

الهيئة العامة للطيران المدني
GENERAL CIVIL AVIATION AUTHORITY



Air Accident Investigation Sector

Accident

- Summary Report -

AAIS Case N° AIFN/0006/2021

Parachutes Mid-Air Collision

Operator:	Skydive Dubai
Make and Model:	Skylark/Magellan 150"
Make and Model:	NZ Aerosports/JPX Leia 74"
Place of Occurrence:	Margham, Dubai
State of Occurrence:	The United Arab Emirates
Date of Occurrence:	30 March 2021



This Investigation was conducted by the Air Accident Investigation Sector of the United Arab Emirates pursuant to Civil Aviation Law No. 20 of 1991, in compliance with Air Accident and Incident Investigation Regulation, and in conformance with the provisions of Annex 13 to the Convention on International Civil Aviation.

This Investigation was conducted independently and without prejudice. The sole objective of the investigation is to prevent future aircraft accidents and incidents. It is not the purpose of this activity to apportion blame or liability.

The Air Accident Investigation Sector issued this Summary Report in accordance with national and international standards and best practices. Consultation with applicable stakeholders, and consideration of their comments, took place prior to the publication of this Report.

The Summary Report is publicly available at:

<http://www.gcaa.gov.ae/en/epublication/pages/investigationReport.aspx>

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Investigation Process

The occurrence involved two skydivers who were in freefall with parachutes and collided in mid-air. The occurrence was reported to the Air Accident Investigation Sector (AAIS) Duty Investigator by a phone call to the Hotline Number +971 50 641 4667.

After the initial on-site investigation, the occurrence was classified as 'Accident' due to one of the parachutist sustained fatal injuries.

The scope of this Investigation is limited to the events leading up to the occurrence; no in-depth analysis of non-contributing factors was undertaken.

Notes:

1. Whenever the following words are mentioned in this Report with a first letter **Capitalized**, they shall mean the following:
 - (Accident) – this investigated accident
 - (Club) – Skydive Dubai LLC
 - (Investigation) – the investigation into this accident
 - (Parachute) – the parachute of the fatally injured skydiver
 - (Reserve Parachute) – the reserve parachute of the fatally injured skydiver
 - (Skydiver) – the skydiver who was fatally injured
 - (Report) – this Summary Report.
2. Unless otherwise mentioned, all times in the Report are the United Arab Emirates local time (LT = UTC plus 4 hours).
3. The structure of this Summary Report is an adaptation of the ICAO Annex 13 Final Report format.

Factual Information

History of the Flight

On 30 March 2021, at 1030 local time (LT) of the United Arab Emirates, a DHC-6-300 fixed-wing light-sport Aircraft, registration mark A6-SD5, owned and operated by Skydive Dubai LLC (Club), took off from Skydive Desert Drop Zone (DDZ), for a commercial skydiving operation flight at Margham, Dubai. There were 20 skydivers and a pilot on-board. It was the fifth freefall activity out of six planned freefall jumps.

After ten minutes from the takeoff, while cruising at about 13,000 feet above ground level (AGL),

skydivers started to prepare the in pairs, for freefall from the aircraft.

The 20 skydivers (5 groups) initiated freefall in pairs, as planned, at 1040 LT.

The fourth group of skydivers' planned to conduct a 2-way free-fly jump, whereas the fifth group which was also last group in the aircraft, planned to perform a 4-way tracking jump. All skydivers in these groups made normal break off and deployment of the main parachute.

All the 20 skydivers deployed their main parachutes at approximately 4,000 feet AGL without any difficulties or abnormalities.

The fatally injured Skydiver was performing fifth jump for that day, he deployed his Parachute at approximately 4,000 feet AGL. During his descent, he performed spirals turns at 1,100 feet AGL, in the approach area east of the landing zone. He made two spiral turns of 360 degrees each that descended him to about 600 feet AGL.

At the same time, another skydiver performing third jump for day and he was above the fatally injured Skydiver, while he was heading south initiated a right swooping spiral turn, at about 900 AGL, to targeting a high-speed landing. The other skydiver, before he completes a 360 turn, impacted the fatally injured Skydiver Parachute from the top at about 600 feet AGL. The lines of the fatally injured Skydiver and the other skydiver parachutes were entangled.

The fatally injured Skydiver was cleared from entanglement with the other parachute, but his Parachute lines were twisted. He cut away his main Parachute at about 450 feet AGL (figure 1). He attempted to recover stability and pulled the Reserve Parachute handle, but there was no enough height to inflate the Reserve Parachute. The fatally injured Skydiver dived in a free fall until he impacted the ground causing fatal injuries.



Figure 1. The fatally injured Skydiver Parachute entangled with another skydiver parachute



The main parachute of the other skydiver was entangled with line twist. He pulled the cutaway handle to release the main parachute and his reserve parachute deployed successfully. He landed safely near the landing zone without any injuries.

