Pegasus XL-Q, G-MYBR

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Aircraft Type and Registration:	Pegasus XL-Q, G-MYBR
No & Type of Engines:	1 Rotax 462 piston engine
Year of Manufacture:	1992
Date & Time (UTC):	21 August 1999 at approximately 1815 hrs
Location:	Radwell, near Baldock, Hertfordshire, UK
Type of Flight:	Private
Persons on Board:	Crew - 1 - Passengers - 1
Injuries:	Crew - Fatal - Passengers - Serious
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Private Pilot's Licence (Microlight aeroplanes)
Commander's Age:	50 years
Commander's Flying Experience:	120 hours (of which 90 were on type) Last 90 days - 5 hours Last 28 days - 1 hour
Information Source:	AAIB Field Investigation

History of flight

The pilot had recently adjusted the batten profiles in both outer wings of the microlight and intended to conduct a brief flight in order to assess the subsequent trim of the aircraft. The flight was to be from a prepared field that was routinely used for microlight operations. The passenger, who was also a microlight pilot, described the local weather prior to the flight as good with a light easterly surface wind, excellent visibility and little cloud. Luton Airport, situated 11 nm south west of the accident site, reported the following meteorological details at 1810 hrs: surface wind of 060°/11 kt, visibility 30 km, a few clouds at 4,500 feet, temperature of +15°C and QNH 1024 millibars.

When the passenger arrived at the take-off site the pilot had already partially rigged the wing onto the trike. The passenger assisted with the remaining preparations for the flight. The pilot then completed his pre flight checks, started the engine and taxied to the threshold of the prepared landing strip, orientated 040°. The pre take-off checks were completed including a check for full

and free movement of the control bar. At this time the windsock indicated that the surface wind was blowing from about 30° to the right of the strip.

The take off was uneventful. After take off the passenger recalls that the aircraft rose rapidly and the pilot initiated a turn to the right in order to align the flight path into the prevailing wind. At a height of about 30 feet to 40 feet, as the aircraft was level with the tree line and still turning to the right, a strong gust of wind struck the aircraft under the left wing causing a marked increase in the bank angle to the right. The aircraft lost height rapidly and fell into trees on the right side of the take-off field. Throughout the flight the engine sounded normal to the passenger.

The emergency services arrived at the scene at 1833 hrs. The passenger was pulled from the wreckage by a passer-by who had heard the aircraft crash. He was then moved further from the wreckage because fuel was leaking from the aircraft fuel tank. The pilot sustained fatal injuries at impact. Post mortem examination showed there to have been no evidence of any pre-existing disease, alcohol, drugs or any toxic substance which may have caused or contributed to the cause of the accident.

Description of field

The British Microlight Aircraft Association (BMAA) provides recommended criteria for a private microlight site, which include the following:

a. Boundary obstructions at either end of a runway in use should not exceed a height of

   2 metres - that of a normal hedge - when a runway is of the minimum length of 250 metres.

b. There should be enough clear ground surrounding the site to allow a safe landing to be made following engine failure at any stage in the circuit - particularly on take off.

The field used by the microlight contained a cereal crop that was standing about 2 feet tall. The owner of the field had cut a landing area into this crop. The landing area, orientated 040°/220°, was 314 metres in length and had a dry, hard packed surface. The width at the 04 threshold was 13·2 metres, this width remained constant for approximately 190 metres when it then narrowed to 5 metres. A windsock situated to the right of the strip was clearly visible from the 04 threshold. A hedge bound the field. Around the south-west perimeter the hedge was light and less than 2 metres high. The hedge became progressively thicker and taller towards the north-east of the field and eventually incorporated trees up to about 40 feet in height. Also at the north-eastern end were a number of farm buildings. Telephone wires, suspended 15 feet above the ground, ran at right angles across the landing strip 30 metres from the Runway 22 threshold; these wires were clearly marked with a number of plastic balls attached to them. This field therefore did not meet the BMAA recommended criteria for operations as a private microlight site particularly when operating from Runway 04.

The field was routinely used for microlight operations by a number of pilots including the pilot involved in this accident. It was unusual for pilots to use the 040° take of direction since the prevailing winds were from the south west.

Performance

The maximum certified weight of the microlight at take off was 365 kg and the estimated weight at take off was 333 kg. At the time of the take off there was a headwind component of about 5 kt. The manufacturer's performance data provided information for a take off on dry grass. At maximum take off weight, in still air conditions, the required distance to clear a 50 feet obstacle was 151 metres. The pilot thus had an adequate field length available but he may have been concerned about the presence of substantial trees at the end of the field and this could explain why he was climbing at a high rate.

Handling characteristics

The description in the operator's manual of the take off procedure for this aircraft concludes with the following sentence. *"Roll control is also impaired at low airspeed. Therefore DO NOT PERFORM STEEP CLIMB-OUTS*". (Capitalisation is from the manual). The passenger described the initial rate of climb as rapid but not necessarily steep; nevertheless the roll control may still have been impaired.

