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AAIA

Air Accident Investigation Authority

Loss of Control – Inflight (LOC-I)

Investigation Report

Accident to Ozone Buzz Z5 Paraglider, Shek O, Hong Kong

23 December 2021

05-2022

AAIA Investigations

Pursuant to the Hong Kong Civil Aviation (Investigation of Accidents) Regulations (Cap. 448B), the sole objective of the investigation and the Investigation Report is the prevention of accidents and incidents. It is not the purpose of the investigation to apportion blame or liability.

The Chief Inspector ordered an inspector's investigation into the accident in accordance with the provisions in Cap. 448B.

This accident investigation report contains information of a fatal occurrence involving a paragliding activity at Shek O in Hong Kong on 23 December 2021.

The Civil Aviation Department, Fire Services Department, Government Flying Service, Hong Kong Observatory, Hong Kong Police Force, Lands Department, Hong Kong Paragliding Association, Hong Kong Paragliding Federation, MET SPA (the helmet manufacturer) and Ozone Gliders Limited (the paraglider manufacturer), provided assistance to the investigation team.

Unless otherwise indicated, recommendations in this report are addressed to the regulatory authorities of the State or Administration having responsibility for the matters with which the recommendation is concerned. It is for those authorities to decide what action is taken.

This Investigation Report supersedes the Preliminary Report concerning this accident investigation.

All times in this Investigation Report are in Hong Kong Local Times unless otherwise stated.

Hong Kong Local Time is Coordinated Universal Time (UTC) + 8 hours.

Chief Accident and Safety Investigator

Air Accident Investigation Authority

Transport and Logistics Bureau

Hong Kong

September 2022

Synopsis

At approximately 1347 hours (hrs) on 23 December 2021, an Ozone Buzz Z5 paraglider took off from Dragon's Back, a paragliding area in Shek O, and planned to land on Rocky Bay Beach in the south-eastern part of Hong Kong Island.

At approximately 1349 hrs, the paraglider descended towards a bush area at the west of Shek O Peak. The pilot, who was flying solo, was fatally injured in the accident.

At around 1409 hrs, the witness called the Hong Kong Police Force (HKPF) for emergency help and reported that a paragliding pilot was stranded on the hillside. The Fire Services Department (FSD) immediately launched a Mountain/cliff rescue operation in conjunction with the HKPF and the Government Flying Service (GFS).

At 1602 hrs, the GFS located the pilot and his paraglider on a hill slope of Shek O Peak, about half a kilometre southwest of where he took off. The pilot was immediately conveyed to the Ruttonjee Hospital for medical treatment and was certified dead later.

The investigation found that this fatal accident was probably caused by the loss of control of the paraglider, resulting in an impact with the terrain that rendered neck injury to the pilot.

The investigation team has made one safety recommendation.

Contents

1. Factual Information

1.1. History of the Flight

(1) Between 1315 hrs and 1345 hrs on 23 December 2021, two paraglider pilots (the accident pilot ("the Pilot") and the witness ("Pilot A")) were carrying out the flight preparation at the Shek O (Dragon's Back) take-off site and planned to land on Rocky Bay Beach in the south-eastern part of Hong Kong Island.

(2) Pilot A witnessed the accident flight and was interviewed to share his observations with the investigation team. According to Pilot A, during their flight preparation, the wind was considered suitable for take-off.

(3) At approximately 1346 hrs, the Pilot started to carry out the reverse inflation (face to the canopy), and then he was suddenly lifted when the canopy was at about 45 degrees to the backward direction (opposite to take-off direction).

Figure 1: Typical Paragliding Reverse Inflation

(4) He immediately turned 180 degrees, and moved his upper body facing the normal take-off direction, but he could not make the paraglider move forward. The paraglider continued to move backward and flew into the leeward side of the mountain.

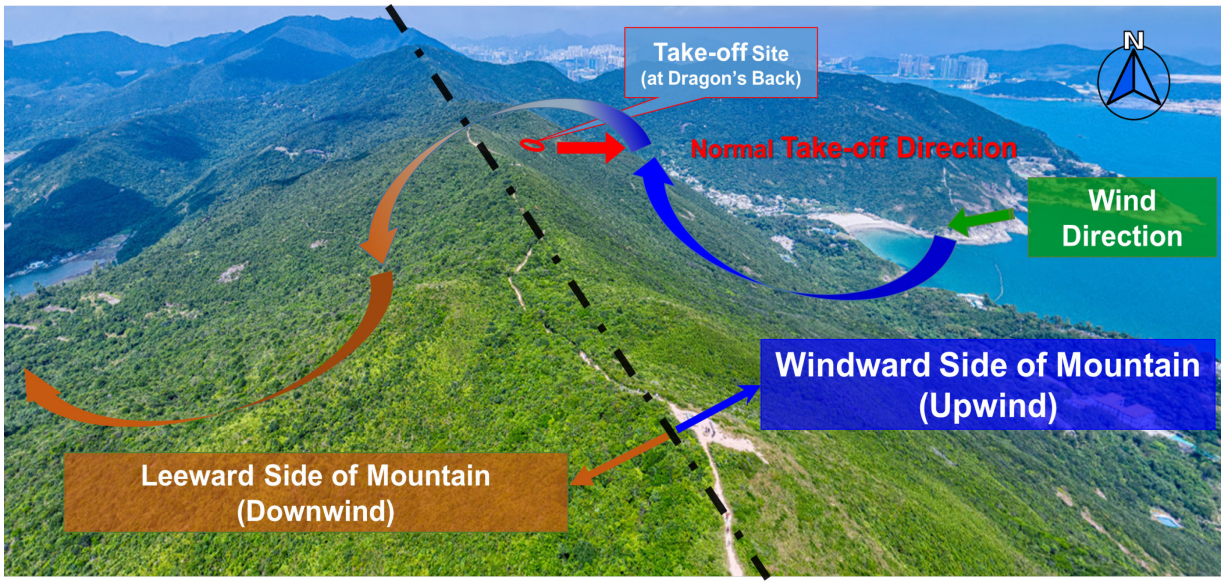

Figure 2: Leeward Side of Dragon's Back

(5) At approximately 1349 hrs, shortly after the take-off, Pilot A witnessed that the Pilot descended towards a bush area at the west of Shek O Peak.

(6) At around 1409 hrs, Pilot A called the HKPF for emergency help and reported that the Pilot was stranded on the hillside.

(7) The FSD immediately launched a Mountain/cliff rescue operation in conjunction with the HKPF and the GFS.

(8) At 1602 hrs, the GFS located the Pilot and his paraglider on a hill slope at about 230 m above mean sea level (AMSL) west of Shek O Peak, almost half a kilometre south-west from where he took off.

(9) The Pilot was immediately conveyed to the Ruttonjee Hospital for medical treatment and was certified dead later.

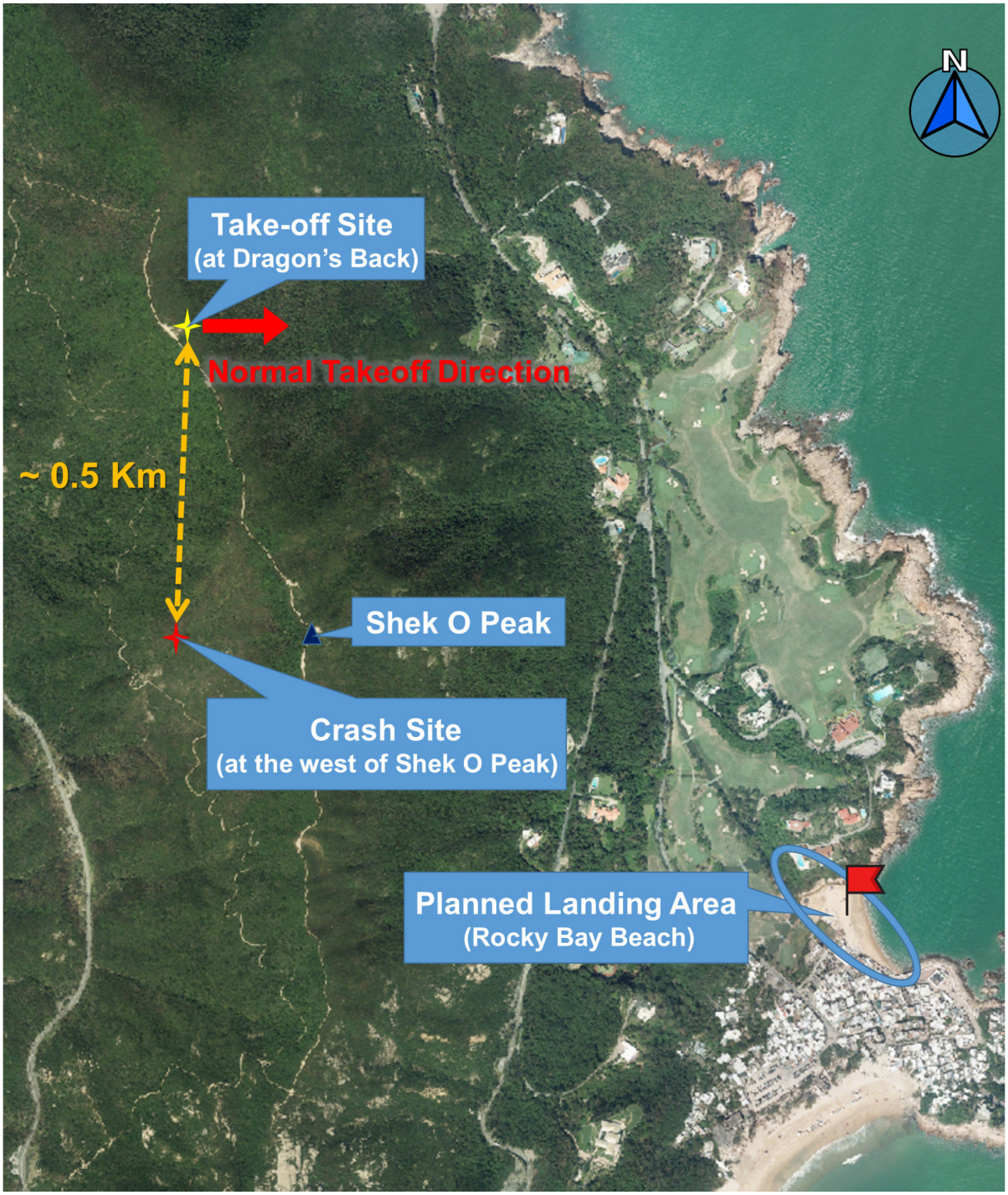

Figure 3: Paraglider Accident at Shek O Paragliding Area

1.2. Injuries to Persons

The Pilot was fatally injured.