Personnel Information

The fatally injured Skydiver

The fatally injured Skydiver was 45 years old. His weight was 86 kilograms.

He held a Skydiving 'A' license issued on 12 April 2018 by the Federation of Parachute Sport (FAI), Russia, and a Skydiving 'C' license issued on 16 August 2019. He has registered 400 jumps in his personal skydiving logbook.

The other skydiver

The other skydiver was 34 years old. His weight was 74 kilograms.

He held a Skydiving 'A' license issued on 27 November 2018 by the USPA, in United States of America. He also held Skydiving 'B' license issued on 4 April 2019, Skydiving 'C' license issued on 5 June 2019, and Skydiving 'D' license issued on 3 March 2020.

The other skydiver was also qualified on 30 November 2021 as Accelerated Freefall Instructor (AFF-I), Coach and Tandem-I Rating. He has 1700 plus jumps registered at the USPA organization.

Injuries to Persons

The fatally injured Skydiver was a Belarus national. The other skydiver did not sustain any injury.

Parachute Information

Parachute equipment – The fatally injured Skydiver

Table 1 illustrates the Parachute equipment details:

Container	Rig Checked	Validity
	15 March 2021	11 September 2021
Manufacture	Parazone	
Model	Status Pro	
Reserve Canopy		
Manufacture	Aerodyne	
Model	Smart 150 inch	
Main Canopy		
Manufacture	Skylark	
Model	Megallan 150 inch	
Automatic Activation Device (AAD¹)		
Manufacture	Mars	
Model	m2 Expert	
Reserve Static Line (RSL²)		No

Parachute equipment – The other skydiver

Table 2 illustrates the parachute equipment details:

Container	Rig Check	Validity
	31 October 2020	30 April 2021
Manufacture	United Parachute Technologies	
Model	Vector 3 V304	
Reserve Canopy		
Manufacture	Aerodyne	
Model	Smart LPV 110	
Main Canopy		
Manufacture	NZ Aerosports	
Model	JPX Leia 74 inch	
Automatic Activation Device (AAD)		
Manufacture	Airtec	
Model	Cypres 2C Mode	
Reserve Static Line (RSL)		Yes

Video cameras

Video recordings are essential investigation evidence in such aerial light sports activities that reveal factual information.

According to the Club's policy, parachutists are not required to install video cameras as part of the essential equipment list. The video camera recording is optional for freefall jumps.

The fatally injured Skydiver was not equipped with a video camera whereas the other skydiver

¹ Automatic Activation Device (AAD): The acronym AAD stands for automatic activation device. In essence, the parachute automatic activation device is a precise microprocessor computer located within the skydiving container. This safety system is responsible for deploying a Skydivers reserve parachute in the event that a jumper is unable to do so. Source: <https://skydivemonroe.com/blog/what-is-a-parachute-aad/>

² Reserve Static Line (RSL): The reserve static line has been designed to deploy the reserve as soon as the cutaway

procedure has been performed. This allows for the reserve to deploy as soon as possible after a cutaway. This is particularly important during an unplanned low cutaway and the design has saved many lives. equipment. Source: [http://www.sky-science.com/Main-Packing-Courses-Reserve-Static-Line-\(RSL\).htm](http://www.sky-science.com/Main-Packing-Courses-Reserve-Static-Line-(RSL).htm)



was equipped with a Go-pro video camera installed on his helmet. This camera recorded 3 minutes 37 seconds of the freefall jump.

Video recordings from other skydivers who participated in the freefall jump were collected by the Investigation for analysis.

Skydiving license requirements³

Table 3 below illustrates the licensing requirements for skydiver:

Table 3. Skydiving licensing requirements		
Skydiving license level	Minimum number of jumps	Minimum freefall time
Skydiving 'A' license	25	not applicable
Skydiving 'B' license	50	30 minutes
Skydiving 'C' license	200	60 minutes
Skydiving D License	500	3 hours

As per the Club's standard operating procedure (SOP), the minimum container opening is allowed at 3,000 feet AGL for students and 'A' and 'B' license holders; 2,500 feet AGL for 'C' and 'D' license holders; and 5,000 feet AGL for Tandem jumps.

Skydiver altimeter

CAR-PAO.TEC.145 – Equipment Regulation, of the *Civil Aviation Regulations* of the United Arab Emirates, states that "All parachutists on free-fall descents of more than 15 seconds shall be equipped with a suitable altimeter, securely mounted so that the parachutist can observe it without difficulty throughout the descent and set to indicate height above the PLA [parachute landing area]."

The skydiving altimeter is an essential device worn on the hand or wrist. It shows the altitude on an analogue altimeter by clock illustration.

The digital altimeter shows a digital number display as opposed to the round clock face. The yellow colour on the dial indicates to the skydiver the decision height of preparation for landing. The red colour indicates decision height for landing. The numbers on the dial show a 1:1,000 scale, so any number indicated by the pointer shall be multiplied by 1,000 to indicate the altitude (figure 2). Parachuting is limited to 13,000 feet altitude.



