the South Island flying conditions are quite different to Australia and, in their opinion, would have been challenging for the pilot, despite his experience in USA and France.

The pilot was cognisant of his lack of local experience and completed the mountain soaring course and conducted solo flights prior to the Championship. The organisation's owner stated that given the pilot's age and lack of New Zealand mountain flying experience, he reviewed the tracks from every flight the pilot completed and discussed these with him. He stated that the pilot had flown appropriately and in accordance with "what he had been told" in the first Championship task.

The owner reviewed ZK-GXG's track leading up to the accident. He noted that the pilot had flown well with a steady pattern of climbing and soaring and had achieved the first point, Stewarts, well into the circle. He stated the pilot "clearly had a plan for the task" and "appeared to have easily achieved Makarora".

The owner, and experienced local pilots all stated that the pilot's actions close to the Hunter Ridge were contrary to gliding best practice. Several stated they felt the conditions were "stretching [the pilot's] ability".

In 2016 the CAA investigated an accident that occurred during the South Island Regional Gliding Championship. During a reversal turn, away from a ridge, the right wing of the glider G-OJTA struck terrain, the glider was destroyed, fatally injuring both occupants.

[13] The angle of attack is the angle between the line of the chord of an aerofoil and the relative airflow. When this angle increases beyond a certain point - the critical angle of attack - lift rapidly decreases.
[14] Exact hours flown are unknown as this logbook could not be located.

The CAA Accident Report, G-OJTA Section 4.1[15] made a recommendation to GNZ that they: *"encourage gliding clubs to mentor visiting pilots, and pilots with limited experience on gliding in the New Zealand Southern Alps during a contest environment".*

It appears that the pilot in ZK-GXG did receive mentorship from:

- the organisation - both during the course and during the Championship
- the Championship itself, via daily briefings and a competitor mentorship programme
- fellow competitors and local pilots on an informal basis.

However, a safety recommendation has been made to GNZ to consider the appropriateness of visiting pilots flying as solo competitors if they are new to the New Zealand Southern Alps and have limited recent experience in similar mountainous environments. GNZ has accepted this recommendation and has provided further guidance in GNZ Advisory Circular 2-13 *Mountain & Ridge Soaring Safety Principles* Section 7 Competitions. [16]

The pilot made an error in judgement by delaying a decision to stop circling

It appears the pilot made a late decision to stop circling below the ridge, leaving no escape option. The series of right turns plus the effect of the south-westerly tail wind (12 kt average) took the glider progressively closer to the side of the Hunter Ridge. The general south-easterly airflow over the Hunter Ridge created pockets of sinking air which reduced the thermal lift. Any remaining water ballast would have increased the stall speed and adversely affected the handling of the glider close to the stall but was unlikely to be a contributory cause of the stall.

GNZ Advisory Circular AC2-13 *Mountain & Ridge Soaring Safety Principles* provides advice on circling near a hill which states:

> *"It is vitally important when considering circling near a hill that you consider the risk of sudden loss of height if sink is encountered. Many mountain flying accidents have occurred due to insufficient margin when circling near the hill. Both horizontal and vertical separation needs to be considered along with drift due to wind. Circling against slopes (as opposed to figure of eights) is potentially hazardous, particularly in weak climbs. In these conditions, there is a constant need to closely monitor drift and push out from the slope for a few seconds on each turn. Figure of eights should be used if you have any doubt, carefully watching your drift and always turning away from the hill."*

The pilot had been taught to perform figures of eights in the mountain soaring course. His instructor commented that he demonstrated proficiency in conducting the figure of eight. This was confirmed by the investigation review of the tracks from the training flights.

It is likely due to the weak thermal conditions that the pilot opted to use the circling technique instead of the figures of eight. During the circles, the glider had drifted progressively closer to the ridge. Following the sixth circle the glider flew parallel to the ridge and commenced the left turn. It takes some time to reverse a turn and, in this case, this was compounded by the tailwind and loss

[15] https://www.aviation.govt.nz/assets/publications/fatal-accident-reports/G-OJTA_Fatal_15_Nov_06.pdf
[16] http://gliding.co.nz/wp-content/uploads/2020/04/AC2-13v4.pdf

of thermal lift. The glider covered significant ground in this time. With the spur in front of him and little clearance from the terrain, the pilot had no escape options remaining.

Gerrard G Dale[17] explains the importance of making early decisions when circling below hill tops.

If continuing the turn into a circle, make the decision early

When the wind on the ridge is very light and there are thermals mixed into the flow, you may climb better by circling. It takes a long time to reverse a turn from one direction to the other and in that time a glider will travel quite a long way over the ground. By circling you can keep the glider in a smaller area of lift. However, if you want to continue a turn and fly a full circle near or below the hill top then you must make the decision very early, when you are flying parallel to the ridge. If you try to change your mind later on you may find that you are already committed - you are pointing towards the hill and cannot turn away if you suddenly realise you are too close.

A late decision may lead to an inevitable crash

This is a trap for newcomers to ridge soaring and one of the reasons you should not circle beneath the hill top until you are experienced in this type of flying. Even then you should think carefully about the situation before you decide to circle. If you are not absolutely sure, without any doubt, that there is room to circle plus a big safety margin - don't! Fly a figure-eight instead.

Source: Dale, G. The Soaring Engine, Volume 1, page 19.

