FINAL REPORT

AAIU Synoptic Report No: 2009-007
AAIU File No: 2007/0089
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In accordance with the provisions of SI 205 of 1997, the Chief Inspector of Air Accidents, on 27/9/07, appointed Mr. John Hughes as the Investigator-in-Charge to carry out a Field Investigation into this Accident and prepare a Synoptic Report.

Aircraft Type and Registration:	Mainair Blade 912 Microlight G-CCFM	
No. and Type of Engines:	1 x Rotax 912-UL	
Aircraft Serial Number:	1354-0603-7-W1149	
Year of Manufacture:	2003	
Date and Time (UTC):	27 September 2007 @ 06.55 hrs	
Location:	Nunstown, Aghadoe, Killarney, Co. Kerry	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 1
Injuries:	Crew - 1	Passengers - Nil
Nature of Damage:	Aircraft Destroyed	
Commander's Licence:	UK PPL (A)	
Commander's Details:	Male, aged 44 years	
Notification Source:	Pilot notified the AAIU at mid-day on 27 Sept 2007	
Information Source:	AAIU Field Investigation.	

SYNOPSIS

The aircraft was operating from a grass field at Aghadoe and the Pilot, with his son as passenger, lined up for take-off in an easterly direction. As the aircraft accelerated the Pilot felt a loss of power. He immediately abandoned the take-off but ran out of runway and impacted a ditch which contained an embedded concrete pillar, at the far end of the field. The Pilot and his son exited the aircraft unaided. The Pilot sustained an injury to his left wrist. His son was uninjured. There was no fire.

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1. FACTUAL INFORMATION

1.1 History of the Flight

The Pilot/Owner of the aircraft intended to fly with his son to the National Ploughing Championships at Tullamore, Co. Offaly, some 103 nautical miles (nm) distant. Because of the intended early take-off, the aircraft was parked outdoors overnight.

The Pilot contacted ATC Kerry at 06.24 hrs (07.24 hrs local time) on the morning of the accident, indicating his intention to fly to Ballydesmond via Dromcolliher. ATC informed him that the local QNH was 1028 hPa. At 06.55 hrs (07.55 hrs local time) the aircraft was positioned for take-off from a grass airstrip near the owner's home. As the aircraft accelerated the Pilot said that he felt a loss of power. He immediately abandoned the take-off but ran out of runway and impacted a ditch which contained an embedded concrete pillar at the far end of the field. The Pilot and his son exited the aircraft unaided. The Pilot telephoned ATC at 07.16 hrs (08.16 hrs local time) cancelling his intended flight.

At 10.51 hrs (11.51 hrs local time) the Pilot telephoned ATC again saying that he had earlier taken off at 06.55 hrs (07.55 hrs local time) but aborted the take-off. He said he had landed heavily and did a *"bit of damage"* to the aircraft. He informed ATC that he was reporting the matter to the IAA. Following the accident, the Pilot's brother helped to remove fuel into containers prior to the aircraft's removal and salvage.

1.1.1 Witness Observations

The passenger stated that they *"got into the air but came down because they were not climbing quick enough"*. They landed, were rolling (forward) and hit a concrete pillar in the ditch.

Another witness said that the aircraft was quite low, the take-off was aborted and a collision followed seconds later.

1.2 Injuries to Persons

The Pilot, who was wearing a lap harness, sustained a serious injury[1] to his left wrist (broken wrist bone). He was initially hospitalised on 27 September 2007, where a routine wrist operation was carried out. He was subsequently transferred to another hospital on 1 October 2007 where he died on 6 October 2007.

The passenger, who was wearing a lap and shoulder strap harness, was uninjured.