Figure 2: Skydiver Altimeter

Emergency procedures

As per the emergency procedures, during parachute malfunction or collision, skydivers are required to pull the cutaway handle of the main parachute and pull the reserve ripcord handle to deploy the reserve parachute.

In case the malfunction occurs below 1,500 feet, the skydiver shall pull the reserve ripcord handle without pulling the cutaway handle of the main parachute.

Skydiving gear has two handles for emergencies. One handle to cut away the main parachute and a second handle to deploy the reserve parachute. In sequence, the main cutaway handle is pulled first then the reserve parachute handle (figure 3). The manual described the sequence as follows:

³ There are four types of skydiving licenses. These are categorized as A, B, C and D licenses. The A license is the first license obtained by a new skydiver and each license is progressively more challenging to achieve, requiring the skydiver to prove certain skills and reach certain experience levels. The D license is the highest level of skydiving license and skydivers need a minimum of 500 and to have completed all requirements of the previous licenses as well as two night jumps.

Source: <https://skydiveparacletexp.com/2017/02/15/skydiving-license-levels/#:~:text=Skydiving%20%E2%80%9CB%E2%80%9D%20License&text=B%20license%20skydivers%20have%20proven,incluing%20lanned%20jumps%20with%20groups.>

“1. Cutaway

- Look right at your cutaway handle & locate (grab) it with both hands
- Peel the Velcro of the cutaway handle
- Pull the cutaway handle to full arm extension downwards

2. Reserve

- Look left at your reserve handle & locate (grab) it with both hands
- Peel the reserve ripcord handle
- Pull the reserve handle to full arm extension downwards.”



Figure 3. Cutaway and reserve handle

Automatic Activation Device (AAD)

As per *CAR-PAO.TEC.145*, paragraph (g) states

“(g) All parachutists shall use parachuting equipment that is fitted with an operational Automatic Activation Device (AAD) at least until they have completed the training phase and have been issued a license;”

Paragraph (h) states

h) All AADs shall be installed in accordance with acceptable procedures and serviced in accordance with the manufacturer’s requirements. They may be used in conjunction with either the main or reserve parachute, but shall only back up the manual operation.

Paragraph (h) states

“i) All Tandem parachute equipment shall be fitted with an AAD specifically designed for Tandem equipment.”

The AAD consists of three functional parts

- Processor unit
- Control unit
- Cutter (release) unit



Figure 4. Automatic Activation Device (AAD)

Processor unit

The processor unit contains a factory-programmed microprocessor that is capable to process real-time calculations of the jumper’s altitude and rate of descent based on barometric pressure. By monitoring this data, certain logic is analyzed from which the release unit will be triggered to initiate the reserve parachute container release sequence.

Control unit

The body of the control unit is made of stainless steel and is connected to the processor unit by a flexible cable. The control unit has a display for various icons, the control button and the label specifying the device version that is STUDENT, EXPERT, TANDEM and SPEED.

The fatally injured Skydiver was equipped with m2 EXPERT version which indicates that the reserve parachute activation triggers if the altitude above the landing area is below 270 m (885 feet) and above 100 meters (330 feet) and also the falling speed is over 35 meters per second (78 mph).

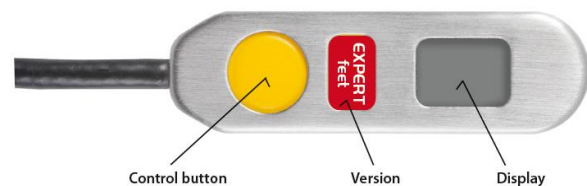


Figure 5. AAD Control unit

Cutter unit

The cutter unit (release) for the reserve parachute container is completely independent of the rig’s primary system because it does not pull the ripcord pin out of the closing loop but rather cuts

the loop inside the reserve container to initiate the opening sequence. The reserve closing loop has to pass through the cutters passing hole. (Figure 6)

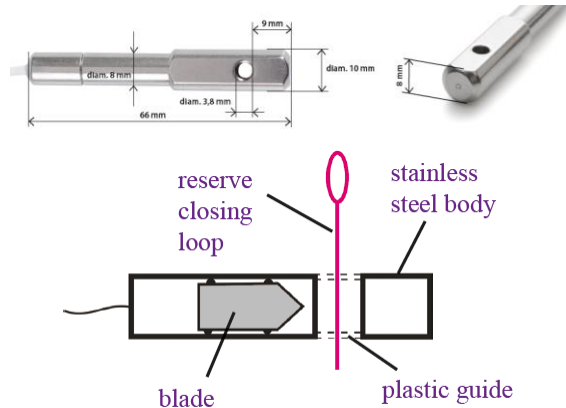


Figure 6. Cutter (release) unit functional diagram

AAD operation principle

The AAD is an electronic automatic activation device, operating on the principle of pressure reading. The primary means for detecting the altitude and fall rate is a pressure sensor. The altitude is calculated based on the difference between two atmospheric pressures: the pressure at current altitude; and pressure on landing location "GROUND ZERO". The pressure on the landing location is measured and set after switching on the device during calibration.

