

民航意外調查機構

AAIA

Air Accident Investigation Authority



Loss of Control – Inflight (LOC-I)

Investigation Report

**Accident to
Ozone Alpina 3 Paraglider
Sunset Peak
Lantau, Hong Kong**

01-2022

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 then Chief Inspector of Accidents-cum-Director-General of Civil Aviation ordered an inspector's investigation into the accident in accordance with the provisions in Cap. 448B. As the powers of accident investigation were transferred to the Air Accident Investigation Authority (AAIA) with effect from 10 September 2018, the investigation of the accident was carried on by AAIA.

This accident investigation report contains information of a fatal occurrence involving a paragliding activity at Lantau South Country Park in Hong Kong on 22 July 2018.

The Fire Services Department, Hong Kong Police Force, Government Flying Service, Civil Aid Service, Hong Kong Observatory, Civil Aviation Department, Lands Department, Hong Kong Paragliding Association, Hong Kong Paragliding Federation and Ozone Gliders Limited, provided assistance to the investigation team.

This investigation report supersedes all previous preliminary report and interim statements concerning this accident investigation.

All times in this report were 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 Housing Bureau
Hong Kong
April 2022

Synopsis

At approximately 1350 hours (hrs) on 22 July 2018, a paraglider pilot (the Pilot) took off from South Lantau East Takeoff Site, a paragliding activity area in the Lantau South Country Park.

At 1934 hrs, the Hong Kong Police Force (HKPF) received a report that the Pilot was missing. The Fire Services Department (FSD) immediately launched a search and rescue operation in conjunction with the HKPF, the Government Flying Service (GFS) and the Civil Aid Service (CAS).

As a tropical depression associated with the re-intensification of the remnant of tropical cyclone, Son-Tinh, moved closer to Hong Kong on 23 July 2018, the joint-departmental search and rescue (SAR) operation was hindered by adverse weather, in particular continuous conditions of poor visibility and low cloud base, which prevailed from 23 to 26 July 2018.

On 27 July 2018 at 1147 hrs, the GFS located the Pilot and his paraglider on a hill slope of Sunset Peak about one kilometre north-east from where he took off. The Pilot was immediately conveyed to hospital by a GFS helicopter and was certified dead later.

The investigation found that this fatal accident was probably caused by loss of effective control of the paraglider under rapidly deteriorated weather conditions, resulted in an impact with the terrain that rendered multiple injuries to the Pilot.

Three safety recommendations were made.

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1. Factual Information

1.1. History of the Flight

- (1) On 22 July 2018 between 1340 hrs and 1400 hrs, five paraglider pilots were preparing to fly from the South Lantau East Takeoff Site (Figure 1). A few others were operating from the South Lantau West Takeoff Site. One paraglider pilot (Pilot A) operating from the West Takeoff Site and three paraglider pilots (Pilots B, C and D) operating from the South Lantau East Takeoff Site were available for interview to share their observations on the conditions of weather and flying on that day.
- (2) According to Pilots B, C and D taking off from the South Lantau East Takeoff Site, the wind was considered weak and not too favourable for takeoff during their flight preparation. At approximately 1340 hrs, a layer of cloud about 50 to 100 m above the takeoff site was starting to form. The wind picked up to a range of 15-20 kilometres per hour (kph) from the south and there was no gust. At about 1345 hrs, a message was broadcasted possibly by a person of the paraglider group through the radio frequency channel designated by Hong Kong Paragliding Association (HKPA) that there would be a heavy shower within 30 minutes. The group at the South Lantau East Takeoff Site planned to fly to Cheung Sha Beach as soon as possible and they took off one by one.
- (3) The accident pilot (Pilot) launched at around 1350 hrs from the South Lantau East Takeoff Site. After takeoff, he joined Pilot B who took off at 1348 hrs to ascend in rising air and fly around the takeoff site. The Pilot climbed and overtook Pilot B soon afterwards.
- (4) He was last seen above Leyburn Villas by Pilot C who was executing an emergency descent to Cheung Sha Beach due to the strengthening wind. Pilot C described to the investigation team that the Pilot was not in the cloud and not making any descent manoeuvre above Leyburn Villas.
- (5) Noticing the Pilot's motorbike was still parked in Shek Mun Kap, his peers reported to the Police at 1934 hrs that the Pilot was missing. A joint-departmental search and rescue operation led by FSD was launched immediately.
- (6) On 27 July 2018, GFS located the unconscious Pilot and his paraglider at about 680 m Above Mean Sea Level (AMSL) on the southern slope of Sunset Peak, 1 km north-east of the South Lantau East Takeoff Site, at 1147 hrs. The Pilot was subsequently recovered by the CAS mountain rescue team and was airlifted to Pamela Youde Nethersole Eastern Hospital (PYNEH) by a GFS helicopter which later arrived at PYNEH at 1420 hrs.

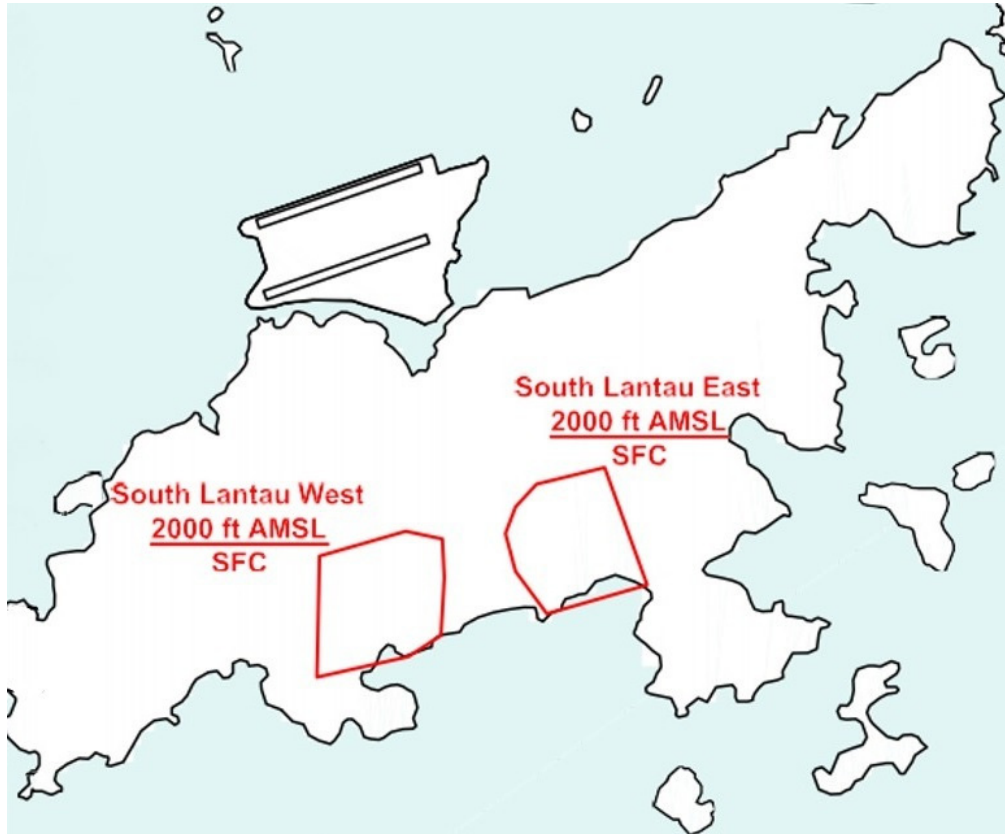


Figure 1: Paraglider Takeoff Sites at Lantau Island

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 paragliding equipment.

1.4. Other Damages

No other damage was caused.

1.5. Personnel Information

1.5.1. General

Pilot	Male, aged 41
Weight	78 kg
Hong Kong Paragliding Federation	Member
HKPA	Member
HKPA Qualification	Pilot rating

Table 2: Pilot Information

1.5.2. Experience, Training and Qualification

(1) The Pilot attended a basic theoretical training of paragliding in September 2014. He obtained a United States Hang Gliding & Paragliding Association (USHPA) P2 Qualification with certification in April 2015. Subsequently, he attained USHPA P4 Qualification in October 2016 and then USHPA P4 with cross-country in January 2017.

(2) He was qualified as an Association of Paraglider Pilots and Instructors (APPI) Pilot in June 2016. He completed the APPI Basic Simulated Incident in Flight (SIV) Course in January 2017, APPI Tandem Course in December 2017 and APPI Advanced Pilot course in June 2018.

Note: SIV course is a training given above water with appropriate safety equipment. The pilot explores his paraglider's limits and learns how to avoid and recover from flight incidents and improve the pilot's emotional control in emergency situations.

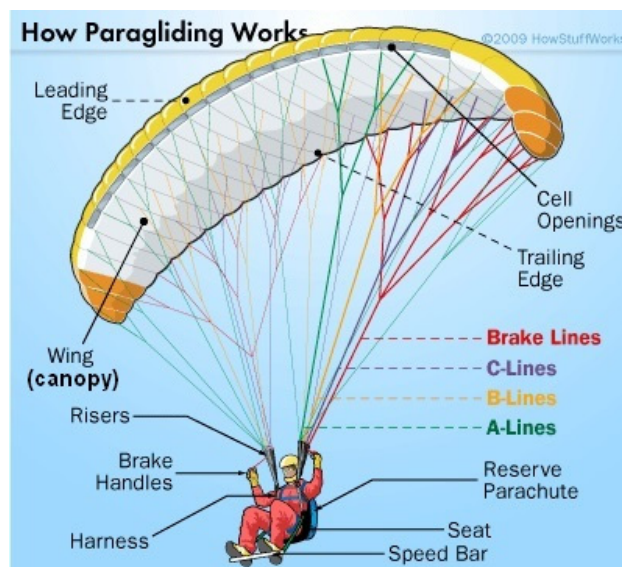
(3) In May 2018, he was upgraded from a HKPA Club Pilot rating to a HKPA Pilot rating.

Note: HKPA Pilot rating is equivalent to International Pilot Proficiency Identification (IPPI) Stage 4. Refer to Paragraph 1.17.5.2. for more details on HKPA Pilot Ratings.

- (4) He had operated about 450 flights, accruing about 300 flying hours, from 2014 to 2018. He had flown at 37 paragliding sites in different countries.
- (5) He had participated in international cross-country flying competitions and logged 38 cross-country flights for the period between 15 April and 5 July 2018.
- (6) About a month prior to the accident, he completed the requirements of the APPI Advanced Pilot Course.

1.6. Paraglider Information

- (1) A typical paraglider consists of a canopy which is inflated by the wind to form an aerodynamic wing from 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.



Source: <https://adventure.howstuffworks.com/paragliding.htm>

Figure 2: A Typical Paraglider

- (2) The Pilot operated an Ozone Alpina 3, an EN-C certified paraglider of MS size (Photo 1), which was purchased new in April 2018. It was fitted with an Advance Lightness 2 harness of L size (Photo 2).

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.



Photo 1: The Paragliding Canopy of the Pilot



Photo 2: Harness of the Pilot

- (3) The EN-C certified paraglider has a higher aspect ratio and generates more lift than an EN-A category paraglider. According to the British Hang Gliding & Paragliding Association (BHPA) (Table 3), EN-C paragliders were “for pilots who were Advanced Pilot rated, have several hundred hours logged (many of these in thermic conditions), have completed SIV course, were

flying ten or more hours a month, and enjoy dealing with large asymmetric collapses etc.”.

Class	Description of Flight Characteristics	Description of Pilot Skills Required
EN-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
EN-B	Paragliders with good passive safety and forgiving flying characteristics. Gliders with some resistance to departures from normal flight.	Designed for all pilots including pilots under all levels of training.
EN-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.
EN-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.

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

Table 3: EN Classes of Paragliders published by BHPA

- (4) The manufacturer advised the investigation team that “paragliding was a light wind sport, flying when the wind was strong (above 25 kph) or in turbulent conditions increases the risks considerably”.
- (5) The defined in-flight weight range of the paraglider was 75 to 95 kg as specified in the Ozone Alpina 3 Pilots Manual. The weight of paraglider, harness & equipment were 4.3 kg and 5.5 kg respectively.
- (6) According to the flight test report EN 926-2:2013 & LTF 91/09 dated 11.04.2017 issued by Air Turquoise SA for glider model: Alpina 3 MS, the

trim speed was more than 30 kph. Trim speed and maximum speed were not mentioned in Ozone Alpina 3 Pilots Manual.

Note (1): EN 926-2 is the European Standards for the Paragliding Equipment – Part 2: Requirements and test methods for classifying flight safety characteristics.

Note (2) : The paraglider manufacturer Ozone advised the investigation team that “the results of any performance test on paraglider are influenced by many variables, such as type of air mass, altitude above sea level, wing loading, instruments used, harness type, pilot position, etc. Therefore, it is very difficult and almost impossible to make accurate measurements. The paraglider manufacturer does not measure the performance data themselves. According to their estimation, with a normal loading the trim speed will be around 37 kph and the maximum speed be around 50 kph. These figures are well below the operational limits. Ozone do not publish performance figures on its Pilots Manual as the figures are dependent on local conditions.”

1.7. Meteorological Information

1.7.1. Weather information from the Hong Kong Observatory

1.7.1.1. Weather Forecast for Local Aviation at 1230 hrs

On 22 July 2018 around noon, a line of convection edged towards the Pearl River Estuary from the southwest. At 1230 hrs, Hong Kong Observatory (HKO) issued a weather forecast for local aviation (within a 100-km radius of Hong Kong) for the period from 1300 to 2300 hrs. According to the forecast, significant weather for the period included strong winds, severe gust and severe turbulence. The surface wind would be from South-South West 10 knots (kt), temporarily variable in direction with wind speed 20 kt gusting to 30 kt in a thunderstorm. Wind at 2000 feet (ft) above ground level was from West South West 15 to 20 kt occasionally gusting to 25 kt. There were isolated squally showers and thunderstorms.

1.7.1.2. Special Weather Tips at 1300 hrs

On 22 July 2018, HKO alerted the public at 1300 hrs by issuing a Special Weather Tips on the HKO Website as well as through its mobile application “MyObservatory”. The Special Weather Tips advised that “bands of thundery showers now to the southwest of Hong Kong were gradually edging towards the Pearl River Estuary and may affect the territory in the next couple of hours”. The radar image with rainfall rate at 1348 hrs and 1400 hrs is shown in Figure 3 and Figure 4 respectively.

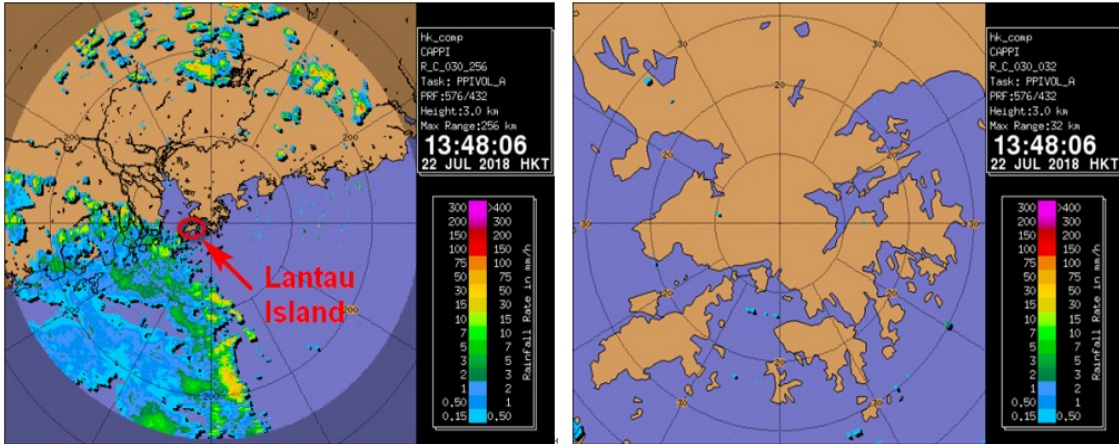


Figure 3: Radar Image with Rainfall Rate (256 km and 32 km) at 1348 Hrs

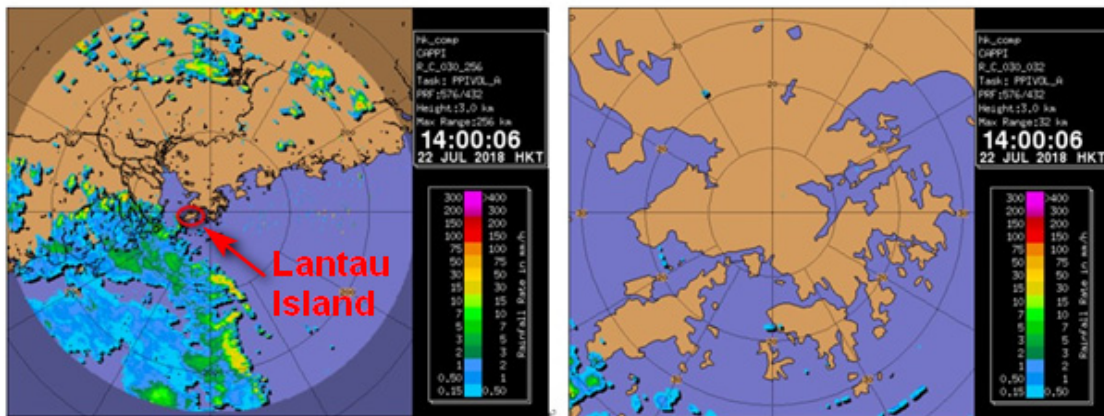


Figure 4: Radar Image with Rainfall Rate (256 km and 32 km) at 1400 Hrs

1.7.1.3. Thunderstorm Warning at 1400 hrs

On 22 July 2018 at 1400 hrs, HKO issued a Thunderstorm Warning. Isolated squally thunderstorms were expected to occur over Lantau and New Territories West until 1600 hrs. Gusts reaching 70 kph or above might affect Lantau and New Territories West. High gusts associated with passing echoes were recorded by wind stations over Lantau. A gust of maximum 18.2 metres per second (m/s) (66 kph) was recorded at Nei Lak Shan at 1406 hrs.

