Czech Accident data

Microlight Accidents and Accident Rates

Data sources

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.
- LAA-ČR

The data elements obtained were:

- AAII – accident data 2003 to 2008, categorised by weight and type, fatal injuries, serious incidents, incidents (Czech and English)
- LAA-ČR accident reports in magazine, 1998-2008, with analysis, in Czech language.
- EMF returns compiled by Jan Fridrich including LAA-ČR accident summary 2001 to 2006, in English, with paragliders removed. Fatality rates were also provided.
- Jan Fridrich's European GA accident data graphs 2001-2004 with tables in foreign encoding

Cross-reference footnotes in this report identify the data sources and observations from these bodies in a variety of studies, bulletins, and other documents.

Completeness and accuracy of data

The AAII data covers the years 2003 to 2008. The LAA-ČR data covers 1998-2008. Information is not yet available on accident and other data for 2009.

The available data on fatal accidents provides the number of fatalities (persons) but does not provide the number of fatal accidents.

The number of annual operating hours is not available. It could only be extrapolated based on an assumed average annual hours per aircraft.

Therefore there are limitations in arriving at annual or longer period accident rates expressed as the number of fatal accidents per 100,000 hours

Aircraft classes

In Czech, microlight aircraft are classified into seven groups or classes:-

ULLa	aerodynamic or "3-axis" control microlights
ULLt	weight shift or "flexwing" control microlights
ULH -	microlight helicopter
UW	gyrocopter
PK	paraglider
MPK	motorized paraglider
ZK	hang glider

This report includes only classes ULLa and ULLt, the aerodynamic and weight-shift microlights and their pilots

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. The best guess we have been given is c. 70 hours per aircraft per annum. Whilst this may be on the low side, it would extrapolate to an annual operating hours' total of that shown in the following table

Accident data

Czech Republic **Microlights**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Air Accidents										
3 axis	N/A	N/A	N/A	27	28	22	20	19	22	O/S
Weight-shift	N/A	N/A	N/A	1	2	0	2	6	3	O/S
Total Air Accidents	**N/A**	**N/A**	**N/A**	**28**	**30**	**22**	**22**	**25**	**25**	O/S
Fatalities										
3-axis	N/A	N/A	N/A	4	5	8	9	4	12	O/S
Weight-shift	N/A	N/A	N/A	1	0	0	1	2	1	O/S
Microlight total fatalities	**N/A**	**N/A**	**N/A**	**5**	**5**	**8**	**10**	**6**	**13**	O/S

Source: Czech AAII reports 2003 to 2008

Notes:

1. Fatal accidents are classified as air accidents, but not all air accidents involve fatalities

2. 2005 data did not classify the classes of fatal accidents; 3-axis microlight fatalities may include other classes (hang and paragliders, helicopters etc)

Accident rates

The true rates of fatal accidents cannot be calculated without actual annual operating hours' data; however as a substitute, using the assumptions above under 'Population & activity data' the following rates emerge for *fatalities* (not fatal accidents):

Czech Republic **Microlights**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Fatalities per 100,000 hours	N/A	N/A	N/A	2.94	2.86	4.26	5.35	3.02	6.50	N/A

Caution should be exercised in interpreting the above figures due to them being based on only one element of the calculation with probably > 95% confidence as regards accuracy – the number of fatalities. The other element, operating hours are based on microlight aircraft numbers (with < 95% confidence level) factored by an estimated average of 70 hours per annum per aircraft.

In the absence of data on the number of fatal accidents, converting the fatality rate to a fatal accident rate per 100,000 hours can only be estimated in a range. For the years 2003 to 2008 the average (weighted by estimated hours) *fatality* rate per 100,000 hours is 4.20. The six year *fatal accident* rate per 100,000 hours will be lower than the fatality rate as some of the accidents are very likely to have involved 2 fatalities (occupants of the aircraft) per accident. The fatal accident rate would only be half the fatality rate if every fatal accident involved only one fatality. This is unlikely to be the case and therefore the six-year fatal accident rate probably lies between 2.50 and 3.50 per 100,000 hours.

Accident trends

The number of reported air accidents (including fatal accidents) in Czech microlighting is a broadly consistent number year-on-year from 2003 to 2008. Clearly there are two peaks years (2006 and 2008) in terms of the number of fatalities, though without the data on the number of fatal accidents it is not possible to make any further observations.

Causal Analyses

AAII reports indicate human factors / pilot errors are the significant feature, including exceeding maximum take-off weights, quoted in the 2005 AAII report as ‘in most cases’ (six accidents) of fatal accidents in ’sports equipment’. Another cause quoted in the 2005 AAII report was ‘use of sports equipment for purposes other than those specified by Art. 49/1997 Coll’ (flights with friends and colleagues – 5 accidents) although the report is not specific as to whether some or all of these involved microlights. No mention of structural failure or other airworthiness issue was made in the accident reports on microlights.

Appendix 1 B

Czech Republic

Light Aeroplane Accident data

Data sources

Data on Czech Republic aeroplane accidents was obtained from the published annual reports of the Air Accidents Investigation Institute (AAII) of the Czech Republic for the years 2003-2008. The limitations of this data are explained in Section 2, paragraph 5.6.1.

Studies and reports on aeroplane accidents

No comprehensive studies or reports have been located, other than those referred to above.

Accident data

The following data was extracted from the two principle referenced sources.

Czech Republic Aeroplanes less than 2250 Kgs	2000	2001	2002	2003	2004	2005	2006	2007	2008	2008	*10 Years*
Fatalities – aeroplanes / gliders*	N/A	N/A	N/A	8	2	-	1	5	2	O/S	O/S
Fatal accidents – gliders++	0	2	0	1	0	0	1	1	O/S	O/S	O/S
Number of glider accidents++	16	25	21	30	17	21	21	20	O/S	O/S	O/S
Number of Air accidents*	N/A	N/A	N/A	36	17	24	36	29	21	O/S	O/S

Source: (a) Czech AAII reports 2003 to 2008 and (b) EGU accident data base 98-07

Notes:

1. * = as per AAII reports only numbers of fatalities are recorded but these include gliding fatalities
   ** = as per AAII reports all air accidents including fatal accidents, but including gliders
   ++ = per EGU database (accidents)

2. The <2250kg category represents GA aircraft including gliders but excluding microlights, hang-gliders, para-gliders, autogyros, balloons and parachuting. Glider Accidents are not separated in the AAII data.

3. Aircraft categories were not identified in the 2005 and 2006 data on fatalities.

Accident rates

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

Accident trends

No particular trend can be determined from the limited data available.

Causal analyses of accidents

In the AAII reports the majority of fatal accidents to aircraft <2250kg but not classified as sport flying aircraft (microlights, hang-gliders etc) are attributed to gliders out-landing in fields.

Appendix 1 C

Czech Republic

Accident data for Gliding

Data sources

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

Accident rates

Czech Gliding	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*Total*
Fatal accidents – gliders	0	2	0	1	0	0	1	1	O/S	O/S	5
Number of glider accidents	16	25	21	30	17	21	21	20	O/S	O/S	171
Fatal accident rate per 100,000 flights	0	2.49	0	1.14	0	0	1.22	1.16	O/S	O/S	0.77

Source: EGU accident data base 98-07

In the absence of data on operating hours for Czech gliders, the assumption is that the average flight time is < one hour and therefore the fatal accident rate per 100,000 hours for eight years to 2007 would be > 0.77.

The equivalent total accident rate (for eight years) is 26.6 per 100,000 flights.

Appendix 2A

France

Microlight Accidents and Accident Rates

Data sources

Data for population, activity and accident data in France is reasonably comprehensive, and has been obtained from three main sources:

1. FFPLUM –Fédération Française de Planeur Ultra Léger Motorisé
2. DGAC –Direction Générale de l'Aviation Civile
3. BEA – Bureau d'Enquêtes et d'Analyses

Cross-reference footnotes in this report identify the data sources and observations from these bodies in a variety of studies, bulletins, and other documents.

Completeness and accuracy of data

The data for microlight operating hours is not recorded by either the DGAC or the FFPLUM (as log books are not a requirement for the pilot) and is therefore an estimate from the FFPLUM. The accident data for all accidents (2000 to 2009) is considered by the DGAC to be complete and accurate.

More comprehensive data covers the years 2004 to 2008. Some data is available for earlier years, namely 1990, 1995 and 2000 and there are some gaps in the data.

The population data (number of microlights, number of pilots) is assessed as reasonably accurate with a probable +/- 10% error rate. This is inevitable where aircraft registration cycles lead to omissions and where individual membership of the national microlight organisation, FFPLUM, is not obligatory. FFPLUM considers its members currently represent approximately 80 to 85% of the active microlight pilots in France. Some other pilots are members of the FFA – Fédération Française Aéronautique.

Activity data, in terms of flying hours of the microlight pilot population, is less complete than population data. The figures included in this report are based on extrapolation of voluntarily reported annual pilot hours of between 45 to 50% of the members of FFPLUM. The extrapolation has been factored by the number of members, and then further extrapolated by reference to the estimated microlight pilots who are not members of FFPLUM. In this extrapolation there is both potential understatement and potential overstatement of hours. For example, individual reporting may have resulted in duplication where both a P1 pilot as well as a P2 pilot report their hours for the same flight.

