British Hang Gliding and Paragliding Association

REPORT

Investigation of a paragliding incident which occurred at City Airport, Barton, Manchester, on 27th September 2020 in which the student pilot suffered serious injury.

Introduction

On 27th September 2020 the British Hang Gliding and Paragliding Association (BHPA) received reports of an air incident at Manchester Barton Airfield ("City Airport"), that had resulted in serious injury to the pilot. The BHPA tasked Mark Shaw, BHPA Senior Technical Officer, to investigate the incident and submit a report to the Flying and Safety Committee (FSC) of the BHPA 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.

The report is presented in de-gendered format to protect identities.

BHPA investigation serial number: GBR-2020-16106.

Summary

Pilot A was a student pilot receiving training from a BHPA Paragliding School operating a vehicle tow at Manchester Barton Airfield. On the 27th September 2020 at 7:08am (BST) Pilot A made a forward inflation and the flight commenced normally, the paraglider climbing under tow from a vehicle operated by a BHPA Senior Instructor. The paraglider climbed to an approximate height of 150 feet under tow along runway 32, when the weak link activated. The paraglider was seen to depart from its expected trajectory and descend vertically before pitching forwards and assuming a nose-down attitude at approximately 80ft above ground level, in a left-hand turn. Pilot A swung under the paraglider, before impacting the grass airfield surface. The emergency services attended, and Pilot A was evacuated to hospital.

This document is confidential until ratified.

Date ratified by the BHPA Flying and Safety Committee: 7th September 2023

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 1 - FACTUAL INFORMATION

1.1 History of the flight

On the 27th September 2020 a group of flyers (including two BHPA Instructors, a student and qualified pilots) assembled at Barton airfield with the intention of flying. The Instructors worked within a registered BHPA School teaching parascending and paragliding in the tow environment and providing vehicle tow launches to qualified pilots. The paragliding school had an arrangement with the airfield management to use the airfield before other aircraft movements commenced.

Instructor B (the school's Chief Flying Instructor and a BHPA licensed Senior Instructor) recorded the weather conditions as being cold, with a wind speed of 0-3mph from a northerly direction. The Landrover tow vehicle laid the towline out, and participants in the flying group performed a check on the hydraulic tensiometer in the Landrover.

At 06:56 (BST) an initial flight was made by a Club Pilot rated pilot (Pilot D). The school's manifest recorded the tow driver as Instructor C (a BHPA licensed Senior Instructor). Instructor B determined from their observation of this flight that the conditions were suitable for student training.

Pilot A, a pilot under training by the school was given a briefing by Instructor B, which was to complete a circuit flight. At 7:08am (BST) Pilot A made a forward inflation and the flight commenced normally, climbing under tow along runway 32. The paraglider climbed to an approximate height of 150 feet AGL when the weak link activated. The wing was noted to be perpendicular to the towline prior to the weak link activating. Witnesses described the paraglider pitching forwards and collapsing. Pilot A descended vertically, the aircraft and pilot turning through 90 degrees in a stall. The paraglider was then seen to pitch forwards and assume a nose-down attitude in a left-hand turn at approximately 80ft above ground level. Pilot A swung under the paraglider, before impacting the grass airfield surface. The emergency services attended, and Pilot A was evacuated to hospital.

The approximate incident location is illustrated in Figs. 1 and 2.

