Air Accident Investigation Unit Ireland

ACCIDENT REPORT
Reims Aviation Cessna 172M, G-YORK
Ballyboy Airfield (EIMH), Co. Meath
8 May 2011

An Roinn Iompair Turasóireachta agus Spóirt
Department of Transport, Tourism and Sport

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In accordance with Regulation (EU) No. 996/2010 and the provisions of SI 460 of 2009, the Chief Inspector of Air Accidents, on 8 May 2011, appointed Mr. Graham Liddy as the Investigator-in-Charge to carry out a Field Investigation into this Accident and prepare a Report. Due to Mr Liddy's retirement, the Chief Inspector, Mr Jurgen Whyte, appointed himself on the 29 February 2012 as the Investigator-in-Charge to complete the Investigation. The sole purpose of this Investigation is the prevention of aviation Accidents and Incidents. It is not the purpose of the Investigation to apportion blame or liability.

Aircraft Type and Registration:	Reims Aviation Cessna 172M, G-YORK
No. and Type of Engines:	1 x Lycoming 0-320-E2D
Aircraft Serial Number:	1354
Year of Manufacture:	1975
Date and Time (UTC):	8 May 2011@ 09.40 hrs
Location:	Ballyboy Airfield (EIMH), Co. Meath N53.38', W06.52'
Type of Operation:	Private
Persons on Board:	Crew - 1 Passengers - Nil
Injuries:	Crew - Nil
Nature of Damage:	Substantial
Commander's Licence:	Private Pilot Licence (PPL) Aeroplane (A) issued by the Irish Aviation Authority (IAA)
Commander's Details:	Male, aged 50 years
Commander's Flying Experience:	393 hours, of which 258 were on type
Notification Source:	Airfield Licensee
Information Source:	AAIU Pilot Report Form submitted by Pilot AAIU Field Investigation

SYNOPSIS

On the landing roll-out on Runway (RWY) 11, braking response was not as expected by the Pilot and the aircraft overran the runway, coming to rest against a tree stump in the runway-end boundary hedgerow. While there was propeller and other ancillary damage, the Pilot exited the aircraft unaided and without injury.

1. FACTUAL INFORMATION

1.1 History of the Flight

The Pilot had intended to carry out some circuit practice on RWY 11 at Ballyboy Airfield, near Athboy, where the aircraft (G-YORK) was hangared. While refuelling, the Pilot noted that the sun was shining and the windsock was indicating a wind of about 170° at less than 15 kts. On engine start-up, a mist of rain appeared on the windscreen for approximately two-minutes. He back-tracked on the active runway, where he noted that the mist had stopped. The Pilot completed a power check and noted the wind sock indicating a 60° crosswind at about 15 kts. The Pilot reported no technical problem whilst taxiing or during the power check.

Take-off was reported by the Pilot as uneventful. He tracked the centreline on climb-out and then turned downwind, where he carried out his approach checks. Due to the prevailing conditions the Pilot made the decision to use Flap 20 for each approach and landing. On finals he experienced some turbulence and, as his speed was too high, he decided to carry out a go-around without touching down.

On the second approach, the Pilot reported that airspeed was better but still somewhat high and turbulent conditions were again encountered. The Pilot decided to abort the landing after the main wheels touched on and carried out a second go-around.

Earlier in the flight, he had noticed rain showers in the Trim area and beyond, so, due to the wind conditions and the expected weather, he decided to make the third landing a full stop. There was no local area rain at this time. With an approach speed of approximately 60 kts and Flap 20 he touched down *'well before the windsock'* [1](within the first third of the runway), as normal, and held the centre line. With all wheels on the ground the Pilot applied the brakes but found no traction and poor braking action on the grass. At that stage the Pilot stated that *'he was committed to the full stop and no go-around was possible'*. While he was shocked at the poor braking performance response, he *'expected to be successful'* in stopping the aircraft. As the end of the runway approached, the Pilot attempted to steer the aircraft to the left to avoid an impact, but the aircraft continued to show poor traction and it slipped into the boundary hedgerow at the end of the runway.

