Air Accident Investigation Unit Ireland

FACTUAL REPORT

ACCIDENT

ICP Srl Savannah S, EI-GEO
Navan Airfield, Co. Meath

2 October 2019

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 2 October 2019, appointed Clive Byrne as the Investigator-in-Charge assisted by Daniel Delaney, an Inspector of Air Accidents, to carry out an Investigation into this Accident and prepare a Report.

Aircraft Type and Registration:	**ICP Srl, Savannah S, EI-GEO**
No. and Type of Engines:	**1 x BRP-Rotax 912 ULS**
Aircraft Serial Number:	**15-08-54-0413**
Year of Manufacture:	**2015**
Date and Time (UTC)[4]:	**2 October 2019 @ 12.20 hrs**
Location:	**Navan Airfield (EIHH), Co. Meath**
Type of Operation:	**General Aviation**
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 Age:	**58 years**
Commander's Flying Experience:	**11,552 hours, of which 14 were on type**
Notification Source:	**Pilot**
Information Source:	**AAIU Report Form submitted by the Pilot, AAIU Field Investigation**

[4] **UTC:** Co-ordinated Universal Time. Unless otherwise stated, all times in this report are quoted in UTC. Local time was UTC +1 hour on the day of the accident.

SYNOPSIS

The Savannah S aircraft departed from Navan Airfield, Co. Meath for a local flight. Shortly after take-off, and while still over the runway, the aircraft experienced an uncommanded loss of engine power. The Pilot attempted an emergency landing onto the remaining runway. After touchdown, the aircraft passed through a wire fence at the end of the runway and came to rest nine metres beyond the fence. The Pilot, who was the sole occupant, was uninjured and exited the aircraft unaided. The aircraft sustained substantial damage. There was no fire.

NOTIFICATION

The Pilot notified the AAIU of the accident.

1. FACTUAL INFORMATION

1.1 History of the Flight

The Pilot arrived at EIHH at approximately 11.40 hrs and conducted a pre-flight inspection of the aircraft in the hangar. The Pilot stated that the engine oil was checked as part of the pre-flight inspection and two fuel samples were taken from the fuel drain. The fuel samples were clear and free of any visible contamination. The Pilot described the quantity of fuel on board as being '*close to full*' and no fuel was uplifted.

The Pilot stated that the weather conditions were good with '*a slight north-westerly breeze*' and that '*heavy dew*' was on the ground. The Pilot removed the aircraft from the hangar and positioned it onto the grass taxiway, then started the engine and taxied to the holding point of Runway (RWY) 27, where the pre-take-off checks were completed. The Pilot said that it took approximately *'five minutes or slightly longer'* for the oil to reach the minimum required operating temperature of 50 °C.

Take-off commenced using full throttle and flaps set at '*half*' deflection. The Pilot recalled '*rotating'*[5] at an indicated airspeed of 35 miles per hour (mph), and when airborne accelerating to a climb speed of 70 mph. The Pilot stated that '*at or slightly above a height of one hundred feet above the runway, the engine wound back over the course of about a second to idle power*'. In response, the Pilot lowered the nose of the aircraft and the engine briefly regained power before again reducing to '*near idle power*'.

The Pilot recalled closing the throttle and attempting an emergency landing onto the remaining runway. The Pilot described the braking action as being '*less effective than normal*', and '*like braking on ice*'. The aircraft passed between two large fence posts and through a wire fence at the end of the runway, which caused the aircraft to decelerate rapidly. The nose landing gear folded rearwards under the fuselage and the propeller made contact with the ground.

[5] **Rotating:** An application of back pressure on the control stick to raise the nose-wheel off the runway.

The right wing tip contacted the ground and the right main tyre partially detached from the wheel hub before the aircraft came to a stop, nine metres beyond the fence (**Photo No. 1**). There was no fire, and the Pilot exited the aircraft without assistance.

Photo No. 1: Final resting position of EI-GEO

1.2 Injuries to Persons

No injuries arising from the accident were reported to the Investigation.

1.3 Personnel Information

The Pilot's PPL(A) contained a valid SEP (Land)[6] class rating. The Pilot's Medical Certificate was valid. **Table No. 1** shows the Pilot's total and recent flying experience.