An alternative means of ascertaining annual hours would be from aircraft operating times, but as there is no national requirement for keeping a microlight aircraft log book or reporting aircraft hours to a central data collection point, this potential source is not available.

Aircraft classes

In France, microlight aircraft are classified in 5 groups or classes, with three sub-classes in 1,2 & 3 for types with an MTOM of less than 170kg, a maximum continuous power rating of less than 25 kW and a wing loading of less than 30kg /sq. metre:

Class 1 & 1A ‘Paramoteur’ – Paramotor
Class 2 & 2A ‘Pendulaire’ – Flexwing or weight-shift
Class 3 & 3A ‘Multiaxe’ – 3-axis
Class 4 ‘Autogire ultraléger’ – light autogyros
Class 5 ‘aerostat dirigeable ultraléger’ – light balloons

In addition there are powered parachutes.

This report excludes consideration of autogyros (as per the TOR) and also excludes ‘aerostat dirigeable ultaléger’ as being insignificant in number, although their numbers are shown below for information reference.

Data is not available prior to 2004. The latest data shows there is approximately one aircraft for every two active microlight pilots, reflecting a high proportion of private ownership.

Microlight pilot population data from 1990 to 2007 based on membership returns from the FFPLUM and is shown in the table below

The numbers only reflect membership of FFPLUM, but the Association believes that in 2009 that there were a further estimated 1,000 ULM pilots who are members of the FFA and a further estimated 1,000 who are believed to be active ULM pilots but are not members of any of the recognised national recreational / light aviation air bodies.

The trend shows a consistent growth in participation of microlighting since its origins in the early 1980s.

There is no legal requirement for French microlight pilots to keep a pilot’s logbook (though we were told many do) therefore, complete records of all annual flying hours in microlights in France do not exist. However, pilots have made annual returns of hours from 2004 onwards on a voluntary basis to FFPLUM when renewing their membership.

The following table of estimated annual flying hours is based on these voluntary returns, assuming the overall individual pilots’ hours figures are accurate +/- 5%; the figures below have then been extrapolated for the FFPLUM members’ returns by grossing up for the total estimated number of microlight pilots in France. The additional pilots are assumed to do the same average number of hours p.a. as the FFPLUM members.

Year	1990	1995	2000	2004	2005	2006	2007
No. of Pilots	5,360	5,238	7,501	9,842	10,532	11,262	12,496
No. of flying hours per annum	-	-	-	288,483	304,374	371,838	386,710
No. of pilots reporting flying hours	-	-	-	4,934	5,456	6,861	7,702
% of members reporting activity	-	-	-	50%	51%	61%	61%
Extrapolated annual flying hours national fleet	-	-	-	432,700	459,600	598,660	622,600

With the non-membership pilots included, there was a probable annual activity rate approaching 750,000 flying hours in 2009.

6.6.6 Studies and reports on French microlight accidents

Several studies and reports are available:

1. BEA regular accident bulletins, containing individual accident reports and periodically providing summarised accident data for each year, usually two or three years in arrears
2. BEA selective studies on particular accident trends
3. DGAC annual accident statistical data
4. FFPLUM annual accident reviews, which provide summary data on all reported accidents. This data includes annual tables of fatal accidents, fatalities, serious injury accidents, number of personnel subject to serious injuries, and accidents without injury or fatalities.

In April 2007 a report was published by the Inspection générale de l'aviation civile on "Sécurité de l'activite 'vol à moteur' de l'aviation générale" – Safety of GA powered flight activities. This is a comprehensive report and is used in this study as a reliable source of data, observations and conclusions on microlighting safety outcomes in France, as well as comparative data for other light GA activities.

Comprehensive accident data is available for 1990, 1995, 2000 and from 2004 to 2008 inclusive, but complete data for 2009 is not yet available.

Subject to the various caveats concerning data completeness, accuracy and time span contained in this section of the report, the following approximate microlight accident rates per 100,000 hours have been calculated

France Microlights	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
Number of accidents											
Fatal accidents – trike & 3-axis	8	16	11	17	19	10	12	15	16	23	147
Serious injury accidents – trike & 3-axis											
Total all accidents – trike & 3-axis	55	91	77	96	98	99	89	82	103	66	856
Exposure data (000s hours)											
Microlight reported annual hours (inc. PPGs, paramotors and autogyros) – 000s	255	267	271	310	433	460	599	622	650	700	4567
Accident Rates – trikes & 3 axis only											
Fatal accident rate per 100,000 hours	3.1	6.0	4.1	5.5	4.4	2.2	2.0	2.4	2.5	3.3	3.2
All accidents rate per 100,000 hours	22	34	28	31	23	21	15	13	16	9	19
Fatal accident rate per 1,000 aircraft	1.6	3.1	2.0	2.9	3.0	1.5	2.0	2.1	2.2	3.0	2.3
All accidents rate per 1,000 aircraft	28	46	37	40	39	37	33	29	36	23	34

Note: Annual hours are partly based on surveys (2004 to 2007), extrapolated to the total estimated national pilot population; other years' hours are estimated.

6.6.8 Accident trends

The accident data does not comprise a long enough time span to calculate statistically meaningful trends.

6.6.9 Causal Analyses

For the years 2004 to 2008 the data is supported by individual accident report one-line summaries in the FFPLUM publications indicating the nature of the accident and in some cases the cause of the accident.

There is no comprehensive cumulative, year-by-year causal analysis of accidents in numerical terms; each year is reported in isolation. Some of the 'one-off' studies do focus on particular causes of accidents. However, no statistically valid analysis of causes over a longer period of time is available.

Appendix 2B

France

Light Aeroplane Accidents

Data sources

Accident rates

France GA Aircraft >450 kg	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*Total*
Number of accidents											
Fatal accidents											
Serious injury accidents											
Total all accidents											
Fatalities and serious injury											
Fatalities											
Serious injuries											
Aircraft reported annual hours											
Accident Rates											
Fatal accident rate per 100,000 hours											
All accidents rate per 100,000 hours											

Source: DGAC report April 2007 – GA accidents

Appendix 2C

France

Gliding Accidents and Accident Rates

Data sources

DGAC, FFVV and EGU.

Completeness and accuracy of data

Number of gliders

Data for 2008 and 2009 is awaited. There is doubt that the glider population data for 2000 to 2007 is understated, which if the case would reduce the quoted accident rates per glider in this report. Further clarification of the data may be obtained before competition of the final report.

Number of glider pilots

The data originates from the FFVV and is believed to be accurate, as it is based on membership returns from clubs.

Activity levels

Annual flight numbers also originate from the club returns to the FFVV and are believed to be reasonably accurate. However, by the nature of the recording systems, there may be some understatement.

Accident data

The accident data does not identify accidents in France to French registered gliders and those to non-French gliders visiting France. If the latter are excluded then the numbers of accidents in France may therefore be understated. Further clarification is being sought on the scope of the accident data, and will be included in the final report should any changes be identified.

Accident rates

FRANCE Gliding	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
Number of accidents											
- Fatal	1	6	5	8	3	5	6	2	O/S	O/S	36
- Total	34	45	36	36	35	34	27	26	O/S	O/S	273
Accident Rates per 100,000 **Hours**											
- Fatal accidents	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
- Total accidents	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Accident Rates per 100,000 **Flights**											
- Fatal accidents	0.52	3.01	2.68	4.07	1.69	2.89	3.63	1.20	O/S	O/S	2.47
- Total accidents	17.6	22.6	19.3	18.3	19.7	19.6	16.3	15.6	O/S	O/S	18.7
Accident Rates per 1,000 **Gliders**											
- Fatal accidents	0.5	3.4	3.0	5.0	1.9	3.1	3.5	1.3	O/S	O/S	2.7
- Total accidents	18.6	25.7	21.6	22.4	22.8	21.0	15.6	17.0	O/S	O/S	20.8

Source: DGAC report April 2007 – GA accidents

Accident trends

No particular trends are identifiable.

Causal analyses of accidents

No comprehensive causal analyses were available. However, a brief commentary is included in paragraph 7.8.3 in Section B in respect of the nature of ‘alpine gliding’.

Appendix 3A

Germany
Microlight Accidents and Accident Rates

The accident numbers that have been ascertained for this report come primarily from the annual accident data presentations of DAeC, which covers mainly 3-axis microlights. Although it is believed the DAeC data is complete, there is no guarantee in view of the lack of mandatory reporting. Data in respect of weight-shift microlights, including some or all accident, data, is missing due to the representative of the DULV not meeting or communicating with the study team.

Data sources

The sources for the various data in this report are:

- LBA
- BFU
- DAeC
- EMF (via Jan Fridrich of Czech LAA)

The study team wanted to interview the DULV representative but unfortunately did not receive co-operation.

The German national register of aircraft and the database of licensed pilots are not available as public databases.

The study team acknowledges with thanks the efforts of these five organisations for providing what data they could.

Aircraft classes

Microlight aircraft are categorised into weight-shift, 3-axis and autogyros.

Studies and reports on Microlight accidents

No comprehensive studies or reports were identified during the data collection phase, other than the summarised database provided by the EMF and the information provided by DAeC.

Completeness and accuracy of data

Microlights

The data for number of microlights for the years 2001 to 2006 was obtained from the EMF. In turn these data were collected from the EMF national members. An estimate of microlight aircraft population from DAeC for 2009 was 1,500 but this figure is much lower than the EMF figures for earlier years. The accuracy of either dataset cannot therefore be assessed as having a high level of confidence.