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

Table 1: Injuries to Persons

1.3. Damage – Paraglider

There was no significant damage to the paraglider.

1.4. Other Damages

No other damage was caused.

1.5. Personnel Information

1.5.1. General

Pilot	Male, aged 74
Weight	61 kg
Licence details:	Paraglide Tandem International Organisation (PGTI) [1] Solo Pilot – Novice Paragliding Rating (SP-2)
Flying experience:	Approximately 200 hours

Table 2: Pilot Information

[1] PGTI was a non-profit corporation incorporated under the laws of the state of New Jersey in the United States of America.

1.5.2. Experience, Training and Qualification

(1) The Pilot had attended paragliding training since 2017 and obtained a Solo Pilot – Novice Paragliding Rating (SP-2) from PGTI in March 2019.

(2) He had accumulated about 200 flying hrs from 2017 to 2021.

1.6. Paraglider Information

(1) A typical paraglider consists of a canopy which is inflated by the wind to form an aerodynamic wing to which the pilot is suspended by a harness equipped with control lines. The inflated wing enables the paraglider to fly forward and downward. To gain height, it has to make use of rising air. It has rudimentary means of directional control.

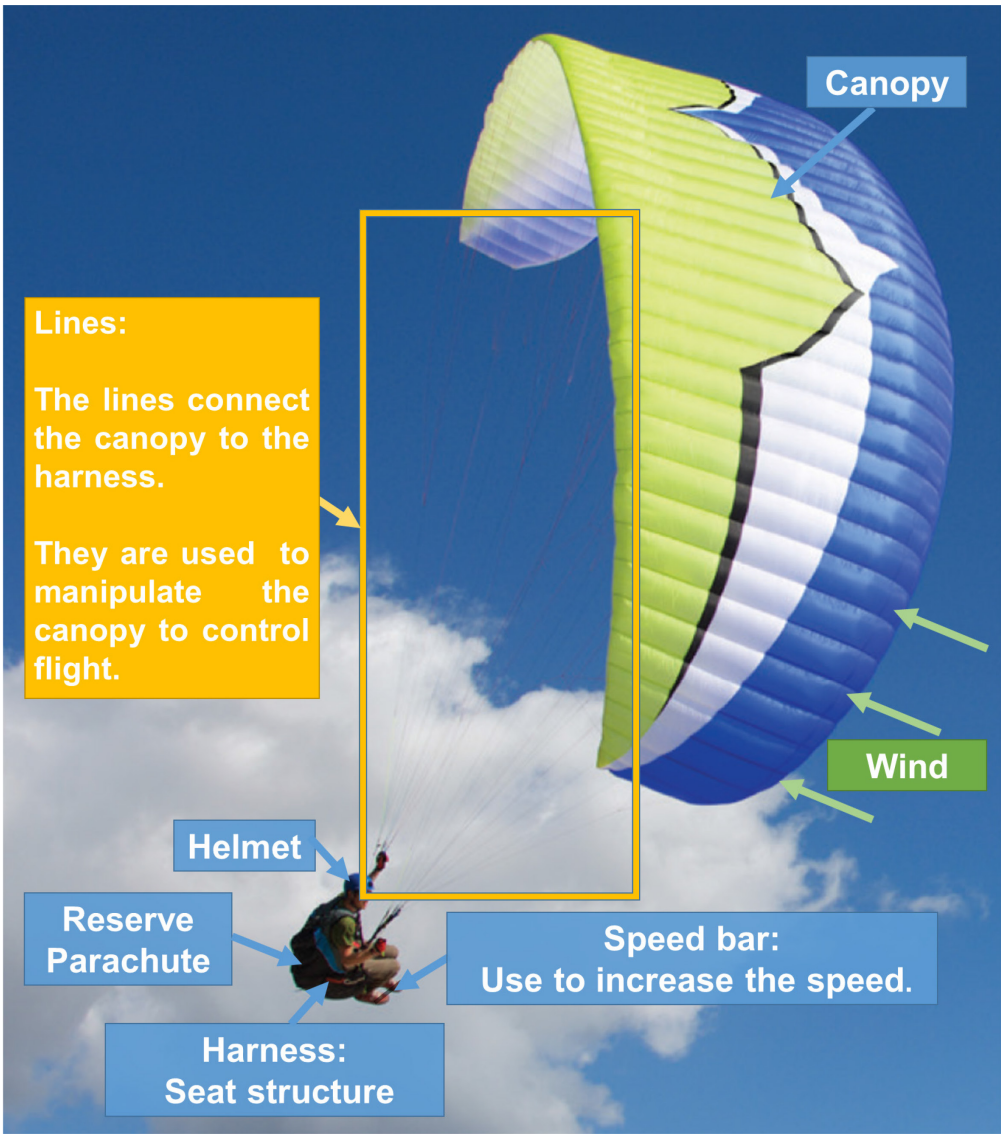

Figure 4: A Typical Paraglider

(2) The Pilot operated an “Ozone Buzz Z5”, an EN-B certified paraglider of S size, which was built in 2017. It was fitted with an “Advance Progress 3” harness of M size.

Note: European Norm (EN) is a 4-level paraglider certification system A, B, C & D. EN-A is the beginner glider while EN-D is for highly skilled pilots.

Figure 5: “Ozone Buzz Z5” Paragliding Canopy of the Pilot

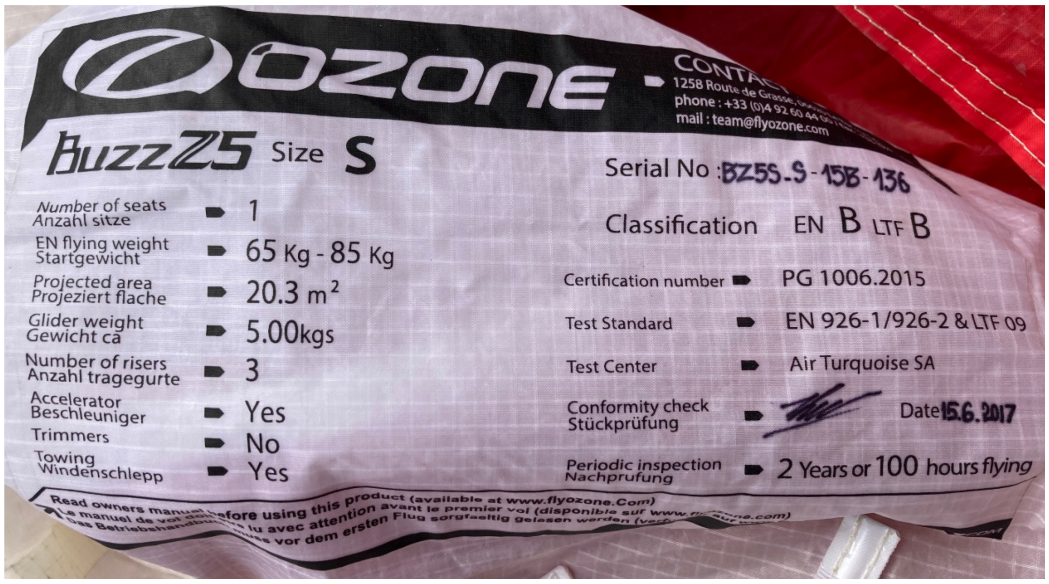

Figure 6: The Model & Certification Label of the Paragliding Canopy

Figure 7: "Advance Progress 3" Paragliding Harness of the Pilot

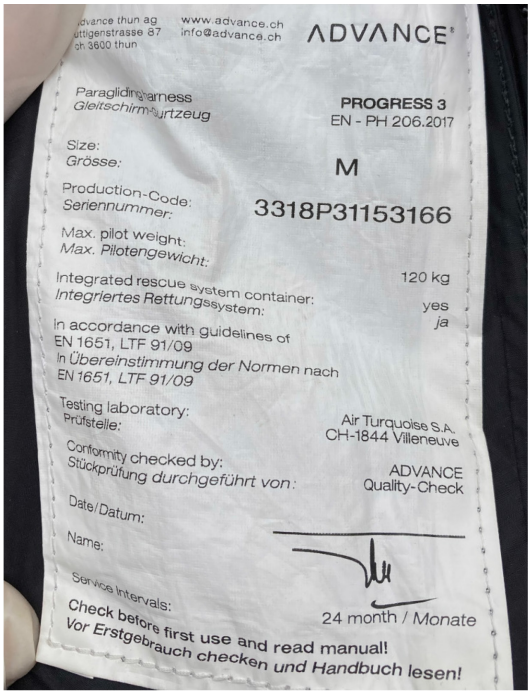

Figure 8: The Model & Certification Label of the Paragliding Harness

(3) According to the British Hang Gliding & Paragliding Association (BHPA), EN-B paragliders were designed for all pilots and also suitable for experienced pilots who fly less than 50 hours a year.

Class	Description of flight characteristics	Description of pilot skills required *(BHPA expanded version)*
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. *(For all pilots especially those in their first year of flying and for experienced pilots with limited currency, for example those who fly less than 25 hours a year.)*
B	Paragliders with good passive safety and forgiving flying characteristics. Gliders with some resistance to departures from normal flight.	Designed for all pilots and may be suitable for pilots under training if recommended by the manufacturer. *(There are a wide range of gliders produced in this category. Some are closer to 'A' class gliders. Others are for pilots who have gained more than 30 hours mixed flying (at least ten in thermic conditions) and hold a 'Pilot' rating. B class gliders are also suitable for experienced pilots who fly less than 50 hours a year.)*
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. *(For pilots who are Advanced Pilot rated, have several hundred hours logged (many of these in thermic conditions), have completed SIV courses, are flying 10 or more hours a month, and enjoy dealing with large asymmetric collapses etc.)*
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. *(For pilots who have been flying for many years, fly more than two hundred hours a year often in strong thermic conditions and are masters of the various SIV skills.)*

Figure 9: EN Classes of Paragliders Published by the BHPA

Source: https://www.bhpa.co.uk/pdf/En_PG_Classes.pdf

(4) The in-flight weight range of the paraglider in S size was 65 to 85 kg as specified in the Ozone Buzz Z5 Pilots Manual.

