

Aircraft Type and Registration:	MW5D Sorcerer, G-MZEI	
No & Type of Engines:	1 Rotax 503 piston engine	
Year of Manufacture:	1997	
Date & Time (UTC):	2 September 2004 at 1648 hrs	
Location:	Belle Vue Farm, Great Torrington, Devon	
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:	Private Pilot's Licence	
Commander's Age:	63 years	
Commander's Flying Experience:	420 hours (of which 10 were on microlights) Last 90 days - 5 hours Last 28 days - 3 hours	
Information Source:	AAIB Field Investigation	

Synopsis

The pilot had recently purchased the aircraft and on the day before the accident, he had assembled it and carried out some taxiing trials to familiarise himself with it. On the day of the accident the pilot once again confirmed that the aircraft was properly assembled and following further taxi practice, he elected to carry out his first flight on the type. The aircraft accelerated quickly and became airborne after what seemed like a short take-off run following which, the pilot experienced difficulty in controlling the aircraft, mainly in pitch but also in roll. Despite having inadvertently applied substantial nose-down trim before takeoff and having applied full forward control column after becoming airborne, the pilot was unable to lower the nose of the aircraft. After a short distance, the right wing dropped and the aircraft impacted the grass area to the north of the runway in an inverted attitude, seriously injuring the pilot.

History of the Flight

The pilot purchased the aircraft in January 2004 and kept it in his garage in a dismantled state whilst preparing an operating site adjacent to his home. On 1 September 2004 the pilot moved the aircraft to Belle Vue Airstrip and assembled it in the main hangar. Having re-checked his work and confirmed that all the flight controls operated in the correct sense and were full and free, he took the aircraft for some taxiing checks and to gain some experience of the feel of the aircraft without becoming airborne. Satisfied that the aircraft was functioning correctly, he placed the aircraft in the hangar intending to fly it for the first time the following day.

The next day the pilot arrived at the airfield at about 1445 hrs and made a thorough inspection of the aircraft. He once again confirmed that the flight controls were correctly rigged, full and free but this did not include the mechanical full-flying tail trimmer. He calculated that the aircraft's weight and centre of gravity were within the operating limits before carrying out some further taxiing practice along the runway in preparation for his first flight.

Belle Vue Airstrip has a single grass runway orientated 26/08; it is 625 metres long and 15 metres wide. The surface is smooth and well maintained with no significant undulations or bumps. The grass areas to the north and south are large, level and open with no obstructions and the wind sock to the north was clearly visible from the point at which the pilot commenced his take-off roll.

After the taxiing practise, the pilot refuelled the aircraft and made a final external check before moving out to the runway. He decided to carry out a take-off run, raising the nosewheel to the point of lift off before closing the throttle and stopping on the runway. His intention was to gain a feel for the effects of the flight controls, in particular the amount of aft stick movement required to get the aircraft airborne. Having completed two such runs the pilot was satisfied that he was ready to get airborne and carry out some general handling before returning to the circuit for landing.

The aircraft was lined up on Runway 26 abeam the hangar with the surface wind from approximately 310° at a speed estimated to be about 5 kt. The pilot advanced the throttle to maximum power and the aircraft accelerated rapidly. He held the control stick aft and the nose landing gear lifted off, followed almost immediately by the aircraft becoming airborne with the nose continuing to pitch up. The pilot applied full forward nose down elevator control but the aircraft did not appear to respond and it began to roll left and right, which he was unable to correct, even with large aileron control inputs. The pilot's last recollection of the accident was the right wing low with full left aileron applied and the ground rushing up from the right. A witness driving along the road to the north of the airfield from the west did not see the take-off run but saw the aircraft rise up from behind a hedge and then make what he described as a cartwheel manoeuvre to the right.

The aircraft impacted the ground in a nose-down attitude almost inverted, seriously injuring the pilot, who lost consciousness. The witness drove to the scene of the accident and with the assistance of those at the airstrip, removed some of the wreckage from the pilot and cut his four-point seat harness in an attempt to remove the pilot because petrol was leaking from the fuel tank onto him. As it was not possible to extract the entangled pilot, initially they tore off a transparency and placed this across him to protect him from the leaking fuel. Eventually they were able to cut the fuel tank securing strap, close the fuel shut off valve and then remove the tank. The emergency services attended the scene and the fire service extracted the pilot who was then removed to hospital by an air ambulance.

Pilot experience

The pilot commenced flying on 27 April 1981 on a Piper PA-28 aircraft type gaining his Private Pilot's Licence on 27 July 1983. He continued to fly the PA-28 with occasional flights in other types until April 1992, accumulating 91 flight hours. In that year he procured a Pulsar aircraft which he flew until 24 March 2002, logging 317 flight hours on the type. Having sold the Pulsar, he did not fly again until 30 September 2004 when he carried out differences training on an X'Air (a kit-built 3-axis microlight) and completed a general flying test on that date. From then until the date of the accident he flew 10.7 hours in the X'Air microlight at the rate of one hour, every other month until August when he flew 3.3 hours.

Accident site details

The aircraft crashed approximately 55 metres off the right hand side of Runway 26 and about halfway along its length. It had come to rest essentially inverted, but with the right wing reportedly pointing into the air. (Note: some dismantling of the aircraft had occurred during the operation to recover the pilot.) Only three impact marks were apparent on the ground and they were found to have been made by the engine/propeller assembly, a wing tip and the nose. It was determined that the aircraft had struck the ground in a steep, inverted dive, on a track of 315° magnetic, with the lack of ground-slide indicating a low forward speed. The aircraft had come to rest less than 2 metres from the impact marks. It was apparent that a significant amount of fuel had been leaking from the tank (which was located behind the pilot's seat), although nearly 10 litres remained.