1.7.1.4. Gust Data from Weather Stations at Lantau

“10-min mean wind speed” and “1-min gust” data during the period from 1300 hrs to 1800 hrs of 22 July 2018 from HKO’s weather stations (Figure 5) at Yi Tung Shan (YTS), Nei Lak Shan (NLS), Tai Fung Au (TFA) and Pak Kung Au (PKA) were collected. Gusts of about 56 - 66 kph were recorded across the Lantau high ground during the period from 1352 to 1406 hrs (Appendix 8.1).

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

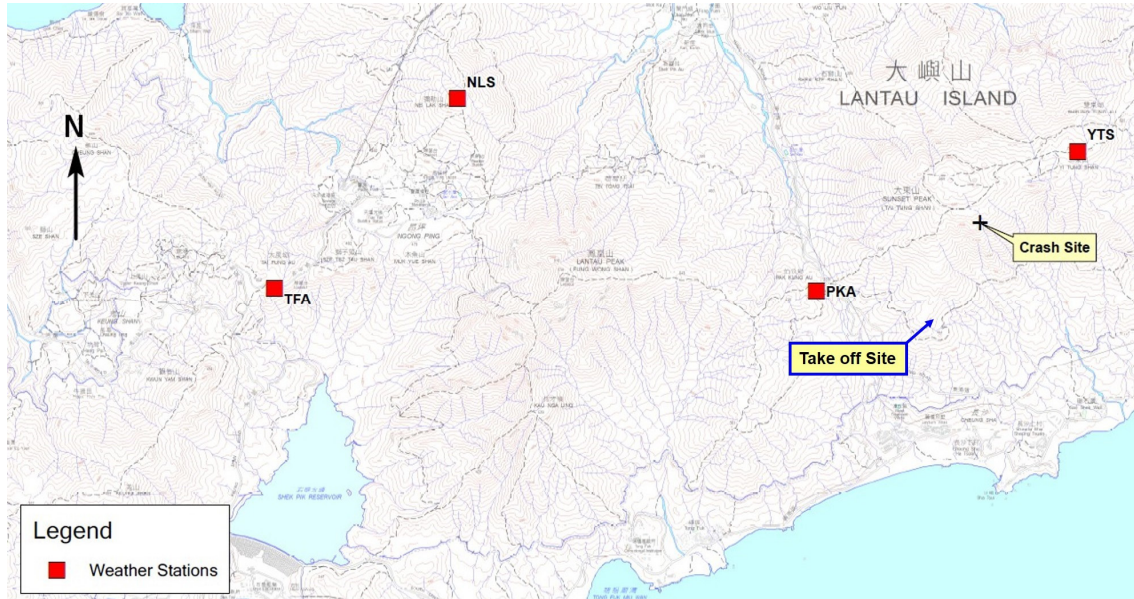


Figure 5: Locations of the Four Weather Stations

1.7.2. Weather of the Accident Day

The HKO webcam from Lamma Island Yung Shue Wan Pier captured the general weather condition of South Lantau Island during daytime (Figure 6). With the approach of thundery showers before 1400 hrs on 22 July 2018, the tops of Lantau Peak (Fung Wong Shan) and Sunset Peak (Tai Tung Shan) were progressively covered by cloud from 1345 hrs to 1410 hrs on 22 July 2018 (Photos 3 to 7).

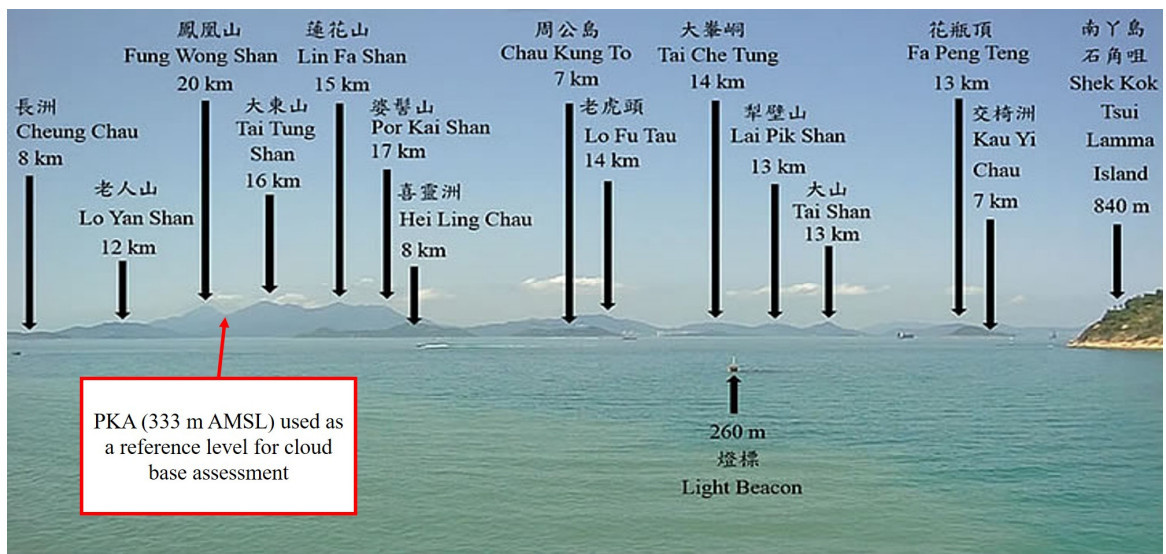


Figure 6: Landmarks and the Respective Visibility (Viewed from Lamma Island)



Photo 3: Cloud Base Level at South Lantau at 1345 Hrs on 22 July 2018

Note: The Pilot took off at around 1350 hrs.



Photo 4: Cloud Base Level at South Lantau at 1355 Hrs on 22 July 2018



Photo 5: Cloud Base Level at South Lantau at 1400 Hrs on 22 July 2018



Photo 6: Cloud Base Level at South Lantau at 1405 Hrs on 22 July 2018



Photo 7: Cloud Base Level at South Lantau at 1410 Hrs on 22 July 2018

1.7.3. Inclement Weather between 23 and 27 July 2018

1.7.3.1. Movement of Tropical Cyclone Son-Tinh

- (1) The weather during the period was affected by the irregular track of tropical cyclone Son-Tinh.
- (2) After weakening to a low-pressure area, Son-Tinh re-intensified into a tropical depression when moving from the northern part of Vietnam into Beibu Wan. It moved eastward closer to Hong Kong gradually on 22 July 2018.
- (3) The weather was mainly cloudy with isolated showers and squally thunderstorm from 23 July 2018 (0200 hrs) to 27 July 2018 (1000 hrs).
- (4) No.1 Standby Signal was issued at 1540 hrs on 23 July when Son-Tinh was about 460 km west-southwest of Hong Kong. With Son-Tinh edging closer to Hong Kong, the local weather turned cloudier with occasional heavy showers and a few squally thunderstorms on 23 July 2018. As Son-Tinh changed course in the north-west direction and moved away from Hong Kong (Figure 7), all tropical cyclone warning signals were cancelled at 1040 hrs on 24 July 2018.

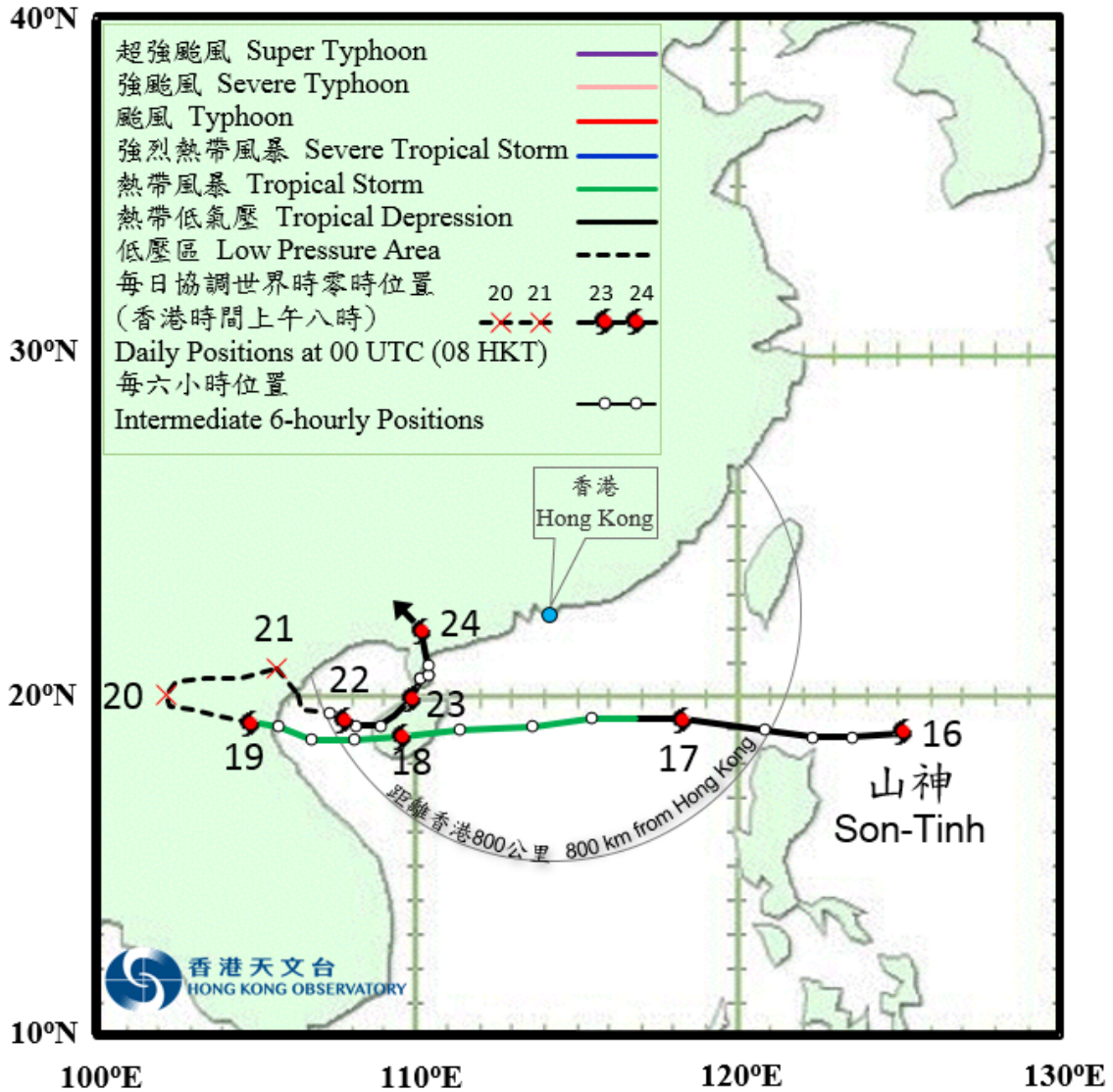


Figure 7: Track of Tropical Storm Son-Tinh from 16 to 24 July 2018

1.7.3.2. Low Cloud Base

- (1) A review of weather photographs of the south Lantau Island revealed that the high ground areas of Lantau Peak and Sunset Peak were covered by cloud most of the time during daytime. The cloud base was consistently below 400 m AMSL throughout 0600 hrs of 23 July 2018 to 1100 hrs of 27 July 2018 (Photo 8).
- (2) Search and rescue operations at the high ground of Lantau Island were impeded by poor flight visibility resulting from the low cloud base.

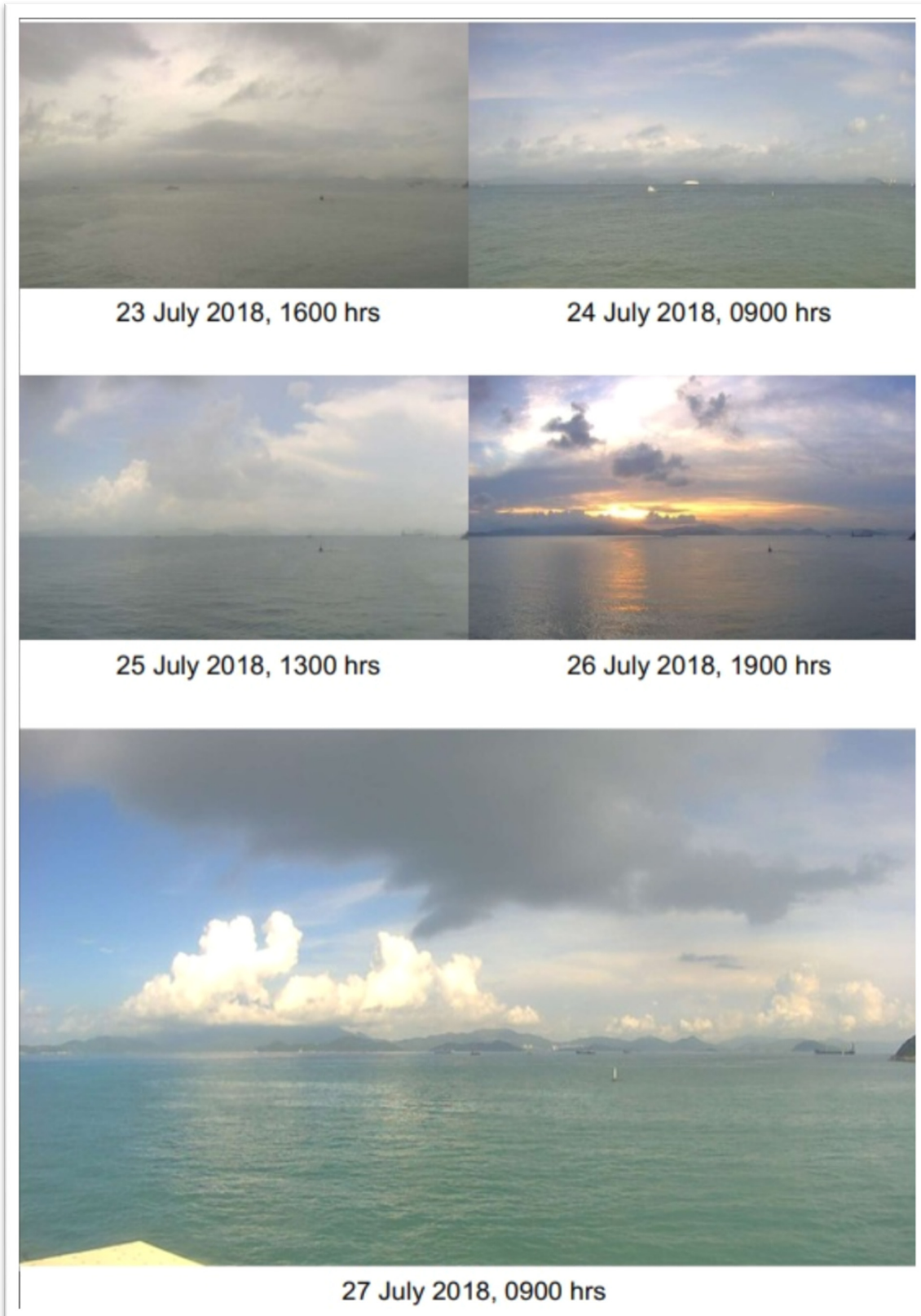


Photo 8: Cloud Base Level at South Lantau between 23 and 27 July 2018

1.7.3.3. Improvement of Weather Condition

On 27 July 2018, Sunset Peak and Lantau Peak were momentarily clear of clouds at around 1130 hrs (Photo 9). This had created a window of opportunity for a GFS helicopter to conduct reconnaissance at the south of Sunset Peak, before taking up another casualty evacuation operation at Shek Pik. At about 1147 hrs, the GFS crew spotted the paragliding canopy and the Pilot at about 680 m AMSL south of Sunset Peak. Refer to Paragraph 1.15.5.(1) for more details on the GFS flight operation.



Photo 9: Pak Kung Au Visible at 1130 Hrs on 27 July 2018

1.8. Aids to Navigation

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. 145.9875 MHz was published on HKPA website for emergency distress, urgency and safety priority calls. 436.360 MHz was the radio frequency for general communication adopted by Hong Kong Paragliding Federation on 21 March 2017. There was no information from Pilots B, C and D that the Pilot had made a radio call during the flight.
- (2) Pilot C recalled that at around 1345 hrs, he and Pilot D checked HKO's radar image and found that there would be a thunderstorm coming in about half an hour time. Both of them recalled someone, possibly a person of the paraglider group, had broadcasted on the HKPA's designated radio

channel at 145.9875 MHz about bands of cloud and precipitation approaching from the Pearl River Estuary.

1.10. Paragliding Takeoff Area

- (1) The South Lantau East paragliding activity area in the Lantau South Country Park was located within the Lantau Control Zone, which was defined in the Aeronautical Information Publication Hong Kong (AIP HK) published by the Civil Aviation Department (CAD) (Figure 1). The operating altitude of the area was from the ground surface (SFC) to 2000 feet (609 m) AMSL. The South Lantau East takeoff area (Photo 10) was at about 400 m AMSL, at approximately 1.2 km east of PKA along the South Lantau Country Trail.



Photo 10: South Lantau East Takeoff Area

- (2) According to the HKPA Operations Manual (Version 11 Mar 2015), the South Lantau site was open to paragliders subject to certain guidelines stated. Paragliding shall only take place during daylight hours on Saturday and public holidays. Paragliding activities shall be limited to not above 2000 ft (609 m) AMSL and within the areas designated as South Lantau East in the AIP HK. Paragliders shall notify the GFS Operations Room before the commencement of the paragliding activities at the site. Paragliders shall remain at least 1500 m horizontally and 1000 ft (305 m) vertically away from the cloud and in a flight visibility of at least 5 km when flying at the site. Pilots should remain visible and not enter the cloud. For the solo paragliding activity in South Lantau Island (East & West), the HKPA Operations Manual (Version 11 Mar 2015) stated that the pilot rating required was Solo Novice or above, and Lower Cheung Sha Beach was the landing site.

- (3) Since the Pilot was holding a HKPA Pilot rating, the Pilot was qualified to carry out the solo paragliding activity in South Lantau Island (East & West).

1.11. Recorded Information

1.11.1. Data from the Variometer

- (1) The Pilot's variometer (Figure 8) which was attached to the harness, was recovered by the rescue team on 27 July 2018. This model, SkyDrop, 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. Data stored from the variometer in the International Gliding Community (IGC) file could be used 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 8: The Type of Variometer Used by the Pilot

- (2) Data in an IGC file contains information on (i) UTC time; (ii) GPS location in longitude/latitude; (iii) pressure altitude and GPS altitude (in metres). An example of the data format is shown in Table 4. Refer to Appendix 8.2 for more details on the data description.

