Air Accident Investigation Unit Ireland

SYNOPTIC REPORT

ACCIDENT

Airwave Hang Glider/Mosquito Motor Harness
Near Miltown Malbay, Co. Clare

18 September 2022

An Roinn Iompair
Department of Transport

Foreword

This safety investigation is exclusively of a technical nature and the Final Report reflects the determination of the AAIU regarding the circumstances of this occurrence and its probable causes.

In accordance with the provisions of Annex 13[1] to the Convention on International Civil Aviation, Regulation (EU) No 996/2010[2] and Statutory Instrument No. 460 of 2009[3], safety investigations are in no case concerned with apportioning blame or liability. They are independent of, separate from and without prejudice to any judicial or administrative proceedings to apportion blame or liability. The sole objective of this safety investigation and Final Report is the prevention of accidents and incidents.

Accordingly, it is inappropriate that AAIU Reports should be used to assign fault or blame or determine liability, since neither the safety investigation nor the reporting process has been undertaken for that purpose.

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[1] **Annex 13**: International Civil Aviation Organization (ICAO), Annex 13, Aircraft Accident and Incident Investigation.
[2] **Regulation (EU) No 996/2010** of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation.
[3] **Statutory Instrument (SI) No. 460 of 2009**: Air Navigation (Notification and Investigation of Accidents, Serious Incidents and Incidents) Regulations 2009.

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In accordance with Annex 13 to the Convention on International Civil Aviation, Regulation (EU) No 996/2010 and the provisions of SI No. 460 of 2009, the Chief Inspector of Air Accidents, on 18 September 2022, appointed Kate Fitzgerald as the Investigator-in-Charge to carry out an Investigation into this Accident and prepare a Report.

Aircraft Type and Registration:	**Airwave Magic 166 hang glider / Unregistered**	
No. and Type of Engines:	**Swedish Aerosport (Mosquito)**	
Aircraft Serial Number:	**Not applicable**	
Year of Manufacture:	**Unknown**	
Date and Time (UTC)[4]:	**18 September 2022 @ 16:00 hrs**	
Location:	**Near Miltown Malbay, Co. Clare**	
Type of Operation:	**General Aviation**	
Persons on Board:	**Crew – 1**	**Passengers – Nil**
Injuries:	**Crew – 1 (fatal)**	
Nature of Damage:	**Minor**	
Commander's Licence:	**Unknown**	
Commander's Age:	**62 years**	
Commander's Flying Experience:	**Unknown**	
Notification Source:	**Shannon Air Traffic Control**	
Information Source:	**AAIU Field Investigation**	

[4] **UTC**: Co-ordinated Universal Time. All times in this report are quoted in UTC unless otherwise stated; local time was UTC +1 hour on the date of the accident.

SYNOPSIS

At approximately 15:45 hrs on 18 September 2022, the Pilot prepared the powered hang glider for flight from an agricultural field, located near Miltown Malbay, Co. Clare, and launched a short time later. The powered hang glider travelled less than 100 metres and impacted with the ground. There was no fire. The Pilot was fatally injured.

NOTIFICATION AND RESPONSE

The AAIU received notification of the accident from Shannon Air Traffic Control at 17:10 hrs on 18 September 2022. An Investigation team travelled to the accident site the following morning to commence an Investigation.

1. FACTUAL INFORMATION

1.1 History of the Flight

At approximately 15:45 hours on 18 September 2022, the Pilot prepared the powered hang glider for flight from an agricultural field near Miltown Malbay. Witnesses in the vicinity of the field recalled hearing an engine running and seeing the Pilot working on the powered hang glider.

The witnesses reported seeing the Pilot launch the powered hang glider by running across the field with the engine running. Witnesses reported that after the powered hang glider became airborne, they saw the powered hang glider jerk slightly as the Pilot lifted his legs into the attached pod harness[5]. The powered hang glider then veered left, before pitching down, losing altitude, and impacting the ground. Witnesses recalled hearing the engine running after the impact.

A person who lived nearby arrived at the scene shortly after the accident, and upon realising there had been an accident alerted local people and the emergency services.

1.2 Witness Statements

The Investigation spoke to three witnesses who had seen the powered hang glider on the day of the accident.

The first witness was a short distance away and saw the Pilot at one side of the field, preparing the powered hang glider prior to the flight. The witness, who was familiar with the hang gliders that the Pilot had flown previously, observed that the Pilot was using a different wing and was going to use an engine with it. The witness did not observe the powered hang glider get airborne but about an hour later observed that it was on the ground at the other side of the field. The witness drove to the accident site and found the Pilot secured in the hang glider's pod harness. The witness immediately sought assistance from local people and alerted the emergency services.

