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**Text:**

Microlight Aviation is still in its infancy, yet in the 20 years since enthusiasts around the world started fitting lawnmower engines to hang-gliders or small makeshift wings progress has been remarkable. Since then, microlight flying has become a mainstream activity in General Aviation; in the United Kingdom alone Microlights are now 21% of civil registrations, outnumbering either gliders or homebuilt light aircraft.

The rapid expansion in microlight or ultralight aircraft worldwide has unfortunately not been matched by the development or commonality of regulations. Even the name is not common; the UK, New Zealand and Ireland refer to "Microlights", France refers to "ULMs" (Ultra Leger Motorise), whilst many other countries have preferred the term "Ultralight", including the USA and Australia.

This is unsurprising when one considers the hurried way in which most countries were forced to find a niche for these small aircraft which permitted them to be treated with an appropriately minimal amount of regulation. Considering a few countries at the start of 2000, the differences are clear: -

- In the USA, an ultralight is a single seat aircraft with a ZFW below 254 lb and carrying no more than 5 gallons of fuel.
- In Britain a microlight is a single or 2-seat aircraft with an MTOW not exceeding 390kg, and carrying no more than 50 litres of fuel.
- In France, a ULM is an aircraft with an MTOW not exceeding 450kg for 2-seaters or 300kg for single seaters, with a V<sub>so</sub> not exceeding 35 knots.
- In Australia, an ultralight is a single or 2 seat aeroplane with an MTOW of no more than 540 kg.
- Switzerland are willing to accept any other country's definition of a microlight, but they are banned from her airspace.

Fortunately, in Europe at least, there have been attempts to converge these definitions. Europe Airports and the FAI (Federation Airsport International) have for some years operated a sporting definition which permitted an MTOW of up to 450kg for 2-seaters and 300kg for single seaters, with a maximum V<sub>so</sub> of 35 knots; an extra 10% on MTOW and 5% on V<sub>so</sub> being permitted for seaplanes and amphibians.

France and Germany have operated this definition for several years, with some other countries following suite. A major blow for standardisation was struck when in late 1999 the JAA finally published an orange paper to JAR-1 which implemented the FAI definition, and used the term microlight. In July of the same year, the UK CAA published a set of exemptions creating the "Small Light Aeroplane" category, which implemented the landplane part of the definition. SLAs are being treated identically to microlights, and it is likely the ANO will be amended in the spring of 2001 amending the microlight definition and thus causing all SLAs to be reclassified as microlights, eliminating the current dual definition. Current indications are that, with the exception of the USA, most of the globe may now adopt this definition within the next few years.

### Airworthiness Regulation

The convergence of definitions is only the first of two stages permitting convergence. The second stage is that of a common airworthiness standard. The two countries with the largest microlight fleets, the USA and France, are disinterested in implementing a formally assessed design code - so there is little chance of them leading the way. The next two largest players on the world stage, Britain and Germany however, successfully operate such standards; these respectively are BCAR Section S, and BFU-95. Other countries have tended to either follow the French model of a definition and compulsory registration (e.g. Australia), but without a formal design code; or to "borrow" either the British or German regulations. To the authors knowledge, BFU-95 is also used by Austria, whilst Ireland, Israel and New-Zealand have all adopted BCAR Section S.

The preferred route in Europe would be a Joint Airworthiness Requirement (JAR) based upon the key elements of Section S and BFU-95. Given that these two standards have similar objectives and are based in many aspects upon JAR-VLA, the standard for light aircraft below 750kg, this should be relatively straightforward. The primary differences are: -

- A requirement in German regulations only for whole-aircraft recovery parachutes to be fitted.
- Section S uses a minimum design cockpit weight of 86kg, which is lower than the 70kg permitted by BFU-95. This creates problems for some heavier German designed aircraft.
- BFU-95 has stricter longitudinal stability requirements for weightshift aircraft, based upon hang-glider certification requirements. UK based research led by the British Microlight Aircraft Association (BMAA) is currently seeking to close this gap.

However, the JAA Council has not committed any resources to preparing such a standard and without such a commitment, this seems far off. For now, this plethora of national approaches creates a very real barrier to both trade and international flight; a British Type Approved microlight for example requires individual permission to fly to any adjacent country.

It is worthwhile briefly to mention the economics of microlight aircraft certification against any standard. These aircraft are comparatively simple and cheap to both build and operate - hence prototyping and load or flight testing are often considerably cheaper than structural or aerodynamic analysis. Analysis is usually restricted to that essential to prove that testing work may be safely conducted, and then virtually all certification data is based upon test reports rather than analysis. This approach may appear backwards, but it does work and is borne out both by a long track record of safe operation of certified microlight aircraft, and in recent years by the comparatively uneventful lives of those engaged in the testing work.

