Contract Number EASA.2009.C.53

Approval and Authorisation

Prepared by	**R.J.Thwaites**	
	D.G. Roberts	
	G.J. Newby	
	Dr. F.P. Welsh	
Approved for issue	**R. J Thwaites**	

Record of Revisions

Version	Description of Revision
1.0	First draft for review by EASA
2.0	Interim report with corrections / additions

This report was created by Hawk Information Services Limited under contract number EASA .2009.C53

Hawk Information Services Limited
Templehurst House
48 New Street
Chipping Norton
Oxfordshire
OX7 5LJ
UK

Contents

Executive Summary

Background to the Study

Microlight aircraft are a comparatively new class of machine that evolved from ‘powered hang gliders’ in the 1970’s. They currently operate in individual EU States under a wide range certification and operational scenarios, and with the sub-450 Kg class being subject to Annex II of Basic Regulation (BR) 1592/2002 of 15th July 2002, such aircraft classes come under the auspices of the National Aviation Authorities.

With the design evolution of aircraft and engine technologies, these simple, low powered structures have increased in complexity, but have been able to stay within the weight limitations by the application of modern, strong lightweight materials.

Recital 5 of BR 216/2008 indicates that consideration should be given to regulate at Community level, aeroplanes and helicopters with a low maximum take-off mass (MTOM) and whose performance is increasing, that can circulate throughout the Community and that are produced in an Industrial manner.

In addition, there is a significant and increasing industrial base in some EU States that are designing and manufacturing aircraft to meet the Light Sport Aircraft (LSA) category successfully introduced to the United States some five years ago.

Many of the most successful designs (in commercial terms) have been designed and built in the EU by German, Czech and Italian companies. However, those aircraft cannot be legally operated within the EU as they do not comply with existing regulation; that is they are neither EASA certified nor fall under the provisions of Annex II for Member State regulation. It is open to these companies to opt for certification of their aircraft, but the costs and constraints that this implies suggests an alternative route to be followed.

It is therefore this class of aircraft that the proposed ELA1 category and the proportionate regulation envisaged by Recital 5 of BR 216/2008 is aiming to address.

Scope of Study

It was agreed at the outset of this study that helicopters and gyroplanes should be excluded.

The study addressed a sample of European States that it was felt best represented the span of regulatory environments across Europe at the current time.

Conclusions of Study

1. The degree of regulation of microlight aircraft varies enormously across the EU Member States that were investigated during the course of this study. The level of regulation and control in each of the domains (original airworthiness, continuing airworthiness, Licensing and Operations) applied by each NAA, appeared to reflect the historical perspective adopted by the State when microlight activity arose.

2. Those Member States that have a lighter regulatory environment also have the largest populations of both microlight a/c and adherents and the largest microlight-related industrial activity.

3. Three Member States have a significant design and manufacturing industry based not only around the European microlight category, but also (and often significantly larger) activity in the design and supply of aircraft to the USA Light Sport Aircraft category.

4. Those Member States with a high degree of regulation have the smallest populations but (not surprisingly) have better data records with regard to accidents and activity rates. One of the significant and widespread difficulties encountered during the study was access to consistent and comparable data for comparison across States. This was particularly important with regard to accident causal analysis. Many States do not involve their Accident Investigation Agencies in microlight accidents – even when there have been fatalities. Many States have delegated the responsibility of accident investigation to the local police and judiciary for the purposes of determining liabilities rather than causes. Access to this data was not possible.

5. Microlighting is successful in many of the Member States because of the following attributes:

   - low costs of operation and training increases the population able to afford to fly
   - operations from unprepared grass fields allows many more airfields to exist
   - instruction by individuals without a CPL and from unlicensed airfields increases the number and spread of instructors
   - shorter and simpler training reduces time commitment
   - often simpler medical requirements
   - large variety of aircraft types and costs available, including used examples

6. Technical advances in the design and construction of airframes and engines has been a result of the following parameters:

   - low initial entry costs have allowed many manufacturers to become established
   - larger numbers of manufacturers leads to strong competition and leads to technical innovation
   - a tightly defined microlight class leads to innovation to distinguish between aircraft designed within similar constraints

- innovation can be very rapid if not restricted by long certification requirements
- innovation encouraged if changes to designs not restricted by re-certification costs
- larger markets sustain a variety of types and companies

7. Accident Rates In the countries that were studied have remained constant for the ten years for the two predominant microlight types (flex-wing and 3-axis). Overall the findings were that that microlight fatal accident rate was around 1.6 per 1,000 aircraft, which compares with the glider fatal accident rate of around 1.4 per 1,000 aircraft.

8. In January 2008 the FAA initiated the LSA Manufacturers Assessment to evaluate the health, state of systems implementation, and compliance of the LSA industry as a whole. Specifically, the goal was to assess current LSA industry manufacturing systems and processes through on-site evaluation, analysis, and reporting under a continuous improvement process, and to provide recommendations to enhance aviation safety.

   The FAA team visited 30 of the 52 US based registered facilities, which provided a 93% confidence level in the results. The report was published in June 2010 and contains criticisms of the LSA industry's lack of compliant processes. However the FAA, in discussions with the Hawk study team, was also of the view that the level of oversight and method of regulation was appropriate for the level of safety required for this category of aircraft and it was content with its decision to use consensus standards. Recommendations in the report have been or are being addressed by both the industry and the FAA. Further detail on this report is in Section C.

Recommendations for the RIA options in Phase II of the Study

Objective of the RIA

The objective of the RIA is to consider a range of options for the future regulatory framework, including if necessary changes to the Basic Regulation EC 216/2008, of aircraft covered by the proposed ELA1 process. Such aircraft are those that are currently subject to regulation at Community level, viz. aeroplanes above 450kgs MTOM (472.5kgs with ballistic parachute systems), gliders and balloons. By agreement with EASA helicopters and airships are excluded from consideration in the RIA.

Recommendations for Options to be evaluated

The details as regards each option are set out in **Section D**.

1. Do Nothing

   This represents a position of 'no change' from the current proposals for ELA 1. The baseline for what represents 'Do Nothing' is described in Section D.

2. Modify the current ELA 1 proposals

   This option would focus on changes to the current proposals for ELA 1 whilst retaining the overall legal scope of Community regulation in terms of the MTOM range (451kg to 1,200kg).

3. Delegation or devolution to Assessment Bodies

   This option would consider the application of the concept of Assessment Bodies, as referred to in Regulation 1108/2009, to ELA 1, whilst retaining the overall Community regulatory framework.

4. A 'Mixed Economy'

   This option would evaluate a range of issues under each regulatory topic for the range of aircraft from 451 kg up to 1,200 kg MTOM that are subject to Community regulation, with a view to recommending changes that would represent a mixture of regulatory approaches. It represents partial deregulation, with some regulatory topics and / or aircraft categories de-regulated from the EU level whilst retaining elements of the EU regulatory framework for certain aircraft categories and / or regulatory topics.

5. Total de-regulation from EU regulation

   This option would in effect take the aircraft within the ELA 1 process out of the scope of the EU regulation completely and into Annex II of the Basic Regulation.

<u>Scope of the RIA</u>

It is emphasised that in proposing these options the detailed technical and legal implications in terms of Community regulatory and EASA rule-making synergy are not elaborated at this stage. It is proposed to address the key strategic issues and principles in the proposed options rather than try and work out all the technical and legal solutions of how any of the options for change would be implemented.

Abbreviations

Within this report, the following abbreviations are understood to have the assigned meaning.

Abbreviation	Definition
AAIB	UK Air Accident Investigations Board
a/c	Aircraft
AECI	Italian Aeroclub
agl	Above Ground Level
AMC	Acceptable Means of Compliance
Amdt	Amendment
AME	Aeronautical Medical Examiner
AMO	Approved maintenance organisation
amsl	Above Mean Sea Level
ATC	Air Traffic Control
BEA	Bureau d'Enquêtes et d'Analyses
BFU	Bundestelle fur Flugunfalluntersuchung
BMAA	British Microlight Aircraft Association
BR	Basic Regulation
CAA	UK Civil Aviation Authority
CFI	Chief Flying Instructor
CPL	Commercial pilot's licence
CS	Certification Specifications
DAeC	Deutscher Aero Club
DGAC	Délégation Générale d'Aviation Civile
DOA	Design Organisation Approval
DULV	Deutscher Ultraleichtflugverband
EAA	Experimental Aircraft Association
EASA	European Aviation Safety Agency
ELA	European Light Aircraft
EMF	European Microlight Federation
ENAC	Italian Civil Aviation Authority
EU	European Union
FAA	Federal Aviation Administration
FAFR	Fatal Accident Frequency Rate
FAR	Federal Airworthiness Regulation
FFPLUM	Fédération Française de Planeur Ultraléger Motorisé
FIVU	Federazione Italiana Volo Ultraleggero
Ft	Feet
G	Grams
GA	General Aviation
IAS	Indicated Airspeed
ICAO	International Civil Aviation Organisation
JAA	Joint Aviation Authorities
JAR	Joint Aviation Requirements

KNVVL	Royal Dutch Aero Club
KSAK	Royal Swedish Aero Club
kg	Kilogram
LAA UK	UK Light Aircraft Association
LAA-CR	Czech Light Aircraft Association
LAMS	Light Aircraft Maintenance Schedule
Lb	Pounds (weight)
LBA	Luftfahrt-Bundesamt (German CAA)
LG	Landing Gear
L/H	Left hand
LSA	Light Sport Aircraft (USA)
LTF	German Microlight Design Code
MEL	Minimum Equipment List
N/K	Not known
NLF	Norwegian Airsports Federation
OUV	Oskar Ursinus Vereinigung
NPPL	National private pilot's licence
NTSB	US National Transportation Safety Board
PIC	Pilot In Command
POA	Production organisation approval
PPL	Private pilot's licence
PTF	Permit to fly
Ref	Reference
R/H	Right hand
RTC	Restricted type certification
SBT	Swedish Board of Transport
SHK	Statens Haverikommission
SLMG	Self Launching Motor Glider
SLSA	Special Light Sport Aircraft (USA)
TCDS	Type certification data sheet
TMZ	Transponder Mandatory Zone
ULM	Microlight aircraft (French)
USA	United States of America
VFR	Visual Flight Rules
VHF	Very high frequency
VLA	Very light aircraft

Section A

1.0 Overview of consultations with stakeholders and methodology of study

2.0 Restrictions on use of data

3.0 Regulatory Topic Overview Charts

4.0 Pan-European Data Overview

5.0 Environmental Aspects

1.0 Overview of consultations with stakeholders and methodology of study

In order to undertake this study, Hawk deemed it important from the outset to consult with as many and varied stakeholders within the European microlight community that was possible within the constraints of both time available and the study objectives.

Stakeholders were divided into three groups:

1. National Aviation Agencies (or regulatory authority if not the NAA)
2. National Microlight Associations
3. Microlight Industrial representatives - manufacturers, importers and operators (flying schools)

Research was then undertaken to establish names and contact details of the various individuals concerned in each of the stakeholder groups for the target countries of the study.

A complete list of correspondents for each country is to be found at *Annex F* to this report.

1.0.1 Methodology

During the initial planning phase it was decided that it would be important to ensure as far as possible, equivalence across all of the countries and stakeholders and that this could be best accomplished by having an agreed structure to the study questions. Accordingly, the team compiled a set of questions to encompass the four major study areas:

- Original airworthiness
- Continuing airworthiness
- Licencing and Medical
- Operations

Each of the study domains could then be approached in a uniform manner, to ensure as far as possible the study looked at the features within each country with a similar approach.

Prior to widespread issue, the question sets were tested within the UK stakeholder communities and further refined in the light of these field trials.

The question sets may be found at *Annex G* to this report.

Over a period of some 16 weeks, visits and meetings were arranged with the various individuals to undertake face-to-face interviews in each of the nominated Countries.

The date and location of each interview may additionally be found within *Appendix 9*

1.0.2 Cooperation

With one notable exception, we encountered extremely high levels of cooperation throughout the first phase of the study across all countries. As may have been expected each organisation concerned was keen to establish its own particular point of view. Once the stakeholder community understood the true nature of the study, a large degree of openness and helpfulness was evident across all stakeholders and domains. The sole exception seems to have been the one of the German stakeholder organisations, the DULV, which for whatever reason was not forthcoming in assistance or the provision of data.

1.0.3 Limitations of Methodology and data constraints

Whilst the questions were constructed in order to establish factual responses, it is inevitable that any personal bias of the interviewee may influence the responses. Also it was not always possible to find one correspondent in each organisation that was sufficiently familiar with all four domains, and so the input and opinion of others was sought and recorded.

Most of the data collected was fact (as opposed to opinion), but wherever appropriate, the opinions of the correspondent were sought – not just their personal views but also those of the community they represented. In this way it was possible to develop a picture not only of the situation as it stands, but the views of both the user and the regulator on the positive and negative aspects of the local situation, any changes being proposed and how the regulatory position may be improved.

Naturally all of this commentary is subjective and difficult (if not impossible) to quantify; therefore, many of the outputs from the consultations are statements of fact about the regulatory environment together with perceptions and opinions.

The only area of real statistical study, but with significant limitations as to what was available, particularly for the Community regulated sector, relates to the accident and safety data.

2.0 Restriction on use of data

During the first phase of this study data and information has been obtained from a variety of sources.

Whilst the study team has explained to the various stakeholders the use to which the data will be put, the study team has not as yet reverted to the stakeholders with the drafts of the interim report in order to confirm that the stakeholders are content with the form and content of the report in so far as it uses the data and information stakeholders have supplied.

The study team will be reverting to the stakeholders before production of the final report, in order to provide them with an opportunity to correct or add to any data or information supplied and to confirming their agreement to the use of the data and information in the final report.

Therefore the data and information in this interim report carries this caveat.

Consequently the data and information in this interim report should be restricted to the EASA project team responsible for this study, and not be distributed, published or communicated beyond the EASA project team.

3.0 Regulatory Topic Overview Charts

The tables on the following pages offer a comparison of regulatory topics across the European counties studied.

The regulatory regimes are:

- Licencing and Training
- Operations
- Initial Airworthiness
- Continuing Airworthiness

Licencing & Training	CZ	F	D	I	NL	N	S	UK
Licence type	NPL(M)	NPL(M)	NPL(M)	NPL(M)	NPL(M)	NPL(M)	NPL(M)	NPPL(M)
Authority for licence issue Delegated to Aero Club	✓	✗	✓	✓	✗	✓	✗	✗
Separate Ratings for different classes	✗	✓	✓	✓	✗	✓	✓	✗
Validity Period (years)	2	Lifetime	5	Lifetime	5	2	1 or 5	Lifetime
Revalidation requirements	5 hrs in 2 yrs	None	Same as JAR PPL	None	Similar to JAR-PPL	12 hrs In prev 24 months	12 hrs In prev 12 months	12 hrs In prev 12 months every 2 years
Privileges	Day VFR	Day VFR	Day VFR	Day VFR	Day VFR	Day VFR	Day VFR	Day VFR
Theoretical Knowledge Exam	✓	✓	✓	✓	✓	✓	✓	✓
Theoretical Knowledge Hours	45	No min specified	No min specified	33	JAR-PPL	No min specified	No min specified	No min specified
Minimum Flying Training Hours for Initial Issue of licence	20	10-15	30	16	45	Min 25	20 with min 5 solo	25
Further hours required for carrying a passenger	50 hrs total + min 5hrs on type	Additional 10	✓	Additional 30	✗	Min 50	Additional 10	✗
National training Syllabus	✓	✗	✓	✓	✓	✓	✓	✓
Syllabus controlled by	LAA	None	DAeC	AeCI	NAA	NLF	NAA	NAA
Pilots Log Book required	✗	✗	✓	✗	✓	✓	✓	✓
Licensed Airfield required for Training	✗	✗	✓	✗	✓	✗	✗	✗
Examiner Structure	✓	✗	✓	✓	✓	✓	✓	✓
Medical requirements	ICAO Class II	Certificate	JAR Class II	Certificate	JAR Class II	Self certification	JAR Class II	Self certification
Status of examining doctor	'Approved' Doctor	Sport Doctor	AME	Sport Doctor	AME	Any doctor	AME for initial	Own Doctor

Operations	CZ	F	D	I	NL	N	S	UK
Basic Licence Privileges	Day VFR	Day VFR	Day VFR	Day VFR	Day VFR	Day VFR	Day VFR	Day VFR
VFR 'On Top' permitted	✗	✗	✓	✗	✓	✓	✗	✓
Are Operations regulated by the State ?	✓	✓	✓	✓	✓	✓	✓	✓
Flight in Controlled Airspace permitted	✗	✓	✓ (depends on equipment fit)	✗	✓ (requires min equipment)	✗	✓ (depends on equipment fit)	✓
Approved Airfield required for Training	✗	✗	✓	✗	✓	✗	✗	✗
Altitude restriction in Class G or lower	✗	✗	✗	500' and 1000'	1200'	✗	✗	✗
Operation allowed from Licensed airfields	✓	✓	✓	✗	✓	✓	✓	✓
Operations only allowed from an approved airfield	✓	✗	✓	✗	✓	✓	✗	✗
Mandatory Radio fit	✗	✗	✗	✗	Comms Mode S			✗
Min Equipment = ASI, Altimeter, Compass and Engine Instruments	✓	✓	✓	✓	+ Mode 'S' & ELT	✓	✓	✓
Can Microlights be hired?	✓	✓	✓			✓ within Clubs only	✓ within Clubs only	✓
Is there a Minimum fuel requirement?	✓	✓	✓	✓	✓	✓	✓	✓

Operations Comparison

Initial Airworthiness	CZ	F	D	I	NL	N	S	UK
Microlight definition	Annex II	Annex II	Annex II	Annex II	Annex II	Annex II	Annex II	Annex II
Particular requirements	Max empty weight allows 2x70kg pilots + 30mins fuel	Engine power limits. 35kts (65kph) max stall	Ballistic parachute system required	35kts (65kph) max stall. No restriction on adjustable propellers, retractable undercarriage,	M/L has to be 'certified' in either UK, D or CZ	35kts (65kph) max stall. Extra 50kgs for amphibians. Flight manual for a/c > 70kg empty.	Two-seat min. payload 175kg 35kts (65kph) max stall. Extra 50kgs for amphibians.	Two-seat min. payload 172kg plus 1 hour fuel at max continuous rpm.
Microlights classes (excluding autogyros, M/L helicopters)	WS, 3-Axis, PP	WS, 3-Axis, PP	WS, 3-Axis, PP	WS, 3-Axis, PP	WS, 3-Axis	WS, 3-Axis	WS, 3-Axis	WS, 3-Axis, PP
State regulation / rules	✓	✓ IAW requirements but option for own	✓	✓	✓ Self-declaration to accepted design codes	✓	✓ (High level: LFS but delegated to KSAK)	✓
Industry implementation of rules	✓	Self-declaration	✓	✓	×	✓	✓	✓
Does State control detailed design	×	×	×	×	✓	×	✓ (high level only)	✓
Does State control production processes	×	×	×	×	✓	×	×	✓
Ultimate legal responsibility	Ministry of Transport	Owner	Ministry of Transport	Owner	Ministry of Transport	Ministry of Transport	Swedish Board of Transport	Dept of Transport
DOA required	×	×	×	×	×	×	×	✓
Alternative to DOA	3 prototypes then submit to ČR LAA	Self-declaration to code followed	DULV or DAeC approval	Owner deposits manufacturer statement with AeCI (NAC)	Only a/c designed to Czech, German, UK codes allowed	Only a/c designed to Czech, German, Swedish, UK codes allowed	KSAK compliance declaration and recommendation to NAA to issue approval for type acceptance	×

Initial Airworthiness(Continued)	CZ	F	D	I	NL	N	S	UK
Design standards / codes applied	UL2 (Germany) for WS	DGAC IAW codes plus 'other'	German LTF codes (recent mandatory requirement)	Manufacturer's choice	Czech, Germany, UK	Czech, Germany, Sweden, UK	KSAK IAW based on UK BCAR-S or ASTM	BCAR Section S (manufactured)
Responsibility for design standards	ČR LAA	Manufacturer	DULV or DAeC	Manufacturer	NL-CAA	NLF	KSAK	UK CAA
POA required	✗	✗	✗	✗	✗	✗	✗	✓
Alternative to POA	ČR LAA approval	Self-declaration	DULV or DAeC approval	Owner deposits manufacturer statement with AeCI (NAC)	n/a	n/a	n/a	✗
Self-certification (by owner)	✗	✓	✗	✓	✗	✗	✗	✗
TC issued	✓	✗	✓	✗	✗	✗	✗	✗
TC ICAO or non ICAO	Non-ICAO	✗	Non-ICAO	✗	✗	✗	✗	✗
Supplemental TC (STC)	✓	✗	✓	✗	✗	✗	✗	✗
C of A	National ČR – prototype (Z), Amateur-built (A), Production (P)	✗	✓ Non-ICAO	✗	✓ special CofA, Non-ICAO for aircraft built to UK, Czech, German codes /standards	✗	✗	✗
Permit to Fly required	✗	✗	✗	✗	✗	✓	✓	✓
Other certification	✗	✗	✗	✓	✗	✗	✗	✗
Differentiate factory produced from amateur-built	✓	✗	✗	✗	✗	✗	✗	✓
Oversight of design	Industry committee inc. CTO ČR LAA	DGAC reserve powers	Delegated to DULV & DAeC	✓ AeIC	n/a	Delegated to NLF (imports)	Delegated to KSAK (imports)	✓ CAA

Initial Airworthiness(Continued)	CZ	F	D	I	NL	N	S	UK
Oversight of production / manufacturers	✗	DGAC reserve powers	✗	✓ AeIC	n/a	Delegated to NLF (imports)	Delegated to KSAK (imports)	✓ CAA
Audit	✓ Ministry of Transport	✓ DGAC reserve powers	✓ LBA audits DULV & DAeC	✗	n/a	✓ Ministry of Transport	✓ of KSAK by NAA	✓ CAA of BMAA & LAA
Is an Unqualified Import of M/L permitted..	Germany	✓	✗	✓	Compliant with Czech, German, UK codes	from Czech, Germany, Sweden, UK	Compliant with Czech, German, UK codes	✗
Environmental compliance certification (noise)	✓	✗	✓	✗	✓	✗	✗	✓
Flight test requirements	✓	✓ but 'optional'	✓ per design code	✗ other than manufacturer	✗	✗ other than manufacturer	✓	✓
State regulatory approval costs for initial airworthiness control	✗	€20 / €40 for filing dossier	✓	✗	✗	✗	✓ SEK 3,000 for type approval	✓ c. £12k p.a.
Other non-state regulatory approval costs	✓ LAA (CR)	✗	✓ DULV& DAeC	AeCI - €207 for WS / €413 for 3-Axis for filing dossier	✗	✗	NAA pays KSAK to manage IAW system. No KSAK charge allowed to importer	BMAA or LAA charges owners for oversight of amateur-built a/c
State registration of microlights	✓	✓ €20 / 2 years	✓	✓ AeCI	✓ (small cost)	✓	✓	✓ (£65)
Repair design standards	✓	✗	✓	?	✓	✓	✓	✓
Parts and appliances certification	✗	✗	✗	✗	✓	✗	✗	✓
Airworthiness Directives	✓	?	✓	?	✓	✓	✓	✓
Is there a Single seat deregulated class ?	✗	✓	✓	✗	✗	✗	✓	✓
Are Microlight gliders permitted	✓	✓	✓	✓	?	?	✗	✓

Continuing Airworthiness	CZ	F	D	I	NL	N	S	UK
Is there a Revalidation of C of A or permit?	✓	✓	✓	✗	✓	✓	✓	✓
Frequency of revalidation	Annual or biennial	Biennial	Annual	None	Annual	Annual	Annual / 100 hrs	Annual
Who approves revalidation	LAA	Self declaration	DAeC / DULV	N/a	NAA	NLF	KSAK	BMAA or LAA
Is there a requirement to follow a specified maintenance schedule?	✗	✗	✓	✗	✓	✓	✓	✓
Who specifies maint' schedule	Manufacturer	Manufacturer	Manufacturer	Manufacturer	Manufacturer	NLF / Manufacturer	Manufacturer	Manufacturer
Is owner maintenance permitted?	✓	✓	✓	✓	✓	✓	✓	✓
Who approves inspectors?	LAA	n/a	DAeC / DULV	n/a	NAA	NLF	KSAK	BMAA or LAA
Is an aircraft logbook required?		✗	✓	✗	✓	✓	✓	✓

Continuing Airworthiness Comparison

4.0 Pan-European Data Overview

Introduction

During the course of the study, accident data from eight Member States' was investigated. In this overview, each of the four categories of aircraft is examined individually in respect of accidents and fatalities, and overviews of the annual rates are tabulated for ease of comparison.

