

Maule MX7, N61331, 8 August 1997

AAIB Bulletin No: 4/98 Ref: EW/C97/8/4 Category: 1.

Aircraft Type and Registration:	Maule MX7, N61331
No & Type of Engines:	1 Lycoming 0-360-C1F Piston Engine
Year of Manufacture:	1988
Date & Time (UTC):	8 August 1997 at 1607 hrs
Location:	Brunton Airfield, Northumberland
Type of Flight:	Private
Persons on Board:	Crew - 1 - Passengers - 1
Injuries:	Crew - 1 fatal - Passengers - 1 fatal
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Private Pilot's Licence
Commander's Age:	51 years
Commander's Flying Experience:	See text
Information Source:	AAIB Field Investigation

History of flight

At about 1145 hrs, the aircraft took off from Maypole Airfield, Kent for a flight to Brunton Airfield via Stapleford, where it landed at 1224 hrs and was refuelled with 185 litres of 100LL aviation gasoline. It took off again at about 1345 hrs.

The aircraft was seen on the approach to Runway 14 at Brunton at about 1600 hrs; the landing lights were on and the flap appeared to be selected to full. The passenger, in the right seat, was seen to have his right arm raised "towards the front above his head maybe holding on to something". There is a tubular piece of aircraft cabin structure in this area which would have made a convenient handhold. It is unlikely that he would have had his hand in this position if he had been flying the aircraft.

The aircraft appeared to touchdown in a three point attitude. The left wing then started to rise and the aircraft moved to the right towards some large straw bales on the grass near the right side of the runway; the right wing tip may have touched the ground momentarily although no physical evidence was found of any such contact. Power was applied and the aircraft became airborne again.

It continued to turn to the right and climbed to what was estimated to be about 100 feet agl; the impression gained from eye witness reports was that the aircraft was flying very slowly in an almost stalled condition. The bank angle steepened and witnesses saw the aircraft in top planform after it had turned onto a north westerly heading having crossed the railway line to the west of the airfield. It then descended rapidly in this attitude until it struck the ground and subsequently caught fire killing the occupants.

The pilot's dog, which frequently accompanied her, normally occupied the rear of the cabin. The dog was unrestrained and escaped with only minor injury; it was in or near the aircraft when the fire started as it suffered some singeing of its fur.

A wrist watch found in the wreckage had stopped at 1707 hrs local time.

Meteorology

An aftercast prepared by the Meteorological office at Bracknell indicated that there was a weak cold front slowly approaching the Northern Isles with a southerly flow established over the Brunton area. The following general conditions existed at the time of the accident:

Surface wind 170° to 210°/5 to 10 kt

Visibility 12 to 18 km

Cloud Few - base 4,500 feet

Temperature + 20°C

Dew point + 16°C

QNH 1015 mb

A strong temperature gradient existed along the coast and it was estimated that Brunton was under the cooler coastal conditions whilst a mile or so west the temperature was + 27°C and the dew point + 13°C; the surface wind was nearer to 210°.

A witness on the airfield at the time of the accident observed that the surface wind was from the south east, "moderate to fresh".

Pilots' flying experience

Neither the licence nor logbook of either pilot was found; it is possible that the documents were on the aircraft and were destroyed in the post crash fire.

In 1996, the passenger had applied to the CAA for an assessment of the requirements for the award of a PPL. He had claimed a total of 73 hours flying up to August 1979. He was required to fly a further 18 hours and take the appropriate flight test. He started the training on 29 January 1997 and passed the test on 2 August 1997; his total experience at this time was about 105 hours.

The pilot was issued with a PPL on 30 January 1989 and gained a night rating on 21 March 1989. She obtained a USA Private Pilot's Certificate with instrument rating on 20 May 1997; this was

validly when accompanied by the UK PPL. On the 16 June 1996, she had an accident in Piper PA28, G-OANI (AAIB Bulletin No: 8/96) at which time she had a total of 545 hours flying experience. The majority of her flying from that time was in the Maule. It is known that she flew regularly however, it was not possible to determine the number of hours.

Medical and pathology

Post mortem examination and study of the medical records of both occupants revealed no pre-existing medical condition which would have contributed to the accident.

Examination of the Wreckage.

Examination of the accident site revealed that the aircraft had struck the ground with its right wingtip whilst steeply banked to the right. The aircraft had subsequently cartwheeled, the propeller, engine cowlings and most of the cockpit glazing becoming separated from the main wreckage before it came to rest, upright and facing the direction from which it had come, about 150 feet from the initial point of impact. At the moment of impact the aircraft was on a track of 332°M, approximately parallel to, and about 20 yards to the west, of the East Coast Main Line.

