ACCIDENT

Aircraft Type and Registration:	Kolb Twinstar Mk III (Modified SS), G-MZZT	
No & Type of Engines:	1 Rotax 582 piston engine	
Year of Manufacture:	1999 (Serial no: PFA 205-12596)	
Date & Time (UTC):	30 January 2022 at 1230 hrs	
Location:	Plaistows Farm, St Albans	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - 1 (Minor)	Passengers - N/A
Nature of Damage:	Aircraft destroyed	
Commander's Licence:	Light Aircraft Pilot's License (LAPL)	
Commander's Age:	60 years	
Commander's Flying Experience:	Unknown hours (of which Unknown were on type) Last 90 days - Unknown hours Last 28 days - Unknown hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot and further AAIB enquiries	

Synopsis

As the aircraft took off it suddenly veered to the right and climbed very slowly, narrowly missing a person, a hangar, power cables and a farm building. At approximately 100 ft agl the engine stopped, and the aircraft struck the ground. The pilot suffered back injuries and reported that he had been unable to control the aircraft due to a control restriction.

No evidence of a control restriction was found, and it is considered that flight just above the stall speed, resulting in a poor response from the flying control surfaces, was the probable cause of the control issues experienced by the pilot. The engine stopped due to overheating of the rear cylinder, but no cause could be found for this.

The general condition of the aircraft was poor, and no evidence could be provided by the pilot to confirm regular maintenance. Owners of Single Seat Deregulated (SSDR) aircraft are reminded of their legal responsibility to comply with the Air Navigation Order (ANO). The British Microlight Aircraft Association (BMAA) and Light Aircraft Association (LAA) have published guidance to assist with this.

History of the flight

The pilot had flown G-MZZT earlier in the day and reported no problems. Following the flight, the pilot stated he adjusted the pitch of the propeller to achieve an engine speed of

6,500 rpm during static ground running as this was when the engine produced maximum power.

The pilot obtained his weather from Elstree Aerodrome approximately 9 km to the south which he recorded as “calm and nice”, clouds at 4,000 to 5,000 ft, visibility over 10 km and winds 4 to 8 mph from 260°. Based on this he lined up to take off from the grass Runway 30. The weather obtained from Luton Airport and RAF Northolt for the time of the accident was 190° at 6 kt.

A witness reported that, immediately after getting airborne the aircraft veered sharply to the right and did not climb. In their opinion the aircraft appeared to be flying “very close” to its stall speed. The aircraft passed low over them, narrowly missing the hangar behind them, some power cables and a farm building. The aircraft continued to fly slowly in a right-hand circuit at an altitude of no greater than 100 ft agl with a repeated small pitching-up motion until it has passed the Runway 30 threshold when the engine stopped. The witness recalled seeing the propeller stationary and then it descended steeply with a slight right-wing drop, until contacting the fallow ground between Runways 30 and 33. The pilot escaped from the aircraft unaided but complained of back pain.

The pilot reported that the aircraft would not respond to any control input and that the aircraft had a control restriction.

Aircraft information

G-MZZT was a Kolb Twinstar microlight that had been modified so that no passengers could be taken and was therefore classified as a SSDR microlight in accordance with Article 24 of the ANO. The passenger seat area had been modified to include a storage tray and the harnesses removed.

The aircraft was powered by a Rotax 582 twin cylinder, two-stroke engine which was mounted above the wing and had a maximum rated power output of 48 kW at 6,500 rpm and a maximum speed of 6,800 rpm. It was fitted with a ground adjustable three-bladed Warp Drive pusher propeller. The high wing had ailerons and flaps along the trailing edge operated by a system of rods and bell cranks. The elevators and rudder were operated by cables passing through the tubular tail boom.

Aircraft examination

The aircraft was recovered to the AAIB for detailed examination and no evidence could be found of a control restriction. The left-wing tip was damaged and there was a significant bend in the right wing at mid span. The right landing gear had detached and the front of the fuselage was disrupted. The tail boom was bent to the right and downwards by approximately 30° with slight collapsing of the aluminium tube but not enough to restrict the movement of the control cables to the tail surfaces. The control rod to the right aileron had detached due to an overload failure and the aft wing to fuselage attachment had also failed in overload from the right wing impacting the ground. The right flap control rod was still attached.

Inspection of the cockpit area revealed many loose items in the storage tray with more items scattered through the cockpit area. Items included charts, pens, plastic cable ties, a water bottle, cloths, a luggage strap and a pencil case. The storage tray was open with no lid. There was evidence of additional electrical wiring having been added, to an amateur standard, with multiple 12v power distribution sockets and provision for a radio. The electric fuel pump was bolted to a length of steel channel which in turn was secured to the airframe with plastic cable ties.

