British Hang Gliding and Paragliding Association

REPORT

Investigation of a paragliding tow incident which occurred at Darley Moor Airfield, on 13th September 2019 in which the pilot suffered serious injury.

Introduction

On 13th September 2019 the British Hang Gliding and Paragliding Association (BHPA) received reports of an air incident at Darley Moor Airfield that had resulted in serious injury to the pilot. The BHPA tasked Mark Shaw, BHPA Technical Officer, to investigate the incident and submit a report to the BHPA's Flying and Safety Committee (FSC) for ratification.

The objective of this investigation is to prevent future accidents and incidents. It does not seek to ascertain blame or apportion legal liability for claims that may arise.

BHPA investigation serial number: GBR-2019-12119

This document is confidential until ratified.

Date ratified by the BHPA Flying and Safety Committee: 20th April 2020.

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 of Air Accident Investigation Branch reports. It is comprised of the following sections:

Section 1 - Factual information

Section 2 - Analysis

Section 3 - Conclusions

Section 4 - Safety Recommendations

SECTION 1 - FACTUAL INFORMATION

1.1 History of the flight

Pilot A was enrolled on an Elementary Pilot tow course at a BHPA registered school ("the school"). She had previously attended the school for an introductory "taster" day on 25th August 2019. On the taster day, she completed and logged two flights to 20 ft above ground level (agl).

On the incident day, Pilot A arrived at the airfield during the morning, and undertook ground run exercises with Trainee Instructor E. The instructional team deemed she was ready for a flight. She was briefed for a straight flight, which she made successfully. Training resumed after a lunch break and the winch was positioned for the wind which had veered from

westerly to a north westerly over the course of the day. The conditions were noted as scattered clouds with light winds.

At approximately 14:10 hours (UTC) Pilot A launched her paraglider on her second flight of the day. Initially, her wing was seen to climb normally under tow. It began to drift off-line to the left (west). Instructor C radioed instructions to Pilot A to correct the drift using the paraglider controls, which she was seen to do. The wing was then seen to drift off-line to the right (north), now climbing more rapidly. Instructor C requested the tow line to be guillotined, which was carried out by the winch operator. Pilot A's wing was seen to continue to climb to a height of approximately 100 ft agl, pointing into wind but moving backwards so that it was downwind of the launch gate. The wing began to descend but at approximately 40 to 50ft agl it experienced a small asymmetric collapse on the right-hand side, followed by a large asymmetric collapse on the left-hand side of her wing. The wing entered a rapid descending turn towards the collapsed side that led to the pilot impacting the ground and sustaining serious injury. She was attended to by the emergency services and air lifted to hospital.

1.2 Injuries to persons

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

1.3 Damage to the aircraft.

No damage was recorded in the incident.

1.4 Other damage.

None.

1.5 Personnel information

Pilot A is female, and aged 45 at the time of the incident. She declared her bodyweight to be 69.8kg. She was on the second day of training on the BHPA Paraglider Tow syllabus, having undertaken a taster day on 25th August 2019. Pilot A's BHPA membership book entry reference number is 234751/09 as an annual member.

1.6 Aircraft information

All the equipment used was provided by the school.

1.6.1 The paraglider used by Pilot A at the time of the incident was an Ozone Element 2, size "Small", serial number ET2S-Q-10E-149. Its manufacturer Ozone states that the Ozone Element 2 is suitable for school use. The wing has an "EN-A" classification rating in accordance with the Paragliding Equipment Flight Safety Characteristics Standard EN 926-2, with a certified total in-flight weight range of 65 to 90 kg for this model and size of paraglider. The paraglider's date of manufacture is listed on its placard as 13th March 2015.

1.6.2 The harness worn by Pilot A at the time of the incident was a Woody Valley Velvet Airbag harness size Medium (harness number 5 designated by the school). This model of harness has been tested to conform to the German "DHV" standard for paragliding harnesses. It contains an underseat airbag compartment as a vertical impact pad.

1.6.3 The helmet worn by Pilot A at the time of the incident was an Icaro helmet certified to the EN 966 Standard.

1.6.4 The tow release fitted to the harness used by Pilot A was a "three ring circus" type.

1.6.5 The tow unit used on the day was a Koch static winch running two winch reels with cables of 2.5mm braided steel. Both the left-hand and right-hand winch reel were in use on the incident day.