[17] Dale, G.2016. *The Soaring Engine, Volume 1.* Alton, United Kingdom. http://thesoaringengine.com/

There is a wealth of information[18] and advice for pilots flying in mountainous areas including flying in proximity to ridge lines. Below is a short summary on threats from experienced glider pilot, Arthur Gatland[19] Refer also to Appendix 2: Safety in Mountain Flying.

Threats	Possible Strategies
Irregular ridge lines	Be aware of the probability of unexpected ridges and spurs appearing in front of you. Irregular ridges are guaranteed to produce strange wind effects. Always have a safety margin in distance from the ridge, and always fly at a minimum of your "safe speed near the ground." Trim for this speed and always have an escape route away from terrain.
Inconsistent winds, giving stronger and weaker lift, windshear, turbulence	There will be instances of loss of airspeed, one wing lifting unexpectedly, possibility of stall. Expect this to happen and allow safety margins. Remember, unlike the car ads – in gliding it is Lack Of Speed that Kills!
Stronger winds due to funnelling etc	Recognise this as a serious threat! Often you will find yourself closing with the ridge faster than expected. Never fly directly towards the ridge, but close on it obliquely so you can always turn away when required.
Difficulty in depth perception	Ridges – particularly in the South Island – that do not have vegetation (trees) make it difficult to assess how far away you are. The rock you can see might be 5 metres wide or the size of a house – you really can't be sure. This has probably resulted in several pilots flying too close and dying as a result. Allow more margin than you think necessary!
Any nagging doubts or uncertainty about what you are doing ...	Get out of there – pronto!
Over-confidence (This includes a level of confidence higher than your level of experience.)	Every pilot must acknowledge that we are all human and we do all make mistakes. Ridge flying is very unforgiving and over-confidence has proven repeatedly to be fatal.

Table 1: Ridge Soaring - Threats and Strategies (source Arthur Gatland)

Previous CAA accident investigation reports[20] describe the causes of gliding accidents in mountainous terrain. Pilots are reminded of the recommendation made in the CAA Accident Report ZK-GZV [21]:

"When operating in close proximity to high or mountainous terrain, it is vitally important that sufficient distance from the terrain is maintained to allow for any sudden height loss due to unexpected changing environmental conditions. Glider pilots need to be aware of not falling into the trap of continued flight close to terrain while leaving themselves with no other options for a safe flight path away from the terrain."

[18] See Mountain flying in the reference section of this report.
[19] Gatland, A. 2010. Gliding Threat and Error Management. *Soaring, August 2010.*
[20] See CAA fatal glider accident reports in the reference section of this report.
[21] https://www.aviation.govt.nz/assets/publications/fatal-accident-reports/ZK-GZV-Fatal.pdf

Pilots are encouraged to:

- gain knowledge and skills from experienced local pilots
- undergo instruction or at least fly with another experienced local pilot until familiar with the environment
- always have an escape route when circling below a ridge and make the decision to turn away early
- be cautious to fly within their own limitations.

It was possible the pilot's performance had degraded after a period of challenging flying

Championship competitors stated the gliding conditions were "difficult" and "challenging" that day. At the time of the accident the pilot had already flown 2 hr 42 minutes and had been preparing for the flight all morning. It is possible that the combined effects of a prolonged period of physical and mental demands on the pilot may have reduced his performance when he encountered the area of poor thermal lift below the ridge.

Hydration and nutrition

It had been several hours since the pilot had eaten or drunk anything[22]. Though he carried one water bottle and snacks in the glider only a few sips of water and a few nuts had been consumed.

Interviews with other witnesses stated they would normally drink one to three litres of water in a three-hour flight. Family members and gliding colleagues stated that the pilot usually drank water from a Camelback ™ type system or bottles during flights. He was an experienced instructor pilot and aware of the need to maintain blood sugar and hydration. However, his instructor stated he had to remind the pilot about maintaining hydration during the mountain soaring course. The Championship daily briefings included reminders about the importance of inflight hydration and nutrition.

A level of mild dehydration or low blood sugar may have affected the pilot's physiological wellbeing and performance, but it cannot be concluded as a definitive causal factor.

All pilots are reminded of the importance to maintain hydration and blood sugar during flight.[23]

Medical fitness

The pilot held a Civil Aviation Safety Authority (CASA), Australia Class 2 medical which was valid to 02 August 2018. He had a current Gliding Federation of Australia Medical Practitioner's Certificate of Fitness stating that he had a chronic condition that was "under control and does not impact his ability to fly". His family reported that he was fit and well.

Concerns were expressed by the course instructor and other Championship competitors that the pilot appeared "frail", "physically and mentally tired". Some made comments relating to the pilot's age (78 years). The owner stated he reviewed the pilot's performance during the mountain

[22] His friend stated the pilot had eaten and drunk fluids prior to the flight.
[23] See Dehydration in reference section of this report.

soaring course and after all solo flights. He said had there been any concerns he would not have authorised the pilot to enter the Racing Class solo. The pilot was aware of the effects of ageing on pilot physical and cognitive performance and had written an article titled "Ageing Pilots", for his local gliding club.

The pilot's friend stated that the pilot had a good night's sleep the day prior to the accident. He had taken his prescribed medications, was in good spirits, and appeared fit to fly. The autopsy report determined that the pilot died of injuries sustained in the accident and not from any pre-existing medical condition.

Physical and cognitive demands

The pilot was an experienced instructor and competition pilot. He had, however, been exposed to an intense period of mental and physical exertion; the week's mountain soaring course followed by the Championship. This was in a new and challenging environment flying a glider different to his own.