UTC Time (HHMMSS)	Latitude (DDMMmmN/S)	Longitude (DDMMmmE/W)	Pressure Altitude (PPPP)	GPS Altitude (GGGG)
055026	2214658N	11357069E	00446	00421

Table 4: Readout Format of IGC File

- (3) The data in the Pilot's variometer was downloaded successfully and used for flight track analysis.

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 9).

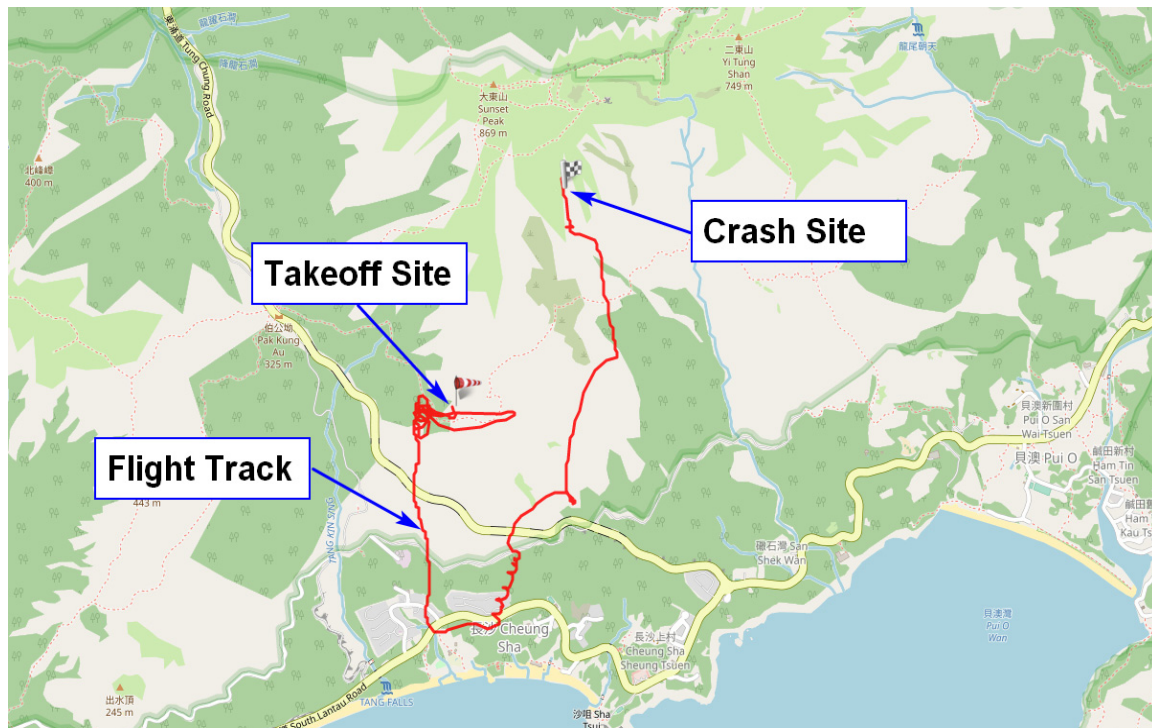


Figure 9: Flight Details from “Logfly”

1.12. Wreckage and Impact Information

1.12.1. General

The Pilot and his paraglider were found on a hill slope at 680 m AMSL on the south of Sunset Peak on 27 July 2018. The rescue team released the Pilot from his paraglider by cutting the lines of the canopy and the harness. The rescue team had to relocate

the Pilot to a lower level and packed the canopy to ensure a safe airlift by GFS. All items of the Pilot collected from the accident site were preserved by HKPF. After the then Chief Inspector of Accidents ordered an investigation on 2 August 2018, information of the location of the accident site recorded by the rescue team was provided to the investigation team. Detailed examination of the wreckage was conducted with the assistance from HKPA Safety Officer at the Air Accident Investigation Centre on 13 August 2018.

1.12.2. Canopy and Reserve Parachute

- (1) The paragliding canopy was examined and found in good shape (Photo 1). There was a ripped hole (1 cm x 2 cm) found on the canopy (Photo 11). Harness shoulder straps and all lines connecting the canopy were cut during the recovery operation.



Photo 11: A Ripped Hole (1 cm X 2 cm) on the Paragliding Canopy

- (2) The reserve parachute, Model “LIGHTNESS”, was inspected and the rescue team verified that it was intact inside the reserve compartment when the Pilot was found. The reserve parachute was subsequently removed from the reserve compartment by HKPF during their initial investigation of the equipment. The reserve parachute was later visually inspected by the investigation team with no abnormal findings observed.

1.12.3. Harness

The shoulder straps and several other attachment of the harness, with Advance Lightness 2 L size (Photo 2), were cut during the recovery operation. There were two small cuts on the bottom of the cocoon surface nylon layer (9 cm and 5 cm in length) and there were no dirt marks near the cocoon cut areas.

1.12.4. Helmet

The helmet, Model “Plusmax I helmet” (Photo 12), which was certified with EN966 standard, was found detached from the Pilot’s head, approximately midway between

the canopy and the Pilot. The helmet buckle was secured when found and there was no observable damage to the helmet. A camera mount appeared to be missing or sheared off, leaving only the adhesive tab on the helmet.



Photo 12: Helmet of the Pilot

1.12.5. Gloves

A pair of gloves was found near the helmet. The gloves were detached from the Pilot's hands. There was no damage to the gloves.

1.12.6. Camera

A joint-departmental search operation for the Pilot's camera and compass was conducted by FSD, HKPF, CAS and AAIA on 4 October 2018 and the camera was recovered near the crash site. 16 video clips of the Pilot's paragliding activities during the period from 4 and 6 July 2018 were found in the camera memory card. However, there was no video record for the accident flight.

1.12.7. Compass

The recovery operation on 27 July 2018 and the equipment search on 4 October 2018 could not locate any compass.

1.12.8. GPS Tracking Device

The recovery operation on 27 July 2018 and the equipment search on 4 October 2018 could not locate any GPS tracking devices.

1.12.9. Variometer

A variometer that was attached to the harness, was recovered by the rescue team on 27 July 2018. Refer to Paragraph 1.11.1.(1) for more details on the variometer.

1.12.10. Other Equipment

A two-way radio transceiver was found inside the Pilot's rucksack that was stored inside the Pilot's harness, and an android tablet was found inside the Pilot's harness. The switch was selected to the "ON" position when the radio transceiver was collected by the HKPF at the scene. The tablet installed with appropriate application may present flying information as altimeter, compass, flying map and GPS position. A mobile phone was found inside the right front pocket of the Pilot's trouser. The tablet and the mobile phone were under the custody of HKPF throughout AAIA's investigation. HKPF advised the investigation team that the last available log in the tablet was dated before the accident, and therefore there was no recorded data of the accident flight.

1.13. Medical and Pathological Information

- (1) The autopsy revealed multiple injuries, including fractures of the left lower limb, ribcage and lumbar spine with injury to the spinal cord, and injuries to internal organs including lungs and right kidney.
- (2) The autopsy did not reveal any significant natural disease that could have accounted for the death. The cause of death as shown by the autopsy was multiple injuries.
- (3) The autopsy report indicated the estimated time of death was consistent with about several days prior to the discovery on 27 July 2018.

1.14. Smoke, Fire, and Fumes

There were no smoke or fire on the paraglider after the incident.

1.15. Survival Aspects

1.15.1. Distress Call

No distress call was received from the Pilot and no one witnessed how the accident occurred. No radio or phone call from the Pilot was received during the flight and after impacting the hill slope.

1.15.2. Joint-departmental Search and Rescue Operation

- (1) At 1934 hrs on 22 July 2018, the HKPF received a report that the Pilot was missing since he took off at about 1350 hrs. A joint-departmental search and rescue operation was conducted by FSD, HKPF, GFS and CAS mountain rescue team along the hillside and nearby islands. A HKPF command post was set up at about 2130 hrs on 22 July 2018 at PKA. The command post was relocated to Lantau South Divisional Police Headquarters at noon, 23 July 2018. Aerial search by GFS and maritime search by FSD fireboats and Marine Police vessels along nearby islands were coordinated by the search command. In addition, underwater search and rescue operation by FSD divers were carried out near Cheung Chau. Search and rescue operation from 22 July to 26 July 2018 covered hill trail areas and seashores of east and south Lantau Island, Ping Chau and Cheung Chau. The search and rescue operation made reference to the Pilot's mobile phone signals as received by mobile network operators' base stations in the area.
- (2) Comparing to the urban area, the high ground at South Lantau was not well covered by mobile network operators' base stations. It was, therefore, less reliable to work out the specific location of the mobile phone transmission source using mobile phone signals received by mobile network operators' base stations.

1.15.3. Other Assistance

The joint-departmental search and rescue operation received assistance from local paragliding groups, and volunteers with knowledge of radio communication and information technology. Some volunteers operated Unmanned Aerial Vehicle (UAV) to carry out the search at various locations on South Lantau during the period from 22 to 27 July 2018.

1.15.4. Google Location History Files of the Pilot

- (1) The Pilot's family advised the investigation team that on 25 July 2018, the family suggested the HKPF to seek Google Hong Kong's assistance to retrieve the Pilot's Google Location History.

- (2) With an assistance of a friend with professional knowledge of information technology, the family retrieved the Pilot’s Google Location History files from the internet server on 26 July 2018. Refer to Paragraph 1.18.2.3 for more details on the Google Location History.
- (3) After analysis of the files, the family identified two locations with high accuracy reference (Figure 10) and claimed that they were then provided to the FSD search command in person verbally at 1542 hrs on 26 July 2018.

	A	B	C	F	G	H	I	J
1	timestamp	Y	X	accuracy	altitude	latency (mins)		
2	23/7/18 11:28	22.2092627	114.016651	2099		664.58		
3	23/7/18 0:23	22.2093233	114.02074	1700		20.33		
4	23/7/18 0:03	22.2093233	114.02074	1700		20.65		
5	22/7/18 23:42	22.2093233	114.02074	1700		10.23		
6	22/7/18 23:32	22.252914	113.955919	16	679	4.03	Point B	
7	22/7/18 23:28	22.2093233	114.02074	1700		2.92		
137	22/7/18 16:50	22.2093233	114.02074	1700		7.0	6.63	
138	22/7/18 16:42	22.253024	113.956143	18	647	5.92	Point A	
139	22/7/18 16:36	22.2093233	114.02074	1700		2.18		
150	22/7/18 15:46	22.2093233	114.02074	1700		1.02	0.83	h
151	22/7/18 15:45	22.2218332	114.023341	1000		2.4		
162	22/7/18 15:13	22.2218332	114.023341	1000		18.85	0.53	hours
163	22/7/18 14:54	22.2093233	114.02074	1700		2.27		
164	22/7/18 14:52	22.2218332	114.023341	1000		5	0.58	hours
176	22/7/18 14:17	22.2218332	114.023341	1000		1.95		
177	22/7/18 14:15	22.2217741	114.021483	1000		2.07		
182	22/7/18 14:04	22.2217741	114.021483	1000		2.02	0.18	hours
183	22/7/18 14:02	22.2267559	113.926695	2200		2.05		
184	22/7/18 13:59	22.2456367	113.946769	1299		2.23		
185	22/7/18 13:57	22.2626248	113.938591	1500		2.02		
186	22/7/18 13:55	22.2626248	113.938591	1500		2.02		
187	22/7/18 13:53	22.2473228	113.944911	1399		4.05	0.88	hours
194	22/7/18 13:00	22.2473228	113.944911	1399		2		
195	22/7/18 12:58	22.2456367	113.946769	1299		2.13		
196	22/7/18 12:56	22.2467422	113.946398	1100		10.35		
197	22/7/18 12:46	22.2703866	113.934429	912	30	2.03		
198	22/7/18 12:44	22.2703866	113.934429	730	30	2.07		
199	22/7/18 12:42	22.2703866	113.934429	543	30	2.23		takeoff period
200	22/7/18 12:39	22.2703866	113.934429	343	30	2		
201	22/7/18 12:37	22.2703866	113.934429	163	30	1.68		
202	22/7/18 12:36	22.2703869	113.934428	10	30	0.27		
203	22/7/18 12:35	22.2703872	113.934427	10	30	0.25		
204	22/7/18 12:35	22.2703872	113.934427	10	30	0.27		
205	22/7/18 12:35	22.270387	113.934427	10	30	0.25		
206	22/7/18 12:35	22.2703868	113.934426	10	30	0.27		
207	22/7/18 12:34	22.2703866	113.934426	10	30	0.27		
208	22/7/18 12:34	22.2703869	113.934427	10	30	0.25		

Figure 10: Google Account Location History as Analysed by a Friend of the Pilot’s Family

- (4) Records from the FSD search command indicated that these two high accuracy reference locations were received at 2043 hrs on 26 July 2018. An arrangement was made with GFS to air-lift search teams to the target location on 27 July 2018 morning.

1.15.5. Recovery of the Pilot

- (1) In the morning of 27 July 2018, the FSD search command coordinated with GFS to air-troop FSD and CAS search teams to the target location. Before the planned operation, a GFS helicopter operated a casualty evacuation (CASEVAC) flight from Hei Ling Chau to Wan Chai at 1129 hrs. The crew was assigned another CASEVAC operation in Shek Pik after the completion of the first CASEVAC flight. While the helicopter was on the way to Lantau, the GFS pilot decided to conduct an aerial search at the south of Sunset Peak before the CASEVAC operation in Shek Pik. At about 1147 hrs, the GFS crew spotted the paragliding canopy and the Pilot at about 680 m AMSL south of Sunset Peak (Figure 11). After being notified, the Rescue Command then coordinated with the GFS Air Command and Control Centre (ACCC) to deploy mountain rescue teams of CAS and FSD on separate flights to recover the Pilot. The CAS rescue team reached the location at 1234 hrs. The unconscious Pilot was air-lifted by a GFS helicopter to PYNEH which later arrived at PYNEH at 1420 hrs, and was certified dead by a duty medical officer at 1431 hrs.



Figure 11: Paraglider Canopy Spotted by the GFS Crew

- (2) The recovered location was close to the two GPS coordinates with high accuracy reference retrieved and identified by the Pilot's family and friend from the Google Location History files. (Figure 12)

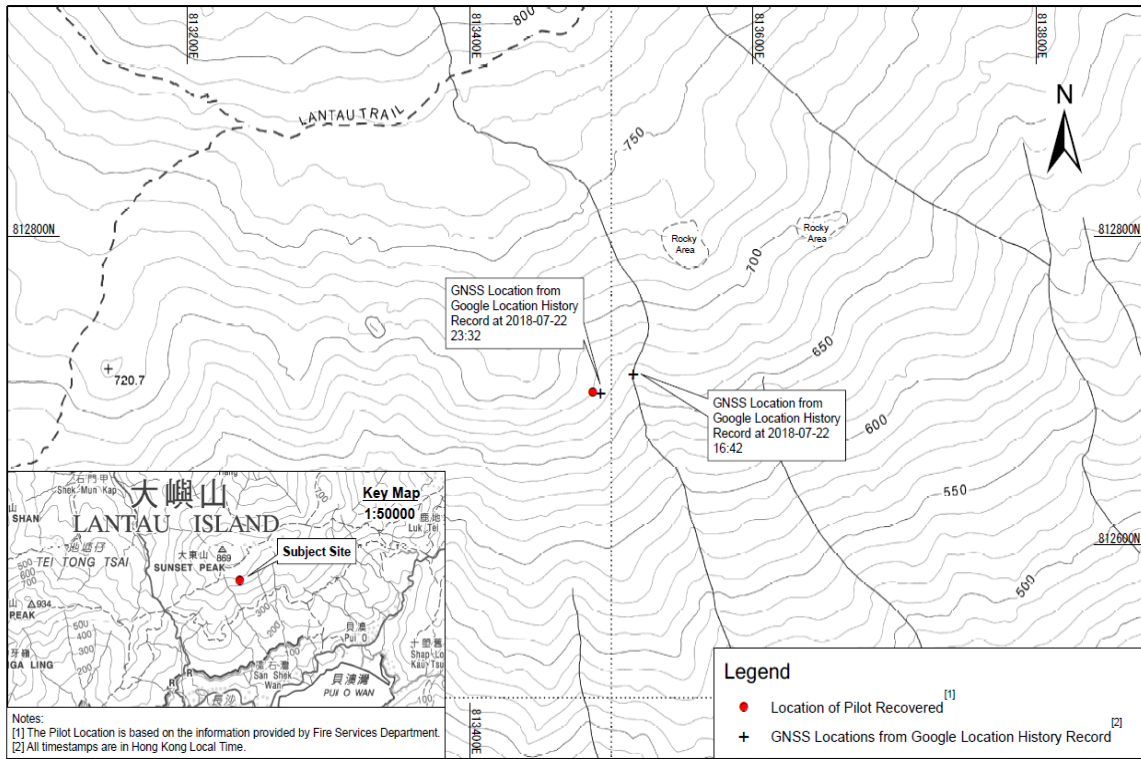


Figure 12: Location of Pilot Recovered versus the GPS Locations from Google Location History Record

1.16. Tests and Research

1.16.1. Paraglider Lines Aging Check

Paraglider lines aging check was carried out with the assistance from HKPA Safety Officers on the upper “A gallery” (Figure 13). The difference between manufacturer’s length and calibrated measurement should not be greater than 10 mm. The check revealed that the differences of the four “A gallery” lines were all less than 10 mm (Table 5). There was no sign of significant aging or wear observed on the paraglider lines.