[1] *S.I. No. 205 of 1997 Air Navigation (Notification and Investigation of Accidents and Incidents) Regulations 1997, states in part, that a "Serious Injury" means an injury sustained by a person in an accident and which (a) requires hospitalisation for more than 48 hours, commencing within 7 days from the date the injury was received and (b) results in a fracture of any bone (except simple fracture of fingers, toes or nose).*

1.3 Damage to the Aircraft

The aircraft was examined by the Investigation at a contractor's premises and the following extensive damage was noted:

The damage to the trike was considerable. The wing keel was twisted. The lower trike keel was pushed rearwards destroying the integrity of the airframe structure. The seat frame was broken in four places. The monopole to the trike keel hinge bracket was sheared. All three propeller blades had tip damage. The right and lower A-frame bars were bent. The wing hang bracket was bent. The wing fabric suffered some impact damage. The nose undercarriage was damaged and the whole front chassis twisted to the left at impact. There were pieces of concrete imbedded in the front keel. Apart from the engine, which requires detailed inspection and shock testing, the aircraft was deemed a write-off.

1.4 Personnel Information

The Pilot, aged 44 years, had a full UK PPL (A) licence, which was issued by the CAA in October 1997 and was valid for life. He had previously owned and flown a Mainair Blade 582 (62 HP 2-stroke engine) and purchased this more powerful version (80 HP engine) in early February 2007. On 18 February 2007, the aircraft suffered a heavy landing in a field at Aghadoe whilst being flown by its new owner, the Pilot, who reported the event to the AAIU. This field is in the same local area as the accident field.

1.5 Aircraft Information

1.5.1 General

The Mainair Blade is a two-seat, flex-wing, weight-shift microlight aircraft **(Appendix A)**. The pilots are seated in a trike, which comprises a triangulated aluminium frame, containing a fibreglass pod, which forms the cockpit. The wing is attached to the top of the vertical member of the aluminium frame (the monopole), which is located behind the rear seat. The wing can be pivoted by the pilot via a control bar that provides pitch and roll control. The engine is rear mounted in a pusher configuration. The aircraft was fitted with an opposed 4 cylinder, 4-stroke liquid/air cooled petrol engine. The Rotax 912-UL, 80 HP engine, running at a nominal 5,000 rpm, has two carburettors, a mechanical fuel pump, electronic dual ignition and an electric starter. Carburettor heating is affected through the engine coolant system once the oil temperature reaches 50°C during the engine warming up period.

Whilst the 912A and the 912F versions are certified to JAR 22 and FAR 33 aviation standards respectively, the 912 engine models UL/ULS are not aircraft certified. They are all of the same basic engine but the UL/ULS version has not received any safety or durability testing in the microlight aircraft in which they are installed. The engine manufacturer states that "*the operator assumes all risk of use, and acknowledges by this use that he knows this engine is subject to sudden stoppage"*(Maintenance Manual, 1998).

Following the above heavy landing in February 2007, a qualified Inspector carried out a complete inspection of the aircraft and the aircraft was released for flight. On 18 February 2007, the Investigation noted that the aircraft had flown a total of 83 hrs since new. The logbook did not record any further flight times. The CAA technical approval data sheets (TADS) quotes as follows:

Minimum Performance at Max Take-Off weight:

Rate of Climb:	1000 ft/min at 55 mph
Stall or Min Flying Speed:	30 mph at MTOW
Empty Weight:	190 kg

Limitations:

MTOW:	390 kg
Max Cockpit Weight:	172 kg
Manoeuvring Seed:	60 mph
Max Useable Fuel:	44 litres or 65 litres (mod 99)

Manufacturer's Performance Data:

Take-off to 15 metres:	140 metres
Landing Distance from 15 metres:	195 metres
Fuel Consumption at 60 mph:	9 to 14 litres per hour
Max RPM:	5500 rpm

Similar Parameters for the Mainair Blade 582 show:

Empty Weight:	174 kg
Take-off to 15 metres:	159 metres

1.5.2 The Flight Manual Take-off Instruction

"Take-offs are straight forward and the wing will lift the weight and hence fly when the correct airspeed is reached. The correct technique is to hold the wing parallel to the ground during the initial stages of the take-off run so as to reduce the drag and increase the acceleration. At around 30 mph push the bar gently forwards slightly until the aircraft unsticks, this should be approximately 35 to 40 mph. The trike unit will swing forward and a wise pilot will hold the aircrafts climb rate down until a safe climb out speed is reached, 50-55 mph."

