British Hang Gliding and Paragliding Association

REPORT

Investigation of a paragliding accident
which occurred at Corndon Hill, Shropshire,
on 12th April 2009
in which the pilot suffered fatal injury.

Introduction

On 12th April 2009 the British Hang Gliding and Paragliding Association (BHPA) received reports of an air accident at Corndon Hill, Shropshire that had resulted in the death of the pilot. The BHPA is required by the Air Accident Investigation Branch of the Department for Transport to carry out an investigation and produce a report under its delegated authority. The BHPA tasked Mr Mark Dale, BHPA Technical Manager, to investigate the accident and submit a report to the Flying and Safety Committee (FSC) of the BHPA for ratification.

BHPA investigation serial number: IR 09/029

Summary

On 12th April 2009, a number of experienced paraglider pilots had gone to Corndon Hill to fly, but were largely frustrated by the light wind conditions. At approximately 4 pm four pilots launched into a thermal. As the second pilot flew into the core he lost control of his glider which descended rapidly in a series of large asymmetric collapses (a 'cascade'). Just before impact his emergency parachute was activated but did not have time to open. The pilot suffered fatal injury.
The investigation found that the pilot had previous unreported incidents and accidents involving loss of control of paragliders, that his harness chest strap was incorrectly set (50% wider than the correct setting), that his emergency parachute system was incorrectly configured and that there was no evidence that he had ever undergone training in paraglider recovery skills.

The investigation concluded that the cause of the incident was that the experienced pilot was flying a wing/harness combination that he had configured in such a way that the likelihood of a loss of control was high and that recovery to normal flight (if possible at all) would require very high levels of recovery skill .

This document is confidential until ratified.

Date ratified by the BHPA Flying and Safety Committee: 14th August 2009

THE STRUCTURE OF THE REPORT

The structure of this report conforms to that recommended in the BHPA Technical Manual and is intended to follow the principles pertaining to AAIB reports. It is divided into four sections.

Section 1 - Factual information

SECTION 1 - FACTUAL INFORMATION

1.1 History of the flight

The first pilot arrived on Corndon Hill at approximately 10:30am. The sky was blue and there was a light breeze on the east face. Other pilots arrived and prepared to fly. Soon regular light thermic cycles were coming through and it seemed as if it would be possible to stay up in the thermic lift even though the dynamic wind was too weak to soar. The sky developed into a perfect paragliding soaring sky, full of cumulus clouds.

The accident pilot (Pilot B) had been flying sailplanes at the Long Mynd in the morning, completing two circuit flights. He is believed to have arrived at Corndon at around 11:30.

The first two pilots to launch took off sometime shortly after 12 o clock, into a thermal, and managed to climb to cloud base. Then Pilot A launched followed by Pilot B, but they missed the thermal and went down. Pilot A slope landed and Pilot B landed at the bottom. As he neared the ground Pilot B went out of sight of the pilots on the hill when at about 20 feet and flying normally to land. According to a pilot airborne some 2000 feet above, Pilot B's glider then had a 'frontal deflation' which the pilot above radioed down to those on the hill about, fearing there might have been an accident. Pilot B's flight instrument recorded this flight and shows a momentary rate of descent of 7m/s at this point. It seems that whatever occurred, it happened at very low height (or as part of the landing) as Pilot B was obviously uninjured and gathered his equipment together and walked back up the hill and prepared to fly again. When asked later, Pilot B told Pilot A that he had accidentally spun the glider.

Shortly after this a third pilot also launched and climbed up to cloud base. It was now approximately 12:30pm and the cumulus clouds had developed rapidly, spreading out to cover 6/8 of the sky and shutting down thermic activity on the hill.
The three pilots airborne set off on triangle flights, landing back on the hill about two hours later.
The very light wind was switching about and various pilots (approximately twenty in total) were trying to fly from the north face of the hill at different times during the afternoon, but nobody managed to stay up – some landing at the bottom and others slope landing.

Towards 3:00pm in the afternoon the sun began to break through again and a light Easterly breeze set in.