The aircraft impacted a tree stump embedded within the hedgerow (**Photo No. 1**) at a low power setting. The propeller stopped and the Pilot carried out shutdown checks, including fuel-off. He exited the aircraft unaided and without injury.

Post-accident examination of the aircraft revealed no evidence of any mechanical malfunction or failures.The Pilot had a valid licence and Air Medical.

[1] The windsock is positioned in the middle of a field approximately 132 m to the right of the right hand side runway boundary fence, halfway down RWY 11.

Photo No. 1: Final resting position of G-YORK (*Pilot's Photo*).

1.2 Damage to Aircraft

A technical inspection of the aircraft showed a bent propeller and substantial damage to the lower fire wall/front lower fuselage area.

1.3 Weather Conditions

The Pilot utilised the Met Éireann self-brief system and reported the actual weather conditions at the time of the occurrence as follows: Wind 170/15 kts, visibility 10 km, cloud FEW at 2000 ft, temperature 12°C, dewpoint 7°C.

A post-accident weather report for the time of the accident (08.40 UTC) was provided by the Aviation Services Division of Met Éireann and gave the following:

A depression of 981 hPa[2] centred around 51N 18W maintained a strong, moist southerly airflow over the area. The associated cold front had moved over the UK whilst an embedded, active trough was off the SW coast of Ireland.

Surface Wind: 160-170/14-18 kts. Wind 2000 ft: 180-190/35-40 kts. Visibility 10 km. Weather: Isolated showers, cloud scattered 2000 ft, isolated scattered 1800 ft CB, surface temperature 14°C and dew point 09°C. Mean Sea level (MSL) pressure 1001/1002 hPa.

Met Éireann advised the Investigation that the surface wind values are averages based on the actual winds from weather stations in the vicinity and an assessment of the gradient wind. Depending on exposure and topography it is possible that the surface wind speed at the accident site could have been significantly stronger, especially if reinforced by a localised convective downdraft. In these circumstances the surface wind speed could have been as high as 20-24 kts and low-level moderate turbulence could not be ruled out.

[2] **hPa: hectoPascals**

1.4 Airfield Information

The airfield has a single grass runway orientated 11/29. At the time of the Occurrence the surface was well prepared with a firm sub-soil and the grass cut short. The overall length between the runway end boundary hedgerows is 510 m. However, the published length is 400 m, with a width of 18 m. The distance from the end of the published length on RWY 11 and the boundary hedgerow at the end of the runway is 30 m. Three sets of white runway edge markers are present at the touchdown point (first third) of RWY 11 and two sets identify approaching the end of the published runway length (RWY 29 end). There is a slight down slope (approximately 1%) in the RWY 11 direction. In addition, there is a line of mature trees (approximately 300 m) and a hedgerow on the approach (approximately 100 m) to the west of the touchdown point of RWY 11.

Subsequent to a landing accident on RWY 11 in 2010 (AAIU Report No. 2012-009) and this particular event, the airfield owner removed an eastern boundary hedgerow as part of an on-going safety enhancement and replaced it with a white frangible fence. In addition, in June of 2012, the airfield owner completed significant work at the airfield, which included, reducing the height of the trees on the approach to RWY 11, removal of a hedgerow at the end of RWY 11 and the construction of a runway safety overrun of 180 m at the western end of the airfield.

1.5 Cessna 172M Skyhawk

The 172M of 1973-76 vintage was produced with a drooped wing leading edge for improved low speed handling.

The Owner's Manual provides under Section 6: Operational Data, landing data and the landing distance on a hard surface runway, at gross weight, with no wind, Flap 40 and power off. At sea level, the ground roll is 158 m (520 ft) and to clear a 50 ft obstacle 381 m (1,250 ft). Note 1 in the Manual requires that you reduce landing distance by 10% for each 5 kts headwind and Note 2 requires that for operation on a dry, grass runway, increase landing distances (both "ground roll" and "total to clear 50 ft obstacle") by 20% of the "total to clear 50 ft obstacle" figure. The landing data does not provide for a wet grass runway.