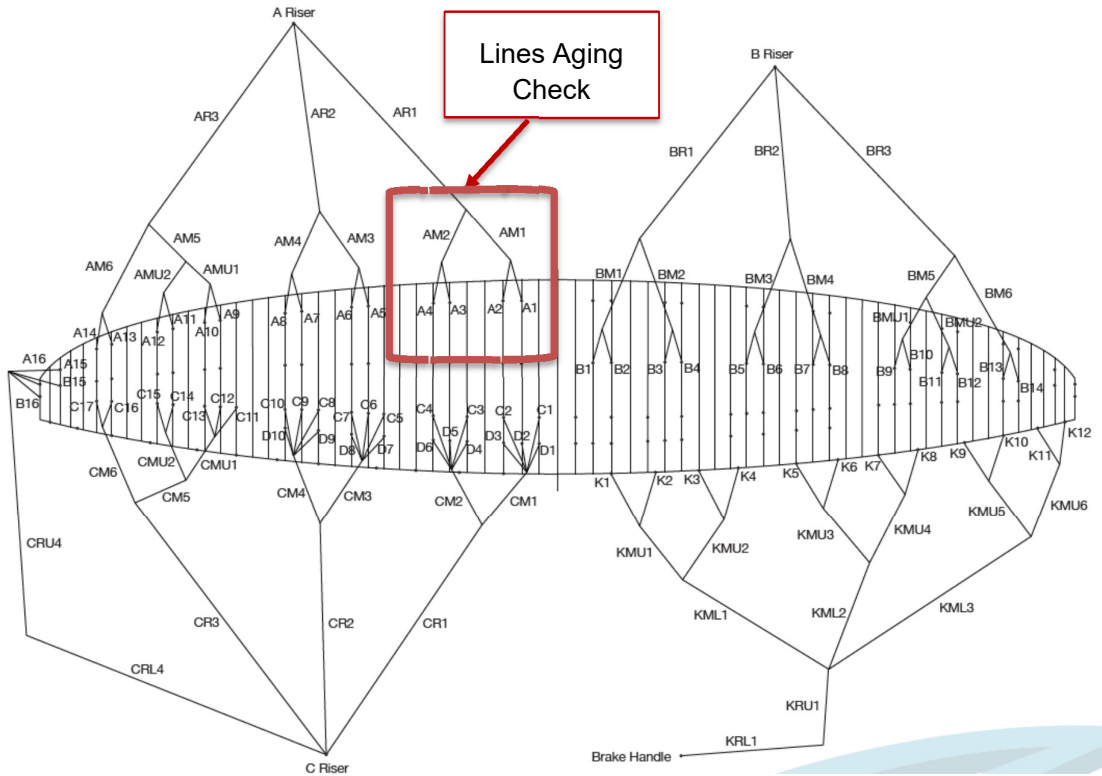


Figure 13: Lines Aging Check at Upper “A Gallery”

	(A)	(B)	(C)	(D)
	Line Length Suggested by manufacturer	Laser Measurement	(B) With Calibration	Difference between (A) & (C)
A1+AM1	1968	1988	1970	-2
A2+AM1	1976	1995	1977	-1
A3+AM2	1930	1949	1931	-1
A4+AM2	1939	1955	1937	2

Table 5: Lines Measurement Check Result

1.16.2. Radio Transceiver Functional Checking

- (1) Before the functional check, the battery of the radio transceiver was recharged. The transceiver was then switched on and it displayed frequencies 145.9875 MHz and 436.360 Mhz. It was confirmed that the Pilot had prepared the radio frequencies settings for emergency/distress calls and general communication respectively.

- (2) A transmission test was done with another transceiver of the same model. The transmission was good and messages received were loud and clear. The transceiver functioned properly.

1.17. Organisation, Management, System Safety

1.17.1. Civil Aviation Department

CAD regulates civil aviation activities in Hong Kong. In view of the increasing popularity of paragliding activities in Hong Kong, CAD has taken initiatives to enhance the safe operation of paragliding activities. Refer to Paragraph 4.1. for more details on actions taken by CAD.

1.17.2. Hong Kong Sector Flight Safety Committee

- (1) The Hong Kong Sector Flight Safety Committee (HKSFSC) comprises local airspace users including fixed wing operators and rotary wing operators (GFS, Hong Kong Garrison of the People's Liberation Army, Sky Shuttle Helicopters Limited, Heliservices (Hong Kong) Limited and Hong Kong Aviation Club), HKPA and private aircraft owners. They meet regularly to coordinate safety issues in the local airspace to promote flight safety. CAD chairs the HKSFSC.
- (2) A Committee Meeting is held once every six months, or as required, to discuss and review safety issues related to flight operations in Uncontrolled Airspace Reporting Areas (UCARA), Control Zones and Shek Kong in Hong Kong with local airspace users with a view to enhancing safety in above-mentioned airspace. The frequency of the meeting was revised to nine months, or as required, since May 2019. HKPA has attended HKSFSC meetings as a member ever since CAD took over HKSFSC Chairmanship from the Royal Air Force in 1996. Hong Kong Paragliding Federation has attended the HKSFSC meeting as an observer since September 2018.

1.17.3. Air Navigation (Hong Kong) Order

- (1) There were no legal provisions under the Air Navigation (Hong Kong) Order (Cap. 448C) for CAD to impose any licence requirements for paraglider pilots or any requirements on the use of paraglider and associated equipment.
- (2) CAD had advised HKSFSC members at the meeting on 24 September 2013 that paraglider was technically a parachute and it should not be classified in the category of aircraft heavier than 7 kg and was not bounded by the provisions of Cap. 448C except Sections 48, 70, 98(1) and 98(8).

- (3) CAD advised the investigation team that paraglider was considered as a “modified parachute” under Section 100(d) of Cap. 448C.
- (4) CAD further advised the investigation team that although “paraglider” was not specifically defined in the legislation at present, CAD considered that “paraglider” was a modified parachute which was falling within Section 100(d) of Cap. 448C, and therefore Sections 48, 70, 98(1) and 98(8) were applicable (Appendix 8.3). The longer term review of the legislation by CAD would include whether “paraglider” needed to be added under Section 100(d) of Cap. 448C, taking into consideration international practices and the local operating environment.

1.17.4. CAD’s Approach to Paragliding Operations

- (1) At the HKSFSC Meeting on 18 June 2015, CAD reminded HKPA that any paragliding activities should be notified to the Hong Kong Air Traffic Control (ATC) in advance so that proper warning could be given to other airspace users. At the HKSFSC meeting on 14 May 2019, CAD indicated to HKPA, as well as representatives from Hong Kong Paragliding Federation, that notification of paragliding activities to ATC was no longer required, given “Designated Paragliding Areas” were published in the AIP HK and other airspace users had been duly advised of possible paragliding activities in those areas to ensure safety.
- (2) CAD informed the investigation team that they adopted a cooperative approach with local paragliding organisations and took initiatives to liaise with HKPA and Hong Kong Paragliding Federation to strengthen safety promotion. Apart from reviewing and providing comments to HKPA on their Operations Manual and Safety Management System (SMS) Manual, CAD has also encouraged Hong Kong Paragliding Federation to consider developing similar documents to promulgate good operation and safety principles and to provide members with systematic guidance on the safe conduct of paragliding activities. Furthermore, in consultation with HKPA and Hong Kong Paragliding Federation, CAD has published a “Safety Guidance on Paragliding Activities” on its website for reference by the paragliding community since 2 October 2018. Both HKPA and Hong Kong Paragliding Federation have incorporated such information on their respective websites. CAD has also reviewed the regime of the offering of air services using paraglider for hire or reward under the Air Transport (Licensing of Air Services) Regulations (Cap. 448A). To raise the awareness of the paragliding community on the requirements of a permit for the provision of such air services for hire or reward, as well as to facilitate their applications and submissions, CAD has enhanced the website to include application details and associated guidelines on 2 December 2019. Local paragliding associations were informed of the enhanced website after publication.

1.17.5. Hong Kong Paragliding Association

1.17.5.1. General

- (1) 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.
- (2) HKPA does not have any power to enforce standards or implement control measures to ensure the safe conduct of paragliding activities. There is no legal basis for CAD to require any paraglider pilots in Hong Kong to register as a member of any paragliding association or club.

1.17.5.2. HKPA Pilot Ratings

HKPA issued HKPA Pilot and IPPI ParaPro Stage Ratings to members in accordance with the requirements stipulated in HKPA Operations Manual (Version 11 Mar 2015). The paragliding qualifications applied by HKPA are based on the APPI system. HKPA does not have any statutory power to require a pilot to hold a rating for paragliding activities in Hong Kong.

HKPA	IPPI ParaPro Stage
Student	Nil Card to be issued
Novice Pilot and Solo Novice	2
Club Pilot	3
Pilot	4
Advanced Pilot	5

Table 6: The HKPA Pilot Ratings to IPPI Ratings Mapping

1.17.5.3. Operations Manual / Safety Management System Manual

- (1) HKPA voluntarily publishes an Operations Manual which stipulates established standards for operations, pilot certification and pilot training for HKPA members to follow. Standards and amendments prepared by HKPA were submitted for review by CAD. According to CAD, despite the fact that there is no legal basis for CAD to approve the HKPA's Operations Manual and SMS Manual, with the aim of strengthening cooperation and enhancing safety awareness, CAD has provided from aviation safety perspective

comments and recommendations on these documents and such comments are accepted by HKPA.

- (2) There was a chapter on safety in the HKPA Operations Manual (Version 11 Mar 2015) which primarily concerned the carriage of safety equipment. The mandatory safety equipment was a reserve parachute, a helmet and footwear, while a variometer and a GPS device to help with locating the pilot's position and tracking were classified as "Useful Equipment". HKPA amended the Operations Manual in August 2018 and the chapter on safety was transferred to the HKPA Safety Management System Manual (Version 9 Aug 2018). HKPA promulgates and updates safety notices and articles on its website.

1.17.5.4 Safety Reporting System

All HKPA members are required to report accidents and incidents in which they are involved or that they witness to the HKPA Safety Officer using the HKPA website safety reporting system. HKPA utilises de-identified safety reports to produce statistics that can be analysed to prevent recurrence of similar events. After safety hazards and risks are identified, improvement and mitigation measures will be implemented and disseminated through further safety promotion and training.

1.17.6. Hong Kong Paragliding Federation

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. An online forum is administered to share flying experience in order to strengthen knowledge and safety awareness. The Federation neither provides documentation for specific operations nor Safety Management System to members. Hong Kong Paragliding Federation attended the HKSFSC meetings as an observer since September 2018.

1.18. Additional Information

1.18.1. Information from Other Paragliding Pilots

The investigation team interviewed four paragliding pilots who took off from South Lantau takeoff areas before and after the takeoff time of the Pilot.

Pilot	Takeoff Site	Takeoff Time
A	South Lantau West	1320
B	South Lantau East	1348
C	South Lantau East	1355
D	South Lantau East	1358

Table 7: Takeoff Time and Sites of Other Paragliding Pilots

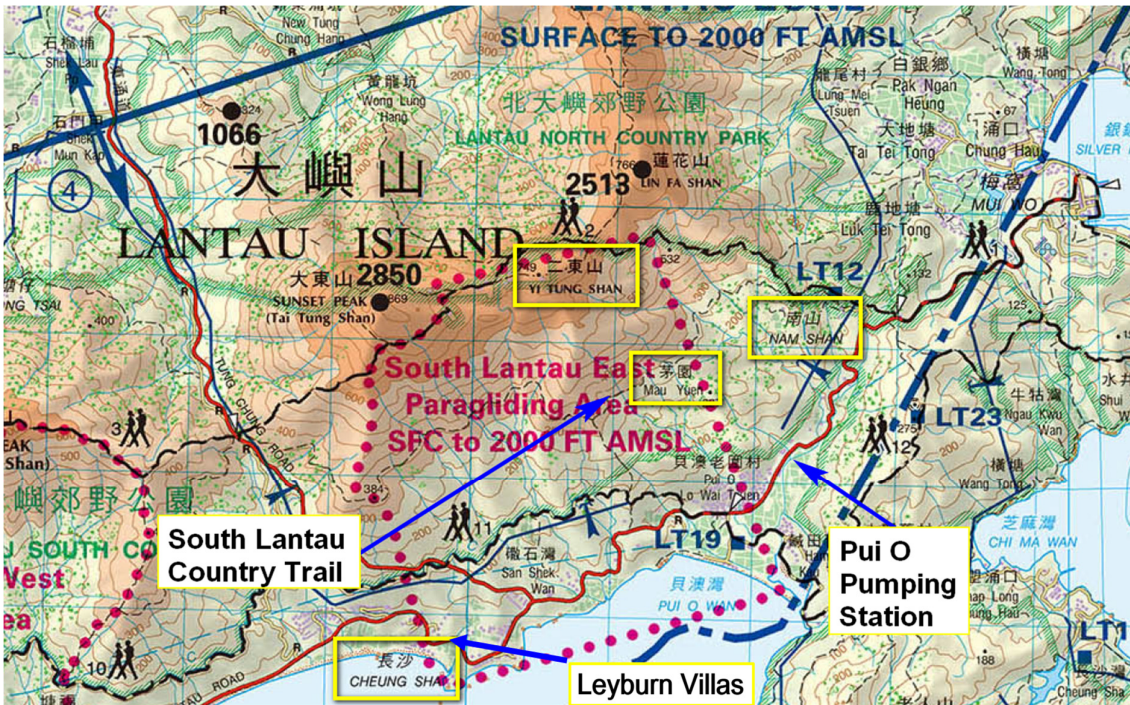


Figure 14: Landmarks in Lantau South Country Park

1.18.1.1. Pilot A Took Off at 1320 Hrs

Pilot A took off with his EN-B certified paraglider from the South Lantau West Takeoff Site at around 1320 hrs. While airborne, he saw a long band of black cloud spreading across the horizon from the east to the west; “cliff-like” clouds associated with thunderstorm kept pressing on from the south. The amount of clouds increased and were coming in fast and the cloud base kept pressing down. Pilot A felt uneasy as more than half of the time he was blocked by clouds. He landed at Lower Cheung Sha Beach at 1357 hrs.

1.18.1.2. Pilot B Took Off at 1348 Hrs

- (1) Pilot B launched from the South Lantau East Takeoff Site with EN-A certified paraglider at 1348 hrs. Having just been airborne for 5-10 mins, he decided to land because the cloud over the sea made him thought that the weather was deteriorating. Based on his experience, he decided to turn left for Yi Tung Shan for landing instead of to the south towards Cheung Sha. He recalled that a south-westerly gust arrived when he was at Yi Tung Shan. The headwind arrested his forward speed. The sudden gusting reached 70 kph, which he had never encountered before. He was not moving forward and was momentarily drifted backwards as the wind was getting stronger. He could not land until he went beyond a pumping station in Pui O.
- (2) During the interview, Pilot B shared his personal flying techniques of cloud avoidance. As far as the South Lantau East takeoff site was concerned, if a pilot enters into the cloud, he should exit immediately by flying south towards the sea, thereby staying clear of the terrain. To start with, he should check the compass, which is attached to the harness, to maintain heading, and descend as much as possible using “Big Ears”, a technique where the outside portions on both sides of the paraglider were intentionally collapsed by pulling down on the outermost A lines. Pilot A adopted similar techniques to exit clouds.

1.18.1.3. Pilot C Took Off at 1355 Hrs

Pilot C launched from the South Lantau East Takeoff Site with EN-A certified paraglider at 1355 hrs. After a bit of ridge soaring, he found himself gradually climbed to 480-490 m (GPS altitude). Even though he was “still far from the cloud base”, he sensed that the wind has strengthened. He decided to commence descent with Big Ears facing Cheung Sha. The descent was slow, and as the wind changed to west/south-westerly, he was blown towards Pui O, precluding a landing on Cheung Sha Beach. The canopy travelled at a maximum speed of 78 kph under a strong tailwind. He commented the flight as bumpy, and that the wind was “so strong that it ceased to be suitable for flying.” Knowing he would not be able to glide to a landing place in Pui O, he elected to land on top of a thick bush at 200 m (GPS Altitude) near the South Lantau Country Trail west of Mau Yuen. While waiting for FSD, he packed his canopy, which would otherwise catch the attention of rescuers.

1.18.1.4. Pilot D Took Off at 1358 Hrs

Pilot D took off from the South Lantau East Takeoff Site with EN-A certified paraglider at 1358 hrs, roughly, as Pilot C commenced the descent. Just as he, too, decided to descend, he entered into the cloud and was pushed up by the wind from 430 m to 510 m (GPS Altitude) while in clouds. He applied Big Ears. According to his variometer record, the maximum speed of the flight reached 80 kph near Yi Tung Shan. He encountered south-westerly gust abeam Yi Tung Shan. Once exited the cloud, he

was overhead Nam Shan at 380 m (GPS Altitude). The speed slowed down so that he could land on a hill trail.

1.18.2. Position Tracking Device, Service and Application

1.18.2.1. Automatic Packet Reporting System GPS Tracker

After the accident, Hong Kong Paragliding Federation developed an “Automatic Packet Reporting System (APRS) GPS Tracker” (Photo 13) to detect the location of registered paraglider pilots. APRS device provides a reliable GPS tracking and 2-way radio communication during extreme situation, when existing mobile phone/internet networks are not available. The location of the APRS GPS Tracker unit, once activated, can be tracked by other APRS GPS Tracker units and monitored on a website.



Photo 13: APRS GPS Tracker

1.18.2.2. Satellite Communicator

With a subscription of the satellite service, a paraglider pilot can stay in touch anywhere in the world using a satellite communicator (Photo 14). This device provides a two-way communication that works well even in the absence of mobile phone network. In addition, the flight route can be shared with, and therefore tracked by persons chosen by the pilot. In an emergency situation, the pilot can trigger a distress signal to get assistance from a 24/7 global emergency response coordination centre via the global satellite network with a worldwide coverage.



Photo 14: A Typical Satellite Communicator

1.18.2.3. Google Location History

- (1) Google Location History is a setting of a Google Account that logs the user's whereabouts, provided that the user signs in to the Google Account and turns on Location History and Location Reporting of the mobile device.
- (2) By sharing the "live" Google Location History, a paraglider pilot allows other person(s) to view and track his/her real-time location, provided that the mobile device of the pilot is continuously powered up.
- (3) Location reports and position data of a pilot may be retrieved from the Google Location History files. Upon data conversion using an appropriate tool/application, coordinates of high accuracy reference may be identified.