1.6.6 The radios used by the instructors and student on the day were the school's 2M radios.

1.7 Meteorological information

An Aftercast was obtained from the Met Office for the incident day. The Aftercast reported an area of high pressure centred near southwest Ireland, generally leading to settled conditions across much of the UK. The Aftercast reported the following:

> "Low Level Spot Wind Chart (F214): light North or Northwesterly winds.
>
> Low Level Significant Weather Chart (F215): scattered cloud with a base between 1500 and 3500ft amsl.
>
> Actual observations at Manchester Airport and East Midlands Airport: generally light winds between 5 and 10 kts."

Aftercast summary of findings:

> "Friday the 13th of September 2019 was a fine day across much of the UK with light winds and good visibility for most areas with the exception of some showers affecting the far north of Scotland. The satellite images indicate some patches of cloud across the area of interest which is likely to be convective in nature of very little vertical extent. I would expect that the conditions at Darnley *(sic)* Moor would be similar to those reported at Manchester and East Midlands. With light winds from the surface to 5000FT, and only few amounts of convective cloud with a base between 3500FT and 4500FT."

1.8 Communications

Pilot A was equipped with a radio, mounted to her harness near the shoulder.

1.9 Airfield

The school operates on the airfield at Darley Moor, near Ashbourne in Derbyshire. The airfield is used for flight training for tow-launched paragliders and hang gliders, paramotors and powered hang gliders, and flexwing and three axis microlight aircraft. It has an elevation of 580 feet above mean sea level and has two principal runways on an approximate north-south axis, length approximately 650m.

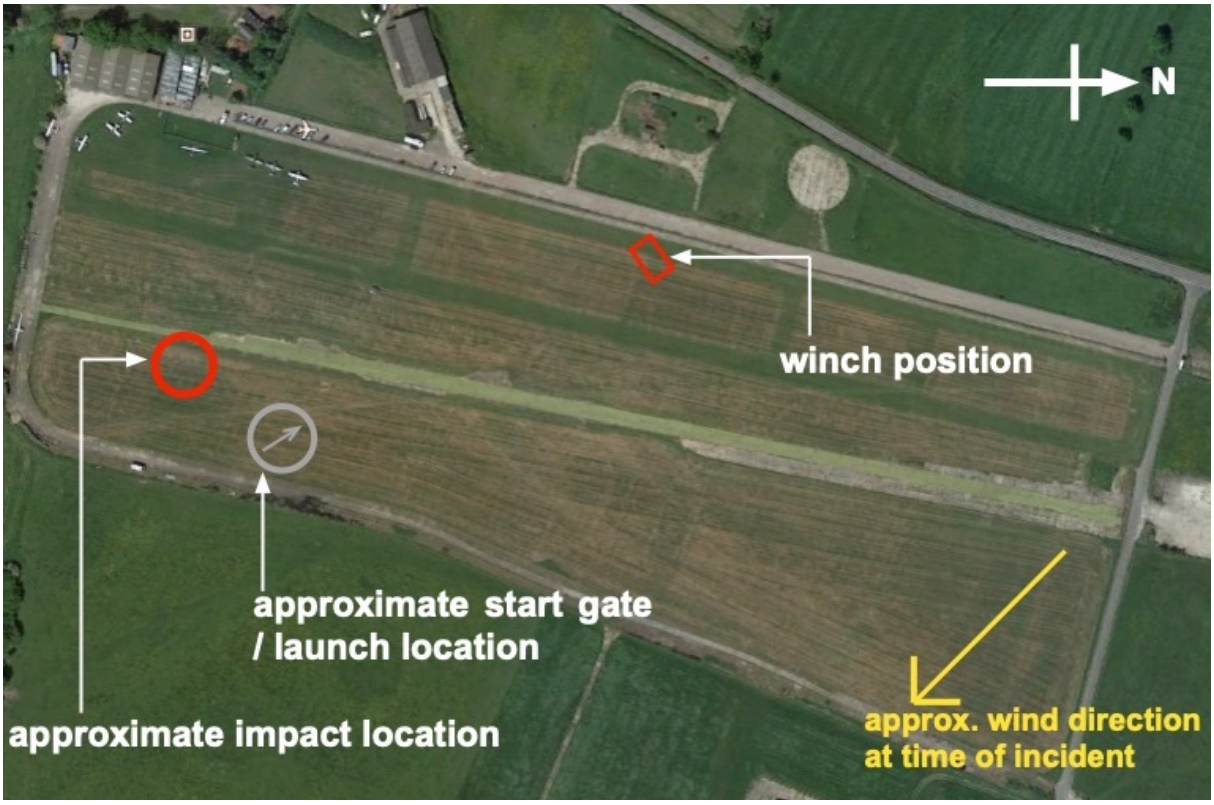

Fig 1: Site photograph (source Google Earth). Approximate wind direction at time of incident, and incident location are shown.