Pilots

Apart from a figure of 13,800 licensed microlight pilots in 2009, obtained from DAeC, the only other pilot population data was in the form of the DAeC annual report for 2009 presented at Friedrichshafen Aero in April 2010 and listing membership numbers for 2001 to 2009. The pilot population figures are members of DAeC. Whilst the numbers for some aviation activities such as gliding are likely to embrace all or nearly all glider pilots (because of the club-based structure for activities), for other activities the numbers may not reflect the full national picture of microlight pilots.

Activity

Annual activity data for microlighting does not exist, or at least does not exist in an easily available summarised form for any of the years under review. The best estimate of the average annual operating hours per aircraft was provided by DAeC, at 69 hours per annum. This has been used to extrapolate a total hours' activity, but as it uses unverified data for the number of microlight aircraft, not much reliance should be placed on the resulting numbers and resulting accident rates.

Accidents

In the absence of mandatory reporting to the BFU for most of the years 2000 to 2009, accident data is based primarily on DAeC annual presentations for microlight activity. It is not complete for the ten-year period. Comprehensive statistics for serious injury accidents are generally not available. Causal analyses, where available in summary, are limited mainly to analysing in which phase of flight the accident happened, without showing the likely 'real' cause, particularly for fatal accidents with no survivors.

Population and Activity data

Germany Microlights	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of Microlights	2550*	2694	2462	2466	2449	2421	2437	2450*	2465*	2500*
Pilots	N/A	10951	11955	12587	12555	12594	12594	N/A	N/A	13800
Hours	N/A	188580	172340	172620	171430	169470	170590	175000*	175000*	175000*

Note: * estimated numbers

Annual activity (hours) is based on a common average number of hours per aircraft p.a.

Accident data

The reporting of microlight accidents was not mandatory from 1998 to 2007 and as a result the data from the BFU is incomplete for the ten year span

The accident data from the BFU for the 10 years 1988 to 1997 is shown in a separate table below.

The accident data supplied by the DAeC, which it is understood covers 3-axis only, is shown below. No data was received from the DULV relating to weight-shift.

Microlights GERMANY	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
	Note 1		Note 3			Note 2		Note 1			
* estimated numbers to provide 10 year dataset	**Number of fatal accidents**										
Fatal accidents weight-shift (DULV)	Data not available from the DULV										
Fatal accidents (Trikes & 3-axis) (per DAeC)	4*	5	4	3	7	7	7	7*	15	8	67
	Total number of accidents										
Total of all accidents 3-axis – per EMF		46	70	57	52	48	51	?	?	?	
Total of all accidents – per DAeC	55*	52	78	66	56	62	53	60	63	40	585
	Number of fatalities or serious injury										
Fatalities – per DAeC & EMF (Note 3)		6	5	6	12	9	10	?	25	11	84+
Seriously injured per DAeC/ EMF	Note 3	10	4	12	2	7	7	?	?	?	
	Microlight reported annual hours flown (000's). Note 4										
000s hours	170.0*	188.6	172.3	172.6	171.4	169.5	170.6	175.0*	175.0*	175.0*	1,739.(
	Accident Rates per 100,000 hours – trikes & 3 axis only										
Fatal accident rate per 100,000 hours	2.35	2.67	2.33	1.73	4.09	4.12	4.09	4.00	8.57	4.57	3.85
All accidents rate per 100,000 hours	32.3	27.8	45.3	38.2	32.7	36.5	31.0	34.3	36.0	22.9	33.6

Source data – DAeC (annual presentations in powerpoint of microlight accidents) and EMF annual statistics survey.

Note 1: Fatal accidents: data missing for 2000 and 2007.Estimates inserted to complete 10 year dataset.

Note 2: 2005 fatalities – 8 per EMF

Note 3: 2002 Seriously injured persons - 7 per EMF

Note 4: The annual total hours are an extrapolation of the number of microlights per EMF x estimated 70 hours p.a. per aircraft (DAeC estimate). For 2007 to 2009 the number of microlights has been estimated by the Hawk team at approximately 2,500 for each year

Accident rates

Due to the lack of objectively measured microlight annual operating hours in Germany and also some questions over the reporting of accidents, no firm conclusions can be drawn from the data that has been made available. However, using the reported number of microlight aircraft and the estimated of 70 hours per aircraft p.a. provided by DAeC, on the face of it the fatal accident rate in Germany is generally **in the range of 2.0 to 4.0 per**

100,000 hours. 2008 would appear to be a statistical 'blip' with 15 fatal accidents, over twice the annual average rate.

Accident trends

The fatal accident trend appears to be consistent between 4 and 7 per annum, with 2008 being an exceptional bad year at 15. The total reported accidents would appear to be steady at around 60 per annum.

Causal Analyses

No comprehensive causal analyses for German microlighting could be established.

Relationship of microlight accidents to the German microlight regulatory framework

In the absence of available in-depth causal analyses, no overall conclusions can be drawn from the accident statistics on the relationship between microlight accidents and the regulatory framework.

However, 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 which proved to be fatal could have been a reason for the fatal nature of the accident. This is, in the BFU view, because at higher airspeeds the effect of deployment of a ballistic system can result in wrenching the whole system from the fuselage causing airframe failure. Whereas in cases where the aircraft was perhaps still flyable (engine failure only, or example) a better option for the pilot may have been to 'fly the aircraft' (glide it) to a forced landing. The BFU is considering the need to review the requirement for all microlights to be fitted with ballistic recovery systems.

Appendix 3B

Germany

Glider Data and Accidents

Data sources

Accident and activity data was initially available from the EGU accident database. The LBA provided an extract of the German aircraft registration database for 2001 to 2009, with gliders identifiable.

On 20th July 2010 the BFU provided an extensive database of glider accidents in Germany, amounting to some 1,046 individual records. Analysis of database has not been completed, an indeed may not be worthwhile as it appears not to identify those accidents which were fatal, nor other key data. If this data does prove worth analysing a summary of it will be incorporated in the final report.

Completeness and accuracy of data

Number of gliders

It is assumed that the numbers of gliders / sailplanes recorded in this extract are at a point in time for each year, rather than the average number of registered gliders / sailplanes during the year.

The extract is divided between 'pure' gliders / sailplanes and motor gliders which it is assumed comprises SLMGs, self-sustainers ('turbos'), and TMGs. TMGs in Germany are classified as gliders not aeroplanes.

As the data listed was provided by the LBA, and all gliders including any Annex II gliders have to be registered in the LBA national register, it is assumed this is an accurate record. Within these numbers the number of Annex II gliders is not identified.

As gliding is essentially a non-commercial activity, the question of gliders / sailplanes certified for commercial operations does not arise.

Subject to the above matters, the extract is believed to be complete and accurate to an order of 95% confidence.

Glider pilots

The only pilot population data was in the form of the DAeC annual report for 2009 presented at Friedrichshafen Aero in April 2010 and listing membership numbers for 2001 to 2009. The pilot population figures are members of DAeC. The reported numbers for aviation activities such as gliding are likely to embrace all or nearly all German glider pilots in because of the club-based structure for gliding activities linked to DAeC.

In the absence of any other available data, the numbers from the DAeC 2009 report are included below.

Activity levels

Records of nationally aggregated annual operating hours of gliders and motor-gliders do not exist. The figures in the table below for the annual number of flights are estimates from 2001 from the DAeC, provided to EGU.

Accident records

The data from the EGU accident database is used for this interim report. It will be checked and validated against the BFU database extract in the next phase of the study. In the meantime it is assumed to be accurate as regards fatal accident numbers to a 90% level of confidence.

Accident data

GERMANY Gliding	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
Number of accidents											
- Fatal	9	11	18	17	9	12	10	18	O/S	O/S	104
- Total	117	121	125	116	121	93	82	92	O/S	O/S	869
Accident Rates per 100,000 **Hours**											
- Fatal accidents	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
- Total accidents	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Accident Rates per 100,000 **Flights**											
- Fatal accidents	0.71	1.00	1.64	1.70	0.90	1.20	1.00	1.80	O/S	O/S	1.23
- Total accidents	9.3	11.0	11.4	11.6	12.1	9.3	8.4	9.2	O/S	O/S	10.3
Accident Rates per 1,000 **Gliders**											
- Fatal accidents	0.71	1.00	1.63	1.55	0.90	1.20	1.00	1.80	O/S	O/S	1.25
- Total accidents	9.3	11.0	11.4	10.5	12.1	9.3	8.2	9.2	O/S	O/S	10.4

Source: DAeC fatal accidents and launches

Causal analyses of accidents

Until the BFU database is analysed, no causal analyses are available. Once the analysis is done there is no certainty that a complete causal analysis will emerge.

Appendix 4A

Italy

Microlight Accidents and Accident Rates

Data sources

The primary data source for microlight population, activity and accident data was the AeCI with supplementary data from the microlight federation FIVU Investigation of air accidents in Italy is the responsibility of the local police,

Completeness and accuracy of data

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.

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 the same figure that has been indicated by most microlight stakeholder associations in other Member States.

Aircraft classes

In Italy the principle microlight classes are Flex wing and 3-axis; however there are significant numbers of other classes including powered-parachute, helicopters & gyroplanes.