1.18.2.4 GPS Tracking Mobile Application "Enjoy Hiking"

A free GPS tracking mobile application, "Enjoy Hiking" was co-developed by the Agriculture, Fisheries and Conservation Department (AFCD) and the Communications Association of Hong Kong to support speedy rescue operations. Tracking location data will only be transmitted when there is mobile network or Wi-Fi coverage. By activating the "Hiker Tracking Service" and GPS of the mobile phone before the trip, the system will auto-feed the person's tracking location and the data will be recorded at the service centre. The data may then be retrieved and can facilitate rescue if the need arises. Tracking data is encrypted and stored at the system for 7 days, and erased automatically after 7 days if no incident is reported. In the event of an emergency, location data may be made available on request by HKPF or FSD.

1.19. Useful or Effective Investigation Techniques

Not applicable in this investigation.

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. Reconstruction of the Flight Path

The flight path was reconstructed based on the information retrieved from the IGC File with flight sections A to H being labelled as different flight phases (Figure 15). The flight path was within the “South Lantau East” zone of paragliding activity area defined in AIP HK.

Note: The reconstruction of the accident flight path may not reflect the actual heading as the data in the IGC file did not record it.

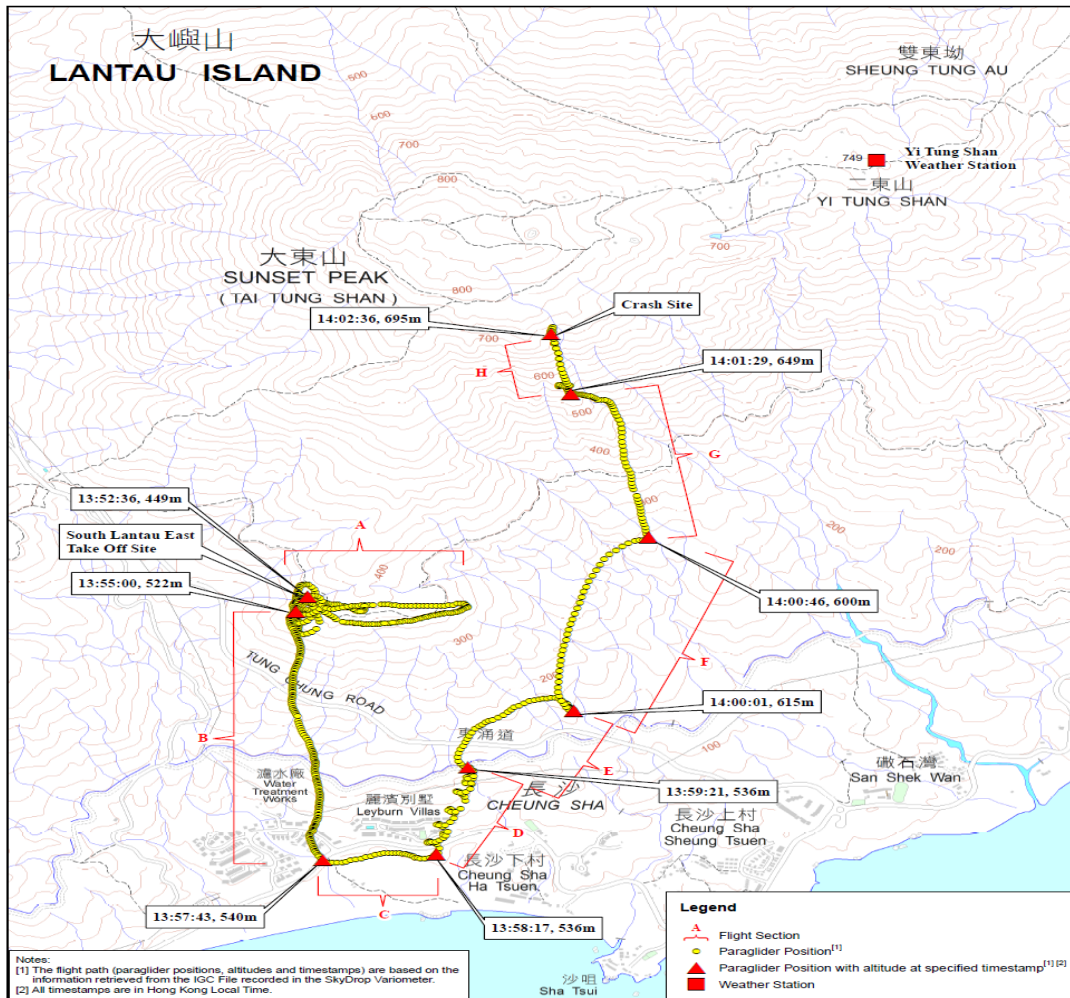


Figure 15: Reconstruction of the Accident Flight Path

2.2. Flight Track and Wind Data Analysis

Information on time, GPS position, height (refer to GPS altitude), distance and direction of travel (i.e. flight track direction) from Sections A to H of the whole flight, together with the wind information collected from HKO weather stations were reviewed and tabulated (Table 8).

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

Flight Analysis									
Flight Sections	A	A	B	C	D	E	F	G	H
Time	13:50:24	13:52:37	13:55:01	13:57:44	13:58:17	13:59:22	14:00:01	14:00:47	14:01:29
Time	13:52:36	13:55:00	13:57:43	13:58:16	13:59:21	14:00:00	14:00:46	14:01:28	14:02:36
Max. Height ^[a]	449	519	556	548	548	614	615	616	695
Min. Height ^[a]	421	449	520	530	529	550	599	599	616
Approximate Vertical Distance from Hill Slope ^[b]	69	219	536	448	388	344	265	56	0
Ground Speed ^[c]	32	25	18	35	29	63	63	47	42
Flight Track Direction	Soaring East and west / Rising air		175	90	20	45	20	340	350
10 min mean Wind Direction (YTS)	200-198	197	197	197	197	197	197	197-196	196-195
10 min mean Wind Speed (YTS)	30	30	30	30-31	31	31-32	32	32	32
10 min gust	40-41	40	40	40	40	40	40	40	40
1 min gust	32-37	34-40	36-39	37-39	35-37	35-40	40	32-40	32-36
General: All heights and vertical distances are in metre. All directions are in Degree Magnetic North. Note: Flight Track Direction may not reflect the Pilot's Heading Direction. All speeds are in kilometres per hour. [a] GPS altitude [b] At the end of the flight section [c] Speed information from Logfly (software for evaluation of flight track / GPS data) at the end of the flight section									

Table 8: Flight Track and Wind Data Analysis

2.2.1. Flight Section A

- (1) From 13:50:24 to 13:52:36, the Pilot took off from the East Lantau takeoff location at 421 m, and started soaring at the southern side of the takeoff area. The track logs showed the paraglider moved from left to right in front of the hill slope. This was a common pattern for paraglider soaring along the hill slope using dynamic lift generated by wind.
- (2) From 13:52:37 to 13:55:00, the Pilot joined Pilot B who launched before him, and made 3 anticlockwise circling upward turns along rising air to a height of 519 m on the right of the takeoff site. The paraglider was circling in the lift area to gain altitude. The ground speed was around 25 kph.

- (3) Pilot B described the rising air as “not particularly strong”. He was soon overtaken by the Pilot, whose canopy fared better in generating lift.
- (4) 10-minute wind speed recorded at YTS Weather Station was from 197 degrees at 30 kph gusting to 41 kph from 13:52 to 13:55.

2.2.2. Flight Section B

- (1) From 13:55:01 to 13:57:43, the Pilot flew southward towards Cheung Sha Beach and was overhead Lantau South Road, west of Leyburn Villas at 540 m.
- (2) 10-minute wind speed recorded at YTS Weather Station was from 197 degrees at 30 kph gusting to 40 kph from 13:55 to 13:57.

2.2.3. Flight Section C

- (1) From 13:57:44 to 13:58:16, the Pilot changed the flight trajectory to the east. The paraglider flew at a height of 542 m heading east for a distance of about 350 m. The ground speed was around 35 kph.
- (2) During this Section, he was last seen above Leyburn Villas by Pilot C, while the latter was executing an emergency descent to Cheung Sha due to the strengthening wind. Pilot C described to the investigation team that the Pilot was not in the cloud, and was not making any descent manoeuvre.
- (3) 10-minute wind speed recorded at YTS Weather Station was from 197 degrees at 30-31 kph gusting to 40 kph from 13:57 to 13:58.

2.2.4. Flight Section D

- (1) From 13:58:17 to 13:59:21, the Pilot carried out 8 anticlockwise circling turns towards the north-east within 64 seconds. The circular manoeuvre carried out was consistent with spiral dive, which was a pilot-induced manoeuvre for a rapid descent. From the flight IGC data, the spiral dive manoeuvre was not effective. The sink rate change to positive (+) for most of each 360 degrees turn in flight section D. He started to ascend and his position was found moving towards the terrain. The track was consistent with the wind direction.
- (2) The ground speed after the circular manoeuvre was 29 kph.
- (3) 10-minute wind speed recorded at YTS Weather Station was from 197 degrees at 31 kph gusting to 40 kph from 13:58 to 13:59.

2.2.5. Flight Section E

- (1) From 13:59:22 to 14:00:00, the paraglider was found moving northeasterly and reached a height of 614 m. It was travelling in the north-east direction towards the southern slope of Sunset Peak, instead of the low ground at the south near Cheung Sha Beach.
- (2) 10-minute wind speed recorded at YTS Weather Station was from 197 degrees at 31-32 kph gusting to 40 kph from 13:59 to 14:00.

2.2.6. Flight Section F

- (1) From 14:00:01 to 14:00:46, the paraglider made an abrupt right turn of approximately 200 degrees from the south-east direction with a ground speed of 10 kph to the north direction with ground speed to 70 kph. It descended from 615 m to 599 m. The IGC file data suggested a partial collapse of the canopy, which resulted in a rapid change of flying direction during the asymmetric wing flying.
- (2) After the turn, the paraglider was found moving for some 750 metres northward towards the high ground with 265 m clearance from the ground. The maximum ground speed recorded in this flight section was 75 kph. The flight track maintained towards the hill slope, instead of turning out to sea. It was probable that the Pilot was in the cloud and/or had difficulty maintaining a southerly heading. Moving towards the terrain with ground speeds of 63 kph indicated that the Pilot was moving downwind under strong wind conditions.
- (3) 10-minute wind speed recorded at YTS Weather Station was from 197 degrees at 32 kph gusting to 40 kph at 14:00.

2.2.7. Flight Section G

- (1) From 14:00:47 to 14:01:28, the paraglider continued moving northward at a ground speed of 47 kph, reaching 616 m from 599 m. Clearance from the ground was now narrowed to 56 m. The IGC data indicated that the paraglider probably encountered a further updraught when it was in close proximity to the ground.
- (2) 10-minute wind speed recorded at YTS Weather Station was from 197-196 degrees at 32 kph gusting to 40 kph from 14:00 to 14:01.

2.2.8. Flight Section H

- (1) From 14:01:29 to 14:02:36, 10-minute wind speed recorded at YTS Weather Station was from 196-195 degrees at 32 kph gusting to 40 kph.
- (2) At 14:01:45, the paraglider entered a strong rising air. The updraught wind was probably formed by wind traversing the slope at this point.
- (3) At 14:02:20, the paraglider was quite close to the terrain and moved through a strong rising air. Strong variations in the sink rate were recorded and the flight was probably associated with turbulence, which could collapse a canopy.
- (4) At 14:02:28, the paraglider turned away from the terrain and entered back into the rising air again with a low ground speed due to the strong wind. This part of the flight would probably be associated with turbulence. There was no indication of a sudden increase in sink rate from the IGC data. At 14:02:36, the Pilot was moving to the north at 42 kph and collided with the terrain at 695 m.

2.3. Pilot Experience, Training and Qualification

- (1) The Pilot had operated about 450 flights, accruing about 300 flying hours, from 2014 to 2018. He would be experienced enough to operate an EN-C paraglider.
- (2) Based on the Pilot's records, the investigation team does not consider the Pilot's training or experience level to have been a factor in this accident.

2.4. Paraglider

2.4.1. Paraglider Condition

- (1) The ripped hole on the canopy was not significant. It would not lead to equipment failure.
- (2) The two small cuts at the harness cocoon had no impact on the operations of the harness. The minor damages were suspected to have been a result of the crash or during the recovery of the canopy.
- (3) The paraglider lines were examined and found within the limit.
- (4) There was no evidence of the failure of the paraglider.

2.4.2. Paraglider Performance

- (1) The manufacturer advised the investigation team that flying when the wind was strong (above 25 kph) or in turbulent conditions increases the risks of the paragliding activities.
- (2) When the paraglider pilot was in a cloud, he would have no visual reference to the ground surface and might not be able to maintain effective control of the paraglider under low visibility.

2.4.3. Mass and Balance

The weight of the paraglider, harness & equipment, and pilot were 4.3 kg, 5.5 kg and 78 kg respectively. The total weight of the Pilot and paraglider was 87.8 kg, which was within the defined in-flight weight range of the Ozone Alpina 3 MS size paraglider.

2.4.4. Paraglider Equipment

2.4.4.1. Variometer

The variometer that integrated functions of position and altitude provided a useful source of data to analyse the flight tracking and positions of the Pilot after the accident. With the flight data extracted from the variometer, the investigation team was able to reconstruct the flight path prior to the impact, which in turn is essential to identify the cause of the accident and then in devising safety recommendations and actions in order to prevent future occurrences.

Note: A variometer has its limitation that the Pilot's heading direction cannot be recorded.

2.5. Flight Planning

2.5.1. Decision to Takeoff from the Lantau East Site

To comprehend the takeoff decision from the Lantau East Site, three paragliding pilots (Pilot B, C and D), who took off from the same site before and after the takeoff time of the Pilot, were interviewed. They were all aware of the approaching of thunderstorm when they were preparing for takeoff. They decided to take off and made a quick flight for Cheung Sha Beach before the arrival of the thunderstorm. However, the weather deteriorated more rapidly than they had expected. They all experienced difficulties in controlling their paragliders under the strong and gusty wind, so much so that they had to carry out emergency descent and landed at various distant locations east of Cheung Sha Beach.

2.5.2. Risk Assessment for Planning of a Safe Flight

Information of recommended pilot rating, wind direction and wind speed for the paragliding activity sites was not available from CAD “Safety Guidance on Paragliding Activities” or HKPA Operations Manual (Version 11 Mar 2015). Based on a risk assessment, the recommended pilot rating, wind direction and wind speed for individual paragliding activity site might be worked out, and these useful information could be provided to the paragliding community. Additionally, for planning of a safe flight, a risk assessment with regard to inclement weather and under emergency situations should be conducted prior to flight. Risk assessment with regard to inclement weather and under emergency situations need to be further developed and promoted to the paragliding community.

2.6. The Weather of the Accident Day

2.6.1. Gusts

Refer to Appendix 8.1, one-minute gusts of up to 56-66 kph were recorded at four weather stations on the high ground of Lantau between 13:52 and 14:06 hrs. The high wind speed exceeded the normal paragliding operating wind condition.

2.6.2. Updraught

Updraught was created from a vertical component of the wind when the wind was approaching the hill slope with enough speed (about 18 kph). The southerly wind was almost perpendicular to the ridge of Sunset Peak. Stronger winds produce stronger updraughts and create stronger turbulence closer to the slope. It was probable that the Pilot experienced strong updraught when he was flying close to the hill slope.

2.6.3. Low Cloud Base

The low cloud base was associated with the approaching thunderstorms. Pilot A, who took off from the West site around 1320 hrs, saw a long band of black cloud spreading across the horizon from the east to the west; “cliff-like” clouds associated with thunderstorm kept pressing on from the south. He observed the amount of clouds increased and the clouds were coming in fast and the cloud base kept pressing down. Pilot A felt uneasy as more than half of the time he was blocked by clouds. Pilot D reported he was pushed from 430 to 510 m while in clouds. Consistent with the weather camera photos (Photos 3 to 7), it was probable that the Pilot was in the cloud after Section C of his flight. Loss of visual reference to the ground was hazardous to paragliding. It was published in the HKPA Operations Manual that paraglider pilots should never fly in clouds.

2.6.4. Precipitation

Paragliders are not designed or tested to be flown in rain. It is known that a paraglider's stability and recovery characteristics are degraded when wet. Although a person of the paraglider group broadcasted the approach of precipitation through the radio frequency channel designated by HKPA, the witnesses reported that it did not rain during their flights. Precipitation was not a factor of the accident.

2.7. Inclement Weather between 23 and 27 July 2018

The weather was mainly cloudy with isolated showers and squally thunderstorm from 23 July 2018 0200 hrs to 27 July 2018 1000 hrs. The weather photographs revealed that the high ground areas of Lantau Peak and Sunset Peak were covered by cloud most of the time. The cloud base was consistently below 400 m AMSL in the period. Search and rescue operations at the high ground of Lantau Island were impeded by poor flight visibility resulting from the low cloud base.

2.8. Survivability

2.8.1. Analysis of Fatal Injuries

- (1) Based on the autopsy report, the pattern of injuries was consistent with injuries caused by blunt force impacts against hard object/surface.
- (2) The cause of death as shown by the autopsy was multiple injuries.

2.8.2. Search and Rescue

- (1) The joint-departmental search and rescue operations were hindered by the adverse weather, in particular continuous conditions of poor visibility resulting from the low cloud base, which prevailed from 23 to 26 July 2018.
- (2) The location of the Pilot was undetermined in the absence of distress call or signal. The high ground at South Lantau was not well covered by mobile network, making it difficult to work out the Pilot's location by using his mobile phone transmitted signals.
- (3) When the weather conditions improved momentarily and the high ground at South Lantau became visible, the Pilot and his paraglider were spotted by the GFS crew at a location which was close to the high accurate referenced coordinates retrieved by the Pilot's family and friend. The Pilot was recovered by the rescue team on 27 July 2018 that was 5 days after the occurrence day.

- (4) The investigation team noted the benefits of employing location data from Google Location History files or other devices/applications as described in Paragraph 1.18.2. in the SAR operations, which may potentially shorten exposure to adverse weather and geographical conditions by the missing person and SAR personnel.

2.8.3. Survival Aspects

2.8.3.1. Reserve Parachute

Reserve parachute was carried by the Pilot but was not deployed. It was probable that the weather conditions, and lack of visual references to the ground together with rapidly changing situation did not allow the Pilot to use the reserve parachute.

