EUROPEAN COMMISSION
DG MOBILITY AND TRANSPORT

STATISTICAL DATA, DATA ANALYSIS AND RECOMMENDATION ON COLLECTION OF DATA IN THE FIELD OF GENERAL AVIATION IN EUROPE

FINAL REPORT

WORK ORDER: MOVE/E4/SER/2014-757

DECEMBER 2015

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List of acronyms

ADF	Automatic Direction Finder
ADP	Aéroports de Paris
AENA	Aeropuertos Españoles y Navegación Aérea
AESA	Spanish Aviation Safety Agency
AIP	Aeronautical Information Publication
ANSP	Air Navigation Service Provider
AOPA	Aircraft Owner and Pilot Association
ATO	Approved Training Organisation
ATS	Air Traffic Services
AvGas	Aviation Gasoline
BA	Business Aviation
BAF	Federal Authority for Air Navigation Services (Germany)
BIA	Brevet d'Initiation Aéronautique
BMVI	Ministry of Transport and Digital Infrastructure
CAA	Civil Aviation Authority
CAEA	Certificat d'Aptitude à l'Enseignement Aéronautique
CAT	Commercial Air Transport operations
CIA	Central Intelligence Agency
CIAIAC	Commission for Investigation of Accidents and Incidents in Civil Aviation
CO	Commercial Operations
CO_2	Carbon Dioxide
CTR	Control Zone
DEHSt	Deutsche Emissionshandelsstelle/German Emissions Trading Authority (Germany)
DFS	Deutsche Flugsicherung GmbH (National ANSP Germany)
DGAC	Direction Générale de l'Aviation Civile
DME	Distance Measuring Equipment
EAS	Europe Air Sport
EBAA	European Business Aviation Association
EC	European Commission
ECOGAS	European Council of General Aviation Support
ELT	Emerging Lifesaving Technology
ETS	Emissions Trading Scheme
EU	European Union
FFA	Fédération Française Aéronautique
FFPLUM	Fédération Française d'ULM
FLARM	Flight and Alarm
FNAM	Fédération Nationale de l'Aviation Marchande

GA	General Aviation
GAMA	General Aviation Manufacturers Association
GBP	Pound sterling
GDP	Gross Domestic Product
GPS	Global Positioning System
GVA	Gross Value Added
IAOPA	International Council of Aircraft Owner and Pilot Association
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
ILS	Instrument Landing System
KSAK	Kungliga Svenska Aeroklubben
LBA	Luftfahrt Bundesamt (Federal Aviation Office of Germany)
LAPL	Light Aircraft Pilot License
MALGH	Mission Aviation Légère, Générale et Hélicoptères
MM	Maintenance Manager
MOGAS	Motor Gasoline
MRV	Registration and Monitoring & Verification
MS	Member State
MTOM	Maximum Take-off Mass[1]
MTWA	Maximum Total Weight Authorised
NAA	National Aviation Authority
NM	Nautical Miles
NPPL	National Private Pilot's Licence
PLB	Personal Locator Beacon
PoC	Point of Contact
PPL	Private Pilot License
PPL-A	Private Pilot License for Airplanes
PPL-H	Private Pilot License for Helicopters
PRM	Persons with reduced mobility
PwC	PriceWaterhouseCoopers
QAR	Quick Access Recorders
RNAV	Area Navigation
RoCAA	Romanian Civil Aviation Authority
RPAS	Remotely Piloted Aircraft System
SAMA	Swiss Aircraft Maintenance Association

[1] The term MTOM also covers maximum certified take-off mass (MCTOM), as it is used for helicopters.

SME	Small Medium Enterprise
SMS	Safety Management System
TCAS	Traffic Collision Avoidance System
ToR	Terms of References
UAV	Unmanned Aerial Vehicle
UBA	Umweltbundesamt/Federal Environment Agency (Germany)
UK	United Kingdom
ULM	Ultra-Light Motorized
VAT	Value-added Tax
VFR	Visual Flight Rules

1 Executive Summary

1.1 Introduction

Generalities

General aviation (GA) provides individuals, enterprises and local communities with tailored, flexible, door-to-door transportation that contributes to people`s mobility, productivity of businesses and regional cohesion. Based on the use of privately-owned aircraft, GA offers an alternative to scheduled commercial flights, responding to users' needs with better flexibility and adaptability due to lower operational restrictions or less constraining economic considerations.

At European level, there is no comprehensive GA information available, most of the related data being generally gathered in a non-systematic and non-coherent way by national aviation authorities or associations.

In order for policy makers to address appropriately the GA sector, it is necessary to improve the current data collection process with a view to facilitating the collection and analysis of the relevant information.

In 2007, the European Commission identified[2] the need to establish a basic set of data with a view to ensure proper application of proportionality and subsidiarity principles in future GA developments, and in particular:

- Take into consideration airspace and infrastructure needs in capacity planning and optimisation;
- Promote new technologies that maintain European industry's competitive edge and tap regional and local capacities cost efficiently;
- Facilitate General aviation access to foreign markets;
- Ensure environmental sustainability of General aviation.

[2] Communication from the Commission: An Agenda for Sustainable Future in General and Business Aviation, Brussels, 11.1.2007 COM(2007) 869 final (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0869:FIN:EN:PDF)

In 2014, the European Aviation Safety Agency (EASA) issued the Roadmap of General Aviation of 2014[3] with the intention to bring positive changes to the GA community by simplifying existing regulations where possible, introducing flexible measures where necessary and developing safety promotion to address safety risks. In that context, only data related to accidents and incidents shall be collected and analysed systematically by EASA and Eurostat. For all other aspects, it is still required to define at European level what type of data should be collected and analysed systematically.

[3] http://easa.europa.eu/easa-and-you/aviation-domain/general-aviation?page=general-aviation-road-map

Study objectives

The present study focuses on safety, economic and environmental aspects related to GA operations with the objective to:

- Identify existing information detained by the various GA stakeholders;
- Detect missing statistical data;
- Provide recommendations regarding future collection of missing data.

For this study, the GA definition covers the following scope:

- On-demand activities including Air-taxi (less than 19 passengers) and Business Aviation;
- Corporate aviation;
- Aerial work;
- Leisure flights including aerial sport;
- Training flights.

In general, this definition is in line with those applied by the National Authorities. However, some differences have been identified:

- In some States (e.g. Latvia), Business Aviation and Aerial work are considered as commercial operations as well as balloons in the United Kingdom.

Study output

The Study provides:

- A quantitative and qualitative overview of the data currently available in EASA Member States (MS) regarding the GA sector;
- Recommendations to create and maintain a specific database supporting the monitoring and the analysis of future GA sector evolutions in Europe.

1.2 Methodology developed for the study

The study has been conducted according to the following steps:

- Identification of data necessary to conduct the study;
- Identification of stakeholders who could provide these data;
- Collection of data through on-line surveys and interviews;
- Assessment of the quality of these data;
- Analysis of the data collected;
- Development of the database; and
- Development of conclusions and recommendations in the domains of economy, safety and environment.

The identification of necessary data and stakeholders has supported the development of two web-based questionnaires:

- Questionnaire A addressed to National Aviation Authorities (NAA) and European GA associations;
- Questionnaires B addressed to end users.

1.3 Availability of data

Twenty-six Member States have answered the Questionnaire A. Among them, one declined the invitation to participate and two declared that they do not collect GA data. In addition, responses have been received from one air navigation service provider (ANSP), one airport manager, three associations (one national and two European) and one flying club. In some cases, the Civil Aviation Authorities (CAA) contacted external administrations or private companies[4] to gather data not collected in house.

Most of the data available were related to the number of aircraft registered and pilot licences. These two types of data are recorded by the NAAs, which have the legal responsibility for aircraft registration and pilot licensing.