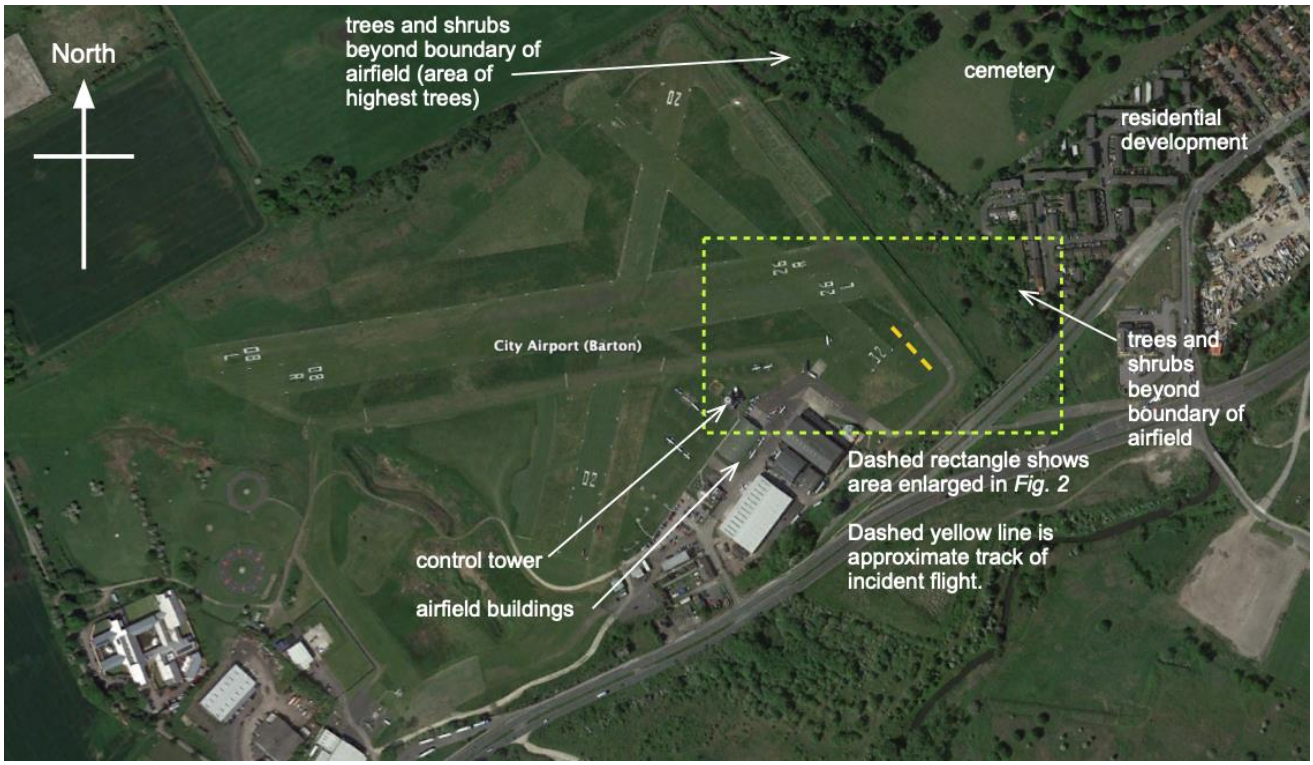

Fig. 1. Airfield layout and approximate incident location. Source of background map: Google Earth (2019).

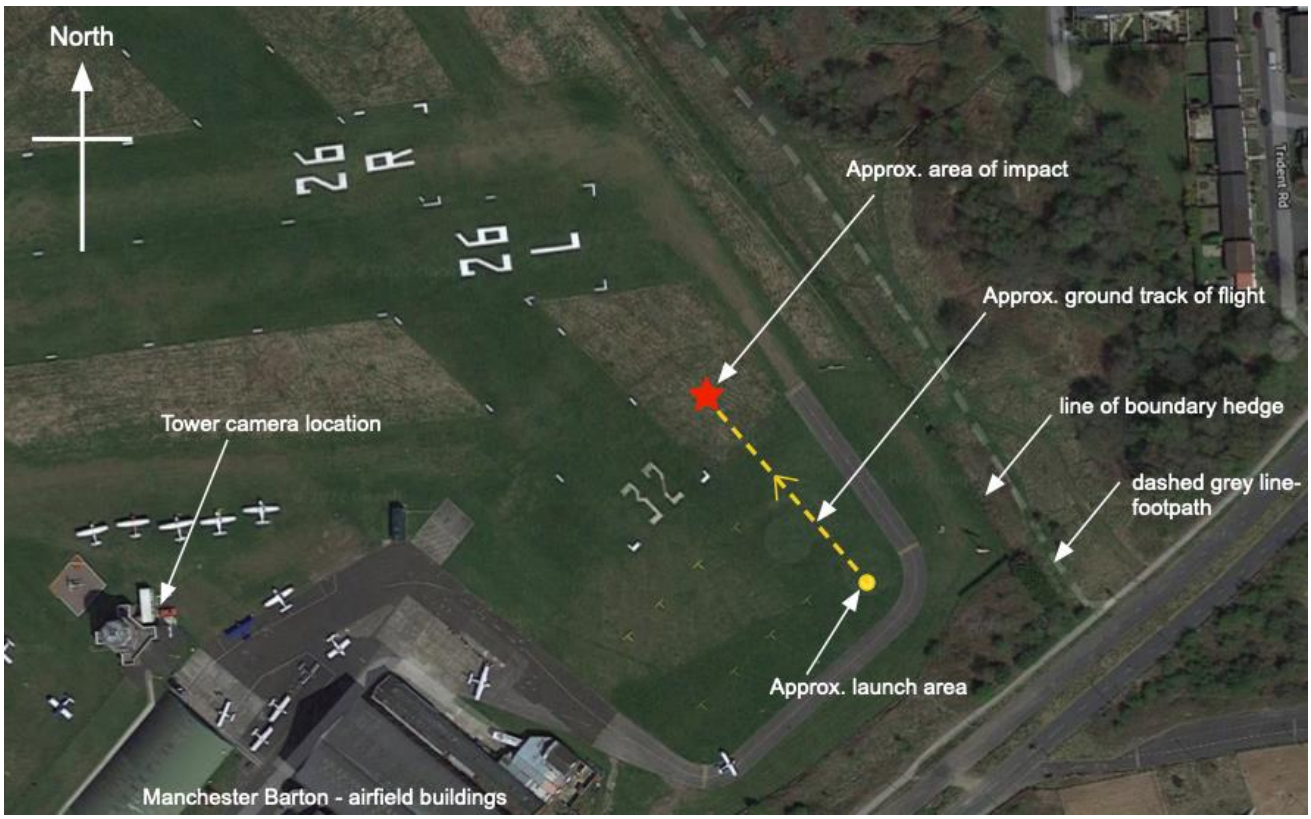

Fig. 2. Incident flight approximate ground track and impact location superimposed onto aerial view of site. Source of background map: Google Maps.