2.8.3.2. Use of Position Tracking Device, Service and Application

- (1) A position tracking device/service/application that would send out a distress signal or share the real-time location information of the pilot in flight to alert SAR units, and to deliver an immediate rescue service is considered essential for paragliding activities. There are some devices, services and applications as shown in Paragraph 1.18.2. available in the market for pilots' use.
- (2) It would be advisable to include position tracking device, service and application as a safety equipment to be carried/used by paraglider pilots in the "Safety Guidance on Paragliding Activities" posted on CAD website.
- (3) Departments taking charge of a SAR operation, as the case may be, are encouraged to make use of location data from these devices, services and applications as far as applicable during a search and rescue operation.

2.9. Legislative Framework on Paragliding Activities

- (1) As CAD considers that paraglider is regulated as a modified parachute falling within Section 100(d) of Cap. 448C, the requirements under Cap. 448C with regard to pilots' licence and safety equipment to be carried during flights are not applicable. It would be advisable for CAD to suitably review and consider the extension of the scope of safety oversight beyond that currently defined under Section 100(d) of Cap. 448C.
- (2) It would be advisable that the longer term review of the legislation by CAD suitably empower its safety oversight function for paragliding activities.

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-C paraglider in this approved paraglider activity site stated in HKPA Operations Manual (Version 11 Mar 2015). (1.5.2.) (1.6.) (1.10.) (2.3.)
- (2) The paraglider was found to be serviceable and appropriate for the Pilot's weight. (1.12.2.) (1.12.3.) (1.16.1.) (2.4.1.) (2.4.3.)
- (3) Three other pilots, launching from the same takeoff site before and after the takeoff time of the Pilot, experienced difficulties in controlling their paragliders under the strong and gusty wind after takeoff, as the weather deteriorated more rapidly than they had expected. (1.18.1.) (2.5.1.)
- (4) The weather condition deteriorated rapidly since 1400 hrs on 22 July 2018, and the high wind speed exceeded the normal paragliding operating wind condition. (1.7.) (2.2.) (2.5.1.) (2.6.1.)
- (5) The Pilot was probably in the cloud and had no visual reference to the ground surface under rapidly deteriorated weather conditions, and he might have lost effective control of the paraglider. (1.7.2.) (2.4.2.) (2.6.1) (2.6.3.)
- (6) The impact caused multiple injuries to the Pilot. (1.13.) (2.8.1.)
- (7) The SAR operations were hindered by adverse weather, in particular continuous conditions of poor visibility resulting from the low cloud base. (1.7.3.) (2.8.2.)
- (8) The SAR unit encountered difficulties to search for the Pilot as the present location information of the Pilot was undetermined in the absence of distress call or signal made. (1.15.1.) (2.8.2.)

- (9) The Pilot was located by the GFS crew at a location that was close to the high accurate referenced coordinates retrieved from the Google Location History files. (1.15.4.) (1.15.5.) (2.8.2.)
- (10) Information of recommended pilot rating, wind direction and wind speed for the paragliding activity sites was not published in either CAD “Safety Guidance on Paragliding Activities” or HKPA Operations Manual (Version 11 Mar 2015). (1.17.4) (1.17.5.3.) (2.5.2.)
- (11) Risk assessment with regard to inclement weather and under emergency situations should be further developed and promoted to the paragliding community. (1.17.5.3.) (2.5.2.)
- (12) There are several position tracking devices, services and applications that send out a distress position signal or share the real-time location information of the pilot available in the market. (1.18.2.) (2.8.3.2.)
- (13) Paraglider is not specifically defined in the legislation at present, and it is regulated as a modified parachute falling within Section 100(d) of Cap. 448C and associated Sections 48, 70, 98(1) and 98(8). (1.17.3.) (2.9.)

3.2. Cause

The accident was probably caused by loss of effective control of the paraglider under rapidly deteriorated weather conditions, resulted in an impact with the terrain that rendered multiple injuries to the Pilot. (3.1.(5)) (3.1.(6))

3.3. Contributing Factor

- (1) The paraglider was under strong and gusty wind. (3.1.(3))
- (2) The high wind speed exceeded the normal paragliding operating wind condition. (3.1.(4))

4. Safety Actions Already Implemented

Whether or not AAIA identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk.

AAIA has been advised of the following proactive safety action in response to this occurrence.

4.1. Safety Actions Taken by CAD

The AAIA was advised by CAD of the following safety actions that had been taken:-

- (1) In view of the increasing popularity of paragliding activities in Hong Kong, CAD has all along been communicating and collaborating closely with the two paragliding organisations on operating paragliding activities safely, reviewing paragliding sites, promulgating safety guidance, investigating paragliding incidents, implementing safety recommendations, following up on complaints as well as promoting safety awareness.
- (2) To notify other local airspace users of the possible paragliding activities and to ensure aviation safety within the limited airspace of UCARA and Lantau Control Zone, CAD has published in the AIP HK details of the designated paragliding areas since 1990s, including individual site boundaries and operating altitudes. Similar information is also published on the CAD's and HKPA's websites for reference by the paragliding community.
- (3) Upon consultation with stakeholders (including the two paragliding organisations), CAD has published the "Safety Guidance on Paragliding Activities" on the website in October 2018 to draw the attention of paraglider pilots to the applicable laws and the importance of ensuring safety. To widely promulgate the above safety guidance to the paragliding community, CAD has also requested the paragliding organisations to include a link to the CAD's "Safety Guidance on Paragliding Activities" on their webpages.
- (4) To review and enhance the regulatory regime for paragliding activities, joint divisional meetings have been held. The part of the review involving the requirements on paragliding activities for hire or reward was completed in late 2019. Taking into consideration feedbacks from the stakeholders (including the two paragliding organisations), the requirements including a regime of permit application for conducting paragliding activities for hire or reward have been published on the CAD website since December 2019.
- (5) With a view to enhancing paraglider pilots' understanding on aviation regulations, flight rules and local operating environment, CAD has established and conducted the Air Law Examination (Paragliding) since

2019. While it is a mandatory requirement for the permit applicants to pass the examination, CAD also recommends all other paragliding pilots (through the paragliding organisations) to sit for the examination to strengthen their knowledge on aviation regulations, flight rules and local operating environment.

- (6) CAD has also requested the paragliding organisations to conduct a comprehensive review on the existing paragliding areas, including but not limited to the identification of recommended take-off / landing / emergency landing sites and the skill levels required to conduct paragliding activities within each of the areas, and publish these information on their websites for reference by the paraglider pilots.
- (7) CAD will continue to coordinate with the stakeholders, inter alia, relevant government departments in erecting signs at various paragliding take-off sites, so as to provide the paragliding community with safety information on site.
- (8) In addition to providing comments and recommendations on their Operations Manual, Safety Management System (SMS) Manual and incident / accident investigation, CAD will continue to proactively engage the paragliding organisations with a view to establishing closer liaison and collaboration with them on safety promotion.

4.2. Safety Actions Taken by HKPA

The AAIA was advised by HKPA of the following safety actions that had been taken:-

- (1) HKPA published Safety Management System Manual on 9 August 2018 to provide guidances on the safety risk assessment.
- (2) HKPA revised the Operations Manual and its website to provide more safety information and site guides, such as minimum pilot rating requirement and weather minima, on 9 August 2018.
- (3) HKPA revamped their website by adding bilingual text to improve readability of safety information; added information on recommended suitable wind conditions for the different paragliding sites; check in/out for flying sites; and added a webcam for the Lantau flying area.
- (4) HKPA actively promoted CAD Licensing of Air Services permit system to enhance legitimacy of body with competency to provide paragliding training in safe manner.
- (5) HKPA worked with the Hong Kong Observatory to improve readability of weather information for aviation sports.

- (6) For facilitating the SAR missions, HKPA established the communication channel with GFS to receive and broadcast the message of requesting paraglider pilots to free the airspace.
- (7) HKPA recommended paraglider pilots to fly with a personal beacon with tracking and distress signal function. In addition, a SAR exercise was conducted with GFS to test different types of personal beacon on 16 December 2020.

4.3. Safety Actions Taken by Hong Kong Paragliding Federation

The AAIA was advised by Hong Kong Paragliding Federation of the following safety actions that had been taken:-

- (1) After the accident, Hong Kong Paragliding Federation developed an “Automatic Packet Reporting System (APRS) GPS Tracker” to detect the location of registered paraglider pilots (For details refer to Paragraph 1.18.2.1.), and recommended paraglider pilots to fly with this GPS tracker.
- (2) Hong Kong Paragliding Federation actively promoted CAD Licensing of Air Services permit system to enhance legitimacy of body with competency to provide paragliding training in safe manner.

5. Safety Recommendations

5.1. Safety Recommendation 02-2022

It is recommended that CAD to coordinate with the paragliding organisations:-

- (1) to enrich the guidance promulgated to the paragliding community, especially on the recommended wind conditions and pilot qualifications for different designated paragliding sites, to enhance safety awareness on the paragliding activities;
- (2) to encourage paraglider pilots to conduct risk assessment for paragliding activities with regard to changing weather conditions, inclement weather and under emergency situations;
- (3) to encourage paraglider pilots to carry a position tracking device that would send out distress position signals or use services or applications that share their real-time location information, in order to facilitate a timely search and rescue service.

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

5.2. Safety Recommendation 03-2022

It is recommended that CAD to review the needs to refine the existing legislation to empower its safety oversight function on paragliding activities.

Safety Recommendation Owner: Civil Aviation Department, Hong Kong

5.3. Safety Recommendation 04-2022

It is recommended that departments taking charge of a SAR operation, as the case may be, to make use of location data from position tracking devices, services or applications as far as practicable during a search and rescue operation.

Safety Recommendation Owner: Fire Services Department and Hong Kong Police Force

6. Abbreviations

AAIA	Air Accident Investigation Authority
ACCC	Air Command and Control Centre
AFCD	Agriculture, Fisheries and Conservation Department
AIP HK	Aeronautical Information Publications Hong Kong
AMSL	Above Mean Sea Level
APPI	Association of Paragliding Pilots and Instructors
ATC	Air Traffic Control
CAD	Civil Aviation Department
Cap. 448A	Air Transport (Licensing of Air Services) Regulations
Cap. 448B	Hong Kong Civil Aviation (Investigation of Accidents) Regulations
Cap. 448C	Air Navigation (Hong Kong) Order
CAS	Civil Aid Service
CASEVAC	Casualty Evacuation
cm	Centimetre
ft	Feet
FSD	Fire Services Department
GFS	Government Flying Service
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HKO	Hong Kong Observatory
HKPA	Hong Kong Paragliding Association
HKPF	Hong Kong Police Force
HKSFSC	Hong Kong Sector Flight Safety Committee

hrs	Hours
IGC	International Gliding Community
IPPI	International Pilot Proficiency Identification
km	Kilometre
kph	Kilometre per hour
kt	Knot
m	Metre
mm	Millimetre
m/s	Metre per second
MHz	Mega Hertz
min	Minute
NLS	Nei Lak Shan
PKA	Pak Kung Au
PYNEH	Pamela Youde Nethersole Eastern Hospital
SAR	Search and Rescue
SFC	Surface
SIV	Simulated Incident In Flight
TFA	Tai Fung Au
UAV	Unmanned Aerial Vehicle
UCARA	Uncontrolled Airspace Reporting Area
USHPA	United States Hang Gliding & Paragliding Association
UTC	Coordinated Universal Time
YTS	Yi Tung Shan

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8. Appendices

8.1. Gust Data from HKO's Weather Stations at Lantau

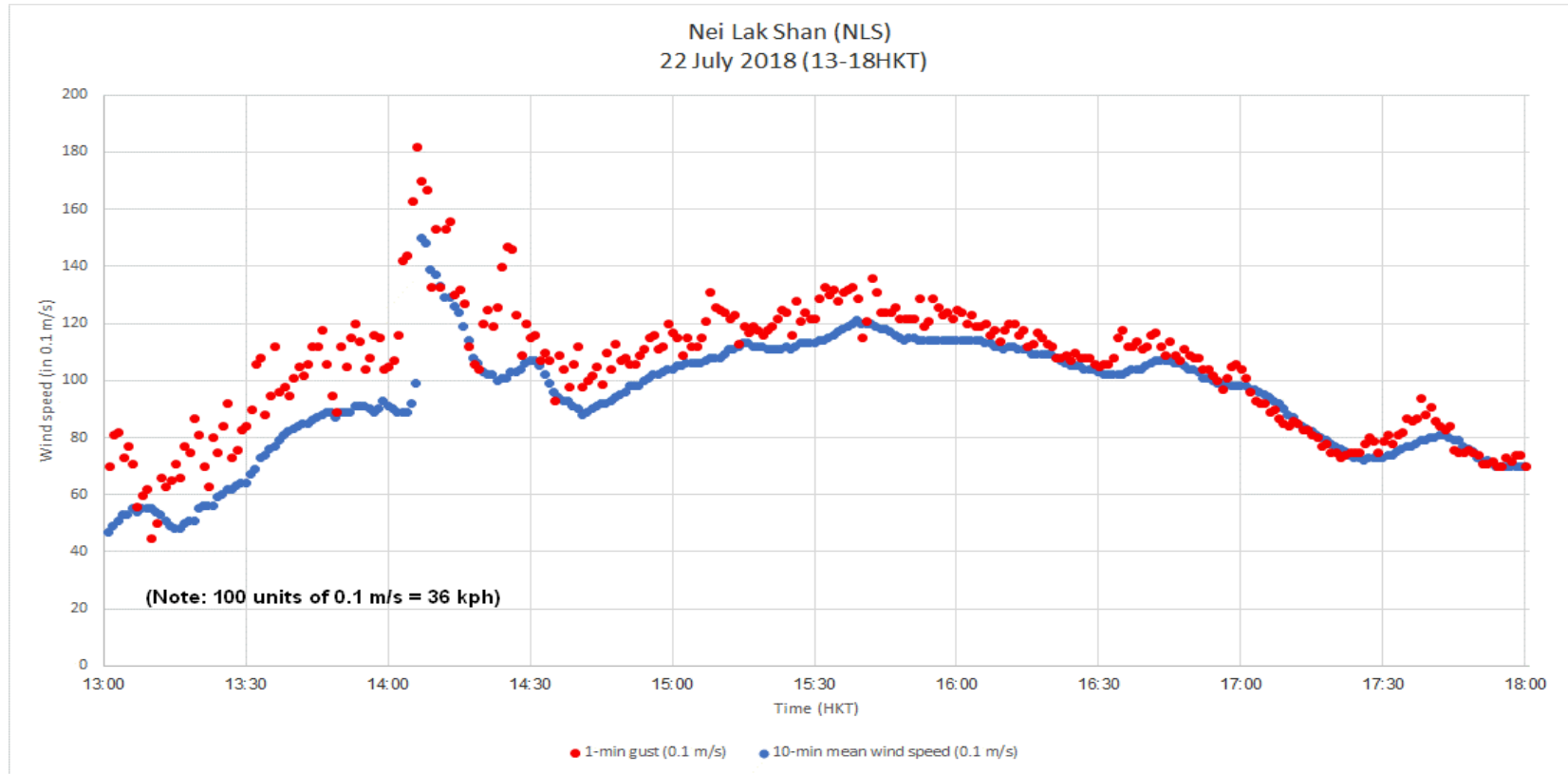


Figure 16: Maximum 1 Min Gust of 66 Kph Recorded at NLS at 1406 Hrs.