Information related to aircraft operations were difficult to gather from the various stakeholders. Most of these data are currently not systematically collected by CAAs but provided by the end users to the CAA on a voluntary basis. When detained by national authorities they are rarely published.

Our investigation shows that there is almost no reliable and representative economic data available. The economic information that could be found is scattered and can merely illustrate parts of the respective sector. However, there is limited availability of data for a thorough economic analysis at European level.

GA associations do not generally publish information related to the implementation of a Safety Management System (SMS).

Environment data are limited due to the fact that in Europe no mandatory legal requirement applies to GA for CO_2 emission monitoring. The main concern reported by the countries and associations is related to noise complaints in the vicinity of aerodromes. In general, operational restrictions and noise abatement procedures are implemented in order to limit the impact on neighbouring populations.

[4] Jeppesen provided aerodrome data on request of the German CAA. Jeppesen is a private company producing aeronautical charts and procedures.

1.4 Main findings

From the perspective of future establishment of a European database, the process of collecting data should involve all stakeholders, and in particular NAAs, airports and end users. There is no systematic process established to gather economic data, most of them being collected solely on a case-by-case basis for specific studies. Environment data are currently not collected at national level.

Safety related data

In Europe, safety data availability varies from one Member State to another and from one organisation to another, particularly in areas where no legal obligation exists.

In most of the States, NAAs are the main focal point for providing safety-related data but the format used for collecting and storing data are not harmonised and hence does not facilitate comparison and analysis. For this study, NAAs had to extract the data from various databases. In many cases the format and the presentation of the information detained was different from the one developed for the survey so some adjustments were required before they were included in the database.

Regarding pilots, most of the personal data are generally not available, since NAAs do not consider this information relevant. It is easier to gain access to quantitative information regarding pilot licences, qualification and medical certificates as they usually come from tests and exam results. However, statistics do not take into account the fact that a single pilot can detain several licences, making it difficult to accurately measure the number of GA pilots operating in a Member State or in an organisation.

Data related to aircraft operations have been provided by end users but they present different levels of quality and accuracy depending on the country and the organisations involved in the monitoring and recording process.

GA aerodrome data are not collected by NAAs, in particular those data that are not subject to any airport certification requirement. There is no single management model for aerodromes depending on the Country or region where they are established, their ownership and their administrative entity (aero clubs, local committees, service providers, etc.). Accordingly, they apply different internal rules and procedures for the monitoring and the recording of their activities.

The number of Approved Training Organisations (ATOs) and maintenance companies was quite easily collected as they are generally documented in official national publications.

Economic data

Based on an unrepresentative sample of data (only nine State authorities were able to actively provide economic data)[5], it can be deduced that the main bottlenecks for the development of GA in Europe is a regulation that does not appreciate the specifications of this sector. Further, taxes and charges are broadly seen as a burden for developing GA.

Environmental data

Gas emissions data are scarce and difficult to obtain for GA, mainly due to the fact that no requirement exists at national or European level to monitor them.

Mitigation measures for noise abatement of GA activities have been implemented in many aerodromes subject to complaints, consequently bringing substantial information on the subject. However, this information is not gathered by the NAAs.

In general, the end users provided details of their fuel consumption, which could give some indication on the impact of GA on the environment.

1.5 Main recommendations

Strategies

Several strategies have been defined and analysed by the consultant, in order to assess the feasibility for the establishment of a European GA database. Five domains of interest have been considered for the evaluation: data completeness, level of difficulty to access and collect the data, the quality of these data, an estimate of the cost to collect the data and the human resources required to carry out the collection.

The results of the analysis are presented in the table below with the following symbols: "++" Achievable with limited effort, "+" Easily achievable with the establishment of specific processes, "-" Difficult to achieve, "--" not achievable".

	Data completeness	Ease for collection	Data quality	Cost	HR
Collection of data from identified sources	-	+	++	-	-
Legal obligation to collect data	++	++	++	--	--
Data collection on a case-by-case	+	-	++	-	+

[5] These are: Croatia, France, Germany, Latvia, Poland, Romania, Spain, Sweden and UK

basis					
Voluntary approach	+	++	-	++	++
Cooperative approach	+	++	++	++	++

Recommendations for the collection, management and analysis of data

In terms of GA data collection, the recommendations have been grouped as follows:

- Data collection: GA data should be collected on a regular basis in collaboration with all stakeholders;
- Data management should be conducted by National authorities and data published regularly;
- Data analysis: specific indicators should be established for monitoring the GA sector.

Recommendations with regard to regulations

Future regulations of the GA should be proportionate in order to take into account sector specificities and its mainly non-professional nature. Regulations should also be adapted to take account of the type and volume of operations and facilitate their implementation by small managing entities, as aero-clubs. Besides rules, it is recommended that supporting measures and tools are developed to help the sector improving the level of safety, including the development of a specific safety culture, reporting exercise and data collection. A major revision of all current rules for GA is well underway through the GA Roadmap project initiated by EASA and supported by the industry. [6]

A step-by-step approach should be envisaged for the licences based on the type of flight e.g. local flights could be authorized e.g. with limited medical aptitude, language proficiency, etc.

Recommendations with regard to environmental aspects

Specific indicators are suggested for the monitoring of CO_2 emissions and noise pollution around the aerodromes.

Dissemination of results

There is a broad consensus among the associations that a European database could be of substantial use to the GA sector. However, some concerns were expressed regarding the potential use of such data by the European Commission (EC).

[6] http://easa.europa.eu/easa-and-you/general-aviation/general-aviation-road-map

1.6 Conclusion

The main conclusions of the study is that for GA, the volume and the quality of information available is still limited. In that context, it is still difficult to develop statistics and to draw conclusions on activities, practices and the organisation of the sector. However, some interesting data could be obtained for analysis and have allowed the identification of relevant information to be collected in the future at national and European level on a permanent and continuous basis.

It is clear that there is a need to establish a European database, to be built in close cooperation with the GA community, relevant associations and national authorities. Furthermore, regular reports and feedback should be provided to the NAAs and end users in support of the development of specific measures to promote GA or to improve the safety of operations.

2 Introduction

General Aviation (GA) in the European Union (EU) is a diverse and dynamic sector undergoing rapid changes, involving a wide spectrum of aircraft ranging from gliders to complex business jets and provision of high value services such as aerial works or emergency and business door-to-door transportation. As such, General Aviation constitutes an important part of the EU aeronautical industry.

GA refers generally to all flights other than military (state) and commercial transport. **In the current study, "General Aviation" has been defined as:**

- **On-demand activities including air-taxi (less than 19 passengers) and Business Aviation**
- **Corporate aviation**
- **Aerial work**
- **Leisure flights including aerial sport**
- **Training flights**

In 2008, the EC adopted its Communication "An Agenda for Sustainable Future in General and Business Aviation"[7]. This paper concluded, among others, that the European Commission would in particular focus on building a basic set of data regarding European General and Business aviation.

In September 2014, the European Aviation Safety Agency (EASA) revealed its new organisation, which aims at preparing the agency for the challenges of the future. The new organisation enables EASA to engage more pragmatically with General Aviation. For this purpose a dedicated General Aviation and Remotely Piloted Aircraft System (RPAS) Department has been created.

Earlier in 2014, EASA issued the General Aviation Roadmap 2014[8]. Through

[7] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0869:FIN:EN:PDF
[8] http://easa.europa.eu/easa-and-you/aviation-domain/general-aviation?page=general-

this roadmap, the agency aims to bring positive changes to the General Aviation community by simplifying existing regulations where possible, introducing flexible measures where necessary and developing safety promotion to address safety risks.