The detail of the calculations, the basis upon which the rates are derived and most importantly, the caveats associated with the base data, may be found in each Appendix related to the aircraft class.

This overview of accidents and accident rates is divided into four sections combining the overall data from the Member States that were investigated, as follows**:**

I. Microlighting

II. Power Flying - GA Aeroplanes < 1,200 kgs MTOM

III. Gliding

IV. Ballooning

Much of the data is also shown in the individual country sections within the main body of the report, where applicable.

4.1 Overview of findings

The degree of regulation of microlight aircraft varies enormously across the EU Member States that were investigated during the course of the first phase of this study. The level of regulation and control in each of the domains (original airworthiness, continuing airworthiness, licensing and operations) applied by each NAA, appeared to reflect the historical perspective adopted by the Member State when microlight activities started.

Those Member States that have a lighter regulatory environment also have, in general, the largest populations of microlight aeroplanes and participants, and also the largest microlight-related industrial activities.

Three Member States have a significant microlight design and manufacturing industry based not only around the European microlight category, but also - and often significantly larger - activity in the design and supply of aeroplanes to the USA LSA category.

In attempting to compare accident rates between the different categories (microlights, aeroplanes, gliders and balloons) extreme caution needs to be exercised. This is because each activity has different characteristics in terms of the risk profile. Ballooning is quite different to the other activities; gliding is also distinct in terms of inherent risk. The two activities that resemble each other most closely in risk profile are microlighting and aeroplanes but unfortunately in this study, ascertaining the accident rates for aeroplanes up to 1,200 kgs has proved particularly difficult.

4.2 Completeness of data

4.2.1 Microlights

As anticipated in the tender response for this study, the authors have found it very difficult to collect all the necessary data in order to meet the requirement for an analysis of accident rates in microlighting in the selected countries across the ten-year period. Comprehensive, complete, consistent, comparable, accurate and reliable accident databases for microlighting across Europe does not exist, though credit should be given to the European Microlight Federation for its attempts to create such a database.

Generally the data for the number of fatal accidents and fatalities has been available, with a few exceptions for certain years in one or two countries. Some difficulty was experienced in segregating autogyro fatal accidents where these were included in the total of microlight fatal accidents, and therefore some assumptions have been made. In some countries paramotors are classified as hang gliders where as in others they are treated as microlights in accident data.

The data for the total number of accidents, serious injury accidents, and particularly exposure data in the form of total annual microlight operating hours in each country, was not available in many cases. Where it was available, difficulties were experienced in ascertaining whether the ICAO definitions of serious injury accidents, minor injury accidents and incidents had been followed in the categorisation of data. The data sources for each country are given in the individual ‘country’ sections.

In the microlight accident data that was obtained, causal analyses were either very limited or non-existent. In most cases the analysis that was available against individual accidents was generally very brief, often only a single sentence, and descriptive more of the phase of flight than reflective of the real cause of the accident. The exception to this was two of the smaller microlight population countries.

For many Member States, annual reporting of exposure (hours) data is not required, and therefore, except for a few countries, there is very little data available for a 10-year period. Therefore, on the advice of the EASA project team, the study calculated fatal and total accident rates in relation to the microlight population data, which is generally more complete. This is the only basis upon which comparisons with accident rates for light aeroplanes, gliders and balloons can be attempted.

Generally, those Member States with a high degree of regulation of microlights have the smallest national populations but, not surprisingly, have better data records with regard to accidents and activity levels. One of the significant and widespread difficulties encountered during the study was access to consistent and comparable population, activity and accident data for comparison across Member States. This was particularly important with regard to accident causal analyses. Many Member States do not involve their Accident Investigation agencies in microlight accidents – even when there have been fatalities. Some have delegated the responsibility for accident investigation to the local police and judiciary for the purposes of determining liabilities rather than causes, and access to this data was not possible.

4.2.2 Aeroplanes' accident data

The study team had the greatest difficulty in data collection for aeroplanes up to 1,200kg MTOM (the currently proposed upper limit for ELA1 process).

In all EU countries studied, any available national database, usually under the control of the NAA or accident investigation agency, whilst having individual records of accidents in a database, was not in a form that enabled a data selection to be made by the required MTOM range.

Often the records were grouped in an MTOM range up 2,250 or 5,700kgs and in a form that did not provide the study team with the ability to search the database against the relevant MTOM parameter, even if the MTOM of aircraft in the individual records was recorded. However, in some cases (e.g. the UK database) the study team was able to analyse a significant number of records over the selected 10 years (2000 to 2009) to extract the relevant records and data.

A further limitation in trying to establish a valid data set of accidents involving aeroplanes up to 1,200kgs, but used for non-commercial purposes (a parameter relevant to the purposes of the study), was the absence in the source data of any identification, generally, of commercial or non-commercial use or certification.

As one of the objectives of the study is to compare accident rates, expressed as 'accidents per 100,000 hours' in the countries selected for the study, as between microlighting and the relevant aeroplanes, it is necessary to try and establish the national annual volume of activity (hours), as the measure of exposure to risk.

Unfortunately it was found that no such comprehensive records exist in many of the selected countries. At this stage of the overall study, it has not been possible to provide a comprehensive overview of relevant aeroplanes' accident statistics, or even the raw data of aeroplane populations or pilot populations. The study team is still trying to find a way of obtaining this data or extrapolating from other data, and proposes to include whatever it can in the final report.

Therefore, for the purposes of the interim report, any aeroplane accident data and rates are almost without exception, guesstimates.

4.2.3 Gliding accidents data

The European Gliding Union (EGU), which represents nearly all national gliding associations throughout the EU and the wider Europe in regulatory matters, has for some 15 years or more compiled an accident and activity database. The national gliding associations provide the data annually.

This EGU database has been the main source for the gliding accident statistics presented in this report, cross-checked and supplemented where possible with data obtained during and after country visits for this study.

In some of the countries there exists an extensive and detailed database with causal analyses of gliding accidents going back over many years. Aggregation of causal analyses across the countries selected for this study has not been possible, but where individual countries' analyses are available they have been used to illustrate the typical profile of accident causes.

The standard measure of accident rates in aviation is in relation to 100,000 hours p.a. (or million hours in CAT). In the gliding world, the key measure of activity that is reasonably available and reliable in most countries from the recording systems at club level is the number of launches (i.e. flights). Some of the national statistics also present total hours, but by no means all. In most countries the collection of the hours' data is not as comprehensive as flight numbers, and the reliability of the hours' data that is collected is almost certainly less robust than the flight numbers.

In consequence the gliding accident rates, expressed in relation to flights, require conversion to a rate per 100,000 hours, using some assumptions. These assumptions are set out in detail in the country sections of this interim report. Only by understanding these assumptions can any meaningful comparison be made with the accident rates for microlighting.

Another issue to be borne in mind when reading the results in this interim report is that there is a risk of double-counting or omission in recorded accidents. This arises where an accident occurs outside the country of the pilot (s) or the registration of the glider.

4.2.4 Ballooning accidents data

Ballooning population and accident data was obtained for some countries though activity data (hours) was not generally available. As the incidence of fatal accidents in the ten year period was negligible, EASA agreed that the presentation of ballooning data could be included in the overview section of this report without the detail in the country sections. It is noted that in some countries ballooning has a significant element of commercial operations. It was often not clear from the data obtained whether commercial operations are separated from non-commercial operations.

4.3 Microlight Accident rates

The evidence gathered points to a higher rate of accidents in those Member States that have less regulated regimes – especially so in those Member States that do not have a nationally approved flight training syllabus. The population, operational hours and accident data for some countries represent low numbers. In these cases a very small number of statistically random events (accidents) can have a very significant impact on the calculated rates of accident. Therefore no statistical significance may be attached to the resulting accident rates in those countries. The countries that fall into this category of low numbers are Netherlands, Sweden and

Norway. However two of these countries were able to provide the most comprehensive data of all the countries studied.

The next level in terms of population and activity numbers are the Czech Republic, Germany and UK, where the data, if complete, can be regarded as statistically reasonably significant.

The top two countries in terms of population and activity numbers are France and Italy. Here the numbers are sufficiently large to ensure that the randomness in the numbers of accidents is of less significance statistically.

Despite these statistical constraints, some observations and conclusions can be made but again with the caveat that they depend on the completeness, accuracy and reliability of the data. In particular the assumptions that underpin the population and activity data are very important and due allowance should be made for gaps and / or inaccuracies in this data.

The following table summarises, for the 10 years 2000 to 2009 by European country studied:

- the total number of fatal accidents
- the total number of reported accidents
- the average microlight aeroplane population
- the average annual fatal and total accident rates per 1,000 microlight aeroplanes

It is emphasised the aeroplane population figures are 10 year arithmetic averages and disguise the growth in general of the microlight aeroplane population during this period.

The accident rates are weighted by country populations and accidents.

Fatal Accidents	CZ	F	D	I	NL	N	S	UK	Total
Combined 3-Axis & flex-wing									
No. of Fatal Accidents (10 year total)	40	147	67	115	2	2	5	20	398
Total No. of reported accidents (10 year total)	282	856	585	203	25	151	104	456	2,662
Total a/c in Country (10 yr average)	2,490	6,303	2,489	8,032	365	193	345	4,011	24,228
Fatal accidents p.a. per 1000 a/c	1.61	2.33	2.69	1.43	0.55	1.04	1.45	0.50	1.63
Total accidents p.a. per 1000 a/c	11.3	38.4	23.5	2.5	6.9	78.3	30.2	11.4	10.9

Caution is required in interpreting the total accident rates per population, as the basis of accident reporting varies country to country. Furthermore, countries with a small microlight aeroplane population are subject to statistical randomness in accidents influencing unduly the resultant accident rates.

In terms of state regulatory control, the Netherlands is probably the highest, followed by the UK. The fatal accident rates of 0.55 and 0.50 per 1,000 microlight aeroplanes seem to suggest there is correlation. However, in the case of the Netherlands there were just two fatal accidents in 10 years.

Because of the population size, the UK can be regarded as a sufficiently statistically significant.

Sweden and Norway have a degree of state oversight but with substantial delegation of day-to-day control to the national microlight organisation. Their fatal accident rates per 1,000 microlights are in the 1.0 to 1.5 range, but again the populations and accidents are small numbers. The accident rates are subject to large variability with a very small absolute change in the fatal accident numbers.

France and Italy have the largest populations of microlight aeroplanes combined with the highest absolute number of fatal accidents. Both countries have a 'light' regulatory framework in which there is minimal control by the State over airworthiness, and in the case of France, a totally devolved pilot training regime. France has the second highest fatal accident rate, whilst Italy compares with the Czech Republic where there is a comprehensive delegated regulatory framework managed by the Czech LAA.

The fatal accident rate for Germany needs to be interpreted with caution because of some uncertainties over the microlight aeroplane population numbers, which are believed to be understated.

4.4 Aeroplane Accidents and Accident Rates

(Text and tables to be inserted when available)

4.5 Gliding Accidents and Accident Rates

Gliding flying presents some different risks to powered aircraft flying and some of the factors that present themselves as risks in gliding are:

- The low visual profile of modern all-white painted glass-fibre gliders leading to a higher propensity for mid-air collisions
- Close proximity flying with other gliders in thermals.
- Often flying at speeds close to the stall speed to obtain maximum lift
- Winch launching involving high rates of ascent at a high angle to the ground at low altitude

- Flying very close to hills and mountain ridges to gain from rising air currents, often in turbulent conditions
- Off-airfield landings during cross-country flying, due to lack of lift to stay airborne
- The nature of competitive gliding where pilots fly close to the limits of their abilities and the performance of the glider much of the time

Therefore comparing accident rates and causes of accidents in gliding with those in power flying, whether microlights or 'conventional' EU-regulated light aeroplanes, caution needs to be exercised.

The tables below presents the consolidated data for 7 of the 8 European states studied (no data from Italy) for the eight years 2000 to 2007.

Consolidated Data from 7 European States in Study	2000	2001	2002	2003	2004	2005	2006	2007	Total
Average No. of Gliders	16,518	16,433	16,457	16,466	16,493	16,688	16,901	16,775	16,591
Average No. of Pilots	69,996	69,733	69,407	68,221	66,684	64,137	64,277	61,768	-
Average annual number of launches (000s)	2,108.2	1,925.9	1,925.7	1,937.3	1,761.5	1,756.3	1,713.0	1,716.8	14,843
Total No. of Fatal Accidents 8 yrs	13	27	27	30	20	21	20	25	183
Total No. of Accidents 8 yrs	267	279	294	283	253	217	208	215	2,016
Fatal Accident Rate per 100,000 launches (flights)	0.62	1.40	1.40	1.55	1.13	1.20	1.17	1.46	1.23
Total Accident Rate per 100,000 launches (flights)	12.6	14.5	15.0	14.7	14.3	12.4	12.1	12.6	13.6
Fatal Accident Rate per 1,000 gliders (aircraft)	0.79	1.64	1.64	1.82	1.21	1.26	1.18	1.49	1.38 Av. p.a.
Total Accident Rate per 1,000 gliders (aircraft)	16.1	14.8	17.9	17.2	15.3	13.0	12.3	12.8	15.1 Av. p.a.

Accident Data and Rates	CZ	F	D	I	NL	N	S	UK	Total
Gliders – 8 years 2000 to 2007									
Total No. of Fatal Accidents in 8 years	5	36	104	No data	6	0	3	29	183
Total No. of Accidents in 8 years	171	273	869	No data	174	65	108	356	2016
Exposure – FLIGHTS (Annual average of 8 year total in '000s)	81	182	1070	No data	132	12	42	314	1833
Average No. of glider over 8 yrs	649	1637	10427	No data	725	168	454	2,576	16636
Fatal accidents p.a. per 1000 a/c	0.96	2.75	1.25	No data	1.03	0	0.83	1.41	1.38
Total accidents p.a. per 1000 a/c	32.9	20.8	10.4	No data	30.0	48.4	29.7	17.3	15.1
Fatal accidents per 100,000 FLIGHTS	0.77	2.47	1.23	No data	0.57	0	1.66	1.05	1.23
Total accidents per 100,000 FLIGHTS	26.2	18.7	10.3	No data	16.4	69.9	25.6	14.8	13.6

Note: Two countries had 10 years' accident numbers available but the above reflects only the data for 8 years.

Subject to the various caveats in respect of the completeness and accuracy of the relevant data, which are discussed in detail within the Appendices, the eight-year (2000 to 2007) ***fatal accident rate*** **for seven countries is *1.23 per 100,000 flights (launches*).** This data excludes Italy for which no statistics are available currently.

Translating the above rate into a rate per 100,000 hours can only be done using a broad assumption on the average flight time across these countries. As a significant proportion of gliding activity is training combined in some countries with winch launching, the average of that sort of flying is likely to be 8 to 10 minutes per flight. On the other hand training using aerotow, predominant in some countries could see an average flight time of 20 to 30 minutes. At the other end of the spectrum, cross-country gliding often involves flights of several hours. So an assumption using these weighting factors in fraught with difficulty. The UK records suggest a relationship of an average 26 minutes per flight. Taking into account the probably higher ratio of aerotow launching in other countries and the cross-country flying elements, a more rational assumption would be a relationship between hours and flight numbers closer to 1:1, at say 75%. In that case **the *fatal accident rate* would be of the order of *1.65 per 100,000 hours* across**

the European countries studied. It is emphasised that this is an estimate based on those assumptions.

Accident causal analyses are not generally available in the public domain. However, some information has been obtained from the countries studied. And this is used in body of the report to illustrate the types of accidents that are probably representative of gliding in many countries. However, some caution is required in making comparisons between countries owing to the differing operating, environmental and geographical factors (e.g. mountain flying) involved.

What is clear from the available causal analyses is that original airworthiness failures are extremely rare in gliding accidents. Failures in the integrity of the structure generally only occur when the glider is flown well outside its design flight envelope or there is a failure to connect the controls properly when rigging.

4.6 Ballooning accidents and accident rates

The 10 year data (where available) is as follows:

Ballooning	CZ	F	D	I	NL	N	S	UK
Data sources:	Czech Balloon Federation	CIA	LBA BFU & DAeC				Swedish Ballooning Federation	UK CAA
Average No. of pilots	128	650 E	2,600	N/A	N/A	N/A	144	1,126
Average No. of balloons	117	N/A	1,331	N/A	N/A	N/A	74 E	1,783
No. of fatal accidents	0	N/A	1 (a)	N/A	N/A	N/A	0	0
Total No. of accidents	4	N/A	12 (a)	N/A	N/A	N/A	4	18
Total Hours (000s)	N/A	N/A	N/A	N/A	N/A	N/A	40 E	193
Fatal accident rate per 1,000 balloons	0	N/A	0.75	N/A	N/A	N/A	0	0
Accident rate per 1,000 balloons	34	N/A	9	N/A	N/A	N/A	54	10
Total accident rate per 100,000 hrs	N/A	N/A	N/A	N/A	N/A	N/A	10 E	9.3

Notes:
N/A = Not available
E = Estimate
(a) Germany: 7 years 2002 and 2004-2009

Fortunately the incidence of fatal accidents in ballooning is rare. The accidents that do happen are almost always in the landing phase – not surprising given the nature of ballooning – involving collisions with ground objects, occupants of the basket suffering slight and occasionally serious injuries. Collision with electricity power lines appears in accident reports quite frequently.

4.7 Comparison between Microlight, Aeroplane and Glider Accidents and Accident Rates

Accident rate	Microlights	Aeroplanes	Gliding	Balloons
No. of European countries in accident rate calculations	8	TBA	7	4
Countries excluded (no data)	-	TBA	Italy	France, Italy, Netherlands, Norway
Years covered by rates	2000 – 2009 (10)	TBA	2000 – 2007 (8)	2000 – 2009 (10)
Fatal accident rate per 1,000 aircraft (rounded to one decimal)	1.6	TBA	1.4	0.3
Fatal accident rate per 100,000 flights (rounded to one decimal)	Flight #s not available	Flight #s not available	1.2	Flight #s not available
Fatal accident rate per 100,000 hours (rounded to one decimal)	2.6 (E)	Hours not available	Hours not available	Hours not available
Total accident rate per 1,000 aircraft (rounded to one decimal)	10.9	TBA	14.9	11.5
Total accident rate per 100,000 flights	Flight #s not available	Flight #s not available	13.6	Flight #s not available
Total accident rate per 100,000 hours (rounded to one decimal)	17.3 (E)	Hours not available	Hours not available	Hours not available

Note:
1. The largely estimated activity statistics for German gliding have a significant influence on the accident rates per 100,000 flights.
2. (E) = mainly estimated exposure data (hours) used.

Overall, the microlight accident rates for fatal accidents do not compare unfavourably with the same rates for gliding. The comparison with accident rates for light aeroplanes is more difficult to judge. This is because of the general lack of available data classification for aeroplanes below 1,200kg MTOM and the lack of available segmented exposure and population data.

Ballooning is in a different category in terms of a negligible fatal accident risk probably due to its nature of slow speed of landing, although ballooning does have a similar level of reported (non-fatal) accidents. This is primarily due to the landing risks, particularly in relation to the more precarious position of the occupants of a balloon basket compared with an enclosed aeroplane cockpit.

4.7.1 Conclusions

Microlighting would appear to have a similar fatal accident rate to gliding, when measured in relation to the respective aircraft fleet populations. Utilisation of gliders in terms of operating hours is probably higher than microlights as a result of the longer average times of the cross-country element. This is likely to place the fatal accident rate for gliding better than microlighting.

Comparison of microlighting fatal accident rates with ‘conventional’ light aeroplanes is not really possible, as the data for the latter is generally not available in the segmented structure required.

As referred to above, ballooning is statistically the safest form of light aviation in terms of the risk of fatal accidents.

5.0 Environmental Aspects

Environmental Overview

Microlight aeroplanes have a number of advantages over conventional light aeroplanes that contribute to their success and popularity: fuel type and efficiency, operation from smaller unprepared airfields, and low noise footprint. These factors increase availability and reduce costs, and are more environmentally friendly than the alternatives presented by conventional light aircraft.

5.1 Unleaded fuel

Microlight aeroplane engines are mostly operated on normal automotive 95RON unleaded fuel. Typical light aircraft engines are operated on aviation fuel, known as 100LL or 100 low-lead, which costs substantially more than unleaded automotive fuel and despite its name contains considerably more lead than leaded automotive fuel.

5.2 Fuel efficiency

A typical two-seat tubular construction Rotax 912 powered microlight aeroplane, such as the Best Off Skyranger or Ikarus C42, consumes around 12lph (litres per hour) at cruise speed. Older 2-stroke powered aeroplanes also operate at similar values of fuel consumption but return lower airspeeds. This may be compared to a typical light aeroplane such as the Cessna 152, which consumes around 24lph at cruise speed.

Note that whilst examples of different types of both microlights and light aeroplanes can exhibit higher or lower fuel consumptions and cruise speeds the examples chosen are reasonably representative of the choice of aeroplanes presented to an aspiring pilot: a new or quite recently built microlight aeroplane or a considerably older light aeroplane.

The fuel consumptions are compared on an hourly basis as flying time is often the main consideration in leisure flying rather than distance travelled. However, the typical cruise speeds of the named examples given above are fairly similar at around 80-100kt depending on source of data.

Taking the cost saving due to reduced fuel consumption and the lower price of unleaded automotive fuel, typically around €1.4 compared to aviation fuel around €2.0 per litre, the annual fuel saving for a microlight aeroplane over a comparable light aeroplane can be around €1800.