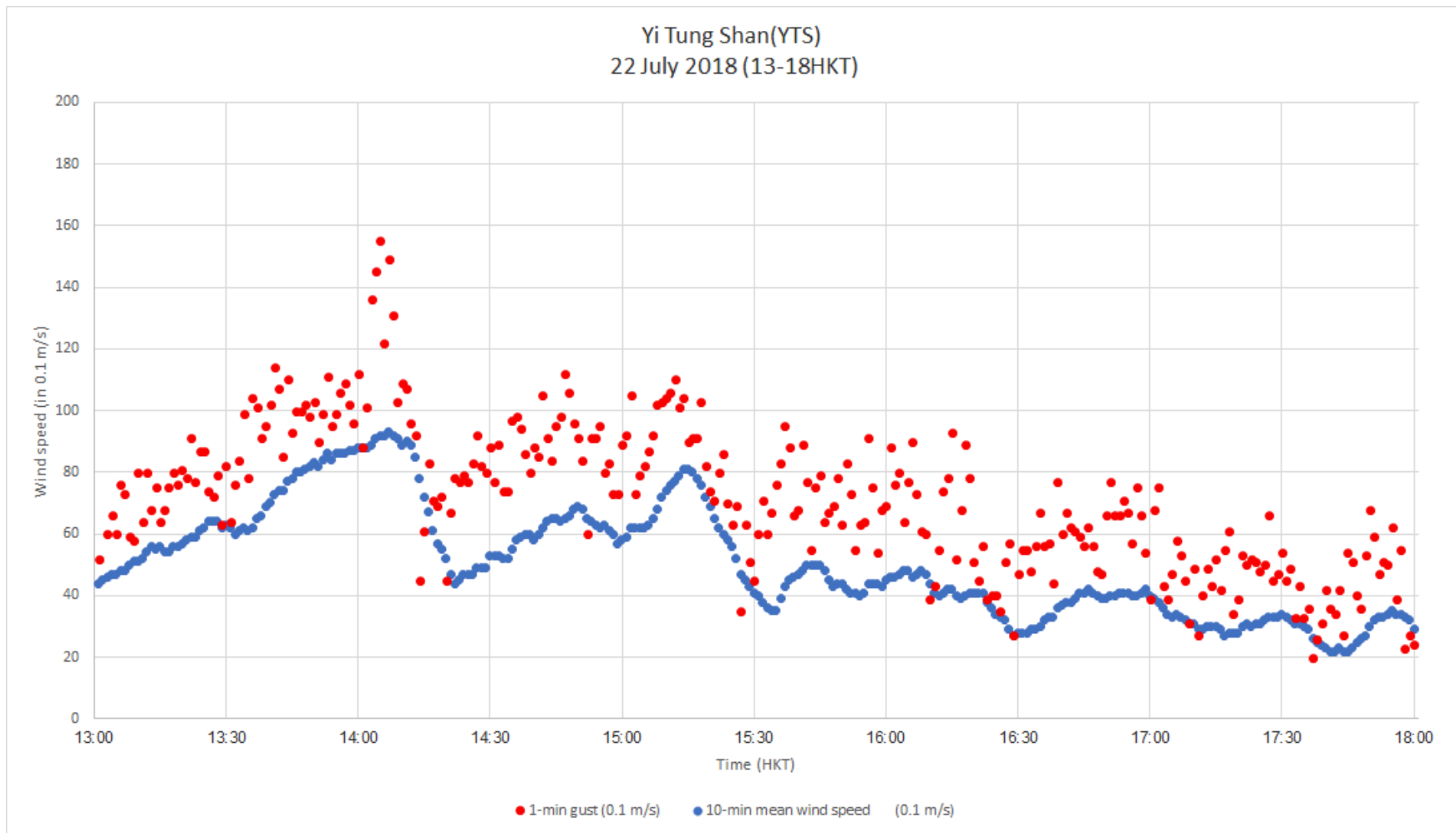


Figure 17: Maximum 1 Min Gust of 56 Kph Recorded at YTS at 1405 Hrs

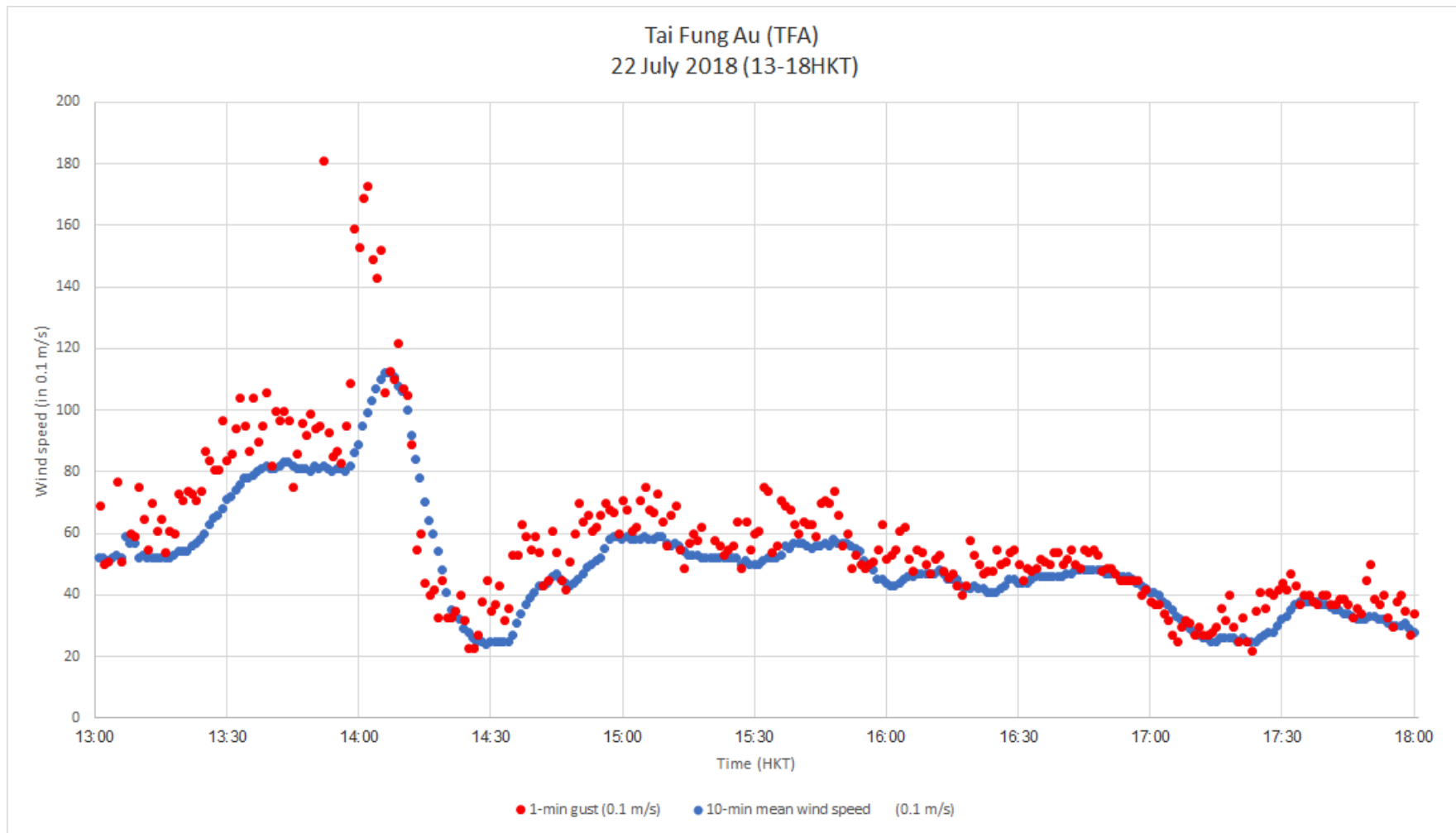


Figure 18: Maximum 1 Min Gust of 65 Kph Recorded at TFA at 1352 Hrs.

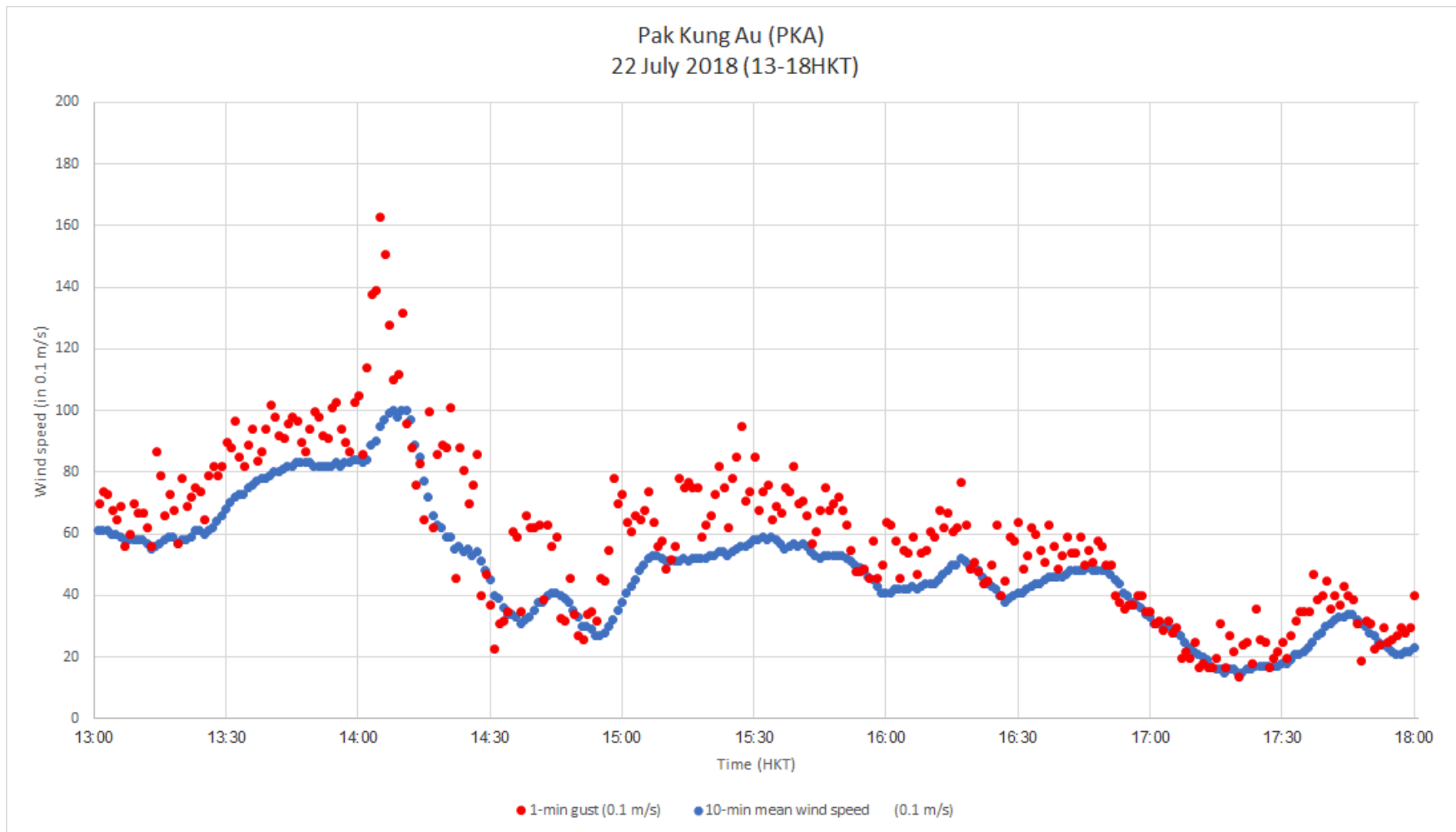


Figure 19: Maximum 1 Min Gust of 59 Kph Recorded at PKA at 1405 Hrs.

8.2. The Basic Data Format in an IGC File

B record – Description	Size	Element	Remarks
Time UTC	6 bytes	HHMMSS	Valid characters 0-9. The leap-second correction must be applied to all recorded fixes so that UTC always appears in the B-record. When a GNSS system initially locks on, in the short period before the current leap-second data is available from the ephemeris data of the GNSS system, the leap-second correction that was used when that recorder was last locked on should be used
Latitude	8 bytes	DDMMmmmN/S	Valid characters N, S, 0-9. Obtained directly from the same GNSS data package that was the source of the UTC time that is recorded in the same B-record line. If no latitude is obtained from satellite data, pressure altitude fixing must continue, using times from the RTC. In this case, in B record lines must repeat the last latitude that was obtained from satellite data, until GNSS fixing is regained.
Longitude	9 bytes	DDDMMmmmE/W	Valid characters E,W, 0-9. Obtained directly from the same GNSS data package that was the source of UTC time that is recorded in the same B-record line. If no longitude is obtained from satellite data, pressure altitude fixing must continue, using times from the RTC. In this case, in B record lines must repeat the last longitude that was obtained from satellite data, until GNSS fixing is regained.
Fix validity	1 byte.	A or V	Use A for a 3D fix and V for a 2D fix (no GNSS altitude) or for no GNSS data. Note that pressure altitude data must continue to be recorded using UTC times from the RTC.
Press Alt.	5 bytes	PPPPP	Altitude in metres relative to the ICAO ISA 1013.25 HPa datum, valid characters 0-9 and negative sign "-". Negative values to have negative sign instead of leading zero
GNSS Alt.	5 bytes	GGGGG	Altitude in metres above the WGS84 ellipsoid, valid characters 0-9

Figure 20: Description of IGC Data

8.3. Relevant Sections of Cap. 448C

AIR NAVIGATION (HONG KONG) ORDER 1995 (Cap./Instrument No.: 448C) (Version date: 2.7.2021)

48. Endangering safety of any person or property

(L.N. 77 of 2008)

A person shall not recklessly or negligently cause or permit an aircraft to endanger any person or property.

70. Balloons, kites, airships, gliders and parascending parachutes

(1) Within Hong Kong—

- (a) a captive balloon or kite shall not be flown at a height of more than 60 metres above the ground level or within 60 metres of any vessel, vehicle or structure;
- (b) a captive balloon shall not be flown within five kilometres of an aerodrome;
- (c) a balloon exceeding two metres in any linear dimension at any stage of its flight, including any basket or other equipment attached to the balloon, shall not be flown in controlled airspace;
- (d) a kite shall not be flown within five kilometres of an aerodrome;
- (e) an airship shall not be moored;
- (f) a glider or parascending parachute shall not be launched by winch and cable or by ground or sea tow to a height of more than 60 metres above ground or sea level; *(L.N. 77 of 2008)*
- (g) a parascending parachute shall not be launched within five kilometres of an airfield;

without the permission in writing of the Chief Executive and in accordance with any conditions subject to which that permission may be granted. *(36 of 1999 s. 3)*

- (2) A captive balloon when not in flight shall be securely moored, shall not be left unattended and shall be fitted with a device which ensures its automatic deflation if it breaks free of its moorings.
-

98. Interpretation

(1) In this Order, unless the context otherwise requires—

Aerial work means any purpose (other than public transport) for which an aircraft is flown if hire or reward is given or promised in respect of the flight or the purpose of the flight;

Aerial work aircraft means an aircraft (other than a public transport aircraft) flying, or intended by the operator to fly, for the purpose of aerial work;

Aerial work undertaking means an undertaking whose business includes the performance of aerial work;

Aerobatic manoeuvres includes loops, spins, rolls, bunts, stall turns, inverted flying and any other similar manoeuvre;

Aerodrome operating minima in relation to the operation of an aircraft at an aerodrome means the cloud ceiling and runway visual range for take-off, and the decision height or minimum descent height, runway visual range and visual reference for landing, which are the minima for the operation of that aircraft at that aerodrome;

Aerodrome traffic zone, in relation to an aerodrome, means the airspace—

(a) which is in the vicinity of the aerodrome that is notified for the purposes of Rule 35 of Schedule 14 to this Order; and

(b) which is of defined dimensions established around the aerodrome for the protection of aerodrome traffic; (*L.N. 77 of 2008*)

Aeronautical beacon means an aeronautical ground light which is visible either continuously or intermittently to designate a particular point on the surface of the earth;

Aeronautical ground light means any light specifically provided as an aid to air navigation, other than a light displayed on an aircraft;

Aeronautical radio station means a radio station on the surface, which transmits or receives signals for the purpose of assisting aircraft;

Aeroplane means a power-driven heavier-than-air aircraft, deriving its lift in flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight; (*L.N. 77 of 2008*)

Air traffic control unit means a person appointed by the Chief Executive or by any other person maintaining an aerodrome or place to give instructions or advice or both instructions and advice by means of radio signals to aircraft in the interests of safety but does not include a person so appointed solely to give information to aircraft, and **Air traffic control service** shall be construed accordingly; (*36 of 1999 s. 3*)

Air traffic service shall include an air traffic control service and flight information service;

Air traffic service surveillance system means automatic dependent surveillance—broadcast, primary surveillance radar, secondary surveillance radar or any comparable ground-based system that enables the identification of aircraft; (*L.N. 77 of 2008*)

Air transport undertaking means an undertaking whose business includes the carriage by air of passengers or cargo for hire or reward;

Aircraft means a machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface; (*L.N. 77 of 2008*)

Approach to landing means that portion of the flight of the aircraft, when approaching to land, in which it is descending below a height of 1 000 feet above the relevant specified decision height or minimum descent height;

Appropriate aeronautical radio station means in relation to an aircraft an aeronautical radio station serving the area in which the aircraft is for the time being;

Appropriate air traffic control unit means in relation to an aircraft the air traffic control unit serving the area in which the aircraft is for the time being or the air traffic control unit serving the area in which the aircraft intends to enter and with which unit the aircraft is required to communicate prior to entering that area, as the case may be;

Area navigation equipment means equipment carried on board an aircraft which enables the aircraft to navigate on any desired flight path within the coverage of appropriate ground based navigation aids or within the limits of the equipment or a combination of the two; (*L.N. 77 of 2008*)

Article 83 bis transfer, in relation to an aircraft, means a transfer under Article 83 bis of the Chicago Convention of all or part of the functions and duties under Articles 12, 30, 31 and 32 a) of the Convention in respect of the aircraft; (*L.N. 77 of 2008*)

Authorized person means any person authorized by the Chief Executive either generally or in relation to a particular case or class of cases, and references to a person authorized by the Chief Executive include references to the holder for the time being of any office designated by the Chief Executive; (*36 of 1999 s. 3*)

Beneficial interest has the same meaning as in section 53 of the Merchant Shipping (Registration) Ordinance (Cap. 415); (*36 of 1999 s. 3*)

Cabin crew, in relation to an aircraft, means those crew members assigned by the operator or pilot in command of the aircraft to perform, in the interests of the safety of passengers, duties on board the aircraft but does not include members of the flight crew; (*L.N. 77 of 2008*)

Captive balloon means a balloon which when in flight is attached by a restraining device to the surface; (*L.N. 77 of 2008*)

Cargo includes mail and animals;

Certificate of airworthiness includes any validation thereof and any flight manual, performance schedule or other document, whatever its title, incorporated by reference in that certificate relating to the certificate of airworthiness;

Certificate of maintenance review and **certificate of release to service** have the meanings respectively assigned to them by Articles 9(1) and 11(5) of this Order;

Chief Executive means—

- (a) the Chief Executive of the Hong Kong Special Administrative Region;

- (b) a person for the time being assuming the duties of the Chief Executive according to the provisions of Article 53 of the Basic Law; and
- (c) in relation to any purpose of this Order, other than the purposes of Article 97 thereof, any person authorized by the Chief Executive for that purpose; (36 of 1999 s. 3)

Class A Airspace, Class B Airspace, Class C Airspace, Class D Airspace, and Class E Airspace means airspace respectively notified as such;

Cloud ceiling in relation to an aerodrome means the vertical distance from the elevation of the aerodrome to the lowest part of any cloud visible from the aerodrome which is sufficient to obscure more than one-half of the sky so visible;

Competent authority means in relation to Hong Kong, the Chief Executive, and in relation to any other country the authority responsible under the law of that country for promoting the safety of civil aviation; (36 of 1999 s. 3)

Conditional sale agreement means an agreement for the sale of goods under which the purchase price or part of it is payable by instalments, and the property in the goods is to remain in the seller (notwithstanding that the buyer is to be in possession of the goods) until such conditions as to the payment of instalments or otherwise as may be specified in the agreement are fulfilled;

Congested area in relation to a city, town or settlement, means any area which is substantially used for residential, industrial, commercial or recreational purposes;

Contracting State means any State (including the People's Republic of China and Hong Kong, being a part thereof) which is a party to the Convention on International Civil Aviation which, on 7 December 1944, was opened for signature at the International Civil Aviation Conference held at Chicago; (36 of 1999 s. 3)

Controlled airspace means airspace which has been notified as Class A, Class B, Class C, Class D or Class E airspace;

Control area means airspace which has been notified as such and which extends upwards from a notified altitude or flight level;

Control zone means airspace which has been notified as such and which extends upwards from the surface;

Co-pilot in relation to an aircraft means a pilot who in performing his duties as such is subject to the direction of another pilot carried in the aircraft;

Country includes a territory or place; (36 of 1999 s. 3; 2 of 2012 s. 3)