(5) The weight of the paraglider and the harness with equipment were 5 kg and 6.5 kg respectively while the weight of the Pilot shown on the autopsy report was 61 kg. Thus, the total in-flight weight was 72.5 kg which was within the weight limit (65-85 kg) of the paraglider.

(6) A reserve parachute was installed in the harness.

Figure 10: Typical Paragliding Reserve Parachute in "Advance Progress 3" Harness

1.7. Meteorological Factors

1.7.1. Weather information from the Hong Kong Observatory

1.7.1.1. Weather Forecast for Local Aviation at 1230 hrs

(1) At 1230 hrs on 23 December 2021, the Hong Kong Observatory (HKO) issued a weather forecast for local aviation for the period from 1300 to 2300 hrs.

(2) According to the forecast, there was no significant weather within the 100-kilometre (km) radius of Hong Kong. The synopsis of the weather situation was "northeast monsoon affecting the coastal areas of South China". The surface wind would be 10 knots (kt) from the 070 (around east-northeast) wind direction.

1.7.1.2. Special Weather Tips

There were no Special Weather Tips issued on the date of the occurrence.

1.7.1.3. Thunderstorm Warning

There was no Thunderstorm Warning in force on the date of the occurrence.

1.7.1.4. Rainfall Rate

(1) The HKO's weather radar observes the rainfall rate at a height of 3 km AMSL once every 6 minutes.

(2) The radar images with rainfall rates in the 64-km range at 1342 hrs, 1348 hrs and 1354 hrs are shown below. The colour scale on the right indicates the magnitude of the rainfall rate.

(3) According to the following images, there was no precipitation in Shek O during the period from 1342 hrs to 1354 hrs.

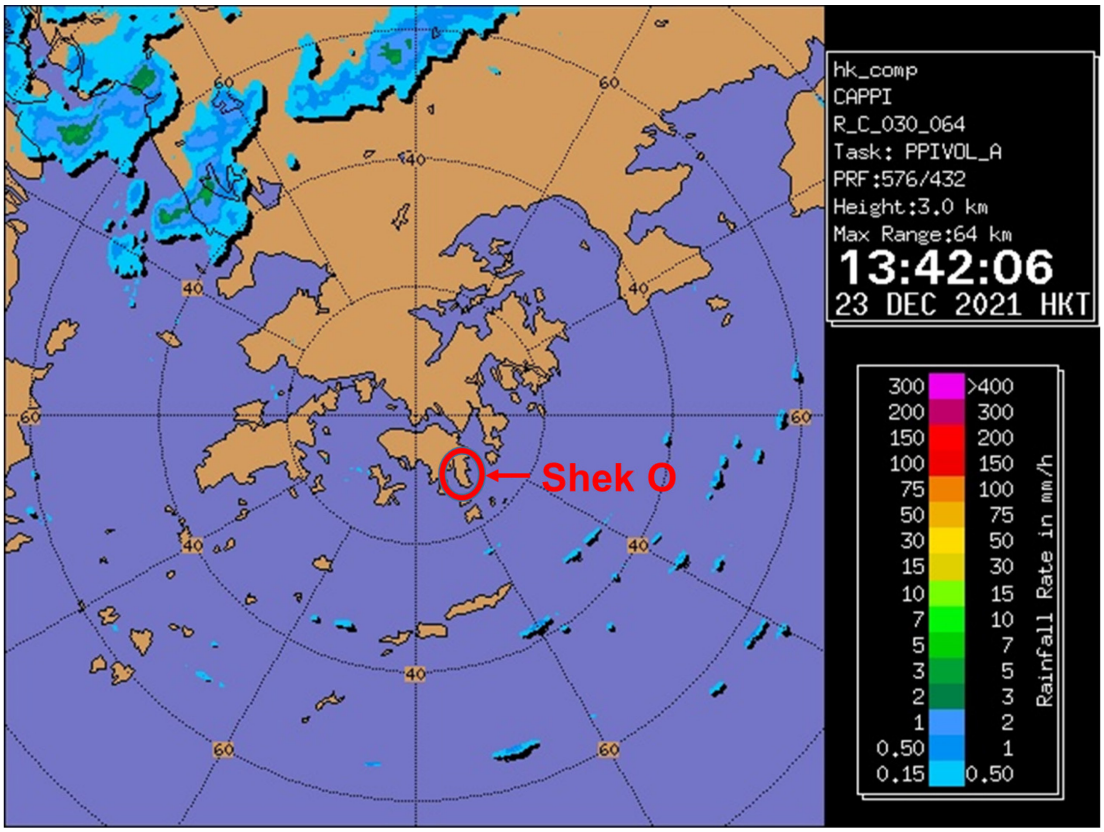

Figure 11: Radar Image with Rainfall Rate in 64-km Range at 1342 Hrs

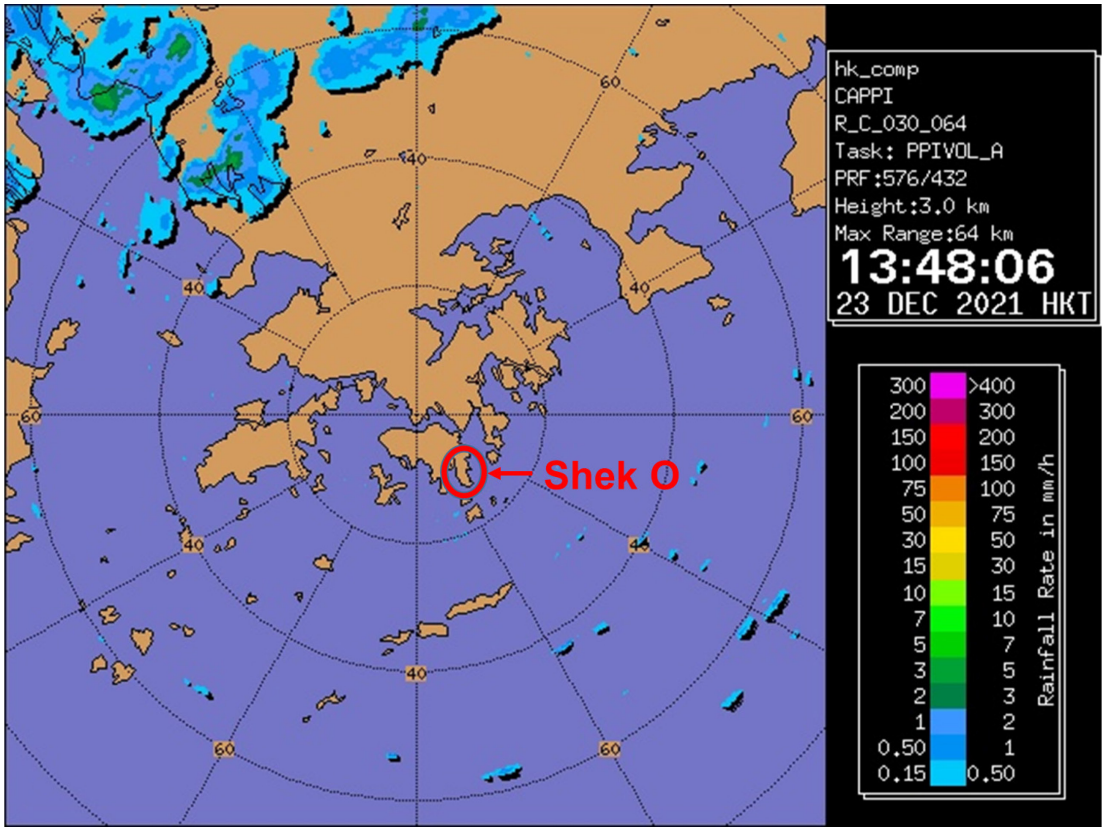

Figure 12: Radar Image with Rainfall Rate in 64-km Range at 1348 Hrs

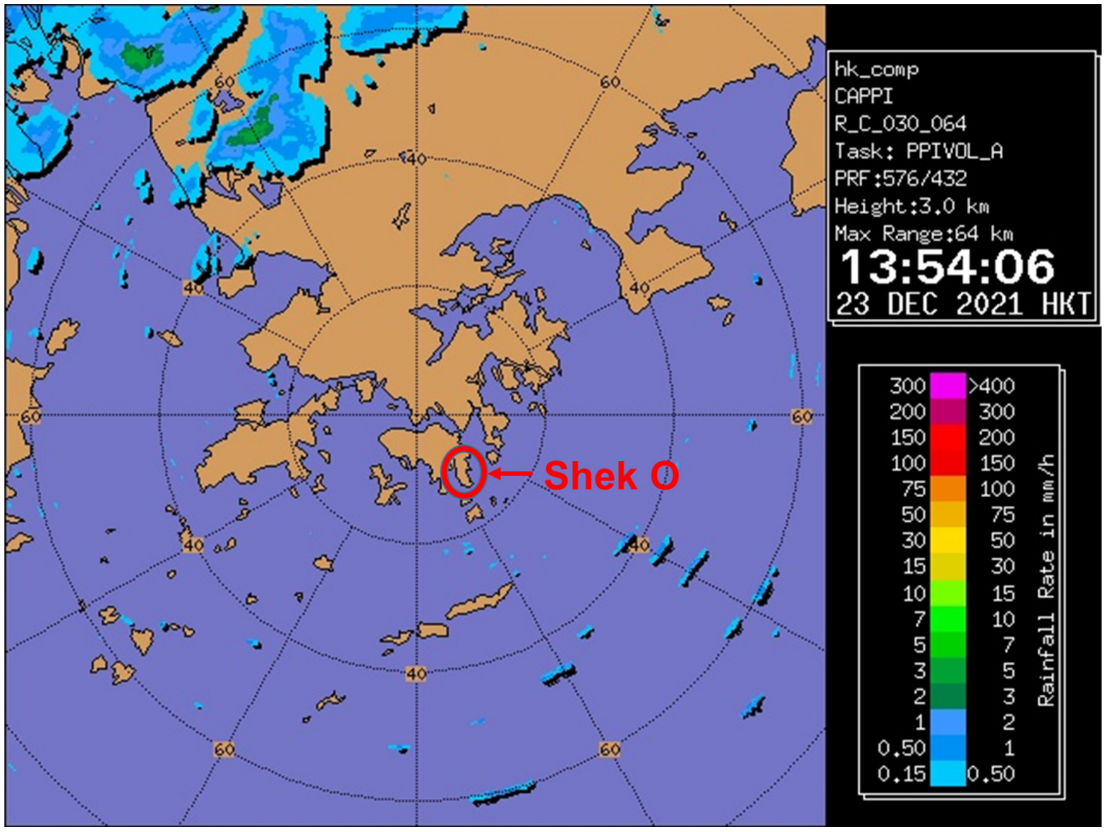

Figure 13: Radar Image with Rainfall Rate in 64-km Range at 1354 Hrs

1.7.1.5. Wind Data from Nearby Weather Stations

(1) The nearby HKO weather stations of the Shek O paragliding area are at Waglan Island and HK Sea School. The wind condition of the accident flight was expected more or less the same as the ones recorded at these two nearby weather stations.