5.3 Low noise footprint

Early microlights utilised small 2-stroke petrol engines for reasons of lightweight, high power and low cost. These engines were not very fuel efficient, and operated at high rotational speeds. The use of tuned exhaust systems was common, and small propellers were often used without reduction drives. The result was the generation of considerable high frequency noise, which when coupled with the slow flying speed of early microlights resulted in much noise nuisance.

As a consequence of the noise problems a number of countries introduced noise limits on microlight aeroplanes, or adapted existing aeroplane limits, notably the UK and Germany. This led to reductions in noise levels, and more recently the popularity of fast Rotax 912 powered aerodynamically controlled aeroplanes with tractor configuration propellers has reduced the noise levels noticeably below that of conventional light aeroplanes.

5.4 Small airfields

The ability of microlights to operate from short, unprepared airfields has allowed them to avoid large concentrations of aeroplanes at traditional aerodromes. This reduces the impact of aircraft operations, in particular noise but also including land use: farm airstrips often go unnoticed in the countryside in contrast to traditional airfields, and barns may have a secondary use to hangar a small number of aircraft. This land use can provide a useful supplementary income to small farms.

Many microlight types are designed to be de-rigged and transported on a trailer, allowing home storage and operation from any field where owner permission and national rules permit. This further dilutes the impact of aircraft operations and storage, and reduces costs. Where hangarage is constructed it may be of simpler and lower-impact design than conventional hangarage, with weight shift microlights particularly easy to store with their wings detached from the trike unit.

5.5 Electric power

The lower regulatory burden on microlights allows and encourages innovation. In particular a number of electrically-powered aircraft have been flown to date, mainly battery-powered but also utilising fuel cell technology. The light weight, low power and often low endurance requirements of microlights are well suited to current motor and battery technology, with electric power already verging on practicality for single seat designs intended for self-launch soaring flight.

Whilst battery costs are high, due to the high costs of low production-run specialist engines used in aeroplanes the additional costs are not as significant as they are in the automotive world.

As observed in the model aircraft world, it is expected that improvements in technology over the next few years will allow electric power to spread to the heavier and faster microlight types.

The low duty-cycle of most microlight aeroplanes makes renewable energy sources a practical proposition in combination with electric power plants.

Section B

Analysis by European Country

Czech Republic

6.0 Summary

The regulation of microlights in the Czech Republic is entirely delegated to the Light Aircraft Association (LAA-ČR) by the Czech Republic Ministry of Transport, which fully supports the work of the LAA–ČR and encourages innovation. This means that personnel from within the microlight community, including industry, carry out regulatory activities. This ensures timely responses, knowledge and understanding of microlighting, and gives them priority. This is perhaps in contrast to an NAA where specialist knowledge is often at a premium and microlighting may not be a priority. The Ministry undertakes regular audits of the LAA-ČR to ensure compliance with the delegation. The audits are primarily checking of paperwork.

Whilst the LAA-ČR undertakes all of the tasks associated with regulation and control, the legal liability remains with the Ministry, although this has never been contested in the courts.

The LAA-ČR is a non-profit making organisation and costs are kept to a minimum. The LAA-ČR decides on the charges. Regulatory overhead costs of both initial airworthiness and continued airworthiness are kept as low as possible. This assists both manufacturers and operators, leading to large numbers of both.

The Czech Republic has the largest production manufacture of microlight aircraft in all of the EU countries studied.

6.1 Initial Airworthiness

The definition of a microlight follows that of Annex II to the Basic Regulation, with a maximum empty weight allowing for 2 x 70kgs for pilots plus 30 minutes fuel at maximum rpm.

There are weight-shift, conventional control (3-axis) and powered parachute classes, each having separate airworthiness standards, but there is no single-seat deregulated category as in some other countries studied.

Airworthiness standards are based on UL2 for aerodynamic control microlights, which is a derivation of the German code now overseen by the LAA-ČR. Imported microlights certified to German standards are usually accepted with minimal validation, others are validated against the appropriate Czech airworthiness national code.

There are three different national Cs of A - a prototype (Z), an amateur built (A) which have one-year C of A validity and a production certificate (P) that has two-year validity.

An 'opponent' (who is a member of a small committee of experts drawn from within the microlight industry, which includes the Chief LAA-ČR Technical Officer), is responsible for presenting the methodology etc of a new design to that committee. The limit load tests, verification of calculation methods etc are all agreed before any test flying takes place.

The airworthiness system incorporates a route to allow easy start-up of manufacturers without large front-end costs. When a manufacturer starts the design and production process only the first three aircraft have to meet the basic prototype requirements and then before ten aircraft are produced the manufacturer must go through the full Czech type certificate process. This therefore encourages innovation, ensures affordable start-up costs and allows the manufacturer to “work his way “into the system. This route has resulted in a large number of start-up companies entering the Industry successfully.

6.1.1 Approval of Manufacturers

Company approval is to LAA-ČR standards. The view from manufacturers is that it was a good system in that it requires a high degree of oversight but still encourages new designs and innovation.

6.2 Continuing Airworthiness and Maintenance

The maintenance of the aircraft is the sole responsibility of the owner. Work must be carried out to the manufacturer’s schedule but is discretionary. The owner or anybody else who is competent may carry out the work. Secondary inspections of any type are not compulsory.

A flying club must nominate a competent person who is responsible for the maintenance of school-owned / operated aircraft.

The Certificate of airworthiness is renewed either annually, if the aircraft is a prototype or amateur built, or biennially if a production aircraft.

6.3 Pilot Training and Licensing

6.3.1 Licensing

A state licence issued by the LAA-ČR is required to fly a microlight and there are different training requirements for each class of microlight. All syllabi are designed by the LAA-ČR and operate on a national basis.

The basic minimum requirement is 45 hours of theoretical training and 20 hours practical training. A multiple choice computer-based theory exam is taken which the instructor modifies depending upon the aircraft licence for which the student is being trained. A student has to complete a minimum of 21 hours’ theoretical training before commencing practical flying training.

In order to maintain a licence a pilot must fly a minimum of 5 hours within a 2-year validity period of the licence. However, a pilot’s logbook is not mandatory.

Ratings for towing and parachute jumping from microlights are the only additional ratings available.

6.3.2 Training

Training does not need to be carried out at a licensed airfield but the airfield must meet some basic guidelines issued by the LAA-ČR, one of which is that the runway must be a minimum of 500m in length and 35m in width.

6.3.3 Instructors

The initial entry requirement for an instructor rating is 100 hours P1, have flown a minimum of 3 different types in the category of Instructor licence being applied for and have carried out a minimum of 40 take off and landings.

The Instructor course comprises of a minimum of 20 hours theoretical training which is primarily instructing in good teaching practices.

No further flying training takes place to assess a pilots flying abilities.

There is no requirement for a different medical standard to a standard microlight pilot.

The instructor rating has 2-year validity and there is no standard revalidation process. Revalidation is carried out by an examiner.

An instructor is also allowed to approve a microlight flying facility for training and an Instructor is allowed to receive remuneration.

6.3.4 Examiners

The initial entry requirement for an Examiner rating is to hold an Instructor rating and have a minimum of 500 hours P1.

There is no specific training or revalidation requirement.

All initial assessment and approval and revalidation assessment for an Examiner rating is carried out by the CZ LAA Chief Examiner.

As with the instructor rating there is no requirement for a different medical standard to a standard microlight pilot.

6.3.5 Medical Requirements

An ICAO Class 2 medical is required which is issued by a doctor who has applied to the Aviation Medical Centre in Prague. He is not necessarily an AME in the ICAO meaning.

The medical has differing revalidation periods depending on age.

6.4 Operations

Operations are restricted to day / VFR. Flight in controlled airspace is not permitted.

6.4.1 Required Equipment

ASI, Altimeter, Compass plus engine instruments as required by the manufacturer.

6.5 Economic and Social Aspects

The Czech microlight sector is very large and active. Around 1,600 microlight aircraft are in an operational state, quite a large number compared to the population of around 10 million people. Much more significantly, the Czech microlight and LSA aircraft manufacturing industry is one of the largest in Europe.

Data reported by the LAA-ČR:

18 manufacturers of complete microlight and LSA aircraft,
9 manufacturers of microlight aircraft parts and subsystems
11 manufacturers of accessories
151 Airports

- More than 1500 employees in the industry
- Annual production of more than 550 aircraft, 1,400 propellers, 1,000 ballistic rescue systems and 1,500 instruments.
- Total value of the industry is estimated around €40 million p.a.
- 90% of production is exported to a value of c. €36 million p.a.
- Most of the manufacturers are private enterprises and employ up to 25 people.
- The main players are currently employing some 50 – 200 workers and have a turnover of above 100 million CZK (about €3.5million).

Some of the microlight / LSA manufacturing companies are large by microlight standards. These include those such as Evektor Aerotechnic with a turnover of around €4.5 million p.a. About 150 employees are involved in microlight production, down from 260 some 2.5 years ago, producing about 80 aircraft p.a. which is down from peak of 155 p.a. 2.5 years ago.

The success of the Czech microlight design and manufacturing industry may be attributed to the large number of experienced and capable engineers released by the demise of the large aircraft industry and the encouragement and helpful approach of the regulators in the form of the LAA-ČR, which is focused on creating a successful leisure aviation sector in contrast to the task being seen as a very minor one in terms of the overall business of a NAA.

6.6 Microlight Accidents and Accident Rates

The primary data sources for population, activity and accident data are:

- Air Accidents Investigation Institute (AAII) of the Czech Republic (which only started operations in 2003), and.
- LAA-ČR

6.6.1 Population and Activity data

In the absence of actual recorded data for annual operating hours, the only way to arrive at an estimated figure is to take the average number of microlight aeroplanes for each year and assume an average annual utilisation per aircraft. of 70 hours per aircraft per annum.

Czech Republic Microlights.	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*
Number of pilots	-	3941	4240	4583	4945	5256	5604	5740e	5790e	5800e
Number of Microlights	-	2000	2060	2420	2510	2680	2670	2840	2870	2900e
Annual Total Hours (,000)	-	140	144	170	175	188	187	199	201	203*e*

Source: EMF statistics

Note*:* *e* = Estimated by trend. Annual hours were provided based on an average of 70 hours p.a. per aeroplane.

6.6.2 Fatal Accident rate

The fatal accident rate for Microlights in the Czech Republic probably lies between 2.50 and 3.50 per 100,000 hours. (See **Appendix 1A** for calculations and caveats).

6.6.3 Conclusion

No firm conclusions on the fatal accident rates for Czech microlighting can be drawn at this stage, due to the absence of data on fatal accident numbers and reliable operating hours' data. However, the fatal accident rates would appear to be above the average of other countries' rates. As is the case with other countries, analyses from the official source (AAII) indicate that frequently the causes of fatal accidents involve flight beyond the MTOM of the aircraft, flight outside other operating parameters, and handling errors

Failure of airframes does not seem to feature in the causes of fatal accidents, although engine failures do happen

6.7 Light Aeroplane Accidents

6.7.1 Data range and limitations

The data available covered aeroplanes greater than 450kgs up to 2,250kgs MTOM. For accidents the data covers the years 2003 to 2008.

Czech accident data from the annual reports 2003 to 2009 of the Czech Air Accident Investigation Institute does not identify the number of fatal accidents but does identify the total number of 'Air Accidents' which include fatal accidents. However, the categorisation of aircraft results in aeroplanes (450kgs to 2,250kgs MTOM) being combined with gliders.

In addition the number of fatalities is recorded, again with aeroplanes up to 2,250 kgs combined with gliders. It is not possible to deduce the number of fatal accidents for aeroplanes from the fatalities data.

6.7.2 Population & Activity data

No data was available on the annual operating hours or the population of light aeroplanes.

6.7.3 Accident data

Appendix 1B contains information on accidents, within the constraints noted above.

6.7.4 Accident rates

In the light of the lack of appropriate data it is not possible to calculate any accident rates for aeroplanes.

6.8 Gliders

6.8.1 Data sources

Data for Czech gliding was obtained from the EGU accident database.

6.8.2 Population data and Activity data

Czech Gliding	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of gliders	562	586	598	635	663	678	690	687	O/S	O/S
Number of pilots	3,450	3,316	3,221	3,183	3,249	3,195	3,230	3,209	O/S	O/S
Annual flights ('000s)	82	80	76	88	77	81	82	76	O/S	O/S

Source: EGU accident data base 98-07

6.8.3 Accident Rate

The *fatal accident* rate for eight years to 2007 is less than 0.77 per 100,000 hours.

The equivalent *total accident rate* for the same period is 26.6 per 100,000 flights.

The Calculation of this rate can be found in **Appendix 1C**

6.8.4 Conclusion

The incidence of fatal accidents is small and subject to randomness and accurate data is only available over an 8-year period; therefore it is unwise to draw any statistically significant conclusions from the data.

France

7.0 Summary

The French system for the regulation of microlights is entirely based upon a concept of 'declaration of the truth' by all participants within the sport. Whilst the State aviation authority (DGAC) retains the legal right to investigate all aspects of airworthiness licensing and operations, and to 'police' the system if it is found necessary, the reality is that the system seems to be self-policing to a satisfactory extent. There is a very active and influential national association: *La Fédération Française de Planeur Ultra-Léger Motorisé* (FFPLUM).

With an agreed and published framework of technical boundaries within which the manufacturers, builders, owners / pilots, clubs and instructors must work, liability for adherence to the rubric is placed entirely with the individual to operate legally.

This "declarative" system was the most de-regulated environment that we found during the study, and also comprised the greatest number of aircraft and participants (15,500 active pilots) in any EU State.

In common with a number of Member States studied, there was general agreement amongst the stakeholders that the one area of relative weakness was that of training and approval of competence. The accident statistics bear this out to a large extent that 'human factors' during piloting are by far the largest single cause of fatalities.

The main cause for concern on this issue was that of a lack of consistency and common standards being applied at training establishments across France. The FFPLUM is actively engaged in a process to address this and, whilst it has no formal delegated authority from the DGAC to be responsible for implementing change, the self-imposed responsibility allows the sport association to decide and implement 'best practice'.

7.1 Initial Airworthiness

Under the French statute provisions, the general scheme of airworthiness for aircraft is based on the provisions of Article R. 133-1 of the Code of Civil Aviation, which requires that all aircraft must be issued with an airworthiness document.

However, Section A. 133-1-2 introduces a possible exception to this principle, for the benefit of certain aircraft, single or two-seat, either un-powered or with low power engines, and under certain conditions the Authority may define by decree a variation to this regulation. It is under this provision that microlight aircraft are exempt from holding an airworthiness document, under the conditions set by decree and instruction of September 23, 1998 (general definition) and Order 17 June 1986 (noise emitted by ULMs).

The decree of September 23rd 1998, defines a microlight in the following way:

A single place or two seat aircraft with a low powered motor, corresponding to one of the following class definitions:

Class 1 – Powered Parachute:

A single-engine aircraft sustained by a flexible parachute type wing meeting the following technical conditions:

- a maximum continuous power is less than or equal to 45 kW for a single-seat and 60 kilowatts for a tandem;
- maximum power is less than or equal to 60 kW for a single-seat and 75 kilowatts for a tandem;
- maximum mass not exceeding 300 kg for a single-seater and 450 kg for a tandem.

Class 2 –Flex-wing trike ('pendulaire')

A pendulaire is a single engine microlight aircraft sustained by a rigid wing under which is generally hung a wheeled nacelle containing the pilot and the motor.

Class 3 - Multi-axis

A multi-axis microlight aircraft with a single engine supported by a fixed wing of conventional construction.

A Microlight Class 2 or Class 3 has to meet the following technical requirements:

- a maximum continuous power is less than or equal to 45 kW for a single seat and 60 kilowatts for a two-seat;
- maximum power is less than or equal to 60 kW for a single seat and 75 kilowatts for a two-seat;
- maximum mass exceeding 300 kg for a single-seater and 450 kg for a two-place.

  (These masses can be increased by 5% in the case of a microlight equipped with a safety parachute, or 10% in the case of an float plane. The parachute and its Installation must meet technical requirements set by the DGAC, but it is not possible to mix BR parachutes and floats).
- a minimum steady flight speed in landing configuration not exceeding 35 knots (65 km / h).

There is no formal approval or acceptance by the State of 'airworthiness' as such. There is a regulation that sets out the requirements for airworthiness and there are technical airworthiness codes, which must be approved by DGAC. The recommendation of DGAC is to use part B and C of VLA code but the owner is at liberty to chose another code or define his own. Whatever the airworthiness code applied, the DGAC must accept the definition.

For the airworthiness application, a technical reference dossier is sent to the DGAC, which declares everything that has been done in accordance with the applicable technical codes. Whilst DGAC has a final right of audit (through reserved rights) to investigate airworthiness issues on the design, in practice this is rarely, if ever, used.

The system works on the principle that the manufacturer (or builder if it is an individual) makes a declaration that the aircraft meets the appropriate technical requirements and (in the case of a factory supplied kit) has been built in accordance with the manufacturer's instructions.

Charges applied for the system are nominal. For the owner/pilot there is a one-time charge for the deposition of a dossier with the DGAC of €20 (or €40 in the case of a kit or purchased aircraft). The cost every two years of renewing the *Carte d'Identification ULM* (the registration document for the individual aircraft) is €20.

7.1.2 Demonstration of Original Airworthiness

The method of demonstrating compliance against the selected codes is by simple self-declaration that the aircraft complies in all respects. A flight test may or may not be required and if so, there is a provisional approval granted for the aircraft to fly and to undertake flight tests to demonstrate a particular aspect if required; the owner may carry out this flight test. Following a declaration that the tests were satisfactory, a full approval is granted.

7.1.3 Approval of Manufacturers

There is a very large indigenous microlight manufacturing industry in France, ranging from very small operations to companies that manufacture significant quantities of aircraft for the home and export markets. Despite this, there is neither approval nor oversight by the State or by any delegated body of any design or manufacturing process, either in recognised manufacturing companies or 'homebuilt' environments.

7.2 Continuing airworthiness & maintenance

Ensuring that the aircraft is correctly maintained is the absolute responsibility of the pilot (not necessarily the owner). He must ensure that before he flies the aircraft each time that it has been maintained and serviced in accordance with the manufacturer's instructions /recommendations. This may mean that for a machine that belongs to a flying club, any club member who intends to fly it must ensure that he has personally followed the maintenance programme. Maintenance may be undertaken by any competent person and must be carried out in accordance with the manufacturer's instructions. Owners or pilots who do not consider themselves capable of undertaking a particular maintenance task are encouraged to seek advice from others.

The *Carte d'Identification ULM* has to be renewed every two years by way of further declaration that the aircraft has followed a prescribed maintenance programme and that it remains in an airworthy state. The only third-party inspection required is a check on the frequency stabilisation of the communications radio (if fitted) and this is also only required if the radio is not of the modern, digital frequency generation type.

There is no legal requirement for any airframe or engine log book to be maintained. However the FFPLUM encourage their members to use these as 'good practice' and to ensure a proper and comprehensive record is available of maintenance on each aircraft.

7.3 Pilot Training and Licensing

A State licence is required to fly a microlight and a separate rating is needed for each class /sub-class. Whilst the licence is issued by the DGAC the approval to grant a licence is solely the responsibility of the invigilating instructor at any particular flight school. It is important to note that there is no 'Examiner' rating structure within the licensing and training process.

Theoretical knowledge training is undertaken on an ad-hoc basis at the flying training establishment, and a single theory test consisting of 40 multiple choice questions is taken by pupils. The questions cover a range of topics including navigation, theory of flight air law and technical aspects. These theory tests are carried out at regional DGAC establishments every 2 months, using multiple-choice question papers approved by the DGAC.

Around 15 to 20 hours instruction is considered adequate for issue of the brevet, followed by a further period of instruction (10 hours nominal) and a demonstration of competence for the approval of a full licence; after which the pilot may fly a two-seat with a passenger.

7.3.1 Instructors

The practical instruction does not follow any recognised national curriculum, and each school and instructor teaches in his or her own individual way. The instructor is the sole arbiter of judgment as to when any pupil is ready to go solo and when he is ready to apply for his '*brevet'* to permit solo flight.

There is no revalidation requirement for ULM pilot licence; however, instructors have to re-validate their approval every two years by a practical demonstration of capabilities to an instructor from another training school.

7.3.2 Medical Requirements

A JAA type medical certificate (issued as a result of a medical examination by an authorised medical examiner) is not required; however prior to the first application for a licence, the pilot must have obtained a '*certificat médical de non contre-indication à la pratique de l'ULM'.* This is a self-certification that the applicant does not display any contra-indications of certain physical conditions, including heart problems, lung dysfunction, epilepsy etc.

A medical practitioner must countersign the certificate.

7.4 Operations

All microlights flying in France are bound by the rules governing VFR flight, with no instrument or night flying permissible. Flying in controlled airspace is exactly the same as for other light aircraft and subject to the same restrictions and freedoms.

7.5 Economic and Social Aspects

The manufacture, training and operation of microlights in France is extensive, and of significant economic importance, both nationally and at a regional level.

Whilst not being able to accurately ascertain a financial or employment value to the French economy, the following statistics in terms of numbers of organisations involved serve to illustrate the size of the industry:

155 Organisations involved in the manufacture or importation of Airframes, engines and ancillary components.

23 Companies solely involved with repair and maintenance of ULM airframes & engines.

347 Flight schools.

Clearly the low-level regulation environment in France encourages design and manufacturing innovation. With little or no certification requirements for manufacturers, the barriers to entry for new, start-up companies are arguably the lowest in the Countries examined by this report, making it very easy for new players to enter the market. The negative aspect of this un-regulated environment is that this is almost an exclusively domestic market within mainland France. Unless an airframe or engine manufacturer certifies his product to the airworthiness requirements of another State (the UK or Germany for example) it is not possible for them to sell outside of France. The industry is therefore almost entirely dependant upon an increase in domestic demand to enable growth. In contrast, a small number of the largest French manufacturers are very successful exporters via external certification: 'Air Creation' (arguably the world's largest flex-wing manufacturers) undertakes UK, German and US LSA certification, and has a large export business. 'Best Off' (Skyranger) has undertaken UK certification and uses this as a basis for a large export business.

The absence of a National flying instruction curriculum probably explains the large number of flight schools. Elsewhere in this report it will be noted that there is no flight examiner status or instructor advancement structure for ULM class of aircraft. This means that the minimum entry level for a flying school instructor is a two-seat licence and instructor rating. Neither does training have to undertaken at a licenced establishment, simply a field that is 'notified' as being used for microlight flying. It is therefore relatively easy to start a flying school.

In addition to the manufacture, maintenance and operation of microlights there appears to be a significant aura of supporting industries involved with magazine publications, specialist clothing, flight equipment and even trade show providers who organise regional events for the microlight industry.

Trying to place an economic value on this is extremely difficult within the parameters of this report. Suffice to say that it is quite obvious that this economic success has been predicated by the low-regulation environment and that any hardening of regulation in this sector would have a significant, detrimental economic effect.

7.6 Microlight Accidents and Accident Rates

7.6.1 Introduction

France is a country with the second highest number of microlight aircraft and participants in Europe. The sector operates under relatively benign regulatory conditions, based on a 'declarative' system. This relies upon a framework of regulations and rules under which the individual aircraft owner / pilot is personally responsible for ensuring compliance.