Following the on-site examination, the wreckage was removed to the AAIB's facility at Farnborough for a detailed analysis.

Detailed examination of the aircraft



A photograph of G-MZEI shown above. The main structural member of this type of aircraft is a longitudinal alloy boom running from the tail, through the wing centre section and then beyond the leading edge. The fuselage is located below the wing such that the boom runs along the cockpit roof. The engine is mounted on the front of the boom and so is positioned above and forward of the pilot. This arrangement had served to protect the pilot to an extent, as the main force of the impact had been borne by the engine and mounting structure. However, additional bracing was provided in the form of struts located between the engine mount and the cockpit sides, and the compressive failure of one of these during the impact had resulted in a broken end penetrating the pilot's right thigh, causing a serious injury.

There was no evidence of a pre-impact structural failure, or of any pre-impact failure or disconnection of the flying controls. However, the tailplane trim system was the focus of some attention. The aircraft featured an 'all flying' tail, which is usually more powerful than the tailplane and elevator combination that was a feature of the X'Air aircraft on which the pilot had conducted some training. This had necessitated the fitting of an anti-balance tab on the trailing edge of the left side, which also functioned as the trim tab. The trim adjustment wheel in the cockpit had been fabricated from the hollow cap of a plastic 'Jerrycan' container and was mounted on a pair of brackets with a threaded insert in its centre. Rotation of the wheel caused a longitudinally orientated threaded shaft to move either fore or aft, depending on the direction of rotation. The rear end of the shaft was connected to the trim cable, which moved the tab against the tension of a spring mounted between the tab operating horn and the underside of the tailplane. The design was such that normal operation

of the tailplane resulted in relative movement between it and the fixed trim cable, which in turn caused deflection of the tab, thereby achieving the anti-balance function.

The trim operating cable had remained intact, although the boom along which it was clipped had broken at its join with the fuselage. Some stretch had inevitably occurred during the accident and subsequent recovery, but after allowing for this, the as-found position was considered to be excessively trailing edge up (ie aircraft nose down). This corresponded with the as-found position of the trim adjuster, which was set with 24 mm of exposed thread ahead of the wheel and only 7 mm to the rear. Rotating the adjuster until the threaded shaft was in its mid position produced a tab position that was only slightly nose down. It thus appeared that the trim had been set to a markedly nose-down position prior to the accident flight. However, it was noted that a casual glance at the adjuster, which was located under the pilot's right elbow, gave the impression of an approximate mid position, due to the length of threaded shaft that was "hidden" under the rim of the hollow Jerrycan cap.

Aircraft history

Following its construction in 1997, the aircraft was withdrawn from service in June 2002, after accumulating around 63 flying hours, in order to exchange its Rotax 447 engine for its current Rotax 503 model, which has approximately 10% more power. The new engine was heavier than the unit it replaced, which necessitated a modification that moved its mounting point rearwards. This was accomplished by the end of August 2003 and the aircraft flew a further 8 hours in September. The last flight entered in the log book was an air test on 19 September 2003. The aircraft was subsequently acquired by its current owner, who conducted no additional work other than rigging it prior to his first flight.

Analysis

The owner was both an experienced private pilot and a trained engineer who had re-assembled the aircraft and thoroughly checked it for the correctness of his work before flying it. There was no operating manual and he relied on the differences training and the experience he had accumulated on the X'Air to provide the basic level of skill he would need to fly the MW5D Sorcerer. This was added to his experience on the Pulsar, which was a responsive aircraft similar in handling qualities to the Sorcerer.

His taxiing trials and abandoned takeoff exercises had been an incremental approach to carrying out a first flight and apart from the rapid acceleration, he had detected no major differences from what he was used to. The weather was good for his first flight, which was to be general handling, stalls to confirm the calibration of the ASI and a landing. He followed information he had researched from articles that the control column should be held aft for half to two thirds of its travel and the aircraft

allowed to accelerate until the nose landing gear could be lifted off. The researched information then advised that the control column should then be moved forward to check the nose-up rotation and the aircraft allowed to maintain that pitch attitude and climb away.

From the interviews held with the pilot, it was clear that he believed that the rapid acceleration may have led him to raise the nose too early and continue the rotation to a higher pitch attitude than intended (despite the inadvertent nose-down pitch trim setting). The aircraft became airborne in a partially stalled condition and the low airspeed, and hence low airflow over the tailplane, contributed to a lack of aircraft response to the pilot's full-forward control column movement.

The aircraft's designer stated that although the ailerons are still effective at the stall, the rolling motion to left and right reported by the pilot, coupled with his difficulty in controlling the rolling motion, were consistent with the aircraft type's stalling behaviour.

Conclusion

The accident occurred when the aircraft became airborne in an attitude and at an airspeed, which did not permit the pilot to control it properly. The aircraft stalled and the right wing dropped, rolling the aircraft to a nose down inverted attitude from which insufficient height remained in which to recover. There was no aircraft operating manual or supervisor present to warn the pilot of the specific hazard he encountered.

Advice to microlight pilots

Generally, the privileges of a fixed-wing Private Pilot's Licence are applicable to classes of aircraft and there is no regulatory requirement for type conversion training before flying unfamiliar microlight aircraft types. However, when transitioning to a new type or variant of microlight, where only a single seat version is available, the pilot should have authoritative documentation available containing all the necessary information and handling advice to operate the aircraft safely. If appropriate documentation is not available, a suitably qualified and experienced person should be present to advise the converting pilot on what to expect during the first flight on type.