It is understood that, while there are already plans to collect and analyse data on accidents and incidents in a systematic way by EASA and Eurostat in relation to the Roadmap, most of the market and its contribution to economic performance is not yet well documented by either quantitative or qualitative surveys.

2.1 Objectives of the study

The general objective of the study is to capture missing statistical data on GA, to provide recommendations on the collection of missing data and to provide an overview of the economic landscape of General Aviation that could result in a better understanding of the market and support decision makers at national and European level.

Accordingly, the study aims to develop an initial database related to GA operations in Europe. The analysis of these data has led to the provision of recommendations to develop this sector and improve safety while limiting its impact on the environment.

The study also identifies which data are available, assesses their quality and compares them with data already collected on Commercial Aircraft Transport (CAT) operations in order to identify which relevant data are missing. In a final step, recommendations related to the data to be collected are proposed.

2.2 Domains covered by the data analysis

The study specifically focuses on safety, economic and environmental aspects, with the following objectives:

Safety Aspects

- Illustrate the current situation by examining what statistical information is available and can be gathered using the existing sources or method.
- Perform a gap analysis and identify data that are not yet available but necessary to depict the current situation.
- Recommend/develop a method of data collection that is necessary to further analyse the GA market.

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aviation-road-map

Economic Aspects

- Gather and systemise information/data available on (i) workforce employed by General Aviation stakeholders (ii) direct and indirect impact on related industries including airports/aerodromes (iii) ground handling services offered for General Aviation (iv) contribution to the Gross Domestic Product (GDP).
- Describe what taxation regimes are currently in effect with relation to General Aviation.

Environmental Aspects

- Identify and if possible quantify the environmental impact of General Aviation.
- Recommend meaningful sets of indicators that are easy to collect and would allow tracking of the development of environmental effects of General Aviation.

2.3 Scope of the report

The scope of this project is:

- To identify existing data related to GA operations in EASA MS based on information already published or provided by NAAs, associations and end users on a voluntary basis;
- To provide recommendations for the collection of GA data with the objective to create and maintain a European GA database;
- To propose relevant indicators for monitoring the impact of GA operations on the environment.

The effort allocated to the project did not allow for contacting directly all aero clubs or associations in EASA MS, hence the results are providing only an overall view of the current GA situation to be further enhanced when harmonised collection procedures shall be in place at EU level. The study has mainly focused on information considered relevant to follow the evolution of GA in Europe.

Case studies have been elaborated for eight countries to assess the availability of data, present the methodology implemented in those countries to collect GA data and estimate the applicability of this methodology to other States.

2.4 Document structure

Chapter 1 provides an executive summary of the study;

Chapter 2 provides the introduction to this Final Report. It describes both purpose and structure of the document;

Chapter 3 illustrates the methodology developed to conduct the study;

Chapter 4 presents the assessment of data availability and quality;

Chapter 5 illustrates findings based on data analysis and interviews;

Chapter 6 provides the conclusions and recommendations.

3 Methodology to conduct the study

3.1 Overall Methodology

The methodology implemented to perform this study included the following main steps:

- Identification of data required to conduct the study;
- Identification of stakeholders who could provide these data;
- Collection of data through on-line surveys and interviews;
- Assessment of the quality of these data;
- Analysis of data collected;
- Development of the database; and
- Development of conclusions and recommendations in the three domains economy, safety and environment.

In parallel to the methodology implemented for this study, specific steps have been developed to analyse the data received from the end users and to perform a comparison with the responses received from the other stakeholders.

For data which are not comparable, a separate analysis has been performed, the objective being to deliver an overview of GA operations from an end user's point of view. This analysis is presented in Appendix B of this study.

The questionnaire of the economic part can be roughly divided into two parts. The first part covered the areas of workforce, taxation, charges & fuel as well as access to services. In those sections the questions are directly linked to the information sought after and would allow for direct comparison. The aim of the questions in the second part, however, was to gather a set of data, which would allow for an estimation of the impact of General Aviation on the GDP. The distinction of the two parts of the economic section is crucial, as the questions in the first part – although linked to each other – would provide individual information, while it was essential for the second part to have all questions answered to get a meaningful result.

3.2 Methodology for data collection

This section presents the methodology developed for the collection of data from the various countries, relevant European associations and from the end users. Two questionnaires were developed. The first one was sent to Civil Aviation Authorities and European Associations (Questionnaire A), the second one to end users and European GA associations (Questionnaire B). The latter was developed with the support of the International Council of Aircraft Owner and Pilot Association (IAOPA) and EASA. The e-surveys were launched in June 2015.

3.2.1 Desk review

A desk review has been conducted during the first step of the study in order to support the development of Questionnaire A, particularly to identify the type of data available on-line, on dedicated websites and various existing reports.

General information on GA

In general, EASA MS provide a limited set of data on-line that are not harmonized. Only 13 States publish their aircraft register on-line, but none of those are GA aircraft registries[9]. These registers do not specify the type of operation. The databases are updated either on a monthly basis, providing the current status of aircraft registration or on a yearly basis providing a status for the last calendar year. Links to these data are provided in Appendix D.

GAMA produces an annual report with limited data related to GA operations in Europe. These data are contributed by national authorities on a voluntary basis. For 2014, twenty-one countries have provided their database. However, these data are not harmonized and for several countries, the latest figures are not available.

Only one country (Germany) provided the number of pilot licences on-line. This is an overall figure without details on the ratings. France provided these figures per aircraft type. However, these data have not been updated since 2011.

Based on the information available on-line, a database could be built with the following information, some of them being available from a limited number of States:

- Registration mark;
- Aircraft type;
- Maximum Take-off Mass (MTOM);
- Owner;
- Engine manufacturer, engine type and number of engine;

[9] Austria, Croatia, Cyprus, Estonia, France, Germany, Greece, Iceland, Luxembourg, Malta, Norway, Switzerland and UK

- Aircraft base;
- Number of passengers (as defined by the manufacturer);
- Operator;
- Year of manufacture;
- Hours flown;
- Pilot licences.

Safety

Safety related data are limited to the number of incidents and accidents registered. This information is provided by most of the countries and is already available through EASA. There are no information related to the implementation of a Safety Management System.

Environment

There is no information related to the environment available on-line.

Economics

The information identified through the desk review relating to the questions falling under the economic section is included in the presentation of economic findings in Appendix A.

3.2.2 Data collection from Authorities and stakeholders

The activities performed included the identification of required data and the stakeholders who could provide these data, the development of a questionnaire (Questionnaire A) and the selection of the tool to be used for the on-line survey.

Data were divided in three main domains: 1) Safety including general data, 2) Economy and 3) Environment.

Summary of feedback from European agencies and associations

General Aviation Manufacturers Association (GAMA)

GAMA publishes a General Aviation Statistical Databook and Industry Outlook on a yearly basis[10]. This report provides a worldwide overview of GA with a focus on GA activities in the United States. European GA fleet data are provided by national authorities[11] on a voluntary basis. The number of aircraft is given per category of aircraft. However, the aircraft categorization is not harmonized between the States.

[10] General Aviation Manufacturers Association (2014): *General Aviation Statistical Databook & 2015 Industry Outlook*
http://www.gama.aero/files/GAMA_2014_Databook_LRes%20-%20LowRes.pdf

[11] For 2014, the NAAs providing data were Austria, Belgium, Cyprus, Denmark, Estonia, Finland, France, Germany, Ireland, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

Data related to airports and heliports are also published. Their source is the Central Intelligence Agency (CIA) World Factbook[12]. EASA gives data related to the number of accidents.

European Business Aviation Association (EBAA)

Data collection by EBAA is limited mainly due to limited internal resources, but also because some economic data are considered to be commercially sensitive by some end users. Accordingly, these data have not been provided.

From an EBAA perspective, the definition of GA should be adapted to reflect Business Aviation (BA) operations more precisely, since it currently includes several types of operations.