The wing planform of this microlight, in common with many other tailless delta wings, has a high washout and moderate sweepback. Therefore the roll due to sideslip is positive and produces an increased level of lateral stability. This *dihedral effect* of sweepback is strongly dependent upon the angle of attack and is greatest at high incidence. It results in the roll response being sluggish at low speeds and thus roll authority is reduced at a time when the aircraft would be particularly susceptible to gusts.

Wreckage and engineering information

The aircraft impacted the far bank of a large ditch bounding the right side of the field, at position approximately 300 metres from the threshold end of 04 and 100 metres to the right of the strip centreline. The orientation of the wreckage and its position relative to the main point of impact, together with the pattern of damage, suggested that the aircraft had struck the ground whilst in a descending turn to the right, with the right wing low. The first point of ground contact on the right outer wing appears to have caused the aircraft to swing to the right in a cartwheeling motion, before the nose of the trike impacted heavily the far bank of the ditch. The cartwheeling motion continued briefly after the impact, resulting in the aircraft bouncing out of the ditch, before it was brought to rest by trees and dense undergrowth. It was apparent that nothing had become separated from the aircraft prior to ground impact.

None of the propeller blades exhibited significant blade strike damage, but this is not unusual in low power engines involved in a ground impact; and there was insufficient evidence in this case to form any reliable opinion as to the amount of power being delivered by the engine at impact. In light of the evidence from the passenger, to the effect that there had been no loss of engine power, the engine was subject to visual examination only. The fuel selector valve was in the ON position and the ignition switch was also ON at impact. Fuel was present in the tank, and in the fuel lines and the carburettor bowl. The carburettor had separated from the engine block at its rubber coupling, evidently during the impact, and the hand throttle cable had pulled out of the coupling in the cable system where the foot and hand operated throttle controls merged into a single cable to the carburettor. All damage to the engine was entirely consistent with the impact.

It was found that the wing structure was deformed and broken in several areas, but all of the damage was consistent with the impact and no evidence was found of any pre-accident defect or failure of the wing structure, the fabric covering, or any of the rigging wires. All of the wing

battens were in place and secure. The washout rods were in place and both wing tips rotated freely. The Velcro fastenings were all in place except where local disturbance had occurred in the impact. All rigging cables and connections were intact and secure, and the over-centre tensioners correctly rigged. The luff lines were examined closely at the point where they passed over the central set of pulleys, and the positions of the slight permanent set which the cables had adopted at this point was measured in relation to their end attachments to the sail, with a view to establishing whether there had been any long-term asymmetry. This suggested that the aircraft had operated with the luff lines equally (i.e. correctly) disposed on either side of the keel, implying that the wing had been operating in a balanced condition, which in turn tended to rule out any significant difference in wing profile between the left and right sides of the aircraft.

Notwithstanding the evidence suggesting that the wing profiles were symmetrical, all wing battens were checked against pattern profiles supplied by the manufacturer. Except for the central region of the wing, where the battens had become badly bowed in the accident, all matched the manufacturers' profiles very closely except for the three outermost battens on each wing (batten N°s 9 - 11 on each side), which displayed slightly increased camber in the case of battens 9 and 10, and a significant increase in camber in the case of the N° 11 batten on each side. The profiles were symmetrical on each wing, however, (ie matching left to right wing). In the case of the most highly profiled (N° 11) battens, the change in camber was approximately 15 mm at about 20% chord, which did not exceed the manufacturer's allowable limit of 15 mm deviation from the published profile. It is not considered likely that this change in camber would have resulted in any adverse handling characteristics within the accident flight regime. Specifically, it is unlikely to have resulted in any tendency to tip-stall. The manufacturer has expressed the opinion that the only practical effect of the increased camber would have been to raise the hands-free trim speed by about 5 mph, from about 48 mph to perhaps 53 mph.

Except for damage clearly attributable to the accident, the aircraft was in excellent overall condition and gave the appearance of having been regularly maintained. It had been subject to a recent inspection for the renewal of its Permit to Fly after which the Permit was re-issued, valid till 16 June 2000.

Summary

The aircraft was in excellent overall condition and there was no evidence of any technical malfunction.

The pilot had recently altered the profiles of the three outermost battens on each wing but it is not considered likely that these changes resulted in any adverse handling characteristics. The aircraft climbed rapidly after take off and the pilot turned into the prevailing wind as soon as practicable, possibly in an attempt to increase the climb performance in order to climb above the trees in his take off path. However, the aircraft encountered a gust of wind whilst it was climbing at a low airspeed: conditions under which the handling characteristics are affected adversely by a reduction in roll authority. The pilot was then unable to control the aircraft, which struck the ground.