1.6 Additional Information

1.6.1 SafetySense Leaflet

As identified in previous AAIU Reports, the UK Civil Aviation Authority (CAA) produced "*SafetySense Leaflet 7 Aeroplane Performance*", which is based on information contained in the CAA's Aeronautical Information Circular "*AIC 127/2006, TAKE-OFF, CLIMB AND LANDING PERFORMANCE OF LIGHT AEROPLANES*".

The purpose of the leaflet was to provide performance planning guidance to pilots and the leaflet noted at the outset "*Accidents such as failure to get airborne, collision with obstacles after take-off and over-run on landing occur frequently to light aeroplanes*". The leaflet provides detailed information on many aspects of performance planning including the use of "*unfactored*" performance data.

In a paragraph titled "*Landing – Points to Note*", SafetySense Leaflet 7 states, "*Landing on a wet surface…can result in increased ground roll, despite increased rolling resistance. Tyre friction reduces, as does the amount of braking possible. Very short wet grass with a firm subsoil will be slippery and can give a 60% distance increase (1.6 factor).*" The leaflet also notes that a downhill slope increases landing distance, giving the example of a 2% slope and to clear a 50 ft obstacle, the landing distance increases by 10%.

1.6.2 Safety Promotion Leaflet (AED 1)

The Irish Aviation Authority (IAA) issued a Safety Promotion Leaflet in August 2011 outlining risks of collision with obstacles at small airfields and offers advice on methods to reduce risk. The Leaflet, as well as others, is available on the IAA website, and AED 1 is reproduced at **Appendix A.**

2. ANALYSIS

Due to its high lift wing and low speed handling characteristics, the Cessna 172M is more prone to floating prior to touchdown than the standard Cessna 172. This can make landing more difficult in crosswind conditions.

The surface of the well-maintained runway was firm with short grass. The Pilot reported that he experienced a two-minute period of mist/rain on start up. Therefore the runway surface condition could not be classified as dry. In addition, the Pilot recalled that he was shocked at the poor braking response on landing. The CAA SafetySense Leaflet 7 describes how landing on short wet grass, with firm subsoil, can give a landing distance increase of up to 60%. The Owner's Manual provides landing data in order to determine the landing distance required for 'ground roll' and/or the 'total to clear a 50 ft obstacle'. The landing data does not factor in prevailing wind conditions, runway surface condition (other than hard runway surface) or slope. **Table No. 1** below provides approximate calculated gross weight landing distance in meters for 'ground roll' and 'total to clear a 50 ft obstacle' and is factored for dry grass, wet grass (long) and wet grass (short) conditions. The Table is not factored for runway elevation, slope, or prevailing wind conditions.

	Condition	Factor	Ground Roll (1)	Total to clear 50 ft obstacle (2)
A	**Owner's Manual Hard surface runway, no wind, Flap 40, power-off**		**158 m**	**381 m**
B	**Dry Grass Runway (+20%) of 50 ft obstacle distance**	**x 1.20 of A(2)**	**+76 m 234 m**	**+76 m 457 m**
C	**Wet Grass Runway Long Grass (+35%) of 50 ft obstacle distance**	**x 1.35 of A(2)**	**+133 m 291 m**	**+133 m 514 m**
D	**Wet Grass Runway Short grass (+60%) of 50 ft obstacle distance**	**x 1.60 of A(2)**	**+228 m 386 m**	**+228 m 609 m**

Table No 1: Approximate calculated total landing distance for 'ground roll' and 'total to clear 50 ft obstacle' for various runway surface conditions.

Note 1: The Investigation recognises that the aircraft was not at gross weight and the approach was conducted with Flap 20.

Note 2: Landing distances quoted in the Owner's Manual assume the correct approach speed and using average pilot technique.

When considering the distance required for 'ground roll' alone, **Table No. 1** clearly shows that when the runway surface conditions are factored into the landing data at (A) 158 m, the required ground roll distance increases significantly for the different surface conditions at B, C and D and could be as much as 386 m. If you were to factor the landing data at (A) 381 m to clear a 50 ft obstacle, the required landing distance increases significantly for the different surface conditions at B, C, and D and could be as much as 609 m. Factoring for airfield elevation, runway slope and prevailing wind conditions could affect these factored distances further.