International Aircraft Owners and Pilots Association (IAOPA)

IAOPA does not collect GA related data on a regular basis. However, IAPO had carried out a survey to capture data related to GA operations in Europe and provided the results of this survey.

EUROSTAT

Eurostat provided an overview of the data collected and the procedure of data collection. According to their feedback, Eurostat collects data only on commercial passenger and freight transport. Eurostat does not publish any GA data.

Eurostat solely publishes data assessed, verified and validated by the States. Due to the voluntary nature of this process, response rate and completeness of data are very low.

European Council of General Aviation Support (ECOGAS)

ECOGAS recognized the importance of data collection, but acknowledged that no data are directly collected by the association.

Europe Air Sport (EAS)

Similarly to ECOGAS, EAS recognized the need for the establishment of a database, but does not collect any data itself. However, EAS accepted to support and promote this study to its members.

EASA

EASA is collecting data related to incidents and accidents through the occurrence reporting process defined in Regulation (EU) No 376/2014 of the European Parliament and of the Council, of 3 April 2014[13]. However, data related to

[12] Central Intelligence Agency (2015): World Factbook https://www.cia.gov/library/publications/the-world-factbook/index.html

[13]

paragliders and hand gliders accidents/incidents are currently not accurate, mainly because investigations are often undertaken by the police. Another difficulty is linked to the diversity of formats in which accident data are provided.

Some data are not available, like those on non-European products. Only data regarding EASA certified aircraft are captured, yet a collection of data on non-certified aircraft is increasing especially on microlights in order to get a better overview.

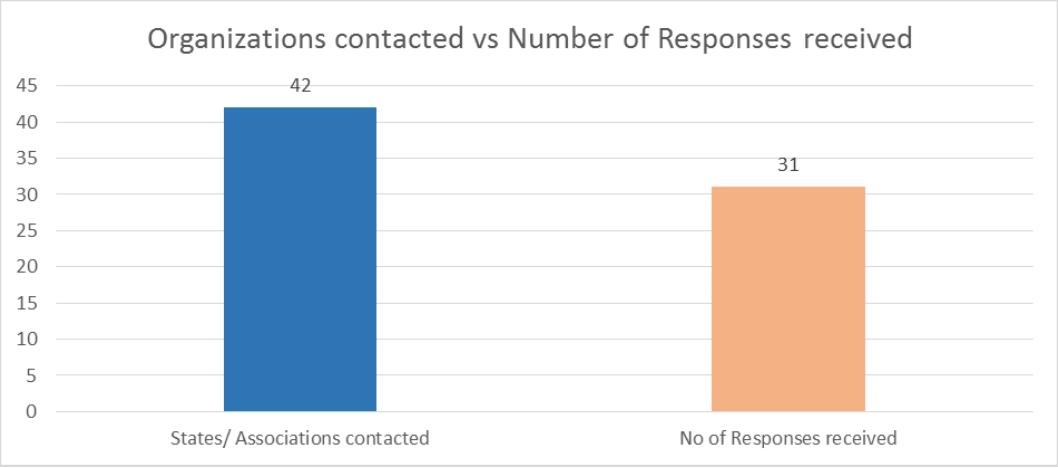
Summary of feedback from National Authorities

In order to ensure consistency and relevance of the data to be collected, the authorities of the Netherlands, United Kingdom, Germany and Belgium have been asked to review and test Questionnaire A prior to its dissemination. The broad scope of the survey was highlighted and the Netherlands and Belgium stated that some of the data required could not be made available, particularly economic data.

The on-line survey was launched the 15th of June 2015. It was sent by email to National Authorities and European associations.

Responses were received from twenty-six States, including responses stating that they do not collect GA data or that they declined the invitation to participate. One airport service provider (Aeropuertos Españoles y Navegación Aérea (AENA)), one airport manager (Tallinn Airport Ltd), three associations (GAMA, EBAA and SAMA (Swiss aircraft maintenance association (SAMA)) and one aero club (Aeroklub Szczecinski, Poland) have responded. Figure 1 presents the ratio between the number of States and associations contacted and the number of responses received.

Figure 1: Ratio Stakeholders contacted/ Number of Responses received



amending Regulation (EU) No 996/2010 of the European Parliament and of the Council and repealing Directive 2003/42/EC of the European Parliament and of the Council and Commission Regulations (EC) No 1321/2007 and (EC) No 1330/2007

Cyprus and Slovakia declared that they do not collect any GA data. Liechtenstein declined the invitation to participate, due to the fact it does not have aerodromes in the country.

The on-line data collection was completed by specific meetings in States for which a Case Study has been developed. These States are France, Germany, Latvia, Poland, Romania, Sweden and the United Kingdom.

3.2.3 Data collection from individual owners

As explained above, to ensure a better coverage and refine the current situation of GA in Europe, 13 questions have been sent to end users. The questionnaire has been suggested by EASA and adjusted to ensure consistency between the two questionnaires. Questionnaire B was forwarded to European associations and 61 national associations identified as member of a European association or through a specific search on the Internet.

In total, 2,029 responses were received. Figure 2 presents the number of responses per State and Figure 3 presents the number of responses per ownership.