This pressure is automatically adjusted by a change in barometric pressure during the day without the need for user intervention. The AAD checks the ambient barometric pressure every 32 seconds and it determines whether the aircraft has taken off. If yes, it begins to monitor the skydiver's altitude and fall rate.

The pressure sensor measures the atmospheric pressure eight times per second in free fall. The information collected is evaluated by the means of a microprocessor and software and is then converted to real fall rate and altitude.

The AAD is capable of meeting the preset criteria of fall rate in combination with altitude above the landing location, it then cuts the reserve parachute closing loop by the means of the cutter and thus initiates the deployment sequence.

Meteorological Information

The Investigation reviewed the weather information provided by the National Center of Meteorology (NCM). The data were collected at Margham weather station which was the nearest

weather station to the Club. The reports generated from this station are non-aviation standard.

Table 4 illustrates the weather data:

Table 4. NCM weather report	
Time	1030 LT
Wind	230 degrees / 11 knots
Visibility	10 Kilometers or more
Clouds	CAVOK
Air temperature	26.5 degrees Celsius
Relative humidity	53%
Pressure (Altimeter)	1012 Hectopascal
Time	1045 LT
Wind	267 degrees / 20 knots
Visibility	10 Kilometers or more
Clouds	CAVOK
Air temperature	27.3 degrees Celsius
Relative humidity	51%
Pressure (Altimeter)	1012 Hectopascal

Margham weather station is approximately 350 meters southeast of the DDZ. The weather station over there records weather data in intervals of every 15 minutes.

The data recorded at 1045 LT showed a wind speed of 20 knots from 267 degrees, a temperature of 27.3 degrees Celsius, and air pressure of 1012 Hectopascal. The wind speed was within the ground-wind speed limitation for parachuting freefall jumps activity for licensed skydivers (25 knots).

There was no weather station installed at the DDZ. An anemometer was fixed and a weather (temperature, wind speed and wind direction) information displayed on a screen) visible to the parachutists for obtaining wind speed and direction.

According to the Club's policy, the weather forecasts are announced by the manifest, if any weather observation with a significant change in wind speed and direction is announced if required with immediate suspension of parachuting activity for 30 minutes in case the wind speed exceeds the limits.

Skydive Desert Drop Zone (DDZ)

The Skydive DDZ is geographically located at 24°53'14.65"N latitude and 55°32'53.03"E longitude with an elevation of 515 feet above sea

level (ASL). It was equipped with a runway of 1,600 meters (1 mile) in length for skydivers' flight operation. There is a designated area for the boarding of skydivers. (Figure 7)

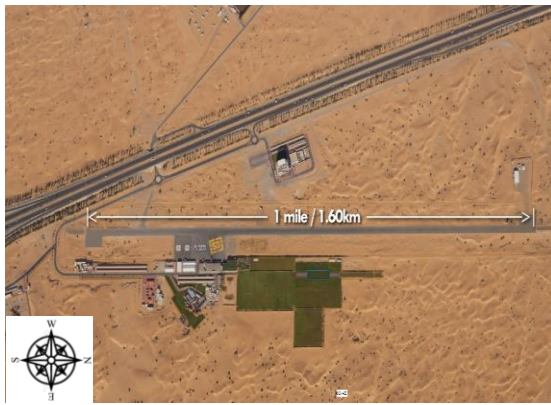


Figure 7. Skydive runway for Skydiver flight operations

The Parachute Landing Area (PLA) was divided into four different areas: Student Landing Area; Main Landing Area; High-Speed Landing Area; and Swoop Pond.

There will be a red arrow mark indicating the parachutist which way to land (figure 8). As per the SOP, the red arrow always indicates landing into the winds opposite to the wind direction.



Figure 8. Skydive Desert Drop Zone landing area

The landing pattern can be performed from either the right side of the desert or the left side depending on the wind direction. (Figure 9)

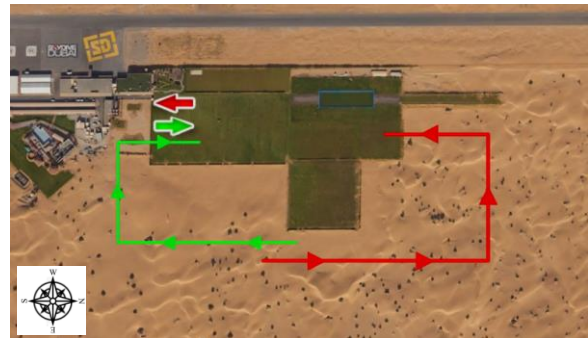


Figure 9. Skydive parachute landing pattern

There were restrictions for the skydivers to fly above the runway or designated landing areas under 1,000 feet

The Club applied 'canopy rules' which dictated that if two or more parachutes are in the vicinity flying at different altitudes, the lower canopy flying below have 'the right of way' (priority to manoeuvre as per the SOP). If they are at the same altitude and approaching head-on, each of them shall turn right. According to the SOP, spiral turns were not allowed below 1,500 feet altitude.