Age:	58 years
Licence:	PPL (A)
Total all Types	11,552 hours
Total on Accident Type:	14 hours
Last 90 Days:	40 hours
Last 28 Days:	9 hours
Last 24 Hours:	0 hours

Table No. 1: Pilot's Flying Experience

[6] **SEP (Land):** Single Engine Piston (Landplanes).

1.4 Aircraft Information

The Savannah S is a single engine, all-metal, high-wing, two-seat aeroplane with a fixed tricycle undercarriage. The subject aircraft, EI-GEO, was manufactured in Italy in 2015. The IAA issued a Flight Permit for the aircraft on 14 December 2017, and the Flight Permit Validity Certificate was valid until 14 December 2019. On 23 June 2019, at 181.1 hours total time, a National Microlight Association of Ireland (NMAI) authorised Inspector recorded the completion of a 200-hour maintenance check in the airframe logbook. On 11 August 2019, at 201 hours total time, one of the aircraft's owners recorded the completion of a 200-hour engine check in the engine logbook. The airframe and engine had accrued a total time in service of 218.3 hours at the time of the accident. The maximum operating weight as stated on the Flight Permit was 600 kg.

1.4.1 Engine and Propeller

EI-GEO was powered by a BRP-Rotax 912 ULS engine. The engine is a four-cylinder, four-stroke, horizontally opposed, spark ignition engine. The '*ULS*' designation indicates that the engine was a non-certified aircraft engine with a maximum engine power output of 73.5 kW (98.6 Horsepower)[7]. A clockwise-rotating (when viewed from the cockpit) three-blade '*DUC FLASH*' ground-adjustable propeller was fitted which was driven via a reduction gearbox.

1.4.2 Ignition System

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The engine's spark ignition system was independent of the aircraft electrical system and incorporated two ignition units for redundancy. Each engine cylinder had two spark plugs, each energised by a different ignition unit, thereby ensuring engine operation in the event of a failure in one ignition system.

1.4.3 Fuel and Induction System

The engine was equipped with two float-type carburettors to supply the appropriate fuel/air mixture to the cylinders during operation (**Photo No. 2**). The left carburettor supplied cylinders No. 2 and No. 4, while the right carburettor supplied cylinders No. 1 and No. 3. Each carburettor was fitted with an individual air filter. When checked by the Investigation, the fuel in both carburettor bowls was free from contamination and the floats were in good condition. On the subject aircraft, the means to prevent and eliminate engine induction icing (carburettor icing) relied on air entering the two air intakes within the engine compartment, being warmed by engine operation.

[7] Operators Manual for BRP-ROTAX Engine Type 912 Series (BRP-ROTAX GmbH).

