الهيئة العامة للطيران المدني
GENERAL CIVIL AVIATION AUTHORITY

United Arab Emirates

Air Accident Investigation Sector

Accident

- Summary Report -

AAIS Case Nº AIFN/0012/2024

Wingsuit Flyer
Loss of Control - In Flight

Operator:	Skydive Dubai
Make and Model:	AirGlider, Falcon 2
Place of Occurrence:	Margham, Dubai
State of Occurrence:	The United Arab Emirates
Date of Occurrence:	20 October 2024

This Investigation is conducted pursuant to the United Arab Emirates (UAE) *Federal Act No. 20 of 1991*, promulgating the *Civil Aviation Law, Chapter VII- Aircraft Accidents,* Article 48*.* It is in compliance with the *Air Accident and Incident Investigation Regulation (AAIR),* and in conformity with *Annex 13* to the Convention on International Civil Aviation.

The sole objective of this Investigation is to prevent 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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The United Arab Emirates

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Investigation Process

The occurrence involved a recreational Wingsuit Flyer who was unable to recover after entering a spin, resulting in an uncontrolled descent and impact with the ground, resulting in fatal injuries

The Air Accident Investigation Sector (AAIS) Duty Investigator was notified of the occurrence via the Hotline Number +971 50 641 4667.

Following the initial on-site investigation, the occurrence was classified as an 'accident' due to the fatality of the Wingsuit Flyer. The scope of this investigation scope is limited to the events leading to the accident. There is no in-depth analysis of non-contributing factors.

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
   - (Instructor) – the instructor of the accident flight
   - (Investigation) – the investigation into this accident
   - (Report) – this accident investigation Summary Report
   - (Wingsuit Flyer/Flyer) – the flyer who was fatally injured
   - (Wingsuit) – the wingsuit that was used in the accident.
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 Annex 13 Final Report format.

Factual Information

History of the Flight

On 20 October 2024, at 11:11 local time of the United Arab Emirates; a DHC-6-300 Twin Otter aircraft, registered as A6-SD6, owned and operated by Skydive Dubai, commenced a commercial skydiving mission from the Skydive Desert Drop Zone (DDZ) [1] in Margham, Dubai, UAE. The aircraft was carrying 14 parachutists, 2 wingsuit flyer and a pilot.

Following takeoff, the parachutists and wingsuit flyers readied themselves for freefall[2] as the aircraft climbed to a cruising altitude of 13,000 feet. Among them was a Wingsuit Flyer completing his fourth jump of the day as part of a training session[3]. The Wingsuit Flyer is a tourist, who participated in these jumps for recreational purposes and to improve his skills in recovering from instability during flight as the Instructor stated.

Video footage from the Instructor's overhead camera shows the Wingsuit Flyer exiting the aircraft in an unstable position and successfully regaining control on his first attempt (figure 1).

Figure 1. Wingsuit Flyer after recovering

After stabilizing, the Instructor directed Wing Flyer to re-enter instability, as he stated and indicated from his hand signal (figure 2).

1 GCAA approved location to operate parachute activities at Skydive Desert drop zone.

2 Freefall refers to the phase of a parachute jump where descent occurs without the parachute deployed, allowing gravity and air resistance to act freely on the jumper. It ends when the parachute is deployed, significantly reducing the descent rate.

3 Training sessions for parachutists refer to structured exercises and practice routines designed to enhance their skills, physical readiness, and precision in executing aerial manoeuvres.

Figure 2. Instructor directed him to re-enter instability

In response to the Instructor's signals, the Flyer initiated the manoeuvre for a barrel roll[4] but became unstable during the attempt, resulting in an inadvertent flat spin. However, his recovery movements did not align with standard operating procedures (SOP) which resulted in a rapid, uncontrolled descent toward the ground (figure 3).

Figure 3. Flyer spinning

The Wingsuit Flyer descended outside the designated skydive drop zone area (figure 4). This area was not equipped with cameras to capture the impact.

Figure 4. The Flyer's impact point

It was observed that the Wingsuit Flyer did not deploy the main parachute as per the SOP which required the main parachute in normal condition. While the automatic activation device (AAD) had activated the pilot chute, it was unable to fully deploy the reserve parachute due to the Flyer's rapid spin, which caused the reserve Pilot chute bridle entangled to wrap, preventing the chute from filling with air. Images indicate that the pilot chute riser deployment created tension marks around the Flyer's neck.

The Flyer sustained fatal injuries upon immediate impact with the ground, resulting in multiple fractures and severe trauma throughout his body, according to the forensic report.

Damage to the Wingsuit

No damage was observed in the Wingsuit, main parachute, or reserve parachute (figure 5)

Figure 5. Wingsuit

Personnel Information

The general data of the Flyer are shown in table 1.

Table 1. Wingsuit Flyer data	
Age	45
Weight	77 Kg
Hight	169 cm
License Category	C[5]

[4] A barrel roll in skydiving refers to a manoeuvre where the skydiver performs a 360-degree roll along their longitudinal axis during freefall.

