ACCIDENT

Aircraft Type and Registration:	Pegasus Quantum 15-912, G-MZDH
No & Type of Engines:	1 Rotax 912 piston engine
Year of Manufacture:	1996 (Serial no: 7248)
Date & Time (UTC):	15 August 2016 at 1843 hrs
Location:	Holy Cross Green, Clent, West Midlands
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (Serious) Passengers - N/A
Nature of Damage:	Aircraft destroyed
Commander's Licence:	National Private Pilot's Licence
Commander's Age:	43 years
Commander's Flying Experience:	702 hours (of which 172 were on type) Last 90 days - 5.0 hours Last 28 days - 3.5 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

The weight shift microlight was returning from Otherton to Halfpenny Green when the accident occurred. The pilot was seriously injured in the accident and had little memory of the accident flight. There were various witness descriptions of the final descent, including the wing collapsing and the microlight spiralling down but the initiating event was not identified. The pilot was not able to recover from a tight spiral or tumbling condition which continued to the ground.

History of the flight

The pilot had flown from Halfpenny Green to Otherton in order to carry out his annual flight test. The weather was good with visibility in excess of 10 km, high cloud and light winds. During the flight, he noticed that the 'Flydata' instrument indicated an abnormally high value for the engine's cylinder head temperature (CHT). When he arrived at Otherton, he spoke to the examiner and they tried to establish the cause of the high CHT but were unable to do so. The examiner offered to use his aircraft but the pilot decided to abandon the test and return his aircraft to Halfpenny Green. Before departure the CHT was normal and the pilot did not recall any abnormal indications during the return flight.

The pilot thought that he had climbed to 2,000 or 3,000 feet for his return flight but witnesses who saw the microlight immediately prior to the accident thought it was at about 200 to 500 feet.

There were various descriptions by the witnesses of the aircraft's descent but, generally, it was seen to spiral to the ground. Some witnesses thought the engine noise changed or had stopped and saw smoke with the aircraft believed to be on fire. The change in engine noise may have been the pilot closing and opening the throttle. The most graphic description was from a witness who reported that the pilot:

> *'powered up and climbed steeply. A minute later and the engine cut out. He then seemed to go into a controlled stall. The engine restarted and he climbed again very steeply. It was in the steep climb that I saw the wings fold in half and the microlight went spinning to the ground and disappeared behind some trees. I did not see any flames or smoke.'*

Due to his injuries, the pilot was unable to recall details of the accident flight other than that:

> *'the 'A' frame came back abruptly at some point and the aircraft adopted a spinning motion.'*

It is not known what caused the accident but it appears that, following an event, the pilot lost control of the aircraft and was unable to recover it to normal flight before impacting the ground. A witness who saw the aircraft in the final moments reported that it had come down on top of a large farm bale which had absorbed a lot of the impact energy.

Accident site

The pilot's injuries, although serious, were not life threatening. The wreckage was removed with the approval of the AAIB but was not viewed by AAIB inspectors and has since been disposed of. The engineer who recovered the wreckage described it as "heavily broken up".

Aircraft information

The Pegasus Quantum 15-912 is a weightshift microlight consisting of a wing, suspended under which is a tandem two-seat 'trike' on the rear of which is mounted an engine with a three bladed 'pusher' propeller. Attached to the 'trike' is a tricycle landing gear comprising a nose and two main wheels. An 'A frame' is attached to the wing and is used to control the aircraft.

Aerobatic manoeuvres are not permitted and nose-up or nose-down attitudes must not exceed 45° with maximum bank angles not to exceed 60°. The normal acceleration limits are +3.8/-0g.

The 'A frame' is used to manoeuvre the microlight in pitch and roll. Moving the base bar at the bottom of the 'A frame' forward causes the wing leading edge to move up which results in the nose pitching up and the microlight climbing. Moving the base bar aft has the opposite effect and causes the microlight to descend. Moving the base bar to the left causes the microlight to bank and turn to the right whilst moving the base bar to the right will cause the microlight to turn to the left. The microlight is responsive to control inputs

with large and rapid movements of the base bar resulting in equally large and rapid attitude changes. The stall speed recorded on the BMAA Check Flight Schedule was 36 mph.

Microlight 'tumbling'

The microlight 'tumble' is a rapid uncontrolled rotation about the pitch axis from which there is no known recovery technique. It usually results following rapid movement from a large nose-up attitude to a large nose-down attitude such as at a 'whip stall'[1]. This is accompanied by the pilot pulling back on the base bar to adopt a nose-down, stall recovery attitude, which when combined with the natural pitching forward of the wing, causes the microlight to tumble. The tumbling achieves very high rates of rotation up to, and possibly exceeding, 360° per second. This induces transient accelerations in the region of 8g.

The 'tumble' can result in the failure of the wing and publically available recorded images show that, once the wing has failed, the microlight can assume a spinning motion akin to a falling sycamore leaf.

A comprehensive explanation of the microlight tumble is set out in a paper, '*Towards the Tumble Resistant Microlight*', by Dr Guy Gratton and Dr Simon Newman[2].

Survivability

The pilot was properly dressed for the flight with a weatherproof flying suit, boots, gloves and protective helmet. During the impact with the ground he received serous leg injuries but no life threatening other injuries. The arrival on the large agricultural bale with its energy absorbing qualities was probably the main element that made this a survivable accident.

Information from the pilot

The pilot did not recall performing a manoeuvre which might have resulted in overstressing and folding of the wing structure as was observed. He commented that he always respects the limitations contained within an aircraft's Pilot's Operating Handbook.

Analysis

Given the evidence of those who saw the final moments of the aircraft, it appeared that it either entered a whip stall or carried out a rapid turn. After this, the aircraft possibly tumbled or the wings were overstressed in the manoeuvre. Whatever the initiating event, the wings folded and this caused the microlight to adopt a spinning motion akin to a sycamore leaf. No explanation of the entry manoeuvre was positively identified – and the pilot's comments suggested that extreme manoeuvring would have been out of character – but, at some point, wing loading was clearly excessive.

Footnote

[1] The whip stall is caused by an aggressive entry at a high deceleration rate to the aerodynamic stall, followed by an equally aggressive recovery initiation by the pilot, pulling back the control bar rapidly.

[2] Available: https://eprints.soton.ac.uk/43858/1/GrattonNewman_TumbleResistance.pdf

Conclusion

The microlight entered an irrecoverable spinning flightpath probably due to some manoeuvre that induced overstressing and failure of the wing structure.