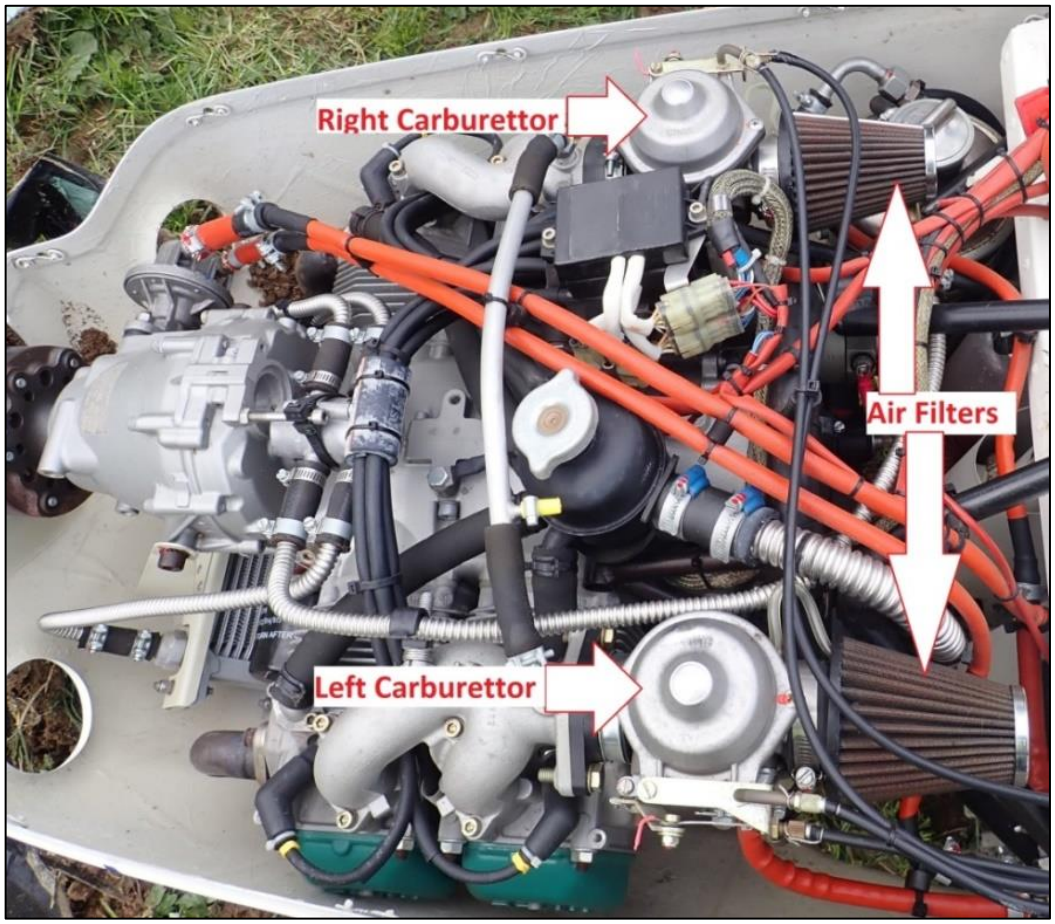

Photo No. 2: BRP-Rotax 912 ULS engine installation in EI-GEO

The inboard part of each wing contained a 36 litre (L) fuel tank, giving a total capacity of 72 L. Fuel was fed from both wing tanks to a 6 L collection tank located in the fuselage which incorporated a fuel drain. An engine-driven fuel pump transferred fuel from the collection tank to both carburettors via an *ON*/*OFF* fuel valve and filter. A separate electrically powered fuel pump was fitted for redundancy, and engine starting. The Pilot recalled checking the correct operation of both fuel pumps and that the electric fuel pump was selected to '*ON*' prior to take-off.

The Engine Manufacturer, in its Operator's Manual and the BRP-Rotax Service Instruction SI-912-016, recommended the use of Mogas[8], with a minimum RON[9] of 95 (EN228 Super or EN228 Super Plus) and with not more than 10% ethanol. The Pilot reported that the fuel used in the aircraft was Mogas, sourced from a service station with a high turnover of fuel stock. Recent flying recorded in the aircraft logbooks indicated that the entire fuel system would have contained fresh fuel. In addition to the regular pre-flight checks for water and other contamination, the Pilot reported that a funnel designed to separate water and filter solid contaminants from the fuel, was always used when transferring fuel into the aircraft tanks.

[8]**Mogas:** Motor Gasoline.
[9]**RON:** Research Octane Number. The higher the octane number the more compression the fuel can withstand before detonating.

1.5 Damage to Aircraft

The three propeller blades were broken, and the propeller spinner was cracked. The nose landing gear had collapsed, and the lower engine cowling was damaged. The fuselage below the cockpit was distorted, the structure above the cockpit ruptured, the fuselage on both sides forward of the cockpit doors creased and the windscreen was cracked. The outermost part of the right wing leading edge and wingtip was dented and contained soil. The right main undercarriage tyre had partially detached from the wheel hub. **Photo No. 3** shows some of the damage sustained during the accident. Post-accident examination of the engine by a Rotax Engineer did not reveal any defects that may have caused the reduction in power reported by the Pilot. No other defects were reported to the Investigation after repairs to the aircraft were completed.

Photo No. 3: Some of the damage to EI-GEO

1.6 Other Damage

The wire fence at the end of the runway was detached from the poles, and the orange and black warning boards were displaced and damaged. The debris from the warning boards can be seen in **Photo No. 1** and **Photo No. 3.**

1.7 Meteorological Information

Met Éireann, the Irish meteorological service, provided the Investigation with the following aftercast for the general area at the time of the accident (**Table No. 2**).