[5] The 'C' license an advanced certification issued by organizations like the United States Parachute Association (USPA), signifying

Valid to	31 January 2025
License issued by	Parachute Association of the United States (USPA).
Rating	NIL
Total Jumps	450+ jumps

The Flyer had completed over 450 parachute jumps, including 25 wingsuit jumps, prior to joining the Club, and had undertaken an additional 13 jumps since becoming a member.

Injuries to Persons

The forensic examination report for the Flyer revealed a deep laceration on the upper posterior part of the right thigh, accompanied by a fracture with protruding bone fragments. Another laceration with a comminated fracture was found on the posterior left buttock. Additionally, fractures were identified in the nose, forehead, jaw, and throughout the upper chest, back, and lower limbs. Extensive abrasions were scattered across the forehead, anterior chest, back, and both upper and lower limbs.

A toxicology report confirmed the absence of narcotics and alcohol in his body.

Wingsuit and Parachute Information

Table 2 illustrates the Wingsuit details:

Table 2. Wingsuit details	
Manufacture	Airglide
Model	Falcon 2
Category to use	Beginner

Table 3 illustrates the main and reserve parachutes' details:

Table 3. Main and reserve parachutes' details		
Container	**Rig Checked**	**Validity**
	17September 2024	16 March 2025
Manufacture	United Parachute Technologies	
Model	Vector-3	
Reserve parachute		
Manufacture	Icarus World	
Model	Icarus Nano-126	
Main parachute		
Manufacture	JYRO	
Model	Kraken-139	
Automatic Activation Device (AAD[6]**)**		
Manufacture	Vigil	
Model	Vigil-2 Cuarto (Pro)	
Reserve Static Line (RSL[7]**)**	Yes	

Both the Wingsuit and parachute were owned and maintained by the Flyer.

Wingsuit

The Falcon 2 wingsuit is the smallest model in its series (figure 6). It is designed for ease of control, making it suitable for beginners and first-flight students. Its compact structure provides stability and straightforward handling, which are important for those new to wing-suiting. Experienced pilots may also use it for activities such as dynamic and acrobatic flights, including flocking and freestyle manoeuvres.[8]

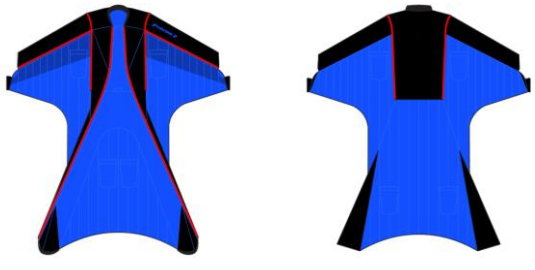

Figure 6. Wingsuit

a high level of experience, typically requiring 200+ jumps, proficiency in complex freefall and canopy skills, and knowledge of emergency procedures.

6 Automatic activation device (AAD): is a mechanical device that is designed to deploy a reserve parachute in the event that a jumper is unable to or does not deploy a parachute for themselves.

[Source:https://skydivemidwest.com/what-is-an-automatic-activation-device/.

7 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: https://paraorg.dfv.aero/uploads/manual_reflex_iied3-02.02.pdf].

8 AirGlide Wingsuits. (n.d.). Falcon 2. Retrieved January 20, 2025, from https://airglide.ws/catalogue/suits/falcon-2/

Main and reserve canopy

The Flyer departed with maintained, registered main and reserve canopies. He had used the same Wingsuit gear since registering it on 17 September 2024.

The Flyer did not deploy the main parachute during the jump (figure 7) as per the SOP. Although the AAD successfully activated the pilot chute, it was unable to fully deploy the reserve due to the Flyer's rapid spin, which caused the reserve pilot chute bridle entangled to wrap and prevented the Parachute from inflating properly.

Figure 7. Pilot chute, main and reserve canopies

Automatic activation device (AAD)

CAR-PAO.TEC.145 of the *Civil Aviation Regulations* of the United Arab Emirates 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;"
>
> 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.
>
> i) All Tandem parachute equipment shall be fitted with an AAD specifically designed for Tandem equipment."

Additionally, the Club's operational manual states that all parachutists must use equipment fitted with an operational AAD, which must be turned on unless the freefall delay is less than 10 seconds.

The AAD in skydiving is a safety mechanism designed to automatically deploy a skydiver's reserve parachute if the main parachute has not been deployed by a certain altitude. The AAD consists of three primary components: processor unit; control unit; and cutter unit (figure 8).

Figure 8. Automatic activation device (AAD)

Processor unit

The processor unit includes a factory-programmed microprocessor capable of performing real-time calculations to determine the skydiver's altitude and descent rate based on barometric pressure.

This core component houses the battery, processor, electronic circuits, and a pressure sensor, continuously monitoring these variables to analyse specific logic that determines when the release unit should activate.

If it detects that the skydiver is descending at a high speed below a predetermined altitude—suggesting that the main parachute has not been deployed—the processor unit sends a signal to the cutter unit to initiate the reserve parachute container release sequence, ensuring the timely deployment of the reserve parachute.