The AeCI indicated that total microlight aircraft operating hours per annum were currently in the range of 600,000 to 800,000. For the number of active and current microlight pilots (c. 12,000) this translates to between 50 and 67 average hours per pilot per annum. Likewise, with a current microlight registered aircraft population of 10,126 (2009), this would equate to 60 and 80 hours per aircraft per annum.

In this report we have therefore adopted the above relationships between registered aircraft numbers and average flight hours to arrive at the estimated annual operating hours of the total fleet, as the denominator for the fatal accident rate.

FIVU provided the following data in relation to Italian microlight activity:

- Currently 128 microlight training schools
- In 2009 there were 1,698 new ULM pilot qualifications bringing an overall cumulative total of 44,073 microlight pilot licences since inception of microlighting.
- An estimated 12,000 active microlight pilots in 2010, of which 66% are flying powered aircraft.

8.7.6 Accident Data

In Italy, because microlights are not recognised as aircraft but as ‘vehicles’, the local police deal with accidents and incidents involving microlights. This means that accident data is not very reliable nor is it comprehensive. Whilst

some data is available, the true facts of accidents are only documented if a prosecution ensues and ends up in a Court of law with a legal ruling.

The AeCI supplied 'unofficial' accident data for fatal accidents for 2000 to 2009 by year.

ITALY	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
No .of Accidents	10	18	13	8	8	13	12	13	8	12	**115**
Fatalities	15	23	18	13	11	20	16	19	13	17	**165**

8.7.3 Accident Rates

Using the above data on reported fatal accidents, and the assumed correlation between the annual population of microlight aircraft and average operating hours per aircraft per annum, the following estimated fatal accident rates emerge:

Fatal Accidents – Powered Microlights			
Year	*No. of Accidents*	*Range of Estimated Hours p.a.(000s)*	*Estimated Fatal Accident Rate per 100,000 hours*
2000	10	375 - 500	2.67 to 2.00
2001	18	393 – 524	4.58 to 3.44
2002	13	413 – 551	3.15 to 2.36
2003	8	432 – 576	1.85 to 1.39
2004	8	462 – 615	1.73 to 1.30
2005	13	491 – 654	2.65 to 1.99
2006	12	518 – 691	2.32 to 1.74
2007	13	548 – 731	2.37 to 1.78
2008	8	580 – 773	1.38 to 1.03
2009	12	607 – 810	1.98 to 1.48
Total	115	4,819 – 6,425	2.39 to 1.79

The ten-year mean is therefore **around 2.09 fatal accidents per 100,000 hours**, based on the above assumptions for total operating hours per annum of the Italian microlight fleet.

The European Microlight Federation (EMF) has supplied data of accidents and incidents with fatal and serious injuries, and aircraft damage for the years 2001 to 2005. This data does not identify the number of fatal accidents, but otherwise correlates reasonably closely to the fatalities table above.

In view of the investigatory arrangements for microlight accidents in Italy (local police) no comprehensive causal analyses or summaries are available.

Appendix 5A

Netherlands
Microlight Accidents and Accident Rates

Data sources

The primary data source for microlight population, activity and accident data was the Dutch CAA with supplementary data from the Microlight section of the KNVvL Investigation of air accidents in the Netherlands is the responsibility of the Dutch CAA, but unless there is a fatality they generally do not get involved apart from recording the brief details of the event.

The CAA maintains records and statistics of accident reports when appropriate, with brief causal analyses.

There has been an issue with the availability of GA data from the NAA headquarters in The Hague, and comparative accident data is still awaited. However the accident data relating to microlights is comprehensive, although lacking in detailed causal analysis.

Completeness and accuracy of data

The data for microlight operating hours is not recorded by the CAA and is therefore an estimate from the KNVvL. The accident data for all accidents (2001 to 2009) is considered by the CAA to be complete and accurate.

Aircraft classes

In the Netherlands the principle microlight classes are 'trikes' (Flex wing), 3-axis and Powered-parachute.

Netherlands	***2000***	***2001***	***2002***	***2003***	***2004***	***2005***	***2006***	***2007***	***2008***	***2009***
No of Microlight aircraft	-	-	-	-	-	-	-	-	-	245
Microlight pilots	-	-	-	-	-	-	-	-	-	400
Microlight reported annual hours	-	-	-	-	-	-	-	-	-	9000

Studies and reports on microlight accidents

Investigation of air accidents in the Netherlands is the responsibility of the CAA, but unless there is a fatality they generally do not get involved apart from recording the brief details of the event.

The CAA maintains records and statistics of accident reports when appropriate, with brief causal analyses.

Accidents and Accident Rates

Netherlands Microlights	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*Total*
Number of accidents											
Fatal accidents – trike & 3-axis			1				1				2
Serious injury accidents – trike & 3-axis								1			1
Total all accidents – trike & 3-axis		1	2	0	0	1	2	2	4	-	12
Fatalities and serious injury											
Fatalities – trike & 3-axis			2				1				3
Serious injuries– trike & 3-axis							1	1			2
Microlight reported annual hours (000's)										9	

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 draw any conclusions about accident rates.

Accident trends

The accident data does not comprise a long enough time span to calculate statistically meaningful trends.

Causal Analyses

There is a brief causal analysis for each of the recorded accidents. The Three fatalities were caused by piloting incidents and a suspected medical problem (although this was not confirmed by the official report into the accident).

Appendix 5B

Netherlands

Glider Data, Accidents and Accident Rates

Aircraft groups and classes

The only category of aircraft with any reasonable numbers and adequate data availability is gliding. Powered GA accident statistics were not available

Data Sources

Data has been drawn from the EGU statistical database, in which the Netherlands data was provided by KNVvL. It is up to 2007. Data for 2008 and 2009 is expected to be received after delivery of this interim report and will be included in the phase 2 report.

Accident data for 2000 to 2008 has been drawn from the EGU database.

Studies and reports on gliding accidents

No separate studies or reports on Netherlands gliding accidents have been identified, yet.

Completeness and accuracy of data

Number of gliders

Subject to missing data for 2008 and 2009 (see above) the data is believed to be complete and accurate with a 95% confidence level.

Numbers of glider pilots

Subject to missing data for 2008 and 2009 (see above) the data is believed to be complete and accurate with a 95% confidence level.

Activity levels

As with other countries' gliding activities, levels of activity measured in hours in not available, but instead the number of launches (flights) is available. The KNVvL figures submitted to the EGU are rounded thousands p.a. and are therefore not considered as highly accurate. Subject to missing data for 2008 and 2009 (see above) a confidence level of 85% is given for these annual flight numbers

Accident data

The data for the number of fatal accidents, and for the total number of accidents, 2000 to 2007 is taken from the KNVvL returns to the EGU. Subject to missing data for 2008 and 2009 (see above) the figures are believed to be complete and accurate to a confidence level of 98% and 90% respectively.

Accident data

Netherlands Gliders	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*Total 00-07*
Number of accidents											
Fatal accidents	0	1	2	1	0	1	0	1	N/A	N/A	6
Serious injury accidents											
Total all accidents	20	21	38	36	13	14	16	16	N/A	N/A	174
Fatalities and serious injury											
Fatalities	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	40
Serious injuries	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Gliding annual flights ('000s)	140	150	135	140	127	125	115	126	N/A	N/A	1058
Accident Rates per 100,000 flights											
Fatal accident rate	0	0.6	1.5	0.7	0	0.8	0	0.8	N/A	N/A	5.7
All accidents rate	14	14	28	26	10	11	14	13	N/A	N/A	16

Source: EGU accident surveys

Source: EGU accident surveys and Gliding International magazine (fatalities 10 years figure)

Accident trends

As the numbers of fatal accidents is small, it is not appropriate to try and detect any trend.

The trend for the total number of accidents is essentially a decreasing one after the higher number years of 2002 and 2003.

Appendix 6A

Norway

Microlight Accidents and Accident Rates

Data Sources

The NLF supplied all the data on microlight population statistics, activity levels and accidents, with causal analyses.

Completeness and accuracy of microlight data

The data for microlight operating hours is recorded by NLF is complete and accurate to a 95% confidence level. The accident data for all accidents (2005 to 2009) is considered by NLF to be complete and accurate of the same confidence level, with fatal accident data for 2000 to 2009 100% complete.

Aircraft classes

In Norway the three principle microlight classes are Flex wing, 3-axis and autogyros. Autogyros are excluded in this report although the annual operating hours include autogyros as these are not separated in the database.

Studies and reports on Norwegian microlight accidents

Investigation of air accidents in Norway is the responsibility of the NLF under delegation.

The NLF maintains comprehensive records and statistics of accident reports, with brief causal analyses.

Accident data

NORWAY 3-axis & weight-shift	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	10 years
Number of accidents											
Fatal accidents	1					1					2
Serious injury accidents		1							2		3
Total all accidents	5	11	15	15	17	13	20	16	16	23	151
Number of fatalities or serious injury											
Fatalities	2					2					4
Seriously injured persons		1							?		1
Microlight reported annual ('000s) hours flown	4.5	5.3	5.2	5.7	6.2	7.0	7.5	9.3	11.3	10.7	72.8
Accident Rates per 100,000 hours											
Fatal accident rate	22	0	0	0	0	14	0	0	0	0	2.75
All accidents rate	110	210	290	270	270	143	268	172	141	214	207

Source: Microlight Section of the Norwegian Air Sports Federation

The NLF has provided the total accident rate for 2000 to 2004 but not the total number of accidents. In order to calculate a 10 year total accident rate, these have been 'back-calculated' by reference to the operating hours' data, and are highlighted in the table above in blue

Accident trends

The fatal accident numbers (only 2 in 10 years) are (fortunately) too small to determine any trend.