The external inspection of the engine showed no visible damage except for crushing of one of the air filters. The aft left engine mounting bolt was too short with no threads protruding through the nut. Approximately 23 litres of 50:1 two-stroke fuel/oil mix was removed from the two plastic fuel tanks behind the cockpit. The spark plugs were removed from the cylinder head and an unidentified red sealant compound was found on the threads. The colouration of the plugs was considered normal however the electrode gaps were 0.33 to 0.356 mm instead of the recommended gap of 0.5 mm.

Figure 1

Example spark plug showing unidentified red sealant

A borescope inspection of the engine was performed to inspect the cylinders. The forward cylinder exhibited normal wear however the aft cylinder bore showed evidence of overheating with heavy scoring (Figure 2). Furthermore, the piston skirt was scored with black staining, typical of overheating. The total running time for the engine was unknown as the owner did not supply the aircraft or engine logbooks to the AAIB.

The oil from the reduction gearbox was removed and contained an unidentified black contaminant. The gearbox casing was split and it was found that silicone sealant had been used in addition to the paper gasket between the casing mating faces (Figure 3 left). A significant amount of the sealant was also found at the gearbox to crankcase interface (Figure 3 right). Much of the sealant had exuded into the gearbox where it had been ground between the gears to form the black contaminant seen in the oil. The general condition of the gears was good.

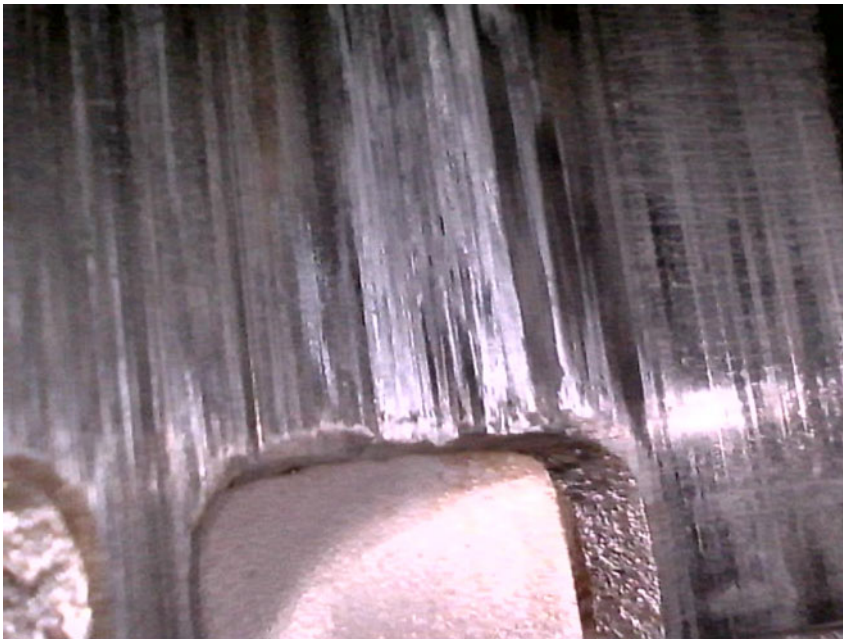


Figure 2

Aft cylinder bore scoring

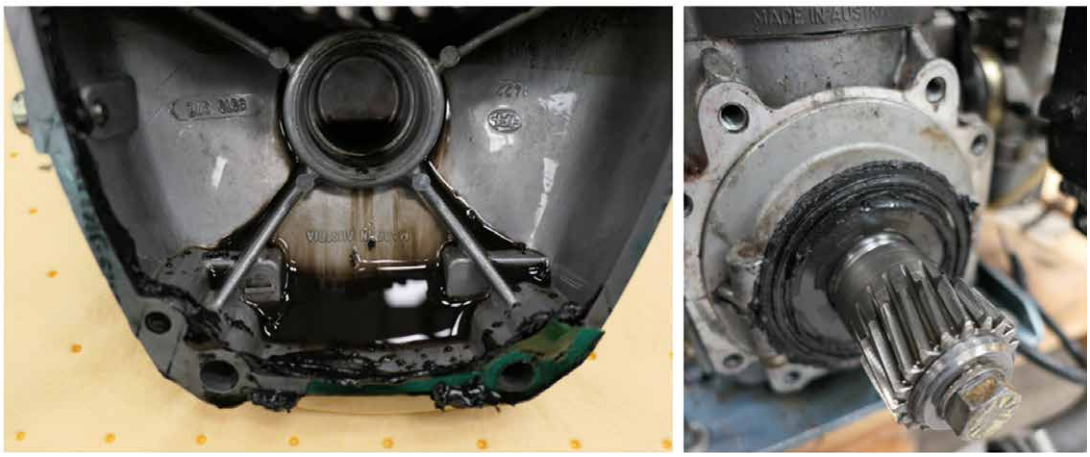


Figure 3

Left – exuded sealant inside casing
Right –sealant on crankcase interface

Prior to removal of the propeller, the pitch of the blades was measured using the Warp Drive blade setting tool. The blade pitch was found to be between 5° 20' and 4° 50'. The condition of the blades was good, however when the propeller was removed from the gearbox hub, the threads of two of the six retaining bolts were found partially stripped (Figure 4).