Control unit

The control unit is essential for skydivers to operate and monitor the device. It includes a 32 x 96 dot reversible LCD display that provides clear alphanumeric information, facilitating straightforward interaction and feedback during use. This display is

shielded by a stainless-steel cover, offering durability and protection from external elements.

The control unit has a red LED for setting the timing of startup and shutdown procedures and a green LED to confirm the completion of startup. An orange push button on the right side of the display in the standard setup serves as the control mechanism. The control unit also includes an infrared communication port via the red LED, allowing data transfer and downloading recorded jump data to a computer if connected to the optional IR Download Box (figure 9).

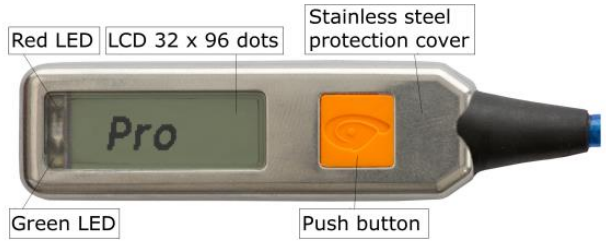

Figure 9. AAD control unit

Cutter unit

The cutter is a specialized component designed to release the reserve parachute in an emergency. It works by cutting the closing loop of the reserve container when it receives a signal from the processing unit. This action opens the reserve parachute, ensuring deployment even if the main parachute has not been activated.

The cutter uses a pyrotechnic mechanism with a circular knife to sever the loop instantly, usually within milliseconds, and it generates high internal temperatures to melt the loop for complete separation. The cutter is enclosed to prevent any potential damage to the parachute or other equipment. (Figure 10)

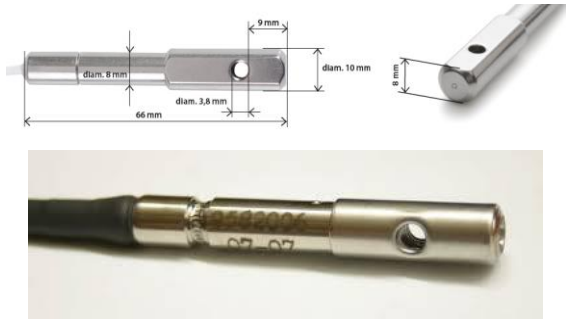

Figure 10. Cutter

AAD operation mechanism

The operation principle relies on continuous altitude and descent monitoring to provide an automated backup deployment of the reserve parachute. This system begins with initialization and automatically calibration before takeoff. The AAD is powered on at ground level, setting a "ground zero" reference for altitude, allowing the device to understand the baseline air pressure. Periodically, the AAD automatically recalibrates to account for minor atmospheric changes to ensure accuracy throughout the jump.

Once in freefall, the AAD's processor continuously monitors barometric pressure to calculate both the skydiver's altitude and descent rate. This real-time data collection is essential to distinguish between freefall and a controlled descent under an open canopy. The AAD can then evaluate whether the skydiver's descent remains within safe limits or if there's a risk of uncontrolled descent.

Each AAD is programmed with specific activation thresholds based on the type of jump, such as student, tandem, or professional modes. These thresholds include an altitude and a minimum descent speed that, if reached, indicate a potential emergency typically suggesting that the main parachute has not been deployed. When the device detects a speed below a certain altitude that meets these thresholds, it activates the reserve deployment sequence.

At this point, the AAD sends an electronic signal to the cutter, a component designed to release the reserve parachute instantly. The cutter uses a pyrotechnic blade to sever the closing loop of the reserve container. This action allows the reserve parachute to deploy, often within milliseconds, providing a critical safety measure when manual deployment is not possible.

After the AAD activates and deploys the reserve parachute, it may store data from the event, such as altitude, speed, and time of activation. This recorded information can be reviewed to understand the conditions under which the reserve deployment occurred. The AAD's operation principle provides a reliable automated system to initiate reserve deployment when needed, offering an essential layer of safety in situations where the skydiver cannot deploy the parachute manually.

In the Accident, the AAD activated and deployed the pilot chute; however, it was unable to fully deploy the reserve due to the Flyer's rapid spin, which caused the reserve pilot chute bridle entangled to wrap and prevented the reserve Parachute's extraction.

Meteorological Information

The Investigation reviewed weather data from the nearest station to Margham, as provided by the National Centre of Meteorology (NCM), with all information summarized in Table 4.

Table 4. METAR at 1130 LT	
Wind	Direction 360 degrees, speed 9 knots
Visibility	Clear
Humidity	39%
OAT	37°C
Dew point	30°C
Pressure (Altimeter)	1010 mbar
Condition	No significant change in the weather

The weather condition was suitable for skydiving, consistent with the Club's procedure.

Aerodrome Information

The Club operates two parachute landing areas (PLA) locations in Dubai: Skydive Dubai Palm (PDZ) and Desert (DDZ) Drop zones in Margham. The Accident occurred at DDZ.

DDZ is situated at a latitude of 24°53'14.65"N and a longitude of 55°32'53.03"E, with an elevation of 515 feet above sea level (ASL). It includes a 1,600-meter (1 mile) runway dedicated to skydiving flight operations and a designated boarding area for skydivers (figure 11).

