

No: 9/84	MICROLIGHT	Ref: EW/C863
Aircraft type and registration:	Mitchell wing B10 G-MJXC (single engined microlight aircraft)	
Year of manufacture:	1983	
Date and time (GMT):	15 February 1984 at 1540 hrs	
Location:	Pilling Sands, Lancashire	
Type of flight:	Private	
Persons on board:	Crew — 1	Passengers — Nil
Injuries:	Crew — 1 (fatal)	Passengers — N/A
Nature of damage:	Aircraft destroyed.	
Commander's Licence:	Unlicensed but had previously held Private Pilot's Licence	
Commander's Age:	38 years	
Commander's total flying experience:	Approximately 38 hours plus 15 hours on gliders.	
Information Source:	AIB Field Investigation.	

The Mitchell B10 Wing is an American designed ultra light flying wing of which many examples have been built and flown successfully in the USA but only a few in this country. The aircraft has a 34 ft span cantilever wing of conventional construction with 3 axis control via wing tip mounted rudders and stabilators (elevons) attached to the outer wing trailing edges. The rudder pedals are attached to a steerable nose wheel and a system of push pull rods and bell cranks operates the elevons via a mixer unit to give roll and pitch inputs from the control column which is suspended from the centre wing to hang at eye level above the pilot's right hand. A tubular frame attached below the wing centre section supports the landing gear, pilot and rear mounted engine with pusher propeller.

G-MJXC was home built during 1981/3 by a first time constructor with little aviation experience working from a set of plans. During 1983 it was extensively damaged on several occasions during ground taxi trials and attempted or inadvertent flights. These culminated in an incident in which the aircraft became airborne and then control was lost during an attempted turning manoeuvre. The ballistic parachute was deployed but became entangled with the propeller. Despite this the aircraft was landed without injury to the pilot. This incident was reported to the safety officer of a microlight group which the constructor had by now joined and as a result a working party of experienced microlight constructors and pilots including some with experience of the Mitchell Wing was set up by the group to consider the problem. Various defects and deficiencies in construction were observed and commented on by the group but they concluded that the basic reason for the loss of control was the pilot's inexperience of the flying technique required by the particular characteristics of this type of aircraft. In the ensuing months the constructor repaired and modified the aircraft to correct the defects that had been found. In addition a wooden nacelle was constructed round the tubular framework below the centre section incorporating a flat windscreen in front of the pilot extending up to the wing leading edge. The portable fuel tank was also re-positioned in the wing centre section above the pilot's head and approximately 10 lbs of lead installed in the nose of the aircraft.

The pilot on the accident flight had been a member of the working party previously referred to and had constructed and successfully flown his own Mitchell wing aircraft. He had volunteered to fly the aircraft for the constructor on what was effectively a first flight by virtue of his previous experience on the type. He had previously held a Private Pilot's Licence but this had expired and he was unlicensed at the time of the accident.

On the day of the accident the aircraft was prepared at the flying site on Pilling Sands and a balance check carried out by trestling the aircraft. The pilot's seat was not attached directly to the aircraft. Its rearward movement was intended to be restrained by a strap (originally a car seat belt) attached to the forward cage framework and passing behind the pilot's back. The pilot himself was secured to the aircraft by a strap not attached to the structure but passed round and knotted over his lap.

Following some fast taxi runs the pilot reported that he was unable to raise the nose of the aircraft adequately and the constructor adjusted the elevon controls to give increased up travel. It subsequently transpired that re-positioning the fuel tank in the centre section had limited the rearward movement of the control column to about half travel. The constructor believed that it was the pilot's intention to make another fast taxi run and possibly a low hop but in the event the aircraft took off directly and climbed to approximately 100 feet where it made two wide circuits of the area over the sands. It then began to lose height as though it was going to land but at about 50 feet it suddenly

nose-dived into the ground. The pilot, who was not wearing protective headgear, was thrown forward of the aircraft when the single strap knotted round his lap broke on impact and he died in the accident. Because the crash occurred approximately $\frac{3}{4}$ of a mile from where the eye witnesses were positioned, they were unable to give a detailed description of the aircraft's last manoeuvre or whether it was accompanied by changes in engine power.

Examination of the wreckage showed that the aircraft had struck the ground with the left wing and nose whilst in a steep nose-down attitude and at a relatively high speed. The airframe was intact on impact and the engine developing power. During the examination it became apparent that the aircraft was of unskilful construction to the extent that it was not airworthy. The most serious deficiencies were in the construction of the wing folding joints and in the flying control system. The construction of the wing joint allowed sufficient free play for an attempt to be made to stabilize the joint by inserting wooden blocks retained by elastic cord between the ribs adjacent to the joint. This arrangement would have led to structural damage and possible failure of the joint had the aircraft continued to fly but there was no evidence of this having occurred during the short period of the accident flight. In order to provide an adjustment point in the flying control circuit, the connection of each push pull rod to its elevon was formed by a fork end attached to the elevon screwed into the end of the push pull rod by means of a thread insert. Insertion of the thread into the end of the $\frac{1}{2}$ inch diameter push pull rod had reduced the thickness of the tube wall to an extent that made it a potential failure point. The main pivot point in the mixer unit adjacent to the control column connection comprised a welded tubular joint and this was broken with a large fatigue crack revealed in the failure together with areas of incomplete weld penetration. It appeared that the loads necessary to initiate this failure could have been caused when the disconnected wing had been repeatedly placed on the ground with the control column protruding below the wing acting as a prop. It was not possible to reconstruct the wing and control system to allow a valid rigging check to be carried out but it appeared probable that an adequate range of elevon movement could have been obtained had the rearward movement of the column not been limited by the fuel tank supports. This had necessitated the adjustment of the elevons towards increased negative travel with the result that the requirement to maintain the elevons in the negative sector throughout their range of movement in order to obtain pitch stability of the aircraft was probably complied with.

The accident could not be attributed with certainty to any particular defect of construction. The failures at the elevon connections and at the control column pivot were both potential accident causes since they would have disconnected the control from the column. However following metallurgical examination it was not possible to conclude with certainty that final separation had occurred in flight. The aircraft was potentially unstable in pitch. This situation would have been aggravated by the restricted range of aft control column movement, the addition of a nacelle and windscreen to the aircraft likely to produce a nose-down pitch, and possible centre of gravity shifts if the pilot's position moved because he was inadequately secured to the aircraft. There was also the possibility that in trying to brace himself against moving the pilot could have inadvertently imparted a movement to the hanging control column.

When the aircraft was weighed after the accident its basic weight was found to be 161 kg. In the belief that it weighed less than 150 kg, which it probably did at the time that it was registered, and was therefore in the microlight category, it was intended to operate it in accordance with the regulations current at the time. These allowed it to be operated without a Permit to Fly and made it unnecessary for the constructor to submit the aircraft to any form of supervision during its construction or examination before its first flight.