### Britain - the Industry and the Aircraft

Despite lack of international commonality, as well as a comparatively small domestic market, the UK maintains a thriving microlight aircraft industry. This includes over 75 training schools and six manufacturers, the latter exporting roughly half of their total production. Oversight of this is carried out through a unique working partnership between the BMAA and the CAA. This partnership includes broad delegation to the BMAA of matters as diverse as flying instruction, test flying and design approvals, allowing microlight aircraft to be operated at incredibly low cost and with minimal restrictions (for example, the author's privately owned 2-seat Raven microlight cost £19/hr to operate during 1999). At the same time, a satisfactory degree of safety (around 1 fatality per 40,000 flying hours) is maintained.

The manufacturing industry in the UK is, like other countries, divided between manufacturers of weightshift aircraft, and conventional 3-axis controlled aircraft. At present only one company, Pegasus Aviation of Marlborough manufactures aircraft in both classes.

In the weightshift market, the dominant player is Pegasus who manufacture the Quantum (used by Brian Milton for his well publicised round-the-world flight), followed closely by Mainair Sports of Rochdale who build the Blade and Rapier. The smaller player in this sector is Medway Microlights of Rochester, who build a family of aircraft based upon the Raven wing.

In three axis controlled aircraft, the market dominance is somewhat fluid; historically CFM's Shadow and Pegasus' AX have been the biggest selling. However, both aircraft have been suffering in this fast changing market from limited development and competition from imported kits such as the Indian Raj Hamsa X' Air or the Australian Jabiru. For some time a struggling smaller player however, Thruster Air Services of Wantage have a full order book thanks mainly to their development of the unpopular T300 tailwheel aircraft into the much more refined T600N tricycle undercarriage trainer. Whilst Thruster capitalises on its success by testing a floatplane version of the T600; Suffolk based CFM whose finances have been boosted

by a 24 aircraft sale in 1999 to the Indian Air Force are developing a heavier version of the Shadow - the Shadow 410; Pegasus is considering license production of the German Flightdesign CT, which if it goes ahead is likely to retail at around £40,000, more than any previous UK microlight and four times the cost of a new basic weightshift aircraft. The smallest manufacturer, Aviation Enterprises, who build the Chevvron, a lightweight SLMG derivative have largely abandoned the microlight market, although they may be developing either a slightly more powerful or a light aircraft derivative of the Chevvron. It is notable that whilst in the USA the single-seat aircraft is dominant, in the UK as with the rest of Europe, virtually all aircraft sales are for 2-seaters; single seat types are rare, and sales of them still rarer.

### The Future

Operationally, little change seems likely; the current limitation of day VMC / sight of ground / not over built up areas which exists in the UK and with variations in most other countries causes few problems and is likely to remain. Most countries operate a form of licensing which consists of a cut-down version of the PPL(A) and whilst convergence might be desirable, this is unlikely to happen in the foreseeable future, or the lack of convergence to cause many problems.

Airworthiness convergence seems unlikely to occur at JAA, through a lack of political will. However increasingly the world votes with its feet and in the medium term seems likely to polarise on either the British model of Section-S plus a treatment based upon simplified light aircraft practice, or the more minimalist French approach. So far as the microlight definition, genuine convergence has already happened in all but a handful of countries. In this context however, the world community largely excludes the USA who remain determined their own thing with their single-seat deregulated category enshrined in FAR-103.

In the UK, it seems likely that microlight aviation will continue to grow as it demonstrates an excellent safety record at a fraction of the cost of conventional recreational flying. In particular, the recent appearance of aircraft in the 450kg 2-seat category that comfortably outperform many light training aircraft offers considerable development over the next few years.

The author, Eur.Ing. Guy Gratton MRAeS at time of publication was Chief Technical Officer of the British Microlight Aircraft Association. The BMAA may be contacted on 01869-338888, or at <http://www.bmaa.org/>

### Photographs

The following are labelled thumbnail reductions of the illustrations used in the published article.

1. Mainair Blade 912 - an example of this model has been flown from the UK to Australia.



2. Microlight Aviation is not exempt from the modern aviator's love of avionics (cockpit of a Mainair Flash 2 alpha).



3. The Murphy Renegade Spirit, an elegant Canadian Import which has been approved in the UK as a homebuilt.