1.5.3 Permit-to-Fly

On 24 July 2007, an annual inspection prior to the issue of the Permit to Fly was carried out and the aircraft was released for a check flight on the 30 July 2007, which was successful. The UK CAA Permit to Fly was valid from August 2007 for one year.

This UK CAA Permit to Fly states, inter alia, that the aircraft should not be flown in another State, without the permission of the airworthiness authority of that country. The Irish Aviation Authority (IAA) has no record of any such application being made on behalf of G-CCFM.

1.6 Meteorological Information

1.6.1 Met Éireann

Met Éireann provided the following conditions for the area at the time of the accident:

Surface Wind: VRB03KT

Cloud Amount: FEW 2000 ft (locally FEW 500-1000 ft was possible)

Cloud Type: Stratus/Stratocumulus

Visibility: Most likely 25-30 km. However due to the fact that the preceding night was a "radiation night" with clear skys and slack winds, some mist was likely in the vicinity bringing the visibility down locally.

Weather: Nil (barring local mist)

Temperatures: Air temperature 6 deg.C
Dew point temperature 3 or 4 deg.C

Freezing Level: 9000 ft

MSL Pressure: 1028 hPa

1.6.2 Weather Observations

A member of the public telephoned the Investigation following the accident and said that on the morning of the accident he had observed ice on the wings of aircraft at Farranfore (Kerry Airport). Farranfore is 7 nm North of Aghadoe and 100 ft AMSL. The recorded TAF for 08.00 hrs indicated a temperature of 03 deg.C and a dew point of 02 deg.C. ATC Kerry recorded a few mornings of hard frost in late September 2007.

1.7 Airfield Information

The grass runway strip, 373 ft AMSL and measuring approximately 280 metres in length, runs west to east in a field which declines slightly (38/1) in the same direction **(Appendix B)**. A row of mature trees runs along the lower eastern boundary of this field, with those to the right of the take-off path in the region of 30 to 40 ft high. This strip is adjacent to the aircraft owner's residence but, heretofore, in general, the owner would fly his aircraft to and from the nearby Farranfore Airport.

1.8 Additional Information

The UK AAIB conducted an investigation into a similar accident involving a Mainair Blade 582 aircraft and published their Report in Bulletin 10/2002. In that particular case the strip was 400 metres in length with the aircraft taking off in a down slope with trees adjacent to the end of the runway. The aircraft with two persons on board failed to gain height and during a left turn to avoid the trees, collided with the ground. The conclusion reached was that the aircraft failed to climb due to the combined affects of the reduced lift and increased drag caused by frost contamination on the wing upper surface.

A Safety Recommendation (2002-22) resulted in the incorporation of a flight manual warning on frost contamination of flex-wing aircraft. This is reproduced in **Appendix C.**

2. ANALYSIS

The Pilot was well qualified and skilled on microlight aircraft and was held in high regard by his microlight colleagues. He also had a fixed-wing aircraft licence. He had flown various types of microlights down through the years, particularly the Mainair Blade 582. The aircraft logbook for the Mainair Blade 912 records that up to the heavy landing incident in February 2007, the aircraft had flown a total of only 8 hours whilst in his ownership.

Pilots who have flown both types of microlight state that they handle quite differently and, apart from the differences of 4-stroke and 2-stroke handling, the subject aircraft's empty weight is some 16 kg heavier. In addition, the aircraft, with two persons on board, must have had sufficient fuel for the intended flight of 100 nm range. Under normal circumstances considerable skill would be required to take-off and clear the trees with safety in the runway length available.