The instructor stated that the pilot "wasn't used to putting in the effort required [for the environment] …. he could fly okay, but performance dropped at the end". He passed the course, but the instructor cautioned the pilot about entering the Championship due to concerns about the prolonged (five-hour) effort required.

ZK-GXG's flight track showed the expected pattern of thermalling and soaring to achieve the first two points of the racing task. However, below the Hunter Ridge the pilot made an error in judgement, flew too close to terrain, and left no escape options, ultimately leading to the accident. The difficult soaring conditions likely subjected the pilot to prolonged physical and cognitive demands, possibly leading to fatigue. A level of fatigue could explain his decision to persevere with circling below the ridge.

Several similar accidents[24] have occurred involving younger/fitter pilots who were equally inexperienced in the South Island mountainous environment. Other Championship pilots reported they found the flying conditions challenging that day. Therefore, the pilot's age and fitness can only be considered a possible contributory factor in context of the environment he was in.

All pilots are reminded to assess their fitness to fly both before the flight and as the flight progresses. Refer to the IMSAFE acronym.[25]

Flying in the Championship may have influenced the pilot's decision- making

It is possible that the pilot's decision-making prior to the accident was influenced by an unconscious bias to continue with the original plan despite changing conditions (plan continuation bias). He got into a hazardous situation by becoming fixated on the challenge of finding rising air in the difficult thermal conditions, rather than turning away earlier from the rising terrain.

[24] See CAA Fatal glider accident reports ZK-GVW; G-OJTA and D-2929 in the references section of this report.
[25] Consider IMSAFE aspects – Illness, Medication, Stress, Alcohol/drugs, Fatigue, Eating https://www.aviation.govt.nz/assets/publications/posters/Are_U_fit_2fly_Retro.pdf

Alternative options were to land at the Dingleburn airstrip or conduct an outlanding on the valley floor (see Figures 2 and 6). Both were well within gliding range and annotated on the Oudie map.

Several factors may have influenced his decision to continue to thermal in that location:

- His desire to complete the set task. An outlanding would mean he would not achieve the task that day. His family and gliding friends reported that flying in the South Island mountains was a long-held goal for the pilot. He did not have an expectation to place high in the Championship contest.
- His lack of familiarity with the area and outlanding sites.
- Possible concern about damaging the (rented) glider in an outlanding.
- The inconvenience to others of his retrieval so distant from Omararama.

Previous accidents[26] have involved competition flying. The CAA Accident Report, ZK-GJO highlighted the adverse effect that competition flying can have on decision-making.

> *"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".*[27]

Though not a conclusive contributory cause to this accident, the CAA reminds pilots again of the influence competition flying can have on decision-making, especially the risk of continuation bias.

Environmental factors

The soaring conditions were challenging that day

Many witnesses stated that the soaring conditions were not easy that day but comparable to previous days with clear blue sky and variable winds. The thermals were reported as "choppy" "mashy" and "rough" by some. Pilots experienced in the area stated they deliberately stayed high above the ridges as they expected it to be rough lower down, and lift would be hard to find. The pilots in the glider that descended below the ridge to the accident site found it "rough" and that they "had to hunt around" for thermals to climb back above the ridge.

A briefing was provided by the Championship Meteorological Officer (refer to Appendix 3: Meteorological forecast) and the pilot was cited by family and flying colleagues as having a keen interest in meteorology. However, "summer easterlies" were cited by many experienced local pilots to be "the most difficult [conditions]" and local knowledge was vital. Whilst the general airflow may be south-easterly, the winds are often quite different below the ridges. The Hunter Ridge is known to be particularly difficult to find good lift. On the day of the accident several phenomena existed which could have created local rotors and turbulence below the ridge:

- a general south-easterly flow above and over the ridge line
- thermal (solar) heating on the westerly face of the mountain
- an afternoon sea breeze from the west coast

[26] See CAA Fatal glider accident reports ZK-GJO; G-OJTA and D-2929 in the reference section of this report.
[27] Brigliadori, L & R.2005. *Competing in Gliders: Winning with your mind.* Missaglia (LC): Bellavite, A.G.

- a local south-westerly airflow
- funneling up the valley from Lake Hawea.

These conditions contributed to ZK-GXG drifting closer to the ridge, and to the difficulty the pilot had in gaining lift. The witnesses stated that the conditions were "flyable that day" but would have been "challenging" for a pilot with limited experience in the local environment.

The South Island mountainous area is regarded as one of the world's most challenging gliding environments

Without exception, every witness stated that the South Island mountainous area is regarded by the worldwide gliding community to be one of the most challenging gliding environments. Several pilots (including local instructors) with between 30-50 years of local gliding experience said they still learn something every flight. Some of the comments included:

- "It can be quite tiring - harsh, demanding, unrelenting."
- "When flying low in these mountains you must be 100 percent and sometimes that's still not enough."
- "In 20 years of flying in New Zealand only now getting a handle on it. First 15 years I was still ironing out wrinkles. The conditions here are tricky."
- "Flying conditions are enormously different from Australia - almost all thermal flying is well away from terrain. The [NZ] mountain thermals are more broken and turbulent than our [Australia] flatland thermals."

Previous gliding accidents[28] in the South Island have involved visiting pilots who were considered experienced glider pilots but inexperienced in the New Zealand mountainous environment.