On the day of the Accident, the landing direction at the Main Parachute Landing Area was towards the west as the wind direction was towards the east. (Figure 10).



Figure 10. Skydive Desert Drop Zone landing area direction

Organizational and Management Information

The Skydive Dubai was approved by the General Civil Aviation Authority of the United Arab Emirates (GCAA) under *Approved Flying Club Certificate* number U.A.E.AFC-P-01/2015. The Club was authorized to operate aircraft at Nad Al Sheba Area as per *the Areas of Operations OMR-97 and OMD-18 LAA008*, issued on 17 September 2020.

The application for the Parachuting Approved Organisation certificate was submitted to GCAA for approval.



Organization Structure

According to the Club's organisation structure, the following job roles are designated for the parachute operations:

- Accountable Manager
- Operations Manager Palm Drop Zone
- Operations Manager Desert Drop Zone
- Special Project Manager
- Safety & Compliance Manager
- Manifest Manager and Manifest
- Chief Instructor and Instructor
- Ground Controller
- Rigging Loft Manager
- Parachute Rigger and Parachute Packer.
- Load Master

The designations involved during the parachute freefall operations were as follows:

Manifest

The role of Manifest was to efficiently allocate instructors, students, and licensed parachutists to aircraft loads and organize aircraft timings. Manifest reports to the Manifest Manager and the duties include:

- Establishing radio contact with ground control and aircraft pilot(s)
- Confirming operations are cleared to start with ground control
- Manifesting parachutists to aircraft loads
- Providing manifest Load sheets to necessary personnel
- Providing public announcements pertaining to aircraft timings
- Generating daily aircraft manifest reports

Ground Controller

- The role of the Ground Controller was to monitor and ensure that skydiving activities are carried out safely and in accordance with the *Operation Manual* and applicable SOP(s).
- The Ground Controller reports to the Operations Manager and his duties include:

- Conduct all necessary inspections prior to authorizing operations to commence
 - Continually monitor skydiving activities while in progress to ensure they are carried out in accordance with the *Operation Manual* and relevant SOP(s)
 - Respond to parachuting and/or ground emergencies and enact emergency procedures as prescribed in the OM and SOP(s) as required.
- Report safety incidents and/or accidents to the Ground Control Supervisor and/or Operations Manager
 - Maintain a ground control safety reporting system.

Rigging Loft Manager

The Loft Manager reports to the Operations Manager and oversees the daily activities of the rigging loft and packing mat.

The Loft Manager:

- Is responsible to carry out rigger induction and ensure riggers fully understand their duties and responsibilities
- Ensure riggers hold an appropriate rigger rating
- Ensures packers are inducted, assessed, and approved to pack main parachutes through the issuance of an approved packing certificate
- Maintain parachute rigging and packing records as required
- Provide reporting of rigging and packing activities
- Maintain a safety reporting system.

Rigger

The parachute rigger reports to the Rigging Loft Manager and duties include:

- Hold and maintain a valid rigger rating
- Assemble, inspect, maintain and/or repair parachute equipment in accordance with regulatory and manufacturer requirements
- Perform duties in compliance with all regulatory, manufacturer and Club's standards and practices



- Remain knowledgeable in all current manufacturer service bulletins
- Maintain all necessary record keeping
- Safety reporting.

Load Master

- Load Masters shall collect aircraft load sheets from the manifest department
- Load Masters shall conduct a headcount prior to aircraft boarding, to ensure that only persons listed on the sheet may board the aircraft and that all persons are accounted for and not missing. Discrepancies shall be reported to manifest and manifest load sheets amended prior to aircraft boarding
- Load Masters shall ensure aircraft boarding is carried out in the order appropriate to the type of descents each parachutist plans to make
- Load Masters shall ensure, prior to take-off, the aircraft pilot receives the manifest load sheet as appropriate
- In an emergency LMs will, if practicable, seek and follow the instructions of the pilot. If this is not possible, they will use their own judgement and act accordingly.

Manuals hierarchy

The Club developed manuals at the organisational level and for specific operations and submitted them to GCAA for acceptance and approval process to acquire Operations license. The following were the manuals hierarchy:

- Safety Management System Manual (Organisational level) -GCAA Approval/Accepted
- Parachuting Operation Manual (Palm Drop Zone and Desert Drop Zone)
- Student Manual (Accelerated Freefall Course).