1.10 Medical and pathological information

Pilot A was airlifted to hospital and was treated for serious injuries consistent with a fall from height.

1.11 Tests, research and evidence.

This report is based on the following evidence:

Statements from Instructor B, Instructor C, Trainee Instructors D and E, Winch Operator F; statements from Microlight Instructors G and H; statements from paraglider Trainees J and K; Notes taken during interview with Pilot A, and comments by Pilot A on these Notes; The inspection report by the paraglider service centre “The Loft”; the visual inspection of Pilot A’s harness and helmet; the visual inspection of the winch; the Aftercast supplied by the Met Office; the school’s records for Pilot A; the school’s administration documents.

SECTION 2 – ANALYSIS

2.1 Instructional personnel.

The Investigation considered the personnel involved in the training of Pilot A.

2.1.1 Instructor B is the Chief Flying Instructor of the school. He is a current BHPA member, a BHPA licensed Senior Instructor and a licensed Operator.

2.1.2 Instructor C is a current BHPA member and holds a BHPA Instructor licence in the Tow and Power Environments. Instructor C was acting as Launch Marshal and was providing instruction to Pilot A during the incident flight.

2.1.3 Trainee Instructor D is a current BHPA member, a BHPA licensed Club Coach, and is registered as a Trainee Instructor (since April 2017).

2.1.4 Trainee Instructor E is a current BHPA member, a BHPA licensed Club Coach and is registered as a Trainee Instructor (since January 2015).

2.1.5 Winch Operator F is a current BHPA member, a BHPA licensed Club Coach, is registered as a Trainee Instructor (since July 2019) and has held a BHPA Winch Operator's licence since June 2019.

2.1.6 On the evidence presented, the Investigation finds that the personnel were deployed in accordance with the requirements of the BHPA Technical Manual and were acting within the parameters of their licences or their remits as Trainee Instructors on the day the incident occurred.

2.2 The site.

The Investigation considered the site.

The airfield has been in regular use for many years by the school for teaching paragliding and hang gliding from a tow. The airfield adequately serves a variety of wind directions including the directions present on the incident day.

2.3 The weather conditions.

The Investigation considered the weather conditions.

The wind direction forecast was noted to be westerly veering northwesterly over the course of the day. Evidence from the instructors and students at the site indicated that the actual wind followed the forecast. The wind speeds were noted by Instructor B as being between 4 and 5 Knots. Leading up to the incident, the conditions were benign with light thermic activity. It was evidently suitable for flying paragliders, as flights were made throughout the morning and afternoon. There is evidence of some thermic activity as Instructor B undertook a tandem flight and noted that his landing was approximately 30 minutes before the incident flight. When released from the tow, he was able to maintain height but not climb. He stated that the flight was about 10 minutes duration and the lift was not very strong.

Microlight Instructor H described the weather conditions on the day as being "5 – 8 mph from the north west", with "no strong gusts and the air was relatively smooth creating perfect flying conditions for myself and another flying instructor throughout the day." The instructors operating the microlight training school evidently judged the conditions to be suitable for flexwing microlight student circuit training to take place throughout the day.

The Investigation finds that prior to the incident occurring, the meteorological conditions were suitable for the training activities on the day.

2.4 The equipment.

The Investigation considered the condition, the suitability and the operation of the equipment used to train Pilot A.

2.4.1 The paraglider.

The Ozone Element 2 (Small) is classified EN-A in the flight safety characteristics standard EN 926-2 and is suitable for beginner training. The Investigation finds that Pilot A's weight was within the certified in-flight weight range of the Ozone Element 2 paraglider, when calculated with the harness and other equipment contributing to her total in-flight weight.