Pilots must know and fly within their limits and apply a much larger margin when flying in the South Island mountains. Fly with a local pilot especially in competitions when there are additional pressures.

The Championship operated in accordance with Gliding New Zealand (GNZ) procedures and Civil Aviation Rules

GNZ has standard procedures for conducting the Championship. This Championship has been running for many years and the procedures are progressively updated.

The safety investigation reviewed the following procedures, with no concerns raised:

- daily task briefings (meteorology, pilot wellbeing, safety, task route, rules)
- pilot mentorship
- flight tracking and following
- post-flight debriefing of the pilot (conducted by the operator)
- emergency response plan.[29]

[28] See CAA Fatal glider accident reports ZK-GVW; G-OJTA and D-2929 in the reference section of this report.

[29] The overdue aircraft and emergency response procedures were implemented within 28 minutes of the accident. This is within the 60 minutes required by the GNZ Advisory Circular AC 1-05 Emergency Plans.

Though competitors described the conditions as challenging, no-one stated that it was not suitable for the day's flying to go ahead. The Championship committee had cancelled the previous day's flying and have done so in previous championships. There was no pressure for the tasks to go ahead and several pilots elected to return, or not fly, based on their personal limits.

Given the information at the time, the Championship committee and the organisation had no specific reason to enforce the pilot's withdrawal from the day's flying or the Championship.

Ultimately it was the pilot's decision to participate in and continue to fly the racing task that day.

Safety actions already taken

The accident has been discussed within GNZ, GFA and wider gliding community. The accident has served as a sobering reminder of the risks of flying below and close to a mountain ridge. The operator has stated that they will be extremely conservative about renting gliders to solo visiting pilots, no matter how much overall gliding experience they may have.

GNZ has updated GNZ Advisory Circular 2-13 Mountain & Ridge Soaring Safety Principles. The GNZ Flight Training Program, "Task Flying" and "Alpine Flying" sections will also contain more detailed guidance and information for mountain soaring glider pilots.

Accident data summary

Aircraft make and model and registration:	Schempp-Hirth Discus-2c, ZK-GXG
Aircraft serial number:	31
Year of manufacture:	2007
Accident date and time:	21 November 2017, 1629 NZDT
Location:	Huxley Range, Central Otago Latitude S44°17' 42" Longitude E169°29’44.8”
Altitude:	4564 feet above mean sea level
Type of flight:	Private
Injuries:	1 fatal
Nature of damage:	Destroyed
Pilot’s licence:	Glider Pilot Certificate, Gliding Federation of Australia
Pilot’s age:	78 years
Pilot’s total flying experience:	4682 hours
Information sources:	Civil Aviation Authority field investigation
Investigator in Charge:	Ms L Child

References

Ageing pilot

Civil Aviation Authority, 2000. "Growing Old Gracefully". *Vector March/April 2000.* Civil Aviation Authority New Zealand.

Civil Aviation Authority, 2010. "The Ageing Pilot". *Vector 2010.* Civil Aviation Authority New Zealand.

Mackay, P. 2012 "Risk-taking, Stress and Ageing". *Proceedings from the GNZ Annual Conference 2012.* http://gliding.co.nz/pilots/training/safety-information/

Perkins, S. 2017. "Don't Let AMD Stop you Flying High". GNZ website. http://gliding.co.nz/wp-content/uploads/2017/05/AMD.pdf

CAA fatal glider accident reports

Civil Aviation Authority, 2002. *Aircraft Accident Report* Occurrence Number 02/99 Alexander Schleicher Segelflugzeugbau ASW20 ZK-GVW Near Omarama 22 January 2002. Civil Aviation Authority, New Zealand.

Civil Aviation Authority, 2008. *Aircraft Accident Report*. Occurrence Number 06/4214; Powered Sailplane, Stemme S10-V, G-OJTA, Mount Prospect, Central Otago 15 November 2006. Civil Aviation Authority, New Zealand.

Civil Aviation Authority, 2008. *Aircraft Accident Report*, Occurrence Number 07/4533; Alexander Schleicher Flugzeugbau ASG-29 D-2929 Turret Peaks, near Makarora, 21 December 2007. Civil Aviation Authority, New Zealand.

Civil Aviation Authority, 2010 *Aircraft Accident Report.* Occurrence Number 08/497; WSK "PZL-Swidnik" S.A. PW-5 ZK-GJO, Waharoa, 11 February 2008. Civil Aviation Authority, New Zealand.

Civil Aviation Authority, 2013. *Aircraft Accident Report*. Aircraft Accident Report Société Siren Pik-30 ZK-GST Impact with Terrain, Omarama, 18 January 2012. Civil Aviation Authority, New Zealand.

Civil Aviation Authority, 2017. *Safety Investigation Report* Collision with terrain involving ZK-GZV Alexander Schleicher GmbH & Co. ASH 31 Mi Ben Ohau Range Otago, 06 February 2016. Civil Aviation Authority, New Zealand.

Dehydration

Wishaw, K Dr. n.d. "A Contrary view to the one that only water should be taken during long flights". *Gliding Kiwi* http://gliding.co.nz/wp-content/uploads/2014/01/Ken-Wishaw.pdf

Spiesser, S. n.d. "Hydration in Flight". Gliding Club of Victoria, Australia. http://www.glidingclub.org.au/fly/tasks/hydration-for-peak-xc-performance/

Civil Aviation Authority, 2005. “Need a drink? The Dangers of Dehydration”. *Vector Issue 6 November/December 2005.* Civil Aviation Authority, New Zealand.