There had been a fierce ground fire at the main wreckage site, which appeared to have started in the cockpit area. This had consumed all the fabric covering of the fuselage and empennage and caused localised melting of the wing skins at the roots of both wings and at a secondary fire site centred on the right wingtip tank. During the 'on site' investigation it was found that the two inboard and the left tip fuel tanks still contained a considerable quantity of fuel. The left tip tank was still basically intact; the two inboard tanks had both split at their horizontal seams and drained down to that level. The right tip tank had become pressurised, distorted to a near spherical shape and then burst; the ejected fuel igniting as it was released.

The distance from the initial wingtip strike to the propeller strike indicated that the aircraft had been in a relatively level pitch attitude, but descending rapidly. The engine crankshaft had broken just behind the propeller flange and the complete propeller had come to rest about 8 feet beyond the point where it had first struck the ground. The characteristics of the crankshaft failure were mainly of bending in combination with a slight degree of torsion. One blade of the propeller had marked erosion of the paint around the leading edge on both thrust and suction faces and leading edge damage with twist towards fine pitch near the tip; the other blade had only twist towards fine pitch at the tip. Examination of the ground marks at this point revealed only one very large propeller blade strike and one relatively small one. This combination of features was indicative of a high engine speed but little power.

The 'on site' examination also showed that at the time of impact the flaps were set at the 'Take-off' position and that the mechanism had been intact. The flying controls were examined and all breaks were consistent with having been caused by impact generated distortion of surrounding structure. This indicated that the control circuits had remained continuous and correctly attached, with no evidence of a persistent restriction in any of them. All the engine controls were continuous and, as found, the throttle was closed, the propeller selected to fully fine pitch and the carburettor heat selected to 'hot'. The main fuelcock was found selected to the 'both' position. The fire had been particularly intense in the area between the fuselage front bulkhead and the rear of the engine and had partially melted the carburettor and hot air box.

The wreckage was removed to the AAIB at Farnborough for further investigation.

The position of a witness mark of contact by the inboard closing rib of the right aileron on the outboard end of the flap showed that the ailerons had been deflected to almost full left roll travel at the time of impact. This was established by a comparison of relative surface positions with control positions performed on a similar aeroplane. The aileron position was further evidenced by the positions of the aileron controls near the control yokes and by the rudder bias tab which is automatically applied with aileron. No reliable indication of the elevator or rudder positions could be determined.

Because the propeller flange and forward crankshaft was broken off, it was not possible to perform compression or timing checks on the engine. A bulk strip examination showed that the condition of the cylinders and pistons was generally consistent with that expected in engines with similar 'in service' time. Examination of the valve-gear showed that it was in similar condition, with no abnormal wear of the guides or seats. Although there were considerable deposits of lead on the piston crowns and on the cylinder heads around the inlet valves, which may have been indicative of a consistently cool running engine, there was no sign of lead fouling of the plugs. Fire damage to the magnetos precluded their being tested.

The carburettor, which had been fractured at its connecting flange to the induction manifold, was separated from the hot air box. Within the carburettor bore there was a considerable amount of debris adhered to the venturi casting. It was evident that the temperature to which both the carburettor and hot air box had been subjected was close to the melting point of the alloys from which they were constructed. The hot air flap, which was fabricated from sheet rubber gripped between two alloy plates, had been totally charred.

The hot air flap had been the subject of a manufacturer's Service Letter (#56, Feb 1993), issued following reports of a break-up of the rubber element of the flap, leading to occlusion of the carburettor and subsequent loss of engine power. It called for an inspection of the rubber part of the hot air flap and its replacement by one with an improved material specification (different rubber with cotton reinforcing), if necessary. Compliance with this Service Letter was considered Mandatory by the manufacturer, but was not the subject of Airworthiness Directive by the FAA, the Primary Certificating Authority. There had been a subsequent Service Bulletin (#16, March 1996, approved by the FAA) which detailed the manner in which the flap rubber part was changed; compliance was strongly recommended but optional. There was no evidence found in its log book to suggest that this Service Bulletin had been applied to this aircraft.

The debris found on the carburettor venturi was analysed and a comparison made with the charred flap fragments from the hot air box. This analysis showed that the elemental make-up of the debris on the carburettor venturi was inconclusive but not inconsistent with charred flap rubber being a constituent along with other vegetable matter. There was no evidence found in the charred rubber from between the plates in the hot air flap to suggest that the rubber had been cotton fibre reinforced.

Analysis of evidence

An overall view of the witness information and the evidence derived from examination of the wreckage revealed a number of features consistent with the engine not developing its full potential power. The aircraft's climb performance, after it was seen to abort the landing and the engine was heard to accelerate, was poor even after allowing for the fact that it was in a turn. The loss of power associated with the application of hot air on a hot day would have been at least partially responsible for the loss of climb performance and this may have been exacerbated if the pieces of rubber from

the hot air flap had also occluded the carburettorventuri. The evidence of very low power at the point of impactcombined with high engine rotational speed was consistent withthe engine control settings. The high rotational speed inferredthat the throttle was closed very shortly before impact.