The Investigation found that the paraglider was of suitable size and type for teaching Pilot A and the glider type was not a factor in the incident.

The Investigation considered the airworthiness of the incident paraglider. The most recent service record indicated that the paraglider had been checked on 7th January 2019 and was noted as being "serviceable". An independent expert undertook a condition check of the wing following the incident and reported that the wing was generally within manufacturer's specifications. The general glider condition was recorded as "fair". The main brake lines were recorded as being 30mm short overall; however, the Investigation determined that this was not a contributory factor to the incident.

2.4.2 The harness.

A maintenance log for the particular harness used in the incident recorded that the harness was checked and found suitable for service on 10th July 2019.

The Investigation finds that the harness was of suitable type for teaching Pilot A.

2.4.3 The helmet.

The Investigation finds that the helmet given to Pilot A was suitable for the purpose of training.

2.4.4 The tow release.

The Investigation finds that the tow release fitted to the harness was suitable for the purpose of training.

2.4.5 The radio.

Pilot A stated that the radio fitted by the instructors in preparation for her flights was mounted to her harness. It is evident that she could hear instructions over the radio.

2.4.6 The winch.

The winch used at the time of the incident was a Koch static winch with a steel cable and guillotine. The school's winch maintenance log recorded that maintenance was last performed on the winch on 30th August 2019 and 4th September 2019.

At the time of the incident, the winch was fitted with a weak link of 125 DaN in accordance with the requirements of the BHPA Technical Manual. The load applied by the winch operator during the incident flight was not high enough to cause the weak link to break. The Investigation determined that the winch was correctly fitted out in accordance with the BHPA Technical Manual and of suitable type for the training of paragliding students.

2.5 The training of Pilot A.

The Investigation considered the training given to Pilot A.

2.5.1 The training on 25th August 2019 (the first training day).

Pilot A was trained by Trainee Instructor E on the two initial training phases (Phase 1 and Phase 2) in the Elementary Stage (Tow) of the Student Training Record Book (STRB). The sections of the STRB were signed, acknowledging that training in Phase 1 and 2 had been completed. She received a tow briefing, a commands and communications briefing and a responsibilities briefing (Phase 3, Exercises 9, 10 and 11), which were signed off by Pilot A and Trainee Instructor E. She then undertook two straight towed flights (Ex.12) which were successful, and Pilot A recalled she made good landings.

2.5.2 The training on 13th September 2019 (the day of the incident).

Pilot A arrived on the field later than the other participants, and her equipment had already been daily inspected by another participant. Over the course of the morning, she undertook hand-towed “ground runs” supervised by Trainee Instructor E, recapping on exercises 7 and 8 in the STRB. The number of attempts was not recorded by the school; however, Pilot A recalled she made four or five ground runs using both a forward and reverse inflation technique. It is apparent that paraglider tow flights and microlight operations were taking place throughout the period when Pilot A was undertaking practice launches.

Pilot A expressed to Trainee Instructor E that she was nervous and wanted to better understand the launch sequence. She stated that Instructor C seemed to be rushing them to get her into the air. It is apparent that Pilot A felt rushed into making her first flight of that day and communicated her concern and nervousness to the instructors. However, Instructor C discussed Pilot A’s progress with Trainee Instructor E and judged that she was ready for a straight towed flight (Exercise 12 in the STRB).

Pilot A recalled that the brief was the same as for the flights she made on 25th August 2019. She performed a good launch and flared to land, and she was happy with the flight. She was congratulated by Instructor C, who told her the flight was “as good as it gets”. Instructor C stated that that Pilot A was “on-line” throughout the flight.

On the basis of the evidence presented, the training was appropriate given the student ability. On the morning of the incident, Pilot A was provided with refresher training in launching and wing control, which would be expected given the gap between training sessions.

2.5.2.1 The incident flight.

After a lunch break, flying activities resumed. Over the course of the afternoon, the instructional team repositioned the winch and the launch gate in response to the veering wind, which was noted to be around 4 to 5 Knots from the northwest. Conditions remained suitable for flight training and students were making straight and level flights.

