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SPECIFICATION OF ULTRALIGHT AIRCRAFT MAINTENANCE STANDARDISATION

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Abstract

The exact definition of an Ultralight Aircraft is still defined very differently from country to country. Internationally, there are different Ultralight Aircraft (UL) classes with nationally varying certification regulations. Accordingly, the term Ultralight Aircraft is used colloquially more or less comprehensively for Very Light Aircraft or Light Sport Aircraft. However, the latter are subject to much stricter certification and maintenance regulations. This work aims to compare the current legal situation in the European Union countries, extract the best practices, and create a proposal of how a new "state zero" should define the laws and regulations to create the best possible environment for UL maintenance. This thesis is written based on information and directions published on the websites of the responsible authorities of the respective countries, as well as communication with these authorities and first-hand knowledge obtained by conducting numerous interviews with people in the field of UL maintenance. The results indicate how different each country regulates the maintenance and continuing airworthiness of ULs and how important a harmonized regulation would be. It is especially important in order to have clarity as with larger aircraft and thus also to prevent numerous accidents and hazardous situations in the future.

Keywords

Law, Ultralight Aircraft, Europe, Standardisation, Introduction

1. INTRODUCTION

Although there have been uniform international rules for the registration and safety of aircraft and flights since the Chicago Convention in 1944, there are still categories of aircraft that are not subject to international standards. One of these is the so-called Ultralight (UL) or Microlight (ML) category. Usually, people from the aviation environment understand something under it and certainly know some, but it can be difficult to imagine an ultralight for people who are not familiar with it. Of course, it is a very light and small aircraft, but in the period of the last 40 years, a lot has changed in this category. It began with self-built constructions with which people tried to climb into the air to fly a few hundred meters. It was not uncommon for people to lose their lives in the process. Nowadays, however, it is safe and mostly engine-powered aircraft, which are produced by professional manufacturers. Above all, the opportunity to create or invent something that would allow people to travel faster in the future and at the same time independently, was often the motivation for many "do-it-yourselfers".

At that time, people who bought or built an ultralight to be able to fly whenever and wherever they want, would not be satisfied, if conditions and regulations for flying existed. Thus, the people around the ultralight aviation have always fought hard against the legislators of the countries and represented their rights to continue to claim the freedoms for themselves. Therefore, we now have our own ultralight category in almost in every country, which is independent of the international rules. However, with independence, we are facing new problems in the present time. Today, when we can move freely within the European Union (EU) or the Schengen area, each country has its regulations and laws for flying with ULs. Although there are a few countries with agreements and groups of countries that have established uniform rules, you mostly cannot simply fly into another country with an UL. Usually, it is necessary to obtain a permit from the relevant authority in the other country and plan an ultralight flight down to the smallest detail. Otherwise, you can get into trouble very quickly or must turn back. This means that the former understanding of freedom applies, but the lack of uniform rules also restricts us. The former understanding even seems outdated, considering the freedoms you have e.g., in traveling by car in the EU. To bring things up to date, uniform regulations of maintenance and servicing as well as registration and flight regulations in the states of the EU, would be necessary. Although there have been several attempts to achieve this, no one has yet managed to implement a uniform solution. Today, we are even further away from such a solution than we were 10 years ago. If it does not already exist, each country is working on publishing its regulation. These regulations deal with more and more details and with every detail a uniform solution is further and further away. Nevertheless, we think that this is the only way to achieve even greater freedom for UL flying and therefore this work deals with the maintenance and airworthiness of ultralight aircraft and tries to find the best solution for a uniform standard.