1.2 Injuries to persons.

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

1.3 Damage to the aircraft.

The paraglider sustained minor damage to a line in the incident or subsequent recovery. The harness was substantially damaged by cutting, assumed to be by the emergency services to evacuate the injured pilot.

1.4 Personnel information.

At the time of the incident, Pilot A was 25 years old, their weight stated as 52 kg.

1.5 Aircraft and tow equipment information.

All the equipment used was provided by the school.

1.5.1 The wing used by Pilot A at the time of the incident was an Ozone Element 2 paraglider, size "Extra Small" ("XS"), serial number ET2XS-Q-13A-069. The wing is classed "EN-B" in accordance with the Paragliding Equipment Flight Safety Characteristics Standard EN 926-2, with a certified total in-flight weight range of 55 to 75kg for this model and size of paraglider.

1.5.2 The harness worn by Pilot A at the time of the incident was a Sup-Air Access Airbag harness with an under-seat airbag impact pad.

1.5.3 The helmet worn by Pilot A at the time of the incident was a Sup-Air helmet labelled "BPC5".

1.5.4 The radios used by Pilot A and the instructional team on the day were the school's Motorola PMR radios.

1.5.5 The tow release fitted to the pilot harness was equipped with a Berkley Swivel weak link.

1.5.6 The tow unit was a Landrover vehicle, with a 210m (690ft) length of dyneema tow line connected to (approximately) 5m of bungee cord at the vehicle end, and a "Budenberg" tensiometer tow line tension measuring gauge (also fitted with an audible tension indicator).

1.6 Meteorological information

The conditions stated on the Met Office Aftercast for the incident day were as follows:

> "METAR and TAF reports were extracted from the database for Manchester Airport approximately 15Km southeast of the area of interest. The automatic reports were reporting north westerly (310 to 330 degrees True) surface winds at around 5 knots. Visibility was reported to be in excess of 10Km, with Few or Scattered (SCT) amounts of cloud at 2500FT AGL. Although no cloud was detected by the automatic sensors at 0620 or 0650UTC.
>
> The conditions at Barton Airfield would be very similar to those at Manchester Airport, with light north-westerly winds at the surface, good visibility in excess of 10Km, with a Few patches of cloud around 2500FT AGL."

The Met Office UK low level spot wind chart Form 214 (for 0600 UTC on the incident day) forecast a generally northerly wind (350 to 360 degrees) of 25 knots at 1000ft AMSL for 5230N 0230W.

The weather recording device from the weather station at Barton Airfield recorded a wind speed varying from 5 to 11mph (4.3 to 9.5 knots) over the course of the morning, the direction averaging 287 degrees (from WNW). At the time of the incident, the wind speed was recorded as being 287 degrees at 7mph (6 knots).

The witnesses reported a clear calm day with winds maximum 15 km/h (8 knots) at ground level. It was noted by Instructor C upon their observation of the first flight that conditions were smooth with a slight increase in wind speed above 500ft.

1.7 Aerodrome and approved facilities

Barton Airfield (designated EGCB) is a civil aerodrome located on the A57 Liverpool Road to the west of Manchester, with an altitude of 73 ft AMSL. To its north and west are fields. A residential development is to the airfield's east. A sports stadium is to the southeast, 0.5km away.

Outside the airfield's northeastern boundary hedge is a copse of shrubs and trees. These are subject to trimming by the airfield management and therefore vary in height from year to year, although the highest trees at the northern end of the copse (around the cemetery) are estimated as of March 2022 to be between 15 and 25m tall. They are known to cause some turbulence in their lee when aircraft are departing on runway 08 in a northeasterly wind. Wind shear is known to be encountered on most runway approaches, although this is stated as being experienced typically by aircraft outside the airfield boundary.

1.8 Tests, research and evidence.

The Investigation considered information from the following sources: reports and information submitted by Instructors B and C, Pilot D, Pilot E, Witnesses F and G; statements taken by the Police; notes taken during an interview with Pilot A on 10th December 2020; video footage from a camera fixed to the control tower at the airfield; a wing inspection report provided by an independent expert; meteorological and aerodrome information from various sources including the Met Office; soaring weather aftercast provided by the UK RASP voluntary open weather service (www.stratus.org.uk).

SECTION 2 – ANALYSIS.

2.1 Based on the information available, the Investigation considered the site; the weather conditions on the day; the equipment used; the instructional personnel; the training given to Pilot A and Pilot A's incident flight.

2.2 The site.

The Investigation considered the site.

The school had elected to use runway 32, a grass surface. The flyers had set up adjacent to the airfield windsock at the southeastern end of runway 32, about 40m away from the boundary and 75m away from line of shrubs and trees to the northeast.

The Investigation determined that depending on the extent of foliage and size of the shrubs and trees beyond the airfield's northeastern boundary, had there been a fresh northerly airflow, rotor may be experienced in the lee of the shrubs and trees outside the airfield boundary.

2.3 The weather conditions.

The Investigation considered the weather conditions.