[5] **Pod Harness:** A type of hang glider harness that totally encloses the Pilot's body from the chest to the feet.

The second and third witnesses were visiting a house in the vicinity of the accident site. The witnesses observed the Pilot in the field with the powered hang glider and said that they could hear an engine running which they believed to be the engine of the powered hang glider. The witnesses told the Investigation that they had never seen the powered hang glider before and one of them used a pair of binoculars to take a closer look.

The witness using the binoculars said that they saw the Pilot launch in an uphill direction. They noticed that once airborne, the Pilot kicked his legs backwards into the harness. As the Pilot did so, the powered hang glider jerked slightly. The powered hang glider was then observed to veer left and rapidly pitch downwards. The witnesses could not see the Pilot and, due to a lack of familiarity with hang gliding, they were unaware that the Pilot may have been injured. The witnesses recalled that they could hear the engine running after the flight.

1.3 Injuries to Persons

The Pilot, who was the sole occupant of the powered hang glider, sustained fatal injuries.

1.4 Medical and Pathological Information

The post-mortem report for the Pilot noted the presence of chest contusions consistent with trauma and an injury to the Pilot's neck. The post-mortem report also states that toxicology tests did not detect the presence of alcohol or drugs.

The post-mortem report states the cause of death as:

> *'I a) Respiratory arrest*
> *b) Severe Chest contusion consistent with trauma*
> *c) Neck injury*
>
> *II Nodular goitre[6]'*

1.5 Damage to Powered Hang Glider

Inspection of the powered hang glider as found identified the following damage:

- One of the two propeller blades was broken into three pieces, with the tip section of the blade found embedded in the hang glider wing
- The second propeller blade sustained tip damage
- The wing was torn due to the impact of the propeller blade
- Small dents were found on the hang glider frame
- The strut-mounted variometer[7] was found detached from the powered hang glider.

There was no evidence of any pre-existing damage.

[6] **Goitre:** An abnormal swelling of the thyroid gland (www2.hse.ie accessed 25 July 2023).
[7] **Variometer:** An instrument used in flying to indicate rate of climb or descent.

1.6 Personnel Information

The Investigation was provided with a logbook and airfield receipts which documented some of the Pilot's flying experience between 1997 and 2000. The Investigation understands that the Pilot flew intermittently over many years and may not have documented all his experience. The logbook describes training undertaken both in the United Kingdom and Ireland involving unpowered hang glider launches from a tow, and foot-launches from a hillside. The Pilot did not hold a Pilot Licence, nor was one required for flying an unpowered hang glider.

1.7 Hang Glider (Powered) Information

The powered hang glider comprised of a Magic 166 wing manufactured by Airwave and a Mosquito harness manufactured by Swedish Aerosport. The harness had an integrated, two-stroke engine which rotated in an anti-clockwise direction when viewed from the rear and powered a two-bladed propeller. The harness was a pod harness, into which the Pilot could place his legs. The engine and propeller were fitted at the rear of the pod.

The Operating Limits section of the Owner's Manual for the Magic 166 wing states that the Magic 166 wing '*must not* […] *be flown with auxiliary power*'. The Operating Limits section of the Owner's Manual for the Magic 166 wing also contains a recommended hook-in weight[8] limit range of 59-105 kg and an indicated stall speed of approximately 24 mph (21 kt) with maximum pilot weight. The Mosquito harness, including engine and all ancillary equipment carried on the hang glider weighed approximately 24 kg.

Witness information provided to the Investigation indicated that the Pilot may have recently acquired the Magic 166. The witness believed that the Pilot had owned the engine for some time but that he had not used it. The Powered Hang Glider was not registered.

1.7.1 Fuel Test

A sample of the fuel from the powered hang glider's engine was sent to a specialist laboratory for testing. The laboratory found that the fuel was a '*rich*' two-stroke engine mix with one part engine oil mixed with 33 parts fuel and that the sample contained dirt, water and appeared to be old.

The fuel filter fitted to the engine was also examined by the Investigation. There were small traces of sediment in the filter, but it was free of blockages.

1.8 Launch Site Information

Examination of the accident site indicated that the powered hang glider was likely launched in a westerly direction from an agricultural field. There were no significant obstructions to the west of the launch site. The field sloped upwards to the north. There was a hedgerow to the south.