Data on microlight accidents and operating hours in France has been obtained from the DGAC (French NAA) and is reasonably comprehensive for fatal and serious incidents but lacking in detail for other causes where only the local Police are involved

7.6.2 Population and Activity data

The number of microlight aircraft on the register in France as having a valid '*carte d'Identification'* over the years 2006 to 2009 is as follows:

Classes	*2006*	*2007*	*2008*	*2009*
02-Pendulaire	2,240	2,505	2,613	2,612
2A-Pendulaire ss-cl 2A	87	94	100	79
03-Multiaxe	3,757	4,434	4,743	4,966
3A-Multiaxe ss-cl 3A	1	0	1	1
Sub total 'Microlights'	***6,085***	***7,033***	***7,457***	***7,658***
01-Paramoteur	789	1,040	980	1,046
04-Autogire	222	298	321	374
05-Aérostat	11	8	9	12
1A-Paramoteur ss-cl 1A	1,767	2,478	2,788	3,189
sans réf. à ULM-type	421	47	1	1
Sub total other types	***3,210***	***3,871***	***4,099***	***4,622***
TOTAL	***9,295***	***10,904***	***11,556***	***12,280***

Paramotors, autogyros and small balloons are included in the French ULM system and are shown separately above.

7.6.3 Accident rate

The overall fatal accident rate has been calculated at 2.33 per 1,000 aircraft. This rate excludes PPGs / paramotors, which have also been excluded from the accident statistics where identifiable.

Appendix 2A contains the calculation and further information.

7.6.4 Views of the FFPLUM

The following aspects regarding accident rates were highlighted during the discussions with senior officials of FFPLUM:

1. The accident rate in relation to the number of members has been falling over the longer term compared with the earlier years of microlighting. This one might expect given the embryonic nature of the activity in the 1980s and early 1990s, and once the focus of attention of accident prevention was developed for a relatively new form of aviation.
2. A significant proportion of fatal and serious injury accidents resulted from operating outside the applicable regulations and / or rules.
3. In France, microlight instructors, once passed as competent, operate independently of any superior authority other than the club environment, if any, to which they are attached. There is concern that the lack of instructor rating renewal assessment, higher-level supervision, and any other form of ‘control’, may be a factor, with links to a number of accidents each year. The FFPLUM has concerns on this issue and is currently active in developing proposals for a National instructor and examiner review scheme to bring a greater degree of consistency and standardisation.

7.7 Other GA Accidents

Aircraft groups and classes

The aircraft groups and classes that have been investigated are Aeroplanes greater than 450kg MTOM but less than 1200 kg MTOM, and Gliders

TBA

7.8 Gliders

7.8.1 Population and Activity

France Gliders	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
No. of Gliders	1831	1750	1669	1606	1535	1619	1732	1532	O/S	O/S
No. of Pilots	12838	13333	13464	13582	12829	12471	12375	12296	O/S	O/S
Annual Flights (000s)	192.6	199.0	186.7	196.6	177.5	173.3	165.2	167.1	O/S	O/S

Sources: DGAC

7.8.2 Accident Rate

The fatal accident rate is around **2.75** per 1,000 aircraft**.**
The total accident rate is around **20.8** per 1,000 aircraft**.**

The fatal accident rate is around **2.47** per 100,000 flights.
The total accident rate is around **18.7** per 100,000 flights.

Further details on the above rates are provided in Appendix 2c

7.8.3 Conclusions

The fatal and total accident rates above may be overstated, as the data on the number of gliders appears understated. This may be investigated further with DGAC before completion of the final report.

The nature of mountain flying, and the associated risks, probably account for the French accident rates being higher than some other gliding nations. The figures also reflect the fact that many glider pilots visit the French alpine region for their activities.

GERMANY

8.0 **Summary**

The German system for the regulation of microlights is one where the German Ministry of Transport has delegated the whole process to a body other than the National Aviation Authority (LBA). The Ministry retains legal responsibility.

The two organisations with delegation are the Deutscher Aero Club (DAeC) and the Deutscher Ultraleichtflugverband e.V. (DULV). The delegated authorities are provided to DAeC and DULV by means of a five-year, renewable contract. There is standardisation between the two organisations and, whilst there are exceptions, DULV generally manage weight-shift microlights and DAeC the conventional control (3-axis) microlights.

DAeC and DULV are subject to irregular LBA audits, but usually annual, although there is no formal audit contract between the Ministry of Transport and the LBA or between the LBA and DAeC and DULV

There are approximately 13,800 current microlight pilots of which 13,100 are for 3-axis microlight licences and 700 weight-shift licences.

8.1 Initial Airworthiness

The definition of a microlight in Germany accords with Annex II of the Basic Regulation with a 65kph maximum stall speed with or without flaps. There is no defined maximum empty weight, (though this requirement is currently under review). There is no restriction on adjustable propellers, retractable undercarriage etc.

Until recently aircraft designed to recognised codes from other member states were accepted in Germany, with various levels of verification, but a policy decision made recently now precludes this. All microlights on the German aircraft register must now be designed to a German (LTF) code.

There are two design codes currently being used, LTF NFL 22/05 for weight-shift aircraft and LTF NFL 17/03 for 3-axis, conventionally controlled aircraft. Powered parachutes over 120kgs use the weight-shift code. The LTF codes were defined in 1993 by DAeC and were accepted by the Ministry of Transport.

There is no difference in the applied design code as between homebuilt and manufactured aircraft. The German Homebuilders Association (OUV) can help the builder but the DAeC performs all regulatory compliance work.

The DAeC or DULV grants original airworthiness approvals in the form of a sub-ICAO Type Certificate under the authority contained in their delegated powers from the LBA. The DAeC reports that the authorities for microlight airworthiness regulations in Austria, Belgium, Czech Republic, Denmark, France and Spain accept the DAeC approvals.

SLMG aircraft that meet the microlight definition, regardless of whether the engine/prop combination is retractable, can be categorised by the manufacturer. If the manufacturer decides the aircraft is a microlight then it needs to meet the national requirements. If the manufacturer decides it is a glider then it must meet the EASA requirements for airworthiness.

Germany has a deregulated category for aircraft with a 120 Kg maximum empty mass, similar to several other EU countries. The first model of a type in this category must demonstrate compliance with an agreed standard, but there are no subsequent requirements for any production controls or annual checks. There are no requirements for aircraft registration or pilot medicals to fly this category of aircraft. The category has recently been expanded to allow 3-axis type aircraft, which were excluded from the category since it's inception in 2001.

All microlights in Germany must be fitted with an aircraft parachute recovery system (Ballistic Recovery System – BRS). This is reported as presenting problems in certain fatal accidents, given the large speed variations between current and older microlights.

8.1.2 <u>Demonstration of Original Airworthiness</u>

The manufacturer presents all documentation to either the DAeC or DULV in order to demonstrate compliance against the appropriate design code. The chief engineer of DAeC or DULV or his staff thoroughly check the submitted documents and decides what further evidence, if any, is needed either in design analysis or load testing. Flight testing requirements are also specified within the design code and overseen by the DAeC or DULV Chief Engineer. A successful conclusion is the issue of a National non-ICAO Type Certificate.

The Ministry of Transport determines all costs for original airworthiness.

8.1.3 <u>Approval of Manufacturers</u>

There are several microlight manufacturers in Germany, many exporting aircraft to other EU Member States, but despite this there is no approval or oversight of a manufacturer. Each individual item produced by a manufacturer has to be checked for conformity with the design code and issued with its own approval. Whilst this system appears to work satisfactorily, the LBA states that this needs review.

Due to some airworthiness problems arising recently, the oversight of airworthiness is now very high. Both the DAeC and LBA are increasing the level of competence of their inspectors as they feel this is the best way of ensuring a high degree of airworthiness compliance.

There are no state regulatory compliance costs associated with design or manufacturing approvals for microlight aircraft.

8.2 Continuing Airworthiness and Maintenance

The pilot / owner is responsible for ensuring that the aircraft remains fit to fly and has been maintained correctly. An aircraft logbook must be maintained showing all work carried out including defects rectified. All work must be carried out in accordance with the manufacturer's instructions / recommendations and the aircraft handbook. This work may be carried out by the owner or by a licensed engineer, who provide their signature to that effect.

There is no requirement for a second signature, even for extensive work such as the removal or replacement of engine controls or flying controls. The owner accepts full responsibility for maintenance work carried out.

For the annual the C of A renewal, both the aircraft and supporting paperwork have to be inspected by an approved inspector ('prüfer'). There are approximately 300 Inspectors approved by the DAeC and DULV, (but not employed by them).

The fee for the renewal of a C of A is set by the Ministry of Transport and is currently €60.00.

Inspectors have to be approved by the DAeC following attendance at a two-week course run by the DAeC. There is no course fee charged to the candidate inspectors. The LBA oversees the syllabus for the inspectors' course.

There is no cost from the State or DAeC / DULV for inspectors' approval. Inspectors are required to attend a biennial 'refresher seminar' and to carry out a minimum of four microlight checks per annum. The DAeC offers inspectors liability insurance at a current cost of €50.00 p.a.

8.3 Pilot Training and Licensing

There are two basic licenses, weight-shift and conventional controls (3-axis), with further ratings for other types, instructing, banner towing etc. The licence has a validity of five years (other than a <120kg class license, which is valid for life).

The complete licensing process is the responsibility of the DAeC / DULV who issue and revalidate microlight pilot licences on German Federal Republic paperwork under the terms of their delegations from the Ministry of Transport.

In the final year of the five-year validity period a pilot must fly a minimum of 12 hours, 6 of which must be PIC, and carry out a 1-hour proficiency flight with an instructor. In the absence of adequate hours the licence holder can undergo re-training, the extent of which depends on the time lapse since the end of licence validity.

The theoretical exams for obtaining a microlight pilot licence are the same for all types of licence with the minimum practical training of 30 hours for conventional controls (3-axis) and 25 hours for weight-shift microlight. The common theoretical subjects are Human factors, Air Law, Navigation, Meteorology, Aerodynamics, Technical and ‘Behaviour of Unusual Landing Characteristics’.

The microlight licence privileges are limited to solo flight unless further training has been completed. The licence is restricted to day / VFR. There is a rather complex cross crediting system that provides a route to gaining an ICAO compliant licence for aeroplanes.

The microlight licence does not allow the holder to fly other classes of aircraft; other licence holders cannot fly microlights without a having a microlight pilot licence.

Microlight pilot licence holders may fly in other countries on bi-lateral bases, subject to the host nation’s rules. Microlight pilot visiting Germany may fly on their own country’s licence subject to it being current and having a required minimum 3rd party insurance and valid documentation for the aircraft.

There were 17,785 microlight licences in existence at the end of 2009

8.3.1 Instructors

Microlight instructors need a minimum pre-qualifying requirement of 150 hours PIC for 3-axis microlights or 75 hours PIC for weigh-shift microlights. A competency test with an existing instructor is required before the candidate attends an instructor course. Following successful completion of the course an instructor operates on probation for a year during which time he cannot send a student solo.

Instructors may be remunerated without having any form of commercial pilot licence.

Instructor revalidation requirements are determined by DAeC / DULV. The instructor rating has three-year validity. During the third year of validity the instructor must have conducted 60 take-offs and landings and carried out a minimum of 10 hours’ training. Failure to meet these criteria requires attendance at a two-day seminar.

8.3.2 Examiners

The training and revalidation of examiners is the responsibility of DAeC / DULV but there are no laid down requirements.

8.3.3 Medical Requirements

An ICAO Class 2 medical is required for all classes of microlight other than the <120kg class, where no medical is required. All medical certificates are issued by an AME and overseen in terms of licence compliance by DAeC / DULV. The ICAO Class 2 standards determine the medical certification periodicity revalidation requirements.

8.4 Operations

All microlight flight is restricted to day VFR (including VFR 'on top'). Flight in controlled airspace is only restricted by the instrument requirement and pilot licence requirement. There are no 'over-flight' restrictions.

The Ministry of Transport determines the operational regulations. Compliance with the operational regulations is the responsibility of DAeC / DULV under the terms of the derogations. Foreign visiting microlight pilots have to comply with the German Ops Regulations including airworthiness and insurance. These rules apply equally to manufactured microlight aircraft and home-built microlight aircraft.

Microlights can be used for training without any additional airworthiness standards or 'commercial status'.

All landings and take-offs must take place at approved landing sites. The local State authority gives the approval under planning rules as regards types that can be flown, hours and days of use etc. However the local authority cannot determine the form of flying and the DAeC or DULV oversees the operational approval.

8.4.1 Required Equipment

The only minimum equipment required is that specified by the manufacturer in the aircraft manual. This normally embraces ASI, altimeter, compass, fuel indicator, seat belts and engine instruments.

There is a minimum fuel requirement of planned flight plus 30 minutes.

8.4.2 Regulatory Issues

There is no approval for manufacturers and therefore no traceability of material sources etc. This is an area that is under review by the LBA.

There is no formal audit contract between the LBA and the DAeC or DULV and therefore it tends to be a reactive rather than proactive system.

Because of the speed ranges of the various aircraft it is proving difficult to design a ballistic recovery system (BRS) that deploys effectively at all speeds. The BFU (Federal Bureau of Aircraft Accident Investigation) believes that potentially survivable accidents are becoming un-survivable because the BRS is deployed.

8.5 Economic and Social Aspects

The microlight industry in Germany is extensive, however it has not been possible from the data available to ascertain an accurate value of microlight activity to the German economy, but the following figures are available:-

30	Companies involved with aircraft design and manufacturing
9	Companies designing & manufacturing engines for microlights
137	Different types of approved microlights
175	Flight Schools
1,174	Microlight Instructors

Whilst product certification is required, this is carried out on an individual basis; therefore there is no requirement for a manufacturer to have an approval. This is one of the reasons behind the large number of manufacturers.

Many manufacturers are producing aircraft for the LSA market, even though they are not available for sale in Europe. Two of the five largest LSA manufacturers (by sales volume in the USA) are German. The buoyant LSA market in the USA has undoubtedly helped microlight manufacturers in Germany to be able to produce lighter versions of the LSA designs, to accommodate the present Annex II regulations.

Germany has a very low mandatory noise requirement and it was reported that many GA pilots have decided to fly microlights since the noise level of these aircraft is far lower. This is important, as many airfields have specific noise restrictions and a wider range of airfields and airports are available to microlights.

8.6 Microlight Accidents and Accident Rates

8.6.1 Introduction

The available information on microlight population, activities and accidents was less than comprehensive. In particular there is a lack of data on microlight annual operating hours. This has meant that statistically valid conclusions cannot be drawn on accidents. From 1998 to 2007 there was no mandatory reporting of accidents to microlight aircraft in Germany with the result that the LBA database is far from complete in this respect.

8.6.2 Population and Activity data

Germany Microlights	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
No. of Microlights	2550*	2694	2462	2466	2449	2421	2437	2450*	2465*	2500*
No. of Pilots	10000*	10951	11955	12587	12555	12594	12594	12700*	12850*	13800
Hours ('000s)	178.5	188.6	172.3	172.6	171.4	169.5	170.6	175.0	175.0	175.0

Sources: EMF database and DAeC

Note: All data from comes from the DAeC. The microlight population numbers do not seem to correlate with the prior years' data from the EMF. This may be because of the absence of weight-shift microlight data (DULV). Estimates (*) have been made to complete the missing years. Annual hours are calculated on a standard average hours per aircraft p.a.

8.6.3 Accident Rate conclusions

The calculation of the fatal accident rate may be found in **Appendix 3A**

Substantive conclusions are difficult to make due to the lack of reliable data. The fatal accident rate would appear to be between 2.0 and 4.0 per 100,000 hours of activity, whilst the total accident rate over 10 years appears to be around 30 per 100,000 hours.

One factor that was brought out during discussions with the BFU was the mandatory fitting of ballistic parachute systems. In the view of the BFU there is perhaps some evidence that deployment of ballistic parachute systems in some accidents that proved to be fatal this could have been a reason for the fatal nature of the accident., The opinion of the BFU is that at higher airspeeds the effect of deployment of a ballistic system can result in wrenching the whole system from the fuselage causing airframe failure

The BFU is currently considering the need to review the requirement for all microlights to be fitted with ballistic recovery systems.

8.7 Other GA Accidents

Aircraft groups and classes

The aircraft groups and classes that have been investigated are

- Aeroplanes > 450kg MTOM (microlights) and < 1200 kg MTOM
- Gliders / sailplanes

8.7 Aeroplanes (> 450kg MTOM and < 1200 kg MTOM)

8.7.1 Population and Activity data

Germany Other GA	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Single engine aircraft less than 2 mt	N/A	6,813	6,731	6,658	6,670	6,682	6,704	6,705	6,738	6,752
Pilots	N/A	13,145	13,271	12,830	12,594	12,209	11,689	11,342	10,987	10,627
Hours	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Source: LBA database (aeroplanes) DAeC pilots

8.7.2 Accident Rates

TBA

8.8 Gliders

In Europe, Germany has the largest population of gliders, glider pilots and activity levels by a substantial margin. The next largest gliding population and activity is France followed by the UK. The only nation outside Europe with a similar level participation is the USA.

8.8.2 Population and Activity data

Germany Gliding	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Gliders	7,778	7,771	7,728	7,686	7,703	7,728	7,741	7,769	7,815	7,891
Motor gliders	2,400	2,434	2,494	2,533	2,584	2,664	2,766	2,824	2,948	3,022
Pilots	36,434	35,852	35,650	35,236	34,642	33,196	33,196	31,279	30,792	30,117
Launches (est)	1.1m	1.1m	1.1m	1.0m	1.0m	1.0m	1.0m	1.0m	1.0m	N/A

Source: LBA database

8.8.3 Accident rates

The **fatal accident rate** is around **1.25** per 1,000 aircraft, or 1.23 per 100,000 flights

The **total accident rate** is around **10.4** per 1,000 aircraft, or 10.3 per 100,000 flights.

Further details on the above rates are provided in **Appendix 3c**

8.8.4 Conclusions

Germany has the highest population of glider pilots of any European country, by a large margin. The accident rates may not fully reflect accidents to German pilots if the accident took place in another country (this is not distinguished in the accident data). These accidents should be included in the host nation's data.

ITALY

9.0 Summary

The Italian microlight community is very buoyant, both from a user and manufacturer perspective. There is a strong Microlight Association, the Federazione Italiana Volo Ultraleggero ('FIVU'), with over 2,200 members and supporting Italian microlight flyers. The Italian Ministry of Transport has devolved the oversight of all sporting aviation activities to the Aeroclub of Italy (AeCI). The AeCI is an organisation funded in part by the Italian government.

The regulation of microlight registration, licencing and training, and most other aspects of operations, is undertaken by the AeCI as a delegated Assessment Body, on behalf of the Italian NAA. A certain amount of the oversight work is also carried out by FIVU but NOT in an official capacity.

Whilst there is no mandatory requirement for a microlight owner to belong to the FIVU, in practice many do so. It is estimated that a total of in excess of 6,000 microlight aircraft are in operation.

As with most countries an accurate number of active microlight pilots is not known but it is estimated that there are 10,000-12,000 pilots who are current.

9.1 Original Airworthiness

The definition of a microlight is as per Annex II of the Basic Regulation and there are microlight gyroplanes and helicopters.

There is currently no system of airworthiness in operation. An owner buys an aircraft, sends the manufacturer's statement of build quality and the appropriate fee (see below) to the AeCI and in return he receives a registration document and a unique registration number. If the aircraft is factory-built then a document of build is sent to the AeCI but no verification of structural integrity is either made or required. The microlight system has no differences for homebuilt or manufactured aircraft.

In all cases the airworthiness, liability resides with the owner and if an accident or incident occurs then the local Police deal with the matter and any liability issues are settled through the Courts.

The cost for the issue of registration documentation from the AeCI is currently €207 for weight-shift, €258 for gyroplanes and €413 for 3-axis microlight aircraft and helicopters.

There is no manufacturer approval (DOA or POA) required and there is no regulatory oversight of manufacturers.

9.2 Continuing Airworthiness

Currently there is no requirement to provide evidence of any maintenance and additionally there is no mandatory requirement for owners to have an aircraft logbook, although it was stated that many pilots do keep a maintenance logbook as evidence of compliance with manufacturers' recommendations.

In practice most aircraft owners follow the engine and airframe manufacturer's maintenance manuals and of course if any accident can be attributed to incorrect maintenance or lack of maintenance then a court will use this as evidence.

9.3 Pilot training and licensing

A licence is required to fly a microlight; but although it is a National ENAC licence, the AeCI undertakes the issue and control under delegation from ENAC.

In order to obtain a solo licence, a student needs to carry out a minimum of 16 hours practical training and 33 hours of theoretical training. There is an approved national syllabus, which has been developed by the FIVU and is endorsed by the AeCI. In order to carry a passenger, a further rating is needed and this involves flying a further 30 hours solo and a further flight test. As with the aircraft, there is no mandatory requirement for the pilot to maintain a flight logbook, and proof of hours is taken on trust.

In order to fly a different class of microlight, extra training is required together with a further skills test in the air. Unusually, it is possible for the holder of a PPL (A) to simply send proof of his licence to the AeCI and it will issue a microlight licence on the strength of the PPL (A) without further training.

The licence has lifetime validity and there is currently no revalidation requirement.

9.3.1 Instructors & Examiners

In order to be an Instructor you must be a minimum of 21 years of age and have held a microlight pilots licence for a minimum of 3 years. There is a national instructor training course and there is a standardisation flight every 2 years with an examiner. To become an examiner it is necessary to follow an approved training route, which is controlled at national level by the AeIC.

9.3.2 Medical

There is no requirement for an ICAO class 2 medical. Instead, every two years regardless of age a pilot must visit a notified 'sport doctor' who issues a sport medical certificate. This is the same medical certification as anybody who carries out a strenuous sport associated with some personal risk ie. mountain climbing, canoeing, rowing etc.

An instructor has exactly the same medical but it is renewed annually.

9.4 Operations

All microlight operations are regulated by the AeCI under the oversight of the Italian NAA (ENAC)

Flight is restricted to day / VFR only and only outside of controlled airspace. Microlights are not permitted to enter controlled airspace under any circumstances (no 'Special VFR' privileges). Microlights are also not permitted to land or take off from licensed airports; because of this regulation there are many published landing grounds and microlight airstrips.

On weekdays, microlights are not permitted by law to fly above 500ft agl and at weekends this upper height restriction is increased to 1,000ft agl.

Microlights may not be fitted currently with communication or navigation radios, (but see para 6.0 below for impending changes to the national regulations).

9.5 Regulatory Issues

Currently the FIVU undertakes much of the work on pilot training syllabi and some other tasks; this is 'unofficial' but they believe that they are best placed to perform these tasks effectively. The AeCI believes that the FIVU should only be involved in the organisation of sporting events and not concern itself with training and licencing. As a result there is apparently some political friction between the two organisations.

During the course of the current year there is to be a change by adaptation of national legislation; an upgraded licence requirement (which will include a radio licence and extended training) is to be introduced. This, together with the fitting of a radio to the aircraft, will permit flight in controlled airspace, flight above 1000ft and operation from licensed airfields. Also at the same time there will be a requirement for some form of mandatory licence revalidation and a mandatory maintenance requirement.