Figure 11. Skydive DDZ drop zone and runway for skydiver flight operations

The PLA of DDZ was divided into four distinct zones: student landing area; main landing area; high-speed landing area; and swoop pond.

The red arrow in figure 12 indicates the designated landing direction for parachutists, always pointing into the wind (opposite to the wind direction), as specified in the SOP.

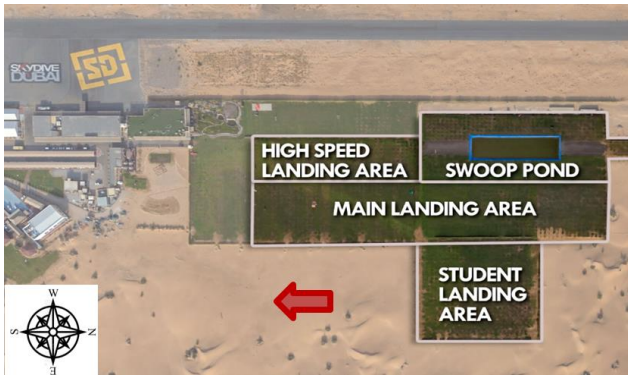

Figure 12. Skydive Desert Drop Zone landing area

The Wingsuit Flyer impacted the ground outside the Club facility, approximately 2 km to the north (figure 13).

Figure 13. Wingsuit Flyer impact point

Organizational and Management Information

The Club operates under the Parachute Approved Organization (PAO) approval, issued by the General Civil Aviation Authority (GCAA) of the United Arab Emirates, in accordance with *Civil Aviation Regulations – Light Sport Aircraft (CAR-LSA)*.

Organization structure

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

- Accountable Manager
- Operations Manage (s) (Palm Drop Zone and Desert Drop Zone)
- Special Project Manager
- Safety & Compliance Manager
- Manifest Manager
- Manifest
- Chief Instructor
- Instructor
- Ground Controller

- Master Rigger
- Senior Rigger
- Packer.

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

Manifest

The Manifest plays a key role in coordinating skydiving operations by efficiently allocating instructors, students, and licensed parachutists to aircraft loads and scheduling aircraft timings. Reporting to the Manifest Manager, the responsibilities include establishing radio communication with ground control and pilots, confirming operational clearance, and assigning parachutists to loads. Additional duties involve distributing manifest load sheets, making public announcements about aircraft schedules, generating daily manifest reports, and verifying licensed skydivers' compliance with requirements while maintaining relevant documentation.

For the Accident, the manifest team conducted a thorough review of instructor, student, and parachutist rosters, coordinated flight schedules, confirmed pre-flight checks, and assigned aircraft loads. All skydiver licenses and medical certificates were verified as current. Following the Accident, the team promptly suspended all tourist wingsuit skydiving operations.

Ground Controller

Ground Controllers oversee the safe execution of skydiving operations, reporting directly to the Operations Manager. Their responsibilities include pre-operation inspections, managing the activation and closure of Skydive airspace, and monitoring all parachuting activities in real-time. Key duties also involve issuing aircraft clearance for parachutist dispatch, responding to emergencies, implementing emergency procedures, and reporting any safety incidents or accidents to the Operations Manager.

For the Accident flight, the Ground Controller ensured that all skydiving activities were conducted safely and in accordance with established procedures. Before operations began, the Ground Controller completed all necessary inspections and confirmed that the Skydive Dubai airspace was properly activated as required. During the flight, the Ground Controller observed the jumper’s unexpected trajectory northward, away from the designated drop zone.

Upon locating the instructor, the Ground Controller assisted him into a buggy and navigated through the dunes to locate the Wingsuit Flyer. Approximately 11 minutes after picking up the Instructor, he reached the site where the Wingsuit Flyer’s body was found. Observing no signs of life, he noted the presence of blood from the eyes, nose, mouth, and back of the neck. Following the SOP, he refrained from touching the body, noting that the legs were already out of the suit and unzipped. He then proceeded to the main roadside to seek assistance and promptly contacted ground operations.

Instructor

Instructors, reporting to the Chief Instructor, are responsible for training and guiding student parachutists. Key duties include maintaining valid skydiving licenses and instructor certifications, ensuring training adheres to safety standards and regulations, and promptly reporting incidents or accidents to the Chief Instructor or Operations Manager.

The Instructor, certified as a United States Parachute Association (USPA) coach, accelerated freefall instructor, tandem instructor, and serving as a coach instructor at the Club, was scheduled to conduct training with a Wingsuit Flyer to enhance his skills in recovering from instability while in a wingsuit. The Instructor had performed seven jumps with him the previous day using the wingsuit.

On the day of the Accident, the Wingsuit Flyer exited the aircraft in an unstable position but recovered successfully. Following this, the Instructor directed him to re-enter an instability phase. The Flyer initiated the manoeuvre but became unstable during the attempt, resulting in an inadvertent flat spin. However, his recovery movements did not align with standard operating procedures (SOP), which resulted in a rapid, uncontrolled descent toward the ground.