The Pilot was on his third approach and landing, having aborted the first two attempts to land. This was an indication that the prevailing conditions at the time were challenging. Furthermore, the runway surface condition was not dry and thus landing distance should have been factored for a damp/wet short grass runway. Such considerations should have been sufficient information for the Pilot to elect to either not operate on the day and/or to divert to an airfield that would have been more appropriate for the prevailing weather and runway surface conditions that existed at the time. In any event, the combination of the prevailing cross wind conditions, the slight down slope and the poor braking action experienced as a result of damp/wet grass conditions, were such that the required factored landing distance exceeded the landing distance available and the aircraft impacted the runway boundary hedgerow at the end of RWY 11. In essence the landing distance available was not sufficient for the given conditions on the day. The clear message for pilot's operating on grass airstrips is that they must factor for prevailing weather and runway surface condition as the braking action will be much less than expected and the required landing distance will be greater when operating on a damp/wet grass runway.

3. CONCLUSIONS

(a) Findings

1. The Pilot was properly licenced and qualified to carry out the flight.

2. The Pilot reported no technical problems with the braking prior to take-off and no mal-function was found with the aircraft's brakes.

3. The prevailing wind conditions, while within limits, were challenging and necessitated two go-arounds prior to the third and final approach/landing attempt.

4. The Pilot reported a two-minute period of misty rain just prior to take-off, therefore the runway surface condition was not dry and thus landing distance required should have been factored for damp/wet short grass conditions.

5. On landing, the expected braking action was not achieved due to the prevailing conditions and the field topography.

6. When factored for prevailing wind and runway surface condition the required landing distance most likely exceeded the landing distance available, the aircraft overran the runway and impacted the boundary hedgerow at the end of RWY 11.

7. Under the prevailing circumstances experienced, a decision not to operate or divert to an alternate airfield would have been the more appropriate action.

(b) Probable Cause

On landing, the aircraft overran RWY 11 and impacted the runway end hedgerow due to poor braking action encountered on the damp grass runway surface.

(c) Contributory Factor(s)

1. The landing runway was not factored for prevailing wind conditions, slope or runway surface condition.

2. The factored landing ground roll distance, exceeded the landing distance available.

4. SAFETY RECOMMENDATIONS

This Investigation does not sustain any safety recommendations.

Appendix A

Aerodrome Safety

Risk from Obstacles at Aerodromes

Safety Promotion Leaflet

AED 1

Analysis of accidents and serious incidents over the last five years has highlighted an ongoing risk from obstacles at aerodromes. While in some cases the primary cause of the accident was not the aerodrome obstacles, they have played a significant role in the severity of the outcome.

Hedges in Ireland can grow quite quickly. The alder (*Alnus glutinosa) and* common ash (*Fraxinus excelsior)*, common in boundary hedges can grow anywhere from 12 – 30 inches per annum. This growth may seriously impinge on the climb and approach path of your aircraft if left unchecked for a number of years.
Typically aerodromes will have overhead wires, either electrical or communications wiring, near their location and these will pose a hazard to operating at the aerodrome.

Additionally there is typically little you can do to have them re-routed or placed underground to completely remove the risk they pose.