Civil Aviation Authority, 2019. “The Need for Water is Real”. *Vector Summer 2019.* Civil Aviation Authority, New Zealand.

Iremonger, G. 2011. “Dehydrated?” *Soaring April 2011* http://gliding.co.nz/wp-content/uploads/2014/01/Dehydrated.pdf

Human factors - general

Gliding New Zealand. *Introduction & overview to HF on gliding* http://gliding.co.nz/wpcontent/uploads/2014/05/GFAHF1intro.ppt

Gliding New Zealand. *Vision and Fatigue* http://gliding.co.nz/wpcontent/uploads/2014/05/GFAHF3visionfatigue.ppt

Helman, M. 2010. “Complacency: What Me Worry?” *Soaring* New Zealand http://gliding.co.nz/wp-content/uploads/2014/01/Complacency.pdf

Gatland, A. 2010. "Gliding Threat and Error Management – or, How to Reduce Mistakes and Fly Safely”, *Soaring August 2010* http://gliding.co.nz/wp-content/uploads/2014/01/TEM2.pdf

Civil Aviation Authority, 2011. “Get-there- itis". *Vector January/February 2011*, Civil Aviation Authority, New Zealand.

Mountain flying

CNVV, 2011. *Safety in Mountain Flying*. Gliding National Centre of Saint-Auban-sur-Durance (CNVV). http://gliding.co.nz/wp-content/uploads/2014/01/Safety-in-Mountain-Flying-CNVV.pdf

Civil Aviation Authority, 2012. “Mountain Flying”. *Good Aviation Practice*. Civil Aviation Authority, New Zealand

Dale, G. 2016. *The Soaring Engine, Volume 1.* Alton, United Kingdom. http://thesoaringengine.com/

Gliding New Zealand Advisory Circular AC2-13 *Mountain and Ridge Soaring Safety Principles* http://gliding.co.nz/wp-content/uploads/2020/04/AC2-13v4.pdf

Appendix 1: Pilot information

The pilot held a valid Civil Aviation of Australia (CASA) Private Pilot Licence-Glider (PPL-G), and a valid CASA Class 2 Medical Certificate issued on 12 May 2016. He was a current member of The Gliding Federation of Australia Inc (GFA) and had held a membership since 1964. He was a qualified GFA Level 2 Instructor[30]. He also held a PPL-Aeroplane but was not current.

He completed a week long mountain soaring course in Omarama prior to the Championship and passed a New Zealand Bienniel Flight Review.

Description of flight hours	**Flight hours (decimal)**
Total hours gliding airplane	4682 100*
Last 7 days	11.13
Last 90 days	20
Last 12 months	82
Total hours instructing	480*
Mountain flying experience France – Sisteron 2012 Australia - Mt Beauty and Mt Kosciusko New Zealand- South Island 2017 New Zealand- South Island - dual flights in period of 1993 to 2016 whilst on holiday	 100-150* excess of 200* 11.13 <50hrs*
Glider types flown (from logbooks provided)	Schempp Hirth Duo Discus models Schempp Hirth Janus models Glaser Dirkes DG-100 Brasov IS-28B2 Schleicher ASG 29 AMS DG Elan Orion

Table 1: Pilot flight hours

*Hours marked with an asterix are estimates as not all the Pilot's logbooks were provided. Previous NZ flying experience was not established but assessed[31] as likely to be dual and less than 50hrs total.

[30] A Level 2 Instructor is authorised to instruct all sequences in Part 2 of the Instructors Handbook; to supervise L1 Instructors carrying out training work; approve first solo flight; to take charge of a club's operation and to carry out the duties of a Chief Flying Instructor.

[31] Information from pilot's family, Gliding New Zealand and long-time Omarama-based instructors.

Appendix 2: Safety in Mountain Flying

Chapter Three pages 7-12 from CNVV, 2011. *Safety in Mountain Flying*. Gliding National Centre of Saint-Auban-sur-Durance (CNVV) discusses techniques for flying close to ridges and associated risks Note that New Zealand standard aviation units are feet and knots, not metres and kilometres as referenced in this article.

3. CONTROL OF THE FLIGHT PATH. SAFETY DISTANCES. RECURRING PROBLEMS.

The pilot must always be aware of the flight path of his glider, taking into account its speed, its angle of bank, the wind, and possible strong sink. He must identify his drift and have a visual image of his trajectory when he modifies it.

A glider flying at 100km/h along a crest moves at around 30m/s. Flying in the vicinity of crests demands a sustained concentration of mind, a perfect knowledge of one's glider and its reactions, all the more if the air is turbulent.

Even the best pilots are subject to tiredness and, after a certain length of flight, they see their faculties of concentration dramatically diminish.

To reduce the risk as much as possible, stay higher than the crests.

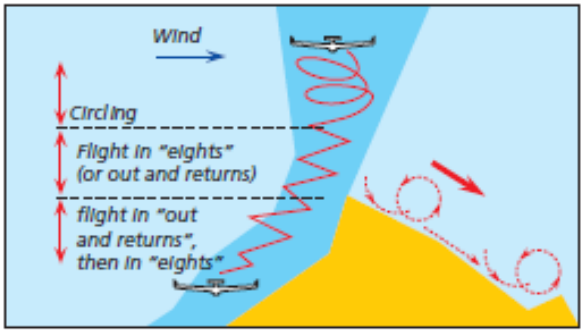
This will provide safety and comfort.

