AAIB Bulletin No: 11/94 **Ref: EW/C94/7/3** **Category: 1.4**

Aircraft Type and Registration:	Kolb Twinstar Mk 3, G-MWWF
No & Type of Engines:	1 Rotax 503 piston engine
Year of Manufacture:	1992
Date & Time (UTC):	21 July 1994 at 1845 hours
Location:	Stradbroke, Suffolk
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - Fatal Passengers - Fatal
Nature of Damage:	Landing gear collapsed, damage to propeller, fuselage and wing structure
Commander's Licence:	Private Pilot's Licence (Microlight Aircraft)
Commander's Age:	54 years
Commander's Flying Experience:	214 hours (of which 62 were on type) Last 90 days - 10 hours Last 28 days - 2 hours
Information Source:	AAIB Field Investigation

History of the flight

The pilot initially trained for his PPL on a weight shift control microlight type between 1989 and 1991. He had approximately 150 hours flying experience when he commenced a conversion course to the Kolb Twinstar Mk 3, three axis microlight in May 1993. The course took about 6 weeks and some 28 hours to complete. The aircraft was then ferried to its new base at Mendlesham, Suffolk, close to the pilot's home.

The pilot, accompanied by his wife, undertook a flight to Cromer (Northrepps) Airstrip on the evening of Tuesday 19 July. On arrival, it was not possible to locate the strip due to low stratus sea fog that had drifted into the area, and the pilot elected to land in a paddock near Antingham, some 3.5 miles away. They were given a lift to a hotel close to the airstrip by a local resident. The aircraft was flown across to the airstrip the next day, and a short local flight was also undertaken later in the day. It was then tied down for the night. On Thursday 21 July, the pilot and his wife returned to the aircraft and placed their light luggage aboard. It became windy (12 to 15 kt) during the afternoon and the flight

controls were tied down. The aircraft was refuelled with motor fuel from a local garage, mixed with two-stroke oil. The aircraft was finally heard to depart by the strip operator at about 1730 hrs, and was observed flying south east at about 1800 hrs over Swafield. It had been the pilot's intention to follow an initial track along the coast towards Great Yarmouth, before turning inland on a direct track towards Mendlesham, but no record of any communications with ATC was located after the accident that could confirm this course of action. However, the distance travelled in the intervening time period is consistent with the cruising speed of the aircraft and this flight routing.

Eyewitnesses in the village of Stradbroke observed the aircraft initially flying normally on a southwesterly heading at around 1845 hrs. The engine noise was heard to decrease abruptly, followed shortly afterwards by a brief burst of engine power, then little noise. The aircraft began to descend fairly steeply, and turned through approximately 90° to the left. A local retained fire fighter observed the flight path of the aircraft, realised that it was going to crash, and raised the alarm. Several residents adjacent to a farm field also noticed the aircraft attempting a forced landing into the standing crop. One observed that the left wing dropped during the final stages of the glide in order to avoid a pole carrying electricity cables, before the aircraft pancaked into the field. Another couple confirmed that the engine was running until the time of the impact, but only quietly.

A local farmer and other residents rushed to the aircraft, and alerted the emergency services. The farmer turned off the fuel cock, which had been selected to feed from the left tank. Once the emergency services had arrived, the pilot's wife was lifted clear of the aircraft, but died shortly afterwards. The pilot remained trapped in the cockpit until part of the nose cone and instrument panel was cut away from above his lower legs and feet. He was taken to the Intensive Care Unit at the area Hospital. He initially responded to treatment, but complications arose and he died about one week later. Both occupants were believed to have been wearing only lap harnesses. Post-mortem information indicated that both occupants suffered back injuries which were consistent with a sharp vertical impact.

An aftercast from the Meteorological Office indicated that at the time of the accident, there was a slack pressure gradient over England, the mean sea level pressure being 1016 mb, with no significant weather or cloud, and a visibility of 15 to 20 km. The surface wind was estimated to be 130°/10 kt, and 160°/10 kt at 1,000 feet. The air was very dry, and the risk of carburettor icing was assessed as unlikely. The final track of the aircraft was into wind.

During the week following this event, another accident involving a Twinstar Mk 3 was reported to the AAIB. That accident was a heavy landing following an engine failure shortly after takeoff, which resulted in severe back injuries to the two occupants.

This problem is well known and the UK distributor issued a safety bulletin on 18 August 1989 calling for a 50 hour inspection of the needle. It is also the subject of a Service Information leaflet from Rotax, issued in June 1991 (8UL 91-E) and is included in the Rotax maintenance plan (3UL 91-E), both of which recommend a 50 hour inspection of the needle and its replacement every 150 hours. These actions have not been made mandatory by the CAA, the PFA, or the BMAA. A PFA inspector carried out the annual renewal inspection approximately 50 flying hours before the accident using the PFA's schedule contained in 'The Application for Renewal'. This included the item: 'Check/Inspect: Air induction system, fuel system....'.

Rotax are developing a modification for new production which will introduce an 'O' ring to each side of the circlip to prevent the needle rotating. The modification is due on the production line at the end of the year. It is therefore recommended that :

94-35 The CAA require that the modification to the carburettor needle fixture on Rotax engines be made retrospective and mandatory, and that in the meantime the 50 hour check be also made mandatory.

Seats

The seat comprised two foam cushion on top of cloth stretched between three transverse structural members with a diagonal tube underneath seat pan. The weld attaching the lower fore-and-aft side member on pilot's side to the axle had failed, allowing asymmetrical loading of that seat.