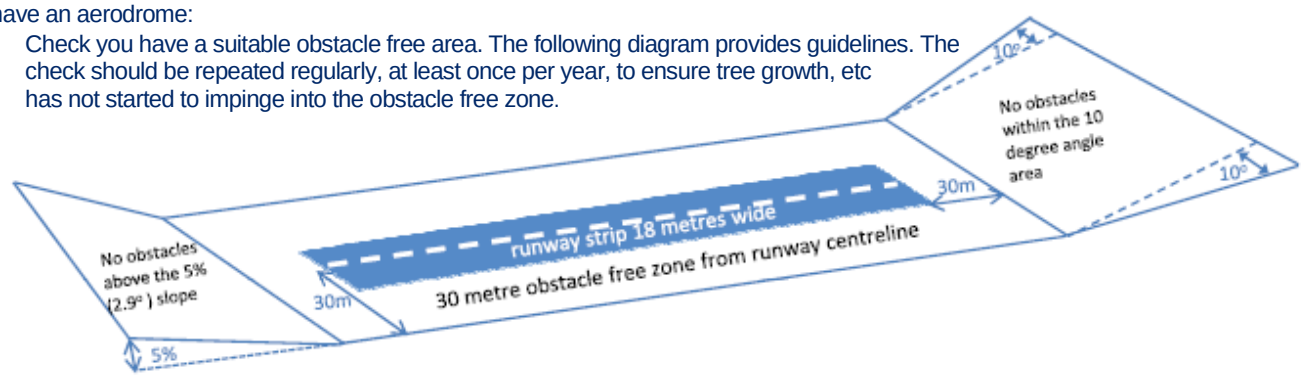
When an aircraft experiences a runway excursion for whatever reason it ideally needs a run-out area free from obstacles. Concrete boundary fences, stone walls, tree trunks, solid pillars and general loose rocks at he boundary can add to the severity of accidents.

Some of the relevant accidents listed on the AAIU site are:

» Accident: Piper PA12, EI-CMN, Birr Airfield Co. Offaly, 27 April 2008: Report 2008-016
» Accident: Mainair Blade 912S, EI-EHR, near Shinrone Co. Offaly, 27 December 2009: Report No 2010-021
» Accident: Laverda SpA Super Falco IV, EI-BMF, Powerscourt Airfield Co. Wicklow, 10 April 2010: Report No 2010-004
» Serious Incident: Cessna 180K, N71763, Private Airfield Co. Meath, 9 August 2009: Report No 2010-015
» Serious Incident: Cessna P210N, N6593W, Brittas House Airfield, Co. Limerick, 12 Aug 2005, Report No 2006-005
» Accident: Mainair Blade 912 Microlight, G-CCFM, Nunstown, Aghadoe, Killarney, Co. Kerry, 27 September 2007: Report No 2009-007
» Accident: Schleicher ASK 13, EI-GLD, near Gowran Grange Airfield, Co. Kildare, 6 March 2010
» Accident: UFMXXL, OK-MUA 78, Clonbullogue Airfield Co. Offaly, 31 May 2008: Report No 2008-020
» Accident: Pilatus PC-6/B2-H4, EI-IAN, Clonbullogue Airfield, Co. Offaly, 4 May 2008: Report No 2008-031
» Accident: Luscombe 8A, N2837K, Navan Airfield, 7 May 2006: Report No 2007-023

Methods to reduce the risk:
If you have an aerodrome:

- Check you have a suitable obstacle free area. The following diagram provides guidelines. The check should be repeated regularly, at least once per year, to ensure tree growth, etc has not started to impinge into the obstacle free zone.



- Check the entire site adjacent to your established obstacle free zone and remove all solid objects where possible. Concrete and heavy timber posts, rocks, stone walls should be removed when possible to reduce the risk of collision.
- Where obstacles exist that cannot be removed ensure that these are well documented and all pilots are briefed prior to using the aerodrome.
- Try to engage with electricity and communication providers to relocate overhead wiring or, at least, make them more visible when they are in the flight path to and from your aerodrome.
- Keep runway surfaces reasonably level and firm. Unpaved surfaces should be regularly mown and inspected daily when in use.

If you are planning to use an aerodrome for the first time:

- Familiarise yourself with the location and ensure you are aware of any obstacles.
- Make sure the runway is adequate for your aircraft. Flight manuals for most aircraft give minimum runway lengths based on paved level surfaces. Pilots should apply appropriate corrections for grass runway surfaces and make additional allowances for any slopes and wind.
- Obtain the appropriate permission to use the aerodrome in advance of starting your flight.

IAA Contacts:
For more information on aerodromes visit the IAA website www.iaa.ie or contact:

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Aerodromes Inspector
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AAIU Reports are available on the internet www.aaiu.ie

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