The first pass along a slope must be done with a fair excess of speed in order to verify the turbulence and the value of the lift. One must then adapt the speed and the distance accordingly.

At the beginning, a slope is flown with out and return patterns to assess its potential; then one eventually uses «eights» in the most favourable zone.

The distance to the slope varies according to the topography, the turbulence and the value of the lift. Flying in a two seater with an instructor will set the appropriate references. It is understandable that a beginner will stay further away from the slope, while staying in the lift area.

Flying very close to the mountain is dangerous.



The height of each of these stages depends on the experience and the training of the pilot, but also on the smoothness of the air-mass and the shape of the slope.

LOSS OF ALTITUDE DURING A CIRCLE IN SUDDEN SINK.
Example for a circular turn of 24 seconds

Half a circle in the sink downwind =	12 s
Oval correction into wind =	3 s
Total :	15 s
Sink downwind:	4 m/s

4 m/s x 15 s = **60 m loss of altitude for half a circle** and 108 m for a full turn.

Do the maths again with -6, -7 m/s…

page 7

Do not circle (Cf page 11) while slope flying, unless you are an experienced pilot with sufficient training having followed appropriate instruction and if there is no other traffic. The flying must be mastered (turn radius, speed, angle of bank, balanced flight), the flight path must be properly evaluated (height margin, topography, wind, turbulence).

DO NOT CIRCLE TOO LOW!

To circle, a beginner in mountain flying, must wait until he is well above the crest (100m to 150m), and not allow himself to fly in the lee of the slope.

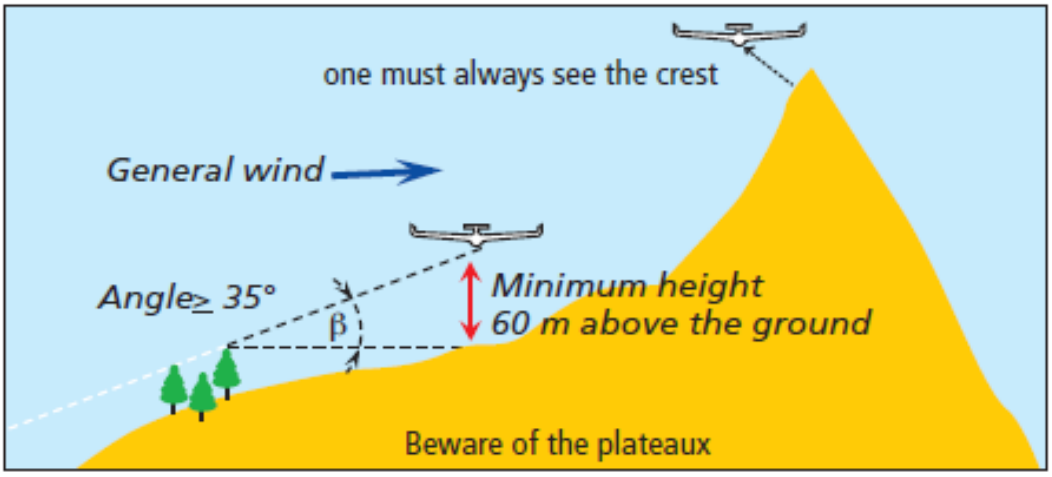
One must remember that the radius of a turn in the mountains is very important, and that the closing speed to the wall is higher [at an Indicated Air Speed (IAS)] than at a lower altitude.

Recommendations while slope flying.

- **The approach to a slope must be done at a converging angle of 30 to 45° at the most, the final phase must be parallel** while slowly applying a drift correction. The same technique is to be followed when making a 180° turn or during the changing of direction in an "8".

Keep a good lookout on both sides

- Some gliders have reduced aileron effectiveness, and need a certain effort on the controls. They need a lot of anticipation, and a substantial excess of speed.
- Avoid facing the ridge and turning at the last moment. An erroneous evaluation of the ground speed would force the pilot to tighten the turn with all the associated risks.
- The first time one flies a ridge, one keeps an excess of speed and of distance to the ridge.
- According to the profile of the terrain, one must maintain a certain height. Beware of the high points on gentle slopes. (cf the following drawing)
- The nearer you are to the slope, the higher the speed must be. One must avoid the small outcrops (a crest more or less perpendicular to the main ridge) by making a bend towards the valley, never by pulling on the stick.
- Follow the general direction of the mountain at an appropriate distance, without trying to follow every notch in the terrain.

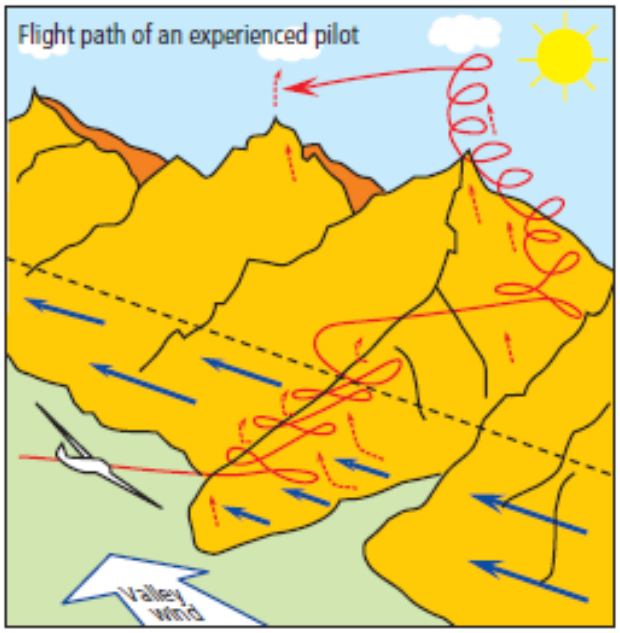


page 8

- Be on the lookout, particularly in turbulent conditions, and be ready **to escape towards the valley**.
- Never fly at the minimum sink speed! Keep a 1,45 Vs (Stall velocity): best L/D speed or a little faster. This **excess of energy** allows you to escape rapidly, without stalling in the case of sudden sink or strong wind shear.
- The stronger the turbulence, the bigger the margins must be (speed, height, distance).
- Apply an appropriate **drift correction.**

