OPERATING DEREGULATED SUB-115 kg MICROLIGHTS

Since 30th April 2007 it is legal to fly a lightweight 'sub-115 kg' single-seat microlight aeroplane without a permit to fly or any of the associated official design investigation, formal flight testing, maintenance schedules, annual inspections or permit paperwork. In this new category the onus is entirely on the owner/pilot to establish that the aircraft is in a fit state to fly. The only requirements in this new category are that the aircraft must have an empty weight not exceeding 115 kg, a maximum gross weight not exceeding 300 kg (330 kg for a float plane, seaplane or amphibian), an empty wing loading of no more than 10 kg per square metre, a stall speed less than 35 kts CAS and be a single-seater. It must be registered with the CAA, display its G-???? registration markings in the normal way, and be covered by third party insurance (minimum of 750,000 SDRs, approximately £600,000 of cover). It may only be flown for private use, by day, in VFR, and only over non-congested areas of the country. The rules of the air must be obeyed as laid down in the ANO. The pilot must be in possession of an appropriate and current pilot's licence to fly a microlight. Airframe and engine logbooks of CAA-approved format must be kept up to date in the normal way. The aircraft must also comply with the noise limitations for microlights (contained in "The Air Navigation (Environmental Standards For Non-EASA Aircraft) 2008") but at the current time these aircraft are exempted from holding a certificate that shows compliance with these regulations: this means that noise testing is not required, but compliance with the regulations might be challenged in a court of law! The CAA may also insist upon a noise test should it come to their attention that a particular aircraft seems to be excessively noisy.

Within this minimal framework of rules there is scope to build a simple but nevertheless practical aircraft of conventional construction, like a lightweight Minimax, or to resurrect some of the very early single seat wire-braced flying bath-chair microlights that flew around at little more than running speed (Quicksilver MX), or to build something with a quite good performance and astonishingly high fuel efficiency using more modern technology, for example by borrowing from the designs of lightweight gliders such as Jim Maupin's carbon fibre 'Carbon Dragon' which weighs less than 80 kg but achieves an L/D of more 20.

Definitions

'Aeroplane' means an aircraft supported in flight by fixed wings (as opposed to rotating wings) and therefore includes conventional rigid wings, flex wings and powered parachutes, with wheels or foot-launched, and controlled by any method including control surfaces or weight shift or a mixture of the two. It does not include gyroplanes or helicopters. It can be powered by any form of motor including reciprocating, rotary, jet, rocket, electric, steam, etc, although it would need to comply with the noise regulations for microlights (see above).

'Empty weight' is the weight of the aircraft without pilot or fuel, and need not include items carried at the discretion of the pilot on a flight-by-flight basis e.g. hand-held radios, extra seat cushions etc.

'Maximum gross weight' is the maximum weight of the aircraft including fuel, pilot and all other items carried. In practise the 300 kg max gross weight limit is unlikely to be even approached with any conventional configuration, as to approach this loaded weight with the empty weight being only 115 kg would mean a ratio of loaded weight to empty weight of better than 2.6. Most aircraft struggle to achieve a ratio of more than 2.

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'Empty wing loading' is the empty weight in kilograms (see above) divided by the wing area in square metres. For a conventional aircraft, the lifting area is taken as the area of the wings, including wing flaps (if fitted) and ailerons. Where the wing panels attach to the fuselage sides, it is normal to include the 'virtual' portion of wing buried in the fuselage. So with a typical parallel-chord wing with square tips, the wing area becomes simply the wing span multiplied by wing chord. If the wing is tapered, multiply the wing span by the mean chord to get the wing area. The mean chord is the chord measured at one quarter of the wing span outboard from the aircraft centreline. In the case of a canard aeroplane it is acceptable to include the canard area with the wing area. With a biplane, add the areas of the upper and lower wings, upper wing centre section and the 'virtual' centre section linking the two lower wings.

'Registered with the CAA' means you must apply to the CAA Registrations Dept for a unique G-???? registration, using a form CA1 which you can download from the CAA's website or obtain from LAA Engineering. There is a registration fee to be paid, but this is a one-off fee.

'Display of G-???? registration letters' means that the registration must be clearly displayed under the port wing, on both sides of the fuselage sides or fin, and indelibly marked on an engraved fireproof metal plate attached to the fuselage. The details of the required sizes of the letters, letter style, colouring, and orientation of the lettering on the surfaces are provided in the CAA booklet CAP 523 which can be downloaded from the CAA website. You will be sent one of these automatically when your G-???? registration letters are allocated.

'Single seater' means the aircraft may only carry one person. This is not as obvious as it sounds, as some microlights do not have seats as such – the pilot of a foot-launched flex-wing for example commonly flies in the prone position supported by a kind of reinforced sleeping bag. Interestingly, the deregulated microlight with its single seat is less regulated than the category of large pilotless radio-controlled model aircraft which have to have a simple design review.