Meteorological Situation:	A transient high pressure ridge covers Ireland.	
Wind:	**Surface:**	North to northwest 3-6 knots (kt)
	2000 feet (ft):	Northeast 5-10 kt
	Between surface and 300 ft:	Directional variation between west and northeast. 5-8 kt.
Visibility:	Greater than 30 kilometres	
Weather:	Dry, with hazy sunshine	
Cloud:	Scattered (3-4 oktas[10]) fair weather cumulus cloud with bases around 3,500-4,000 ft	
Surface Temp/Dew Pt:	11/6 degrees Celsius	
MSL Pressure:	1022 hectopascals	
Freezing Level:	Greater than 10,000 ft	
Other Comments:	Nil	

Table No. 2: Weather aftercast provided by *Met Éireann*

1.8 Airfield Information

Navan Airfield is a private unlicensed grass airfield located three nautical miles north-east of Navan, County Meath, at an elevation of 250 feet above mean sea level. **Figure No. 1** shows the general layout of the airfield. According to the airfield website, the take-off run available on RWY 27 was 700 m. There was a fence at the end of the runway. The fence consisted of a number of large vertical wooden poles set in the ground and spaced across the end of the runway. Fencing wire was attached to the poles and carried orange and black coloured boards to highlight the presence of the fence. The poles are not highlighted in the airfield information as presented on the airfield operator's website.

[10] **Okta:** The World Meteorological Organisation unit of cloud cover. One okta covers 1/8th of the sky.