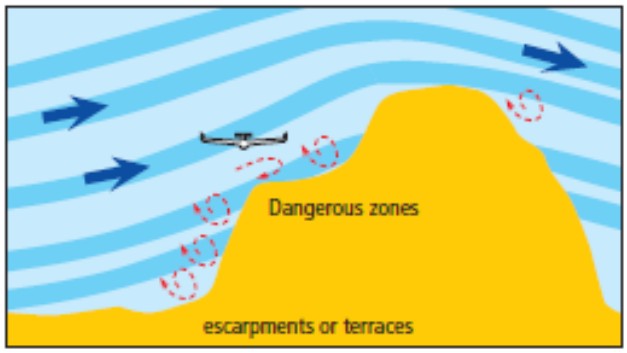
Above the crest, the correct flight path allows the pilot to permanently see sideways, under the glider, the wind face of the slope.

- In a turbulent slope flight avoid using positive flaps, in order to keep adequate manoeuvrability.
- Some slopes, because of their shapes, might be particularly dangerous, causing turbulence/ curl-over around escarpments and terraces. The sides of these slopes might also be dangerous.
- Do not fly into a narrow valley unless you have a sufficient margin to make a turn, and only if the slope of the valley is much steeper than the glide angle of the glider (assess this during preparation of the flight).



- Flying into the sun, in the proximity of the slope, is extremely dangerous. Keep away from the slope.

Flying down a valley in the same direction as the river flows gives more height and more time to find a plan B solution.



page 9

Thermals on the lee side of a slope:

The plus or minus 5 m/s that can be found there are the result of wind shear. They imply an imminent risk of stalling or spin!

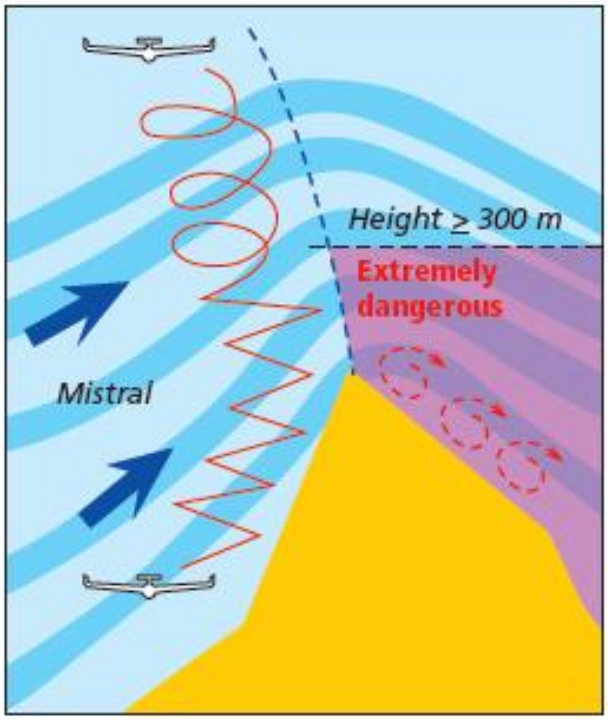
- Exploiting thermals in that zone is to be avoided.
- It can be done, in certain cases, by flying Out and Returns or a narrow "8" with a good margin of speed.
- This technique is for very experienced and highly trained pilots only. It requires a lot of care and attention

Flying the ridge in high winds

- The turbulence is extreme in the vicinity of the slope

Decrease the angle of bank while flying into wind to obtain an oval trajectory and be sure not to find yourself in the lee of the crest.

- In Mistral conditions, sink rates of -5 to -15 m/s can be found in the lee of crests.
- Flying in the lee of crests is extremely dangerous



- If, against your will, you find yourself **in the lee of a crest, nearby its top or lower, the best solution is to flee tail wind,** towards the valley, then reach a landable area, and eventually try to climb again.

page 10

CIRCLING

If the conditions force you to circle under the crest in order to climb, one must take several precautions.

First of all, make sure there is no another solution nearby that would be easier technically, and would present less risks.

To circle, one needs:

- to check other traffic, so as not to be a problem for pilots doing O/R or "8 s";
- to have the right «feeling» of the ridge, to have «taken the temperature» of the ridge during previous O/R or "8 s";
- to have a good and precise way of flying, controlling the **attitude**, the **speed** of the glider as well as the angle of bank and **flying symetrically.**

One also has to make sure that:

- the speed applied at that precise moment offers sufficient manoeuvring ability and enough safety margin against a stall;
- the combination of bank angle and airspeed offers a **circling radius** that positively allows a circle without the risk of hitting the cliff or the vegetation, taking into account the presence of wind and a sudden sink;
- the topography and the turbulence have been correctly assessed;
- the **push** of the thermal (the increase of the load factor) is present and that the **variometer reading** is definitively **positive** when, at the latest, while at 45° to the slope, one takes the decision to keep circling;
- when flying into wind, one decreases the angle of bank, flies straight for 3 or 4 seconds and then increases the angle of bank downwind.