The 912-UL engine installed in this aircraft is not aviation certified. Consideration has to be given as to whether the engine suffered some temporary loss of power during the take-off run. However, CAA Airworthiness Notice No. 98B states: *"The flight and landing characteristics of microlight aeroplanes are designed to be such that an engine failure resulting in partial or total loss of power only, is not an unacceptable safety risk".* Also, the aircraft did become airborne indicating that power was available, at least at aircraft rotational speed.

Beyond this speed, the aircraft failed to produce sufficient forward speed to increase wing lift. Weather conditions for engine carburettor icing existed at the time, but the aircraft had a carb heat modification installed. The Investigation feels that the presence of some frost on the wing could have had a detrimental effect on the lift characteristics of the wing. The CAA cautions against flying with contaminated wings and states: "*Tests have shown that frost, ice or snow with the thickness and surface roughness of medium or coarse sandpaper reduces lift by as much as 30% and increases drag by 40%."*

The UK AAIB also reports that pilots attempting to fly flex-wing microlight aircraft with wings contaminated by frost or rain have typically been unable to climb or have stalled on take-off, resulting in an accident or heavy landing. Such an increase in drag and loss of lift would appear to the Pilot on take-off as a loss of power. The Pilot would be well aware of the runway length remaining and the tree height and had no option other than abort the take-off.

3. CONCLUSIONS

(a) Findings

The Pilot aborted the take-off when his aircraft failed to reach it's required climbing speed.