Figure 2: Number of Responses per State - Questionnaire B

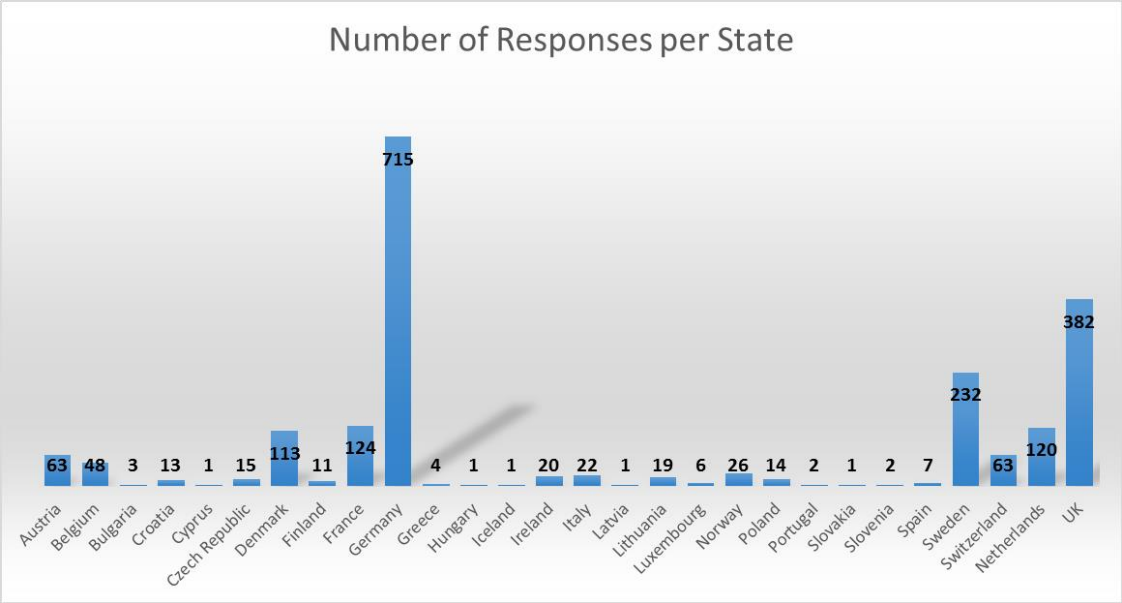
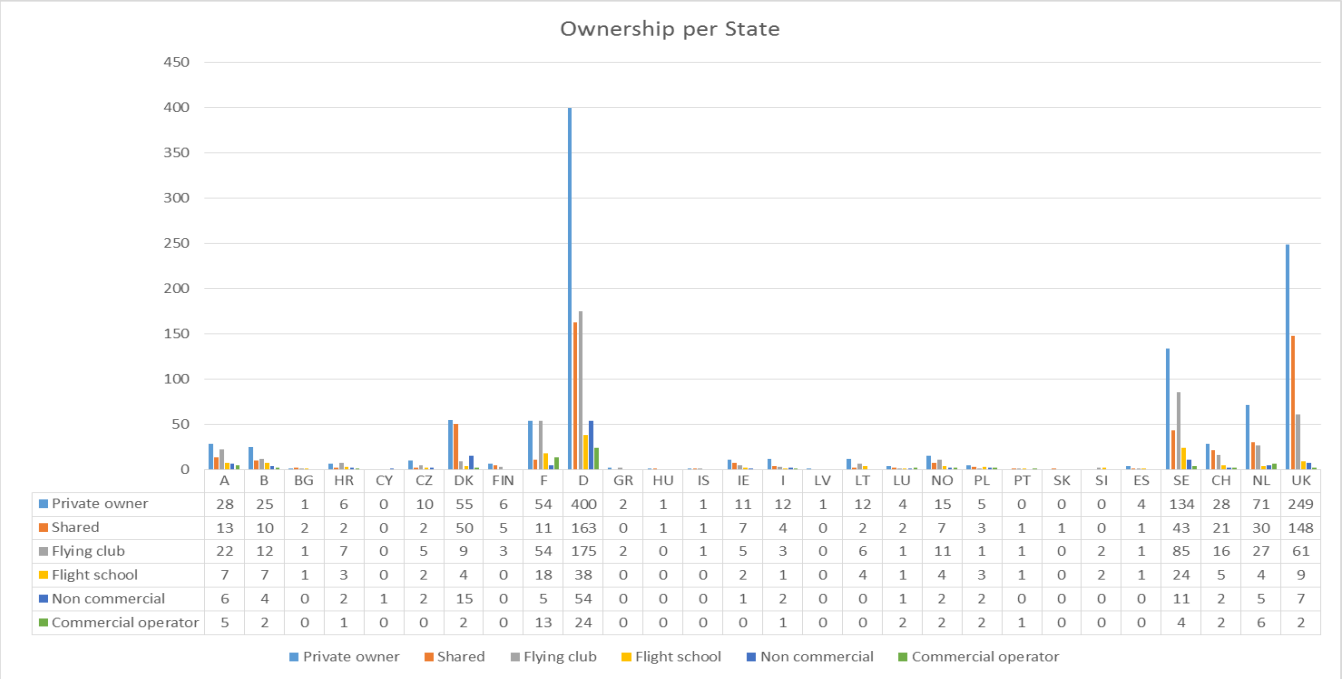


Figure 3: Number of Responses per ownership



	A	B	BG	HR	CY	CZ	DK	FIN	F	D	GR	HU	IS	IE	I	LV	LT	LU	NO	PL	PT	SK	SI	ES	SE	CH	NL	UK
Private owner	28	25	1	6	0	10	55	6	54	400	2	1	1	11	12	1	12	4	15	5	0	0	0	4	134	28	71	249
Shared	13	10	2	2	0	2	50	5	11	163	0	1	1	7	4	0	2	2	7	3	1	1	0	1	43	21	30	148
Flying club	22	12	1	7	0	5	9	3	54	175	2	0	1	5	3	0	6	1	11	1	1	0	2	1	85	16	27	61
Flight school	7	7	1	3	0	2	4	0	18	38	0	0	0	2	1	0	4	1	4	3	1	0	2	1	24	5	4	9
Non commercial	6	4	0	2	1	2	15	0	5	54	0	0	0	1	2	0	0	1	2	2	0	0	0	0	11	2	5	7
Commercial operator	5	2	0	1	0	0	2	0	13	24	0	0	0	0	1	0	0	2	2	2	1	0	0	0	4	2	6	2

3.3 Methodology for data analysis

Two separate methodologies were developed for the analysis of data collected through the two different questionnaires. In both cases, the first step before analysing these data was the assessment of the quality of data.

Detailed results of this analysis are provided in chapters 4 and 5.

3.3.1 Analysis of data of Questionnaire A

Assessment of the quality of data

In most cases, the National Authorities collect data on GA and Commercial Air Transport operations (CAT) in one single database. For this study, it was assumed that data provided by NAAs were correct. Few discrepancies were identified but corrected after a direct dialogue with the data provider.

Data analysis

GA operations in the EASA MS differ significantly from one State to another. As such, a comparison between the States is not possible. Therefore, the analysis was limited to:

- Identification of data available per country and the comparison with the list of required data defined in the questionnaire; and
- The format verification to ensure that the data were provided in the requested format.

3.3.2 Analysis of data of Questionnaire B

Assessment of the quality of data

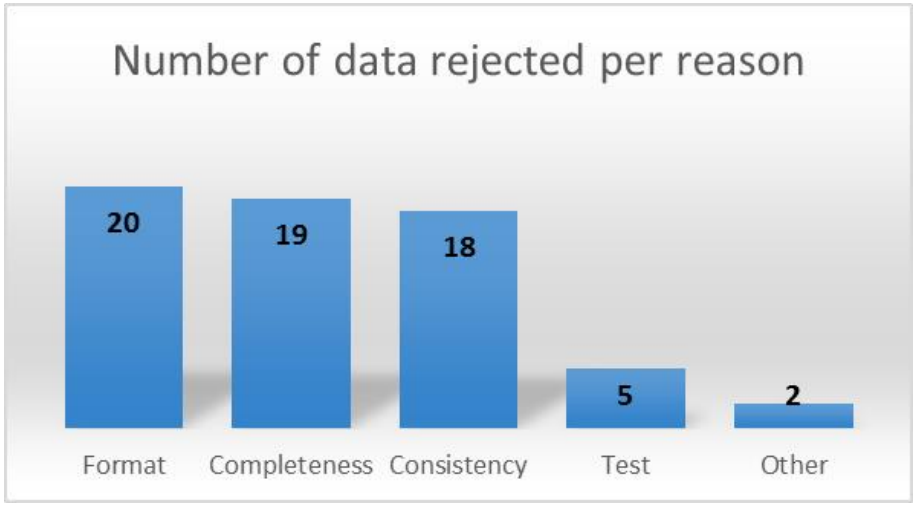
The data quality and consistency has been assessed as follows:

- Format of the data provided: an issue was identified with the average age of the aircraft, which was either defined by the year of construction (this was corrected by the consultant) or in a format which was not compatible with the tool used for the survey;
- Coherence and completeness of the data: number of owned aircraft vs private owner (e.g. 350 aircraft declared for a private owner) or multiple responses in each categories were considered invalid and were rejected for the analysis.

64 responses (3.1% of the responses received) were rejected due to one or more of the following reasons:

- Inconsistency in their format (e.g. age of aircraft: 3,000);
- Lack of completeness (only one information provided e.g. number of aircraft);
- Lack of consistency (e.g. 500 aircraft declared by one private owner);
- Response was a trial (few respondents tested the on-line survey and clearly marked their answers as "Test"); and
- Others (for instance respondents that reported the same information provided twice, as e.g. flight school and commercial operator).

Figure 4: Number of data rejected per reason



Data analysis

The first analysis consisted of a comparison of ownership and number of aircraft declared by the end users. These data were compared to the number of aircraft registered and declared by the NAAs.

The objective of the second step was to extract data as previously defined for the purpose of this study, e.g. number of Instrument Flight Rules (IFR) flights,

equipment of aircraft, and number of aircraft not register in Europe, etc. Detailed results are presented in Appendix B.

Communication, navigation and safety equipment were analysed separately.