9.6 Economic and social aspects

Italy has a vibrant and expanding microlight aircraft and pilot population together with a successful and varied industry producing aircraft and engines for domestic and export markets. The largest manufacturer is Costruzoni Aeronautiche Tecnam who design and manufacture certified, US LSA and sub 450kg aircraft for international markets.

Microlight aviation is therefore of some importance to the economic and social framework of the country. The following statistics of industrial participation show the extent of the industry:

- 67 Companies in total involved in manufacturing aircraft, engines and accessories; amongst which are
- 32 Airframe design and manufacturers
- 5 Engine manufacturers

There are 239 published airfields or ULM airstrips in Italy, but there are also a number of private airstrips, which are not published, all of which create a local economic benefit.

Italy is a country of extreme topographical and climatic difference, from the Alpine north to the Adriatic coastal plains and mountainous Sicily in the far south. So the concept of controlling microlight activity across such vastly different environments has led to the low regulatory situation seen today.

Much of the related industry is in the north (Milan & Turin) but Tecnam is based in the south of the country, to the north of Naples, and is an important employer of skilled labour in a region noted for low employment levels.

Tecnam in particular produce aircraft to the LSA category which cannot be operated in the EU without EASA certification and therefore the benefits of introducing the ELA 1 aircraft category will be of significance to the whole Italian microlight manufacturing community.

9.7 Microlight Accidents and Accident Rates

9.7.1 Introduction

Italy is a country with a comparatively large number of microlight aircraft and participants in a European context. The sector operates under devolved regulatory authority from the Italian CAA with delegation of responsibilities to the Aero Club d' Italia (AeCi)

The data for microlight operating hours is not recorded by either the AeCI or FIVU and it is therefore an estimate from both sources. The accident data for all accidents (2001 to 2009) is considered by the AeCI to be unofficial but reasonably complete and accurate.

9.7.2 Population and Activity Data

The AeCI has produced the following data of current active pilots, total pilots and the number of published airstrips together with the total microlight registrations by year from 2000-2009.

Italy Microlights	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total number of microlights registered	6,241	6,554	6,889	7,203	7,694	8,180	8,638	9,137	9,660	10,126
Annual hours (000s)	437	459	482	504	539	573	605	640	676	709
Total licences issued										44,073
Estimated Active pilots										12,000

As there is no mandatory requirement for pilots or owners to maintain a pilot or aircraft logbook, there is no detailed record of activity data. Both the AeCI and the FIVU estimate that the average pilot flies between 50 to 70 hours per annum. This is reflected in the above estimated hours.

9.7.3 Accident rate and conclusions

The ten-year mean is approximately **1.43** fatal accidents per 1,000 registered microlight aeroplanes or **2.04** fatal accidents per 100,000 hours.

The reported total number of accidents is approximately 64% of the reported fatal accidents. This is much higher ratio that other countries and would suggest considerable under-reporting of non-fatal accidents.

The calculations of these rates may be found in **Appendix 4A**

9.8 Aeroplanes (> 450kg MTOM and < 1200 kg MTOM)

No population or accident data was obtainable for light aeroplanes in Italy.

9.9 Gliders

No population or accident data was obtainable for Italian gliding.

The Netherlands

10.0 Summary

The Dutch CAA strictly controls all aspects of microlight aircraft regulation in the Netherlands; only one small activity is devolved to the national Aero Club. A quarter of the total microlight population of 571 is located at one airfield at Statdskanaal in the North East of the country; the remainder are spread around the country at 5 other sites.

Operation is only permitted from approved sites and all aircraft are required to be equipped with a Mode S transponder if flight above 1200' amsl is required. Licensing and training in accordance with a national syllabus is carried out in accordance with JAR-FCL procedures with an ICAO Class 2 medical certificate also being required.

There are no procedures within the Dutch CAA for the certification of Microlights

10.1 Initial Airworthiness

The classification of what constitutes a microlight aircraft follows the Annex II definitions, except that there is no maximum stall speed regulation. As there is no national certification procedure, only the German, UK and Czech certification rules are acceptable; it follows that only aircraft certified in any of these three States can be registered in the Netherlands. In addition, there is a country-specific requirement that all microlight aircraft have to undergo a noise test and be certified that it does not exceed 60dba (using the German 'Chapter 10' regulation and methodology). This in itself rules-out the use of gyrocopters and microlight helicopters. The KNVVL (Royal Dutch Aero Club) have delegated authority to issue the noise certificate on behalf of the Dutch CAA.

The airworthiness permit is a non-ICAO 'Special C of A' issued on the basis of compliance of the aircraft with one of the three states listed above. There is no physical survey of the aircraft required when application is made for addition to the register, so it is a self-declarative system of conformity. A small charge is made for the registration process.

The system does not differentiate between homebuilt and manufactured microlights, so long as an airworthiness certificate has been issued by one of the approved States. In reality there is very little cost difference between GA and microlight aircraft purchasing and operating costs within this environment.

10.2 Continuing Airworthiness & Maintenance

Routine maintenance may be undertaken by the owner or pilot, in accordance with the engine & airframe manufacturer's maintenance manuals; however, an annual inspection is required to maintain an airworthiness permit. This has to be carried out by a licensed engineer. There is no published light aircraft maintenance schedule to follow; the manufacturer is responsible for setting the maintenance schedule for each aircraft/ engine.

The application for the renewal of the airworthiness permit requires the signature of both the pilot/owner and the supervising engineer.

10.3 Pilot Licensing & Training

The Dutch CAA controls all aspects of pilot licensing. The licence is a single NPL (A) based on the JAR-PPL, with no distinction between microlight classes (3-axis, weight-shift etc), so individual ratings are not required for each separate class of aircraft. A radio operator's licence is also required.

Licence privileges are National, day-VFR with no towing or banner work; no aerial work except training at commercial schools. To earn money as an instructor, a JAR CPL is required.

10.3.1Training

To obtain a licence, a pupil has to pursue course of theory study, which follows a national syllabus defined by the CAA. The course employs JAR-PPL theory content and test structure, followed by a flying skills test. A minimum of 45 flying hours is required for the grant of a licence, which is valid for 5 years and requires re-validation every 2 years in accordance with JAR procedures.

Training and testing must be carried out at a registered airfield; with instructor certification requirements being JAR compliant.

The keeping of both a personal logbook and an airframe/engine logbook are mandatory requirements.

10.3.2 Medical

Medical certification follows JAR Class 2 procedures and must be issued by an AME.

10.4 Operations

The NAA regulates all operational activities. Entry by microlights from other states is permitted with agreement from the NAA. Flight in Class A is not permitted, but VFR 'on top' is acceptable. VHF communications are mandatory, as is Mode S transponder for flights within the TMZs (which now cover more than 90% of Dutch airspace). Flight below 1200' QNH is permitted in the Open FIR without a transponder.

10.5 Microlight Accidents and Accident Rates

10.5.1 Introduction

The Netherlands is a country with a comparatively small number of microlight aircraft and participants in a European context. The sector operates under the Dutch CAA with no delegation of responsibilities to the Royal Dutch Aero Club (KNVvL)

The investigation of accidents is undertaken by the Dutch CAA , but unless there is a fatality or 'serious' accident with injuries to third-parties, the activity is simply a matter of recording brief details of the occurrence.

10.5.2 Population and Activity data

Data on microlight population and operating hours in the Netherlands has been obtained from KNVvL and the Dutch CAA but only data for 2009 was available on record. The years 2000 to 2008 have been estimated in order to arrive at a complete data set for accident rate calculations (see Appendix 5A)

Netherlands	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
No of Microlight aircraft	-	-	-	-	-	-	-	-	-	245
Microlight pilots	-	-	-	-	-	-	-	-	-	400
Microlight reported annual hours	-	-	-	-	-	-	-	-	-	9,000

10.5.3 Conclusion

During the 10-year period there were 3 fatalities and two serious injuries as a result of microlight activity. One of the fatalities was a crewmember in a Belgian Air force F16 that collided with a microlight flying in the circuit at its home airfield.

The small number of fatalities over the 10-year period, the comparatively small population of aircraft and pilots together with the lack of accurate records of annual flight hours makes it impossible to calculate a meaningful or statistically valid accident rate in terms of flying hours.

Nevertheless the data for the Netherlands is included in the aggregate European calculations of microlight accident rates.

Other GA Accidents and Accident Rates

10.6 Introduction

Aircraft groups and classes

The only category of aircraft with any reasonable numbers and adequate data availability is gliding. Statistics for powered aircraft under 1,200kgs were not available to the study team.

Gliding

10.6.1 Population and Activity data

Netherlands Gliders	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Gliders	709	715	725	740	732	739	738	718	715*	720*
Number of Pilots	4186	4175	3816	3844	3760	3509	3783	3523	N/A	N/A
Annual Flights ('000s)	140	150	135	140	127	125	115	126	N/A	N/A

* estimated

10.6.2 Accident rates

The fatal accident rate for the 8 years up to 2007 is calculated as **1.03** per 1,000 aircraft or **0.57** per 100,000 flights (launches), which are at the lower end of the range for European gliding countries

However, the numbers are small and event randomness can unduly influence the calculated rate. The total accident rate for 8 years to 2007 **30.0** per 1,000 aircraft or **16** per 100,000 flights,

If translated into an approximate flying hour rate, this is around **0.7** per 100,000 hours.

Calculation of this rate and further data on the data upon which it is based, may be found in **Appendix 5B**.

10.6.9 Conclusions

Given the small numbers involved it is unwise to draw any firm conclusions although the accident rate.

Norway

11.0 Summary

The Norwegian Civil Aviation Authority – (an independent administrative body under the Norwegian Ministry of Transport and Communications) has devolved the entire regulation of microlight aircraft to the Norwegian Air Sports Federation (NLF). The management of all aspects of regulation has been effectively distilled into a single 'Safety Manual', since being first promulgated in 1985. The NLF is divided into various interest sections (including Light Aircraft, parachuting, model flying etc) and the Microlights section has its own technical board and governing board; it is the recognised authority in Norway for every aspect of microlight airworthiness, licensing and operations.

There are approximately 450 microlight aircraft registered in Norway with about 200 of those aircraft actively flying. The NLF microlight section has 1,084 members (2009) of which there are 350 with active licences.

There is no microlight manufacturing industry in Norway.

11.1 Initial Airworthiness

A microlight is defined as an aircraft with a MTOM of 450kg for a 2-seater and 300kg for a single seat aircraft, with an increase of 5% (15kg and 22.5kg) each for the addition of a ballistic safety parachute and a minimum flying speed at Max. AUW. a (V_s) of 65kph (35 kts). An additional 50kgs is permissible for amphibians or seaplanes. All aircraft that exceed a total mass (without pilot) of 70kg are required to have Flight Manual that describes the aircraft operation and equipment.

There is no National Type Approval certificate issued; approval is via a permit on a case-by-case basis. The NLF system for approving original airworthiness is simple: if the aircraft already has an airworthiness type certificate from the UK, Germany, Sweden or Czech Republic, then it is automatically permitted to be flown in Norway. An aircraft originating from any country other than those listed above has to have a dossier submitted to the technical board of the NLF for review and approval. Any extreme cases requiring an over-burdensome amount of work to approve are simply refused and the applicant is advised to consider a more conventional aircraft.

11.2 Continuing Airworthiness & Maintenance

The keeping of an airframe/engine logbook is a mandatory requirement.

An annual inspection is required to maintain an airworthiness permit. This has to be carried out by a surveyor approved by the NLF at a cost of 600 Krone (c. €75) per aircraft. Maintenance may be performed by the owner or pilot in accordance with the engine & airframe maintenance manuals. Prior to the renewal of the annual permit, a set maintenance procedure (similar to a LAM schedule) must have been completed in accordance with a task schedule (specified by the NLF) and the manufacturer's recommendations or instructions.

There is no specified requirement for a secondary sign-off by an approved inspector, but the NLF encourages owners to take advice and have work either checked or undertaken by someone with proven competency in the particular area (e.g. welding repair).

The surveyor approves any modifications at the time of annual permit renewal.

11.3 Pilot Licensing & Training

All aspects of pilot licensing are devolved to the NLF. A rating is required for each separate class of aircraft, which is obtained by means of a training course (for which there are approved, individual syllabi) and a flight test.

For the basic licence, a course of theory study followed by a test in eight individual subject areas is required, with the addition of rotor theory for microlight helicopters and a radio theory test for the operator's licence.

There is a separate rating for each category of Aircraft (3-Axis, flex wing and gyroplane), although the training course is essentially the same for each category, a different syllabus exists for each. The cost of licence is 435 Nor Kr.

The minimum age foe the grant of a licence is 17 although training may start at 16 years old. There is a minimum flight training requirement of 25 hours although few pupils obtain a satisfactory standard within this time.

A microlight licence is normally valid for two years, but persons over the age of 50 have a limit of one year (due to medical certificate). The requirement for the renewal is that the holder must perform a "Periodical check ride" (PFT/M) with an instructor; this must be performed within the last 24 months before renewal of the licence.

To stay current at each renewal, the holder must have as a minimum 12 hours flight experience on microlights within the last 24 months; if not, then the applicant must have an PFT/M which is not older than 12 months.

Training does not have to be carried out at a licensed airfield, but in practice the training organisations are Clubs based at notified microlight airfields.

The keeping of a personal logbook is a mandatory requirement.

11.3.1 Instructors & Examiners

There is a formalised structure for instructors with three classes from Basic to Examiner status. With specified requirements for instructors to attain and also formal certification of examiners. The entry requirement for an instructor is a minimum flight experience of 75 hrs P1 and the candidate has to undertake a minimum of 10 hours 'Instructor; training. Re-validation of the rating is by either experience or test with a minimum of 15hrs instruction in the previous 24 months or a flight test with an examiner and in addition the mandatory attendance of a training seminar every 3rd year.

11.3.2 Medical

The medical certificate is based on the self-certification principle and must be signed by a doctor (but not necessarily an AME). There is a 3-part declaration certificate that has to be signed not only by the applicant's own medical practitioner, but also a person known to the pilot (not a family member). The declaration system is the same as used for glider pilots, balloons, hang gliders, cabin attendants of commercial aircraft and licensed aircraft mechanics.

The medical condition requirements and the examination structure is essentially JAR class 2, with the re-validation periods relating to age being identical to JAR requirements.

11.4 Operations

The NLF regulates all operational activities; however the Norwegian CAA has a right of audit to ensure that the agreement is being adhered to, however the audit period is infrequent. Entry by microlights from other states is permitted with agreement from the NLF (acting on behalf of the NAA).

True VFR 'On Top' is not allowed but there is a general relaxation of flying above cloud so long as remaining in sight of surface.

Takeoff and landing does not have to be performed at licensed airfields, although microlight flying fields have to have local planning permission to operate. Flights from private land is permitted

11.4.1 Required Equipment

Minimum instrumentation is an ASI, an altimeter and a compass; in addition a first aid kit is mandatory. If the aircraft design has an enclosed cockpit, then a safety helmet must also be worn. Flights taking place more than 10km from land must also carry maritime survival equipment.

11.5 Microlight Accidents and Accident Rates

Introduction

Data on microlight accidents and operating hours in Norway has been obtained from the Norwegian Airsports Federation (NLF) and is comprehensive.

Norway is a country with a relatively small number of microlight aircraft and participants in the European context. The sector operates under the NLF which has complete delegations from the Norwegian CAA.

11.5.1 Population & Activity data

Norway Microlights	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
Number of pilots	293	306	358	395	426	505	525	550	599	662	-
No of Microlights	159	170	159	156	161	180	199	212	257	275	-
Annual Hours	4,516	5,340	5,221	5,657	6,247	6,973	7,475	9,320	11,338	10,732	72,819

Source: Microlight Section of the Norwegian Air Sports Federation

11.5.9 Accident rates

No statistical significance can be placed on the 10-year fatal accident rate of **2.74** per 100,000 hours due to the small numbers of fatal accidents (2) and randomness of such accidents. This translates to a fatal accident rate of **1.04** per 1,000 aircraft**.**

The total accident rate is calculated at **207** per 100,000 hours, or **78** per 1,000 aircraft.

However, caution needs to be exercised in interpreting this rate, as it is believed to include some events that in other regimes would be classified as incidents under the ICAO classification protocols.

11.5.11 Causal Analyses

The NLF accident records revealed the following analysis for all accidents 2005 to 2009, by phase of flight or whether there was a technical cause:

3-axis & weight-shift	2005	2006	2007	2008	2009	5 years
Landing	4	6	6	4	10	30
Take off	1	0	0	3	1	5
Technical / engine	6	5	6	4	9	30
Other	2	9	4	5	3	23
Total Accidents	**13**	**20**	**16**	**16**	**23**	**88**

Source: Microlight Section of the Norwegian Air Sports Federation

The NLF has been asked to provide a more comprehensive causal analysis, as distinct from 'phase of flight', but this has not yet been received. If received, it will be included in the final version of this report.

11.5.12 Conclusions

Norwegian microlight activity is small-scale compared to most other countries surveyed in this study. It is a well-organised activity under the auspices of the NLF, which enjoys extensive devolution and freedom from the Norwegian state. With no indigenous microlight manufacturing the original airworthiness system managed by the NLF is pragmatic and effective, relying upon recognised designs and production from other EU countries applying accepted design codes. The NLF collects and maintains statistical records that have been useful and comprehensive for the purposes of this study report.

Although the fatal accident numbers are statistically insignificant, the rate calculates at 2.74 per 100,000 hours for the two fatal accidents in 10 years.

Other GA Accidents and Accident Rates

11.6 Introduction

11.6.1 <u>Aircraft groups and classes</u>

The only category of aircraft with any reasonable numbers and adequate data availability is gliding. Limited information on GA aeroplanes accident statistics was made available but has not yet been translated from Norwegian.

Gliding

11.6.1 <u>Population and Activity data</u>

Norway Gliders	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*
Number of Gliders	170	173	181	187	187	158	162	155	153*	150*
Number of Pilots	1523	1528	1608	1569	1513	1528	1435	1411	N/A	N/A
Annual Flights ('000s)	12.0	12.0	14.5	13.0	12.0	10.5	9.5	9.5	N/A	N/A

Source: EGU accident surveys
** estimated*

)

11.6.2 <u>Accident rates</u>

There were no fatal accidents in the 8 years to 2007. It is understood there was one fatal accident in either 2008 or 2009 but confirmation is awaited.

The total accident rate for 8 years to 2007 is calculated as **70** per 100,000 flights, which is high relative to other countries. However, the absolute numbers (65 over 8 years) are small and therefore statistically have a large impact in relation to a modest number of flights.

SWEDEN

12.0 Summary

The Swedish Civil Aviation Authority, an independent administrative body under the Swedish Board of Transport (SBT), has devolved a large amount of oversight of microlight aircraft to the Royal Swedish Aero Club (KSAK). The management of all aspects of regulation has been effectively distilled into a single 'Safety Manual', since being first promulgated in 1985. The KSAK is divided into various interest sections (including light aircraft, parachuting, model flying etc) and the microlight section has its own governance structure.

There are approximately 350 microlight aircraft currently based in Sweden (1994 – 90, 1999 – 175). The total microlight pilot population is approximately 1,000 members (2009) of which about 720 have microlight licences in their own right, and a further c. 300 are PPL (A) licence holders with microlight ratings.

The annual hours flown by microlights is recorded as 23,546 in 2009, having risen steadily from 8,466 in 1999 with a peak of 25,230 in 2008.

There is no significant microlight manufacturing industry in Sweden.

12.1 Initial Airworthiness

A microlight in Sweden is defined in line with Annex II of 216/2008, as an aircraft with a MTOM of 450kg for a 2-seater and 300kg for a single seat aircraft, with an increase of 5% (22.5kg and 15kg respectively) each for the addition of a ballistic safety parachute, and a minimum flying speed at Max. AUW (V_s) of 65KpH (35kts). An additional 50kgs is permissible for amphibians or seaplanes. However, in addition, there is a requirement in the Swedish regulations for a minimum payload of 175kgs (i.e. MTOM 450kgs for a two-seater therefore unwritten maximum empty mass 275kgs).

Microlights in Sweden are classified into:

Class A – weight shift ('trikes')

Class B - aerodynamically controlled – fixed wing (3-axis)

Class C – autogyros (currently in Group B)

Class D – microlight helicopters

Home-built microlights are treated the same as factory-built microlights.

There are no microlight gliders in Sweden.

(Paramotors and foot-launched aircraft are not classified as microlights, but come under the hang gliding framework of controls)

12.1.2 Sources of airworthiness material

KSAK has responsibility for microlights' original airworthiness following delegation by the SBT (Swedish Board of Transport), which 'owns' the airworthiness regulations and derives its authority from within the framework of overall state air law. The delegation to KSAK is renewable annually and is now formally in its 2nd year (although in practice KSAK had a less formal delegation for a long time prior to this).

The Swedish state airworthiness law ("LFS") is a high-level document. The practical airworthiness handbook, constituting the 2nd level, was written by KSAK and approved by the NAA. This handbook is derivative of the UK CAA's B section, and is currently being re-written to replace the 1990 version. The content is similar to the UK BCAR Section S. The Swedish NAA has approved this design standard for Class B. There is an addition for Class A. Nothing has yet been written for autogyros.

12.1.3 Acceptance of airworthiness

The NAA issues original airworthiness approvals as type acceptance certificates after KSAK has reviewed and investigated the manufacturer's design. The investigations include test flights and inspections, followed by a recommendation (or otherwise) from KSAK to the NAA to accept a new type. The NAA retains responsibility for consequential liability issues.

Microlights are classified as experimental aircraft. Airworthiness acceptance certificates take the form of a national Permit-to-Fly (PtF), valid only in Sweden but which can be accepted in some other EU countries. There are only two categories of airworthiness in Sweden, either a full Type Certificate or a PtF. Restrictions on the PtF include night and IFR but these restrictions are not unique to microlights.

Microlights must be registered on the Swedish state aircraft register (SE).

The NAA supervises or audits KSAK annually in respect of the processes to determine recommendations for grant of original airworthiness permits, in a similar form to that which the UK CAA exercises over the BMAA or LAA through a technical exposition.

12.1.4 Costs and Timescale of airworthiness acceptance

A charge of 3,000 SEK (c. €310) is made currently by the NAA to the applicant for type approval. The NAA pays an annual subvention to KSAK to manage all aspects of the delegated portfolio of work including delegated work for microlight approvals and associated continuing airworthiness. There is an annual budget process and negotiation for this subvention. KSAK is not allowed to make any charge direct to the designer / manufacturer for demonstration of airworthiness as Swedish law does not allow that route for cost recovery.

Overall KSAK considers the airworthiness approval system is thorough, proportionate, and cost effective (NAA SEK 3000 = c. €310 + Engineer evaluation / test flights etc c. SEK 2000 to 3000 = €206 to €310) in terms of the additional costs for a designer / manufacturer to import microlight aircraft to Sweden and does not constitute a high barrier to entry.

The normal timescale for the approval process, in the case of straightforward ones, is one month. However, if the paperwork is deficient, which is often the case, approval may take between two and four months. The delays are generally because applicants are not completing the paperwork requirements adequately. Established agents importing new aircraft know the system and it works quickly for them.