[8] **Hook-in weight:** This is the total weight of the hang glider harness, engine, pilot, pilot's clothes, and any other equipment carried on the hang glider.

1.9 Meteorological Information

Met Éireann, the Irish meteorological service, was asked to provide details of the weather conditions prevailing in the Miltown Malbay area at approximately 16:00 hrs on the day of the accident. Details from the aftercast received are reproduced in **Table No. 1.**

Meteorological Situation:	An area of high pressure centred off the south-west coast of Ireland gives a light west to north-west flow across the country.
Surface Wind: **Wind at 2,000 ft:**	Westerly, 4-7 (knots) kt Westerly, 5 kt
Between surface and 300ft:	Varying between south-west and west, 4-8 KT
Visibility:	30 km
Weather:	Cloudy
Cloud:	Few (1-2/8ths) fair weather cumulus clouds with bases around 2,000ft and a broken (5-7/8ths) layer of stratocumulus cloud with bases between 4,000 and 5,000ft.
Surface Temperature/Dew Point:	15/9 degrees Celsius
Mean Sea Level (MSL) Pressure:	1025 hectoPascal (hPa)
Freezing Level:	11,000ft

Table No. 1: Weather conditions in the Miltown Malbay area at the time of the accident

1.10 Regulatory Information

In Ireland, Pilots of powered hang gliders are required to register their wing and are required to hold a Pilot Licence. The Irish Aviation Authority's (IAA), Safety Regulation Division (SRD), Aeronautical Notices G.13, and P.35 contain the requirements for registration and licensing respectively.

At the time of the subject accident, the title of G.13 was '*Powered Paragliders*' and the title of P.35 was '*Powered Paraglider Aircraft*'. However, the IAA informed the Investigation that both aeronautical notices have been re-issued and the IAA website has been updated. At the time of publication of this Investigation Report, the extant versions are:

G.13 '*Powered paragliders, powered hang-gliders & similar powered aircraft*', Issue 3 (3 July 2023)
P.35 *'Powered Paraglider Aircraft (PPG) and Powered Hang-Glider Aircraft (PHG)'*, Issue 2 (3 July 2023)

Aircraft flown in Ireland are required to hold a Certificate of Airworthiness or permit in writing. Powered hang gliders are generally uncertified and therefore would not qualify for a Certificate of Airworthiness. However, IAA Aeronautical Notice A.112, '*Flight Permit for Single Seat Aircraft*'[9] provides a generic Flight Permit (permit in writing) for certain types of aircraft described in A.112. Powered hang gliders registered in Ireland, may avail of the generic Flight Permit, provided for in A.112, subject to them being in full compliance with the conditions specified in A.112.

1.11 Powered Hang Gliding

To understand the operational demands of flying a powered hang glider, the Investigation sought the assistance of a technical expert who was an experienced powered hang glider pilot. The technical expert explained that powered hang gliders are generally flown in light winds under 10mph (8.7 kt), and that 5mph (4.3 kt) was ideal but launches become more difficult below 5 mph.

The technical expert described topographic features that can make launches more difficult; this included proximity to sloping terrain, which can cause a down draft, and features such as hedges which can cause rolling turbulence. In addition, the technical expert explained the importance of a clear launch path with a long run out area so that launches can be abandoned safely.

Once launched, the pilot is required to move the weight of the engine left or right in addition to their own weight to steer. This steering method is more physically demanding for a powered hang glider than for an unpowered hang glider. When a pilot makes a roll input to turn, or to correct a turn, it is important to coordinate the movement of his/her own weight and the engine. In a powered hang glider with a pod harness, the mass of the engine is well behind the centre of gravity of the pilot and the hang point of the harness, and if a pilot does not coordinate the roll movement, then he/she will change the thrust vector rather than the roll. Changing the thrust vector, when a powered hang glider is already in a turn can rapidly increase the rate of turn to the point where a pilot may be unable to correct it. In such circumstances the pilot must immediately switch off the engine to regain the desired flight path.

During training, pilots learning to fly with a pod-mounted engine, are taught to *'lead with your feet'* when initiating a roll input. This means that they should move the mass of the engine before moving the rest of the body in the direction of the roll input. Leading with the feet keeps the pilot and harness parallel to the hang glider's central keel/longitudinal axis and prevents a change in the direction of thrust.

[9] **A.112, Aeronautical Notice A.112, '*Flight Permit for Single Seat Aircraft*':** Issue 4 of A.112 was extant at the time of the subject accident. Issue 5 was published on 3 July 2023.