Pilot A had detected that the wind had started to favour the East face again so had moved back around there. He was then concerned about the vertical growth of a cloud that was nearly overhead the site. Pilot B moved around to the East face and Pilot A mentioned his concerns to Pilot B and continued to wait for conditions to settle. After a short while Pilot A judged that conditions were ok and he noticed a bird thermalling – which he pointed out to Pilot B. Pilot A then launched and climbed gradually towards the South East. As he entered the main thermal he found the climb quite strong and rough and decided, as it was quite late in the day, he did not want to deal with this level of turbulence so flew forward into smoother air. Pilot B had launched soon after Pilot A. An unidentified pilot launched in between. A fourth pilot, Pilot C launched after Pilot B. Pilot B had originally flown out 200 metres to the East before finding

lift and making six right-hand 360's, gaining 600 feet. He then flew out to the North East before turning South, losing most of this height before encountering lift again. At this stage Pilot B was approximately 250 metres in front of take off and 100 feet above take off height. Pilot B completed a left hand 360 turn in broken lift then straightened up and flew East for a few seconds into increasing lift, maximising at 4m/s. A maximum height of 240 feet above take off was reached. The flight instrument recording shows that the pilot then descended rapidly backwards which corresponds with the witness report: Pilot C (flying behind Pilot B) saw Pilot B's glider stall – with a full horseshoe shape and the wingtips behind, touching. The glider then entered a 'cascade' series of alternate left/right asymmetric tucks, with large pitching movements, diving to nearly below the pilot in front, then pitching back to 45 degrees behind the pilot. The average rate of descent was 7m/s, increasing to over 13m/s.
The pilot was thrown about extremely violently - at one stage his feet were above his head. Pilots on the hill were shouting at Pilot B to throw his emergency parachute and this message was also radioed. One witness believes he saw Pilot B trying to locate his emergency parachute handle in the final 100ft. Pilot A thinks he saw a flash of white material just before impact. After four of these large asymmetric collapses the glider impacted near the base of the hill. The entire flight had lasted eight minutes. The time from the loss of control to impact was 26 seconds and the height loss 492 feet.

Pilots ran down to assist. The glider was spread out full span with the top surface uppermost. The pilot was underneath the wing. His emergency parachute was in his lap, out of its inner bag but only partially unfolded.

First Aid was administered and the emergency services summoned. A Shropshire Ambulance First Responder who had witnessed the accident from his nearby house arrived within minutes and took charge of the First Aid effort. Shortly after this the air ambulance arrived, and a HEMS Doctor took control. Despite these efforts the pilot succumbed to his injuries and was pronounced dead at the scene.

1.2 Injuries to persons

Injuries	Crew	Passengers	Others
Fatal	1	-	-
Serious	-	-	-
Minor / None	-	-	-

1.3 Damage to the aircraft

None

1.4 Other damage

None

1.5 Personnel information

D.o.B. 11:07:63

The pilot started flying in 1999, gaining the 'Club Pilot' rating PG (Hill) in September that year. He progressed to the 'Pilot' rating in 2001 and the 'Advanced Pilot' rating in 2005.

1.6 Aircraft information

Gradient Avax XC2 26
Serial Number G22262805 193
Manufactured: 05/08
Max total weight in flight: 105kg
Min total weight in flight: 85kg
Certified distance between top of connectors centrelines: 45cms

The glider type is certified at EN 'C' level.

The glider was supplied brand new to the pilot in May 2008.

The glider was examined under supervision at the manufacturer's facility after the accident. No pre-existing defects were found.

Harness
Sol Paragliders Slider L
Chest strap setting: 68 cm between riser centres.
The parachute container was open with no signs of distress.
Back Protector 14 foam insert and Cygnus 'zip-on' airbag.

Helmet
Charly Insider full face.

Emergency Parachute
The emergency parachute was a 16 gore pulled down apex type. The canopy had a serial number but no other identifying marks. The deployment cover ('inner bag') was marked as a Sky Spare 35 but the printed dimensions did not match the canopy.

Instruments
Aircotec XC Trainer

1.7 Meteorological information

At the time of the accident flight there was a light wind from the east with thermic activity and associated turbulence.

1.8 Aids to navigation

Not applicable.

1.9 Communications

Not applicable.

1.10 Aerodrome and approved facilities

Corndon Hill

1.11 Flight recorders

The pilot was flying with an Aircotec XC Trainer instrument. Besides variometer and altimeter functions this instrument also records GPS details of flights. Data from this flight and others was successfully downloaded from this device.

1.12 Wreckage and impact information

The glider was spread out full span with the top surface uppermost. The pilot was underneath the wing. His emergency parachute was in his lap, out of its inner bag but only partially unfolded.

