



Air Accident Investigation Unit Ireland

SYNOPTIC REPORT

ACCIDENT

**Cessna 208B, N208B
Ballyart, Co. Limerick
13 December 2014**



**An Roinn Iompair
Turasóireachta agus Spóirt**

Department of Transport,
Tourism and Sport



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 13¹ to the Convention on International Civil Aviation, Regulation (EU) No 996/2010² of the European Parliament and the Council, and Statutory Instrument No. 460 of 2009³, 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 **ICAO Annex 13:** International Civil Aviation Organization, Annex 13 to the Convention on International Civil Aviation, Air 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 460 of 2009, the Chief Inspector of Air Accidents, on 13 December 2014, appointed Mr Leo Murray as the Investigator-in-Charge, assisted by Mr Howard Hughes an Inspector of Air Accidents, to carry out an Investigation into this Incident and prepare a Report.

Aircraft Type and Registration:	Cessna 208B, N208B
No. and Type of Engines:	1 x Pratt & Whitney Canada PT6A-114A
Aircraft Serial Number:	208B1023
Year of Manufacture:	2003
Date and Time (UTC⁴):	13 December 2014 @ 08.58 hrs
Location:	Ballyart, Co. Limerick
Type of Operation:	General Aviation - Private
Persons on Board:	Crew - 1 Passengers - Nil
Injuries/Incapacitation:	Crew - Nil
Nature of Damage:	Substantial
Commander's Licence:	Commercial Pilot Licence issued by the Federal Aviation Administration (FAA) and an EASA Commercial Pilot Licence (Aeroplanes) issued by the Irish Aviation Authority (IAA)
Commander's Details:	Male, aged 56 years
Commander's Flying Experience:	9,570 hours, of which 200 were on type
Notification Source:	Pilot-in-Command
Information Source:	AAIU Field Investigation and AAIU Report Form submitted by the Pilot

⁴ **UTC:** Coordinated Universal Time (equivalent to local time on the date of the accident).



SYNOPSIS

The aircraft was departing from Brittas House Airfield in Co. Limerick on a private flight to a destination in the United Kingdom. With normal take-off power applied and the aircraft well established in the take-off run, the Pilot felt that the aircraft was not accelerating as expected. Despite the application of extra power the speed did not increase sufficiently for the take-off to be continued safely. The Pilot attempted to overfly the deep ditch at the departure end of the runway but made contact with fencing posts in the process. The aircraft came to rest at the far boundary hedge of the adjacent field and sustained substantial damage. The Pilot exited the aircraft without injury.

NOTIFICATION

The Pilot notified the AAIU immediately following the accident. He also notified the Irish Aviation Authority (IAA) and the Federal Aviation Administration (FAA) as he was the holder of an FAA Airman Certificate. The AAIU deployed two Inspectors of Air Accidents to the scene who arrived at 10.50 hrs.

1. FACTUAL INFORMATION

1.1 History of the Flight

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The Pilot was planning to fly the aircraft to Gloucestershire Airport (EGBJ) in the United Kingdom. He filed a flight plan with Air Traffic Control (ATC) with the intention of activating the plan once airborne. The aircraft had been parked in the open overnight adjacent to the hangar.

The Pilot reported that the grass runway surface was wet but not unduly soft or frozen, with occasional spots of water-logging and mud. The wind was light and from an easterly direction making Runway (RWY) 15 the preferred runway direction for departure. Following the removal of engine and pitot covers, the engine was started and the aircraft positioned away from the hangar to an area at the beginning of RWY 15. Following extension of full flap to permit proper inspection of the flap mechanisms, the engine was shut down and a pre-flight inspection was carried out. Engine start was completed and included a check of the propeller control to ensure the pitch changing mechanism was functioning correctly. Take-off checks were completed from memory and the take-off run was commenced on RWY 15.

With take-off power applied the aircraft appeared to accelerate normally. The Pilot used a soft field technique where aft pressure was applied to the control yoke and the nose-wheel was lifted just off the runway surface as soon as possible. With the aircraft well established in the take-off run, the Pilot felt that the aircraft was not accelerating as expected. As a reserve of take-off power was available, he applied maximum available engine power, however there appeared to be no appreciable increase in acceleration.

The Pilot realised that continuing the take-off in these circumstances was not safe and that stopping in the remaining runway length would likely result in an overrun. As he was familiar with the airfield he was also aware that any overrun would result in the aircraft entering the ditch at the end of the runway. With few options remaining at that point, the Pilot attempted to overfly the ditch at the departure end of the runway with the intention of stopping the aircraft in the adjacent field. As it passed over the ditch, the aircraft made contact with fence posts embedded in the hedge sustaining significant damage to the left elevator and fuselage underside. The aircraft came to rest at the far boundary of the adjacent field, incurring damage to the engine and propeller. The Pilot shut down the engine and was able to evacuate the aircraft unaided.