Crew has the meaning assigned to it by paragraph (4) of this Article;

Danger Area shall mean airspace which has been notified as such within which activities dangerous to the flight or aircraft may take place or exist at such times as may be notified;

Decision altitude, in relation to the operation of an aircraft at an aerodrome, means the altitude in a precision approach at which a missed approach must be initiated if the required visual reference to continue that approach has not been established; (L.N. 77 of 2008)

Decision height in relation to the operation of an aircraft at an aerodrome means the height in a precision approach at which a missed approach must be initiated if the required visual reference to continue that approach has not been established; (*L.N. 77 of 2008*)

Designated required navigation performance airspace means airspace that has been notified, prescribed or otherwise designated by the competent authority for the airspace in respect of which an aircraft is required to meet the specified navigation performance capabilities when flying in or over the airspace; (*L.N. 77 of 2008*)

Flight and **to fly** have the meanings respectively assigned to them by paragraph (3) of this Article;

Flight crew in relation to an aircraft means those members of the crew of the aircraft who respectively undertake to act as pilot, flight navigator, flight engineer and flight radio operator of the aircraft;

Flight information service means a service that is provided for the purposes of giving advice and information useful for the safe and efficient conduct of flights; (*L.N. 77 of 2008*)

Flight level means one of a series of levels of equal atmospheric pressure, separated by notified intervals and each expressed as the number of hundreds of feet which would be indicated at that level on a pressure altimeter calibrated in accordance with the International Standard Atmosphere and set to 1013.2 hectopascals; (*L.N. 77 of 2008*)

Flight recording systems means a system comprising either a flight data recorder or a cockpit voice recorder or both;

Flight simulator means apparatus by means of which flight conditions in an aircraft are simulated on the ground;

Flight visibility means the visibility forward from the flight deck of an aircraft in flight;

Free balloon means a balloon which when in flight is not attached by any form of restraining device to the surface; (*L.N. 77 of 2008*)

Government aerodrome means any aerodrome in Hong Kong which is under the control of the Chief Executive or is in the occupation of any department of the Government of the Hong Kong Special Administrative Region, or of the Chinese People's Liberation Army; (*36 of 1999 s. 3; 2 of 2012 s. 3*)

Helicopter means a heavier-than-air aircraft supported in flight chiefly by the reactions of the air on one or more power-driven rotors on substantially vertical axes; (*L.N. 77 of 2008*)

Hong Kong includes—

- (a) all waters, whether navigable or not, included in Hong Kong; and
- (b) (*Repealed 36 of 1999 s. 3*)

hire-purchase agreement means an agreement for the bailment of goods under which the bailee may buy the goods, or under which the property in the goods will or may pass to the bailee;

Instrument Flight Rules means Instrument Flight Rules contained in the Rules of the Air;

Instrument Meteorological Conditions means weather precluding flight in compliance with the Visual Flight Rules;

Legal personal representative means the person constituted executor, administrator, or other representative, of a deceased person; (36 of 1999 s. 3)

Licence includes any certificate of competency or certificate of validity issued with the licence or required to be held in connection with the licence by the law of the country in which the licence is granted;

Licence for public use has the meaning assigned to it by Article 73(3) of this Order;

Licensed aerodrome means an aerodrome licensed under this Order;

Lifejacket includes any device designed to support a person individually in or on the water;

Log Book in the case of an aircraft log book, engine log book variable pitch propeller log book or personal flying log book, includes a record kept either in a book, or by any other means approved by the Chief Executive in the particular case; (36 of 1999 s. 3)

Maximum total weight authorized in relation to an aircraft means the maximum total weight of the aircraft and its contents at which the aircraft may take off anywhere in the world, in the most favourable circumstances in accordance with the certificate of airworthiness in force in respect of the aircraft;

Microlight aeroplane means an aeroplane designed to carry not more than 2 persons that has—

- (a) a maximum total weight authorized not exceeding—
 - (i) in the case of a single seat landplane, 300 kg;
 - (ii) in the case of a 2 seats landplane, 450 kg;
 - (iii) in the case of a single seat amphibian or floatplane, 330 kg; or
 - (iv) in the case of a 2 seats amphibian or floatplane, 495 kg; and
- (b) a stalling speed at the maximum total weight authorized not exceeding 35 knots calibrated airspeed; (L.N. 77 of 2008)

Military aircraft includes the naval, military or air force aircraft of any country and—

- (a) any aircraft being constructed for the naval, military or air forces of any country under a contract entered into by the Central People's Government; and
- (b) any aircraft in respect of which there is in force a certificate issued by the Central People's Government that the aircraft is to be treated for the purposes of this Order as a military aircraft; (2 of 2012 s. 3)

Minimum descent altitude, in relation to the operation of an aircraft at an aerodrome, means the altitude in a non-precision approach below which descent must not be made without the required visual reference; (L.N. 77 of 2008)

Minimum descent height in relation to the operation of an aircraft at an aerodrome means the height in a non-precision approach below which descent must not be made without the required visual reference; (L.N. 77 of 2008)

Nautical mile means the International Nautical Mile, that is to say, a distance of 1 852 metres;

Night means the time between half an hour after sunset and half an hour before sunrise, sunset and sunrise being determined at surface level;

Non-precision approach means an instrument approach using non-visual aids for guidance in azimuth or elevation but which is not a precision approach;

Notified means shown in any of the following publications for the time being in force and issued in Hong Kong whether before or after the coming into operation of this Order, that is to say “Notams (Notices to Airmen)”, “Aeronautical Information Publications (AIP)”, or such other official publications so issued for the purpose of enabling any of the provisions of this Order to be complied with;

Operator has the meaning assigned to it by paragraph (5) of this Article;

Parascending parachute means a parachute which is towed by cable in such a manner as to cause it to ascend;

Passenger means a person other than a member of the crew;

Pilot in command, in relation to an aircraft, means the pilot designated by the operator or the owner, as appropriate, as being in charge of the aircraft without being under the direction of any other pilot in the aircraft and charged with the safe conduct of a flight; (*L.N. 77 of 2008*)

Precision approach means an instrument approach using Instrument Landing System, Microwave Landing System or Precision Approach Radar for guidance in both azimuth and elevation;

Prescribed means prescribed by regulations made by the Chief Executive under this Order, and the expression **prescribe** shall be construed accordingly; (*36 of 1999 s. 3*)

Pressurised aircraft means an aircraft provided with means of maintaining in any compartment a pressure greater than that of the surrounding atmosphere;

Private flight means a flight which is not used for the purpose of aerial work or public transport; (*L.N. 77 of 2008*)

Psychoactive substances means alcohol, opioids, cannabinoids, sedatives, hypnotics, cocaine or other psychostimulants, hallucinogens or volatile solvents, but does not include coffee and tobacco; (*L.N. 77 of 2008*)

Public transport has the meaning assigned to it by paragraph (6) of this Article;

Public transport aircraft means an aircraft flying, or intended by the operator of the aircraft to fly, for the purpose of public transport;

Record includes, in addition to a record in writing—

- (a) any disc, tape, sound-track or other device in which sounds or signals are embodied so as to be capable (with or without the aid of some other instrument) of being reproduced therefrom;

- (b) any film, tape or other device in which visual images are embodied so as to be capable (as aforesaid) of being reproduced therefrom; and
- (c) any photograph;

and any reference to a copy of a record includes, in the case of a record falling within paragraph (a) only of this definition, a transcript of the sounds or signals embodied therein, in the case of a record falling within paragraph (b) only of this definition, a still reproduction of the images embodied therein, and in the case of a record falling within both those paragraphs; such a transcript together with such a still reproduction;

Replacement in relation to any part of an aircraft or its equipment includes the removal and replacement of that part whether or not by the same part, and whether or not any work is done on it, but does not include the removal and replacement of a part which is designed to be removable solely for the purpose of enabling another part to be inspected, repaired, removed or replaced or cargo to be loaded;

Rules of the Air means the Rules contained in Schedule 14 to this Order and any supplementary rules made by the Chief Executive under Article 64(1) of this Order; (36 of 1999 s. 3)

Runway visual range in relation to a runway means the distance in the direction of take-off or landing over which the runway lights or surface marking may be seen from the touchdown zone as calculated by either human observation or instruments in the vicinity of the touchdown zone or where this is not reasonably practicable in the vicinity of the midpoint of the runway; and the distance, if any, communicated to the pilot in command of an aircraft by or on behalf of the person in charge of the aerodrome as being the runway visual range shall be taken to be the runway visual range for the time being; (L.N. 77 of 2008)

Scheduled journey means one of a series of journeys which are undertaken between the same two places and which together amount to a systematic service;

Seaplane includes a flying boat and any other aircraft designed to manoeuvre on water;

Special VFR flight has the meaning assigned to it by Rule 23 of the Rules of the Air; (L.N. 77 of 2008)

Specified minimum weather provisions has the meaning assigned to it by paragraph (7) of this Article;

State of the operator means the state in which the operator of an aircraft has—

- (a) his principal place of business; or
- (b) if he has no such place of business, his permanent residence; (L.N. 77 of 2008)

To land in relation to aircraft includes alighting on the water;

Visual Flight Rules means Visual Flight Rules contained in the Rules of the Air;

Visual Meteorological Conditions means weather permitting flight in accordance with the Visual Flight Rules.

(66 of 1997 s. 15; 28 of 1998 s. 2; 36 of 1999 s. 3; L.N. 77 of 2008)

(2) *(Repealed 2 of 2012 s. 3)*

(3) An aircraft shall be deemed to be in flight—

- (a) in the case of a piloted flying machine from the moment when, after the embarkation of its crew for the purpose of taking off, it first moves under its own power, until the moment when it next comes to rest after landing;
- (b) in the case of a pilotless flying machine, or a glider, from the moment when it first moves for the purpose of taking off until the moment when it next comes to rest after landing;
- (c) in the case of an airship, from the moment when it first becomes detached from the surface until the moment when it next becomes attached to the surface or comes to rest on the surface; *(L.N. 77 of 2008)*
- (d) in the case of a free balloon, from the moment when the balloon, including the canopy and basket, becomes separated from the surface until the moment when it next comes to rest on the surface; or *(L.N. 77 of 2008)*
- (e) in the case of a captive balloon, from the moment when the balloon, including the canopy and basket but excluding the restraining device that attaches the balloon to the surface, becomes separated from the surface until the moment when it next comes to rest on the surface; *(L.N. 77 of 2008)*

and the expressions **a flight** and **to fly** shall be construed accordingly.

(4) Every person assigned by the operator of an aircraft to be involved in the operation of the aircraft during any portion of a flight shall be deemed to be a member of the crew thereof. *(L.N. 77 of 2008)*

(5) References in this Order to the operator of an aircraft are, for the purpose of the application of any provision of this Order in relation to any particular aircraft, references to the person who at the relevant time has the management of that aircraft, and cognate expressions shall be construed accordingly:

Provided that for the purposes of the application of any provision in Part III of this Order, when by virtue of any charter or other agreement for the hire or loan of an aircraft a person other than an air transport undertaking or an aerial work undertaking has the management of that aircraft for a period not exceeding 14 days, the foregoing provisions of this paragraph shall have effect as if that agreement had not been entered into.

(6) (a) Subject to the provisions of this paragraph, an aircraft in flight shall for the purposes of this Order be deemed to fly for the purpose of public transport—

- (i) if hire or reward is given or promised for the carriage of passengers or cargo in the aircraft on that flight; or
- (ii) if any passengers or cargo are carried gratuitously in the aircraft on that flight by an air transport undertaking, not being persons in the employment of the undertaking (including, in the case of a body corporate, its directors), persons with the authority of the Chief Executive either making any inspection or witnessing any training, practice or test for the purposes

of this Order, or cargo intended to be used by any such passengers as aforesaid, or by the undertaking; or (36 of 1999 s. 3)

- (iii) for the purposes of Part III of this Order, if hire or reward is given or promised for the right to fly the aircraft on that flight (not being a single seater aircraft of which the maximum total weight authorized does not exceed 910 kilograms and in respect of which a certificate of airworthiness of the Special Category is in force) otherwise than under a hire-purchase agreement or conditional sale agreement, (L.N. 77 of 2008)

and the expression **public transport of Passengers** shall be construed accordingly:

Provided that, notwithstanding that an aircraft may be flying for the purpose of public transport by reason of sub-paragraph (a)(iii) of this paragraph, it shall not be deemed to be flying for the purpose of the public transport of passengers unless hire or reward is given for the carriage of those passengers.

Provided that, notwithstanding that an aircraft may be flying for the purpose of public transport for the purposes of Part III of this Order by virtue of sub-paragraph (a)(iii) of this paragraph if the hire or reward given or promised for the primary purpose of conferring on a particular person the right to fly the glider on that flight is given or promised by a member of a flying club and the glider is owned or operated by that flying club.

- (b) Where under a transaction effected by or on behalf of a member of an association of persons on the one hand and the association of persons or any member thereof on the other hand, a person is carried in, or is given the right to fly, an aircraft in such circumstances that hire or reward would be given or promised if the transaction were effected otherwise than aforesaid, hire or reward shall, for the purposes of this Order, be deemed to have been given or promised, notwithstanding any rule of law as to such transactions.

(7) The specified minimum weather provisions shall be as follows—

(a) Outside airspace notified for the purposes of Schedule 8 to this Order:

- (i) an aircraft flying above 3 000 feet above mean sea level shall remain at least 1 800 metres horizontally and 1 000 feet vertically away from cloud and in a flight visibility of at least 10 km:
- (ii) an aircraft other than a helicopter flying at or below 3 000 feet above mean sea level shall remain at least 1 800 metres horizontally and 1 000 feet vertically away from cloud and in a flight visibility of at least 5 km:

Provided that this sub-paragraph shall be deemed to be complied with if the aircraft is flown at a speed which according to its airspeed indicator is 140 knots or less and remains clear of cloud, in sight of the surface and in a flight visibility of at least 1 800 metres;

- (iii) a helicopter flying at or below 3 000 feet above mean sea level shall remain clear of cloud and in sight of the surface or at least 1 800 metres horizontally and 1 000 feet vertically away from cloud and in a flight visibility of at least 5 km;

- (b) within airspace notified for the purposes of Schedule 8 to this Order an aircraft shall remain at least 1 800 metres horizontally and 1 000 feet vertically away from cloud and in a flight visibility of at least 10 km:
Provided that in a control zone within such airspace, in the case of a special VFR flight the aircraft shall be flown in accordance with any instructions given by the appropriate air traffic control unit.
- (8) The expressions appearing in the “General Classification of Aircraft” set forth in Part A of Schedule 1 to this Order shall have the meanings thereby assigned to them.
- (9) *(Repealed 36 of 1999 s. 3)*
- (10) A power to make regulations under this Order shall include the power to make different provisions with respect to different circumstances and with respect to different parts of Hong Kong and to make such incidental and supplementary provisions as are necessary or expedient for carrying out the purposes of the Order.
- (11) (a) Any power conferred by this Order to issue, make, serve or grant any instrument shall be construed as including a power exercisable, in the like manner and subject to the like conditions, if any, to vary, revoke, cancel or otherwise terminate the instrument.
(b) In this paragraph **instrument** includes any regulations, direction, instruction, rule or other requirement, any notice and any certificate, licence, approval, permission, exemption, authorization, log book record or other document.
- (12) The Chief Executive may delegate any person or body or the person holding any office designated by him to exercise or perform on his behalf any of his powers or duties under this Order other than the power to make regulations under Article 97 and thereupon, or from the date specified by the Chief Executive, the person so delegated shall have and may exercise such powers and shall perform such duties, other than the power to make regulations under Article 97. *(36 of 1999 s. 3)*

100. Small aircraft

The provisions of this Order, other than Articles 48, 70, 98(1) and 98(8), shall not apply to or in relation to—

- (a) any balloon which at any stage of its flight is not more than 2 metres in any linear dimension including any basket or other equipment attached to the balloon;
- (b) any kite weighing not more than 2 kg;
- (c) any other aircraft weighing not more than 7 kg without its fuel;
- (d) any parachute including a parascending parachute.

8.4 Terms and Definitions used in Paragliding

Term	Definition	Source Document
Airspeed	The speed of the aircraft through the air	The Complete Guide to Paragliding, 6 th Edition by Ian Curren
Controls	Primary steering and speed controls which are designated as such by the manufacturer.	European Standards EN 926-2 Paraglider Equipment
Ground speed	The speed of the aircraft relative to or over the ground	The Complete Guide to Paragliding, 6 th Edition by Ian Curren
Harness	Assembly composed of straps and fabric for supporting the pilot in the seated or semi-recumbent or standing position	European Standards EN 926-2 Paraglider Equipment
Heading	The direction in which the aircraft or the pilot is pointed in degrees, true or magnetic	Federation Aeronatique Inewternationale (FAI) - Technical Specification for GNSS Flight Recorder, 2nd Edition
Paraglider	Ultralight glider with no primary rigid structure, for which take-off and landing are on foot, with the pilot carried in a harness (or harnesses) connected to the wing	European Standards EN 926-2 Paraglider Equipment
Maximum speed	Airspeed of the paraglider in straight flight with the controls in the zero position and the accelerator fully activated	European Standards EN 926-2 Paraglider Equipment
Minimum speed	Slowest airspeed maintainable without entering a deep stall or full stall	European Standards EN 926-2 Paraglider Equipment

Spiral dive	<p>Flight condition in which the paraglider is fully inflated and is following a circling, steep, nose down trajectory with pitch angle of more than 70 degrees and the angle of the span relative to the horizontal between 0 and 40 degrees.</p> <p>Note: Spiral dive is one of the descending techniques of paragliding.</p>	European Standards EN 926-2 Paraglider Equipment
Track	The true track (flight path) over the ground that the aircraft has achieved	Federation Aeronatique Internationale (FAI) - Technical Specification for GNSS Flight Recorder, 2 nd Edition
Trim speed	Airspeed of the paraglider in straight flight without activating the controls or the accelerator	European Standards EN 926-2 Paraglider Equipment
Weight in flight	Total weight of the pilot and his entire paragliding equipment ready to fly	European Standards EN 926-2 Paraglider Equipment
Wind speed	The speed of the wind over the ground	The Complete Guide to Paragliding, 6th Edition by Ian Curren