Additional Information

CAR-PAO - Parachute Approved Organization, Issue 01, was issued by the GCAA on 8 November 2020 to be applicable to the parachute operations in the United Arab Emirates.

Analysis

The fatally injured Skydiver

The Skydiver was holding a professional skydiving certificate for parachute freefall activity with registered 400 jumps in the skydiving personal logbook.

He held a Skydiving 'A' license issued on 12 April 2018 and a Skydiving 'C' license issued on 16 August 2019 by the Federation of Parachute Sport (FAI). The freefall jump in which the Accident occurred was the fifth jump for that day, all the previous jumps for the day were uneventful.

The Skydiver carried all four essential equipment required for the freefall jump: the container; main parachute; reserve parachute; and Automatic Activation Device (AAD). All the equipment were required to be certified by an authorized Rigger.

The equipment carried by the Skydiver during the freefall was rig-checked on 15 March 2021 by a designated Rigger, and the rigging was valid till 11 September 2021.

Cutaway

Investigation observed the video recording and collected evidence of cutaway handle from the Accident site which revealed that the main Parachute detached upon pulling the cutaway handle by the Skydiver. (Figure 11)



Figure 11. Fatally injured Skydiver cutaway handle

Reserve ripcord handle

The Investigation observed the video recording shows the fatally injured Skydiver releasing the main Parachute by pulling the cutaway handle at his right side at approximately 400 feet while he was on his back facing the sky.

The main Parachute cut away and the fatally injured Skydiver was free-falling without deploying

the Reserve Parachute. The fatally injured Skydiver flipped 180 degrees and became facing the ground. His hand was observed in the video grabbing the reserve ripcord handle, but he impacted the ground before the Reserve Parachute deploy.

Automatic activation device (AAD)

The Investigation observed at the Accident site that the status of the AAD display was on 'Standard Mode'. (Figure 12)



Figure 12. AAD status display- 'Standard Mode'

AAD Standard Mode

The Standard Mode is used always when the skydiver starts and lands at the same location, same drop zone, and doesn't need to change the device parameters.

In the Accident jump, the landing location was planned to be at the same elevation above sea level (which was 515 feet), for Skydive DDZ as the Aircraft take-off location.

The fatally injured Skydiver was equipped with m2 EXPERT version which indicates that the reserve parachute activation triggers if the altitude above the landing area is below 270 m (885 feet) and above 100 meters (330 feet) and also the falling speed is over 35 meters /second (78 mph)

The fatally injured Skydiver's AAD did not activate as his Parachute collided with the parachute of the other skydiver at about 600 feet AGL and the fatally injured Skydiver pulled the cutaway handle to release the Main Parachute at about 400 feet AGL, and as per the AAD m2 Expert version specification it triggers in the range of 885 feet to 330 feet AGL and also the falling speed if over 35 meters per second; below this range of specification it does not activate

The Investigation also observed at the Accident site that the cutter (release) was intact and the reserve closing loop was not released to activate the Reserve Parachute.



Figure 13. AAD cutter in the fatally injured Skydiver Parachute Container

As per the Investigation analysis, the AAD did not activate as the reserve ripcord closing loop passing through the cutter's hole was found intact which indicate that it did not cut to release the reserve parachute and that the Reserve Parachute opening sequence did not initiate. (Figure 13)

Reserve static line (RSL)

The RSL is a pre-cursor to the AAD, both the devices add an additional layer of safety in the skydiving equipment.

The RSL is connected to the main parachute of via a riser on the skydiving gear. The other end of the RSL is connected to the reserve parachute ripcord. When a skydiver is in an emergency, he/she will "cut away" the main parachute. The RSL then assists the jumper with the reserve deployment.

The job of the RSL is to deploy the reserve parachute. It is connected to both the main parachute and the reserve ripcord. Once a skydiver cuts away the main parachute, the RSL leaves with the main parachute. While the main parachute and RSL jettisons away, the RSL (which is also attached to the reserve ripcord) will deploy the reserve parachute after detaching from the parachute equipment.

Although the RSL is a safety feature, skydivers are trained to use both emergency handles (cutaway and reserve ripcord handle) to cut away the Main Parachute and deploy the reserve parachute during main parachute malfunction or collisions.

The fatally injured Skydiver's equipment did not include RSL.



The other skydiver

The other skydiver was holding Skydiving 'A' license issued on 27 November 2018, Skydiving 'B' license issued on 4 April 2019, Skydiving 'C' license issued on 5 June 2019, and Skydiving 'D' license issued on 3 March 2020 by USPA, in the United States of America.

He was also a qualified Accelerated Freefall Instructor (AFF-I), Coach and Tandem-I Rating on 30 November 2021

He had accumulated more than 1,700 jumps registered at the USPA organization. It was his third jump for that day and all his previous jumps before the Accident freefall jump were uneventful.