Environment data were translated and analysed in order to identify recommendations and relevant indicators for this study.

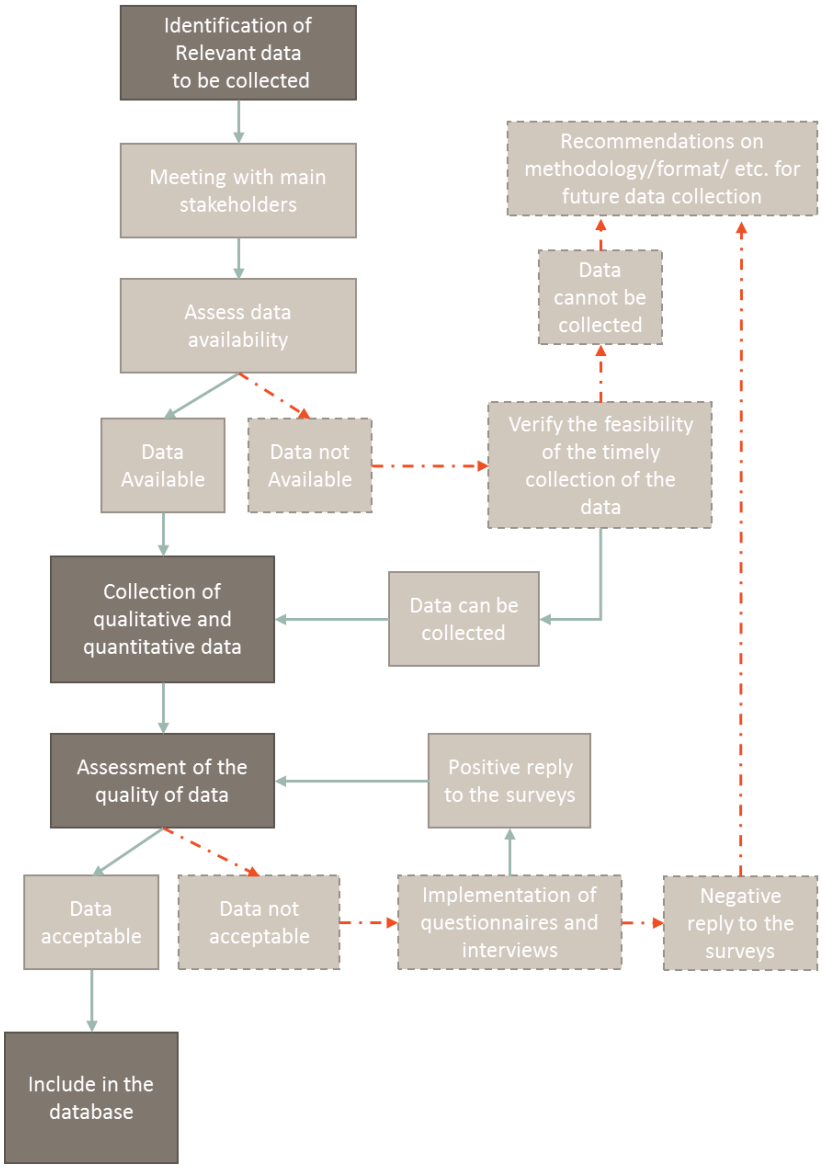
3.4 Methodology for database development

The main objective of the database is to provide easy access to data and support data organisation, management and analysis. The database was developed in Excel.

The database was populated with relevant data after the quality assurance process of the data has been performed by the Consultant.

The process to populate the database is presented in Figure 5:

Figure 5 Dataflow process



3.4.1 Challenges

The main challenges faced by the consultant related to the development and population of the database are presented below:

- Low response rate of Questionnaire A addressed to Civil Aviation Authorities and European Associations;
- Low availability of data;
- Data received in different formats from the countries;
- Definitions, categorizations and data collected are not standardised;
- Combination of large amounts of qualitative and quantitative data in the same survey;
- Conversion of raw data from e-survey into comparable datasets.

3.4.2 Database structure

The database is divided into four sections:

- **0.0_Workbook** data log: summary of the different sections in the database
- **0.1_Definitions:** terms and type of data considered in this database
- **1_DataID:** overview of the data inserted in the database
- **2_Full dataset:** compilation of the data entered into the database. It covers all the questions presented in the e-survey
- **3_Analysis:** pivot table for the data analysis

3.4.3 Data input and analysis

Data was entered via the e-survey prepared using the software Enalyzer.

The database was developed to be completed with the outputs generated by the e-survey software to ensure coherence of the data entered in the database.

Data analysis can be performed easily through Pivot Tables, according to the needs of the respective user. Alternatively, data analysis can be undertaken through specific *queries*[14].

3.4.4 User Guide / Data guide

A short user guide has been developed by the consultant to support potential users with the input, management and analysis of the data in the database. See Appendix H.

[14] The development of the queries was not part of the scope of this study.

4 Data availability and quality

This chapter presents a summary of the available data (as defined for the purpose of this study) and their quality.

4.1 Statistics related to air safety

4.1.1 Data considered as Priority 1

Aircraft and operation of aircraft:

- Number of registered aeroplanes: aircraft registration is one of the tasks of the National Authorities. However, the national register is one single register in which there is no difference made between GA and commercial aircraft and the aircraft are mostly not registered by type, MTOM or number of engine. In a few States, the categorization is different from the categorization defined for the study e.g. Germany and France. The aircraft register is published on-line in some of the European States, but considered as confidential data in other States or provided on request only.

  In some States, part of this task is delegated to a service provider and/or a national association e.g. in Austria the Supreme Civil Aviation Authority main tasks are regulation of the legislative basis and safety oversight. The aircraft registration is delegated to the national service provider Austro Control for commercial aircraft and GA aircraft including motorized gliders and to the Austrian Aero Club for non-motorized gliders and microlight aircraft.

  GAMA publishes the aircraft registered per State in its annual report. This register is provided on a voluntary basis only, and some States refuse to provide these data. As it is provided on a voluntary basis, this is not updated on an annual basis for some States. The categorization is published as provided by the States.

- Average age of aeroplanes: These data are not always provided by the National Authorities. This could be provided by the end users but not with the categorization defined for the study.

- Number of hours flown: These data are in most of the case not available from the National Authorities as it is not mandatory and the need for these data was not identified. Accurate data could be provided by the end users and some national associations. However, this could not be provided and broken down as defined for this study.
- Number of hours flown for private, commercial and training purposes: These data are not available from the National Authorities. GA is a private activity, which does not require this kind of monitoring.
- Number of operations (take-off/landing): These data are available only in a few States. These data are relevant for the aerodromes and airfields for the development of the aerodrome/airfield. These data could be provided mainly by the end users and aero clubs.

Safety Management System (SMS)[15]:

- Safety Management System (SMS): The implementation of a SMS is mandatory for National Authorities as well as for maintenance organisations and Approved Training Organizations (ATOs).

Pilot Licences:

- Pilot licences: These data are available from the National Authorities or from entities to which the National Authority delegated this task e.g. Austria. However, the average age is not always available.

  The total number of licences issued is in some cases available on-line but in most cases, such data are considered to be confidential.
- Number and type of licences issued: Licences are delivered by the NAA or formal entities and therefore available. In some cases, the distinction between the different types of licences is not available assuming that an airline pilot can be a commercial pilot and a private pilot.

  It should be noted that only a snapshot can be provided as these data are in constant evolution. This is due to the fact that pilots are under an obligation to renew their licence(s). This renewal depends on the licence type, the age of the pilot and results of a medical check.

