Article for Flight Safety Bulletin

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Title: Flying microlight aircraft - safety for non microlight pilots (based upon a talk given to the 1999 PFA airmanship awareness day at Kemble).

Words: 1994 words including captions but not the title.

Microlight aircraft are some of the safest, cheapest and most fun aircraft flying in the UK. The fatal accident rate, at around 1 per 30,000 flying hours is similar to that of General Aviation overall, and rather better than some parts of it in recent years. However, at the BMAA we see several perfectly serviceable aircraft per year written off by very experienced GA pilots, typically with several thousand hours. Why? - well because they are different, not more difficult or more dangerous, just different. The phrase "it's only a microlight" has as much validity as "it's only a jet fighter" all aircraft will treat you back as *they* are treated.

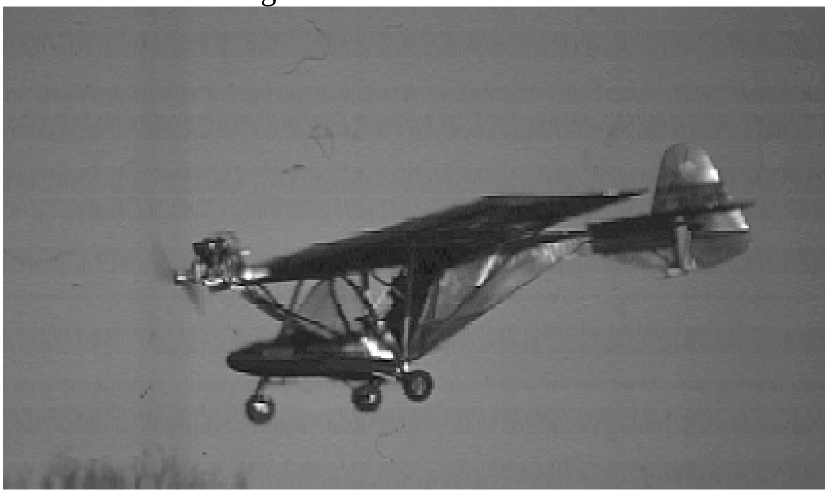
Microlights fall into three basic flavours, 3 axis, weight shift, and powered parachute. The three are completely different in design and control, but can be flown on the one license - a situation which surprisingly has not created many problems over the years; mainly because any pilot worthy of the title will always realise that they don't understand the different controls and operation involved and will happily pay a microlight QFI the required beer vouchers to do the necessary conversion. A conversion between control systems usually takes 10-12 flying hours and most microlight schools are quite happy to take you under their wing.

Weight shift versus 3 axis (Murphy Renegade spirit and Pegasus XL-R)

The real problems seem to come when a pilot experienced on "light" or not so light aircraft elects to fly a microlight, using their existing license and experience. The problem is that although their flying experience should equip them well to fly a microlight, there are perhaps more things they don't understand than they realise. In this article I hope to cover some of those things, and perhaps show that microlights aren't dangerous but do need a bit of respect.

<u>The Inertia / Drag Problem</u>

The two biggest differences between a microlight and a larger aircraft are that they possess much less inertia combined, usually, with a much draggier airframe. This means that particularly when decelerating, the microlight can change speed much more rapidly than light aircraft or gliders. Imagine the scene of an inexperienced pilot who suffers an engine failure in the circuit - the first reaction (before brain kicks in) may well be to maintain height…



Light and draggy - the AX3, a typical microlight trainer

In a typical light aircraft trainer, you are perhaps flying downwind at 80 knots, and the stall speed is about 45 knots. If the pilot starts pulling the stick back, the speed will probably bleed off at around 1½ knots per second. That gives over 20 seconds of mishandling for the pilot to wake up, put the nose down, and avoid stalling the aeroplane.

In a typical microlight, you are perhaps flying downwind at 45 knots, and the stall speed is around 25 knots. If the pilot starts pulling the stick back here ,the speed will bleed off at more than 3 knots per second - giving perhaps 6 seconds for the pilot to react correctly before the stall.

This characteristic also comes into play in the approach and landing. In a typical light aircraft, the approach speed is likely to be around 1.3 V_{stall}, with roundout starting at perhaps 25 feet. Try that in a microlight and you'll stall 15 feet above the ground and be looking for a new aeroplane, here an approach speed of around 1.7 Vstall (say 50 knots in an aircraft that stalls at 30), and the roundout starts at about 10 feet. This is obviously a very unusual picture for those used to have more energy and less drag, but anybody can learn the trick after an hour or two with a microlight QFI. Of course, there is no cloud without a silver lining and this does allow you to use some very small strips, the BMAA training school criteria requires at least a 250m runway, and most experienced microlighters in most types can cope with rather less.

Late roundout and flare (Thruster T600T)

Know your Engine

Microlights are well known for the distinctive drone of the 2-stroke Rotax engine which is as much a standard item on a microlight as a Lycoming is on a light aircraft. It would be fair to say that these engines don’t have the greatest reputation in the world, but they are designed for this class of aircraft. That is to say they are designed for aircraft which are operated usually by one person, who also does the servicing, and needs to know their engine very well.