Once again, this technique is reserved for **experienced pilots** with a lot of training and having received proper instruction.

ALTITUDE, SPEED, RADIUS, TEMPERATURE

The true airspeed of the glider increases by 5% for each 1000 m.

At the same indicated airspeed , the converging speed of an obstacle, or another glider increases in the same proportion. The radius of a turn varies with the square of true airspeed.

For an identical indicated airspeed of 90 km/h, if the radius of the turn is 90m at Authon at an altitude of 1600 m, it will be 105 m at the Barre des Ecrins. One must take that into account. In this situation, in order to keep the same radius of turn, one should increase the angle of bank by 5°.

To avoid any risk of «flutter», some glider manufacturers may reduce the VNE at altitude. One must carefully read the flight manual, and **respect these limits.**

page 11

When the temperature gradient differs from the standard atmosphere, the altimeter that has been set on the ground is going to indicate **a higher altitude in cold weather**, and a lower one in hot conditions. Do not reset the altimeter in flight, but take these changes into account when calculating the «local» altitude, particularly in winter.

RECURRENT PROBLEMS

• False horizons

- A glider pilot might be tempted to bank his glider to keep it parallel to a «false horizon» (strata /layers in the mountain in front of him, or the general slope of the mountain…) or perpendicular to the slope, and thus veer towards the wall! Another risk would be to act on the rudder to maintain the trajectory, and start a potentially dangerous skidding flight.
- One also sees pilots that are captivated by the vicinity of the wall, who have a tendency to bank the glider towards the valley, and press on the rudder towards the mountain. This leads to crossing the controls, provoking a slip that may lead to a spin.
- Others stare at their wingtip on the mountain side, and have a tendency to bank towards the mountain, getting near to it (being fixated on the hazard fatal attraction).
- Some others frequently change the attitude of their glider, with a reduction of the speed, the nose up towards the mountain. **The consequences are fatal.** All these problems derive from a bad external visualisation.
- The pilot must create **a substitute horizon** (moving the head and the direction of sight, taking into account valleys and mountains, observing the line marking the limit of forests or of the snow… keeping an ear for the aerodynamic noises of the glider, not staring at the wingtip in a turn).
- In a turn as well as in straight flight, **setting the trim,** as soon as the attitude is constant, is important. The pilot mustn't apply any force to maintain it constant.

• Sunset

- Take note of the sunset before you take off, and remember that it takes some time to come down from a high altitude. It is the same to come back from a long distance.
- Moreover, darkness sets in earlier in the valleys than at altitude, and some areas are already in shadow when the sun hasn't set yet.
- Think ahead in good time about returning to the airfield, to be able to arrive home at sunset at the latest.
- Always have a watch, on the dashboard or on your wrist.

Appendix 3: Meteorological forecast

The Championship's Meteorological Officer provided a full meteorological briefing to the competitors as part of the daily pre-flight briefing. Below is a summary of the forecast meteorological conditions for the time of the accident.

Meteorological element	**Forecast at time of accident**
Situation	Area of high-pressure area sat over NZ centered over the mid Tasman sea.
Cloud	Scattered[32] possible cumulonimbus over the tops and ridges to the north of task area to a base of 8,000 to 10,000 feet
Precipitation	Nil
Barometric pressure	1024 hectopascals
Temperature	20 - 24°Celsius at Omarama
Wind velocity	Southeasterly 20-30 knots
Thermal up draught velocity	500-600 feet/minute
Thermalling height	5500 to 8500 feet in the task area (7500 feet in region of accident site)

Table 1: Summary of forecast meteorological conditions at time of the accident.

[32]The fraction of the sky that is obscured by clouds is expressed in eighths (oktas). Scattered cloud is 3-4 oktas.

About the CAA

New Zealand's legislative mandate to investigate an accident or incident is prescribed in the Transport Accident Investigation Commission Act 1990 (the TAIC Act) and Civil Aviation Act 1990 (the CA Act).

Following notification of an accident or incident, TAIC may open an inquiry. CAA may also investigate subject to Section 72B(2)(d) of the CA Act which prescribes the following:

> **72B Functions of Authority**
>
> (2) The Authority has the following functions:
>
> (d) To investigate and review civil aviation accidents and incidents in its capacity as the responsible safety and security authority, subject to the limitations set out in Section 14(3) of the Transport Accident Investigation Commission Act 1990

The purpose of a CAA safety investigation is to determine the circumstances and identify contributory factors of an accident or incident with the purpose of minimising or reducing the risk to an acceptable level of a similar occurrence. The safety investigation does not seek to ascribe responsibility to any person, but to establish the contributory factors of the accident or incident based on the balance of probability.

A CAA safety investigation seeks to provide the Director of Civil Aviation with the information required to assess which, if any, risk-based regulatory intervention tools may be required to attain CAA safety objectives.

Civil Aviation Authority of New Zealand
Level 15, Asteron Centre
55 Featherston Street
Wellington 6011

OR

PO Box 3555, Wellington 6140
NEW ZEALAND

Tel: +64-4-560 9400 Fax: +64-4-569 2024
www.caa.govt.nz