ACCIDENT

Aircraft Type and Registration:	Team Minimax 91, G-BZOR	
No & Type of Engines:	1 Rotax 447 piston engine	
Year of Manufacture:	2001 (Serial no: PFA 186-13312)	
Date & Time (UTC):	19 May 2019 at 1006 hrs	
Location:	Godshill, New Forest	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Dented cowling, broken brake cable	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	61 years	
Commander's Flying Experience:	182 hours (of which 22 were on type) Last 90 days - 2 hours Last 28 days - 1 hour	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

During the cruise at 2,000 ft, G-BZOR's engine began running roughly and lost power. Unable to maintain height, the pilot positioned the aircraft for a forced landing on open heathland. Just as the aircraft came to rest it tipped forward onto its nose causing minor damage to the airframe and a brake cable. The cause of the engine failure was traced to a faulty stator in the ignition system.

History of the flight

While cruising at 2,000 ft and 80 kt G-BZOR's engine suddenly began misfiring and lost power. An increase in vibration and reduction in throttle response led the pilot to believe that one engine cylinder had failed. Unable to maintain height, he positioned the aircraft for a forced landing. The pilot was not receiving an air traffic control service at the time and decided to concentrate on flying the aircraft rather than transmitting a MAYDAY call.

Initially over a copse of trees, the pilot selected a suitable landing site south of the woods, on an uphill slope in open heathland (Figure 1). Aware that he would have to execute a tight turn into wind on finals, he increased his airspeed from 55 to 75 mph to give a higher stall margin in the turn.

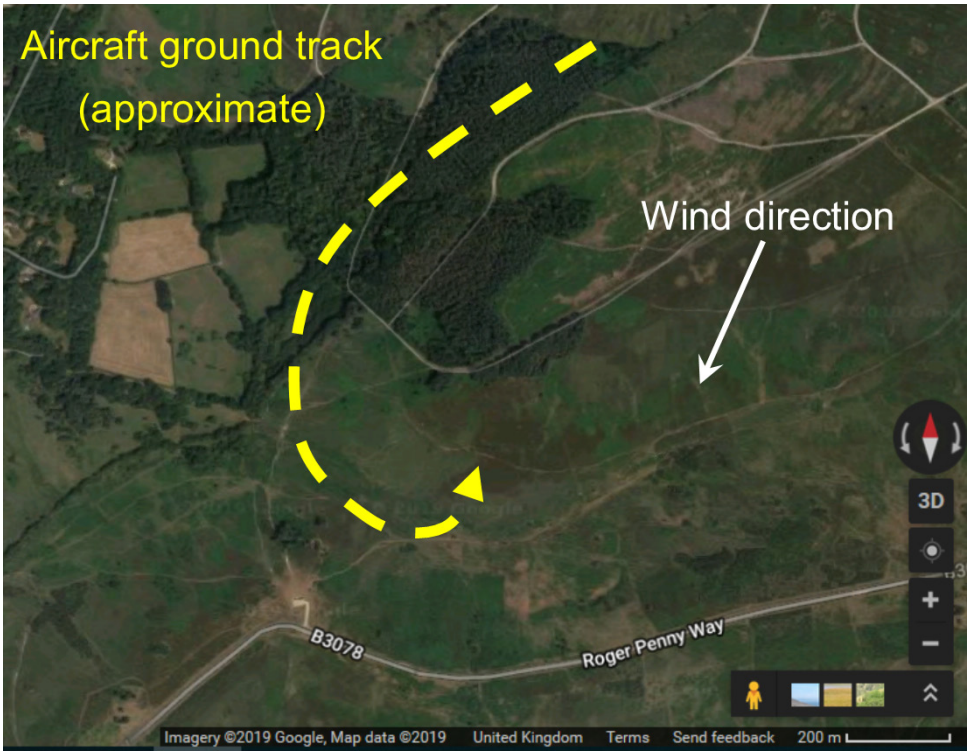

Figure 1

Approximate ground track of G-BZOR during the forced landing

Having rolled out into the light north-north-easterly breeze the pilot reduced speed and achieved a gentle touchdown. As G-BZOR came to a halt its front axle fouled in heather and the aircraft tipped forwards, resulting in minor damage to the airframe (Figure 2) and a brake cable.

Figure 2

G-BZOR after the forced landing with minor damage evident on the engine cowling

Aircraft information

The pilot described the aircraft as being "carefully maintained". Within the previous 30 flying hours the engine had been rebored and rebuilt with new bearings, and fitted with a new main ignition module. The crankshaft had recently been clearance checked, the spark

plugs were less than five hours old and the propeller was brand new. The fuel (MOGAS) had been drawn earlier that day from a "busy source". It was "correctly diluted" with oil and filtered into the aircraft's tank.

While the Rotax 447 is not a certificated aircraft engine it is the recommended engine in the Pilots' Operating Handbook (POH). It is also accepted as the normal engine fit by the Light Aircraft Association (LAA) in their Type Acceptance Datasheet (TADS186[1]) for the Team Minimax 91. The Rotax 447 POH[2] contains the following warnings and safety information for users of the engine:

> *'This engine, by design, is subject to sudden stoppage…This is not a certificated aircraft engine…and conforms to no aircraft standards…User assumes all risks…Be informed and prepared for any situation or hazard associated with flying.'*

On this aircraft, carburettor heating is not pilot-selectable. Fixed ducts circulate warm air from the engine bay past the carburation system.

Aircraft examination

The pilot reported that, on inspection after the accident, the carburettor float bowl contained a "suitable" amount of uncontaminated fuel. When he later removed the spark plugs, the pilot noted that they were "clean", the "correct colour" and sparked normally when tested. Subsequent diagnostic testing found that "the ignition stator was breaking down under load and causing the engine to misfire". The engine ran normally after a new stator had been fitted.

Personnel

The pilot credited good training and regular practice of abnormal situations as significant contributors to a successful outcome in this challenging event. He opined:

> *'Two stroke engines can fail without warning - Be Prepared! The success of the* [forced] *landing considering the adverse nature of the terrain is entirely due to good tuition and well-rehearsed "what if' drills. Practice* [forced landing] *procedures regularly, and when things go wrong: Fly the aircraft.'*

Analysis

The Rotax 447 is not a certificated aircraft engine, but it is approved for use under the LAA type acceptance process. The user guide is explicit in its guidance regarding the risks associated with using the engine in an aircraft. Pilots are left in no doubt that they should be prepared for sudden engine failures at any stage of flight. The accident pilot was aware of the risk and mitigated it by regularly practising emergency drills.

Footnote

1 http://www.lightaircraftassociation.co.uk/engineering/TADs/186%20TEAM%20MINIMAX%2091.pdf [Accessed 11 June 2019].

2 https://rotax-docs.secure.force.com/DocumentsSearch/sfc/servlet.shepherd/version/download/200681H000002wI8PQAU?asPdf=false [Accessed 11 June 2019].

Faced with a forced landing on rough terrain, the pilot prioritised flying the aircraft and planning for the landing ahead of transmitting a MAYDAY call. Landing uphill and into wind required a tight turn on late finals. Aware of the attendant risk, the pilot increased his gliding speed to generate a higher stall margin in the turn. The forced landing was successful.

The cause of the engine failure was a faulty ignition stator.

Conclusion

This was a successful forced landing. Key factors in this outcome were the pilot's knowledge and his preparedness for such an emergency. By prioritising flying the aircraft over communicating, the pilot was able to anticipate problems and focus his thoughts on achieving a safe and controlled touchdown.