4.1.2 Data considered as priority 2

Aircraft and operation of aircraft:

- Number of aircraft using advanced technology: These data are not available from the National Authorities or European Associations as it is not mandatory

[15] SMS: A systematic approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures. (ICAO Annex 19 Safety Management). An SMS is a management tool for the management of safety by an organization (ICAO Doc 9859 Safety Management Manual)

or is considered not relevant. In essence, most of the activity is performed in Visual Flight Rules (VFR) for local flights without the need for advanced technology. These data could be provided by the end users only.

- Average distance flown for private, training and commercial flights: Again, these data are not mandatory and provided in some countries on a voluntary basis only to the National Authority. Accurate data can only be provided from the end users.

Aerodromes:

- Number of aerodromes predominantly used by GA: These data are usually not collected by the National Authorities. Managing entities of such aerodromes could be able to provide such information but they currently have no obligation to do so and no single harmonised way to report.

  In addition, it is somewhat complicated when attempting to identify which entity really does retain the data, given that there are many differences from one aerodrome to another in terms of their administration model, their ownership and lines of reporting. Furthermore, aerodrome administrations do not specifically and systematically collect information related to and/or follow GA activities. Aerodromes might be managed by one single entity, the national airport service provider, a local government or a private organisation - such as Aéroports de Paris - managing both GA aerodromes and international airports.

  Jeppesen, a private company producing aeronautical charts and procedures, provided these data on request from the German National Authority. GAMA publishes these data for some European States as well. However, we could identify some discrepancies between these two databases and between the data provided by Jeppesen and GAMA, and those provided by the States.

- Number of GA aircraft landings using Instrument Landing System (ILS): These data are not available.

- Number of aircraft landings using Area Navigation (RNAV): These data are not available.

Aero clubs/ATOs:

- Number of aero clubs, ATOs and registered facilities: These data are partially available. National Authorities are responsible for the certification of the ATOs and the list of ATOs is published. The number of registered facilities is also available at National Authority-level but not published. The number of aero clubs and their activities are generally not available, and when detained by NAAs, not accurate and/or published.

- Number of members of aero clubs: These data are not available. This information could only be provided by the aero clubs.

- Types of activities/operations performed in the aero clubs: These data are not available. This information could only be provided by the aero clubs.

Technical improvements:

› Response to technical improvements: In most cases, the end users complain about the cost of implementing new systems and about the difficulties linked to the existing regulation, which in some cases prevent any modification for certified aircraft.

4.2 Economic data

Generally, economic data are scarce in the General Aviation sector. This is mostly due to the fact that these data are not collected and thus not available. Every study found in the desk review that comes up with relevant economic indicators is based on both a time and cost-extensive data collection procedure. However, even after this extensive procedure, the data does not allow for a thorough analysis. Hence, these estimations are still based on a number of critical assumptions and one can question their relevance.

The consultant's research shows that even data which was initially considered to be easily accessible, such as the level of taxation or charges, were not provided by most States. Initially, this was assumed to be a consequence of a certain reluctance to support this study. However, after thorough analysis and close interaction through the case study analyses, it became apparent that even this kind of information is either not available or is too complex to be provided through an online questionnaire[16]. Overall, it can be said that none of the economic information sought after in this study is available in a reliable, representative and consistent format.

Figure 6 provides an overview on which data are available per country by sub-category. Red indicates that this information was not provided. Yellow indicates that information was provided to some extent, while green indicates that there is sufficient information available. However, it must be noted that most of the economic data regarding France and the United Kingdom (UK) stems from a separate study. The States were not able to provide raw data for us to analyse the information as developed in our methodology.

Figure 6: Provision of economic data by subcategory

[16] For further specification on those issues, see the case studies.

	Workforce	Taxation & Charges	Access to services	Impact on GDP
Austria				
Belgium				
Bulgaria				
Croatia				
Cyprus				
Czech Republic				
Denmark				
Estonia				
Finland				
France				
Germany				
Greece				
Hungary				
Iceland				
Ireland				
Italy				
Latvia				
Liechtenstein				
Lithuania				
Luxembourg				
Malta				
Netherlands				
Norway				
Poland				
Portugal				
Romania				
Slovakia				
Slovenia				
Spain				
Switzerland				
United Kingdom				

In the following section, the availability of economic data are presented in more detail:

Workforce:

- While some data could be found via desk research, there is no country which could provide reliable and representative data regarding the Workforce, except those States (France and UK) that carried out a comprehensive study on General Aviation in their country.
- No data were provided with regard to average salaries. Generally, those numbers are not available. If they are available, they are considered confidential and thus cannot be shared.

Taxation & Charges:

- Although one would assume that information regarding the level and the application of taxation should be available, most CAAs were not able to provide information with regards to the taxation regime. In some of the cases, where the CAAs were not able to provide this information, the relevant information could be found through desk research.
- Information on charges is partially available. Since the amount of charges is based on several aspects (type of aircraft and MTOM, purpose of operation, type of user, type of provider etc.), which have to be assessed individually by each possible combination of those aspects, it is not possible to provide unambiguous numbers.

Access to services:

› This part of the analysis is rather end-user orientated, thus the CAAs were not able to provide a reliable and representative answer. However, some aspects of this part of the analysis are illustrated within the case studies.

Impact on GDP:

› No State authority was able to provide the data that were needed to estimate the impact on GDP as proposed in our methodology. Most of the respondents stated that these data are simply not collected. Two States (Poland and Germany) provide a rough estimate of the economic impact of GA, but these estimates are not based on any valid methodology. They merely represent a best estimate. However, even those estimates that are based on a methodology and that are part of a comprehensive study (France and UK) cannot be considered to be accurate.

4.3 Environment data

› Measurement of environment effect of GA: These data are not available. There is no mandatory requirement to monitor CO_2 emissions from GA activities.

› 44% of the respondents declared that the environment is an important factor. However, the cost of improving this impact is considered to be too high. (See section 5.4.1).

4.4 Summary of data available

Table 1 below presents a summary of the data available and an assessment of their quality.

Table 1: Availability and quality of data

Data Type	Availability	Quality
Safety related data		
Number of registered aeroplanes	Yes	++
Average age of aeroplanes	Partial	++
Number of hours flown	Partial	+
Number of hours for private, commercial and training purposes	Partial	+
Number of operations	Partial	+
Safety Management System	No	

Number of pilots	Yes	+++
Average age of pilots	Partial	++
Number and type of licences including ratings	Yes	++
Number of aircraft using advanced technology	No	
Average distance flown	Partial	+
Number of aerodromes predominantly used by GA	Yes	-
Number of GA aircraft landings using ILS	No	
Number of GA aircraft landings using RNAV	No	
Number of Aero clubs, ATOs and registered facilities[17]	Partial	+++
Number of members of aero clubs	Partial	+
Types of activities/operations performed by aero clubs	No	
Economic data		
Workforce	No	
Taxation & Charges	Partial	+
Access to Services	Partial	+
Impact on GDP	No	
Environment Data		
Measurement of environment effect	No	

[17] Data available for ATOs and registered facilities only

Environment considered as an important factor[18]	Partial	-

- +++: Data available in the format defined for the study
- ++: Data available but need to be adapted to the format defined for the study
- +: Data available but not validated or partial
- -: Data available from different sources but presenting discrepancies

4.5 Cost/effort of data collection

Aircraft registration and delivery of pilot licences are mandatory tasks for the National Authorities. These data are available and in some cases published. However, the national aircraft registers are developed nationally and do not always follow the categorization defined for the survey. This would require specific efforts and costs to either adapt the national database or refine the responses to be compliant with this categorization. In most cases, the National Authorities provided their own database without refinement.

Non-mandatory data can be provided on request, but this would require additional efforts from National Authorities and end users. The latter would have to provide these data (e.g. number of hours flown/ Types of flights), the former would have to create a specific database to collect and maintain this database.

