Mainair Flash 2 Alpha, G-MTLA

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Aircraft Type and Registration:	Mainair Flash 2 Alpha, G-MTLA
No & Type of Engines:	One Rotax 503 piston engine
Year of Manufacture:	1987
Date & Time (UTC):	17 July 1996 at 1608 hrs
Location:	Rhuallt near St Asaph, Denbighshire
Type of Flight:	Private
Persons on Board:	Crew - 1 - Passengers - Nil
Injuries:	Crew - Fatal - Passengers - N/A
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Private Pilot's Licence Aeroplanes (Microlights)
Commander's Age:	35 years
Commander's Flying Experience:	135 hours of which all were on type. Approximately 10 hours had been flown in the last 12 months
	Last 90 days - Not known
	Last 28 days - Not known
Information Source:	AAIB Field Investigation, assisted by the British Microlight Aircraft Association (BMAA)

History of the flight

The pilot, who owned G-MTLA and had kept and operated it fromthe North Wales Microlight Centre for two years, had recentlybought a new propeller. He arrived to fit it early on the afternoonof the day of the accident. A colleague watched as the pilotfitted the propeller and carried out a full power engine run whichappeared satisfactory. Following this, the two men fitted a camerabracket to the starboard wing tip and connected the wing to thetrike unit. The pilot then commenced his daily check which hehabitually did using a printed check list. Thereafter, he wasseen having a hot drink before refuelling the aircraft and donninghis flying suit and helmet; he seemed to be well and looking forwardto trying out his new propeller. He was seen to start the engineand taxy to the eastern end of the field where he appeared tobe completing his pre take-off checks. The subsequent take-offwas normal and he headed out to the North West and climbed toan estimated height of 1,500 feet agl. During the initial climb,the aircraft was seen to encounter some light turbulence but thisappeared to be easily corrected; at height, the pilot carriedout some normal

manoeuvres while staying close to the operatingfield. At the time, the weather was excellent with a clear skyand a light surface wind.

There were various witnesses who were aware of the last momentsof the flight. All agreed that the aircraft was flying at approximately1,000 feet agl. One witness, who has flown in microlight aircraftas a passenger, reported that she was about 600 yards away fromthe Microlight centre and saw the aircraft approach and undertakea very tight turn; it maintained this turn through approximately540° before there was a loud crack and the left wing foldedup. G-MTLA descended in an increasingly rapid spiral before impactingthe ground. One other witness, who was approximately one mileaway from the operating field, stated that he watched the aircraftflying over and that the engine suddenly stopped at the same timeas the pilot seemed to lose control. The attention of other witnesseswas drawn to the aircraft by either a loud crack or the enginenote changing; these noises happened close together and therewas some confliction as to which came first. However, all theclose witnesses confirmed that the left wing folded up early inthe sequence and that the aircraft entered a steep spiral to theleft from which it did not recover; the witness who had seen thepilot fit the propeller also saw the right wing fold up soon afterthe left wing folded. As the aircraft descended, there was noengine noise. Additionally, bits of the aircraft were seen tofall to earth subsequent to the impact.

The post mortem examination of the pilot did not reveal any medicalcondition which may have contributed to the accident.

Aircraft description

The Manair Flash 2 Alpha is a flex wing aircraft with the engineand propeller mounted behind the trike unit which has provisionfor two occupants. Control of the aircraft in flight is accomplishedby the movement of the wing relative to the trike. The wing isa simple tubular aluminium wire braced structure supporting afabric cover, which is stiffened and profiled by battens. Itis pivoted at the top of a monopole which forms part of the trikestructure. The pilot controls the wing by movement of an 'A'frame which is attached under the wing at its apex and bracedby fore, aft and lateral rigging wires; the lower transverse baris positioned ahead of the front seat position such that it canbe readily grasped by both hands. To pitch the aircraft up thebar is pushed forward, and to pitch the aircraft down, the baris pulled back. Roll control is achieved by lateral movementof the same bar. When moved fully forward the bar contacts thefront strut and rearward motion of the bar is limited by contactwith the front pilot's chest.

At the time of the accident, the aircraft had a Permit to Flyexpiring on 28 March 1997. The permit applied to the aircraftas defined in the Type Approval Data Sheets (TADS). At the timeof the last inspection, however, the owner was informed that replacementof one of the propeller blades was advisable. He elected to buya new propeller of a different design. It is reported that thispropeller was found to be of a diameter such that insufficientclearance existed between the tips of the blades and the rearflying wires. The owner accordingly reduced the diameter from62 inches to 60 inches. The new propeller type had not been approvedfor incorporation on this aircraft type and it was therefore arequirement that a Major Modification Form was filled in and submitted,(to the CAA or other organisation approved by the CAA) so thatapproval could be granted and the modification incorporated inthe appropriate TADS. These documentary procedures were not followed.

Aircraft operational information

The aircraft is certified for non-aerobatics flight only. Themaximum bank angle is 60° and the maximum pitch angle is30°. Additionally, positive loading must be sustained atall times.

The aircraft manual includes the following statement:

'WAKE TURBULENCE

As an aircraft flies it leaves behindit severely disturbed air. Avoid flying, taking off or landingclosely behind another aircraft, and be particularly careful offlying into your own wake turbulence. It is very easy to flyinto your own wake during 360° turns and the effect can bequite violent. Microlights have been rolled as much as 90°turns by flying into their own wake. If you already happen tobe in a bank, the potential results are self evident. Wake turbulenceis greatest at high G loadings, during turns or slow flight.'

Wreckage examination

The wreckage was subjected to an initial examination by BMAA personnelbefore being dismantled and subsequently transported to AAIB atFarnborough for detailed examination. This revealed that thewing structure had failed initially in a negative-load directionand the control bar had moved forcibly forward into the frontvertical member, causing both these tubes to fracture. The sequenceof the major wing failure and the collision between tubes couldnot be determined from examination of the wreckage. There wasno evidence that any of the bracing wires had contacted the propellerbefore the structural failure. No evidence of pre-existing materialdefect was present in any of the failed areas of the structureor the bracing wires.

The BMAA Inspector was aware that the pilot intended to fit thenew propeller and had issued to him the appropriate major modificationform to complete before the aircraft was flown with the new propeller. Furthermore, the aircraft would have to be officially inspectedprior to flight. However, during the post accident investigation,the propeller was found to be correctly attached and, althoughextensively damaged in the ground impact, was free of any evidenceof pre-impact failure. All other paperwork connected with G-MTLAwas found to be in order.

After the accident, and following discussions with AAIB, the CivilAviation Authority contacted the manufacturers of the machineto establish whether they had data on the pitching moment characteristicsof this wing design in the region of the zero lift incidence angle. They reportedly responded that no such data was available butthe characteristics of the aircraft presented no hazard, providedit was flown in accordance with the limitations specified andalso that the aircraft complied in all respects with the requirementsof BCAR Section S, the airworthiness requirements for microlightaeroplanes. This document requires that a microlight must demonstratea positive slope of control force with flight speed, with airspeedsranging from the recommended approach speed to Vne, which impliesthe full range of incidence normally anticipated throughout theflight envelope. There is, however, no requirement to demonstratethat the slope of control force against speed remains positiveover an incidence range from that appropriate to Vne to the zerolift incidence. The CAA intends to review this issue before thenext revision of BCAR Section S which will be aimed at demonstrationof a positive slope of control force against incidence, down tozero lift incidence. Such revision, when issued, would only affectnew designs.