The equipment carried by the other skydiver during the freefall was rig-checked by Skydive Dubai DDZ designated Rigger on 31 October 2020 and they were valid until 30 April 2021. The other skydiver's equipment included the RSL which inflated the reserve parachute successfully after the main parachute was cut off during the mid-air collision.

Low-Height Swooping Turns

The fatally injured Skydiver was flying at the southeast of the Parachute Landing Area (PLA) and he performed a complete 360 degree spiral left turn followed by a 360 degree spiral right turn resulting in him in the east heading of PLA. After that, he turned 180 degrees left towards the south and after the turn, he was heading west.

The fatally injured Skydiver reached approximately 600 feet AGL, at the same time the other skydiver was approaching from north of PLA facing south and at about a height of 900 feet AGL. The other skydiver executed a swooping turn towards the right, turning 270 degrees. During this turn, he directly impacted the fatally injured Skydiver's Parachute which entangled both of their parachutes.

Video Recording

The video recording downloaded from the other skydiver's camera was vital evidence for the analysis of this Accident. The fifth freefall jump for the day was the Accident jump, and the video recording time for this jump was 3 minutes 37 seconds.

The recording starts at 10:41:59 LT.

The other skydiver was shown jumping from the aircraft at 13,000 feet. When the time was 10:42:45 LT. He opened his main parachute after

53 seconds from the jump at 4,000 feet LT. He surfed for 1 minute 22 seconds with a normal descent to approximately 1,000.

In preparation for high-speed landing, the other skydiver executed a swooping spiral turn to the right facing south of the PLA. Within five seconds, the turn completed a 270-degree facing east. The collision was at approximately 600 feet, at 10:45:05 LT.

The parachutes of both the skydivers were entangled for two seconds. The other skydiver pulled his cutaway handle to release the main parachute which resulted in releasing it while the RSL activated the deployment of the reserve parachute successfully. He landed safely near the PLA at 10:45:22 LT. The total freefall jump time recorded was 2 minutes 37 seconds. The video recording stopped at 10:45:36 LT.

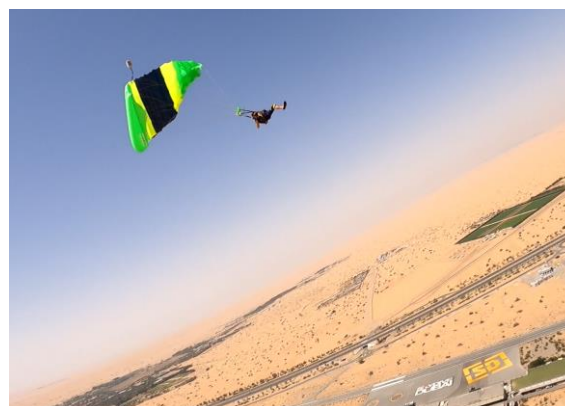


Figure 14. Skydiver Parachute after clear from entanglement

The fatally injured Skydiver's main Parachute was liberalised from entangled lines with the other skydiver's main parachute. The Skydiver's main Parachute lines were still connected to the Container. (Figure 14)



Figure 15. Skydiver pulling cutaway handle to release main Parachute



The video recording revealed that the fatally injured Skydiver pulled the cutaway handle to release the main Parachute (figure 15) and within the next two seconds (at 10:45:08 LT), the Skydiver was freefall with left hand on the reserve ripcord handle, however, the Skydiver impacted the ground with not deployed Reserve Parachute. (Figure 16)



Figure 16. Skydiver main Parachute and trying to pull Reserve Ripcord Handle

The Investigation observed at the Accident site that the ripcord was pulled out triggering the Reserve Parachute out of the Container without inflating. (Figure 17)



Figure 17. The fatally injured Skydiver's Reserve Parachute

Load Master

The *CAR-PAO*–Appendix 1 Section 3 Jumpmaster role, duties and responsibilities requirement is titled as Load Master in *Parachute Operations Manual*. The video recording did not show the Load Master onboard the aircraft. The skydivers commenced the freefall from the aircraft individually. The Club did not assign a Load Master onboard to accompany the skydivers.

The *Parachute Operations Manual*, Section 3. Load Master describes a specific role for Load Master as required by *CAR-PAO*– Appendix 1 Section 3 Jumpmaster. The roles and responsibilities mentioned in the *CAR-PAO* TEC.175- Safety in the Aircraft are not drafted in the *Parachute Operations Manual* Section 3 Load Master responsibilities.

Ground Controller

Investigation observed that Ground Controller reports occurrences and daily activity log to the Operations Manager. However, there is no system to keep a record of non-compliance of the SOPs and the unsafe manoeuvres by the skydivers during free fall jumps as required by the *Parachute Operations Manual*.

Conclusions

From the evidence available, the following findings, causes, and contributing factors were made with respect to this Accident. These shall not be read as apportioning blame or liability to any particular organization or individual.