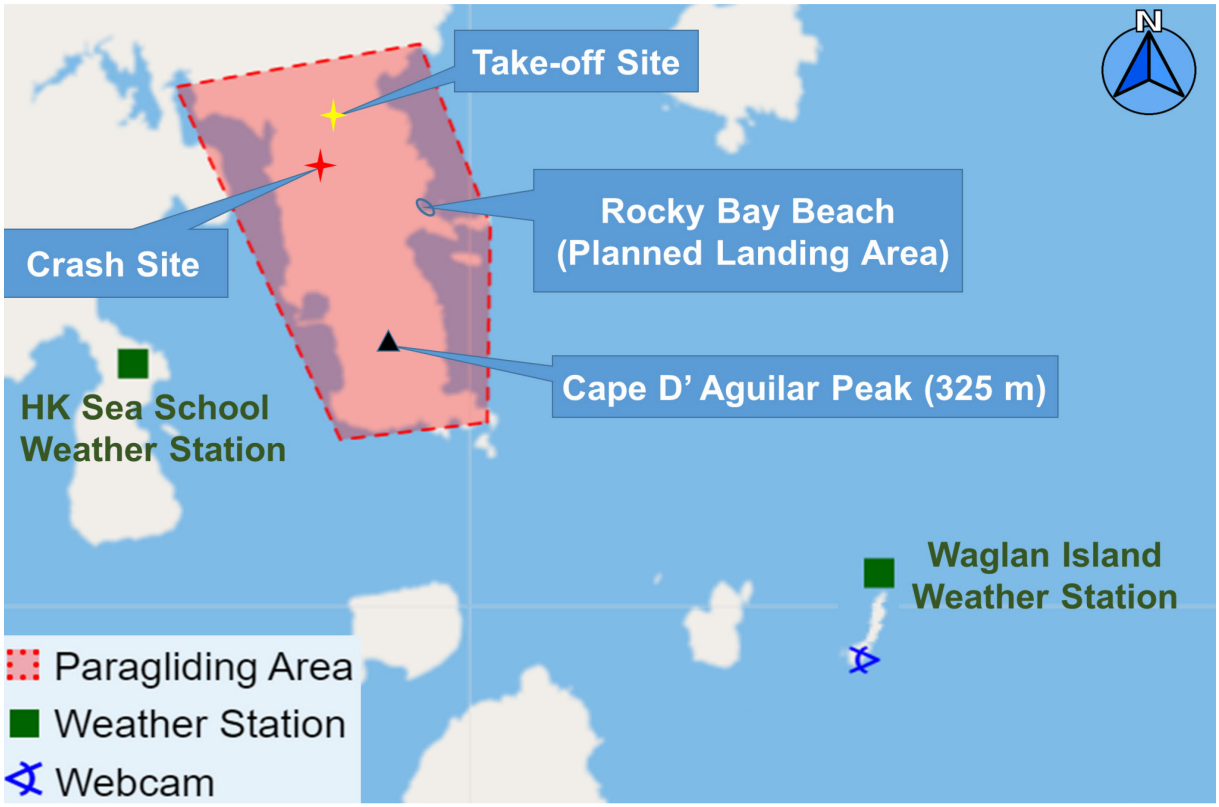

Figure 14: Nearby Weather Stations of Shek O Paragliding Area

(2) "1-min gust" data during the period from 1345 hrs to 1350 hrs of 23 December 2021 from these two weather stations were collected. The data indicated that the wind gust was 12-16 knots (equivalent to wind force 4) from the 60-80 (around east-northeast) wind direction.

Note: "1-min gust" is the maximum of 3-second averaged wind speeds within a 1-minute period.

Time (in HKT)	Mean wind direction/ speed/ 1-min gust (degree/ knots/ knots)	
	Waglan Island	HK Sea School
1345	060/ 12/ 13	080/ 11/ 13
1346	060/ 12/ 13	070/ 10/ 13
1347	060/ 12/ 14	060/ 12/ 16
1348	070/ 11/ 12	060/ 13/ 16
1349	070/ 12/ 13	080/ 10/ 12
1350	080/ 12/ 14	070/ 11/ 13

Table 3: Wind Gust Data from Two Nearby Weather Stations

(3) The site guides of the Shek O paragliding area related to weather were published on the Hong Kong Paragliding Association (HKPA) website as follows:

"Winds to look for on the HKO website are Waglan Island with as much E as possible and force 2-4. Never take off a paraglider in force 5 and above wind condition."

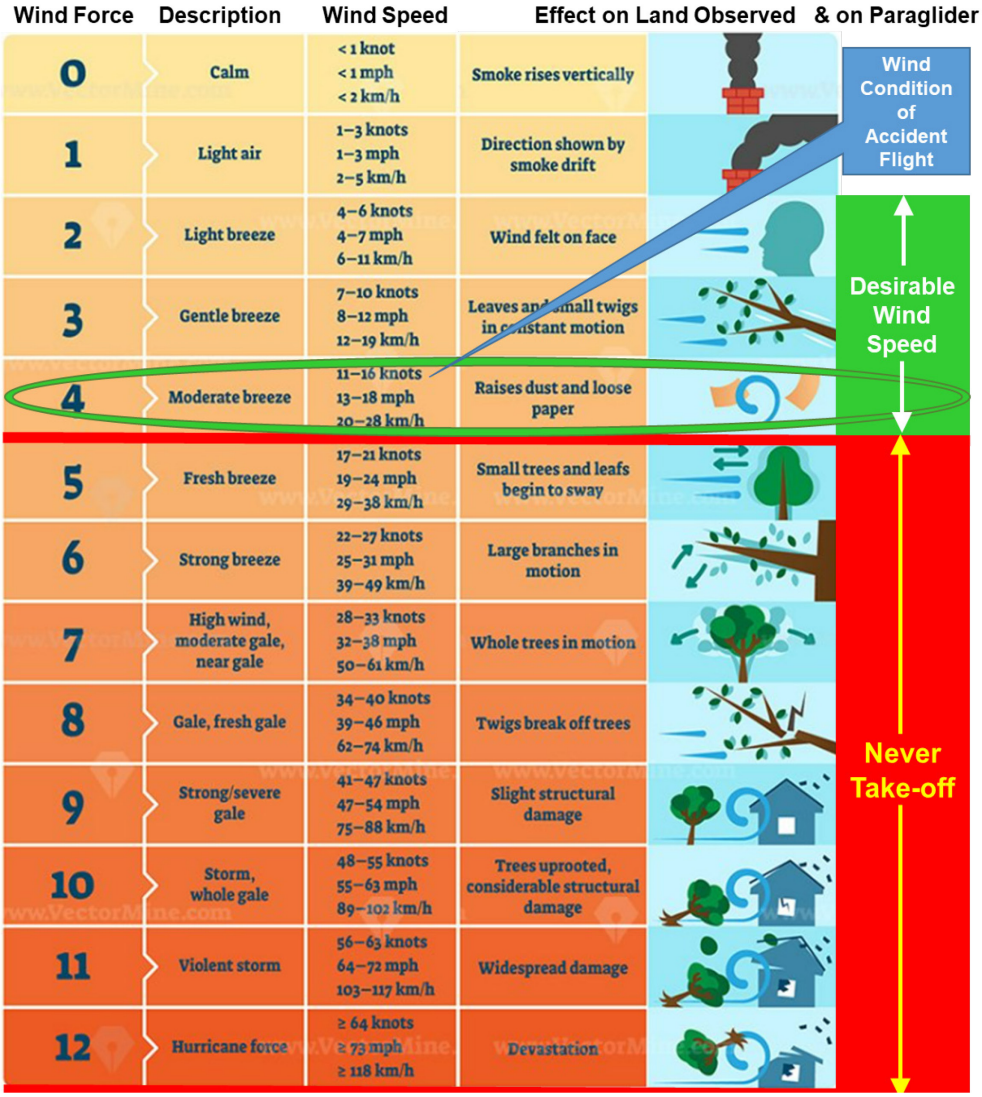

Figure 15: Wind Effect on Paraglider

1.7.1.6. Cloud Base and Visibility

(1) The HKO webcam from Waglan Island viewing west captured the general weather condition of Dragon's Back and Shek O Peak during the daytime.

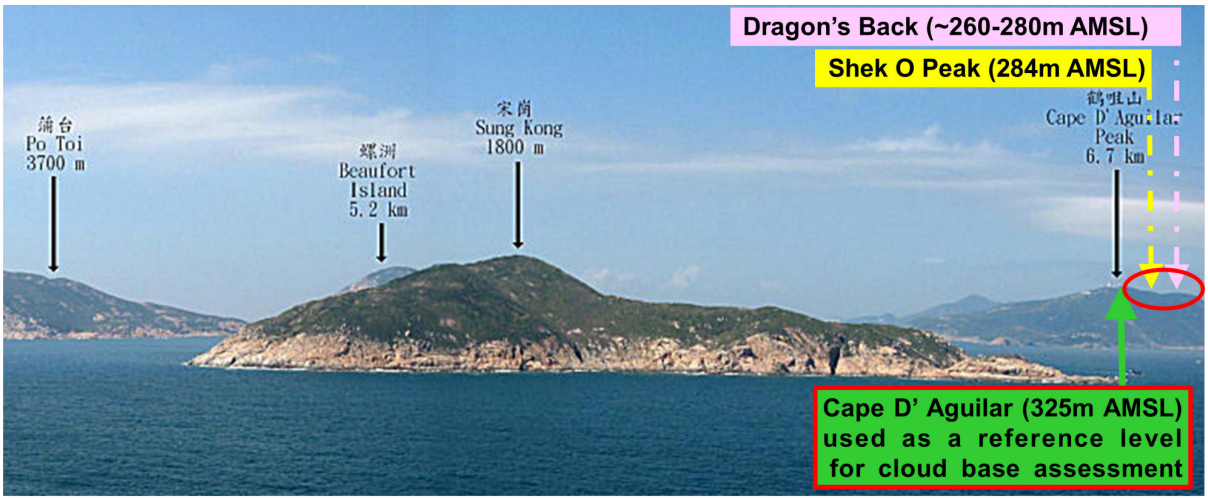

Figure 16: Reference for Landmarks and Respective Visibility

(Viewed from the West of Waglan Island)

(2) Weather photographs taken from Waglan Island viewing the west direction at 1340 hrs and 1350 hrs of 23 December 2021 were collected.