2. CURRENT STATE OF ULTRALIGHTS

2.1. Definition of Ultralight Aircraft

There are different terms for one and the same thing in other countries. Otherwise often different things are understood under one term. This is understandable, because not every country must an ultralight comply with the same characteristics and approval restrictions, and it can therefore be a completely different thing. In Europe, the term microlight or ultralight is mostly used. In the United States (U.S.), these aircraft tend to be known as Light Sport Aircraft (LSA) and the ultralight aircraft are a completely different category of aircraft up to 120 kg. Until

now there have been several definitions of ULs. The first one, which was similar to todays, was the microlight definition from the JAA (Joint Aviation Authorities). There, UL were defined as aircraft with no more than two seats and a MTOM (Maximum Take-Off Mass) of up to 300/450 kg. The same definition was again published in the first BR (Basic Regulation) No. 1592/2002. The new BR (EU) No. 2018/1139, changed the name from microlights to aeroplanes, but again with the same weight limits. The only difference was the possibility to include a BRS (Ballistic Recovery System), that could put 15/25 kg on top. Another definition of these aircraft came from EASA with the new LSA category. The LSA could go up to 600/650 kg and could fly within the EASA member states without restrictions. The negative aspect of it was that all aircraft were under the scope of EASA and maintenance as well as airworthiness standards were a lot stricter than under the national law. However, in 2018 with the new BR also an exemption was included, which allowed every state that used the Option-Out (opt-out) to include ULs up to 600 kg to their national law. Now every aircraft owner whose aircraft has a MTOM up to 600 kg, can decide if he wants to register his aircraft under the national law with more maintenance freedom in his country but more travel difficulties; or if he wants to register it under the CS-LSA EASA rules, with more travel options but less maintenance freedom and higher costs. [1] [2]

2.2. European harmonization

Even though the European Aviation Safety Agency has been working since 2005 on the harmonization of the various national laws and definitions, the Basic Regulation (EC) No 216/2008 states in Annex II, that each country under the organisation can make its own national laws for UL and that these do not fall under the regulations of EASA. In other words, it would be against the national sovereignty of each country, when such a harmonization would be introduced. Of course, there are different opinions about a unification. As published on the website of the European Microlight Federation (EMF), the president of the organisation said the following in 2020:

“All EU countries agreed that microlight will not be regulated by EASA rules but by national rules. We keep our freedom, although sometimes it is difficult when there are differences between the national regulations. But harmonization means more constraints and risks for freedom.“ [3]

On the other hand, there are also many people who would welcome a unification because for them it would be exactly the opposite of the statement mentioned. Many expect more freedom and more possibilities through simplified travel to other countries and maintenance. Today, someone with a German UL (A) license cannot even rent an UL aircraft registered in another country, simply because the national laws do not allow it. The fear of losing freedom in UL aviation is understandable. Nevertheless, in some countries the trend of weakening laws and regulations, or no regulations at all, can get dangerous.

The CS-LSA is for most private aircraft holders not affordable. And if you are honest, it is also the exact opposite of what UL flying is all about. The strict controls and requirements of EASA for LSA aircraft are not what most people think of as freedom of flight. However, the two biggest problems for UL owners remain the sometimes-problematic travel behind the border and the various maintenance and airworthiness (initial and continuing) requirements of the respective countries, which make it almost impossible to maintain an aircraft in another country or to fly it there.

2.3. Advantages and Disadvantages of UL flying

Not the naming but the specifications and advantages of these aircraft are the main reasons why a lot of people want to fly and own them. One of the most influential advantages is lower prices. The buying prices start with the cheapest UL somewhere near 20.000 – 30.000 € for a new one and can get even cheaper when buying a second-hand aircraft, according to the numbers of the year 2022. Compared to light aircraft, fuel consumption may be less than half the gallons per hour.

Advantages:

- Overall rescue system on board (in some countries duty)
- Speed up to 350 km/h
- Range up to 2,000 km
- Lightweight materials with high strength (carbon, titanium etc.)
- Training costs around 50% lower than for conventional motorized aircraft
- Low financial outlay to obtain a license
- Low charter prices
- Low landing fees (calculated according to aircraft weight)
- Very quiet compared to conventional motorized aircraft
- “Un-bureaucratic flying” (almost no paperwork)
- Also suitable as an entry into professional flying
- More airfields that may be approached with ULs (no paved runway required, short breaking distance)

Disadvantages:

- Less flying freedom (daytime only, no IFR, etc.) / (subject to local regulations)
- Slower flight speeds
- Only one engine – less safety in case of engine failure
- More affected by crosswind, turbulences, and windshear
- Short flight training – huge amount of non-experienced pilots

2.4. UL (A) License

In each country the requirements for obtaining an UL license are different. While in some countries only a few hours of flying are needed and no minimum number of theory lessons is required, there are countries where you must complete over 40 hours of flying and in extreme cases even up to over 50 hours of lessons to be admitted to an examination.