RASP historical forecast data was obtained which displayed that the forecast thermal updraft velocity at 0800 BST on the incident day was low (225ft/min or below). The RASP historical forecast for wind at 2m AGL was from the north-northwest, between 2 and 10 knots.

From the airfield video footage (6:45am to 7:29am BST) it is evident from the windsock that the wind direction remained reasonably constant at surface level. The windspeed, although varying, remained light without any evident pronounced gusts.

Twelve minutes prior to the incident flight, a flight was undertaken by Pilot D (a qualified Club Pilot). Instructor B stated that they determined from this flight the weather conditions were good, as the flight went without issues. Instructor C stated that this flight indicated the conditions were smooth with a slight increase in wind speed (above 500ft AGL).

From the available information, the Investigation determined that the weather conditions on the day were suitable for flying, although care would have to be taken as pilots gained height above the ground and were exposed to potentially increasing windspeed. The Investigation determined that given conditions forecast on the day, the presence of wind shear could not be ruled out.

2.4 The equipment.

The Investigation considered the suitability and condition of the equipment used by Pilot A.

2.4.1 The paraglider.

The Investigation used the following calculation to determine whether Pilot A was within the certified weight range for the Ozone Element 2 (EN 926-2 certified weight range 55 – 75kg):

Glider	5.1kg
Harness	4.3kg
Approximate weight of clothing and ancillary equipment	4.0kg
Pilot A declared weight	52.0kg
Total weight in flight	65.4kg

The Ozone Element 2 XS is classified EN-B in the flight safety characteristics standard EN 926-2 when flown within the 55-75kg weight range. The flight test results for this model and size of paraglider state that the tested sample obtained "A" in all flight tests except its behaviour when exiting a fully developed spiral dive test, where it obtained a "B"[1].

The manufacturer Ozone states "The Element 2 is suitable for beginner and low airtime pilots who are learning and discovering this wonderful sport"[2], The paraglider is stated to be suitable for tow launching.

The Investigation found that the paraglider model was of suitable size and type for teaching Pilot A.

The Investigation considered the airworthiness of the incident paraglider. The school's service record indicated that the paraglider had been inspected and test flown on 25th September 2019 and was noted as being "good and flies well".

An independent expert undertook a condition check of the wing following the incident. The expert's report noted that the wing was in general fair to good condition. The paraglider had sustained minor damage to the right-hand side A line and the left-hand stabiliser line was cut. The trim of the wing was noted to be within tolerance.

The main brake lines were noted by the expert as being slightly short (by "a couple of centimetres"). The Investigation determined that of itself, this was not a contributory factor to the incident.

2.4.2 The harness.

A maintenance log for the particular harness used by Pilot A in the incident recorded that the harness was checked and found suitable for service on 15th December 2019. A post-incident visual inspection was carried out. The harness webbing was substantially cut and it was not possible to ascertain the exact chest strap measurement (distance between carabiners).

[1] https://para-test.com/reports/item/654-ozone-gliders-element-2-xs "Behaviour in a steeply banked turn".

[2] *Ozone Element 2 User Manual version 1.0 Nov 2010*, at page 5

This was extrapolated following an assembly of remaining parts as being between 38 and 42 centimetres. The Investigation found the harness to be of suitable type for training.

2.4.3 The helmet.

A maintenance log for the particular helmet worn by Pilot A in the incident recorded that the helmet was checked and found suitable for service on 15th December 2019.

The Investigation found the helmet to be suitable for the purpose of training.

2.4.4 The radio.

The maintenance log for the radio provided to Pilot A recorded that it was checked daily.

2.4.5 The tow equipment.

The Berkley swivel was inspected post incident and was found to have activated.

Berkley swivels have been used in the school for many years. The activation tension of these units had been independently established in 2017 and the mean activation values were recorded at or around 100daN. The BHPA Technical Manual stipulates a maximum weak link value of 125daN for paragliders with an all-up weight of 125kg or under. This is reduced by 20% for non-calibrated weak links such as the Berkley swivel.

The maintenance log for the tow release fitted to Pilot A's harness indicated that it was checked on 15th December 2019.

The tensiometer accuracy had been independently established in 2017. The "Pre 2020 season" maintenance log for the tensiometer recorded that in respect of the inspection it is to be checked daily, as it is fitted to the tow vehicle. Instructor B stated that "several members" checked the tensiometer prior to flying on the incident day, by performing a visual alignment check and physical check of the indicator to ascertain operation of the gauge and its audible alarm. Instructor C (driving the tow vehicle) stated that the tensiometer and quick release were tested prior to starting the day's operations. Instructor C stated that tow tensions during the incident flight were normal and smooth throughout the launch and early part of the tow.

The Investigation determined that on the balance of probabilities, the towing equipment was working within appropriate limits for towing paragliders (as far as they could be established by visual field checks), and it was fitted with a weak link of appropriate type.

2.5 Instructional personnel.

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

At the time of the incident Instructor B was a BHPA member and held a BHPA Senior Instructor licence for paragliding in the tow and hill environments, and for parascending (round and square canopies). They had held a BHPA Instructor licence for over twenty-five years. Instructor B was the Chief Flying Instructor of the school.