The requirements for achieving an approval include inspection and test flights, using accepted and approved airworthiness codes, such as German, Czech and British ones, which in the near future will be built into the Swedish regulations. Consensus codes such as those developed through ASTM are also acceptable.

The method by which compliance with acceptable and approved codes for airworthiness is demonstrated is self-declaration by KSAK. KSAK issues a letter stating the design code used; what KSAK has performed in terms of inspections and test flights etc., and a full compliance commentary and report. This system has operated since 1982 and is a well-established and trouble free process.

12.2 Continuing Airworthiness including maintenance

A PtF renewal is required annually by KSAK or at 100 hours' flying whichever comes first, plus an inspection. At renewal of the PtF there must always be a maintenance form that is less than one year old, which the Inspector checks.

The aircraft owner is permitted to carry out most of the maintenance. Certain actions cannot be done by the owner where special knowledge and skills are required. In these instances the actions can only be conducted by an accepted organisation or the manufacturer. Owners are free to contract all maintenance work to professionally qualified organisations if they wish.

Inspectors are approved by KSAK; they are not employed, but are independent and often volunteers or people working within an EASA Part M business involved with EASA-regulated GA aircraft. Currently there is a network of 26 KSAK-approved inspectors for microlights in Sweden.

Inspectors have to attend an annual two-day refresher meeting, organised by KSAK.

Maintenance must be conducted in accordance with the airframe manufacturer's maintenance handbook, the flight handbook and the engine manufacturer's maintenance handbook. These documents are part of the PtF type approval.

Inspectors check the annual owner-maintenance activity, both physical and paperwork. The owner has to record maintenance activities in the logbook and the technical journal, or if there has been intermediate activity, such as replacing tyres. The inspector checks the substance of the maintenance conducted and then checks the work has been done in accordance with the technical requirements.

Inspectors cannot do both the work and sign as an inspector; another inspector has to sign off the work of someone who is an inspector but who has carried out the maintenance.

12.2.1 Repairs

Owners can apply to the Experimental Aircraft Association (EAA) (Sweden - chapter 2.22) to do a modification or major repair. EAA Sweden is associated to USA EAA. Alternatively the owner can send the aircraft back to the factory, and many do this. The EAA manages the oversight system, mainly as the manufacturer's overseer, for the building of experimental aircraft including microlights.

12.2.2 Regulatory costs of continuing airworthiness

The cost to the owner / operator of a PtF renewal is currently SEK 3000 (c. €310) payable to the NAA, plus a payment to the inspector who determines what to charge the owner / operator – typically between SEK 500 and SEK 800 (c. €51 to €82). In addition the owner / operator pays an annual NAA register fee of, currently, SEK 510 (c. €53).

An individual owner does not have to be a member of KSAK to obtain the benefits of the airworthiness system.

12.3 Pilot Licensing and training

It is a Swedish state requirement to have a pilot's licence to fly a microlight aircraft (Regulation 'LFS 2008:7') just as it is for aeroplanes, gliders, helicopters and balloons.

For hang-gliders, para-motors, para-gliders, and motorised foot-launched aircraft an organisational licence / certificate is required.

The SBT requires a formal rating rather than just 'informal' differences training. Although there is just one licence for microlights the pilot's personal logbook records the different types of microlight that the licence holder can fly, based on differences training for changing the classes of microlight aircraft.

The SBT is responsible for the initial issue of a licence. It is also responsible for policing the pilot community for compliance with the requirement to hold a valid licence but has delegated this oversight function to KSAK. KSAK carries out random checks on pilots for compliance.

The licence is valid for Day, VFR. It is not valid for Night or VFR 'On Top'.
A licence holder has to have completed not less than 10 hours post-licence flying before being allowed to take a passenger in a microlight.

12.3.1 Licence validity and revalidation

A microlight licence is subject to maintaining currency and medical compliance conditions, similar to a PPL (A).

Pilots are required by law to revalidate their licences annually or for a period of up to five years, the decision remaining with the pilot as a function of the price of renewal for the relevant period. The SBT conducts this process.

The experience requirements for renewal of the licence are12 hours flying in the previous year including a minimum of 12 take-offs and landings. In the absence of this a proficiency check is carried out with an instructor. There are no theoretical knowledge requirements for renewal. If a pilot has breached operational regulations in the previous year the SBT may require some re-training before revalidation of licence.

A pilot needs to keep track of four separate dates in order to maintain a valid licence – medical, experience, language and the licence itself.

The initial licence currently costs SEK 710 (c. € 73).

The revalidation / renewal of the licence currently costs SEK 640 (c. € 66) for an annual renewal, or a higher sum calculated pro rata to the annual costs, for periods up to five years. The decision of the pilot as to what period to renew the licence for is therefore a hedging decision against future price changes.

12.3.2 Training

Responsibility for training microlight pilots is not part of the delegation from the Swedish Board of Transport to KSAK, which means that KSAK does not receive any funding for this responsibility. Instead KSAK has to pay the Swedish Board of Transport for this authority.

KSAK is only microlight pilot training organisation authorised by the Swedish Board of Transport; the individual pilot training centres operate under KSAK control. Other pilot training schools could apply for a separate authority from the Swedish Board of Transport but so far none have chosen to. Thus training is conducted within the KSAK club-based framework. The clubs are non profit-making bodies.

KSAK charges the clubs (‘detachments’ of KSAK) for being allowed to train pilots. The SBT is keen for training to be centralised so as to ensure uniform standards.

The State regulation for pilot training sets out the minimum requirements for training for a licence.

In addition the flight training schools with the clubs have a ‘schools handbook’ containing the syllabus for each class of microlight aircraft.

The ground based theoretical syllabus covers the normal subjects such as flight safety, navigation, meteorology, aerodynamics, basics of flight, flying materials, performance factors, mass and balance, human factors, use of radio, and language requirements.

The minimum training hours for a microlight pilot licence are 20 including a minimum 5 hours solo and 30 take-offs and landings.

The training minima can be reduced by the instructor for student pilots who have received training and gained experience on microlights abroad, or if they have held a licence for gliding, PPL (A), a permit for hang-gliders for ultra-light class A or with military flying experience. If a student microlight pilot has a PPL (A) he does not need a microlight licence. However, he will need to have a check on microlights to support an endorsement by the SBT.

There is no requirement for microlight training or any other microlight activity to be conducted only from licensed airfields.

12.3.3 Instructors

The minimum microlight hours to become an instructor are 50, or 200 hours on a combination of microlights and PPL (A).

The max weight of an instructor is 85kgs (KSAK regulation). This means that not more than 50% of the payload can be the instructor. This is a practical load factor not a medical issue. After someone becomes an instructor KSAK does not renew this requirement on people.

The practical test for an instructor is flown with a KSAK instructor. In addition there is an interview in the nature of a personal test of the applicant with KSAK. The methodology used is the same as part of the Swedish Air Force (SAF) test, which is a defence mechanism test (DMT) – to try to find where the candidate's threshold for stress lies. The SAF test started in 1955 in the SAF. Post implementation studies have shown a clear relationship between success and failure in terms of outcomes in instructing and suitability as a pilot. This SAF 'DMT' has been applied in KSAK microlight instructor screening since 1994. In terms of the safety outcome it has been successful in screening out applicants who would not make good instructors, so it results in instructors who are 'stable' and are able to cope with stressful situations. Swedish microlighting appears to be unique in using this form of screening test.

The theoretical knowledge requirements for instructing comprise those for the ordinary licence plus a course of theory for instructors covering the methodology of instructing, and the art of teaching.

12.3.4 Instructor remuneration & re-validation

An instructor is permitted to receive a small amount of remuneration as a microlight instructor, without having a commercial licence or rating. The SBT regulations provide guidance on the circumstances where an instructor cannot be paid. Essentially the remuneration can cover the marginal costs of being an instructor. The cost of becoming an instructor can be of the order of SEK 30,000 (c. € 3,100) and therefore the SBT accepts that some payback for instructors is necessary and acceptable.

To maintain an instructor's rating every two years the instructor has to attend an instructor seminar of two days duration.

In addition an instructor is required to undergo an instructor proficiency check every two years. If the instructor fails to do meet this requirement, and still wants to instruct, he can complete a renewal course. In practice this situation has not yet arisen, so the course content has not been specified.

SKAK currently has 85 instructors.

12.3.5 Examiners

KSAK has an instructor system on two levels - instructors and teachers (the intermediate level) and check pilots (or Examiners).

An Instructor may not send a student solo. The teacher must check out the student. Once the instructor has had three of his student pilots sent solo under a teacher then he can apply to be a teacher.

Check pilots are equivalent to examiners, but they are used for checking marginal student cases, and are instructors (or 'controllers' in Swedish) on the instructor courses.

12.3.6 Medical

The medical requirements for a pilot are determined by the Swedish Board of Transport regulations, which favour AMEs.

The medical standard required to be a microlight pilot is JAR Class 2. This has to be certified by an AME for the first test (entrance); after that the pilot can go to a GP but the GP has to use the JAR Class 2 standards.

The pilot's medical certificate has to be revalidated every five years up to age 40, every two years up to age 50 and annually over age 50.

The availability of GPs is better than that of AMEs in several parts of Sweden, so the use of GPs is a practical geographic issue.

12.4 Operations

The source of operational regulations is the SBT, who police implementation of the regulations with KSAK.

There are only two classes of airspace in Sweden – classes C and G. Class C has flexibility in all areas other than Stockholm for where microlight aircraft – and other air-sports aircraft - can operate within certain parameters and restrictions. All airspace is available if on-board equipment complies with access needs.

Previously there were some restrictions for flights over water. These have now been modified to be more practical in terms of requiring a glide performance to reach the coast or ice cover, or having a life-raft on board. Paragraph 31 of the relevant regulations refers to 'having an engine that is sufficiently reliable…' which is somewhat subjective.

Flight above cloud is permitted providing within sight of the ground or surface water.

Microlights are permitted to land at licensed aerodromes

Microlights may be used for hire but only within the club environment and not commercially. A pilot from another country, for example, can hire a microlight but would have to join a club temporarily to do so.

Foreign microlights are allowed to visit Sweden and Swedish registered microlights are allowed to visit other countries where mutual recognition arrangements are in force.

12.4 Economic, Social and Environmental Issues

Microlighting has grown from only 90 aircraft in 1994 through 175 in 1999 to about 350 currently. There are now some 720 qualified microlight pilots plus a further c. 300 who have microlight ratings on their PPL (A) licences.

The annual hours flown by microlights is recorded as 23,546 in 2009, having risen steadily from 8,466 in 1999 with a peak of 25,230 in 2008.

By comparison with all other countries in this study, (with the exception of the Netherlands), Sweden has a small population of microlight aircraft, pilots, instructors and clubs.

12.4.1 Economic value

No centrally organised data was available for the national annual economic value of microlighting in Sweden. Only the most crude and broadest estimate can be extrapolated from the activity and population data using an estimated €70 per hour flying cost. This aggregates to a total annual hours' value of approximately €1.75 million.

The regulatory framework is regarded by KSAK as 'supportive' of microlighting. It is relatively easy to fly microlights in Sweden. But there are also some unreasonable barriers as well, such as access to certain aerodromes, whether in terms of access cost or denial of access altogether. But these apply equally to the lighter end of general aviation.

KSAK commented that the regulatory costs from the SBT, such as the Permit-to-Fly and its annual renewal, and the annual registration cost, are becoming somewhat prohibitive for owners.

12.4.2 Manufacturing

There are currently no Swedish microlight manufacturers. If there were, the NAA would be responsible for approval of a manufacturer, in close co-operation with KSAK. The NAA would exercise quality control over the manufacturer but is reported as keen to be proportionate and to not create an over-burdensome system. In effect the NAA would ask KSAK 'how do you want this done'.

12.4.3 Clubs

The non profit-making clubs are not marked out as providers of widespread employment opportunities, as some of the key drivers in the club environment are voluntary self-help combined with a desire to minimise the costs of flying.

12.4.4 Social factors

Most 3-axis microlighting is based around clubs. Flex-wing pilots are more likely to operate independently of clubs. There is, as with other air sports, a strong social value, cohesion and mutual support ethos in the non-profit making club environment, with little of no negative social aspects.

12.4.5 Environmental aspects

There are no specific environmental aspects that are peculiar to Sweden

12.5 Microlight Accidents and Accident Rates

Introduction

Data on microlight accidents and operating hours in Sweden has been obtained from the KSAK and is comprehensive. Sweden is a country with a relatively small number of microlight aircraft and participants in the European context

12.5.1 Population data

The study team was provided with current microlight aircraft population (387) and pilot numbers (957) and not a full ten-year history. Estimates of aircraft population for other years (see Appendix 12A) have been used in order to compile aggregate statistics for the 8 countries.

12.5.2 Activity data

Annual operating hours are recorded and aggregated from the each aircraft owner's report when renewing the Permit-to-Fly. Inspectors also report the hours since the previous inspection. The annual aggregation of the information is prepared from the annual hours' data from every aircraft record from 1 January to mid December each year. Sweden is one of only two countries to collect this data comprehensively; the other is Norway.

12.5.3 Accident rates

Sweden Microlights	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*Total*
Number of pilots										957	-
No of Microlights										387	-
Annual Hours	7,820	9,023	10,101	13,076	15,987	15,068	20,200	18,789	25,230	23,546	158,840

Source: Microlight Section of the Swedish Aero Club (KSAK)

In Sweden over the ten-year period 2000 to 2009 there were five fatal accidents involving either trike or 3-axis microlights. With a 10-year activity exposure of approximately 159,000 hours, this translates into an average ten-year rate of **3.14 fatal accidents per 100,000 hours**. Expressed in relation to microlight estimated aeroplane population the fatal accident rate is 1.4

The ten-year **total accident rate is 65 per 100,000 hours** or **30 per 1,000 aeroplanes.**

The calculations of these rates may be found in **Appendix 7A**

12.5.4 Conclusions

Sweden is one of the few countries with comprehensive and accurate microlight accident and exposure data for a recent ten-year period. However, the drawback in terms of reaching any firm and statistically significant conclusions is the small numbers involved for both fatal accidents (which are random) and activity (exposure).

Nevertheless the fact that there is complete data means that the results should not be ignored. The data bears out the general conclusion that airworthiness failure (certainly airframe) is not a major cause of fatal and serious injury accidents, unless of course the pilot is operating outside the flight envelope.

Pilot error, expressed in a variety of forms such as mishandling, poor decision making, or pushing beyond the limits of competence, training, or experience appears as the major cause of fatal and serious injury accidents in Sweden.

12.6 Other Light GA Accidents and Accident Rates

Introduction

Data available in respect of aeroplanes is limited to accident numbers including fatal accidents.

12.6.1 Aircraft groups and classes

The aircraft groups and classes which have been investigated are aeroplanes > 450kg MTOM (microlights) and < 1200 kg MTOM, gliders, and balloons.

Power flying: Aeroplanes > 450kg MTOM and < 1200 kg MTOM

12.6.2 Population and Activity data

No aircraft or pilot population data was available for light aeroplane activity. If any information if eventually located it will be included in the final report.

12.6.3 Accident data

Number of accidents	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Fatal accidents	1	1	1	0	1	1	3	0	1	O/S
Serious injury	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total accidents	25	22	24	17	19	12	10	13	17	O/S

Source: SDT report June 2009

12.6.4 Accident rates

As activity data has not yet been identified, an accident rate accident rates cannot be calculated with regard to exposure. It is noted there was one average one fatal accident per annum.

Attempts will be made to complete the data after the interim report is submitted.

Gliding

12.6. 17 Population and Activity data

Gliding	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of gliders	490	485	490	485	448	451	422	420	425e	425e
Number of pilots	2,590	2,681	2,482	2,466	2,449	2,133	2,105	2,100	O/S	O/S
Number of hours	31,400	35,500	38,100	36,300	33,000	32,700	31,600	26,400	28,500	27,500
Number of flights	56,400	58,900	60,400	55,800	52,165	51,800	46,400	41,400	40,400	40,700

Source: EGU database (gliders and pilots) and Swedish Soaring Federation (flights and hours)
e = Estimated

12.6.19 Accident rates

The fatal accident rate 2000 to 2009 is **1.66** per 100,000 launches (flights) and **2.18** per 100,000 hours.

The fatal accident rate 2000 to 2009 is an annual average of **1.54** per 1,000 aircraft.

As Sweden was only one of two countries that provided data for 2008 and 2009, the last tow years' data is excluded from the pan-country aggregation for 8 years.

The total accident rate is **30.2** per 100,000 launches (flights), **39.6** per 100,000 hours and **2.8** per 1,000 aircraft.

The calculation and any caveats relating to this accident rate may be found in **Appendix 7C**

12.6.23 Conclusions

Swedish gliding does not represent a statistically significant population relative to some other EU countries. Nevertheless the population and activity is not small either. The fatal accident rate and the total accident rate are in the same 'band width' as most other EU gliding nations.

United Kingdom

13.0 Summary

In the United Kingdom, the regulation of microlights is controlled by the UK Civil Aviation Authority (UK CAA). The British Microlight Aircraft Association (BMAA) and the Light Aircraft Association (LAA) are authorised, in the manner of approved companies, to oversee certain aspects of design approval and continued airworthiness. The CAA oversees manufacturer approval directly.

13.1 Initial Airworthiness

The definition of a microlight follows Annex II, plus a requirement to be able to carry 2x86kg passengers and fuel for 1hr flight at maximum continuous rpm (for 2-seaters). This typically amounts to a weight reduction of 182kg (for a Rotax 912 powered aircraft), giving a maximum empty weight of around 268kg. The weight allowance for the carriage of a ballistic recovery parachute has only recently been allowed and previously aircraft typically did not carry such devices.

BCAR Section S is used for approval of all types, with specific reference within the text to aerodynamic control, weight shift control, and powered parachute types.

Approval is subject to detailed examination by competent engineers within the LAA, BMAA or the CAA. Fees can amount to a few thousand pounds and turnaround time can range from days to months.

Flight test is restricted to approved manufacturers or by approval of associations' technical offices.

All foreign aircraft wishing to gain a UK certification must be shown to meet BCAR Section S.

A class exists for lightweight, single seat aircraft with an empty weight less than 115kg and an empty wing loading less than 10kg/m^2. They are exempt from the requirements for airworthiness approval and a permit to fly, but all other requirements (insurance, registration & training) remain in place.

Microlights are issued with a UK CAA Permit-to-Fly.

13.2 Approval of Manufacturers

Company approval (DOA and POA) is controlled by the CAA to a somewhat ill-defined subset of aviation standards. The cost of maintaining approvals is relatively high and unpredictable (~£10k p.a. fees – c. €12k). This is widely viewed as a significant barrier to entry and innovation in the industry.

Other national approvals are accepted, in effect those of similar organisations in Australia and New Zealand. Practically this does not occur within Europe as the manufacturers do not require, and NAAs may not provide, such design or manufacturing approvals for indigenous sales.

13.3 Continuing airworthiness & maintenance

An annual revalidation of the permit-to-fly is required. This is based on inspection by a BMAA or LAA approved inspector, and a check flight by a designated check pilot. There is good availability of inspectors in populated areas, but it is more difficult in remote areas. The permit renewal fee is £140 (c. €170) charged by the BMAA. The inspector's fee is determined individually, but is typically £100-150 (c. €120 – 180).

The owner is responsible for maintenance, which he can perform himself or use anyone else as judged by him to be qualified. Maintenance is according to the aircraft manual, which can specify required or discretionary maintenance. Second inspections are required for some maintenance or repair actions.

Commercial maintenance organisations exist if the owner wants someone else to perform this activity. However commercial competition is the only assurance of competency.

The BMAA and LAA function as 'approved companies' to oversee the activities of homebuilders in relation to amateur-built aircraft. Modifications are handled in a similar manner to original airworthiness, by the approved manufacturers or by the BMAA and LAA on behalf of homebuilders.

13.4 Pilot Training and Licensing

A CAA microlight pilot licence is required to fly any microlight (but doesn't include those meeting the definition of being 'foot-launched'). The licence is valid for life, subject to revalidation by experience or test. The CAA sets the licence requirements, and undertakes the issue and control of the whole licensing procedure.

The keeping of a pilot's Log Book is mandatory

The UK microlight pilot licence is a private pilot's licence; no instructor remuneration is allowed with the exception of appropriately qualified instructors. Flights with passengers, banner towing and hang-glider towing are all permitted, subject to there being no remuneration for the pilot. The licence incorporates many different ratings and the cross-crediting system between microlights and other aircraft is quite comprehensive. Microlights can be flown on some other pilot licences, and can be flown abroad subject to a bi-lateral agreement with the other country.

Training is essentially the same for aerodynamic and weight shift controlled aircraft, but is quite different for powered parachute types. Training is to a specified syllabus, with 25 minimum flying hours and a flight test. In addition a study course on six theoretical subjects is also undertaken and knowledge is assessed by a series of examinations.

A microlight “flight examiner” is responsible for the initial flight test and licence validation by test, if required. Other categories of examiner may also be responsible for licence validation by certifying experience based on pilot logbook records. Revalidation is by experience and one-hour flight with instructor every 2 years is also mandatory.

Flight training may be conducted wherever the instructor considers that to be appropriate.

13.4.1 Instructor Training

This requires 15hrs practical, 14hrs theory, 100hrs P1 entry requirement, and flight and theory tests. Instructors can be remunerated on a commercial basis, without the need for a ‘commercial ‘ licence (JAR CPL). There is a bi-annual instructor renewal requirement by practical and theory test. Examiners for this are selected by experience and recommendation. The instructor system is controlled by the UK CAA, but interacts with the BMAA.

13.5 Medical Requirements

The medical requirements are met by self-declaration of fitness to fly by the pilot to a standard equivalent to a heavy goods vehicle (HGV) professional driving licence (known as DVLA group 2 standards). The pilot’s personal doctor, a General Practitioner, must counter-sign the declaration that nothing in the pilot’s medical records indicates unsuitability for meeting this medical standard. Two levels of standard exist, the lower of which is the DVLA group 1 standard which does not permit the carriage of passengers.

The medical revalidation period reduces with age.

13.6 Operations

All microlights flying in the UK are bound by the rules governing day / VFR flight, with no instrument or night flying permitted. Flying in controlled airspace is exactly the same as for other light aircraft and subject to the same restrictions and freedoms.

Visiting pilots from other EU Member States can fly their aircraft in the UK subject to individual CAA approval and charges; there are however further complexities if they want to fly a UK-registered aircraft in the UK on a non-UK pilot licence.

13.7 Economic and Social Aspects

The UK microlight sector is quite large and active. Around 2500 microlight aircraft are in an operational state, with some of those shared between a number of pilots. The UK market for new microlights is around 200 aircraft per year, although the worldwide economic slow-down has affected this adversely.

Whilst not being able to ascertain accurately a financial or employment value to the UK economy, the following statistics in terms of numbers of organisations involved serve to illustrate the size of the industry:

6 Aircraft manufacturers, of which two produce only kits and one produces in the deregulated category. One manufacturer, P&M, is a quite large (in UK microlight terms c£2.5M annual turnover) and successful trike manufacturer and importer of fixed wing aircraft.