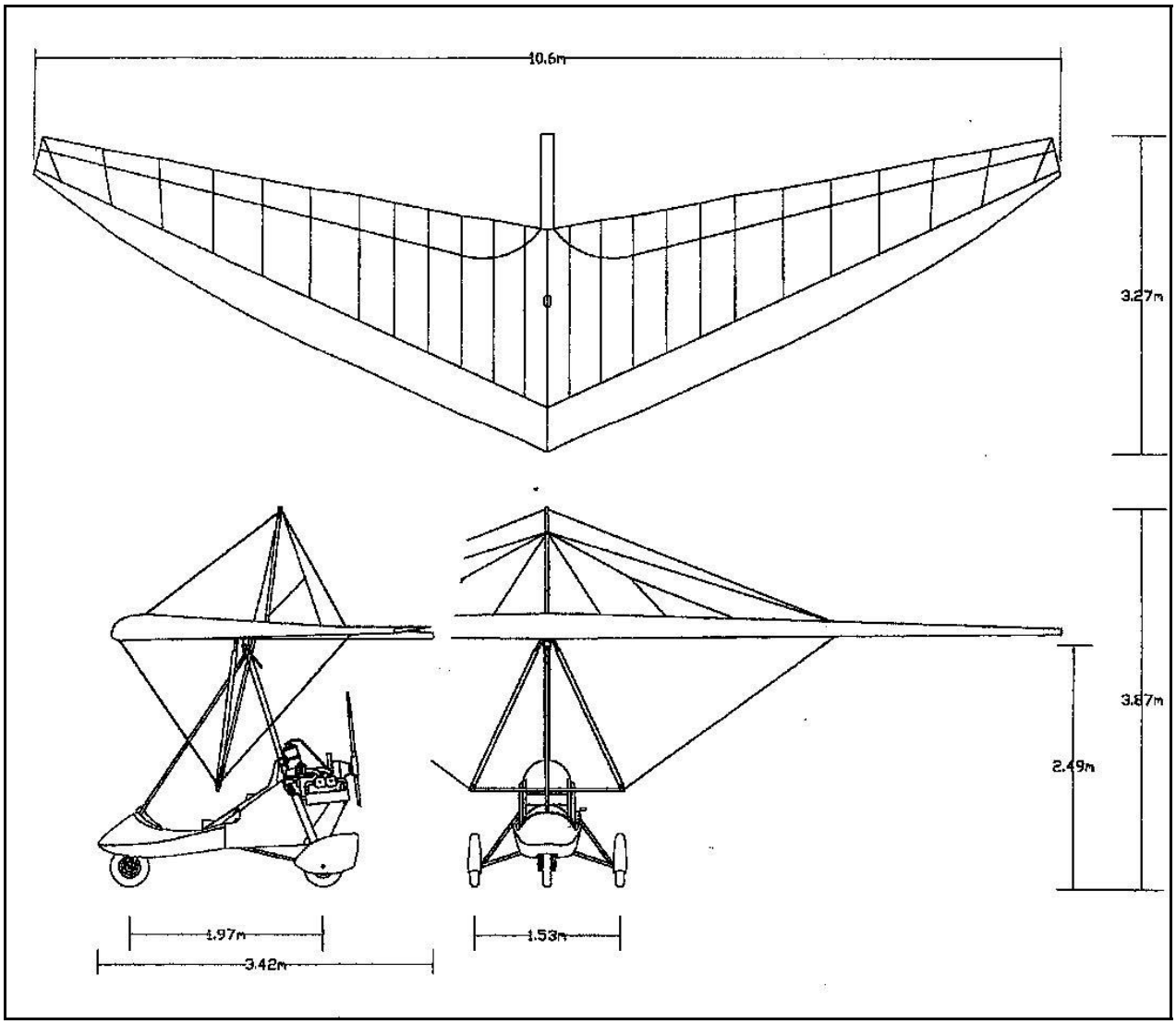
(b) Cause

Overnight frost on the wing surface may have affected the laminar airflow over the wing surface, thereby reducing its lift and increasing its drag component.

4. SAFETY RECOMMENDATIONS

The National Microlight Association of Ireland (NMAI) and the British Microlight Aircraft Association (BMAA) should inform all its members that seemingly insignificant amounts of frost, or even rain on the wings of flex-wing microlights can degrade the performance of the wing to the extent that the aircraft cannot be safely flown. **(SR 07 of 2009)**

Appendix A



General Assembly of a Mainair Blade 912 microlight aircraft.

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Appendix B

The site location from a 1/2500 Co. Council Map of the area.

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Appendix C

3.0 Warning About The Safe Operation Of Your Blade 912

The Blade 912 is certified for non-aerobatic flight only. This means any manoeuvre necessary for safe operation, stalls, steep turns upto a maximum bank angle of 60 deg, and maximum pitch up and pitch down of the wing from normal flight of 30 deg. Spins, whip stalls, tail slides and wing overs are all prohibited.

Loss of flight control may result from negative loading which can occur from steep pitch and/or roll manoeuvres in excess of the above values. It is dangerous to conduct steeply banked reverse turns, wing overs and whip stalls and to fly the aircraft at speeds beyond Vne. Positive action must be taken to avoid your own and other aircraft's wake turbulence.

Be aware of the flight limitations at all times and operate this aircraft in a sensible and considered manner.

Positive loading must be maintained at all times.

Always fly in such a manner that engine failure, or component failure, for what ever cause, does not preclude a safe emergency landing. You should always fly with an eye open for a safe landing field. Always operate from a site where failure after take off is not hazardous. Operation of the aircraft acknowledges that you are aware of the dangers of engine or component failure and accept all risks.

Microlighting is, in general, a fair weather sport but light rain has little effect on flying control. You will notice a slight increase in stall speed but the effects are minimal.

Ice, however, is more serious and can occur through icing meteorological conditions, or by flying a wing which is wet from the bag, without giving it time to dry out. Icing will affect handling and speeds markedly and at the first sign you should cease flying or fly below icing conditions.

In addition if the wing has been left out all night, and a frost has formed never fly until the wing is completely dry and all the frost on the wing has gone.

NEVER FLY IF THERE IS ANY ICE OR FROST PRESENT ON THE WING

Spares parts should only be fitted as supplied by Mainair Sports, if any other components or modifications are carried out to the aircraft without prior permission from the factory all guarantees are invalid, and no responsibility can be taken for the continued safe operation of the aircraft. No repairs, other than those detailed in this manual, should be carried out without the prior approval of Mainair Sports.

Warning about the safe operation of Blade 912

- END -