This aircraft was designed to BCAR Section S with a requirement to take a static 4.5g vertical load. However, this accident and the earlier one notified to the AAIB have inflicted almost identical severe spinal injuries following a high rate of descent. It is considered that in the event of gear collapse the occupant has no protection from hitting the ground, with seat structural members in-between him and the ground exacerbating the potential for spinal injuries. It is therefore recommended that:

94-36 The CAA consider a requirement for the provision of better protection to the occupants of the Kolb Twinstar in the event of a heavy landing.

Engineering Examination

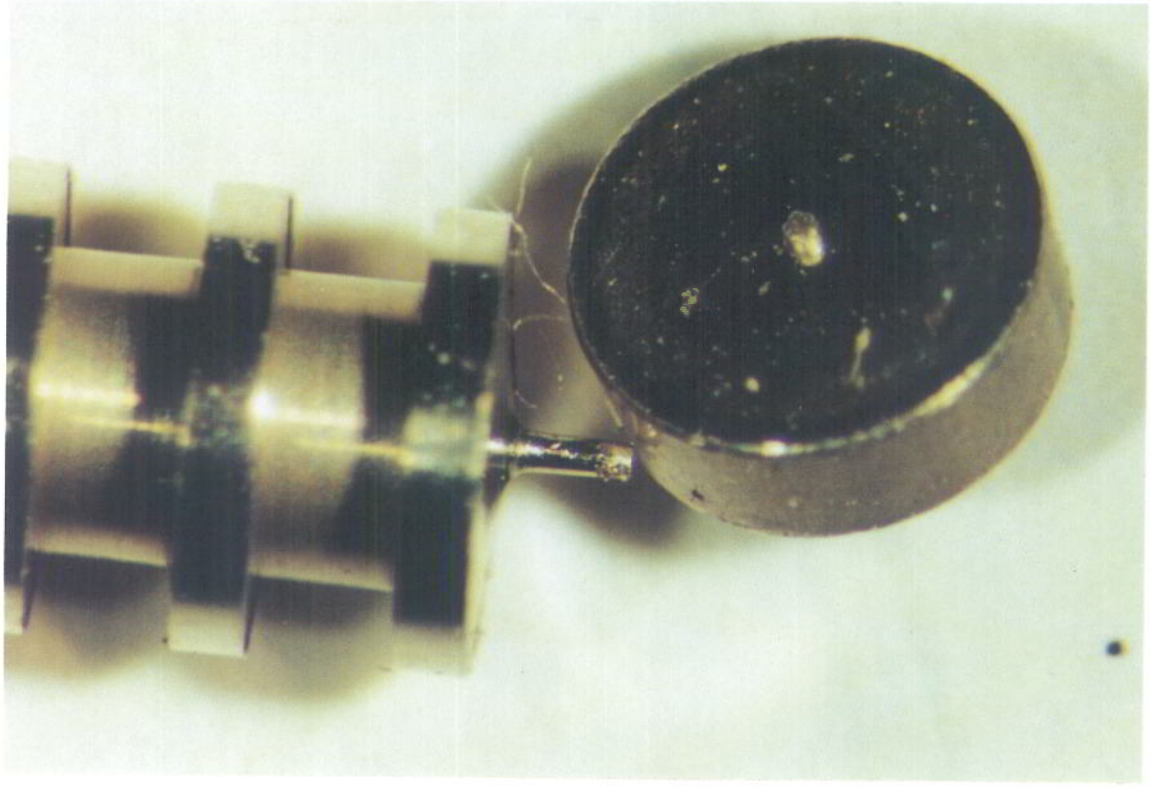
The impact mark from the mainwheels showed that the aircraft had hit the ground with a high angle of descent and had then bounced 17 feet forward and stopped.

The impact had caused the main landing gear to spread outwards allowing the seat structure to contact the ground. The cockpit spaceframe structure showed severe disruption consistent with a high vertical deceleration, and the engine, which was mounted above and to the rear of the wing centre section, had nodded forward damaging its support structure. One propeller blade had contacted the flap operating linkage at the rear of the wing whilst running at an intermediate speed; this had damaged both the linkage and the propeller. The emergency services had removed part of the nose section to facilitate rescue, this included sections of the instrument coaming containing the magneto switches, which were found in the 'OFF' position, and the rev counter. The fuel was 'ON' and witnesses report that the flaps were down when they first arrived at the scene.

Engine

The wings and fuel containers were removed to transport the aircraft to Farnborough, and as the wires to the magneto switches had been disconnected by the fire service the engine was 'live', consequently the spark plugs leads were removed from the plugs for safety. On arrival at Farnborough the engine systems were reconnected with the intention of running it with the minimum amount of disturbance from its condition at the crash site. The engine started on third pull, but could only be accelerated to 3,500 RPM by using choke as well as throttle, and at this speed the engine was rough. At 3,500 RPM the throttle position was as found at the accident site. Opening the throttle beyond this position caused a reduction in RPM. Both magnetos were proved to be serviceable and the fuel filter, although slightly contaminated, did not impede the flow of fuel. The needle on the rear carburettor was found to have worn through at the circlip and had dropped into the carburettor jet, restricting the flow of fuel to the rear cylinder. The needle was replaced and the engine easily achieved 6,000 RPM.

The needle was retained in position by a circlip which was split at the apex of the hole holding the needle; the edges of the split had 'machined' away the groove in the needle as it rotated under the forces generated by vibration. The split still held some fine continuous swarf when the needle was examined. Photographs show the needle with the tip 'machined' off, and the apex of the circlip recess.



Carburettor Needle showing 'machined' off tip and fine swarf

Circlip showing split in apex