



Air Accident Investigation Unit Ireland

FACTUAL REPORT

ACCIDENT

**Citabria, 7ECA, EI-ANT
Trim Airfield, Co. Meath**

13 June 2021



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 13¹ to the Convention on International Civil Aviation, Regulation (EU) No 996/2010² 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.

Extracts from this Report may be published providing that the source is acknowledged, the material is accurately reproduced and that it is not used in a derogatory or misleading context.

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 13 June 2021, appointed Paul Farrell as the Investigator-in-Charge to carry out an Investigation into this Accident and prepare a Report.

Aircraft Type and Registration:	Citabria, 7ECA, EI-ANT	
No. and Type of Engines:	1 x Continental O200A	
Aircraft Serial Number:	38	
Year of Manufacture:	1964	
Date and Time (UTC)⁴:	13 June 2021 @ 16.30 hrs	
Location:	Trim Airfield, Co. Meath	
Type of Operation:	Private	
Persons on Board:	Crew – 1	Passengers – 1
Injuries:	Crew – Nil	Passengers – Nil
Nature of Damage:	Destroyed	
Commander's Licence:	Private Pilot Licence (Aeroplane), issued by the Irish Aviation Authority (IAA)	
Commander's Age:	74 years	
Commander's Flying Experience:	10,000 hours, of which 95 were on type	
Notification Source:	The Commander	
Information Source:	AAIU Report Form submitted by the Commander, AAIU Field Investigation	

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

SYNOPSIS

Having completed two circuits to Runway 28 at Trim Airfield Co. Meath, the aircraft was on the ground roll phase prior to a planned third circuit. At approximately 35 – 40 miles per hour (mph), power was applied to accelerate the aircraft. The aircraft swung to the left, departed the side of the runway and continued through a barbed wire fence before coming to rest in an adjacent field. The aircraft was destroyed. The two occupants exited the aircraft unaided. There was no fire.

NOTIFICATION

The aircraft Commander notified the AAIU Inspector-on-Call by telephone shortly after the accident. Two Inspectors of Air Accidents attended the scene and commenced an Investigation.

1. FACTUAL INFORMATION

1.1 History of the Flight

On the afternoon of 13 June 2021, EI-ANT completed a number of circuits at Trim Airfield (EITM). The crew for these circuits was a licensed pilot who was flying the aircraft from the front seat, and a passenger in the rear seat; both occupants were members of a three-person syndicate that owned and operated the aircraft.

Later in the afternoon, the third member of the ownership syndicate arrived at EITM. A further flight was planned that involved a number of circuits being flown, after which it was intended to fly the aircraft to another airfield to take on fuel and then return to EITM.

The crew for this second flight comprised the passenger from the earlier circuits, who was flying the aircraft from the front seat, and is hereafter described as the '*Handling Pilot*', and the third member of the syndicate, who was a licensed pilot, located in the rear seat, hereafter referred to as the '*Pilot-in-Command*'. The Handling Pilot who was flying the aircraft did not hold a pilot licence. The Pilot-in-Command had many years' experience as a flight instructor, although his Flight Instructor (FI) rating had lapsed, and he was in the process of renewing it. The Pilot-in-Command informed the Investigation that he was monitoring the Handling Pilot (seated in the front seat) from his position in the rear seat, where he had access to the aircraft's dual controls. The Pilot-in-Command said that he and the Handling Pilot had flown the aircraft in this fashion on previous occasions and that the Handling Pilot had demonstrated that he was competent in handling the aircraft.

The Pilot-in-Command informed the Investigation that the aircraft took off from Runway (RWY) 28, and joined the left-hand circuit pattern. He reported that following the first circuit a normal '*Touch and Go*' was carried out and a second circuit was commenced.

The Pilot-in-Command said that following the second circuit the aircraft was established on a visual approach and that the aircraft was stable on the extended centreline and the approach path. He described that a normal three-point landing was carried out and the aircraft was allowed to decelerate to approximately 30 mph. Engine power was then increased and the aircraft was reported to accelerate normally, with no adverse indications.



The Handling Pilot reported that at approximately 35 to 40 mph the aircraft swung '*violently*' to the left, departed the side of the runway and continued through a barbed wire boundary fence, coming to rest approximately 40 metres (m) into an adjacent field.