6 Aircraft importers that have obtained CAA manufacturing approval to permit them to sell finished aircraft.

11 Aircraft importers of kit aircraft.

179 Microlight flying instructors

500 Airfields listed in a UK flight guide (approximately).

In addition there are a number of small companies offering maintenance and repair, a number of companies manufacturing accessories such as intercom and helmet systems, and a number of importers of such accessories as well as engines, propellers etc.

The small number of domestic manufacturers reflects the added costs and difficulties of achieving CAA manufacturing approvals, which are not applied in many other countries. This has restricted the development of this sector of the aircraft industry in the UK since this requirement was imposed; all three of the approved companies were pre-existing. No new manufacturing companies have been established for the past 20 years.

The positive side of the highly regulated system is that the market is effectively sheltered from imports (as importers must effectively also become CAA approved manufacturers) retaining a substantial share of the domestic market, and likewise the approvals are useful for access to export markets where UK certification is recognized as an acceptable standard (e.g. Sweden, Norway and the Netherlands).

To meet market demand, a number of importers have become CAA approved manufacturers. The decreased risk of approval only, versus aircraft development and approval, has encouraged this approach, although a number of companies have failed, and a number have not used this approach, preferring instead to sell aircraft only in kit form.

The pilot training 'industry' is well developed and controlled in the UK, which has led to the establishment of a reasonably large number of flight schools offering high-quality instruction. The schools are well distributed across the country, operating from any suitable field.

13.7.1 Value of Economic Contribution

The economic contribution to the UK economy is not significant in national macro-economic terms and difficult to assess accurately. However, as a very basic approximation of the size of the UK microlight sector the following is suggested:

Annual Value of Item	Number	Cost	Total cost
Aircraft sales	200	£30,000	£6,000,000
Hangarage	2,000	£1,000	£2,000,000
Annual inspection	2,000	£250	£500,000
BMAA membership fees	4,000	£63	£252,000
Fuel	2,000	£900	£1,800,000
Maintenance	2,000	£500	£1,000,000
Training	179x400hr	£100	£7,160,000
Total Value			£18.7M p.a.

The operation of microlight aircraft takes place at airfields ranging from farmers' fields, dedicated microlight airfields, through to large well-established aerodromes.

Many airfields are operated by a club, or have a club established alongside the airfield operation. A large number of social fly-ins occurs during the year, mainly concentrated in the summer months due to the nature of UK weather. The clubs form a focal point for microlighting to become a social activity as well as providing advice and support, which contrasts favourably with much of the powered and certified light aircraft sector.

Microlight Accidents and Accident Rates

13.8 Introduction

Accidents are monitored by the UK Air Accidents Investigation Branch (AAIB) of the Department for Transport (DfT) in cases of fatal or serious injury, reporting of which is a legal requirement. For these and other lesser accidents or incidents the British Microlight Aircraft Association (BMAA) maintains a record of those reported. A copy of this record covering the period 1st January 2006 to end of May 2010 was supplied by the BMAA. For analysis purpose only the complete years 2006 to 2009 have been used in this study.

13.8.1 Population and Activity data

The following table represents (a) the reported numbers of microlight aircraft with valid permits-to-fly issued during each year, compared with (b) the UK CAA aircraft register statistics at the end of each year

Aircraft

Source	Permit to Fly	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
BMAA	New issues	96	125	121	160	196	156	163	157	118	88
	Revalidations	1,656	1,711	1,739	1,852	1,861	1,873	1,808	1,890	1,938	1,948
	Total	1,752	1,837	1,860	2,012	2,057	2,029	1,971	2,047	2,056	2,036
CAA	Aircraft register	3,478	3,531	3,618	3,828	4,070	4,118	4,254	4,392	4,447	4,375

Pilots

NPPL (M)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
New issues	N/A	N/A	187	496	420	395	354	377	388	393
Cumulative NPPL (M) licences issued			207	704	1138	1537	1898	2284	2687	3106

The BMAA has a membership of about 4,000 persons, most of who are likely to be active pilots.

13.8.2 Accident rates

The overall 10 year fatal accident rate is calculated at **1.61** per 100,000 hours. Whilst the total number of fatal accidents is regarded as accurate, the annual flight hours of the UK microlight fleet is a calculated number based on a sample in 2009. A variance of, say, +/- 15% in the annual flight hours statistics would make the fatal accident rate between 1.37 and 1.85 per 100,000 hours.

Translated to rates per population of microlight aeroplanes, the fatal accident rate is around **0.50** per 1000 aircraft; the lowest of all the countries studied.

Total accidents rates are **11.4** per 1,000 microlight aeroplanes, and approximately 37.0 per 100,000 hours.

The calculation of this rate together with caveats as to its validity, may be found in **Appendix 8A**

13.8.3 Conclusions

Within the limitations of available data the fatal accident rate for UK microlighting is calculated as 1.61 per 100,000 hours, depending upon the accuracy of activity data. A +/- 15% variation on the activity data for each of the ten years under review would result in fatal accident rates between 1.37 and 1.85 per 100,000 hours.

Other GA Accidents and Accident Rates

13.9 Introduction

Comprehensive data was available for UK gliding accidents, including causal analysis and activity / exposure data.

Aeroplane accident data was also comprehensive but required detailed analysis to separate aeroplanes < 1,200 kgs MTOM from within the < 5,700kgs MTOM CAA database. Activity data for aeroplanes < 1,200kgs was not available and has had to be estimated. Causal analysis was not codified in a way that could provide summarised conclusions.

13.9.1 Aircraft groups and classes

The aircraft groups and classes for which accident data has been investigated are:

V. Aeroplanes > 450kg MTOM (microlights) and < 1200 kg MTOM

VI. Gliders

Light Aeroplanes > 450kg MTOM and < 1200 kg MTOM

13.9.2 Population & Activity levels

No comprehensive and reliable source of activity (hours) data is available. The UK CAA provided total activity hours for aeroplanes up to 5,700kgs (including aeroplanes with public transport Cs of A), based on C of A renewal data from the national aircraft register. However, it was not possible to split this data in non-public transport C of A aeroplanes < 1,200kgs MTOM without further work including extensive participation of the CAA.

UK Powered Aircraft	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Fixed wing > 450kgs < 750kgs	2,824	2,832	2,859	2,914	2,994	3,022	3,077	3,153	3,186	3,235
Fixed wing > 750kgs < 5700kgs	5,429	5,442	5,461	5,556	5,647	5,711	5,822	5,887	6,000	5,907
SLMGs	273	273	270	274	276	280	280	286	295	292
Annual Totals	8,526	8,544	8,590	8,744	8,917	9,013	9,179	9,326	9,481	9,434

Source: UK CAA aircraft register

CAA valid licences	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
PPL (A)	27,661				22,955				20,146	
NPPL (A) – ***estimated based on licences issued***				504	1,165	1,677	2,199	2,655	3,123	3,693

Source: UK CAA (PPL-A) and NPPL licences issued

13.9.3 Activity data

The CAA registration and other databases for the 10 year period provide operating hours for aeroplanes up to 5,700kgs, based on the airworthiness returns for renewals of the C of A. There are two problems with this. Firstly, there is a data lag due to C of A renewal (prior to Part M rules) being every three years. Secondly, it is not possible to obtain from within this data, without considerable manual effort, the activity data (hours) for aeroplanes < 1200kgs MTOM. There is no other comprehensive source of such data.

A further complication is that a significant number of light aeroplanes operating in the UK are 'N' registered (USA) with the result that comprehensive operating data is not available in the UK authorities' database.

13.9.4 Accident Rates

Although the UK CAA has provided statistics on the number of fatal, serious injury and other accidents, together with fatalities and serious injuries it has not been possible to measure fatal or serious accident rates as a measure of flying hours (exposure). This is due to the activity (hours) data for aeroplanes between 450kgs and 1,200kgs MTOM being included in a single category of up to 5,700 kgs MTOM, and being a mixture of public transport and non-public transport C of A aeroplanes.

Nevertheless a general observation can be made, based on *very rough estimates* of annual activity levels for this group of aeroplanes, for fatal accidents. In the 10-year period the total number of fatal accidents was 55 in relation to a total activity in that period of perhaps around 5 million hours (out of nearly 8 million hours on the CAA database for all aeroplanes < 5,700 kgs MTOM). This would give a fatal accident rate of 1.1 per 100,000 hours

Further information may be found in **Appendix 8B**

13.9.5 Conclusions

The best guess that can be made as to the fatal accident rate for light aircraft in the range up to 2000kg MTOM is of the order of 1.0 to 1.5 per 100,000 hours.

Gliding

13.11.3 Population and Activity data

UK Gliding	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
No. of Gliders	2,578	2,519	2,572	2,594	2,641	2,651	2,650	2,670	2,406	2,481	
Pilots (members of UK Gliding Clubs)											
Full flying	8,975	8,848	9,166	8,341	8,242	8,105	8,153	7,950	7,638	7,487	
Temporary	32,495	29,343	31,407	31,558	25,966	25,702	23,982	21,527	20,383	22,092	
Activity											
Launches (000s)	364.2	325.7	353.4	343.8	315.6	314.2	295.3	288.6	269.4	268.3	3,138.5
Hours (000s)	144.3	129.2	144.8	136.6	149.0	138.6	137.7	134.3	124.1	137.3	1,376.1

Source: BGA Gliding statistics

13.11.4 Fatal Accident Rate

The calculation of fatal accident rates for UK gliding may be found in **Appendix 8C.**

This demonstrates a 10-year fatal accident rate in UK operations of **1.96** per 100,000 hours with a rolling 5-year average of **1.49** per 100,000 hrs.

Including fatal accidents to UK registered gliders occurring outside the UK the rate increases to **2.4** per 100,000 for the 10-year average (and a rolling average over the past 5-years of **1.79** fatal accidents per 100,000 hours).

The above fatal accident rates translate to **0.13** per 1,000 aircraft**.**

The total accident rates are:

14.8 per 100,000 launches, **33.8** per 100,000 hours and **1.8** per 1,000 aircraft.

13.11.5 Conclusions

The BGA's accidents records provide a comprehensive overview of gliding accidents in the UK (and abroad with UK gliders / pilots). The accident rates can be regarded as very reliable statistically for the purposes of this report.

Section C

USA - the Light Sport Aircraft

14.0 Summary

Prior to 2004 an ultralight in the USA was defined under Part 103 as an ultralight vehicle. This allowed individuals to operate these vehicles without requiring pilot or vehicle certification. The rule stated that pilots should participate in industry-established training programmes and since 1993 the Experimental Aircraft Association (EAA) has maintained and developed programmes for training. It has also held an exemption that allowed 2 place ultralight training vehicles to be used by authorised ultralight flight instructors. With the advent of the LSA programme this exemption was rescinded and ultralight training must now take place in suitable Light Sport Aircraft (LSA) aircraft.

The definition of a Part 103 vehicle is:

- It is intended for only single occupancy
- It is for recreation or sport purposes only
- It does not have an airworthiness certificate
- If un-powered it weighs < 155 pounds
- If powered it weighs < 254 pounds empty
- It has a fuel capacity < 5 US gallons
- It is not capable of flying at > 55 knots full power in level flight
- It has a power off stall which does not exceed 24 knots

In 2004, following 10 years of discussion between the interested parties, the LSA programme came into force. This was intended to bridge the gap between the ultralight vehicle and Part 23 aircraft and uses industry standards to regulate the process. These standards are facilitated by ASTM International. The enabling legislation that allowed this method of regulation was the “National Technology Transfer & Advancement Act of 1995 “. This law established policies on Federal use and development of voluntary consensus standards and directs agencies to use these in lieu of government unique standards. This is intended to reduce to a minimum the reliance by agencies on these government unique standards.

The definition of a LSA is:

1. An aeroplane with conventional 3-axis control, a glider, a lighter than air craft, an aeroplane with weight-shift control, a powered parachute or a gyroplane
2. It has a MTOM of 1320lbs (600kgs) for a land aircraft or 1430lbs (650kgs) for operation on water
3. It has a maximum level flight airspeed at continuous power of 120knots (138mph)
4. It has a maximum stall speed of 45knots (52mph) at maximum take- off weight and the most critical centre of gravity (CG)
5. It has a maximum of 2 seats
6. It has a single reciprocating engine if powered
7. It has a fixed or ground-adjustable propeller if an aeroplane or a fixed or auto-feathering propeller if a powered glider

8. It has a fixed pitch, 2 blade rotor if a gyroplane
9. It is non-pressurized if equipped with a cabin
10. It has fixed landing gear except for aeroplanes intended for water operation

It should be noted here that the above definition is defined by the FAA rule and not by the ASTM standards. Other countries adopting the same ASTM standards may choose to apply different definitions.

There are currently 1671 SLSA comprising 1,486 'airplanes', 66 powered parachutes, 100 weight-shift, 17 gliders, 2 balloons and 6,862 ELSA aircraft certificates issued to date (May 2010).

There are currently 74 manufacturers and 105 models of SLSA.

14.1 Initial Airworthiness and Manufacture

The FAA accepted consensus standards apply to aircraft design, production and airworthiness. They include design and performance, required equipment, quality assurance, production acceptance tests, aircraft operating instructions, maintenance and inspection procedures, identification and recording of major repairs and alterations, continued airworthiness, assembly instructions for kit built aircraft and wing interface documentation for powered parachutes.

The FAA does NOT issue type certificates or production certificates for LSA. Each aircraft is certified individually and receives an airworthiness certificate based on the manufacturer's statement of compliance.

There are two forms of certification.

SLSA: aircraft manufactured to consensus standards and delivered ready to fly. These can be used for hire and reward.

ELSA: categorised as 'experimental', these aircraft are assembled from a manufacturer's kit that meets the standard. These aircraft cannot be used for hire or reward and following first flight do not need to meet the manufacturer's or the standards' requirements.

Control of this consensus process by the FAA is by a "Notice of Availability ". This allows the FAA to accept a revision to a standard. ASTM provides the FAA with any new or revised standards. The FAA then coordinates with all divisions relevant to the subject matter. The proposed changes are then made public in the Federal register and only after this, and assuming no opposition to the changes, are the standards matrices updated.

Standards have to be revisited every two years and either agreed as still acceptable or modified.

When agreeing to the LSA process and using consensus standards the FAA accepted that whilst the level of safety was higher than the ultralight class it was not the same as Part 23 certified products and neither is the level of FAA oversight.
A joint Government / Industry body (GA-JSC) has been formed to increase the safety of Light Sport aviation. This body regularly reviews and develops proposed actions to address any concerns.

14.2 Continuing Airworthiness and Maintenance

The airworthiness certificate is renewed annually by inspection.

Two ratings can be obtained by a light sport pilot:-

(1) An inspection rating. This entails a 16-hour course on the inspection requirements of a particular class of LSA. This allows the owner to carry out the annual inspection and maintenance on his own aircraft.

(2) A Maintenance rating, which entails 120 hours training (aeroplane), 104 hours training (weight-shift or powered parachute), 80 hours training (glider or lighter than air) allows the pilot to carry out maintenance and inspection on all LSA of that type for remuneration.

Manufacturers must maintain a register of all aircraft sold, the owners and the revision of the standard in place at the date of sale.

here is a formal FAA process whereby inspectors, when carrying out ramp checks, must report back their findings and these findings are reported back to the F37 ASTM LSA Committee as well as to the manufacturers. The committee and manufacturers must then report back to the FAA on how the findings have been dealt with.

14.3 Pilot Licensing

In order to obtain a sport pilot licence the applicant needs to pass an FAA knowledge test and an FAA practical flight test. The minimum required flight training time is:

20 hours for aeroplane 3 axis, weight-shift and gyroplanes

12 hours for powered parachutes

10 hours for gliders

7 hours for balloons

In order to add an additional class of aircraft to the licence the pilot must receive training from an instructor in that different class and then complete satisfactorily a proficiency check with another instructor.

Any pilot with a higher grade of pilot's licence may automatically fly an LSA with no further training or endorsement. This aspect is undergoing review in the light of accident experience – see below under 'accidents – LSA'.

A sport pilot may fly any aircraft that meets the LSA performance definition regardless of the aircraft certification. Aircraft with a TC cannot however be modified to meet the LSA definition.

A sport pilot may also become a sport pilot flying instructor. In order to do this he must have flown a certain number of hours as P1, in the case of fixed wing and weight-shift aircraft this is 150hours, and pass a knowledge, fundamentals of teaching and practical test.

Any current CFI may also train pilots for the Sport Pilot licence.

14.3.1 Medical

A sport pilot does not generally need a medical. They establish their fitness using a driver's licence. Of course every pilot must self-assess their fitness before every flight.

14.4 Operations

The Sport Pilot Licence privileges are:-

VII. Fly day / VFR
VIII. Share operating expenses with another person
IX. Fly up to 10,000ft above sea level
X. Fly in Class E and G airspace (and in B, C and D with further training and logbook endorsement)
XI. Hire SLSA aircraft

A SLSA may be flown at night and IFR if the aircraft has the necessary equipment and the pilot has the necessary qualifications.

14.5 Current situation

With the LSA and Sport Pilot Licence process having now been in existence for five years the FAA has recently carried out a review. Various issues were found, some of which are listed below:-

- It has been recognised that many LSA manufacturers are small "cottage industries" and the management personnel have not necessarily come from a certified aircraft environment. Whilst there have been no obvious safety issues arising from this the FAA has decided to prepare more comprehensive guidance material in order that these small manufacturers understand their responsibilities to a greater degree.
- As with the manufacturers, it has been recognised that pilots and owners are not necessarily fully aware of their responsibilities and further guidance material is to be issued.
- Further training of inspectors was needed.
- It was noticed that more accidents took place when the pilot had exercised his rights as a full PPL or ATPL to fly LSA aircraft than with pilots trained as Sport Pilots flying an LSA. Further investigation is going to take place but extra guidance is to be drafted which may include some mandatory differences training for pilots transitioning to LSA.

- Some manufacturers that produce Part 23 certified aircraft assume that these processes will fit LSA. This is not necessarily the case. LSA is not necessarily a lesser standard, just different.

14.6 Economic and Social Aspects

During the late 1990s and the early period of this century the light aviation industry in the USA saw the need to revitalise itself and the Light Sport Aircraft was born. Since its inception in 2005 the market has seen a steady growth and only flattened during the worldwide recession. Figures for the years since 2005 are:

2005 sales of approximately 100 aircraft totalling some $10 million

2006 sales of 491 aircraft totalling more than $50 million

2007 sales of 565 aircraft totalling more than $60 million

2008 with the beginning of the financial recession 406 aircraft were sold totalling some $50 million

2009 even during the worst recession since 1930 sales have exceeded $45 million

This equates to some $215 million, and does not account for the several hundred small businesses selling ancillary equipment, flight schools that are beginning to use these aircraft and other businesses which are seeing a value in reducing their overheads by using LSA aircraft as opposed to the current outdated, expensive-to-operate and less environmentally-friendly aircraft currently being used.

As the LSA system is being accepted by more and more countries throughout the world (7 other countries have already accepted it and at the time of writing China and India are considering it) then the global sales could very easily reach $1 billion.

The value of LSA has not been overlooked by the established GA manufacturers with Cessna and Piper, both having entered the marketplace. In June of 2010 the first Cessna Skycatcher was delivered to a flight training school and many more are to follow.

It has been estimated that 125,000 pilots in the USA could consider purchasing an LSA aircraft and this is based on 3 points:

Firstly, following research the FAA decided to do away with the need for an aviation medical exam for LSA and rely on a driver’s licence providing sufficient evidence of medical fitness.

Secondly, the cost of a new LSA aircraft is, in many cases, equivalent to the cost of a used GA aircraft so current owners can have a new aircraft with modern technology and comparable performance for no extra cost.

Thirdly, fuel costs will continue to rise and LSA aircraft generally burn half the fuel of conventional aircraft.

The LSA category also has the potential to open up an as yet untapped market: those people who have the perception that aviation is too expensive; those people who have motorcycles, boats or pursue various other leisure activities. This community has been estimated at 32million, so even a very small percentage of this population could have a significant impact on LSA sales.

The irony is that many European manufacturers are currently enjoying this market. Of the five biggest suppliers, four (Flight Design, Tecnam, Remos and Evektor) are European and the engine mostly used in US LSA aircraft is the Rotax, again of European manufacture; but these aircraft cannot be sold or used in Europe under the LSA consensus standards.

14.7 FAA report on LSA Manufacturers' Assessment ('LAMSA')

In September 2004 the FAA issued rules for the manufacture, certification, operation and maintenance of a new category of aircraft, the Light Sport Aircraft ('LSA').

In January 2008, the FAA established the LSA Manufacturers Assessment ('LAMSA') to evaluate the health, state of systems implementation, and compliance of the LSA industry with the rules as a whole. Specifically, the goal was to assess current LSA industry manufacturing systems and processes through on-site evaluation, analysis and reporting under a continuous improvement process, and thereby to provide recommendations to enhance aviation safety.

14.7.1 Methodology

The team, comprising FAA officials, visited a selection of US based LSA facilities and established that a 92% confidence level was appropriate. This involved visiting 29 of the 52 registered facilities. Thirty facilities were in fact visited and this gave a 93% confidence that the results would represent the LSA industry as a whole. It should be noted here that in the interests of efficiency and costs no manufacturers in Europe were visited.

The team then developed 156 questions to evaluate how the LSA industry understands and applies applicable regulations, standards, and processes. The majority of questions were based on the FAA-accepted ASTM international consensus standard requirements. Some questions were designed to evaluate the application of current best practices used in the aviation industry. The assessment was carried out between September 2008 and March 2009.

14.7.2. Conclusions of the LAMSA report

The report identified four areas that needed minor to significant improvements.

(a) Compliance with FAA-accepted consensus standards.

The majority of LSA facilities surveyed could not demonstrate fully their ability to comply with certain consensus standards.

(b) Implementation of manufacturing systems

Some manufacturers had failed to implement widely-accepted internal quality control and production procedures that are necessary to assure the minimum of compliance to ASTM consensus standards. Many manufacturers also lacked corrective action systems used to address systemic deficiencies. Further compounding this scenario was the fact that current consensus standards identify only minimum requirements without a systems-based approach, which only exacerbates procedural and record keeping weaknesses.

Distributors had not developed and implemented manufacturing and quality system procedures for many of the tasks they perform. When distributors perform assembly, inspections, and other functions, they seldom used the manufacturers' procedures, records, or controls. The consensus standards do not require distributors to use process control procedures and as a result, distributors had only partial manufacturing and quality system procedures and associated records.

(c) Understanding FAA regulatory requirements, policy and guidance, and industry consensus standards

Industry and FAA designees had inadequate knowledge of FAA regulatory requirements and policies and ASTM / industry consensus standards.

d) Industry's system for managing, assessing, and maintaining the effectiveness of the consensus standards

Industry did not have a means to communicate with manufacturers on how to comply with the requirements of the consensus standards. It was concluded that the process for evaluating compliance with the standards and taking corrective action needs significant improvement. Additionally, the process for maintaining and updating consensus standards needs improvement.