To give some examples for illustration of how to obtain a UL license in different European countries we can first look at Italy. The theoretical part there consists of a minimum of 35 hours of classroom lessons held by professional instructors in a flight school. At the end of these lessons the students' knowledge is getting tested trough a written exam and will be evaluated by an Aero Club d'Italia (AeCI) examiner. Furthermore, if you want to obtain a license for the Advanced VDS (UL), which exists only in Italy, you must complete five more hours of flying with an instructor and eight hours of classroom lessons. More details to Advanced and Basic ULs can be found in the Italian Table later in this thesis. [2]

An opposite to these strict rules for obtaining a license can be e.g., France. Although France does not necessarily have poorly trained pilots or poor accident statistics, there is no minimum limit on flying hours or theoretical lessons. So, it could be much easier to take advantage of this and give someone a license after a few hours of flying. This not only allows pilots to enter the cockpit of an aircraft who cannot fly properly, but also makes the flight schools a danger to themselves. For example, a flight school can offer a lower price because of fewer flight hours for the training course. Also, other flight schools may choose this strategy to remain on the market. A dangerous competition arises, which makes use of badly trained pilots. [4] [5]

2.5. Amateur-built aircraft

The term amateur-built aircraft can have, just as UL, a different meaning in every country. In general, it is an aircraft built by individuals and licensed by the responsible authority. In the U.S. it is the FAA (Federal Aviation Administration), in European countries it is mostly the authority that is also responsible for UL. These aircraft get commonly licensed as "Experimental" and are only used for non-commercial, recreational purposes such as personal use or education. The builder must build at least 51% of the aircraft, so that it can get registered in the amateur-built category. In most countries the initial and continuing airworthiness is determined with varying degrees of industry-based oversight. [6]

2.5.1. Self-construction

A self-construction is a completely new development based on the company's (or builders) own designs. It requires extensive knowledge of the existing building regulations, aerodynamics, strength of materials, etc. To put the project into practice, the corresponding craftsmanship and skills are of course also required. This type of amateur construction is naturally reserved for only a few experts. [7]

2.5.2. Replica of a sample according to plans

This is done more often, but still requires exceptional craftsmanship in handling all materials such as metal, wood, synthetic resins, stringing materials, and the corresponding manufacturing processes. These usually must be acquired as construction progresses. [7]

2.5.3. Assembling a kit (kit airplane)

This is the most common way to build an amateur aircraft. Aircraft construction kits are offered in various degrees of prefabrication and price ranges but must still have a self-build share of at least 51% to still be considered a self-built aircraft with the corresponding advantages. [7]

2.5.4. Reconstruction or restoration of an old aircraft:

This is the variant of reconstruction or restoration of an old aircraft, but such projects must be discussed in detail with construction inspectors of the respective country before the project begins. [7]

3. LITERATURE

The only comparable literature that was found, was a report made by the Hawk Information Services Limited. The topic was Regulatory Options for the European Light Aircraft (ELA1), and it was published in November 2010. The aim of their work was to identify successful regulatory scenarios and practices that have been applied to the regulation of microlight aeroplanes under Annex II control in the Member States. They also wanted to rationalise the regulatory practices into the suggested frameworks of the proposed ELA1 process, which was current at that time. The work was commissioned by EASA and published as a pdf document on their official website. The goal of this report, to identify successful regulatory scenarios and practices in the UL sector was achieved. A suggestion was made on what this category would have to contain, and on which points one would have to focus during the creation. However, no proposal or example of such a regulation was created as it also was not the aim of the report. What worked out very well was the accident data and the legal basis for the initial and continuing airworthiness in a kind of database as a table. For this work, therefore, this table was taken as a template and brought up to date. Even during the preparation of this study, the authors encountered the well-known problem that most people do not want a uniform solution to ultralight regulations and reject them for the fear of losing their freedom. The advantages of the national regulations of the countries usually outweigh the advantages of a uniform solution by the ELA1 category and therefore this report remained only an information database for future ideas.