At the time of the incident Instructor C was a BHPA member and held a BHPA Senior Instructor licence for paragliding in the tow environment, and for parascending (round and square canopies). Instructor C had held a BHPA Instructor licence for over twenty-five years.

Both instructors were appropriately licensed to train Pilot A.

2.6 The training of Pilot A.

The Investigation considered the training given to Pilot A. Training was carried out under the supervision of Instructor B.

2.6.1 Pilot A commenced Elementary Pilot training on 24th August 2019, training with the BHPA's Parascending (Rounds) syllabus. No Student Training Record Book (STRB) was raised for this training. Between commencement of the training and their final flight on this type, Pilot A had logged seven flights using a "Waterbird" (small) parascending canopy.

2.6.2 Pilot A commenced the BHPA's paragliding tow environment syllabus and logged 25 training flights between 24th June 2020 and 17th September 2020.

2.6.3 A Paragliding (Tow) STRB was raised, however no exercises were signed off as completed by Pilot A. Instructor B stated that this was to comply with the school's policy during the COVID 19 pandemic to minimise the spread of the virus through cross-contamination. This policy did not follow the BHPA's guidelines for its "Stage 2b Guidelines for schools for a limited return to training" (issued to BHPA schools by email on 3rd June 2020) which required instructors to witness students signing off relevant exercises once satisfactorily complete, whilst minimising cross-contamination risks of continually passing the STRB back and forth between student and instructor.

2.6.4 Instructor B signed off Pilot A's successful completion of the flight requirement (Exs. 12-17) in the Paragliding Tow STRB on 24th August 2020. Pilot A had logged in total 24 flights on the Ozone Element 2 paraglider.

2.6.4.1 On 17th July 2020 Instructor B determined that Pilot A had completed STRB Exercise 14 (straight flights, releasing from the tow). This was signed off in the STRB by Instructor B.

2.6.4.2 On 24th July 2020 Instructor B determined that Pilot A had completed Exercise 16 (flights with turns). This was signed off in the STRB by Instructor B.

2.6.4.3 On 24th August 2020 Instructor B determined that Pilot A had completed Exercise 17 (completing simple flight plans). This was signed off in the STRB by Instructor B.

2.6.4.4 A further flight was undertaken on 17th September 2020, eleven days before the incident day.

2.6.5 Instructor B stated that Pilot A progressed slower than other students, required extra briefing before flights and was given additional support by the Instructors. Instructor B stated Pilot A "was at a stage with [their] training where they needed to consolidate where [they] were up to, by just having more flights, and completing simple circuits."

2.6.6 The weak link breaks (activations) and procedures in the event of other emergencies exercise (Ex. 9) was signed off in the STRB by Instructor B (on 20th June 2020). It was not signed off by Pilot A. The Eventualities Briefing exercise (Ex. 15) with a recap on weak link breaks was signed off by Instructor B (but not Pilot A) on 12th July 2020.

Pilot A stated that they had witnessed weak link activations occurring to other pilots. In their training session before the incident day (17th September 2020), Pilot A was aware of a weak link activation occurring to another pilot when the tensiometer ceased functioning. They stated that the tensiometer was then tested, and no further weak link activations occurred. Pilot A recalled being told what to do in the event of a weak link activation and understood the vital actions, although they had not experienced a weak link activation themselves.

2.6.7 The Investigation determined that despite the lack of written training records and the instructors' divergence from the BHPA's principles of STRB use, the available evidence illustrated that the training provided to Pilot A was sufficient for Pilot A to commence circuit flights under instruction.

2.7 The incident flight.

2.7.1 Prior to the incident flight, Instructor C operated the tow for Pilot D. The flight commenced at 6:56am and the duration was approximately 3.5 minutes. This flight was captured by the airfield tower video camera, the footage showing the take-off and landing. The wind appears to be light and conditions to be benign, and the flight was completed without incident.

2.7.2 Instructor B stated that based on their observations of Pilot D's flight, they considered the conditions ideal for Pilot A to fly. Instructor B briefed Pilot A for a circuit flight, equipped Pilot A with a radio and performed a pre-flight radio check. At the time of interview, Pilot A was not able to recall the points of the brief specifically, but they did not dispute that a pre-take off brief had been given. Witness F, as launch marshal, verified the pre-flight checks had been completed and signalled to to the tow vehicle that the launch sequence could commence.

2.7.3 Pilot A can be seen on the airfield tower video preparing to launch with the centre leading edge being held up by an assistant. Pilot A made a forward launch, and the canopy can be seen rising symmetrically into the air (at 07:08:14). Pilot A left the ground and climbed initially with a gentle rate of climb. Instructor C (operating the tow vehicle) stated that Pilot A's light weight necessitated a low tow tension.

2.7.4 At 07:08:20 the canopy can be seen to begin climbing at a greater rate, the wing further back in relation to the pilot. Instructor C stated that tow tensions were "normal and smooth through the launch and early part of the tow". Instructor C noted that Pilot A made a control input to correct a minor misalignment with the towline. Instructor B stated that no radio intervention was necessary to prompt Pilot A to reacquire alignment with the towline.