Pilot A recalled the brief for her next flight - a straight towed flight, towards the winch, keeping an eye on the winch. She stated that it was the same brief as the previous flight

briefing, and it was clear in her mind what she was going to do. She recalled being at the launch gate whilst clipped-in to her equipment, and being told to "stand down" as the wind strength had increased, and she waited with the glider's risers in her hands. Trainee Instructor D was preparing his equipment to launch following Pilot A. He stated that he witnessed her launch being directly into wind, the wind strength being about 6mph (5 Knots). It is evident that the flight initially progressed as expected - Instructor B observed that Pilot A was at a height of between 30ft and 40ft above the airfield, her wing initially settled.

Instructor C was heard to instruct the winch operator to "back off power" as Pilot A's wing was off-line to the west (to the left-hand side of the line between the launch gate and the winch, viewed from the launch gate). It is apparent that Pilot A responded to radio instructions from the ground and initially brought the wing back on-line. Microlight Instructors G and H both stated that they witnessed control inputs being made by Pilot A in response to instruction.

It is evident that Instructor C and Winch Operator F both noted that Pilot A's wing continued climbing despite there being no tension in the tow line, and both made the decision that the tow line should be guillotined. Although the line was severed, the aircraft continued to climb to a height of around 100ft, still facing approximately into wind. Instructor C stated that the wing was "pulled back behind the launch gate". It is apparent that it had encountered a localised area of turbulent rising air, strong enough that it brought the aircraft backwards, downwind of the launch gate, and caused it to pitch and roll. Microlight Instructor G noted that Pilot A seemed increasingly agitated by the situation but continued to apply positive control inputs that appeared to be in response to Instructor C's radio communications.

Witness evidence is not explicitly clear about the wing's position and direction of flight immediately prior to the collapse. Witnesses reported that it was about 40ft to 50ft above ground level when the wing experienced a small asymmetric collapse on the right-hand wingtip, which re-inflated. A large asymmetric collapse on the left-hand side of the wing then followed, deflating approximately 60 - 70% of the span. The wing was seen to enter a steep left-hand turn, through approximately 180^{o}, before Pilot A's impact with the ground.

In the seconds following the crash, Microlight Instructor H saw a dust devil forming in the field immediately downwind of the airfield, approximately 5-6 metres wide and 25 – 30ft high, defined by the cut grass in the field. The Investigation considered that in air around a dust devil, it is both possible and plausible that a paraglider would experience a rapid climb, and a departure from normal flight such as an asymmetric collapse would be highly likely in the associated turbulent air. Given the height loss in a steep turn, and Pilot A's proximity to the ground, there was insufficient time for her wing to recover from the asymmetric collapse and attain normal flight before impact.

It is evident that none of the instructors had anticipated the turbulent air or detected any sign prior to Pilot A's wing climbing rapidly even though it was not under tow. Prior to her launch Pilot A was "stood down" during an increase in wind strength, and waited in the launch gate with the glider risers in her hands. The wind then evidently settled such that Instructor C judged it suitable to launch a student. Trainee Instructor D was getting ready to launch after Pilot A, and stated that she launched directly into wind, its strength around 6mph. He noted that during the incident the wind speed at the launch gate remained at "a steady 6mph, no gust".

From the statements, it is apparent that neither the paragliding instructional team nor the microlight instructional team were aware of any indication of turbulent air prior to the incident flight and had been able to conduct student training flights throughout the day. The evidence provided points towards generally benign conditions, with sporadic light thermic activity, and this is supported by the records from the Met Office.

2.6 The Investigation considered the operation of the winch by the winch operator.

Winch Operator F described that he backed off power when Pilot A went into a steep climb. The wing settled, then climbed again, and he noted that the winch was not under power at this point. He made the decision to guillotine the winch line as the tow line was taut.

A fast rate of non-powered ascent when hooked-in to a tow is not explicitly referred to in the BHPA Technical Manual; however, the Investigation considered the advice under Section 2, Chapter 3, Point 7 “Emergencies from the tow unit”. This states that if the wing flies off to one side, the tow tension should be released by guillotining the tow line. The Investigation determined that the Winch Operator performed the correct action by guillotining the tow line.

SECTION 3 – CONCLUSIONS

The Investigation concluded that the incident occurred because Pilot A’s wing encountered a localised area of rising turbulent air, which caused a large asymmetric collapse that led to her wing entering a steep descending turn. Pilot A’s proximity to the ground was such that her wing was unable to recover before Pilot A impacted the ground, sustaining serious injuries.

SECTION 4 – SAFETY RECOMMENDATIONS

None.