The available total accident numbers for 5 years 2005 to 2009 represent too short a time period to determine any trend.

Appendix 6B

Norway

Gliding Accidents Data and Accident Rates

Data Sources

Data has been drawn from the EGU statistical database, in which the data for Norway was provided by the NLF. It is up to 2007. Data for 2008 and 2009 is expected to be received after delivery of this interim

Accident data for 2000 to 2008 has been drawn from the EGU database.

Studies and reports on gliding accidents

No separate studies or reports on Norwegian gliding accidents have been identified, yet.

Completeness and accuracy of data

Number of gliders

Subject to missing data for 2008 and 2009 (see above) the data is believed to be complete and accurate with a 95% confidence level.

Pilot numbers

Subject to missing data for 2008 and 2009 (see above) the data is believed to be complete and accurate with a 95% confidence level.

Activity levels

As with other countries' gliding activities, levels of activity measured in hours in not available, but instead the number of launches (flights) is available. The NLF figures submitted to the EGU are rounded thousands p.a. and are therefore not considered as highly accurate. Subject to missing data for 2008 and 2009 (see above) a confidence level of 85% is given for these annual flight numbers.

Accident data

The data for the number of fatal accidents, and for the total number of accidents, 2000 to 2007 is taken from the NLF returns to the EGU. Subject to missing data for 2008 and 2009 (see above) the figures are believed to be complete and accurate to a confidence level of 98% and 90% respectively.

Accident data

Norway Gliders	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*Total*
Number of accidents											
Fatal accidents	0	0	0	0	0	0	0	0	N/A	N/A	
Serious injury accidents	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Total all accidents	8	9	13	9	9	8	7	2	N/A	N/A	65
Fatalities and serious injury											
Fatalities	0	0	0	0	0	0	0	0	N/A	N/A	
Serious injuries	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Gliding annual flights ('000s)	12.0	12.0	14.5	13.0	12.0	10.5	9.5	9.5	N/A	N/A	106
Accident Rates per 100,000 flights											
Fatal accident rate	0	0	0	0	0	0	0	0	N/A	N/A	0
All accidents rate	67	75	89	69	75	76	74	21	N/A	N/A	61

Source: EGU accident surveys and Gliding International magazine (fatalities 10 years figure

Accident trends

The trend for the total number of accidents is constant at around 8 per annum, (except for a low number of 2 in 2007).

Appendix 7A

Sweden
Microlight Accidents and Accident Rates

Data sources

The primary data source for microlight population, activity and accident data was KSAK

Completeness and accuracy of microlight data

The data for microlight operating hours is assessed by KSAK as complete and accurate to a 95% confidence level. The accident data for all accidents is considered by KSAK to be complete and accurate of the same confidence level, with fatal accident data 100% complete. The data cover the years 1999 to 2009 but the analyses used for accident rates is mostly restricted to the ten year period 2000 – 2009.

Aircraft classes

In Sweden the three principle microlight classes are 'trikes' (Flex wing), 3-axis and autogyros. Autogyros are excluded in this report although the annual operating hours include autogyro hours as these are not separated in the database.

Studies and reports on Swedish microlight accidents

Investigation of air accidents in Sweden is the responsibility of the Swedish Accident Investigation Board – Statens Haverikommission (SHK). However, the SHK rarely investigates microlight accidents, this being left to KSAK. Fatal accident investigations are conducted by the Swedish Police.

KSAK maintains comprehensive records of accident reports, with causal analyses, though these tend to be categorised by phase of flight rather than by root cause.

Accident data

SWEDEN Trike & 3-Axis Microlights	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
	Number of accidents										
Fatal	0	0	0	1	0	2	1	1	1	0	6
Serious injury	3	1	2	0	0	0	0	1	1	0	8
Total accidents -	10	9	13	11	10	13	5	15	11	7	104
	Number of fatalities or serious injury										
Fatalities	0	0	0	1	0	2	1	2	1	0	7
Seriously injured	3	2	2	0	0	0	0	2	1	0	10
	Exposure levels (inc. autogyros)										
000's Hours	7.82	9.02	10.1	13.1	15.9	15.0	20.2	18.8	25.2	23.5	158.8
	Accident Rates per 100,000 hours										
Fatal accident rate	0	0	0	7.6	0	13.3	4.9	5.3	4.0	0	3.1
Total accidents rate	128	100	128	84	62	86	25	80	44	34	65
	Accident Rates per 1,000 microlight aeroplanes										
Fatal accident rate	0	0	0	3.0	0	5.7	0	2.7	2.6	0	1.4
Total accidents rate	33	29	41	33	29	37	14	41	29	18	30

Data sources: *(a) Swedish Transport Agency (STA) publication 17 June 2009*
(b) Microlight Section of the Swedish Royal Aero Club (KSAK) / Tomas Backman – 29th March 2010

Accident rates

Over the ten-year period 2000 – 2009 there were six fatal accidents (seven fatalities) involving either trike or 3-axis microlights in Sweden, with a 10 year activity exposure of approximately 159,000 hours. This translates into an average ten-year rate of ***3.1 fatal accidents per 100,000 hours***. In four years of the ten-year period there was one fatal accident and two fatal accidents in one other year.

In the same period there were eight accidents resulting in serious injury to occupants (10 persons), which translates into an average ten-year rate of 5.0 serious injury accidents per 100,000 hours. Six of the serious injury accidents occurred in the years 2000 – 2002 with the remaining two in 2007 and 2008.

As the numbers of fatal and serious injury accidents and the related exposure values are very small on an annual basis, no statistical significance can be attached to the annual figures. However, over the ten-year period the numbers can be regarded as leaning towards a statistical significance, though interpretation of any trends should be avoided in view of the small numbers and randomness involved

The total of all accidents (fatal + serious injury + minor injury + airframe only) over the ten-year period numbers 106 for trikes and 3-axis. This is an overall average ***total accident rate of 65 per 100,000 hours***. Excluding

the fatal and serious injury accidents the overall average for minor injury and airframe-only accidents is 58.2 per 100,000 hours.

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Accident trends

Due to the small numbers of fatal and serious injury accidents involved over the ten-year period, no discernable trend can be identified in these categories of accident.

The trend in the rate per 100,000 hours of all accidents is downwards over the eleven / ten year period from a high point of 212 per 100,000 hrs in 1999, 28 per 100,000 in 2000 to 34 per 100,000 in 2009, (with some contra-trend movements in 2005 and 2007).

Causal Analyses

The causal analyses in the summarised information provided initially by KSAK showed only a broad categorisation between pilot errors and 'mechanical' failures. This was regarded as too coarse an analysis for the purpose of the study and therefore the Hawk team discussed each fatal and serious injury accident report for the eleven years of data with the Secretary-General of KSAK, Mr Rolf Björkman and Mr Tomas Backman of the microlight section. As a result of those discussions the Hawk team was able to compile a causal analysis which identified, as far as possible from the accident reports, a more accurate picture

From the eight fatal accident reports, including two for 1999, apart from one accident where the pilot was post-mortem diagnosed with alcohol as probably the main factor and one accident with 'cause unknown', pilot error was the predominant feature. When broken down further, most reports pointed to poor handling skills and / or lack of competence in being able to cope with a situation

In the eight serious injury accidents from 2000 – 2009, five were due to pilot loss of control or mishandling, one of which was by a pilot without a valid licence. In two cases the aircraft had been modified not in accordance with the technical information, resulting in an engine failure in one case, and detachment of skis in another. The final case was a partial engine failure as a result of the mixture controls not producing the right supply to the engine, followed by poor decision-making for a forced landing.

Relationship of microlight accidents to the microlight regulatory framework

The regulatory framework appears to serve the microlight community well with a sound basis for safe flying. However, as in many other countries, when pilots do not fly within their abilities or competences, or outside the flight envelope and the rules then the inevitable is likely to happen.

Appendix 7B

Sweden
Light Aeroplanes Accidents Data and Accident Data

Data sources

Limited data was obtained on accidents from the published report Q1/2009 from the SDT. No other sources were established for population or activity data.

Studies and reports on light GA aeroplane accidents

Other than the published reports of the SDT no other comprehensive reports on GA aeroplane accidents were found or provided.

Completeness and accuracy of data

Number of aeroplanes No information was available.

Number of pilots No information was available.

Activity levels No information was available.

Accident data

Summarised numerical data on all accidents, with fatal accidents identified, was obtained from the SDT publication dated 17 June 2009. As accident reporting is mandatory in Sweden it is assumed that the reported number of accidents is complete and accurate. However, the data is for private aeroplane flying above the microlight MTOM threshold and therefore will include accidents involving aeroplanes > 1200kgs MTOM, which cannot be separated from within the data.