2.7.5 The climb trajectory appears to steepen progressively during the six seconds until Pilot A is towed above the camera's field of view (07:08:27). Instructor C stated that at "approximately 70-80ft AGL there was a sudden increase in tow tension and the canopy quickly dropped behind the pilot." Instructor C stated they applied the tow vehicle's brakes to reduce the tension, but the increase was too rapid, and the weak link activated. The canopy dropping "quickly behind the pilot" cannot be observed from the video. The Investigation determined that this would have occurred when Pilot A was above the camera's field of view.

At 07:08:29 the drogue 'chute is seen to appear in the camera's field of view, in free descent. The activation therefore occurred in the preceding two seconds, above the camera's field of view. The Investigation determined that Pilot A's climb trajectory continued until the weak link activation occurred, and extrapolated (using stills from the video evidence) that the activation occurred when Pilot A was at a height of approximately 150ft AGL. The Investigation determined that Instructor C's general focus would have been up the tow line towards Pilot A. Their estimation of the height (70-80ft) when the weak link activation occurred was therefore not considered to be accurate.

2.7.6 At 07:08:31 Pilot A reappears in the camera's field of view, in a vertical or near vertical descent. The paraglider appears at 07:08:32, partially deflated and in a stalled configuration. Instructor B stated that they instructed Pilot A over the radio to raise their hands to allow the canopy to fly, and this instruction was noted by Witness G. It is not possible to see control inputs made by Pilot A on the camera footage. At 07:08:33 the paraglider can be seen re-inflating and diving forward, at approximately 80ft AGL. The paraglider made a left-hand turn through approximately 90 degrees in a nose-down attitude, until Pilot A struck the ground about 75 metres from the launch point, facing towards the launch area (at 07:08:35).

2.7.7 In Fig. 3, the flight sequence is illustrated on the composite image. This is compiled with stills captured from the tower camera's video recording. It shows the portion of the flight under tow, and the approximate area of impact following the incident.

Fig. 3. Composite image of Pilot A'a flight sequence captured by airfield camera, produced from stills.

2.7.8 The BHPA Technical Manual states:

> "…once the canopy has been successfully inflated it should be climbed at steady but fairly low tensions. When the canopy has passed 100 ft the tensions can be increased to give the optimum rate of climb for the distance towed. The canopy type, age and trim and the weight of the pilot will all affect the tensions required to gain and maintain height; and wind shear or gradient can exert an influence."[3]

The Investigation determined from the video footage that the steeper climb trajectory began when Pilot A was approximately 30 to 40ft AGL and deviated from the advice in the Technical Manual (that tensions can be increased after 100ft). It is noted that the increasing tension did not result in immediate weak link activation, as the weak link did not activate until the pilot was approximately 150ft AGL.

2.7.9 The Investigation considered the possible causes of the weak link activation.

A composite image was put together from the tower's video recording, comparing Pilot A and Pilot D's towed trajectories. This is shown at Fig. 4.

[3] BHPA Technical Manual 20; 2:4:4 at Page 5: *Launching and Controlling the Canopy to Self-Release*

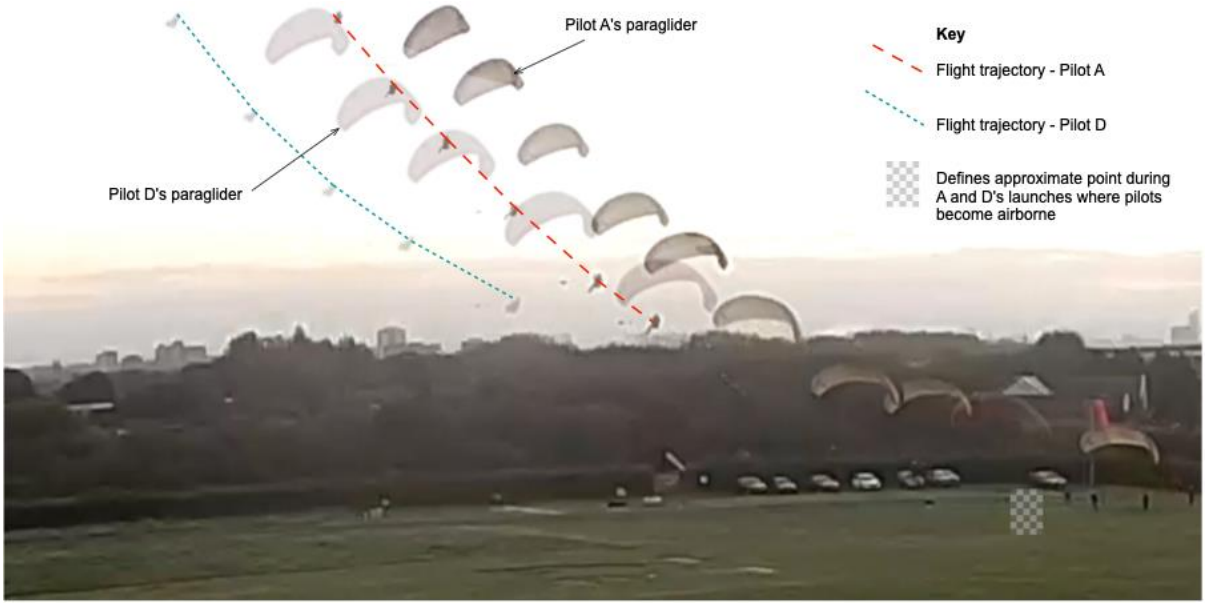

Fig. 4. Composite image of flight trajectories of Pilots A and D captured by airfield camera, produced from stills.