1.2 The Aircraft

The Cessna 208B is a single-engine, high-wing, utility aircraft available in several different versions according to the role intended. In the passenger role it is capable of accommodating 10-14 persons depending on customer preference. It is powered by a single Pratt & Whitney Canada PT6A-114A turbine engine delivering 675 SHP⁵, driving a three-bladed McCauley constant-speed propeller. The aircraft has two pilot seats but may be flown by a single pilot from the left-hand pilot seat.

N208B was constructed in 2003. The most recent Annual Inspection was performed on 25 October 2014. At the time of the accident, the aircraft had a total operating time of 935 hours. The aircraft was configured with an executive seating layout for four persons in the cabin.

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1.3 The Airfield

Brittas House Airfield is a private, unlicensed airfield situated approximately 15 kilometres southeast of Limerick City at an elevation of 175 ft AMSL⁶. It has a single runway orientated 15/33 with take-off and landing from either direction depending on wind conditions. The runway is 700 metres (m) long and 18 m wide and is comprised of a gravel hard-core base covered with grass. The runway has a slight but even downslope in the direction of RWY 15. Adjacent to the beginning of RWY 15, there is a grass area suitable for aircraft parking. A hangar is also situated in this area.

A single windsock is situated at the mid-point of the runway on the northern side.

1.4 Pilot Interview

The Pilot was interviewed on the day of the accident. He furnished the Investigation with all requested documentation and completed an AAIU Report Form. The Pilot also furnished weight & balance calculations for the flight which showed that the aircraft was loaded within limits.

⁵ SHP: Shaft Horse Power.

⁶ AMSL: Above Mean Sea Level.



He recounted his preparation for the flight and his pre-flight inspection. The aircraft was parked in the open overnight and due to the cold conditions frost had formed on the windshield. This was removed by the Pilot using brushes and anti-ice fluid. The Pilot later remarked that it was possible that some clear ice could have been present on the upper surface of the wing. As the area was '*a bit mucky and wet*' the Pilot started the engine and moved the aircraft to a more suitable area. Here, the flaps were lowered to FULL to facilitate the pre-flight inspection and the engine was shut down.

Following engine start, the engine controls were cycled and showed normal functioning of the powerplant. The Pilot stated that as he flew a number of types of aircraft he used a generic mnemonic-type checklist to ensure that 'vital actions' for take-off have been completed.

During the take-off the Pilot used the 'short field' technique as specified in Section 4 of the Cessna 208B Airplane Flight Manual (AFM). The Pilot remarked that everything appeared normal during the take-off roll until he realised that the aircraft had passed the point where it should normally have lifted off, approximately 300 m from the start of the take-off roll (**Appendix A**). After applying maximum available engine power there was no appreciable increase in acceleration. At this point he realised that there was insufficient runway available to stop safely before the boundary ditch. His '*least bad option*' was to keep sufficient momentum to clear the ditch and bring the aircraft to a halt in the adjacent field.

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He said that with hindsight a decision to discontinue the take-off earlier would have been appropriate, however considering the light load on board (the aircraft was approximately 1,500 lbs below MTOW⁷), the acceleration performance of the aircraft should not have been a problem. The Pilot reported that once the aircraft came to a stop following the event, he shut down the engine and exited the aircraft through the left-hand cockpit door. All other controls were left as selected. Baggage and documentation were left in-situ on the aircraft pending the arrival of the AAIU.

1.5 Runway Inspection

The AAIU inspected the runway surface and the path taken by the aircraft beyond the runway end. The surface of the runway was firm but wet and occasionally muddy, with some standing water to the left of the centreline around the mid-section. The Pilot remarked that he had lined the aircraft up slightly to the right of the centreline to utilise the firmest surface available. The Pilot assisted the Investigation by pointing out the tyre witness marks along the take-off run. He indicated a point approximately 300 m from the start of the take-off run, where the aircraft normally became airborne when taking off in this direction.

The ditch situated at the end of the runway had steeply sloping sides and contained water to a depth of approximately 0.5 m. The outer section of the left elevator had detached due to contact with a fence post and was found on the far side of the ditch embedded in the hedgerow (**Photo No. 1** and **Photo No. 2**).

⁷ **MTOW**: Maximum Take-off Weight.