14.7.3. Summary of recommendations given in the report

<u>Industry</u>

- Take immediate steps to fully comply with FAA regulatory and consensus standard requirements
- Standardise the continuous airworthiness notification process for all LSA types
- Develop training to ensure industry fully understands FAA regulatory and policy requirements, and the methods and means to comply with those requirements
- Establish periodic meetings between FAA and industry to work toward full compliance to FAA regulatory and consensus standard requirements
- Conduct an initial conformity inspection of all first-time-manufactured LSA models
- Continue assessments of manufacturers, extensions, distributors
- Review current accepted consensus standards for adequacy and revise existing standards or create new standards where necessary.

<u>FAA</u>

- Update existing policy (Advisory Circulars and Orders) pertaining to airworthiness certification requirements, registration marking, and designee management
- Update Designated Airworthiness Representative(s) (DAR) and advisor training
- Establish a process to receive safety alerts, directives, and other pertinent information
- Continue oversight of the LSA manufacturers to assure compliance with FAA requirements and ASTM consensus standards.

14.7.4. Hawk notes from discussion with FAA representatives regarding the report

Hawk questioned the FAA representatives about the report at the meeting on 21st May 2010 in Kansas City. At that time the report had been reviewed internally at the FAA but not published.

They concluded that whilst on first reading the report is quite critical of the LSA system, industry had recognised many of the issues raised and had either addressed them or were in the process of addressing them.

The comments from the FAA representatives indicated that they felt the level of oversight and method of regulation was appropriate for the level of safety required for this category of aircraft and they were content with their decision to use consensus standards.

Accident data and analysis – LSA

14.8 Introduction

The US LSA category of aircraft, and associated rules, were introduced in 2004. The effect of this introduction was not seen until early / mid 2005.

The Special Light Sports Aircraft (SLSA) category is the one that embraces factory-built aircraft whereas the Experimental Light Sport Aircraft (ELSA) category covers kit-built, amateur-built LSAs together with aircraft with experimental airworthiness certification. The ELSA category thus imported many existing aircraft in this experimental class when it was launched whereas the SLSA started 'with a clean sheet'.

14.9 Data Sources

Data and information was provided by the FAA in Kansas City during the study team's visit. Following the visit, access was provided to the individual fatal accident records on the NTSB database for LSA aircraft.

14.10 Completeness and accuracy of data

The NTSB database and the FAA analyses of accident are assumed to be complete and accurate in terms of the numbers of fatal accidents.

Activity data was obtained from the FAA for 2007 and 2008.

14.10.1 Interpretation of data

It is important to note that the analyses in this section of the report distinguish between SLSA aircraft and ELSA aircraft, because only the SLSA category is comparable to the proposed European LSA category and the related ELA 1 process. The ELSA category is more comparable with home-built / amateur-built aircraft in Europe and experimental type aircraft where they exist in Europe.

Further, the qualifications of the pilots in the fatal accidents have been analysed for the NTSB data. This is particularly relevant as the relatively new US Sport Pilot Licence (introduced 2004) is the one that is the relevant benchmark for comparison with the proposed Basic LAPL or LAPL in Europe.

14.11 Population and Activity data

SLSA activity data is not available for 2005, 2006 or 2009.

The following table was provided by the FAA for 2007 and 2008:

		2007	2008
SLSA	Aircraft population	771	1,290
	Estimated active aircraft population	**778**	**1,233**
	Percentage standard error	0.2	0.2
	Estimated percentage active	95.9	95.6
	Percentage standard error	0.2	0.2
	Estimated total hours p.a.	**66,715**	**95,254**
	Percentage standard error	3.1	2.7
	Estimated average hours per aircraft p.a.	90.4	77.2
	Percentage standard error	3.0	2.6
ELSA	Aircraft population	7,620	8,552
	Estimated active aircraft population	**5,328**	**5,557**
	Percentage standard error	0.6	1.5
	Estimated percentage active	69.9	65.2
	Percentage standard error	0.6	1.5
	Estimated total hours p.a.	**193,048**	**197,711**
	Percentage standard error	2.1	7.0
	Estimated average hours per aircraft p.a.	36.2	35.4
	Percentage standard error	1.5	4.5

14.12 Accident data

Fatal accident and fatalities data for LSA aircraft under the new code and pilot licences begins in June 2005.

The following overleaf is up to April 2010, with the sport pilot licence (only) holders highlighted in purple.

Event / Aircraft category	Category of licence held	2005 7 months	2006 Year	2007 Year	2008 Year	2009 Year	2010 4 months	59 months
Fatal Accidents								
SLSA (3-axis)	ATPL			1				**1**
	CPL	1	1	1		1	1	**5**
	PPL		2	2	2		1	**7**
	Sport				1		1	**2**
SLSA WEIGHT-SHIFT	PPL						1	**1**
	Sport					1		**1**
SLSA POWERED CHUTE	None					1		**1**
Sub total SLSA		**1**	**3**	**4**	**3**	**3**	**4**	**18**
ELSA	CPL					2		**2**
	PPL				2			**2**
	Sport			1	1	2		**4**
	Student				1			**1**
	None				1			**1**
ELSA AMATEUR-BUILT	ATPL					1		**1**
	CPL	1		1	1			**3**
	PPL	3	1	4	2	2	1	**13**
	Sport		1	2	1	1	1	**6**
	None			1				**1**
ELSA VINTAGE	CPL				1	1	1	**3**
	PPL	1				3		**4**
ELSA WEIGHT-SHIFT	CPL				1			**1**
	PPL					1		**1**
	Sport				1			**1**
	Student				1			**1**
ELSA WEIGHT-SHIFT	ATPL					1		**1**
AMATUER-BUILT, NOT REGISTERED OR CERTIFIED	CPL	1						**1**
	None				1			**1**
Sub total ELSA		**6**	**2**	**9**	**14**	**14**	**3**	**48**
Total SLSA & ELSA		**7**	**5**	**13**	**17**	**17**	**7**	**66**

Event / Aircraft category	Category of licence held	2005 7 months	2006 Year	2007 Year	2008 Year	2009 Year	2010 4 months	59 months
Fatalities								
SLSA (3-axis)	ATPL			1				**1**
	CPL	2	1	2		1	2	**8**
	PPL		3	3	3		1	**10**
	Sport				1		2	**3**
SLSA WEIGHT-SHIFT	CPL							
	PPL						2	**2**
	Sport					2		**2**
SLSA POWERED CHUTE	None					1		**1**
Sub total SLSA		**2**	**4**	**6**	**4**	**4**	**7**	**27**
ELSA	CPL					4		**4**
	PPL				3			**3**
	Sport			1	1	3		**5**
	Student				1			**1**
	None				2			**2**
ELSA AMATEUR-BUILT	ATPL					1		**1**
	CPL	1		2	1			**4**
	PPL	3	1	3	2	3	1	**13**
	Sport		2	4	1	1	1	**9**
	None			1				**1**
ELSA VINTAGE	CPL				1	1	1	**3**
	PPL	1				5		**6**
ELSA WEIGHT-SHIFT	CPL				1			**1**
	PPL					2		**2**
	Sport				1			**1**
	Student				1			**1**
ELSA WEIGHT-SHIFT	ATPL					1		**1**
AMATUER-BUILT, NOT REGISTERED OR CERTIFIED	CPL	1						**1**
	None				1			**1**
Sub total ELSA		**6**	**3**	**11**	**16**	**21**	**3**	**60**
Total SLSA & ELSA		**8**	**7**	**17**	**20**	**25**	**10**	**87**

14.13 Accident Rates

The **SLSA fatal accidents** extracted from the above tables, and the calculated fatal accident rates for 2007 and 2008 using the FAA calculations of estimated annual hours for those two years are:

SLSA	Licence	2007	2008
Fatal accidents	Sport pilot	0	1
	Other licences	4	2
Annual hours		66,715	95,254
Accident rate per 100,000 hours	Sport Pilot	0	1.0
	Other licences	6.0	2.1

Source: FAA and NTSB database

Note that whilst the accident data is analysed between Sport Pilot Licence holders and others, the equivalent data for hours cannot be split between SLSA flight hours by Sport Pilot Licence holders and others.

As the two-year time period is so short and the number of fatal accidents a small number, no statistically reliable conclusions can be drawn from this data.

14.13.1 Causal Analyses of fatal accidents – ELSA

Fatal Accidents in ELSA 3-axis & weight-shift aircraft by pilot licence and cause, June 2005 to April 2010.

ELSA / cause	ATPL	CPL	PPL	Sport	Student	All
Stall / spin		1	1	2	1	**5**
Landing		1				**1**
Loss of control in IMC				1		**1**
Loss of control; in-flight break-up				1		**1**
Overstress airframe		1				**1**
Incorrect fin – fuselage fixing				1		**1**
Engine stop					1	**1**
Medical incapacity (heart attack)			1			**1**
Missing / unknown			1			**1**
Total	**0**	**3**	**3**	**5**	**2**	**13**

Source: FAA and NTSB database

Fatal Accidents in ELSA Amateur-Built and Vintage 3-axis & weight-shift aircraft by pilot licence and cause, June 2005 to April 2010.

	ATPL	CPL	PPL	Sport	Student	All
Stall / spin	2	5	9	3		**19**
Landing			1	1		**2**
Loss of control - aerobatics			1			**1**
Overstress airframe			1			**1**
Run out of fuel		2				**2**
Fuel line leak			1			**1**
Fuel contamination			1			**1**
Engine carburettor wrong assembly			1			**1**
Medical incapacity (heart attack)			1			**1**
Unknown				2		**2**
Total	**2**	**7**	**16**	**6**	**0**	**31**

Source: FAA and NTSB database

14.14 <u>Commentary on fatal accident data</u>

It was noted during discussions with the FAA team in Kansas City that of the 66 fatal accidents in the period from June 2005 to April 2010 (59 months) some 21 (or 32%) involved a SLSA 3-axis aircraft and a further 2 accidents occurred with a SLSA weight-shift aircraft. One accident involved a SLSA powered parachute but the pilot did not have a licence.

Thus for the SLSA class there were 17 fatal accidents where the pilot held a valid licence, and one accident where the pilot did not. The latter should be discounted in the statistical analysis.

Of these 17 fatal accidents where the pilot had a valid licence, the pilot analysis is:

SLSA fatal accidents	
Licence held	**Fatal accidents**
ATPL	1
CPL	4
PPL	9
Sport Pilot	3
Total	**17**

Source: FAA and NTSB database

All the other fatal accidents were in ELSA aircraft – experimental category, including amateur-built 3-axis ones, vintage and weight-shift. Out of the total of 48 fatal accidents in this group, 1 was in an aircraft which was not registered or certified – and flown by a CPL licence holder - and in 3 cases the pilot did not have any form of licence (including one case where the aircraft also was not registered). Again, these 4 accidents should be discounted statistically, on the basis that if people do not comply with the law then the accident cannot reasonably be ascribed a status in relation to the effectiveness of regulations.

In the ELSA category, of the remaining 44 fatal accidents where the pilot had a valid licence and the aircraft was 'legal' the pilot qualifications were:

ELSA fatal accidents	
Licence held	**Fatal accidents**
ATPL	2
CPL	9
PPL	20
Sport Pilot	11
Student	2
Total	**44**

Source: FAA and NTSB database

For pilots with valid licences or student status, and flying a SLSA or ELSA aircraft that was 'legal', 3 (5%) held an ATPL, 14 (23%) held a CPL, 28 (46%) held a PPL (A), and 14 (23%) held a Sport Pilot licence. 2 (3%) were students.

The causal analyses reveal 'the usual suspects', mostly pilot-related.

In terms of airworthiness, none of the reports on fatal accidents indicate a fundamental airworthiness problem in the SLSA category, nor indeed with the ELSA category except one case of an incorrect fitting between the fin and the fuselage. There are some cases of structural failure but these are attributed in the reports to the pilots subjecting the aircraft to stresses beyond the design limits. In other 'technical' causes, the predominant one relates to fuel mismanagement in several forms, which points to pilot or operator error rather than a fundamental technical weakness.

The FAA considered it significant that the majority of these pilots suffering a fatal accident in a SLSA or ELSA aircraft had pilot qualifications higher than the Sport Pilot Licence. In particular they were concerned that those with higher level licences may not be equipped to handle the characteristics of the SLSA and ELSA aircraft, and in some cases may have assumed that their qualifications were appropriate for this type of aircraft.

The implications of this observation lie in the issue of type conversion and experience, something the FAA is planning to address.

14.15 Conclusions

The data provided by the FAA and NTSB provides an interesting insight into the relatively new LSA aircraft category and associated Sport Pilot Licence. Although a statistically valid accident rate is not available for the five years since the implementation of these developments, nevertheless some key observations can be made. The main one seems to be that type conversion for existing and maybe very experienced pilots with other licences, when intending to fly a SLSA or ELSA aircraft, might save the lives of those who already have other experience – often extensive – in other fields of piloting.

It may be that the training syllabus to become a SLSA pilot from scratch is 'fit for purpose' but that those with other licences should not necessarily assume they can fly this category of aircraft without some conversion training and familiarisation with a qualified SLSA / ELSA instructor or examiner.

Section D

Recommendations for the RIA Options

Recommendations for the RIA options to be evaluated

15.0 Purpose of the RIA

The purpose of the RIA is to consider a range of options for the future regulatory framework, including if necessary changes to the Basic Regulation EC 216/2008, of aircraft covered by the proposed ELA1 process. Such aircraft are those which are currently subject to regulation at Community level, viz. aeroplanes above 450kgs MTOM (472.5kgs with ballistic parachute systems), gliders and balloons. By agreement with EASA helicopters and airships are excluded from consideration in the RIA.

15.1 Scope of regulatory subjects in the RIA

The scope of the regulatory subjects to be covered in the RIA include, inter alia:

- Initial Airworthiness
- Continuing Airworthiness including maintenance
- Pilot training and licensing
- Pilot medical standards and compliance process
- Pilot training organisations
- Technical personnel training and licensing
- Operations
- Commercial versus non-commercial aspects

15.2 Base material for the RIA

The material that forms the input for the RIA is primarily the result of the first stage of this study. This comprises a survey of the regulatory framework and accident statistics for microlight aircraft in seven EU Member States and Norway together with a survey of the accident rates for the range of aircraft that would come within the MTOM of the ELA1 process.

Microlight aircraft are within Annex II of the Basic Regulation and are therefore subject to regulation, or otherwise, at member state level. In addition a comparison of the US LSA is included in the study. The purpose of using the European microlight and USA LSA experience is to see what benefits are to be gained from a different regulatory approach for the range of aircraft covered by the proposed ELA 1 process, compared to the current situation. The range of regulatory topics is not limited to airworthiness, which forms the basis of the proposed ELA 1 process.

The other material or information to be brought into the evaluation comprises knowledge of the accidents in the range of aircraft embraced by the proposed ELA 1 process operating in the regulatory environment of the last ten years. This material is either already enacted in EU law (initial and continuing airworthiness) or is still covered by national law but subject to EASA rulemaking proposals in the pipeline for the transfer of these elements to Community law.

15.3 Explanation and justifications for recommended options to evaluate in the RIA

It is emphasised that in proposing these options the detailed technical and legal implications in terms of Community regulatory and EASA rule-making synergy are not elaborated at this stage. The authors propose to address the key strategic issues and principles in the proposed options rather than try and work out the technical and legal solutions of how any of the options for change could be implemented.

15.3.1 'Do Nothing' Option

This option is at first glance self-explanatory; however, in a dynamic and changing regulatory environment at Community level the option requires further explanation. By agreement during the study team review meeting at EASA on 24th May 2010 and subsequently, the 'baseline' for evaluating the 'Do Nothing' option comprises the following:

- Initial Airworthiness: the relevant elements of Part 21 as currently applied together with the latest known proposals for ELA1, as embodied in the CRD Part 1 to NPA 2008-07 published 15th July 2010.
- Continuing Airworthiness: the relevant elements of Part M as currently applied to EU regulated light aircraft.
- Pilot training and licensing (including medical): the CRD for NPA 2008-17 (FCL excluding Medical) published by EASA on 9th April 2010 and the CRD for NPA 2008-17c (Medical) published by EASA on 23rd June 2010.
- Pilot training organisations: the NPA 22-2008 published by EASA on 30th October 2008, together with any feedback that may be provided by EASA officials within the timescale of preparing the RIA on progress towards the CRD that would indicate significant changes in approach for pilot training organisations in the light aviation sector. It is noted that the EASA workshop on NPA22 – 2008 is due to be held on 20-21 October, after the production of the RIA.
- Technical Personnel training and licensing: the EASA Opinion 04/2009 of 11th December 2009 based on the CRD for NPA 2008-03 published by EASA on 15th September 2009 for Licences for non-complex aircraft maintenance engineers.
- Operations: the NPA 2009-02 published by EASA on 30th January 2009, together with any feedback that may be provided by EASA officials within the timescale of preparing the RIA on progress towards the CRD that would indicate significant changes in approach for non-commercial operations in the light aviation sector.

In addition, it is considered necessary to evaluate the potential implications on the aircraft owners, pilots, training organisations and others of the definition of 'commercial operations' contained in the Basic Regulation 216/2008 as the future interpretation of this could have significant impact on the sector.

15.3.2 Modify the current ELA 1 proposals

In essence this option would retain the current and proposed framework in terms of which aircraft categories are within the scope of the Basic Regulation. However, the option would propose changes to some or all of the articles in the Basic Regulation or the Implementing Rules etc for the various regulatory topics that are either already embodied in EU law (Original and Continuing Airworthiness) or in the rule-making pipeline (ELA 1, FCL, Medical OPS, Training Organisations etc). The purpose of such changes to be evaluated would be to improve the regulation and implementing rules to make them acceptable by the affected parties and communities, commensurate with overall safety objectives.

It is appreciated that should this option be taken forward in the proposed BR.010 working group and ultimately be adopted at Community level, in part or whole, then the implementation timing of any changes may well be after the adoption of the draft implementing rules currently in progress in the legislative programme.

15.3.3 Delegation or devolution to Assessment Bodies

This option will consider the possibility, presented by the inclusion of a reference in the preamble to Regulation 1108/2009, of introducing the concept and use of 'Assessment Bodies'.

Microlighting in Europe is largely managed by national aero clubs or national microlight associations with varying degrees of delegation for the Competent Authorities (NAAs) of the Member States for managing all or most aspects of their activities including in particular safety management. The delegations operate under a wide range of types of national rules, but there is a common thread throughout in terms of scope. The involvement of personnel in these organisations who have a close affinity with the activity is seen by the participants as very positive, bringing governance proximity to the pilot-owner stakeholders and the local microlight organisations.

Similar arrangements of delegation and management have been in place in many Member States for non-commercial light aviation that is now regulated at the EU level. The activities cover gliding and ballooning in particular, as these activities depend on group organisation to one degree or another, either in clubs or operating groups. In turn these clubs and groups are members of a national body devoted to the oversight and management of their activities, again including safety management in particular.

For aeroplanes similar arrangements exist in many countries, though the scope of the national bodies' activities is sometimes different to those in

gliding and ballooning. This may be because flying aeroplanes can be independent of a club or operating group at local level, and there is less impetus to organise the oversight and management of the activities of aeroplane owners on a national basis. It is emphasised though that the experience varies widely country-to-country, with some having large, strong and effective national associations and others being more inclined to leave it to a direct relationship between pilot owners, support organisations and the NAA.
This option will therefore explore the advantages and disadvantages of the use of 'Assessment Bodies' for the ELA 1 MTOM range of aircraft, as an alternative particularly to Options 1 and 2.

15.3.4 A 'Mixed Economy'

This option would be an evaluation of a range of issues under each regulatory topic for the range of aircraft from 451 kgs up to 1,200 kgs MTOM that are subject to Community regulation, with a view to recommending changes that would represent a mixture of regulatory approaches.

The changes to be evaluated would be sub-divided with a risk analysis matrix so as to determine the likely impacts.

The purpose of this option would be to explore the possibility of retaining elements of Community level regulatory scope whilst devolving other elements to national level so as to achieve a more proportionate approach and greater ownership and proximity for safety management.

This option may appear to some people as 'impossible' given the constraints of the Community's legislative approach; nevertheless it represents an approach of 'thinking outside the box' for the benefit of the sector rather than the pan-EU standardisation approach of EU legislators and administrators.

15.3.5 Total de-regulation from EU regulation

This option would take the aircraft within the ELA 1 process out of the scope of the EU regulation and into Annex II of the Basic Regulation.

The rationale behind this option is that the overall accident occurrence in microlighting is not materially different to that of the Community-regulated ELA 1 range of aircraft. Microlighting appears to benefit significantly from 'light touch' regulatory frameworks in many countries, compared with the range of aircraft up to 1,200kgs that are now subject to Community regulation. This in turn has encouraged technological and economic development in microlights as well as growth in participation levels that compare favourably with the Community regulated sector. The perceived – and to some extent actual - factor that lies behind this is a view from 'industry' that the thinking and culture of Community regulation and rule-making is still driven by the approach adopted for commercial air transport, leading to a disproportionate scope and level of regulation that many consider to be less suitable and appropriate for the largely non-commercial light aviation sector.

Microlights can generally cross international borders within the EU on a mutual recognition basis, as can light aeroplanes, gliders and balloons, although some Member States make a charge for entry and require transactional documentation for each event. Therefore the advantages of falling under Community regulation for the stated reason of 'free movement' do not necessarily represent a sustainable supporting argument.

Further, the perceived burden of Community regulations, compared with previous or existing national regulations governing aeroplanes, gliders and balloons is regarded by many user groups as disproportionate for the nature of the activities and risks in this sector. The ensuing logic therefore is that this sector may be 'better off' by remaining under the previous and still-existing regimes of national regulatory control, where both ICAO and non-ICAO compliant options had been developed successfully over many years, as well as greater flexibility in levels of airworthiness compliance.

The primary driver for considering this option is probably the economic factors that lie behind the increase in Community regulations and their impact on aircraft owners, pilots, clubs and supporting small industry suppliers. The success of microlighting, protected from what is seen by many as disproportionate regulation at Community level in these other sectors, is a model that these other sectors may find more attractive than having to succumb to ever-increasing and disproportionate Community regulations.

There is also concern that the evolving Community rules, added to those for airworthiness already in place, will lead to a reduction in participation in the sector of aviation represented by the ELA 1 range, rather than an increase in participation, particularly in times of economic stringency.

15.4 Criteria to be applied in the evaluation of options

Some of the key criteria that will be used in the evaluation of the various options include:

- Evidence from accident data
- Safety risk and likely safety outcomes of proposed changes
- Proximity and form of regulatory compliance oversight
- 'Knowledge management' of operations and activities in the sector
- Cost of participation by 'end users' (aircraft owners / operators, pilots, training organisations, clubs) embracing capital costs and operating - in the widest meaning of the word - costs
- Economics for designers / manufacturers of aircraft and equipment
- Accessibility to and participation in light aviation

- Free movement of aircraft, parts and personnel within the EU
- Opportunity for technological innovation and progress – materials, performance, environmental
- Social factors relevant to particularly non-commercial, recreational and sporting aviation
- The volunteer nature of participants in many of the non-commercial light aviation sector's activities
- Proportionality in regulation
- Commercial vs. Non-commercial
- Ability of 'industry' to manage itself ('industry' embracing users and user associations as well as supporting enterprises for manufacturing, maintenance, training etc)

Appendices

Data and accident rate calculations