It is apparent from analysis of the camera footage that Pilot A's initial climb trajectory was slightly steeper than that of Pilot D – Pilot A had achieved a greater height above the ground than Pilot D at a comparable horizontal distance from their respective launch points. The Investigation determined that the tow tensions associated with a steep climb trajectory would lead to an increased likelihood of a weak link activation. However, Instructor C did not report that the tow tensions were excessive. The trajectory lines, when compared for the latter visible part of the tows show a similar climb trajectory; however, Pilot A's paraglider was sitting slightly further back behind Pilot A than Pilot D's paraglider was, relative to Pilot D.

This difference in wing pitch or attitude is illustrated at Fig. 5, a composite image assembled from stills from the tower camera footage of when Pilot A's and D's wings were at similar heights above ground. The central axis point is the approximate position of the harness to riser attachment points of both aircraft. This cannot be perceived with absolute accuracy given the distances from the camera to the aircraft, and the low quality of the enlarged images.

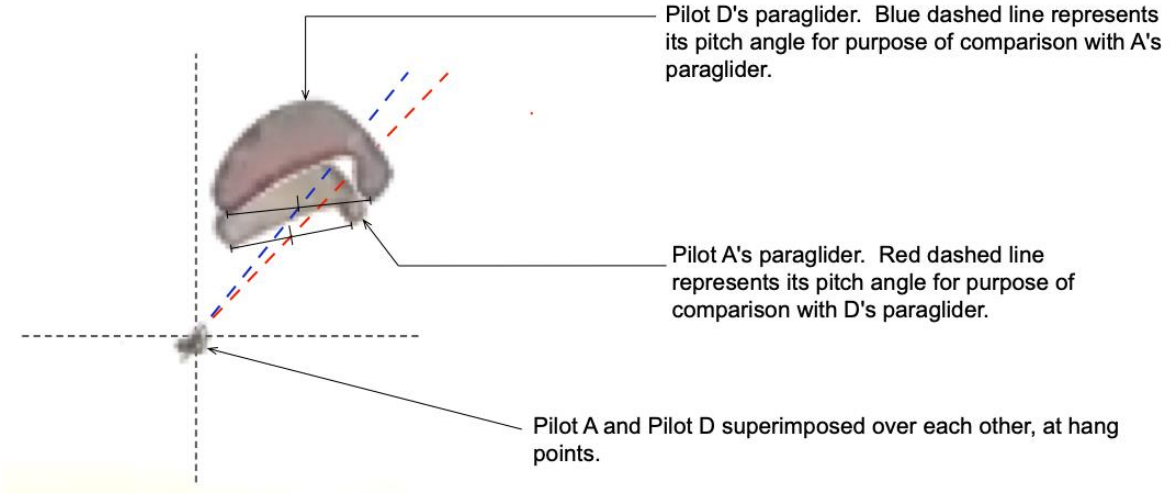

Fig. 5. Composite image showing approximate differences in wing attitudes of Pilots A and D. Comparison of the angles of the red and blue dashed lines illustrate the difference in wing pitch angles. These lines are projected through the half-way point of a notional line drawn wingtip to wingtip of each wing. They are not representative of the centre of the aircrafts' wingspans, which cannot be determined with accuracy from the images.

The Investigation determined that Pilot A's greater rate of climb and greater wing attitude under the same or similar tow force may be attributable to Pilot A's weight and lower wing loading, when compared to the wing loading on Pilot D's wing[4].

The Investigation considered whether an intentional or unintentional control input made by Pilot A further increased the tension so that the weak link activated. It was stated by Instructor C that they observed no control input by Pilot A. No witness at the launch point referred to observing such an action in their statements. However, given the evident distance between Pilot A and the ground, a control input by Pilot A may have been made but not seen by the witnesses. The Investigation determined that a control input by Pilot A cannot be ruled out as a causal or contributory factor in the weak link activation.

The Investigation considered whether a change in wind conditions further increased the tow tension, causing the weak link to activate. Pilots D and E, and Witness F stated they believed that that a gust of wind caused the weak link to activate. The Investigation considered that at the height the activation occurred, Pilot A may have been exposed to greater wind speed and/or wind shear. Witness G's observation of the drogue 'chute descending "off to the left" after Pilot D released from the line on the previous flight suggests a more northerly airflow above ground level. This is consistent with the Met Office forecast of wind direction (Form 214). It is noted that neither instructor made a test flight themselves to assess the conditions before allowing a student to fly, however they had observed a normal tow made by a qualified CP (Pilot D) before Pilot A's flight. Although the Instructors had determined the conditions as being favourable for student training, wind speed increase and wind shear cannot be ruled out as contributory factors.

