

ACCIDENT

Aircraft Type and Registration:	Druine D.31 Turbulent (modified), G-AREZ	
No & Type of Engines:	1 Volkswagen 1834 piston engine	
Year of Manufacture:	1960 (Serial no: PFA 561)	
Date & Time (UTC):	8 July 2021 at 1730 hrs	
Location:	Easterton Airfield, Birnie, Elgin	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - 1 (Serious)	Passengers - N/A
Nature of Damage:	Engine separated from aircraft and aircraft broken in two. Damaged beyond economic repair	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	55 years	
Commander's Flying Experience:	1,614 hours (of which 64 were on type) Last 90 days - 45 hours Last 28 days - 19 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

The engine failed shortly after takeoff. The pilot began a left turn to avoid trees ahead, but the aircraft stalled in the turn and struck the ground. During the touchdown the aircraft broke up and the pilot sustained serious injuries.

Although not positively determined, it appeared likely that a magnet detached from the propeller spinner back plate during takeoff, and this combined with incorrect wiring within the ignition system to stop the engine.

History of the flight

The aircraft had flown earlier in the day for approximately 55 minutes and that flight was routine with no evidence of any issues with the engine. For the accident flight a witness saw the aircraft start up, conduct engine run up checks and taxi out. All of these appeared and sounded normal. The pilot reported that the engine started easily and that oil pressure registered immediately. The pilot allowed the engine to warm up for between five and eight minutes before conducting the power checks. He stated that during the warm-up and power checks all indications were normal and he noticed no issues with the aircraft. The chocks were then removed, and the pilot taxied to the threshold of Runway 26 with the carburettor heat on. He stated that his routine was to taxi with carburettor heat on and turn it off during the pre-takeoff checks.

After completing the takeoff checks the pilot selected full power and during the acceleration checked that the engine and airspeed indications were all normal. The witness saw the aircraft start its takeoff roll but it was soon lost to sight behind a building. At that point the witness left the airfield in his car.

The aircraft lifted off at 48 mph but the pilot held the aircraft close to the ground to accelerate to 64 mph to improve the subsequent climb rate. At approximately 150 ft agl and with the aircraft approaching the airfield boundary the pilot reported that the engine suddenly stopped. He immediately lowered the nose to maintain flying speed. The terrain ahead was undulating, planted with trees and, in the pilot's view, unsuitable for any forced landing. The pilot began a left turn, using 20° to 30° angle of bank, but was concerned that the manoeuvre carried an increased risk of stalling. As he commenced the turn, he switched off the ignition and fuel supply to the engine.

The pilot stated that, during the turn, the aircraft stalled at approximately 50 ft agl and there was a significant left wing drop. The pilot applied full right rudder to attempt to control the roll attitude. The aircraft then struck the ground in an approximately wings level and nose-down attitude. The pilot estimated the time from the engine failure to touch down was 8 to 10 seconds. After the aircraft struck the ground, the pilot believes he was unconscious for a number of seconds. When he regained consciousness, he recognised the severity of the situation. The fuselage had broken at the front of the cockpit, though the pilot had remained secure in his five-point harness. He managed to release his harness and was then able to crawl clear of the wreckage and telephone the witness who had seen his departure.

As the witness was driving home, the pilot of the aircraft phoned to say that he had been in an accident and was on the ground at the end of the runway. The witness, who is a doctor, returned to the airfield and went to the site of the accident to assist the pilot. He called the emergency services.

Ground ambulances arrived approximately 10 minutes after the 999 call and then, due to the extent of the pilot's injuries, an air ambulance was called, arriving 35 minutes after the initial call. The pilot was transferred by air to the major trauma unit at Aberdeen Royal Infirmary.

Aircraft information

G-AREZ (Figure 1) was originally built by Rollason Aircraft and Engines Ltd in 1960. The aircraft was badly damaged in a heavy landing circa 1980, and after a long period out of service it was repaired, refurbished and returned to flying in August 2018. It was sold to the current operator in November 2019.



Figure 1
G-AREZ

Accident site

The aircraft struck the ground at the western end of Easterton airfield close to the threshold for Runway 08 (Figure 2).