Master Rigger

The Master Rigger manages the rigging loft and packing mat, reporting to the Operations Manager. Responsibilities include conducting inductions, ensuring riggers are appropriately qualified, and maintaining parachute rigging and packing records.

Senior Rigger

Senior Riggers support the Master Rigger by holding valid certifications and handling parachute assembly, inspection, maintenance, and repair in compliance with standards and regulations.

Packer

Packers assist by holding approved packing certificates, inspecting and packing parachutes per manufacturer requirements, and maintaining accurate packing records.

The Master Rigger, Senior Rigger, and Packer fulfilled their responsibilities by inspecting the parachute rig, issuing a rig registration approval, and tagging it with a

validity period starting on 17 September 2024, and expiring on March 16, 2025.

Wingsuit training

The Club follows the United States Parachute Association (USPA) standards, setting specific prerequisites for safe wingsuit training[9]. Skydivers must complete at least 200 jumps to develop foundational freefall and canopy handling skills essential for wingsuit flight. Additionally, a USPA B license is required, indicating an intermediate skill level in body control, canopy manoeuvring, and solo jumping proficiency. Wingsuit flyers must also demonstrate precise canopy and landing skills, as wingsuit flights cover extended distances that may require navigating to alternative landing areas. A *first flight course* with a qualified instructor is recommended, covering body positioning, deployment techniques, and emergency procedures. Proper equipment adjustments, including wingsuit-compatible rigs with appropriate modifications, are also necessary to ensure stability during flight and safe canopy deployment.

The Wingsuit Flyer had completed all Club's requirements to begin wingsuit training, including approximately 450 jumps, exceeding the minimum 200-jump threshold. He also possessed a USPA-C license, demonstrating his proficiency in body control, canopy handling, and unsupervised jumping. Additionally, he had developed the necessary landing accuracy and canopy management skills for navigating extended wingsuit flight paths and alternative landing areas.

Skydiving license requirements[10]

Table 3 illustrates the licensing requirements for parachutists:

Table 3. Club licensing requirements

Skydiving license level	Minimum number of jumps	Minimum controlled freefall time
A license	25	not applicable
B license	50	30 minutes
C license	200	60 minutes
D license	500	3 hours

As per the Club's 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.

The Instructor holds a D license, while the Wingsuit Flyer holds a C license.

Skydiving instructor categories[11]

Coach (C): A USPA Coach must hold a B license, have at least 100 jumps, complete a Proficiency Card, and attend a Coach Rating Course. They teach ground school, guide tandem-to-solo transitions, and supervise recurrency and static-line student jumps.

Tandem Instructor (TAN-I): Requires 500 jumps, three years of experience, a USPA instructional rating, and an FAA Class 3 Medical Certificate. Certification includes tandem cutaway practice and a Tandem Instructor Rating Course. They conduct tandem jumps, teach first-jump courses, and supervise Coaches.

Accelerated Freefall Instructor (AFF-I): Candidates need 500 jumps or 12 months as a Coach/Instructor, six hours of freefall time, and must complete the AFF Instructor Proficiency Card with evaluations. They teach AFF jumps, first-jump courses, and oversee various student jumps.

Instructor-Assisted Deployment Instructor (IAD-I): IAD Instructors conduct parachute deployment upon exit, commonly used in early training. They ensure safe deployment and oversee student canopy flight experience.

The Instructor is qualified in Coaching, AFF-I, TAN-I, and IAD-I, with over 5,000 jumps and a valid license until September 30, 2025.

Additional Information

Flat spin[12]

A wingsuit flat spin is an uncontrolled, rapid spinning motion, that can occur during wingsuit flight. As the wingsuit flyer spins uncontrollably on a horizontal plane, akin to the motion of a frisbee. The wingsuit itself, designed to create lift and stability through its webbed structure, amplifies any rotational force due to its large surface area. When a flat spin occurs, a wingsuit flyer loses the ability to stabilize,

9 United States Parachute Association. (n.d.). Section 6-9: Wingsuit student progression. Retrieved January 20, 2025, from https://www.uspa.org/sim/6-9.

10 There are four types of skydiving licenses. These are categorized as A, B, C and D licenses. [Source: https://skydiveparacletexp.com/.

11 The Skydive Dubai Parachuting Activity Operation Manual (SDD PAO OM) provides information on the requirements and instructor categories for skydiving.

12 For a visual understanding of a wingsuit flat spin using video: https://www.youtube.com/watch?v=F_g7ibIAXJ0.

which may prevent proper control of descent and orientation, complicating efforts to deploy the parachute safely. This spinning action creates an intensely challenging situation, as it is extremely difficult to correct once a flat spin has begun, especially at high speeds.

The physical effects on the flyer's body during a wingsuit flat spin are severe. As the body spins rapidly, centripetal force drives blood toward the extremities, away from the head, which can lead to a loss of consciousness. This effect, known as "gray-out" or "blackout," occurs as the brain becomes starved of oxygenated blood, compromising the wingsuit flyer ability to perceive and react. In addition, the high G-forces placed on the body can strain muscles, ligaments, and even bones, risking serious physical trauma. The unrelenting rotational force is also disorienting, disrupting the flyer's sense of balance and making it nearly impossible to regain control without outside assistance or advanced manoeuvring skills.