SWEDEN Light aeroplanes	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*Total*
					Number of accidents						
Fatal accidents	1	1	1	0	1	1	3	0	1	-	9
Total accidents -	25	22	24	17	19	12	10	13	17	O/S	159
					Exposure levels						
000's hours	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
					Accident Rates per 100,000 hours						
Fatal accident rate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
All accidents rate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
					Accident Rates per 1,000 aeroplanes						
Fatal accident rate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
All accidents rate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Data source: Swedish Transport Agency publication 17 June 2009

Note: *Numbers of serious injury accidents, fatalities and seriously injured persons are not provided in the SDT publication*

Accident trends

The number of accidents is small over the 10 years and therefore randomness is statistical factor. As a result, no meaningful trends can be identified.

Causal analyses of accidents

No information on causes of accidents was found for the ten-year period.

Relationship of accidents to regulatory framework

No conclusions can be drawn due to the lack of available data.

Sweden
Gliding Accidents and Accident Rates

Data sources

Population data has been taken from the EGU statistical database, in which the Swedish data was provided by the Swedish Soaring Federation (SSF). Data for 2008 and 2009 may be received after delivery of this interim report.

Accident and activity data for 2000 to 2009 has been provided by the SSF. The STB report in 2009 fatal and total accident was also available up to 2008.

Studies and reports on gliding accidents

The SSF has conducted several safety reviews and initiatives over the last 15 or so years. The study team has requested copies of these but has so far not received them.

Completeness and accuracy of data

Number of gliders

Subject to missing data for 2008 and 2009 the glider population data provided by SSF is believed to be complete and accurate with a 95% confidence level.

Number of glider pilots

Subject to missing data for 2008 and 2009 (see above) the pilot population data by SSF is believed to be complete and accurate with a 95% confidence level.

Activity levels

Levels of activity measured in hours and numbers of launches (flights) are provided by the SSF. These data are provided through gliding clubs' annual returns.

The exposure data is considered fairly indicative of gliding activity in Sweden (subject to some rounding), with a 90% confidence level.

SWEDEN Gliding	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
Hours	31,400	35,500	38,100	36,300	33,000	32,700	31,600	26,400	28,500	27,500	
Flights	56,400	58,900	60,400	55,800	52,165	51,800	46,400	41,400	40,400	40,700	

Data source: Swedish Soaring Federation (SSF) 19 August 2010.

Accident data

The fatal accident data agrees between the STB and SSF. The data is assessed as 100% accurate, as is the data on serious injury accidents and the related number of seriously injured persons.

The total number of accidents varies between these two sources usually by one or two (except 2002). That is probably due to either definition issues between accidents and incidents or classification issues with TMGs or SLMGs. Subject to that the figures are believed to be reasonably complete and accurate.

Accident data – Gliding including motor gliders

SWEDEN Gliding	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
Number of accidents											
- Fatal	0	0	1	0	1	1	0	0	3	1	**7**
- Total	16	18	18	15	17	8	7	9	11	8	127
Accident Rates per 100,000 **Hours**											
- Fatal accidents	0	0	2.62	0	3.03	3.06	0	0	10.52	3.64	**2.18**
- Total accidents	51.0	50.7	47.2	41.3	51.5	24.5	22.2	34.1	38.6	29.1	39.6
Accident Rates per 100,000 **Flights**											
- Fatal accidents	0	0	1.65	0	1.92	1.93	0	0	7.43	2.46	**1.39**
- Total accidents	28.4	30.6	29.8	26.9	32.6	15.4	15.1	21.7	27.2	19.7	25.2
Accident Rates per 1,000 **Gliders**											
- Fatal accidents	0	0	2.0	0	2.2	2.2	0	0	7.1	2.4	1.5 Av p.a.
- Total accidents	32.6	37.1	36.7	30.9	37.9	17.7	16.6	21.4	25.9	18.8	28.0 Av p.a.

Data source: (a) Swedish Transport Board (STB) publication 17 June 2009
(b) Accident data - Swedish Soaring Federation (SSF) 19 August 2010. Rates calculated by Hawk

Accident trends

The fatal accident numbers are probably random.

The total accident numbers show a downward trend over the ten year period. Further information will be sought on this trend as it is believed that the SSF has been proactive in its safety programmes, for which some correlation with the number of accidents may be evident.

Causal analyses of accidents

The study team is awaiting further information from the SSF in respect of causal analyses, which it is understood exist. The limited information provided to date shows the following:

In terms of phases of flight, of the total of 127 accidents (including fatal) reported over the years some 43 involved out-landings away from an airfield. In only 2 cases was stalling or spinning identified as the cause. In 79 cases the accidents were ascribed to ‘pilot error during take off or landing’. No airworthiness or medical issues were highlighted in the high-level summarisation of accidents.

Relationship of accidents to regulatory framework

The study team is awaiting information from the SSF to ascertain if there is any correlation between accidents rates and the regulatory framework, which is largely a devolved one for gliding in Sweden.

Appendix 8 A

United Kingdom

Microlight Accidents and Accident Rates

Data sources

Numbers of microlight aircraft at the end of each year are contained in the published CAA aircraft register statistics. Additionally the BMAA has supplied permit-to-fly data for aircraft for both new issues and revalidation data from 2000 to 2009.

As regards microlight pilot numbers, the UK introduced the National Private Pilot's Licence in August 2002, with a subdivisions for Single Engine Plane (SEP), Self Launching Motor Glider (SLMG) and Microlight (M). Pilots with a higher level valid licence to fly microlights before the introduction of the NPPL were allowed to continue to fly on their previously held licences.

Data on microlight accidents and, for 2009 only, operating hours in the UK has been obtained from the BMAA and the UK CAA.

Completeness and accuracy of microlight data

As national registration was mandatory throughout the 10 years, the microlight aircraft numbers in the UK CAA database are considered to be complete and accurate, subject only to the usual time lags of notifications of cancellation of registrations in the case of accidents or exports.

The UK CAA record of the number of valid pilot licences at a particular date was published at certain intervals during the 10 year period. The validity criteria were the holding of a medical certificate at the census date. As microlight licences require only a locally recorded medical declaration, unfortunately the CAA database does not provide the required statistics.

In the absence of a record of the 'stock' of valid microlight pilot licences at any point in time, the next best measure of active microlight pilots is the record of NPPL (M) licences issued. These are then cumulated, but of course the cumulative figures do not represent the total number of active licence holders at a point in time because no account is taken of non-renewal of licences for experience requirements, medical compliance, deaths or pilots 'dropping out'.

Fatal injury and serious injury accident data is likely to be complete (but 2006 to 2009 only for serious injury accidents); lesser accident categories rely on the openness of the pilots involved: in the UK this is likely to result in a large proportion of accidents being correctly reported, but with no guarantee.

Data for operating hours was recorded by the BMAA for 2009 for a sample of aircraft having their Permit-To-Fly renewed, to be converted to an average flight hours per aircraft statistic. The sampled figures are considered to be accurate +/- 10%.

No comprehensive causal analysis is available; the accidents are only classified by phase of flight.

Aircraft classes

Microlight aircraft are categorised into weight-shift and 3-axis.

Studies and reports on UK microlight accidents

The BMAA records all reported accidents. Accidents are categorised as fatal / non-fatal, weight-shift or 3 axis control type, number of injured persons by type of injury (fatal, serious, minor, none), private or training flight, and phase of flight (taxy, take off, initial climb, climb, cruise, approach, landing, or flight/ground). These records are only available from 2006 onwards.

Activity data

The BMAA provided a summary of 2010 permit-to-fly revalidation data to date (11th June 2010) relating to aircraft hours flown. Revalidations for the 698 aircraft that were either new in 2009 or were previously permitted in 2009 were performed to the date of provision of the data, reporting a total of 44,024 hours flown between 31 December 2008 and 31 December 2009, an average of 63 hours per aircraft. The figure is likely to include private, joint-owned and training aircraft. There is no reason to assume that this figure is unrepresentative of UK microlight aircraft use.

Comparative operating hours' figures were not available for previous years. Therefore, for the purposes of arriving at a denominator to measure accident rates, a figure of 63 hours per aircraft per annum has been used.

The resulting activity hours' figures are:

UK	***2000***	***2001***	***2002***	***2003***	***2004***	***2005***	***2006***	***2007***	***2008***	***2009***
Hours	110,376	115,731	117,180	126,756	129,591	127,827	124,173	128,961	129,528	128,268

Accident Data

UK Microlights	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
Number of accidents											
Fatal accidents trikes Fatal accidents – 3-axis	1	2	1	2	4	1	1 2	4	1	1	20
Serious injury accidents – trikes							6	5	3	2	16
Serious injury accidents – 3-axis							1	2	4	6	13
Total all accidents – trike & 3-axis (Note 2)						31	58	74	69	81	313
Number of fatalities and serious injury											
Fatalities – trike & 3-axis							4	5	1	2	12
Seriously injured persons – trike & 3-axis						7	10	9	7	10	43
Microlight reported annual hours (,000) (note 1)	110.4	115.7	117.2	126.8	129.6	127.8	124.1	129.0	129.5	128.3	1238.4
Accident Rates – trikes & 3 axis											
Fatal accident rate per 100,000 hours	0.91	1.73	0.85	1.58	3.09	0.78	2.42	3.10	0.77	0.78	1.61
Serious injury accident rate per 100,000 hours (see note 2)							5.64	5.43	5.40	6.24	5.68

Source data – British Microlight Aircraft Association (and CAA 'Gasil' publication)

Note 1: Annual flight hours of the UK microlight fleet are calculated on the number of Permits-to-Fly issued / renewed for each year multiplied by the average annual flight hours (63 hours) of a sample of 698 aircraft under the airworthiness control of the BMAA in 2009.