1.13 Medical and pathological information

Cause of death was recorded as multiple injuries**.**

1.14 Fire

None.

1.15 Survival aspects

The pilot's emergency parachute was found in his lap, out of its inner bag but only partially unfolded. One rubber band was still on an 'S' fold of the canopy suspension lines when the equipment was examined after recovery from the site. (This shows that the lines were never stretched.) The parachute outer container on the harness showed no signs of distress and appeared to have been opened normally by the pilot pulling the handle. Further examination of the parachute system revealed that there was no bridle. The connection point at the bottom end of the canopy suspension lines had been connected directly (with a karabiner) to the harness integral Y bridle. It appeared that a bight of the suspension lines had been used as the inner bag mouth-lock. (The harness integral Y bridle was constructed from stiff webbing which could not be folded sufficiently tightly for the mouth-lock.) The geometry of this was explored and it was clear that, set up in this way, once the pilot had pulled the inner bag out of the outer container under the seat-board and moved it a short distance (e.g. to a position in front of him) then the connection would have been tensioned and the mouth-lock released, prematurely releasing the folded canopy.

The bridle's primary function is to ensure that the canopy and lines deploy clear of the pilot, thus minimising the chance of entanglement and maximising the chances of the canopy opening in an undisturbed airflow.

Parachutes incorrectly rigged without bridles have been deployed (from 'zip' wires) at BHPA parachute 'repack' events, without problem. It therefore seems probable that the fact that the canopy was still folded at impact was primarily due to the attempt to deploy it being made at too low an altitude – which may have been due to the pilot having difficulty locating the deployment handle whilst being thrown about violently.

In the general circumstances of this particular accident it was considered likely that a correctly configured emergency parachute system, deployed when control was lost, would have had sufficient time and height to deploy successfully.

1.16 Tests and research

Not applicable.

1.17 Organisational and management information

Not applicable.

1.18 Additional information

During the investigation it was discovered that the pilot had lost control of the glider (and was unable to regain control) on a flight approximately four weeks before the accident (17th March 2009). On that occasion he had been flying with a different harness and emergency parachute. He had deployed his parachute successfully and landed under it, without injury. (His flight instrument shows that the loss of control incident occurred at 300 feet above the ground – it is not clear at what height he took the decision to deploy his emergency parachute but it was obviously below that height.)
It was also discovered that he had suffered serious injury at a BHPA competition in Ager, Spain in 2006 which had detained him in hospital for several weeks.
Neither of these previous accidents was reported and attempts to elicit details of the Ager accident from the competition organisers (BHPA Paragliding comps panel) have been unsuccessful.

1.19 Useful or effective investigation techniques

During this investigation it was found that heavy witness marks on the webbing inside the chest strap buckles provided valuable corroborating evidence of the setting used during flight.
The Aircotec XC trainer's gps recordings of the accident pilot's flights were also of benefit.

SECTION 2 – ANALYSIS

Turbulence around thermals and 'Active Flying'.
Paraglider pilots, as with all glider pilots, use 'thermals' to gain height and enable them to fly cross-country. Thermals are columns or bubbles of warm air which rise through the atmosphere when meteorological conditions are favourable. As the warm air rises, colder air descends around the outside of the thermal, and the resulting junctions (or shears) between the 'undisturbed' air, the descending colder air and the ascending warmer air are invariably experienced by the pilot as turbulence. If the thermal is 'stronger' (so likely to give the pilot a fast rate of climb) then the more pronounced the turbulence around it is likely to be.
In this accident the pilot appears to have lost control of his paraglider in the turbulence associated with the thermal that he was entering. The key to minimising such upsets is not flying too slowly (which can result in stall/spin type departures) and generally flying 'actively'. 'Active flying' is the process of exercising constant accurate pitch control to keep the canopy directly above the pilot's head and to maintain the canopy's internal pressure, not allowing the canopy to rock forward (which can lead to a low angle of attack and collapses) and not allowing it to rock back (which can result in high angles of attack and stalls). Timely, smooth, instinctive, minimal inputs are required. A very experienced coach who was familiar with the accident pilot has commented that he *'seemed to suffer more tip collapses than other pilots in*

turbulent air. I believe that the reason for this was his 'active flying' actions being slightly mistimed, especially in pitch. Other Club members who flew with XXXXXX have described his flying style as "heavy handed".