Witness marks in the adjacent field showed that the aircraft touched down on all three landing gear wheels. Towards the centre of the field a low undulation was present; at this point the nose-wheel track was not evident. Thereafter, the three tyre witness marks continued to where the aircraft had come to rest at the far boundary hedge.



Photo No. 1: End of runway and ditch



Photo No. 2: Close up of ditch with debris

1.6 Damage

The aircraft sustained substantial damage. The aircraft made contact with several wooden posts and a section of pruned hedgerow which was situated at the end of the runway. The most severe damage was caused to the left tailplane (**Photo No. 3**), with compression buckling evident on the fuselage underneath the tailplane carry-through structure. The skin on the aft underside of the fuselage was torn with some damage to the lower fuselage frames. The propeller blades were bent at the tips due to contact with a piece of concrete at the entrance to the field where the aircraft came to halt (**Photo No. 4**).

Repair work subsequently carried out on the engine and propeller revealed neither pre-accident defects nor any factor that may have contributed to a loss of power.

Other damage was limited to a number of dislodged wooden fence posts and surface track marks in the adjoining field.



Photo No. 3: Damage to left tailplane



Photo No. 4: Damage to propeller blades

1.7 Aircraft Inspection

The aircraft was inspected where it came to rest. The position of the controls was noted and photographed. It was observed that the wing flap selector lever was at the FULL detent, the normal flap setting used for landing.

The Pilot recounted that he had set the wing flap selector to the FULL detent as part of his pre-flight inspection. During the inspection by the AAIU, the Pilot informed the Investigation that he had omitted to re-position the flap selection lever to the 20 degree detent following engine-start, the normal setting for take-off. This was consistent with the position that the flap selector was found during the cockpit examination by the AAIU (**Photo No. 5**).

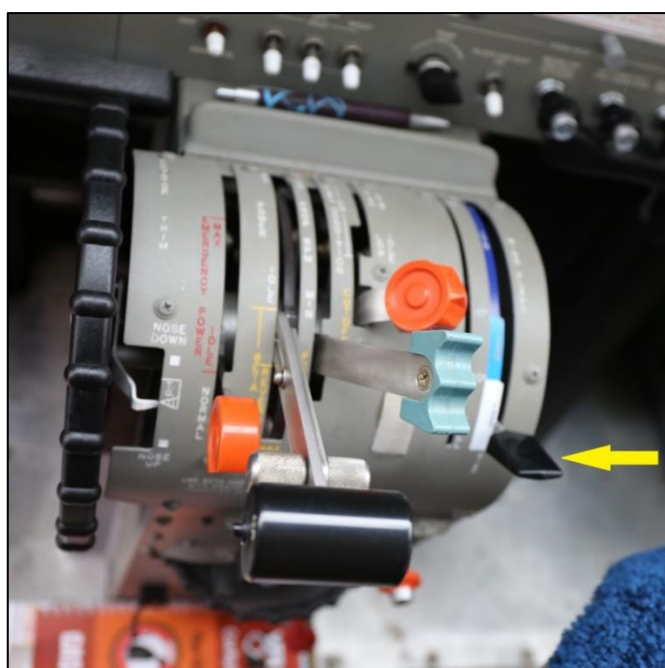


Photo No. 5: Flap lever as found, set to FULL (indicated)

1.8 Take-off Distance Calculation

Section 5 (Performance) of the AFM provides performance data to enable calculation of take-off roll and take-off distance to clear an obstacle at 50 ft. The conditions at the time of the accident were reported as outside air temperature 4 °C, QNH⁸ 1013 hPa and wind calm. The weight and balance report for N208B shows a calculated take-off weight of 7,088 lbs (1,662 lbs below MTOW). Using the applicable 'short field' technique and Flaps 20 on short dry grass, the AFM indicates an expected ground roll on take-off of 285 m.

2. ANALYSIS

2.1 Aircraft Performance

The AFM indicates an expected ground roll on take-off of 285 m on a 'dry grass' runway. This figure is consistent with the 300 m identified as the normal ground roll by the Pilot. The runway surface was wet with mud in places which, by itself was not likely to have lengthened the take-off run or retarded the acceleration of the aircraft to the degree experienced.

The acceleration of the aircraft during the initial part of the take-off run appeared normal to the Pilot. However, as the flaps had been inadvertently left in the FULL position drag was increased to such an extent that the acceleration of the aircraft to normal flying speed was not achieved in the take-off run available.