Both occupants were able to exit the aircraft unaided. Neither occupant reported any injury to the Investigation. There was no fire.

1.2 Observations at the Accident Site

The aircraft came to rest on a magnetic heading of approximately 180 degrees (**Photo No. 1**).



Photo No. 1: Final resting position of the aircraft

The right wing was fractured and bent rearwards and downwards and the associated wing struts were bent and folded. The left undercarriage leg had separated from its attachment point to the fuselage. The propeller's two blades exhibited evidence of ground impact. The door through which both occupants exited the aircraft was restricted in its opening range because of interference with the distorted structure of the right wing.

During recovery, with the aircraft lifted clear of the ground, it was established that both wheel brakes appeared to be functioning normally with no evidence of binding.

A survey of the runway indicated that during the landing the aircraft touched down to the left of centreline, and that approximately 140 m from the runway threshold, the aircraft started to veer to the left. Over the subsequent 20 m (in the runway direction) the aircraft traversed the 24 m wide runway shoulder and impacted with the boundary fence. The aircraft continued into the adjacent field, coming to rest approximately 20 m from the boundary fence.

1.3 Interviews

1.3.1 The Handling Pilot

The Handling Pilot said that the aircraft's normal approach speed was 60 mph, and he believed that this was the speed at touch down. He said that the aircraft touched down normally and he allowed it to settle, and that the tailwheel settled. He said that he then increased the power and as soon as he did so the aircraft veered to the left. He said that he applied full right rudder but that the aircraft did not turn in response to the input (the tailwheel is not steerable). He informed the Investigation that he had been aware that the aircraft was to the left of centreline and that he was probably initiating actions to steer towards the centreline while also applying power for the take-off. He said that he believed that he had brought the power back when the aircraft departed the runway, prior to the aircraft impacting the fence.

He did not think that he had applied the aircraft's brakes. He noted that the brakes are '*heel brakes*' meaning that they are activated by pressing on the brake pedal with one's heel. He informed the Investigation that in normal operation his feet would be on the rudder pedals, and therefore not in contact with the brake pedals.

He informed the Investigation that he had approximately 12 to 14 hours flying experience on EI-ANT, most recently in the previous week when he had flown circuits in the occurrence aircraft with the Pilot-in-Command seated in the rear of the aircraft, and that he had also flown Cessna 172 aircraft.

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He was unable to provide any explanation for the aircraft departing the runway. He informed the Investigation that evacuation from the aircraft was made difficult by the collapsed wing struts interfering with the range of motion of the aircraft door.

1.3.2 The Pilot-in-Command

The Pilot-in-Command had 10,000 hours flying experience, 6,000 of which were as Pilot-in-Command, and 95 of which were on the accident aircraft type. His last Flight Check was on 14 January 2020, and his licence was valid until 28 February 2022. The Pilot-in-Command held a Class 2 medical certificate which was issued on 6 September 2020, and valid until 6 September 2021.

The Pilot-in-Command, who was monitoring the Handling Pilot, informed the Investigation that the first circuit was completed without incident and with a normal '*Touch and Go*'. On the second circuit, the Pilot-in-Command reported that the aircraft was stable on both centreline and in terms of height, and that a normal three-point landing was executed.

The Pilot-in-Command reported that the aircraft decelerated normally to about 30 mph and that there were no adverse indications. He reported that following the application of power, as the aircraft accelerated, it swung '*violently*' to the left and continued through the barbed wire boundary fence into the adjacent field where it came to rest.



He informed the Investigation that there were no prior indications or warnings, no aircraft technical defects, and that he did not believe that the weather, which he described as 'very good', was a factor.

He informed the Investigation that the wheel brakes were not in use and that while he had a clear understanding of tailwheel aircraft and ground-loops⁵, he was at a loss to explain why the event had occurred.

The Pilot-in-Command stated that his Flight Instructor Rating had expired on 30 April 2021, and that due to COVID-19 restrictions its renewal had been delayed. He also said that scheduled renewal flights had been cancelled on two occasions in May 2021 due to unsuitable weather and on another occasion for other reasons. He advised that before the occurrence he had scheduled a rating Renewal Flight for 15 June 2021.