4. METHODOLOGY

There have been a few studies in the recent years that have looked at the regulatory and maintenance issues of light, very light and ultralight aircraft. One of these was the "Regulatory Options for the European Light Aircraft (ELA1)" study by the Hawk Information Services Limited company in the UK. This company did a very similar work of this subject in the year 2010 and used similar methods for information gathering and processing. The following methods were used for data collection:

- Surveys (email);
- Personal interviews (phone and face-to-face);
- Documentation review (published literature and documents of CAAs);
- Focus on stakeholder group (owner of flight schools and aircraft). [8]

The mentioned study was commissioned by EASA, because at that time there was already a talk of a uniform European maintenance solution for UL aircraft and their certification and maintenance regulations. As EASA made no significant changes since 2010, follow-up studies were not conducted, and the study/information remained at the status of 2010. Only eight countries within Europe were compared, which were also very similar and from the more advanced area of Europe as far as ultralight flying is concerned. Countries where UL flying is not so popular and not as much information are at their disposal were not represented and therefore a lot of information was not included. Nonetheless, this study showed a very good, elaborated table with the various regulations and laws of the countries and served as a template for our work. Since 2010, we found no mentionable attempts anymore for a proposal of unified regulations.

Language barrier and lack of interest: It was not always possible to get the necessary information of every country. Language barriers were encountered again and again, especially in developing countries in Europe. As a result, some countries had only limited, and sometimes no information in English and even in the year 2022 some countries do not have national laws for ultralight flying or are still working on those. This means that the search for information is very limited and does cost a lot of effort and money. As this is a student's diploma thesis for a university degree, it was mainly relied on published data and omitted data that was not available in every country. Of course, on the one hand, this is mostly rather unimportant information that does not strongly influence the work and the results. On the other hand, we sometimes had to leave out information of entire countries because they showed no interest in providing information for this study or did not publish anything that we could work with.

5. COLLECTED DATA

The scope of this thesis is targeted on EU member states. Information of 27 all countries of the EU was collected, and the most important information has been summarised in the form of a table. The countries have been listened in alphabetical order and for each country a short summary has been added, which retains the author's opinion, a brief assessment of the situation or possibly, for some countries, further information. The tables have been divided into 3 sections. The first and most important section is for initial airworthiness and defines the individual conditions for certification as well as the requirements to be met when manufacturing or purchasing a UL. These include points such as special equipment that the aircraft must have which distinguishes it from other countries, as well as who makes design standards, whether they are necessary and, if so, who is responsible for them. The second section deals with continuing airworthiness, whether and by what means an aircraft can remain airworthy. Other important points are, for example, the obligation to keep a logbook or whether there is a fixed maintenance schedule and who determines it. The third and final section deals with flight training and licensing. Here you can ask yourself questions such as whether there is a UL licence or what privileges you have in the country with this licence. These questions are answered here.

6. MAINTENANCE PROPOSAL

After comparing the information obtained and listed above, we have decided to elaborate a proposed table that could be used as a guide for other countries. Also included are the various regulations and laws of the countries, which of course are not listed here. It is not possible to go into too much detail here, as there are different aircraft that all require special maintenance, and every country has different kinds of these aircraft. A seaplane MTOM is probably useless in Slovakia and as well as the right of hiring an UL in Greece, where no one provides UL for rent. For this purpose, every piece of information from all the tables was evaluated, analysed and finally the best solution was selected for the final table. For each of these pieces of information, a summary and explanation of the choice was finally added below the table.

With this master's thesis, the author has attempted to create a proposal for a uniform European maintenance standard for ultralight aircraft. It can be stated that through this work a basic framework of this standard was created with the individual specifications on which value was placed. According to the author, this work can be used not only as an ideal proposal for a future maintenance standard but should also serve as an aid to interested parties in any field of UL aviation. Through the email survey conducted four months prior to this work, the author realized that many problems and contradictions exist in the current national regulations of the individual countries. Numerous people who are responsible for these regulations in the countries or who are very closely involved with the topic have already made clear, that they would be very interested in such a work and would like to see it.

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