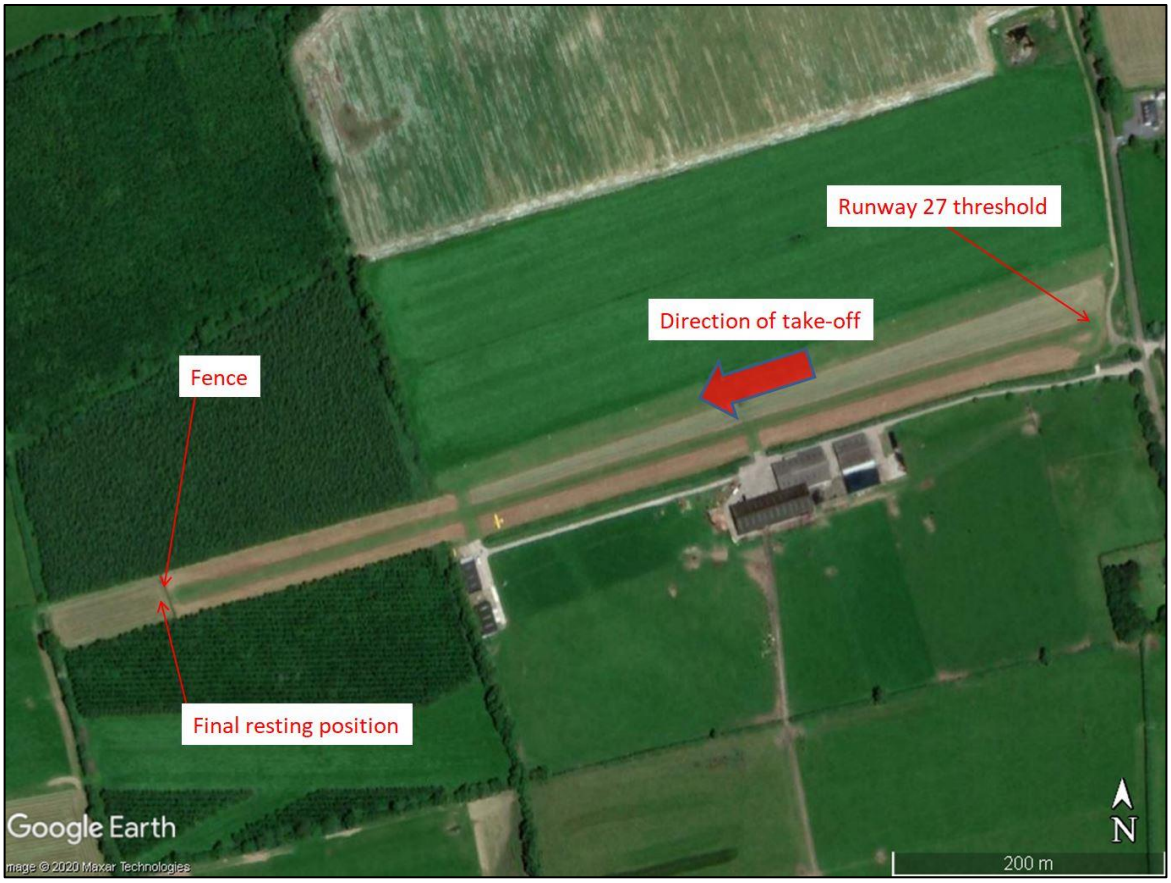

Figure No. 1: Navan Airfield (*Google Earth*)

1.9 Carburettor Icing

The European General Aviation Safety Team (EGAST) safety promotion leaflet '*GA 5*' titled '*Piston Engine Icing*' (June 2013) provides information to assist Pilots of aircraft fitted with carburettor-fed engines. In relation to induction icing, it describes carburettor icing as:

> '[…] *the most common, first to appear, and the most serious* [form]*. There is a sudden temperature drop when the fuel vaporises in the air, and another drop when pressure reduces as the mixture passes through the carburettor venturi and throttle valve. If the temperature drop cools the air below its dew point, water condenses. If the mixture temperature falls below freezing, the condensed water will form ice on the surfaces of the carburettor. This ice gradually blocks the venturi, changing the fuel/air ratio and causing a progressive, smooth loss of power.*'

1.9.1 Effect of Atmospheric Conditions on Carburettor Icing

The EGAST GA 5 safety leaflet includes an illustration of the probability of '*Carburettor Icing*' at various combinations of temperature, dewpoint and engine power setting (**Figure No. 2**). The temperature and dewpoint provided by *Met Éireann* for the time of the accident is highlighted in red.