So, those of us who learned to fly in microlights from scratch know and love our Rotax engines. We check them regularly, we know the vagaries of how to start them on cold mornings, and how to spot a gearbox whose torsional shock absorber is on its way out. If you are going to operate a microlight, and don’t wish to add to the bar gossip about “unreliable Rotaxes” it is important to know your engine, even more than it is for a light aircraft. The good news is that most BMAA (and PFA microlight) inspectors do know the Rotax engine well, and are glad to pass on their knowledge; failing that, the Rotax importer, Skydrive and many other companies and clubs regularly run courses for private pilots on how to look after their engines. You never stop learning in aviation, but here it just doesn’t stop at the cockpit.

Personal Equipment

In a light aircraft you are encouraged to dress for the outside environment, to wear a lifejacket over water and if performing any more entertaining manoeuvres to wear a hard shelled helmet. In a light aircraft this is in case anything goes wrong - in a microlight much of it is for the actual flight; gloves, thermals, a helmet and other protective clothing are often essential for the conduct of the flight - enough said.

Typical microlight flying clothing (the author about to take-off for a flight over the sea)

Range and Endurance

Microlights are by their nature slow and light. So, changing the fuel state or adding a passenger make a huge difference to the speed achievable, and the fuel consumption. Certainly a typical 2-seater such as a Thruster might experience almost a 50% increase in fuel burn through adding an adult passenger.

This means that range and endurance in a microlight is quite difficult to calculate, and certainly very few manuals will give you much in the way of moral guidance on the subject. What this comes down to is that the pilot is required to get to know his or her aircraft very well - to learn the typical and maximum fuel consumptions at the weight and speed they normally fly, and use that in their flight planning.

On the other hand most microlights do come with an inbuilt advantage over many light aircraft… the sight gauge. Generally the fuel gauge will be a sight tube up the side of the tank, so at least you will know exactly how much fuel is in the tank - rather than the rough guesswork which is usually involved in the crude float and capacitance gauges fitted to a great many light aircraft.

Micro-Meteorology

The combination of low speed (a cruise between 35 and 65 knots) and low wing loading (rarely exceeding 25 kg/m²) mean that microlight aircraft are much more affected by the weather than probably other class of aircraft except balloons.

In navigation, the 10 knot headwind which is no more than a minor consideration in a light aircraft cruising at 80 knots can change the time of flight by 25%, and 20 knots can limit you to local flights only. Pilots have run out of fuel in microlights through failing to take proper account of wind conditions, and certainly it can cause great difficulties if you were planning a precise arrival time or were trying to extend your range to the further possible limits. However, being small and slow, we can of-course take advantage of a great bane of many heavier aviators lives - vertical wind shear. Microlight cross country flying often becomes an exercise in reading the terrain and knowing where the wind speed is likely to be most beneficial; anybody who has learned white water canoeing will be very familiar with the concept.

Turbulence is also a great issue, the low wing loading of a microlight makes it far more affected by turbulence than most other aircraft, and although it is possible to fly most microlights in quite horrendous conditions (it's a bit like going into the ring with Frank Bruno, roll with the blows and wait for it all to stop), microlight pilots help themselves a lot by looking at the terrain and avoiding woodland (which causes rotor), freshly ploughed fields and car parks (which create thermals), or the downwind side of towns and hills. I'm not saying this isn't done by other aviators, but not wishing to see our passengers' lunch again, microlight pilots need to be more aware of the surface than perhaps is necessary in something a bit heavier. (If you are demonstrated a microlight aircraft by an experienced pilot who then offers you the controls - if you've just started to fly over some woods, you may have upset him.) Final approaches over woods are a particularly enjoyable experience and generally require the pilot to apply yet more speed on the approach.

Visibility is another issue where microlights are different. A few months ago I sat in the back of a Piper Cub with a friend for a flight of a hundred miles or so. The visibility was just VMC, 5000m which at around 85 knots gave a visibility ahead of under 2 minutes. This was rather unsatisfactory for navigation, and wholly unsatisfactory for lookout, so my friend very sensibly turned around, landed, and we continued by car. Had we been flying a microlight however, we could have trimmed the speed back to perhaps 40 knots, giving over 4 minutes visibility ahead and much more time to get the navigation right. Admittedly it would be no faster than travelling by car- but it beats the M25 any day. So, as with small strips, this is an area where it is possible to operate a microlight safely in conditions that other aircraft should not sensibly do so.

Maintenance

BMAA microlights (which is most of them) are operated on a different basis to aircraft with a CofA or even a PFA permit. The responsibility for care and maintenance of the aircraft rests almost entirely with the owner. Annually, a permit renewal inspection and check flight are of-course required, but they are done on the basis of an independent audit of the owners own good maintenance of the aircraft - they are not a strip down inspection like a C of A renewal. So, the pilot used to paying a licensed technician to oversee their aircraft, or to hiring a club aircraft and letting somebody else look after it, needs to do some rapid learning if they are planning to go the microlight route. Standard BMAA maintenance schedules exist for aircraft which do not already have an approved maintenance schedule contained in their operators manuals but, regardless of the schedule, the price of cheap flying is the time and effort getting to know your aircraft and looking after it.

The owner must know his or her way around the aircraft and engine.

Finally, please don't let me put you off. The point of this article is to say that if you wish to fly microlights (and I hope if you do you enjoy it), please display the sense of a competent aviator and spend some time with an experienced microlight pilot, preferably a QFI, so that you can enjoy the experience safely. Microlights aren't dangerous, just different.

Details of microlight clubs and microlight flying can be obtained from the BMAA, phone 01869-338888; http://www.avnet.co.uk/bmaa