In the Accident, the Wingsuit Flyer went into a rapid, uncontrolled spin during freefall, rotating around the vertical axis.

Flat spin recovery[13]

To recover from a flat spin in a wingsuit, several techniques are effective in regaining stability. First, curling into a ball decreases surface area, which may initially speed up rotation but eventually slows it down, allowing for controlled limb extension to stabilize. Extending and counterbalancing by deploying one arm or leg slightly more than the other can also counteract spin forces, stabilizing flight. If altitude allows, diving out by tucking arms and legs downward can transition into a controlled head-down position, potentially stopping the spin.

For wingsuits with detachable wings, cutting them away reduces drag and enables the use of standard freefall techniques for control. If these measures fail, deploying the parachute may be necessary; although line twists may occur, they can be managed after deployment.

To counter a spin with opposite rotation, extend an arm or leg slightly further on the opposite side of the spin. This creates drag, gradually slowing rotation. Adjusting shoulder or hip alignment towards the opposite direction can further help stabilize flight.

Preventive measures include stable exit positioning, practicing new manoeuvres early in the flight at higher altitudes, and starting with smaller wingsuits to enhance control. These techniques and precautions help in managing and preventing flat spins effectively.

During the Accident, the Wingsuit Flyer initially managed to recover satisfactorily from the first instability (barrel roll). However, upon re-entering instability, he attempted to recover again but was unsuccessful, leading to a rapid spin descent toward the ground. Following the Accident, an inspection revealed that there were no cuts or damage to the wingsuit.

A historical wingsuit accident[14]

An accident documented in the USPA 2023 Fatality Summary published in April 2024 involved a 48-year-old skydiver with six years of experience and 745 logged jumps. During a solo wingsuit jump from approximately 13,000 feet, the skydiver, despite having prior wingsuit experience and successfully managing a parachute malfunction in a previous non-wingsuit skydive, encountered a malfunction that resulted in a fatality.

The accident was observed by a tandem instructor who, shortly after deploying his own parachute, noticed the jumper in freefall, unstable, and rolling with his wingsuit uninflated. Ground witnesses later observed the jumper under a rapidly spinning main parachute from approximately 1,500 feet until he disappeared behind a tree line. One witness reported hearing screams during the descent. The jumper was found face-down on a neighbourhood road near the drop zone, with no evidence of emergency procedures being initiated.

The investigation into that accident found that:

- The wingsuit's arm sleeves were unzipped, indicating the jumper had prepared to attempt emergency procedures.
- The main parachute toggles remained stowed, and the cutaway and reserve handles were untouched.
- The automatic activation device (AAD) had successfully deployed, cutting the reserve container's closing loop. However, the reserve pilot chute became entangled in the main parachute's

[13] Corliss, J. (2019). Wingsuit Flying Safety and Training Manual. Skydiving Institute Press. Link: https://britishskydiving.org/wp-content/uploads/2019/05/Wing-Suit-Training-Manual-2019.pdf

[14] USPA. "A Widespread Improvement: The 2023 Fatality Summary." United States Parachute Association. https://www.uspa.org/about-uspa/uspa-news/a-widespread-improvementthe-2023-fatality-summary.

suspension lines, preventing full reserve deployment.

- The reserve parachute remained in its free bag next to the jumper, with approximately six feet of bridle extended.
- Witness reports and evidence suggested the jumper did not move his arms or legs during the critical moments under the spinning parachute.

The investigators could not determine why the main parachute entered a spinning malfunction or why the jumper failed to perform emergency procedures. The unzipped wingsuit arms suggested an attempt to recover mobility, but no further actions were completed.

The investigation into that accident issued the following safety recommendations:

- Training and Awareness: Wingsuit-specific training should emphasize recovery techniques from instability or flat spins, as outlined in the Skydiver's Information Manual (SIM) Section 6-9[15]. Jumpers should prioritize stable recovery and be trained to deploy the main parachute if instability persists below 6,000 feet AGL.
- Emergency Procedure Standards: Reinforce adherence to SIM Section 5-1 guidelines for initiating emergency procedures[16]. A-licensed skydivers and students must take action by 2,500 feet AGL, while B- to D-license holders must act by 1,800 feet AGL.

In that accident, the Wingsuit Flyer did not implement the emergency procedure standards; however, the AAD activated at approximately 330 meters (about 1,082.68 feet) above the ground.

Analysis

The Wingsuit Flyer

The Wingsuit Flyer held a valid skydiving license for parachute freefall activities, with a Skydiving 'C' license from the USPA valid until 31 January2025, and logged over 450 jumps in his skydiving logbook. Before joining the club, he had completed 25 jumps with a wingsuit. Prior to the accident, he had met all club requirements to begin wingsuit training, completing approximately 450 jumps, well above the 200-jump minimum. His USPA 'C' license demonstrated his expertise in body control, canopy handling, and unsupervised jumping. He had also developed the landing accuracy and canopy management skills needed for extended wingsuit flights and alternative landing sites.