A few words of warning

Just because there are very few formal requirements surrounding this new breed of deregulated microlight, it does not mean they are toys. Like any aircraft, they will kill or injure you given half a chance, especially so as most will offer very little by way of pilot protection in a crash. The deregulated microlight has been freed from the burden of airworthiness regulation not because they are inherently safe for the pilot, but only because they have been judged to cause a negligible risk to third parties. As with any other deregulated hazardous sport such as mountaineering and ocean racing, the responsibility for your safety will lie entirely in your own hands. There is nothing in the new rules to stop you making your wing spars from knotty pine, just as there's nothing to stop you making a rowing boat from blotting-paper – and each will have a similar chance of success. The fact that there is no legal requirement for design evaluation, maintenance or flight testing does not mean that none of these are required: it means that it is entirely up to the owner to decide on his or her own approach to these activities. Based on what happens in other countries where there are similar deregulated forms of aviation, the best safety net is for the owners to be part of a group of like-minded people with the benefit of one or two experienced souls able to act as mentors, giving guidance to those who may be moving unwittingly into particularly dangerous territory. If you are thinking of building your own deregulated microlight then joining your local LAA Strut would be a good first step, and the local LAA inspectors will be able to give advice although for deregulated aircraft, for liability reasons, they will always have to qualify their advice with a statement that their advice is their own opinion only, and that it is entirely up to the owner/pilot to research the situation and form his

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own opinion before deciding what to do. The LAA inspector has no formal responsibility towards a deregulated microlight owner but will nevertheless probably be only too happy to give you the benefit of his advice and experience.

What's that old thing hanging up in the back of the hangar?

A word of caution about resurrecting old single-seat microlights from the early 1980s era which might fall into the new category, many of which can be found hung up in the roof of hangers, festooned in cobwebs, or even 'slung out back' in a heap of aluminium tubing and flapping Dacron, having been long-grounded after the introduction of the dreaded 'Section S' in 1984. Before thinking of getting one of these prehistoric microlights airborne again, look very carefully. Was the design a safe one? Much has been learnt about microlight safety since those days, and things like elevator control cables made of nylon cord have long ago passed from favour – many people died in the early days of microlighting proving that some of the features of these old designs were unsatisfactory. And has the aircraft been properly looked after during its life? Probably not, as its value will have sunk to nothing for many years and it will most likely have been left to corrode away in peace, out of sight and out of mind. The fabric is almost certainly ruined by exposure to ultra-violet light, and will rip to shreds in your hands with way below the original strength. Airframe tubing might look serviceable – but how do you know if it is the original bit? In the early days, when tubing got bent in mishaps it was not uncommon to substitute material from other crashed machines, or whatever was lying around – like electrical conduit for example, even though its strength might be way down on what is needed for the job. To fly any aircraft with suspect materials in the primary structure is like playing Russian Roulette.

Designing your own?

If you are thinking of coming up with your own design in the deregulated category, as long as you are a LAA member we will be happy to give general advice and guidance from LAA HQ, but as with our inspectors, will caution you that this is our opinion only and that it is entirely up to you to research matters and make your own decision. We can point you in the direction of the many aircraft design books available from LAA bookshop, such as Hiscocks 'Design of Light Aircraft', and standard works of reference like Stinton's 'Design of the Aeroplane'. The LAA website is also a ready source of help and in particular, see Technical Leaflet TL 1.15 'example microlight aircraft loading calculations' which leads you step by step through how to work out the loads on the aircraft prior to stress analysis when sizing the structural components, or sand bag testing your completed airframe.

We would recommend you design the airframe to cope with all the main load cases of BCAR Section S even though this is not mandatory in this deregulated class. Appendix A and B of CS-VLA also provide a very helpful simplified approach to working out aircraft loads, which is especially useful for the deregulated microlight designer without too much previous aircraft design experience.

Modifying an existing design

Several designs of single-seat microlight in the USA appear to fall within the new deregulated category weight. Be careful on two counts – firstly, are they really as light as claimed, and

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secondly, do they have enough wing area? You may find that you have to pare every bit of extra weight out of the aircraft to get it to squeak into the 115 kg limit - one LAA'er recently found he had to fit a lighter, much less powerful engine for example – there seems to be very little checking of such things in other countries, so don't take any weight figures from manufacturers as gospel truth – weigh it yourself and see! If you find that the design is short of wing area at the finalised empty weight, be particularly wary of suggestions that the wing area can easily be increased by adding a little extra wing span or chord, or a little of both. This would fall into the category of a serious change needing proper engineering investigation. An extra foot or two of span on each wing can drastically increase the stresses in the wing spars, struts and carry-through structures, not to mention increasing tail loads and fuselage loads - and so it goes on. Increasing the wing chord may similarly alter the distribution of load between the spars or cause serious stability problems. Carrying out such changes on an ad hoc basis will be fraught with danger.

Conclusion

Not since the early 1980s has there been the freedom to design and build simple microlights in the UK without needing a permit to fly. Back then, a number of fatal accidents caused questions to be asked in Parliament and legislation to be hurried into place to close the loophole. Now, twenty years later, the microlight industry has matured, microlight pilot training and licensing are closely controlled and so there is a reasonable chance that history will not repeat itself and this time we can be left to get on the building and flying these very simple, lightweight aircraft without the need for official interference. It is up to all those participating to observe the highest safety standards, avoid an upsurge in the accident rate and so preserve and nurture this new found freedom to build and fly.