1.4 Aircraft Description

EI-ANT was a Citabria 7ECA aircraft manufactured in 1964. It was equipped with a Continental O200A engine and a McCauley two-bladed, fixed-pitch, metal propeller. It had accumulated a total flying time of approximately 3,190 hours. The aircraft had a fixed, conventional undercarriage which means that it had two main wheels on sprung steel legs, one on each side of the forward fuselage and a single, castoring, non-steerable, tailwheel.

The aircraft was fitted with tandem seating, and dual-controls. The fuselage and tail surfaces were constructed of welded metal tubing while the fuselage shape was constructed of wooden formers and longerons, covered with fabric. The aircraft had strut-braced, fabric-covered wings, with wooden spars and aluminium ribs.

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1.5 Airfield Description

Trim Airfield has a prepared grass strip runway, which is 560 m long and 12 m wide. The runway has 24 m wide grass-covered shoulders on each side. The runway designations are 10 and 28. Its elevation is 200 ft. The Investigation observed that the runway grass had recently been cut.

1.6 Meteorology

Met Éireann provided an aftercast for the Trim area at the time of the accident.

The general meteorological situation was that a high pressure system of 1029 hectoPascals (hPa) was centred over NW mainland Europe, giving a light south-westerly or variable flow across Ireland.

Specific details for the Trim area around the time of the accident are set out in **Table No. 1**.

⁵ **Ground Loop:** A violent, uncontrolled horizontal rotation of an aircraft while landing, taking off, or taxiing.

FINAL REPORT

Wind:	Surface:	West-southwest 5-8 knots (kts) with gusts up to 12 kts.
	2000 feet (ft):	West to southwest 15-18 kts
	Between surface and 300 ft:	Similar to surface
Visibility:	Minimum visibility 25 kilometres (km)	
Weather:	Dry, with a mix of hazy sunshine and cloudy patches	
Cloud:	Few (1-2/8 oktas) of fair weather cumulus with bases between 2,000 and 3,000 ft. Broken (5-7/8 oktas) layers of stratocumulus clouds with bases around 5,000ft, and 6,000 ft.	
Surface Temperature/ Dew Point Temperature:	22/16 degrees Celsius	
Mean Sea Level (MSL) Pressure:	1025 hPa	
Freezing Level:	13,000 ft	

Table No. 1: Trim area meteorological information

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1.7 Effects of Propeller Rotation

The aircraft's propeller rotated clockwise when viewed from the cockpit. Consequently, the airflow aft of the propeller would spiral around the fuselage in a clockwise direction.

The following factors (**Figure No. 1**) are known to affect single engine propeller driven aircraft:

- P-Factor
- Roll due to propeller torque effect
- Prop-wash
- Gyroscopic precession

1.7.1 P-Factor

This is the term for asymmetric propeller loading that causes the aircraft to yaw when the propeller disc is not perpendicular to the relative airflow, e.g. when the aircraft is at a high angle of attack.



In the case of a clockwise rotating propeller (when viewed from the cockpit), the descending right side of the propeller disc, as seen from the rear, has a higher angle of attack relative to the oncoming air, and thus generates a higher air flow and thrust than the ascending left side. This moves the propeller's aerodynamic centre to the right of the aircraft centreline, thus inducing an increasing yaw moment to the left. The effect increases with increasing aircraft angle of attack or increasing engine power.

1.7.2 Propeller torque effect

Torque effect is the tendency for an aircraft to roll in the opposite direction to the rotation of the propeller. In the air, this is generally exhibited as a left rolling tendency in a single engine propeller driven aircraft, with a clockwise turning propeller (when viewed from the cockpit). The effect is greater at slow forward airspeeds. During the take-off roll, torque reaction from a clockwise-rotating propeller causes an increase in the load being placed on the left hand main landing gear. This results in increased friction on the left hand tyre compared to the right, causing a turning moment (yaw) to the left.

1.7.3 Prop-wash

A propeller pushes air back in a helix around the fuselage. In the case of a clockwise rotating propeller (when viewed from the cockpit), as the air spirals around the fuselage it pushes against the left side of the vertical tail, causing the aircraft to yaw to the left. This left yawing tendency is compounded by the angle of attack of the spiralling air on the aircraft fin which also induces a left yawing tendency. The prop-wash effect is at its greatest when the airflow is flowing more around the fuselage than along it, i.e., at high power and low airspeed.