Figure 2
Easterton airfield showing accident location

During the accident sequence the forward fuselage separated from the rest of the airframe just forward of the cockpit. There was extensive damage (Figure 3).



Figure 3
Aircraft at accident site

Aircraft examination

The aircraft and engine were examined by an Inspector from the Light Aircraft Association (LAA). He concluded that there was no evidence of a mechanical failure prior to impact, the engine controls were operating normally and the fuel system was operating correctly. The issue of carburettor icing was considered. However, as the pilot reported he had taxied out with carb heat on, selecting it off just prior to takeoff, it was considered unlikely to have caused the engine failure.

The aircraft's ignition system was extensively examined and, while some loose connections were found, both Leburg ignition controllers passed bench tests. The Leburg controllers receive timing information from sensors which detect the passage of magnets fitted to the propeller spinner back plate. The spinner backplate was damaged and one of these magnets was missing. There was evidence it had not been effectively glued in position. The wires connecting the controller to the magnet sensors should be arranged so that the connector responding to north magnet pole in one wiring harness is connected to the sensor for a south magnet pole in the opposite controller wiring harness. The controllers require an alternating sequence of poles passing the sensors, ie north–south–north–south, to operate correctly. If this sequence is not apparent the controller will not initiate the ignition spark.

In G-AREZ the wiring harness for both controllers were wired so the north magnet pole sensors were on identical connectors, so if a magnet was lost the engine would stop. The LAA Inspector made the following statement in his report: *'I believe that in-flight loss of one magnet during take-off, together with the unfortunate alignment of the aircraft's wiring between the controllers and their coils, is the most likely cause of the engine stop on Turbulent G-AREZ.'*

Survivability

The pilot was wearing an RAF pattern “Bone Dome” flying helmet. Despite impact to the head sufficient to cause concussion, he quickly regained consciousness and was able to extract himself from the aircraft and move clear of the accident. Despite the separation of the aircraft nose from the rest of the fuselage, the pilot’s harness remained secure and attached to its mounting points.

Meteorology

The pilot had obtained a weather report from RAF Lossiemouth, which is approximately 10 miles north of Easterton. The forecast for the time of the accident showed light northerly winds, visibility greater than 10 km, broken cloud at 4,000 ft amsl and a temperature of 17 °C.

Analysis

The aircraft had flown earlier in the day with no evidence of engine issues. During the checks for the accident flight departure, all indications were normal and there was no indication of any engine issue. The takeoff was normal and the initial performance of the aircraft was as expected by the pilot. At approximately 150 ft agl the engine suffered a sudden and total power loss, perhaps because of an interruption of electrical power to the ignition system. The pilot adopted a glide attitude but was faced with terrain ahead which he felt presented no opportunity for a safe touchdown.

The pilot began a turn to the left to avoid obstacles and switched off both the ignition and fuel supply. However, during the turn the aircraft stalled and control was lost. The pilot applied right rudder to control the wing drop and the aircraft struck the ground in an approximately level attitude. The fuselage broke just in front of the cockpit, the pilot suffered serious injuries and was briefly unconscious. There was no post touchdown fire and the pilot’s harness remained secure and attached to its mountings. It is likely that the pilot’s decision to wear an RAF flying helmet reduced the severity of his head injuries and thus allowed him to remove himself from the wreckage and telephone for assistance.

Conclusion

The engine suffered a total loss of power at low altitude, the most likely cause of which was a loss of a magnet from a timing sensor, combined with incorrect wiring within the ignition system. During a manoeuvre to avoid obstacles, the aircraft stalled and control was lost. The pilot suffered serious injuries during the touchdown and the aircraft was damaged beyond economic repair.

Bulletin Correction

Following publication of AAIB Bulletin 2/2022, the Light Aircraft Association (LAA) amended its report into this accident to reflect its updated view on the cause of the engine failure. Since the AAIB report was based on the LAA report, the above report has been amended to reflect the change. Full details of the change can be found on the AAIB website and will also be published in AAIB Bulletin 5/2022. The online version of the report was amended on 17 March 2022.