Harness chest strap setting (Distance between risers).

A paraglider's stability (i.e. its tendency to remain undisturbed by turbulence) and its recovery characteristics (its ability to recover to normal flight after an upset) are both significantly affected by the geometry of the pilot's harness. The most critical part of the harness geometry is the distance between the main riser karabiners – which is set by the pilot by adjusting the 'chest strap'. When paragliders are certified, the test pilot sets his harness at the appropriate setting: 38cms for small gliders (<50kg pilot weight), 42cms for medium gliders and 46cms for large gliders (>80kg pilot weight). All the flight tests are carried out at this setting. The glider involved in this accident had a take-off weight range of 85kg to 105kg and had a correctly affixed wing tip placard showing the certification details which includes the harness settings used during certification: these are recorded as being 45cms between the top of the connector centrelines – and at this setting the type was certified at the EN'C' level. (The levels go from 'A' (most stable) to 'D' (least stable)). The accident pilot had set his harness so that the actual distance between connector centrelines was 68cms. With the harness set up in this way the glider's stability and recovery characteristics would be significantly worse than those established at the certified setting.

Glider suitability.

The pilot lost control of the glider (and was unable to regain control) on the accident flight, on the preceding flight and on a flight approximately four weeks before that. Whilst it is almost certainly the case that the setting he had chosen for his chest strap had a major role in his inability to regain control, it seems sensible to question whether he actually had sufficient skills to fly this glider safely. The pilot was a regular competitor at National level competitions – but this only actually means that he had a good skill level at finding lift and gaining height. As far as can be determined the pilot had never completed any courses focussed on 'recovery/prevention' skills. (Such courses are run under the titles of 'pilotage' and SIV' courses.) Nor is there any evidence that he had 'self-trained' in this skill area.

His Gradient Avax XC2 26 glider was certified at the EN 'C' level. The 'Description of pilot skills required' to fly such a glider says: *'Designed for pilots familiar with recovery techniques, who fly "actively" and regularly, and understand the implications of flying a glider with reduced passive safety.'* It is therefore possible that the pilot's skills may not have fully matched these criteria.

Table 1 — Description of the paraglider classes

Class	Description of flight characteristics	Description of pilot skills required
A	Paragliders with maximum passive safety and extremely forgiving flying characteristics. Gliders with good resistance to departures from normal flight.	Designed for all pilots including pilots under all levels of training.
B	Paragliders with good passive safety and forgiving flying characteristics. Gliders with some resistance to departures from normal flight.	Designed for all pilots including pilots under all levels of training.
C	Paragliders with moderate passive safety and with potentially dynamic reactions to turbulence and pilot errors. Recovery to normal flight may require precise pilot input.	Designed for pilots familiar with recovery techniques, who fly "actively" and regularly, and understand the implications of flying a glider with reduced passive safety.

D	Paragliders with demanding flying characteristics and potentially violent reactions to turbulence and pilot errors. Recovery to normal flight requires precise pilot input.	Designed for pilots well practised in recovery techniques, who fly very actively, have significant experience of flying in turbulent conditions, and who accept the implications of flying such a wing.

SIV / Pilotage training.
Unfortunately there is no evidence (other than anecdotal) that learning and practicing recovery skills on 'pilotage' or 'SIV' courses actually results in safer pilots who therefore have fewer accidents. In fact there is some evidence from previous fatal accident investigations that pilots who have learnt these 'recovery' skills have tended, in real-life incidents, to concentrate on attempting to regain control of the wing rather than on saving their life by deploying their emergency parachute. Whilst there are obvious difficulties in trying to establish the true facts as to the efficacy of these courses, it would seem worthy of effort so that a clear recommendation can be made to pilots.

SECTION 3 – CONCLUSIONS

The accident was the result of the experienced pilot flying a wing/harness combination that he had configured in such a way that the likelihood of a loss of control was high and that recovery to normal flight (if possible at all) would require very high levels of recovery skill.

SECTION 4 - SAFETY RECOMMENDATIONS

It is recommended that the FSC should consider altering the advice to pilots about how they choose wings within the EN classes.
The FSC should conduct research to clarify whether 'loss of control/recovery' skills training has a proven benefit.
The FSC should republish advice about the vital importance of correct harness chest strap setting.