2. ANALYSIS

On the day of the accident, witnesses observed the Pilot setting up the powered hang glider, in an agricultural field, after which he launched uphill in a northerly direction. Witnesses reported that shortly after take-off the powered hang glider jerked slightly, veered left and rapidly pitched downwards. The Pilot was fatally injured in the impact.

Following the accident, the Investigation examined the powered hang glider and did not find any indication of pre-existing damage. Laboratory tests carried out on a sample of fuel taken from the fuel tank indicated that the fuel was contaminated with dirt and water; however, witnesses reported hearing the engine running after the accident. Therefore, engine malfunction and fuel quality do not appear to have been factors in the accident.

Powered hang gliding is a physically demanding activity. The Investigation notes that the stall speed of the Magic 166 wing as stated in the Owner's manual was 24 mph at the maximum hook-in weight limit of 105 kg and therefore, in light wind conditions, the Pilot would have to reach a significant speed on foot to lift off.

During the launch, local conditions can have a significant effect on the handling of the powered hang glider, and at low altitude a pilot has limited time to react to any adverse situation. In this accident, witnesses reported that the powered hang glider veered left before pitching down. Whilst the meteorological aftercast indicated that the weather conditions on the day were generally suitable for powered hang gliding, it is possible that the sloping terrain and hedgerows in the vicinity of the launch site may have caused localised turbulence. These factors could have affected the handling of the powered hang glider and could have resulted in a loss of control. In addition, if the hang glider was in a turn and the Pilot made an uncoordinated roll input, (i.e. a roll input where the pilot and harness do not remain parallel to the hang glider's central keel / longitudinal axis) this would probably change the thrust vector of the powered hang glider. A change to the thrust vector could rapidly increase the rate of turn and lead to a loss of control.

The Owner's Manual for the Magic 166 wing states that the wing '*must not* […] *be flown with auxiliary power*'. Unfortunately, the wing manufacturer ceased operations some years ago and the Investigation was unable to determine the wing manufacturer's reason for this warning.

There are certain regulations which apply to powered hang gliders. These relate to registration, airworthiness and licensing. In this occurrence the powered hang glider was not registered, it did not have a flight permit and the Pilot did not have a licence. The Investigation notes that on the date of the subject accident, IAA documents which set out the requirements for powered hang gliders, i.e. Aeronautical Notices G.13 and P.35, had the titles, '*Powered Paragliders*' and '*Powered Paraglider Aircraft*' respectively and this may have made it more difficult for pilots of powered hang gliders to find relevant regulatory information. However on 3 July 2023, the IAA re-issued both Aeronautical Notices, and the words '*powered hang glider(s)*' now appears in the title of each notice. The IAA website was also updated accordingly.

3. CONCLUSIONS

3.1 Findings

1. The Investigation did not identify any pre-existing defects on the powered hang glider.

2. The general weather conditions on the day of the accident were suitable for powered hang gliding operations.

3. Sloping terrain and hedgerows close to the launch site may have caused localised turbulence.

4. The Pilot had some previous flying experience on unpowered hang gliders.

5. The planned flight path did not contain any obvious obstructions.

6. The Pilot did not hold a Pilot Licence for powered hang gliding.

7. The powered hang glider was not registered.

8. The Pilot could not avail of the Flight Permit provided for in IAA Aeronautical Notice A.112 because the Powered Hang Glider was not in compliance with the required conditions.

9. The Owner's Manual for the Magic 166 wing states that it '*must not* […] *be flown with auxiliary power*'.

3.2 Probable Cause

Loss of control shortly after launch resulting in impact with terrain.

4. SAFETY RECOMMENDATIONS

This Report does not sustain any Safety Recommendations.

- END -

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In accordance with Annex 13 to the Convention on International Civil Aviation, Regulation (EU) No. 996/2010, and Statutory Instrument No. 460 of 2009, Air Navigation (Notification and Investigation of Accidents, Serious Incidents and Incidents) Regulation, 2009, the sole purpose of this investigation is to prevent aviation accidents and serious incidents. It is not the purpose of any such investigation and the associated investigation report to apportion blame or liability.

Produced by the Air Accident Investigation Unit

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An Roinn Iompair
Department of Transport

Air Accident Investigation Unit,
Department of Transport,
Leeson Lane,
Dublin 2,
D02TR60,
Ireland.
Telephone: +353 1 804 1538 (24x7)
Email: info@aaiu.ie
Twitter: @AAIU_Ireland