- **Findings.** Statements of all significant conditions, events or circumstances in this Accident. The findings are significant steps in this Accident sequence but they are not always causal or indicate deficiencies.
- **Causes.** Actions, omissions, events, conditions, or a combination thereof, which led to this Accident.
- **Contributing factors.** Actions, omissions, events, conditions, or a combination thereof, which, if eliminated, avoided or absent, would have reduced the probability of the Accident occurring, or mitigated the severity of the consequences of the Accident. The identification of contributing factors does not imply the assignment of fault or the determination of administrative, civil or criminal liability.



Findings

- (a) The GCAA promulgated *CAR-PAO-Parachute Approved Organization*, on 8 November 2020.
- (b) The Skydive Dubai Parachute Operations Manual are not in compliance to the duties and responsibilities of the Load Master or jumpmaster as per *CAR-PAO TEC.175-Safety in the Aircraft* are not drafted in the *Parachute Operations Manual* Section 3 Load Master responsibilities. As observed in the video recordings, the Load Master or jumpmaster did not accompany the parachutists during the fifth jump for the day of the Accident, as required by *CAR-PAO.TEC.175 - Safety in the Aircraft*,
- (c) The fatally injured Skydiver was granted Skydiver 'A' and 'C' license with 400 jumps registered in his personal skydiving logbook.
- (d) The other skydiver was granted Skydiver 'A', 'B', 'C', and 'D' license, and also AFF-I, Coach and Tandem-I, with 1,700 jumps registered at USPA.
- (e) The parachute containers of both skydivers were rigged by designated Rigger. The rigging was valid at the time of the Accident.
- (f) The Accident freefall jump was the fifth jump out of six jumps planned for the day.
- (g) Skydive Parachute Organization submitted an application to the GCAA for a certificate to operate parachuting operations in compliance with *CAR-PAO* of the *Civil Aviation Regulations*.
- (h) The fatally injured Skydiver did not apply the malfunction or collision emergency procedure below 1,500 feet, which requires not to cut away the main Parachute and to activate the reserve parachute in order to keep both parachutes open (Main and Reserve) for more drag during landing.
- (i) The two skydivers performed spiral swooping turns below the minimum altitude.
- (j) The spiral swooping turns were not documented by the Ground Controller.
- (k) The RSL was not installed in the fatally injured Skydiver's equipment which is a

secondary safety device that activates during such occurrences during landing.

- (l) The AAD is mandatory to be installed for all skydivers as per the *Parachute Operations Manual* Section 6 Equipment

Causes

The Air Accident Investigation Sector determines that the Skydiver sustained fatal injuries due to a high-speed impact on the ground.

After the Skydiver's main Parachute was impacted by another skydiver, it was released by the Skydiver who simultaneously pulled the Reserve Parachute handle at a late stage.

The Reserved Parachute did not fully deploy before the impact. That action was not according to the SOP which requires, in emergency procedures such as malfunction or collision of parachutes below 1,500 feet, to pull the Reserve Parachute handle without releasing the main Parachute.

The two skydivers performed non-standard landing spiral swooping turns below the minimum altitude. The other skydiver did not anticipate the proximity of the fatally injured Skydiver who was below him before he initiated the high speed landing during the approach to land.

Contributing Factors

The Air Accident Investigation Sector identify the following as contributing factors:

- (a) The other skydiver did not apply the SOP in giving priority to the lower parachutes for landing.
- (b) The low altitude spiral swooping turns in the landing approach area were not documented during previous freefall jumps to be controlled by the Ground Controller as per the *Parachute Operation Manual*.
- (c) The RSL was not installed in the fatally injured Skydiver's equipment.

Safety Recommendations

The Air Accident Investigation Sector recommends that Skydive Dubai:

SR05/2021

Submit the application to the GCAA for acquiring certificate issued under *CAR-PAO* to operate parachuting activities in compliance with the regulation and conformance with



approved/accepted parachuting operational standards and procedures.

SR06/2021

Establish a system to assure that the Ground Controller at the DDZ Parachute Landing Area carry out his/her assigned duties of monitoring and controlling the operations, and report non-standard reckless manoeuvres below 1,000 feet altitude.

SR07/2021

Carry out a case study for determining the need for equipping parachutes with the Reserve Static Line (RSL) safety equipment. The study shall cover new parachutes entering into service and modifying in-service parachutes.

SR08/2021

Include the AAIS Duty Investigator hotline in the *Safety Management System Manual* and *Parachute Operations Manual* for reporting accidents and serious incidents.

SR09/2021

The *Parachute Operations Manual* shall include the duties and responsibilities of the Load Master as per *CAR-PAO* TECT.135, TEC.140, TECT145, TEC.165 and TEC 175,

SR10/2021

The Load Master shall accompany the skydivers onboard the aircraft and comply to duties as required by the *CAR-PAO* TEC.135, TEC.140, TEC145, TEC.165 and TECT 175.

This Summary Report is issued by-

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