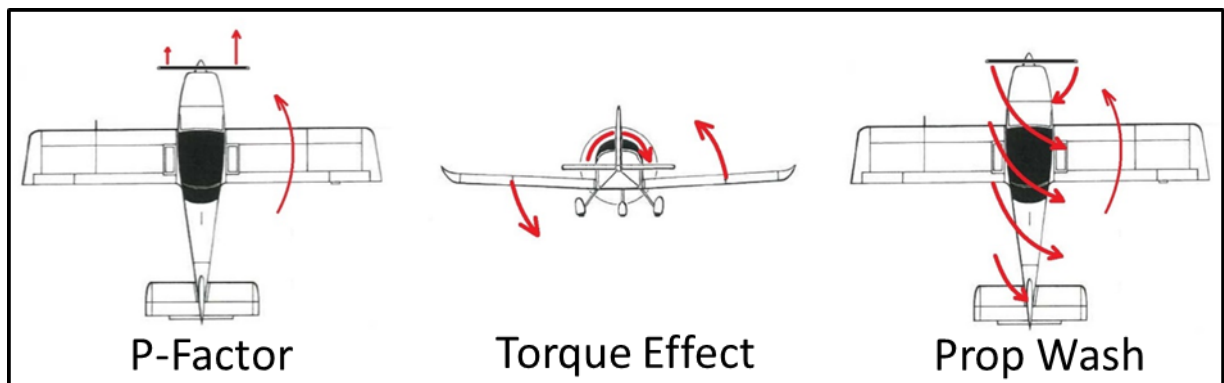


Figure No. 1: Generic schematic of propeller and handling factors

1.7.4 Gyroscopic Precession

The motion of a spinning propeller is gyroscopic in nature. This means that any force applied to a spinning propeller will, because of gyroscopic precession have an effect at 90 degrees (in the direction of rotation) to the applied force. In the case of a tailwheel aircraft, raising the tail of the aircraft during a ground roll causes a force to be applied to the to the top of the propeller disk—and due to gyroscopic precession, this force actually acts on the right hand side of the propeller disk, increasing the tendency to yaw to the left.

2. AAIU COMMENT

The aircraft undercarriage was comprised of two main wheels forward of the aircraft centre of gravity (CG) and a tailwheel aft of the CG. Aircraft with this undercarriage arrangement are usually referred to as tailwheel (tail-dragger) aircraft. Due to this arrangement, with the CG behind the main wheels, the aircraft can suffer from directional instability during ground manoeuvring.

In the case of this aircraft, the tailwheel was not steerable, rather it could castor freely. If such an aircraft swerves/veers while rolling the (ground) rudder authority alone may not be sufficient to prevent the CG from getting ahead of the main gear, which can cause the aircraft to execute an uncommanded yawing manoeuvre. The various forces due to propeller rotation (P-Factor, propeller torque effect, prop-wash and gyroscopic precession) can exacerbate the situation.

The Pilot-in-Command's licence and medical certificate were valid, and his Instructor rating had expired. The Pilot-in-Command had confidence in the Handling Pilot's abilities, based on earlier flights in the aircraft.

Whilst neither the Handling Pilot nor the Pilot-in-Command was able to explain the exact reason(s) for the aircraft departing the runway, the tail-dragger arrangement meant that this aircraft was more susceptible to such a departure and that once it started it would be difficult to arrest. The reported landing to the left of the centreline reduced the time and space available to attempt a recovery before the aircraft departed the runway. There were no reported issues with the aircraft that might have contributed to the accident, and no such anomalies were identified during subsequent examination of the wreckage. Weather was not a factor in the accident sequence.

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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.

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

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Air Accident Investigation Unit,
Department of Transport,
2nd Floor, Leeson Lane,
Dublin 2, D02TR60, Ireland.
Telephone: +353 1 604 1293 (24x7): or
+353 1 241 1777 (24x7):
Fax: +353 1 604 1514
Email: info@aaiu.ie
Web: www.aaiu.ie
Twitter: @AAIU_Ireland