Note: The Pilot took off at around 1347 hrs and crashed into a hill slope at around 1349 hrs.

Figure 17: Cloud Base Level at Shek O at 1340 Hrs

Figure 18: Cloud Base Level at Shek O at 1350 Hrs

(3) A review of the weather photographs revealed that the top of Cape D' Aguilar (325 m AMSL) was not covered by cloud from 1340 hrs to 1350 hrs while the visibility was 6.7 km or above.

(4) All high ground areas of the Shek O paragliding area (around 260 m to 280 m AMSL) were not covered by clouds during the accident flight.

1.8. Navigation Aids

Not applicable.

1.9. Communications

(1) The Pilot carried a two-way radio transceiver with frequencies set at 145.9875 MHz and 436.360 MHz.

Figure 19: Two-Way Radio Transceiver Used by the Pilot

(2) According to the radio usage guideline on the HKPA website, 145.9875 MHz was the radio frequency for emergency distress, urgency and safety priority calls while 436.360 MHz was the radio chatting frequency for general communication.

(3) During the flight preparation, the Pilot carried out the transmission check of the radio transceiver with Pilot A. Pilot A confirmed that the transmission was good and the messages received were loud and clear. The transceiver functioned properly.

1.10. Paragliding Take-off Area

(1) The Shek O paragliding area in the south-eastern part of Hong Kong Island is located within the Island Control Zone. The boundary and operating altitude of this area are defined in Section ENR 5.5 of the Aeronautical Information Publication Hong Kong (AIP HK) published by the Civil Aviation Department (CAD).

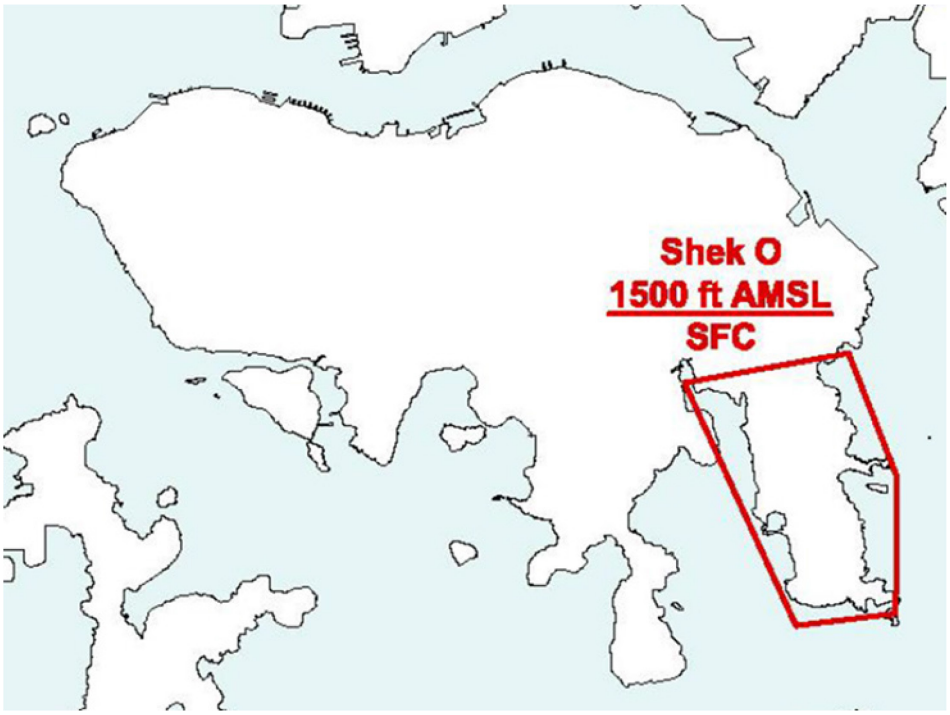

Figure 20: Shek O Paragliding Area Published in AIP HK

(2) The operating altitude of the area was from the ground surface (SFC) to 1500 feet (457 m) AMSL.

(3) The take-off site of the accident flight was at Dragon's Back with a height of about 260 m AMSL and within the boundaries of the Shek O paragliding area.

Figure 21: Take-off Site at Dragon's Back

1.11. Flight Recorders

1.11.1. Data from the Variometer

(1) The Pilot's variometer, Model "SkyDrop", stored in the harness, was recovered during the wreckage recovery operation on the following day of the accident.

(2) The variometer was an integrated device with altimeter, compass and Global Positioning System (GPS) functions. It provided and recorded not only signals of rates of climb and descent, but also GPS positions and pressure altitudes for paragliding activities.

(3) Data stored in the variometer in the International Gliding Community (IGC) file was retrieved for flight track analysis.

Note: The IGC file type was primarily associated with the Global Positioning System by the Fédération Aéronautique Internationale (FAI). "IGC" comes from "the International Gliding Commission". IGC-files provide a standard for exchanging data logs from GPS flight recorders.

Figure 22: Variometer Used by the Pilot

(4) Data in an IGC file contains information on

(i) UTC time;

(ii) GPS location in longitude/latitude;

(iii) Pressure altitude; and

(iv) GPS altitude (in metres).

(5) The data in the Pilot's variometer was downloaded successfully for flight track analysis.

(6) Among the recorded flights, 14 flights, including the accident flight, were made in the Shek O paragliding area between July 2021 and December 2021.

(7) In all previous 13 flights, the Pilot took off from the same take-off site and landed uneventfully, mainly on the Rocky Bay Beach.

1.11.2. Flight Track

The accident flight track was generated by the "Logfly" application using the IGC File data retrieved from the Pilot's variometer.

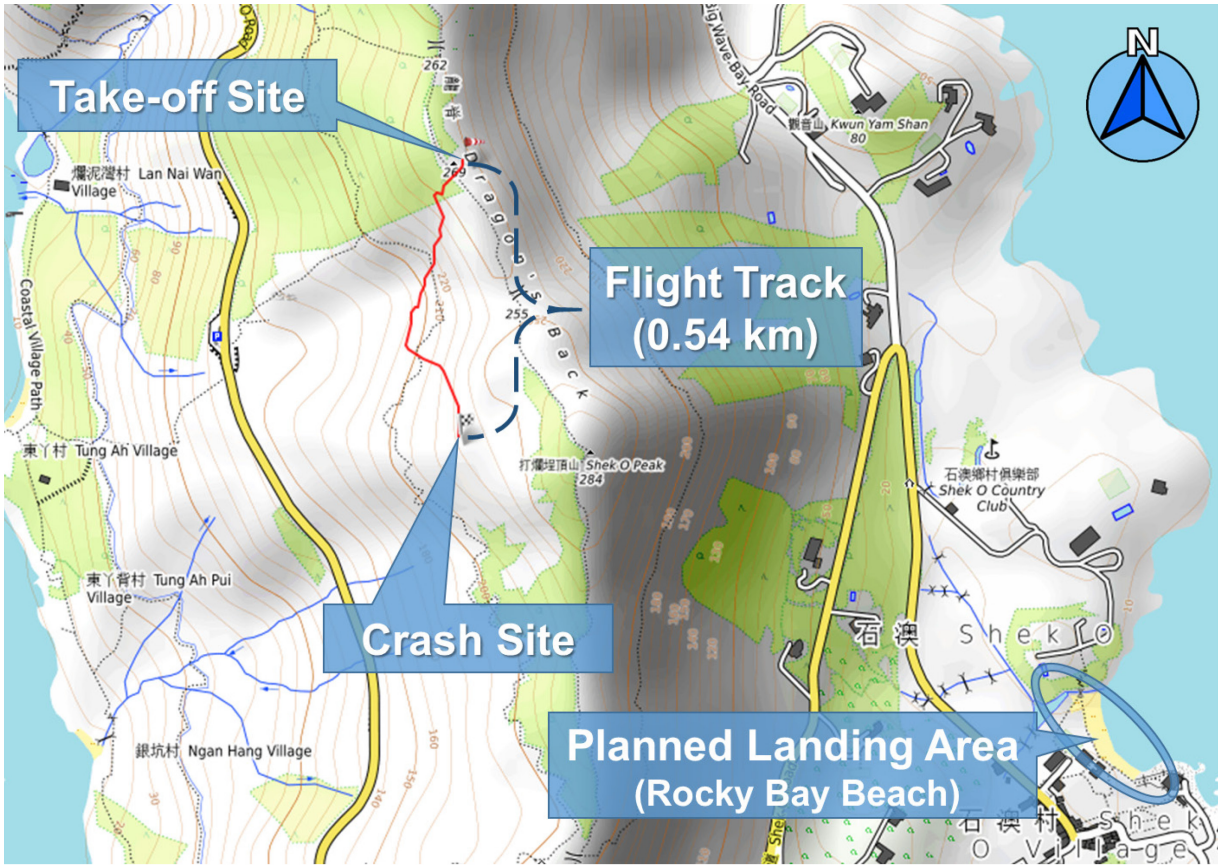

Figure 23: Accident Flight Track

1.12. Wreckage and Impact

1.12.1. General

(1) The Pilot and his paraglider were found on a hill slope at about 230 m AMSL west of Shek O Peak on the accident day. The rescue team released the Pilot from his paraglider by cutting the lines of the canopy and the harness. The rescue team had to pack the canopy to ensure a safe airlift by GFS.

(2) A joint-departmental wreckage recovery operation for the Pilot's paragliding equipment was conducted by the FSD, the HKPF and the AAIA on the following day of the accident. The Pilot's helmet was recovered near the crash site.