The day before the Accident, he performed seven successful jumps. On the day of the Accident, it was his fourth jump, with the previous three executed without incident. He was equipped with all essential gear, including a container, main and reserve parachutes, and an AAD registered by an authorized rigger, valid from 17 September 2024, to 16 March 2025.

Additionally, he had completed the drop zone briefing, acknowledged adherence, and committed to keeping up-to-date with all Club safety and organizational rules. He had also signed a *solo jumper waiver*[17], acknowledging the risks involved in solo skydiving and affirming his readiness and capability to undertake such activities independently.

During the Accident, the Wingsuit Flyer did not implement the emergency procedure standards; however, the AAD activated at approximately 330 meters (about 1,082.68 feet) above the ground.

The Instructor

The Instructor possessed a valid skydiving certificate for parachute freefall activities. He held a Skydiving 'D' license from the USPA, valid through 30 September 2025, and had accumulated over 5,000 jumps. His qualifications included certifications as a Coach, Accelerated Freefall Instructor (AFF-I), Tandem Instructor (TAN-I), and Instructor-Assisted Deployment Instructor (IAD-I), reflecting adequate expertise across various skydiving disciplines. He was qualified to provide a range of training, from tandem jumps for beginners to advanced freefall techniques for experienced skydivers.

15 United States Parachute Association, Skydiver's Information Manual, Section 6-9: Wingsuit Flying Requirements and Recommendations, https://www.uspa.org/sim/6-9.

16 United States Parachute Association, Skydiver's Information Manual, "Section 5-1: General," accessed 29 November 2024, https://www.uspa.org/SIM/5#1.

17 A "Solo Jumper Waiver" is a legal document or agreement that a skydiving organization or drop zone might require a solo jumper to sign before they are allowed to jump on their own without an instructor. This waiver typically outlines the risks involved in solo skydiving and releases the organization from liability in case of an accident or injury.

On the day of the Accident, the Instructor completed three jumps with the Wingsuit Flyer before the Accident jump. He assisted the Wingsuit Flyer in developing skills, specifically focusing on exiting the airplane in an unstable position and recovering stability in freefall. During one exit, the Instructor observed the Wingsuit Flyer exit in an unstable manner but recovered correctly. Following this, the Instructor signalled (figure 2) to the Flyer to practice another round of barrel roll. As the response to the Instructor's signals, the Flyer initiated the manoeuvre but became unstable during the attempt, resulting in an inadvertent flat spin. However, his recovery movements did not align with standard operating procedures (SOP), which resulted in a rapid, uncontrolled descent toward the ground. During this second instance of instability, it was observed that the Flyer was moving his hand but did not actively engage in any established spin recovery techniques. This lack of corrective action may have contributed to the failure to arrest the spin effectively.

The Wingsuit

The Wingsuit was designed for ease of control, which makes it particularly suitable for beginners and less-experienced flyers. This was ideal for the Wingsuit Flyer, who had completed a total of 38 jumps, and was still in the early stages of developing his skills in wingsuit flying. The Wingsuit's design allows for greater stability and maneuverability, helping beginners maintain control during flight and recover from instability more effectively.

Following the impact, an inspection of the Wingsuit revealed that the zipper on the leg section had opened, likely as a result of the force of the impact. However, the Wingsuit did not exhibit marks of cuts, tears, or other structural damage along the sides or the wings.

A comprehensive post-Accident inspection of the Wingsuit revealed no signs of physical damage, such as cuts, tears, or structural compromise.

Automatic Activation Device (AAD)

The AAD successfully initiated the deployment of the pilot chute. However, it was unable to fully deploy the reserve parachute due to the rapid spin of the Wingsuit Flyer. This high rotational velocity caused the reserve pilot chute bridle entangled to wrap tightly, preventing the reserve Parachute's from properly inflating and arresting the descent.

Following the Accident, the AAD was sent to the manufacturer for data analysis. The data revealed that the device was set in Pro mode[18] with no altitude correction and activated correctly at 330 meters AGL when the descent speed reached 35 m/s. The recorded free-fall time was 85 seconds, aligning with the activation criteria. Despite the device performing as designed, the rotational forces and line entanglement prevented the reserve parachute from deploying effectively.

Flat Spin and Flat Spin Recovery

The Wingsuit Flyer initially recovered successfully from the first instability caused by the barrel roll. However, upon encountering a second attempt of instability, he was unable to recover, leading to an unintentional flat spin. This flat spin resulted in a rapid and uncontrolled descent toward the ground.

Footage from the overhead camera revealed that the Flyer entered a rapid, uncontrolled spin during freefall. During this second instability, while the Flyer was seen moving his hand, there was no evidence of active engagement in established spin recovery techniques.

A post-Accident inspection confirmed that the Wingsuit sustained no cuts or damage, indicating that the accident was not related to equipment failure but rather to procedural or recovery-related challenges.