Figure 4

Propeller attachment bolts

Tests and research

The engine and related systems were removed from the aircraft and a temporary test bench was made to run the engine. Aircraft components were used extensively where possible to replicate the installation. Fuel recovered from the aircraft fuel tanks was also used.

Three separate engine runs were performed. The first was in the 'as flown' condition, the second using thermal imaging cameras and the third with the propeller pitch changed to the manufacturers recommended pitch of 9° for this specific aircraft configuration.

For the first test the engine was allowed to warm up before increasing the speed to 6,500 rpm indicated on the aircraft engine tachometer. After holding 6,500 rpm for approximately three minutes the engine ran down and stopped. Subsequent attempts to restart the engine failed.

The second test was performed several days later and again the engine was allowed to warm up before the speed was increased to 6,600 rpm. This time the engine ran for over five minutes with no issues and the thermal images showed all components operating at expected temperatures.

The third test was performed with the blade pitch changed to 9° and the maximum engine speed that could be achieved was 5,500 rpm. It ran for over five minutes with no issues.

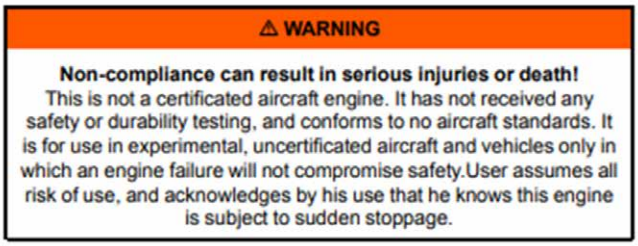
Analysis

Immediately after takeoff the aircraft veered to the right and climbed very slowly to approximately 100 ft before the engine stopped and the aircraft struck the ground. The pilot complained of a control restriction and that the aircraft did not respond to his control inputs. No evidence could be found of a control restriction to any of the control surfaces.

However it could not be ruled out that a loose item in the cockpit may have restricted the controls. An eyewitness reported that the aircraft was flying very slowly and near the stall speed. The effectiveness of the control surfaces diminishes as an aircraft's airspeed decreases and so it was considered more likely that, with the aircraft flying at low airspeed the crosswind caused the aircraft to veer to the right with little control effectiveness to counteract it.

As the aircraft crossed the Runway 30 threshold the engine stopped. There was evidence in the aft cylinder of overheating and heavy scoring of the cylinder bore which may have caused the engine to stop. It was reported that the pilot had changed the pitch of the propeller blades in an attempt to optimise the performance of the engine prior to the flight and this may have contributed to the engine stopping as it would have been operating at higher speed and temperature. The total operating hours of the engine were unknown as the pilot was unable to provide the AAIB with the aircraft or engine logbooks. Article 226 of the ANO requires that owners of SSDR aircraft must maintain logbooks documenting the maintenance history of the aircraft.

The Rotax 582 engine is not a certified engine, and the following warning is printed in the Operators Manual:



Proper and timely maintenance will minimise the risk of sudden engine stoppage. There were multiple findings on G-MZZT where the maintenance of the aircraft appeared to be of a poor standard. Although not contributing to the accident it should be noted that, whilst there is no requirement for the aircraft to be regularly inspected for airworthiness, there is a responsibility for the owner of an SSDR aircraft to ensure their aircraft is airworthy. The BMAA[1] and the LAA[2] provide advice and guidance for owner pilots to help them maintain their aircraft but it should be noted that neither the BMAA nor the LAA are responsible for the administration or airworthiness of SSDR aircraft.

Conclusion

It was considered the most likely cause of the loss of control after takeoff was low airspeed resulting in poor flying control response and an inability to counteract the effect of the

Footnote

[1] BMAA Technical Information Leaflet No.45 - Til 045 SSDR Handbook (https://www.bmaa.org/files/til_045_ssdr_handbook.pdf) [accessed August 2022]

[2] LAA Technical Leaflet 2.17 - (http://www.lightaircraftassociation.co.uk/engineering/TechnicalLeaflets/Operating%20An%20Aircraft/TL%202.17%20Operating%20Deregulated%20Microlights.pdf) [accessed August 2022]

crosswind. The engine stoppage was probably caused by the aft cylinder overheating although no cause could be found for the overheating. The general condition of the aircraft was poor, and no evidence could be provided of regular maintenance and record keeping.

Owners of SSDR aircraft are reminded that although there is no requirement for regular airworthiness inspections, they are still legally responsible for ensuring their aircraft are airworthy and must comply with the ANO. The BMAA and LAA have published guidance to help owners.