Note 2: The records of serious injury and total accidents are limited to 2006 to 2009.

Accident trends

The number of fatal accidents with microlight aircraft from 1990 - 2009 has been constant at between 1 and 2 per annum, except for 2004 and 2007 when there were 4 in each year (source UK CAA 'GASIL'). The five year moving average from 1994 to 2009 is a low of 1.8 to a high of 2.8 fatal accidents per year.

Causal Analyses

There are no available summarised records of causal analysis for UK microlight accidents. The causal analyses could only be ascertained by analysing each individual accident report over the ten year period. If these reports are made available an attempt to determine causes will be undertaken for the final report.

Relationship of microlight accidents to the UK microlight regulatory framework

The UK microlight environment is one of the most highly regulated of the countries reviewed, certainly in terms of original airworthiness and requirements for pilots to obtain a licence. The original airworthiness regulations are delegated to the BMAA in terms of compliance and controlling the applications for and renewals of Permits-to-Fly. The BMAA is active as the main national members' association (the other is the LAA) in providing safety and training guidance for microlighting.

This combination of state rules for all aspects of microlighting combined with a very pro-active stance of the national associations would appear to result in a relatively low fatal accident rate of 1.61 (+/- maybe 15% to reflect uncertainty of the operating hours' statistical basis) per 100,000 hours.

Without the required causal analyses, no overall conclusions can be drawn on the reasons for the fatal and serious injury accidents.

Appendix 8B

United Kingdom

Light Aeroplane Accidents data and accident rates

Data sources

Data for the number of UK registered aeroplanes has been obtained from the published UK CAA aircraft register statistics at the end of each year. However, the MTOM thresholds in the published summaries are set at 750kgs and then 5,700 kgs. There is no sub division at 1,200kgs or even 2,000kgs.

Data on UK aeroplane accidents was obtained from the UK CAA. In addition the CAA publishes CAP 780 (Civil Aviation Publication - Aviation Safety Review) in November 2008 spanning the 10 years from 1998 to 2007.

In the light of difficulties extracting data, particularly exposure data, for aeroplanes < 1200kgs MTOM significant use has been made of the observations and statistical conclusions contained in CAP 780, even though the 10 year time period is not aligned with the focus in this interim report on the years 2000 to 2009.

Completeness and accuracy of data

Number of aeroplanes

National registration of aeroplanes is mandatory and therefore, subject to the caveat above concerning the MTOM thresholds in the published annual statistics from the UK CAA aircraft register, the data is considered to be complete and accurate. The numbers of aircraft on the register does not however mean they are all active. A significant number, particularly of the lower weight aeroplanes, will be 'laid-up' or on long-term repair, maintenance or refurbishment.

As SLMGs are classified as aeroplanes they are included in the aeroplane data table below. However, the indeterminate numbers that are self-launching sailplanes within the SLMG numbers should be regarded as gliders for the purposes of this study. The remainder will be TMGs.

Number of pilots

The published summaries of the CAA database for the various categories of valid pilot licences at 31 March are not available for each of the 10 years under review. The validity criteria are the holding of a current medical certificate. However, with the advent of the UK NPPL (A) in August 2002 – enabling the holder to fly aeroplanes up to 2,000kgs MTOM with a requirement only for an endorsed medical declaration - such licence holders are not included in the statistics. At the current time there are an estimated 3,800 pilots holding the NPPL (A) licence.

Further, many private pilots hold higher level licences such as a CPL or an ATPL with privileges that can be exercised on light aeroplanes < 1,200 kgs MTOM. Added to these limitations in arriving at an accurate data set of licence holders for aeroplanes < 1,200 kgs MTOM is the fact that any pilot

population data would not identify whether the pilots are only flying aeroplanes less than 1,200kgs MTOM.

Accident data

The work conducted for this study required extensive analysis of data provided by the UK CAA in order to separate fatal and serious injury accidents involving aeroplanes < 1,200kgs MTOM. Mandatory reporting of all accidents and incidents leads to the conclusion that the resulting data in the tables below and in the Annex are not less than 95% accurate and complete.

UK Light Aeroplanes	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
Number of fatal accidents											
UK aeroplanes & TMGs in UK	6	4	3	1	2	10	3	7	3	7	46
UK aeroplanes & TMGs abroad		1					2	1	1		5
Fatal accidents – UK aeroplane or TMG / glider mid-air collisions in UK (included in glider statistics)		2								1	3
Fatal accidents – aeroplane / microlight mid-air collisions in UK (included in microlight stats)						1					1
Total Fatal accidents	6	7	3	1	2	11	5	8	4	8	55
Fatalities in aeroplanes &TMGs	9	7	5	2	3	17	6	16	12	14	91
Accident Rates	See note above re activity exposure. Data not available for aeroplanes < 1200kgs										

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.

Accident trends

No particular trends could be identified from the relatively low numbers of fatal accidents in relation to what must be a relatively large activity level through the ten years.

Causal analyses of accidents

Information is the study team is still trying to identify a source of causal analyses for light aeroplane accidents. It is thought that such an analysis may exist in GASCO – the General Aviation Safety Council. The recently retired CEO was a leading analyst of GA accidents for many years.

If this information is obtained it will be included in the final report.

Relationship of accidents to regulatory framework

The assumed low fatal accident rate reflects well the regulatory environment in the UK, particularly the lack of airframe related airworthiness failures.

United Kingdom
Gliding Accidents and Accident rates

Data sources

Data on UK gliding accidents was obtained from the British Gliding Association (BGA). The BGA has been responsible for all accident investigations under delegation from the UK AAIB for many years and has collected and maintained comprehensive gliding accident records since 1974. The UK AAIB investigates fatal accidents, often with the assistance of the BGA's specialist team of accident investigators.

Data on glider and pilot populations and activity levels in UK gliding comprises the aggregate of annual statistical returns from UK gliding clubs to the BGA. Coverage is virtually 100%.

Studies and reports on gliding accidents

The BGA publishes an annual report on accidents in gliding. Apart from providing the statistics, the report analyses and summarises the causes of all accidents. This provides a very useful tool for the safety management aspects of UK gliding through the development of specific initiatives that address the main causes of not just fatal and serious injury accidents but all accidents and incidents.

Completeness and accuracy of data

UK gliding has been outside the scope of state regulation since 1948 until the advent of EASA original airworthiness regulation and rules, applied by the UK CAA from 2007/08 During this long period the BGA has been the governing body of gliding with self-regulatory responsibility for all aspects of gliding other than airspace access, radio frequencies and their use and UK Rules of the Air.

Number of gliders

Prior to EASA airworthiness regulations affecting UK gliding (2007), gliders did not have to be state registered; the BGA maintained the national register of gliders. As a glider had to have a BGA C of A to be able to be flown, the BGA national register during this period would have been accurate to at least a 95% confidence level. However, no records have been maintained of the past number of gliders on the BGA national database. Therefore this data has been obtained from the published annual returns from clubs of the number of gliders based at each club. It is considered that this record is likely to be of a high order of accuracy at each census date, which for clubs was the end of their financial year. Allowing for different club financial years and the inherent risk of duplication or omission as a result, the confidence level in the accuracy of this data is more likely to be around 95% than 98%.

Glider pilots

As a result of UK gliding not being subject to state regulation for the most part, all gliding activities were under the auspices of the BGA, except where a club opted not to be part of the BGA system. There are very few cases in the past of clubs' non-membership of the BGA. The BGA has maintained a comprehensive database of glider and pilot population, activities and

accidents, as part of its SMS responsibilities as the governing body of UK gliding. There has never been a requirement to have a state glider pilot licence, with the result that there is no national database of glider pilot licence holders. The number of pilots in this study is determined from the clubs' annual club of 'full flying' members of each club.

Activity levels

Gliding clubs' records of the number of flights (launches) are assessed as c. 95% to 98% complete and accurate over the ten year period. The number of flight hours, obtained from the clubs' annual returns is likely to be less accurate due to some clubs including estimates in the returns each year. However, overall the accuracy of flight hours is thought to be c. 90% complete and accurate over the ten year period. The number of hours is more likely to be understated than overstated.

Accident records

The 10-year period of accident records, which have been summarised for this report, are assessed as > 95% complete and accurate for all accidents based on the protocols that operated within the BGA and its members clubs. The completeness and accuracy of fatal accidents is assessed as 100%. In particular, the causal analyses for this period are considered to be complete and highly accurate within the constraints of determining the true cause of a few fatal accidents where there were no surviving pilots.

Starting in 2003, all past accident records (1974 onwards for fatal and serious injury accidents, 1987 onwards for all other accidents) and their recorded causes were re-analysed against a revised set of criteria to determine, where possible, the real causes. These new criteria were applied to all subsequent accidents. This work, voluntarily undertaken by Hugh Browning, a BGA volunteer, over two years, covered over 3,000 accidents and incidents. It represents probably, and as far is known, the most comprehensive accident database with attributed causes in existence, of any significant gliding nation in Europe.