(3) All items of the Pilot collected from the accident site were preserved by the HKPF. A detailed examination of the wreckage was conducted with the assistance of the HKPA Safety Officer at Chai Wan Police Station on 3 January 2022.

1.12.2. Canopy and Harness

(1) The paragliding canopy, Model “Ozone Buzz Z5”, and the harness, Model “Advance Progress 3”, were examined and found in good shape.

(2) All lines connecting the canopy to the harness were cut during the rescue operation.

Figure 24: Lines Connecting Canopy and Harness

1.12.3. Paragliding Reserve Parachute

(1) The paragliding reserve parachute, Model “Sup’air Sup 08” of S size, was intact inside the reserve compartment of the harness.

(2) The investigation team removed the reserve parachute from the reserve compartment for inspection and did not identify any abnormal findings.

Figure 25: Paragliding Reserve Parachute in Harness

1.12.4. Helmet

(1) The helmet of the Pilot, Model “MET M98 – Parachute HES”, which was certified to American Society for Testing and Materials (ASTM) 1952-10 and ASTM 2032-06 standards, was found detached from the Pilot’s head.

(2) The helmet manufacturer, MET SPA, advised the investigation team that the helmet was also certified to EN 1078:2012+A1:2012 standard.

(3) The helmet was manufactured in 2015 with serial number (S/N) V150185.

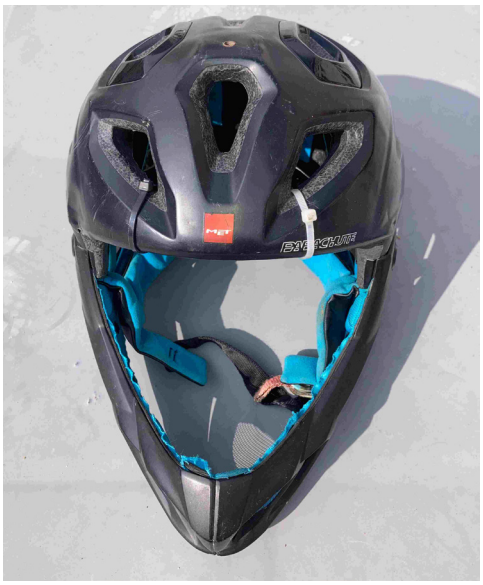

Figure 26: The Helmet of the Pilot

Figure 27: The Model and Certification Label of the Helmet

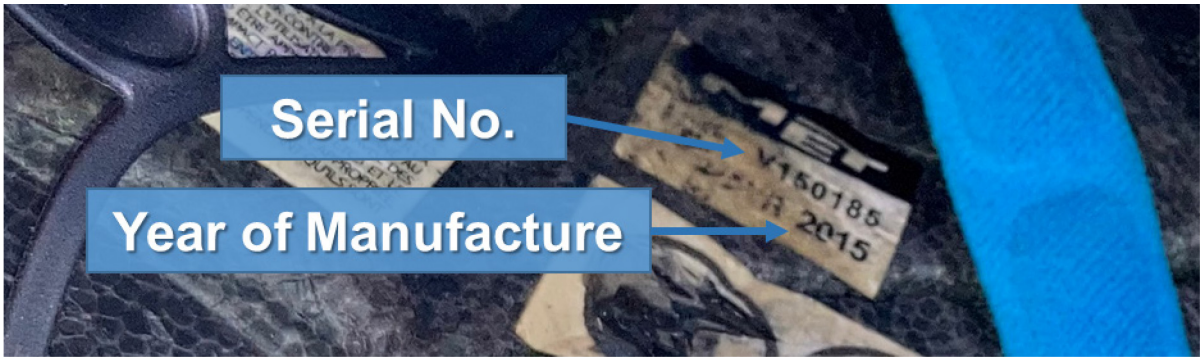

Figure 28: The S/N and Year of Manufacture Label of the Helmet

(4) The examination identified damages on the backside of the helmet, including a crack of 9 cm long in the middle of the backside, and a crack of 14 cm long propagated from the backside to the right-hand side.

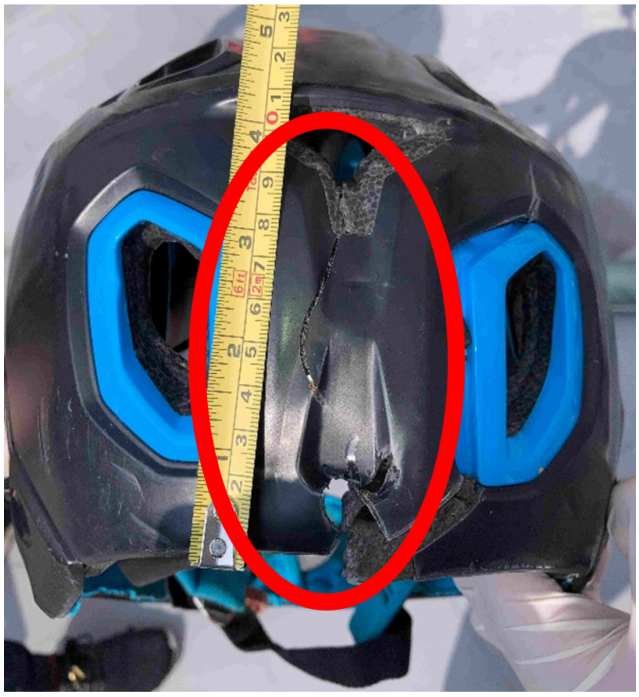

Figure 29: Damage on the Backside of the Helmet (Outer View)

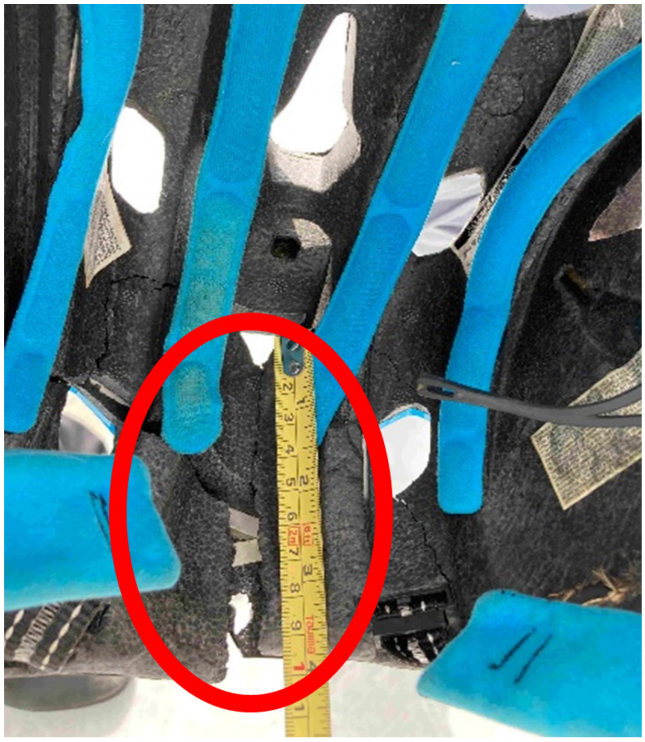

Figure 30: Damage on the Backside of the Helmet (Inner View)

Figure 31: Damage on the Right-hand Side of the Helmet (Inner View)

1.12.5. Other Equipment

(1) During the wreckage recovery operation on 24 December 2021, a compass and a variometer were found in the rucksack of the Pilot's harness while a two-way radio transceiver was attached to the harness.

Figure 32: Compass and Variometer in the Rucksack of the Harness

Figure 33: Two-Way Radio Transceiver Attached to the Harness

(2) During the wreckage examination on 3 January 2022, the compass, the variometer and the radio transceiver were inspected and no damage was identified.

1.13. Medical/Pathological Information

(1) The external examination of the autopsy showed minor blunt injuries in form of abrasions and bruises, mainly on the front of the head and neck.

(2) The internal examination of the autopsy showed injury to the neck with traumatic compression of the cervical spinal cord. The degree of the injury could lead to impairment of breathing and adversely affect one's heart rate and blood pressure and could lead to asphyxia and neurogenic shock, and even death in a relatively short period of time, i.e. in about 10 minutes' time or so.

(3) The cause of death as shown by the autopsy appears to be traumatic compression of the cervical spinal cord due to neck injury.

1.14. Smoke, Fire, and Fumes

There was no evidence of smoke, fire or fumes during flight or after the paraglider impacted the terrain.

1.15. Survival Aspects

1.15.1. Safety Standards of the Helmet

(1) The helmet of the Pilot, Model “MET M98 – Parachute HES” was certified to ASTM 1952-10, ASTM 2032-06, and also EN 1078:2012+A1:2012 standards. All these safety standards were related to pedal cycling and mountain biking only.

(2) The manufacturer of the paraglider, Ozone Gliders, advised the investigation team that a helmet meeting EN 966:2012+A1:2012 standard was acceptable to be used for paragliding.

1.15.2. Lifespan of the Helmet

(1) The helmet of the Pilot was manufactured in the year 2015.

(2) The manufacturer of the helmet, MET SPA, advised the investigation team that it was recommended to replace a helmet every three years, as stated in the User Manual of the helmet.

1.16. Tests and Research

1.16.1. Aging Check of Paraglider Lines

(1) An aging check of paraglider lines was carried out with the assistance of HKPA Safety Officer on the upper "A gallery". The difference between the manufacturer's length and the calibrated measurement should not be greater than 10 mm.

(2) The check revealed that the differences of the four "A gallery" lines were all less than 10 mm. There was no sign of significant aging or wear observed on the paraglider lines.