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On realizing that the aircraft would not reach a safe flying speed despite the application of full power, the Pilot had to make a quick decision. The absence of an over-run area and the presence of a deep ditch at the runway end, meant that failure to bring the aircraft to a stop before the runway end would most likely result in extensive damage to the aircraft and severe injury to himself.

With compromised acceleration, there was no sudden 'failure' to alert the Pilot, rather a gradual realization that the aircraft was not performing as expected. The Pilot did not understand why the acceleration was less than expected and he applied full power. This action did not result in any appreciable increase in acceleration but resulted in the Pilot delaying the decision to discontinue the take-off. The delay in making this decision meant that the Pilot was faced with a poor option later in the take-off run.

Operating a high-performance aircraft from a relatively short airfield leaves little margin for error either during take-off or landing. In this case, braking action would not have been optimal due to the condition of the runway with a wet surface and occasional patches of mud. In the event that expected aircraft performance is not achieved, or is not likely to be achieved, then the decision to abandon the take-off must be made without delay while there is still sufficient runway length available to stop safely.

⁸ QNH: Altimeter barometric setting with reference to sea level.



Notes and general guidance on airstrip operations and take-off/landing performance are available through GACSCI⁹ 'Safety Information Leaflet – Strip Operations' and the CAA¹⁰ 'Safetysense Leaflet No. 7, Aeroplane Performance'. Both of these sources advise determining a decision point on the take-off runway from which the aircraft can be stopped safely in the event that planned performance is not achieved. Although the Pilot was familiar with the point the aircraft normally became airborne, in this case the take-off was continued beyond this point.

2.2 Use of Checklists

The importance of conducting a thorough pre-flight inspection cannot be over-stated especially in conditions where airframe or wing icing may be present.

On complex aircraft types, control and switch positions prior to takeoff are normally verified by means of a checklist. On less complex aircraft, many pilots memorize the checklist or use a mnemonic to ensure that pre-takeoff vital actions have been completed.

In this case, the Pilot positioned the flap selector lever to the FULL or landing position to facilitate inspection of the wing flap mechanisms during the external pre-flight inspection. Following the starting of the engine, the pre-takeoff checks were carried out from memory. However, the Pilot did not realize that the flap selector had been left in the landing detent (FULL) rather than the take-off detent (20°).

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It is important that pre take-off checks are carried out in a careful and deliberate manner. The setting of the flap to FULL to facilitate the pre-flight inspection left the flaps in a non-standard position which was not corrected during the pre take-off checks.

The Investigation notes that the flap selection lever and flap position indicator may be somewhat obscured by engine controls on the quadrant when viewed from the (left) pilot seat.

2.3 Over-run Area

The airfield owner was contacted on the day following the accident. He informed the Investigation that it was necessary to fill in part of the boundary ditch to facilitate recovery of the aircraft.

The Investigation suggested to the airfield owner that he should consider back-filling the entire ditch where it crosses the end of the runway to provide a safe over-run should a subsequent over-run event ever occur. The Airfield Owner agreed to this suggestion and as a result, no Safety Recommendation is made regarding this.

⁹ GACSCI: General Aviation Safety Council of Ireland.

¹⁰ CAA: Civil Aviation Authority (United Kingdom).

3. CONCLUSIONS

(a) Findings

1. The Pilot was properly licenced.
2. The aircraft was properly maintained and in an airworthy condition.
3. The loading of the aircraft was within the limitations specified in the AFM.
4. The runway surface was firm, but wet with occasional patches of mud.
5. The flaps were positioned to the FULL detent to facilitate the pre-flight inspection.
6. Following engine start, the flaps were not positioned to the take-off detent (20°).
7. Drag from the flap surfaces in the FULL position degraded the acceleration performance of the aircraft during the take-off run.
8. The decision to abandon the take-off was made too late in the take-off run.
9. The Pilot took what he considered to be the '*least bad option*' option by attempting to clear the ditch at the runway end and stop the aircraft in the adjacent field.
10. Braking action on the runway was not optimal.

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(b) Probable Cause

The flaps remaining selected in the FULL position following pre-flight checks, which resulted in increased drag and reduced aircraft acceleration during the take-off roll.

(c) Contributory Cause

The decision to abandon the take-off was made too late in the take-off roll.

4. SAFETY RECOMMENDATIONS

This Report does not sustain any Safety Recommendations.



Appendix A

Brittas House Airfield, Co. Limerick



Position at start of take-off, normal lift-off point at 300 m, ditch and final position of aircraft *(based on Google Maps 2015)*

- END -

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.

A safety recommendation shall in no case create a presumption of blame or liability for an occurrence.

Produced by the Air Accident Investigation Unit

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