Accident data

UK registered sailplanes, self-launching sailplanes, self-sustaining sailplanes (but excluding TMGs), for years ended 30 September.

UK Gliding	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
		Note1		Note2						Note1	
Fatal accidents											
UK	1	6	1	3	6	2	2	2	0	4	27
Abroad	2	1	0	0	1	0	1	1	0	0	6
Fatalities											
UK	1	7	2	3	8	2	2	2	0	5	32
Abroad	2	1	0	0	1	0	1	1	0	0	6
Serious injury											
Serious Injury Accidents UK	5	6	4	11	4	4	7	7	6	1	55
Serious injuries in UK (Note 3)	6	6	5	14	4	4	8	9	6	1	63
Total accidents & incidents	56	40	43	41	41	39	46	50	51	58	465
No. of flights	364,186	325,701	353,415	343,803	315,636	314,202	295,278	288,571	269,424	268,266	3,138,482
No. of hours	144,328	129,237	144,787	136,623	148,934	138,625	137,724	134,320	124,174	137,341	1,376,093

Source: BGA annual accident reports

Note1: *The 2001 and 2009 fatal accidents include 2 and 1 (respectively) mid-air collisions with light aeroplanes; these accidents are also reported in the UK aeroplane accident statistics. The two such accidents in 2001 were between a glider and a 'tug' aeroplane used for towing, at or near gliding sites. The fatalities include 1 aeroplane pilot (2001) and 2 aeroplane pilot / crew (2009) – these are also included in the UK aeroplane accidents statistics.*

Note 2: *One fatal excluded in 2003 as it was attributed to suicide.*

Note 3: *Including those in fatal accidents*

Accident rates

All figures are for the year ending 30th September

Fatal accident rates per 100,000 launches (flights)

UK Gliding	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*10 yrs*
Annual / 10 years											
UK	0.27	1.84	0.28	0.87	1.90	0.64	0.68	0.69	0	1.49	0.86
UK + Abroad	0.82	2.15	0.28	0.87	2.22	0.64	1.02	1.04	0	1.49	1.05
Rolling five year											
UK	0.70	0.90	0.88	0.68	1.00	1.09	0.86	0.96	0.81	0.70	
UK + Abroad	0.80	1.06	1.04	0.85	1.23	1.21	0.99	1.16	1.01	0.84	

Note: The rates for UK + abroad are slightly overstated as there is no data on launches or hours conducted abroad.

Fatal accident rates per 100,000 hours

UK Gliding	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	10 yrs
Annual / 10 years											
UK	0.69	4.64	0.69	2.20	4.03	1.44	1.45	1.49	0	2.91	1.96
UK + Abroad	2.08	5.42	0.69	2.20	4.70	1.44	2.18	2.23	0	2.91	2.40
Rolling five year											
UK	1.76	2.26	2.21	1.69	2.42	2.58	1.98	2.15	1.75	1.49	
UK + Abroad	2.01	2.66	2.63	2.11	2.98	2.86	2.26	2.59	2.19	1.79	

Fatal accident rates per 1,000 gliders (aircraft)

UK Gliding	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Av. p.a.
Annual / 10 years											
UK	0.38	2.38	0.39	2.59	2.27	0.75	0.75	0.75	0	1.61	1.05
UK + Abroad	1.16	2.78	0.39	2.59	2.65	0.75	1.13	1.12	0	1.61	1.28

Serious injury and total accident rate per 100,000 hours

UK Gliding	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	10 yrs
Serious injury accidents	3.5	4.6	2.8	8.1	2.7	2.9	5.1	5.2	4.8	0.7	4.0
Total accidents	38.8	31.0	29.7	30.0	27.5	28.1	33.4	37.2	41.1	42.2	33.8

Accident trends

A ten-year time period is considered too short a period to determine objectively any particular trends in fatal accident numbers. The statistics represent a random fluctuation in the frequency of rare events.

The number of serious injury accidents averages 4.0 per 100,000 hours over the ten years, whilst the total accident rate is 33.8. The latter rate shows a rising trend over the last five years from a ‘low’ of 27.5 in 2004 to 42.2 in 2009.

Of more significance for safety purposes are the attributed causes of fatal and serious accidents, for which some conclusions can be drawn (see below).

Causal analyses of accidents

Fatal accidents, fatal injuries and serious injuries in fatal accidents, in UK and abroad

UK Gliding	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*Total*
Fatal accidents	4	0	3	3	2	7	3	1	7	3	33
Fatal Injuries	5	0	3	3	2	9	3	2	8	3	38
Serious injuries in fatal accidents	0	0	1	0	0	0	1	0	0	0	2

Source: BGA annual accident reports

10 Years' Analysis	*Fatal accidents in UK*	*Fatal accidents Abroad*	*Fatally injured people*	*Notes*
Pilot error / airmanship etc				
Incomplete winch launch	9	1	10	
Mid-air collision	7		10	*1 & 2*
Stall/spin	5	1	7	
Undershoot/overshoot	1		1	*5*
Hit hill (CFIT)	1		1	
Pilot incapacity				
Medical – heart attack	1		1	
Technical (aircraft)				
Possible failure airbrake mechanism	1		1	*3*
Wing failure	1		2	*4*
Other / cause not determined	1	4	5	
Totals all categories	27	6	38	

Serious injury accidents and serious injuries in fatal accidents in UK:

UK Gliding	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
Serious injury accidents	1	6	7	7	4	4	11	4	6	5	55
Serious Injuries	1	6	9	8	4	4	11	4	6	5	55

Source: BGA annual accident reports

UK Gliding	*Serious injury accidents*	*Seriously injured people*	*Notes*
Pilot error			
Stall / Spin	16	21	
Incomplete winch launch	13	14	
Field landing	8	8	
Landing (airfield)	3	4	
Undershoot/overshoot (airfield)	3	3	
Mid-air collision	1	2	
Hit hill (CFIT)	1	1	
Misuse of controls	2	2	
Pilot incapacity			
Medical	1	1	*3*
Technical (aircraft)			
Technical	2	2	*1*
Glider integrity	4	4	*2*
Ground			
Non-flying involving glider(s)	1	1	
Total all categories	55	63	

Source: BGA annual accident reports

Note 1. *One of these accidents occurred during a launch off a powerful winch. The glider became airborne quickly and rotated into a normal climb. At 50ft it pitched down and impacted the ground almost vertically, seriously injuring the pilot. It is concluded that the elevator final drive became disconnected as the tail struck the ground during the launch. In the other accident the original wire retaining the rear seat from hinging forward had been replaced, it fractured, and allowed the rear seat to jam the control column in a forward position.*

Note 2. *'Glider integrity' covers events such as incomplete rigging of the glider (controls not connected, particularly the elevator controls), canopy not closed properly, loose articles in cockpit jamming controls.*

Note 3. *Two-seat glider, P1 incapacitated. P2 landed.*

<u>Interpretation of data, accident rates and causes</u>

Technical (airworthiness) causes of fatal accidents are very few and far between and therefore statistically insignificant. This is also the evidence for periods prior to 2000.

The three main causes of fatal accidents are:

1. During a winch launch when the glider is climbing at a steep angle relative to the ground; in such situations the margins for error in

terms of airspeed and control are at the most critical. Equally on the ground run a wing-drop can have rapid and fatal consequences

2. Failing (with enough height) to recover from a (usually inadvertent) stall or spin. Gliders are often flying closer to the stall than powered aircraft, particularly whilst thermalling, and the nearer the ground the greater the risk of non-recovery with enough height. Some stall / spin fatal accidents occur in the more stressful situation of a field landing when the pilot is unable to reach the destination airfield
3. Mid-air collisions. Modern gel-coat finished gliders are white and very difficult for other gliders or aircraft to see in flight. Much research has been conducted into this conspicuity aspect, and safety awareness programmes are frequent and constant

Relationship of accidents to regulatory framework

The relative absence of fatal accidents caused by airworthiness issues is an indicator that the self-regulated airworthiness controls managed by the BGA for many years have been successful, albeit with a large proportion of the UK glider fleet during this ten year period having been subject to the original airworthiness controls – design and production - of EU members states (Germany, LBA in particular) under the JAR 22 (now CS22) design code.

The BGA continuing airworthiness regime, including maintenance, has generally assured a high degree of airworthiness reliability. The accidents that do happen as a result of less than perfect application of the regime have resulted invariably in non-catastrophic accidents, with the integrity of the critical airframe components remaining intact.

The vast majority of fatal and serious injury accidents arise from pilot error in one or more of it many manifestations. Gliding can be an unforgiving air sport when the pilot gets it wrong. Although there are not the problems of engine failure in gliding (except occasionally in sailplanes with engines used primarily for ‘get you home’ when thermals have died away), the risks associated with winch launching, thermalling close to other gliders, ridge soaring, out-landing in fields and glider conspicuity give their own unique sets of circumstances that can lead to accidents for the unwary or inattentive pilot.

Fatal accidents due to medical incapacitation in UK gliding are very rare and are probably statistically lower than the random distribution of incapacitation in all other activities in a human 24 hour day.

Medical assessment for solo pilots has been self-declaration until 2002 when a GPs endorsement of the declaration, based on the pilot’s medical records, was added. Instructors were subject to this rule for many years prior to 2002. UK gliding has never required AME examinations.