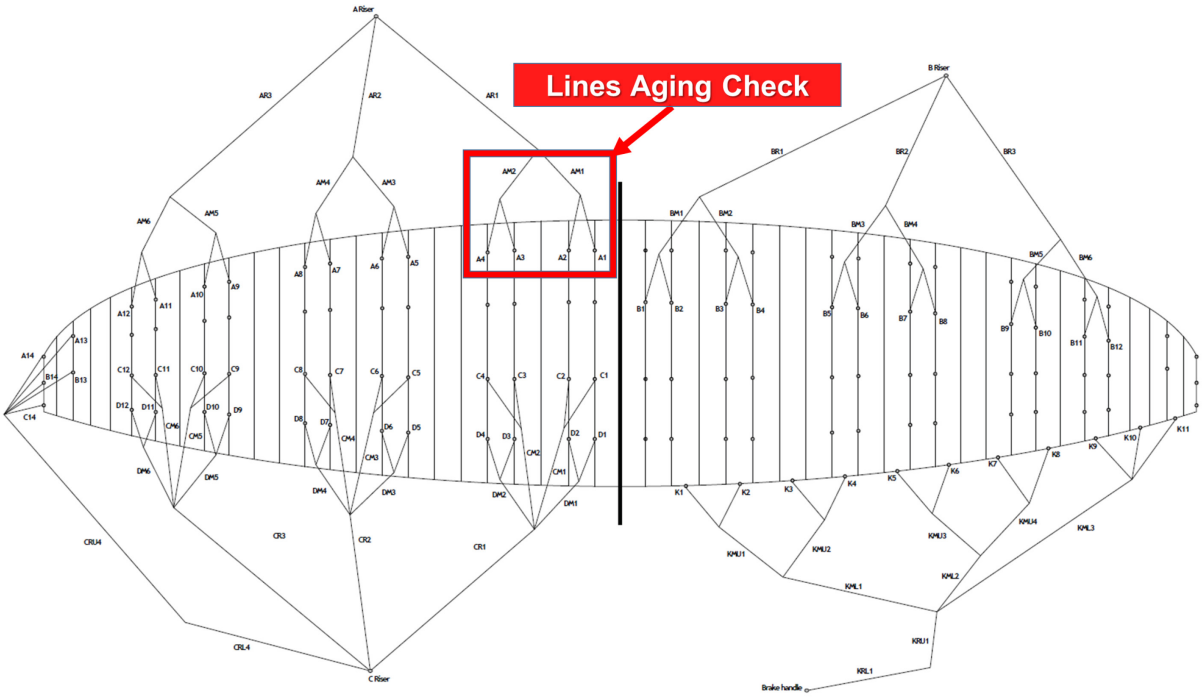

Figure 34: Lines Aging Check at the Upper "A Gallery"

1.17. Organisation, Management, System Safety

1.17.1. Civil Aviation Department

The CAD regulates civil aviation activities in Hong Kong. In view of the increasing popularity of paragliding activities in Hong Kong, the CAD has taken initiatives to enhance the safe operation of paragliding activities.

1.17.2. Hong Kong Paragliding Association

The HKPA was established in 1990 to promote and encourage paragliding activities. The Association was recognised by the Sports Federation and Olympic Committee of Hong Kong as the National Sports Association for paragliding activities in Hong Kong. Operating under the provisions of the Societies Ordinance, the Association represents the interest of paraglider pilots and ensures the safe conduct of paragliding activities in Hong Kong.

1.17.3. Hong Kong Paragliding Federation

The Hong Kong Paragliding Federation was established as a non-profit organisation under Societies Ordinance in December 2015. The Federation promotes the sport of paragliding in Hong Kong and enhances members' knowledge on the use of paragliding equipment.

1.18. Additional Information

1.18.1. Turbulent Flow on Leeward Side of Mountains

On the downwind side of the mountain (leeward side), the airflow would be very turbulent and unpredictable due to the air circulates created by the mountain itself. Paragliding pilots must pay attention to wind direction and avoid flying near the leeward side of mountains, which is a dangerous region with severe turbulences as shown in the figure below.

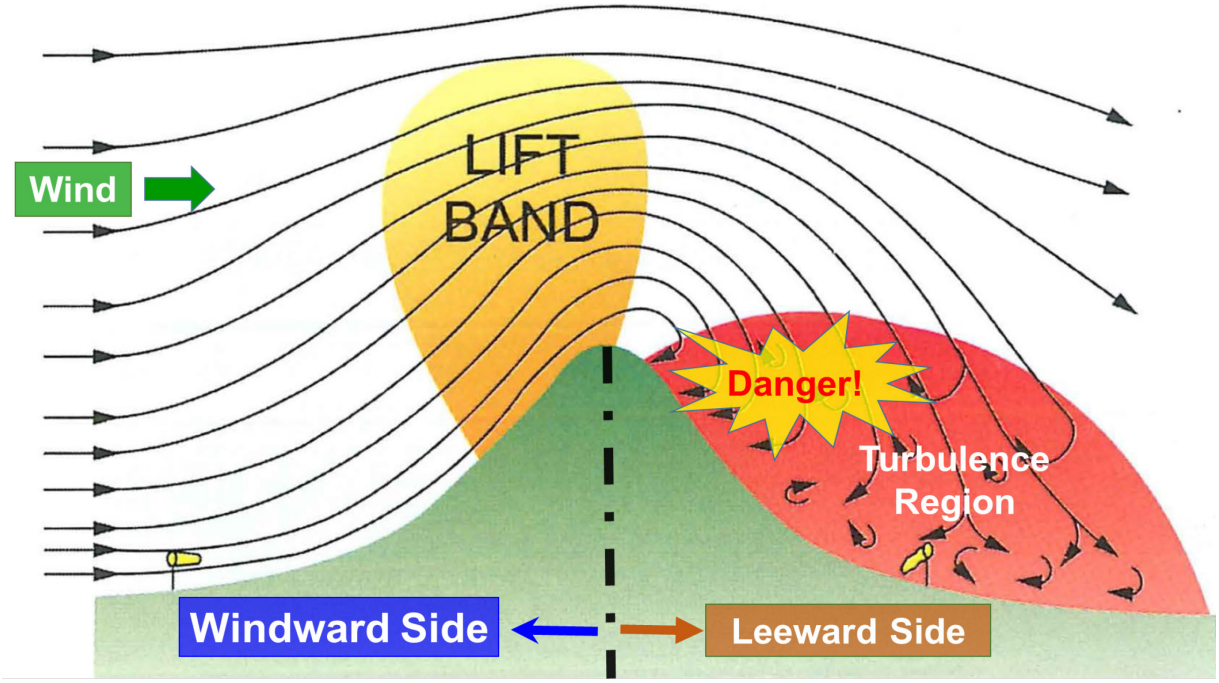

Figure 35: Turbulent Flow on Leeward Side of Mountains

1.19. Useful or Effective Investigation Techniques

Not applicable.

2. Safety Analysis

The Safety Analysis provides a detailed discussion of the safety factors identified during the investigation, providing the evidence required to support the findings, contributing factors and the safety recommendations.

2.1. Pilot Experience

(1) The Pilot accumulated some 200 flying hrs from 2017 to 2021, hence an average of 40 hours per year.

(2) His experience would be sufficient to operate an EN-B paraglider which was designed for all pilots and also suitable for experienced pilots who fly less than 50 hours a year.

(3) From July 2021 to December 2021, he launched 13 flights in the Shek O paragliding area and landed uneventfully.

(4) Based on the Pilot's records, the investigation team considers his experience level was not a factor in this accident.

2.2. Weather

(1) During the period before and after the accident flight, there was no precipitation in the Shek O paragliding area. Clouds did not cover any Shek O paragliding area. With the good visibility and the wind of force 4 from the east-northeast direction, the weather was considered suitable for paragliding activities.

(2) The weather at the Shek O paragliding area was not a factor in this accident.

2.3. Flight Track Analysis

(1) The flight path was reconstructed based on the data in the IGC file and has been divided into five sections (A to E) for analysis. The flight path was within the Shek O paragliding area defined in the AIP HK published by the CAD.

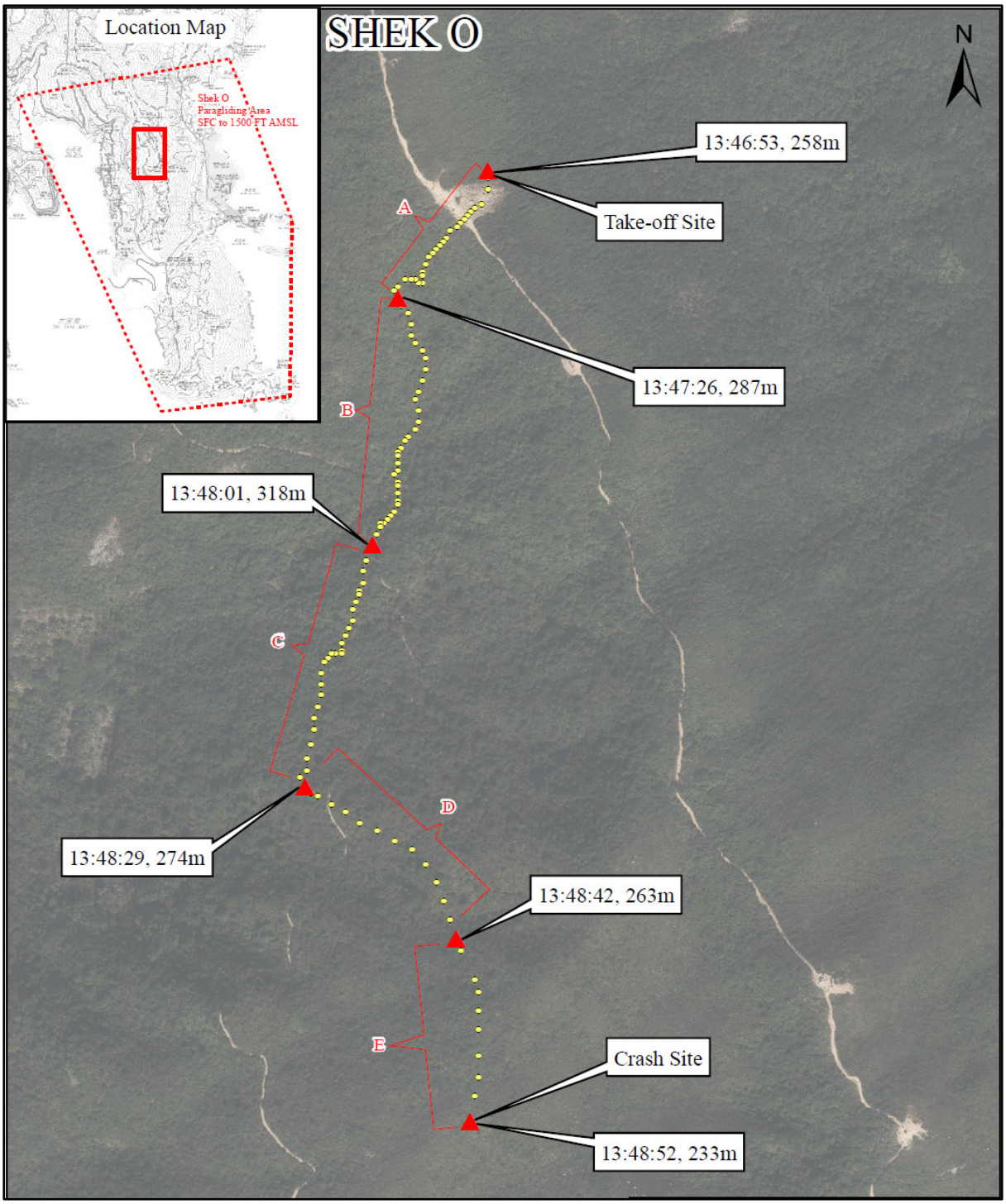

Figure 36: Reconstruction of the Accident Flight Path

(2) The analysis was conducted with consideration of the wind data from the HKO and the statements from Pilot A.