Conclusions

Based on the available evidence, the following findings, causes, and contributing factors were identified in relation to this Accident. These findings are presented without assigning blame or liability to any specific organization or individual:

- Findings: Statements of all significant conditions, events, or circumstances pertaining to this Accident. These findings highlight crucial steps in the accident sequence but are not necessarily causal or indicative of deficiencies.
- Causes: Actions, omissions, events, conditions, or combinations thereof that directly led to the Accident.
- Contributing Factors: Actions, omissions, events, conditions, or combinations thereof that, if eliminated, avoided, or absent, would

[18] Advanced Aerospace Designs, Vigil® Cuatro User's Manual US v2018.04, A.A.D. NV/SA, Brussels, Belgium, 2018, p. 10. The "PRO" mode activates when the device measures a freefall speed of 115 ft/sec (78 mph or 35 m/sec) or greater and an altitude between 840 ft and 1,100 ft (256 m to 335 m) above ground, tailored for experienced skydivers.

have decreased the likelihood of the Accident occurring or mitigated the severity of its consequences. The identification of contributing factors does not imply fault or liability, whether administrative, civil, or criminal.

Findings

(a) The Club was practicing operations under a valid *Parachute Approved Organization (PAO)* issued by the GCAA.

(b) The Wingsuit Flyer possessed a valid USPA-C license and had no additional ratings listed and the Instructor possessed a valid USPA-D license with ratings of AFF-I, IAD-I, Coach and Tandem-I.

(c) The Wingsuit Flyer met the license acceptance criteria, having completed over 450 jumps in total, including 38 jumps with the wingsuit.

(d) The Wingsuit Flyer completed 25 jumps before joining the Club and 13 jumps after becoming a member.

(e) The Accident jump was the fourth jump for the day.

(f) The Wingsuit Flyer was using his own wingsuit and main and reserve parachutes.

(g) The Wingsuit Flyer completed the rig registration on 17 September 2024, valid until 14 March 2025.

(h) The Wingsuit Flyer signed a *solo jumper waiver*.

(i) The Wingsuit Flyer was provided with *drop-zone briefing* which did not contain an instruction to calibrate the AAD before boarding the jumping aircraft.

(j) The Wingsuit Flyer met all the Club's requirements for wingsuit training, including around 450 jumps which was more than the minimum required 200.

(k) The Wingsuit Flyer exited the aircraft unstably but regained control on his first barrel roll maneuver.

(l) Following this, the Instructor signalled the Flyer to practice another round of barrel rolls. In response, the Flyer initiated the manoeuvre but became unstable during the attempt, resulting in an inadvertent flat spin. However, his recovery movements did not align with standard operating procedures (SOP).

(m) The Wingsuit Flyer did not implement the emergency procedure standards.

(n) The AAD, set in Pro mode with altitude automatic calibration, resulted in its activation at 330 meters (1,082.68 feet) AGL.

(o) Despite the device performing as designed, the rotational forces and line entanglement prevented the reserve parachute from deploying effectively.

(p) The reserve parachute did not deploy because it was hindered by the spin.

(q) The Wingsuit Flyer impacted the ground and sustained a fatal injury.

Causes

The Air Accident Investigation Sector concluded that the following causes of the Accident:

(a) The Wingsuit Flyer entering into a flat spin.

(b) The Wingsuit Flyer short experience in wingsuit flying could not enable him to recover from the spin.

(c) The Wingsuit Flyer did not implement the emergency procedure standards.

Safety Recommendations

Safety Actions Taken by the Club

The Club has introduced the following temporary measures for wingsuit jump activities to maintain operational safety and ensure compliance with established guidelines, pending the approval of a wingsuit training syllabus and its integration into the Club Operation Manual:

(a) Restriction on Foreign Wingsuit Jumpers:

Only local wingsuit jumpers are permitted to perform wingsuit jumps at the Club. Foreign wingsuit jumpers are subject to eligibility criteria to ensure their readiness and alignment with safety standards. These criteria include:

- A minimum of 500 total logged skydives.
- At least 100 of these jumps must be wingsuit flights.
- If the total number of wingsuit jumps is fewer than 200, the jumper must have completed at least 25 wingsuit jumps within the preceding 60 days.

(b) Communication of Restrictions:

The updated rules and restrictions will be clearly communicated to all stakeholders. This information will be prominently shared on the

Club's official website and other communication channels to ensure widespread awareness among jumpers and operational staff.

(c) Verification of Experience and Equipment Compliance:

All foreign wingsuit jumpers are required to provide verified logbooks as proof of experience. Additionally, their equipment must comply with the specifications outlined in the "Experienced Wingsuit Pilot Clearance Checklist." This includes ensuring the wingsuit, rig setup, canopy type, and altimeters meet the required standards.

(d) Mandatory Knowledge Evaluation:

Before being granted clearance, all wingsuit jumpers must undergo a thorough knowledge evaluation. This assessment will test their understanding of critical wingsuit flight procedures, including navigation, deployment, and emergency protocols. Only those who demonstrate adequate knowledge will be permitted to proceed with independent wingsuit jumps.

There are no safety recommendations issued in this Report.

This Summary Report is issued by:

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