2.7.10 The Investigation considered the sequence of events following the weak link activation.

When a weak link activation occurs, the pilot will pendulum back underneath the paraglider causing it to surge forward before it stabilises above the pilot's head and recovers to normal flight. The pilot may need to apply the controls to damp the surge, depending on its degree and speed. Pilot A stated they understood the importance of stopping the surge and recalled that on the incident flight they kept their hands up ready to damp the surge, however the expected surge did not occur.

Instructor C stated that upon the weak link activation, the "canopy surged forward in front of the pilot, far more than one would normally expect for a training wing under these circumstances". They noted that a full frontal collapse occurred, although this was not captured on the airfield tower camera. Instructor C stated that they had "never experienced such a violent reaction from a wing where there has been no obvious pilot input following a weak link activating".

The Investigation concluded that based on the presented evidence, the position of the wing behind Pilot A and its climb trajectory prior to the weak link activation prompted a dynamic surge when the activation occurred. This in turn led to the paraglider dynamically changing trajectory with no evident pilot action to counter the surge.

The Investigation notes that the EN 926-2 test report for the Ozone Element 2 (XS) classifies the behaviour of the wing in the symmetric front collapse test to be "A" classification at both upper and lower limits of the weight range. This classification stipulates spontaneous recovery to normal flight in less than 3 seconds and a dive forward of 0º to 30º, keeping course with no pilot input.

Pilot A supplied additional evidence noting that they held the control handles "as normal", and they were instructed to wrap the control lines a couple of times around their hands.

[4] Simple wing loading calculation using flat area of wing. Approx. 2.86kg/m^2 for Pilot A, 3.3kg/m^2 for Pilot D.

Instructor B, when questioned about taking wraps stated that neither they, nor Instructor C, would ever instruct a student or pilot to take wraps. When it was Pilot A's turn to fly, Witness F (launch marshal) was seen by Instructor B to perform a pre-take off check which included checking Pilot A's "harness and helmet were fully clipped up, risers not twisted, control lines not tangled, and that the canopy lines were clear with the 'A' lines on top". Witness F stated that had a wrap of the control lines around Pilot A's hands been detected, they would have asked for them to be unwrapped. The Investigation noted that the control lines on the glider flown by Pilot A were a bright yellow colour, distinct from the blue, red and green of the suspension lines.

The Investigation considered that the effect of taking wraps as described by Pilot A would introduce an additional 20 to 30cms of control input during the flight, reducing the wing's airspeed and causing the wing to "sit back" under tow.

It is not possible to determine from the video the amount of control application or deflection of the trailing edge of the paraglider during the launch (against the backdrop of trees). The Investigation considered that a control input of that extent (two wraps) would be observable when the glider was seen against the sky. Significant trailing edge deflection is not visible on the video. None of the witnesses remarked that a significant amount of trailing edge deflection was noticeable during the flight.

Pilot E was at the launch gate preparing to fly and witnessed the events that followed the weak link activation. They noted seeing a control handle "swinging out on [Pilot A's] right hand side…" as if "[they] had lost [their] grip". Other witnesses did not report they had observed this, and Pilot A did not report dropping or releasing a control handle. Pilot E stated they "didn't notice if [Pilot A] had hold of any of the other brake control".

Pilot A asserted that because they had been instructed to wrap the control lines around their hands "it would be impossible for Pilot E to have seen a control handle with 'lost grip'".

The Investigation considered the grip type used by Pilot A, which may have been grasping the semi-rigid bottom of the handle, or another method – variations on which involve the hand (with or without the thumb) positioned through the control handle (using a method akin to a "ski pole" grip).

Pilot A wore gloves during flight training; however, they were unable to recall with certainty the type of gloves they wore on the incident flight. The Investigation considered that gloves (depending on the thickness of their material) may provide degrees of hindrance to the release of wrapped control line, or to the withdrawing of a hand placed through the control handle. Gloves may inhibit or suppress the sensation of grip of the control handles, or enable their inadvertent release.

From the video, when the paraglider first comes into view it appears to be in a stalled configuration from which it begins to recover. The pilot's hands are not visible at this time in the images. The wing then exhibits a dramatic exit from the stall, diving to recover airspeed, however it is unable to recover to normal flight due to the proximity of the ground. During this phase a left turn can be seen to develop which would be consistent with Pilot E's evidence.

A dynamic departure from the previous flight path as the one evident in this incident often prompts an instinctive and unintentional reaction from an inexperienced pilot - a control input to both sides or to one side only. Had one control handle been released by Pilot A, an asymmetric control input (a control input made on the side where the handle is still held) may have prompted the turning response by the paraglider seen by witnesses and described in section 2.7.6. It could therefore have been a factor that affected the glider's behaviour and delayed its recovery to normal flight. Although no control inputs were detectable on the film footage, the Investigation determined that a control input by Pilot A cannot be ruled out.

SECTION 3 – CONCLUSIONS

The Investigation concluded that the incident occurred as Pilot A lost control of their paraglider after the weak link activated and they were unable to regain control before impacting the ground. A control input by Pilot A during the recovery to normal flight would have affected the glider's behaviour and its recovery, and cannot be ruled out as a factor in the incident.