(3) The probable circumstances of the flight are set out in the following sections.

2.3.1. Flight Section A

(1) From 13:46:53 to 13:47:25, the pilot took off from the Dragon's Back take-off location at 258 m and was lifted to 287 m as indicated by the IGC data.

(2) According to Pilot A, the Pilot started with reverse inflation (face to the canopy). Before the paraglider was fully raised above him, he and the paraglider were suddenly lifted from the ground and flew back towards the west direction (opposite to the normal take-off direction).

(3) The Pilot immediately turned 180 degrees (facing the normal take-off direction) and moved his upper body towards the east direction, but he could not make the paraglider move forward. The paraglider continued to move backwards and flew into the leeward side of the mountain.

(4) It is believed that the Pilot entered a thermal (rising air) generated by the convection of air, as evidenced by the increase in altitude and the position of the paraglider according to the IGC data.

2.3.2. Flight Section B

(1) From 13:47:26 to 13:48:00, the trajectory of the paraglider changed to more southerly, it is probable that the pilot slightly changed his heading to more east-southeast, and the trajectory of the paraglider drifted southerly towards the Shek O Peak.

(2) The pilot remained in the thermal and was lifted from 287 m to 318 m with an average rate of 0.9 m/s.

(3) Pilot A maintained visual contact with the paraglider. The Pilot activated the speedbar in an attempt to increase forward speed and avoid flying into the leeward side of the mountain, which is a dangerous region with severe turbulence.

2.3.3. Flight Section C

(1) From 13:48:01 to 13:48:28, the paraglider maintained its heading, exited the thermal and descended from 318 m to 274 m at an average rate of 1.6 m/s.

(2) The Pilot probably entered the sinking area of the thermal, as evidenced by the decrease in altitude and the change of the position of the paraglider.

2.3.4. Flight Section D

(1) From 13:48:29 to 13:48:41, the trajectory of the paraglider changed to more easterly and more into the leeward side of the mountain. It is probable that the pilot slightly changed his heading to the northeast direction. The paraglider descended from 274 m to 263 m at an average rate of 0.9 m/s.

(2) At the end of this flight section, the paraglider was going down the hillside. Pilot A lost visual contact with the paraglider as it was getting lower and his eyesight was blocked by the bush.

2.3.5. Flight Section E

From 13:48:42 to 13:48:52, the paraglider entered into a stall situation and descended from 263 m to 233 m with an average sink rate of 3 m/s. It impacted the terrain at 233 m with approximately a horizontal speed of 7.8 m/s, according to the analysis of the IGC data. It is probable that the Pilot encountered turbulence on the leeward side of the mountain.

2.4. Paraglider

2.4.1. Paraglider Conditions

(1) The canopy and harness were examined and found in good condition.

(2) The paraglider lines were examined and found within the limits.

(3) There was no evidence of failure of the paraglider.

2.4.2. Mass and Balance

(1) The weight of the paraglider, the harness with equipment, and the Pilot were 5 kg, 6.5 kg and 61 kg respectively.

(2) The total in-flight weight was 72.5 kg which was within the in-flight weight range for a S-size “Ozone Buzz Z5” paraglider as specified in the Pilots Manual.

2.5. Survivability

2.5.1. Analysis of Fatal Injuries

Based on the autopsy report, the cause of death appears to be traumatic compression of the cervical spinal cord due to neck injury.

2.5.2. Survival Aspects

2.5.2.1. Safety Standards of the Helmet

MET SPA advised that the helmet of the Pilot met the ASTM 1952-10, ASTM 2032-06, and also EN 1078:2012+A1:2012 standards. All these safety standards were related to pedal cycling and mountain biking only. The helmet of the Pilot was neither designed nor certified for paragliding.

2.5.2.2. Lifespan of the Helmet

The helmet had been overdue for more than three years since the year 2018.

3. Conclusions

3.1. Findings

From the evidence available, the following findings are made with respect to this occurrence. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

(1) The Pilot had sufficient experience, training and qualification to fly the subject EN-B paraglider. (1.5) (2.1)

(2) The paraglider was found to be serviceable and appropriate for the Pilot's weight. (1.6) (1.12) (1.16) (2.4)

(3) The weather at Shek O during the period of the accident flight was considered suitable for paragliding activities. (1.7) (2.2)

(4) The take-off site at Dragon's Back was within the boundaries of the Shek O paragliding area as stipulated in the AIP HK published by CAD. (1.10) (2.3)

(5) From July 2021 to December 2021, the Pilot launched 13 flights in the Shek O paragliding area and landed uneventfully. (1.11) (2.1)

(6) The data in the Pilot's variometer was downloaded successfully for flight track analysis. (1.11) (2.3)

(7) According to the analysis of the IGC data, it is probable that the pilot encountered turbulence on the leeward side of the mountain. (1.11) (1.18.1) (2.3)

(8) The cause of death as shown by the autopsy appears to be traumatic compression of the cervical spinal cord due to neck injury. (1.13) (2.5.1)

(9) The helmet of the Pilot was neither designed nor certified for paragliding. (1.15.1) (2.5.2.1)

(10) The helmet of the Pilot had been overdue for more than three years since the year 2018. (1.15.2) (2.5.2.2)

3.2. Cause

The fatal accident was probably caused by the loss of control of the paraglider, resulting in an impact with the terrain that rendered neck injury to the Pilot. [3.1(7) and 3.1(8)]

4. Safety Recommendations

During the investigation, the AAIA identified the safety matter on the safety standards and the lifespan controls of the helmet. On 31 January 2022, AAIA issued Safety Recommendation 01-2022 to the Civil Aviation Department, Hong Kong; the Hong Kong Paragliding Association; the Hong Kong Paragliding Federation.

4.1. Safety Recommendation 01-2022

It is recommended that the CAD coordinates with the paragliding organisations:

(1) To review the need to refine the existing Safety Guidance on Paragliding Activities regarding the safety standards and the lifespan controls of the helmet.

Safety Recommendation Owner: The Civil Aviation Department, Hong Kong; the Hong Kong Paragliding Association; the Hong Kong Paragliding Federation

5. Implementation of AAIA Safety Recommendation

5.1.1. Safety Actions Taken in Response to Safety Recommendation 01-2022

5.1.1.1. Safety Actions Taken by the CAD

(1) Upon consultation with the paragliding organisations, the CAD's Safety Guidance on Paragliding Activities was reviewed and updated to incorporate AAIA's subject safety recommendation.

(2) The updated Safety Guidance had been published on the CAD's website on 27 April 2022 and the paragliding organisations had also been requested to promulgate it to their members and the paragliding community at large so as further enhance their safety awareness.

5.1.1.2. Safety Actions Taken by the HKPA

On 14 June 2022, the HKPA published Equipment Safety Notice and associated Technical Note on paragliding helmet standard EN 966 on the HKPA's website. This is intended to encourage more pilots to voluntarily comply with the safety standards and lifespan control of the helmet.

5.1.1.3. Safety Actions Taken by the Hong Kong Paragliding Federation

The Hong Kong Paragliding Federation disseminated the information of helmet safety standards and lifespan control to members to raise their safety awareness.

5.1.1.4. AAIA Assessment on the Safety Actions Taken

In consideration of the safety actions taken by the CAD, the HKPA and the Hong Kong Paragliding Federation, the investigation team confirmed that there were no new discoveries of incomplete safety actions. Hence, the Safety Recommendation 01-2022 was closed.

6. General Details

6.1. Occurrence Details

Date and time:	23 December 2021 at 1348 hours
Occurrence category:	Accident
Primary occurrence type:	Loss of Control - Inflight (LOC-I)
Location:	Shek O, Hong Kong
Position:	22° 14' 9.18" N, 114° 14' 29.10" E

6.2. Pilot Details

Licence details:	Paraglide Tandem International Organisation (PGTI) Solo Pilot – Novice Paragliding Rating (SP-2)
Flying experience:	Approximately 200 hours

6.3. Aircraft Details

Manufacturer and model:	Ozone Buzz Z5 Paraglider	
Serial number:	BZ5SS-15B-135	
Year of Manufacture:	2017	
Type of Operation:	Private	
Departure:	Dragon's Back, Shek O, Hong Kong	
Destination:	Rocky Bay Beach, Shek O, Hong Kong	
Persons on board:	Crew – 1	Passengers – 0
Fatalities:	1	
Injuries:	0	
Aircraft damage:	Nil	

7. Abbreviations

AAIA	Air Accident Investigation Authority
AIP HK	Aeronautical Information Publication Hong Kong
AMSL	Above Mean Sea Level
ASTM	American Society for Testing and Materials
BHPA	British Hang Gliding & Paragliding Association
CAD	Civil Aviation Department
Cap. 448B	Hong Kong Civil Aviation (Investigation of Accidents) Regulations
EN	European Norm
FAI	Fédération Aéronautique Internationale
FSD	Fire Services Department
GFS	Government Flying Service
GPS	Global Positioning System
HKO	Hong Kong Observatory
HKPA	Hong Kong Paragliding Association
HKPF	Hong Kong Police Force
hrs	Hours
IGC	International Gliding Community
km	Kilometre
kt	Knot
m	Metre
m/s	Metre per second
MHz	Mega Hertz
min	Minute

PGTI	Paraglide Tandem International Organisation
SFC	Surface
S/N	Serial Number
UTC	Coordinated Universal Time

8. Table of Figures, Photos, Tables