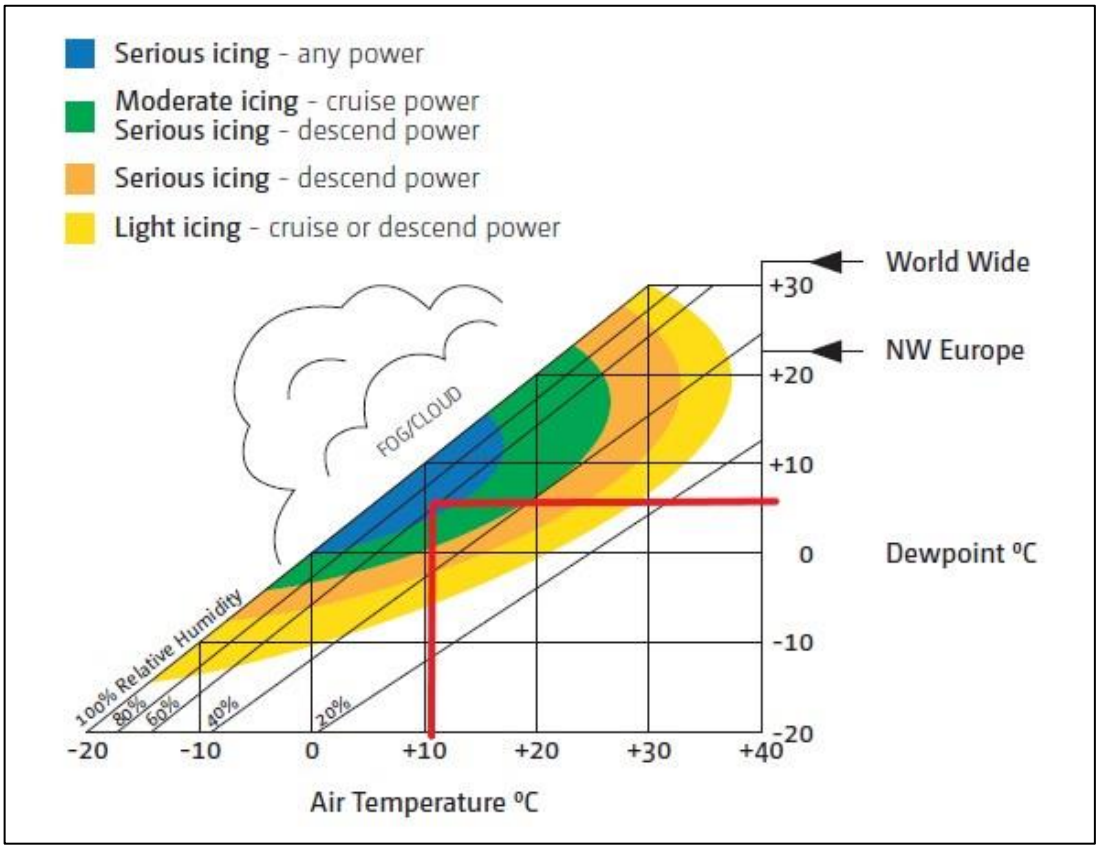

Figure No. 2: Atmospheric conditions for carburettor icing

Figure No. 2 is based on the use of aviation gasoline (avgas). GA 5 states that '*Carburettor icing is more likely when MOGAS is used, because of its volatility and water content*'. Therefore, the risk areas in **Figure No. 2** will be larger when the fuel used is Mogas.

The EGAST safety leaflet states that:

> '*Aviation weather forecasts do not normally include specific warnings of induction system icing. Pilots must therefore use knowledge and experience. Dewpoint readings close to the temperature mean the relative humidity is high.* […] *When dewpoint information is not available, assume high humidity particularly when:* […] *the ground is wet (even with dew) and the wind is light*.'

2. AAIU COMMENT

The aircraft was operating in accordance with a Flight Permit and the associated Validity Certificate was in date. The aircraft maintenance was certified in accordance with the procedures of the NMAI as approved by the IAA.

The Pilot reported that he had observed heavy dew on the grass of the airfield. Based on the atmospheric conditions for carburettor icing chart as published by EGAST in their GA 5 safety leaflet (June 2013), and the environmental conditions prevailing at the time of the occurrence, there was a serious risk of carburettor icing. The inherent characteristics of Mogas further increased the icing risk.

It is probable that '*serious*' carburettor icing was forming during ground operation and continued to form with full throttle selected during take-off. Carburettor icing forms in an insidious manner and may initially go unnoticed. It gradually blocks the carburettor's venturi, changing the fuel/air ratio and causing a progressive loss of power. Carburettor icing has been identified as a factor in several other AAIU investigations.

The subject engine installation relied on the location of the carburettors and air intake filters within the engine compartment and the increased ambient air temperature within the engine compartment while the engine was operating, as the means of preventing carburettor icing. It is probable that, prior to take-off, the temperature of the air within the engine compartment had not reached a temperature that would have precluded the formation of carburettor ice, or to remove any that had already formed, due to the prevailing conditions existing on the airfield at that time.

The Pilot described the braking after touchdown as being '*less effective than normal*' and '*like braking on ice*'. The repairs and maintenance completed after the occurrence did not find any defect in the braking system, and therefore the Investigation is of the opinion that this was probably due to reduced runway friction caused by the '*heavy dew*' on the grass runway.

The ground marks and damage to the aircraft were consistent with entanglement in the wire fence causing the nose landing gear to fold under the fuselage, leading to the propeller and lower cowling contacting the ground. The entanglement also pulled the aircraft's nose to the left of the direction of travel inducing a short skid that briefly rolled the aircraft to the right causing the right wingtip to impact the ground, causing crush damage to the wing tip and outer leading edge. The weight of the fuselage resting on the nose gear leg caused further damage to the fuselage. The aircraft avoided contact with the large fence poles at the end of the runway because it was a high-wing design. The poles are not highlighted in the airfield information as presented on the airfield operator's website. An aircraft impacting with such poles could suffer more serious damage with the potential for injury to the occupants.

SAFETY RECOMMENDATIONS

This Investigation does not sustain any Safety Recommendations.

- 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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