As an example, the *Luftfahrt Bundesamt* (LBA),[19] acting on behalf of the German Ministry of Transport and Digital Infrastructure (BMVI) cooperated with several departments of LBA and BMVI and five external entities to respond to the survey, which took three months.

In Sweden, due to legal constraints, the National Authority has to transfer the costs for providing data to the end users. This would apply particularly if the European Commission implemented a process for collecting these data on an annual basis.

[18] Responses addressed to end users only.
[19] Federal Aviation Office of Germany

5 Main findings

5.1 Overview of GA in Europe

The introduction to this study (Chapter 2) contains a categorisation of GA activities. However, in some States, aerial work, BA and/or air-taxi are considered to be CAT operations instead of GA activities. This is the case for Romania according to International Civil Aviation Organisation (ICAO) Doc 9060/5 and internal procedures. Air-taxi is considered as CAT operation in Latvia. Balloons are categorized as CAT in the UK. RPAS is considered to be GA in Poland. Nonetheless, it is subject to dedicated rules.

In addition, it should be noted that the same aircraft can be used for leisure and commercial purposes, presenting a hybrid operational concept. This was highlighted by the United Kingdom. In such cases, the aircraft was included in the lists presented. This was also highlighted by the Aircraft Owner and Pilot Association (AOPA) Sweden and identified in the analysis of the end users survey. Some end users reported their flight hours as private owner and aero club and/or flight school (i.e. double or triple reporting).

The GA fleet is diverse, aircraft are certified or not, motorized or not and it includes airplanes, helicopters, balloons, microlights, parachutes, paragliding, hang gliders and model aircraft.

5.1.1 What is GA

GA activities can be compared to any other leisure activity performed by people. In the aero clubs, most of the participants are volunteers, providing their time for training, management or safety culture.

GA can be distinguished by two main activities:

- Leisure flights, including activities within aero clubs and flight schools which are mainly supported by volunteers e.g. *Federation Française Aéronautique* (FFA)[20] regroups 600 aero clubs with only 11 employees; and
- Business flights including air-taxi, aerial work and corporate aviation, which are conducted by professionals.

Maintenance companies, specialized in the maintenance of GA aircraft reside at the aerodromes and airfields. These maintenance companies are small organizations with only a few employees.

Based on information provided by the NAA, 103,063 GA aircraft are registered including all types of aircraft and 185,123 pilot licences are delivered for 2014. It has to be taken into account that pilots can have several types of licences. Therefore, the number of GA pilots cannot be deducted from the number of licences delivered.

Based on the information provided by the end users (Questionnaire B), the number of hours flown is 1,336,624, performed for 929,117 flights across Europe. However, due to the limited number of responses received, particularly from France, these figures are not accurate. The French NAA recorded around 1,500,000 hours flown in 2014 for France only. Thus, the exact figure of hours flown across Europe is presumably considerably higher than the 1,336,624 hours indicated above.

Compared with CAT in Germany, GA activities represent 21.8% of aviation activities. This is based on Eurocontrol statistical data for 2014 with 1,800,000 movements recorded in 2013[21] for CAT and number of flights recorded by the end users in 2014 (504,858 flights).

In general, aero clubs, flight schools or private pilots are organized within national federations or associations. These federations/associations can be very active like IAOPA Germany or FFA in France but this is not the case in all countries. In Latvia, there is no strong association supporting the aero clubs or flight schools.

5.2 Safety related data

5.2.1 Aircraft registered, average age and hours flown

The collection of data covered the number of aeroplanes and rotorcraft registered. These data were requested by type (fixed wings, glider, balloons, airship), number of engines and categorized per Maximum Take-Off Mass (MTOM).

[20] FFA is a French association, representing the majority of Aeroclubs in France. www.ffa-aero.fr

[21] Eurocontrol (2013): *Market segments in European Air Traffic 2013*

NAAs are the responsible national entities for aircraft certification and have the obligation to maintain a registry. In Austria, the Supreme Civil Aviation Authority delegates this task to the national service provider Austro Control for powered aircraft and to the Austrian Aero club for gliders and microlight aircraft. This is an exception in EASA Member States. However, in most cases, there is one single register including all aircraft. These aircraft are not categorized by MTOM or the categorization applied is different from that defined for the study.

This is the main source for collecting data. However, if the EC wishes to collect these data on a regular basis and in the format defined for the study, the NAAs will have to adapt their database, which will incur additional costs and effort.

The average age of the fleet and number of hours flown is not recorded by all States. The main purpose of collecting the number of hours flown is to define safety indicators. However, these data are provided by the end users on a voluntary basis only. It should be noted that the French CAA developed a specific tool for the end users to provide their data. This tool is called *AERAL* and it is available on-line. The FFA encourages its members to report their activities on an annual basis and keep track of these activities. These information are used to develop specific guidance in the field of safety, flight preparation, etc. or to target advertising campaigns to attract new pilots. The main sources for collecting the number of hours flown are the end users. However, there is no official requirement to provide these data at European level and the completeness of data will be difficult to assess.

Table 2 summarizes these findings.

Table 2: Aircraft register per State

State	Register	Average age	Number of hours flown	Categorization compliant with the survey
Austria	Published	Not provided	Not provided	No
Belgium	Data provided	Not provided	Not provided	No
Bulgaria	Data provided by GAMA	Not provided	Not provided	No
Croatia	Data provided & Published	Data provided	On-demand activity and training flights only	Yes

Cyprus[22]	Published	Not provided	Not provided	No
Czech Republic	Queries possible on-line if registration number known	Not provided	Not provided	Not available as data were not provided
Denmark	Data provided	Data provided	Not available	Yes
Estonia	Data provided & Published	Data provided	Not available	Yes
Finland[23]	Data provided by GAMA	Not provided	Published	No
France	Data provided & Published	Not available	Data provided & Published	No
Germany	Data provided & Published	Not available	Not available[24]	No
Greece	Data published	Not provided	Not provided	No
Hungary	Data provided	Data provided	Data provided	Yes
Iceland	Data provided & Published	Not provided	Not provided	No
Ireland	Data provided	Data provided	Not available	No
Italy	Published	Data not provided	Data not provided	No

[22] Cyprus stated that the NAA does not collect GA data. However, the national register is published including all aircraft registered in Cyprus.

[23] According to the Finnish CCA and due to the information disclosure policy of the new Aviation Act (13 November 2014), the aircraft register is no longer published. However, the information could be provided on an individual basis.
http://www.trafi.fi/en/aviation/aircraft_register

[24] Only number of take-off and landings are available.
https://www.destatis.de/DE/Publikationen/Thematisch/TransportVerkehr/Luftverkehr/Luftverkehr.html .

Latvia	Data provided	Data provided	Data provided	Yes
Liechtenstein[25]	Data not provided	Not provided	Not provided	Not available
Lithuania	Data not provided	Not provided	Not provided	Not available
Luxembourg	Data provided & Published	Data provided	Not available	No
Malta	Published	Not provided	Not provided	No
Norway	Data published	Not provided	Not provided	Not available
Poland	Data provided	Data provided	Data provided	Yes
Portugal	Data not provided	Not provided	Not provided	Not available
Romania	Data not provided	Data not provided	Data provided	Not available
Slovakia[26]	Data not provided	Not provided	Not provided	Not available
Slovenia	Data not provided	Not provided	Not provided	Not available
Sweden	Data provided	Data provided	Data provided	No
Switzerland	Data provided & Published	Not available	Not available	No
The Netherlands[27]	Data not provided	Not provided	Not provided	Not available

[25] Liechtenstein declined the invitation to contribute to the survey.
[26] The NAA of Slovakia stated that they do not collect GA data.
[27] Only the number of licences was provided by the Netherlands.

United Kingdom	Data provided & Published	Data provided	Data provided	No

- Data not provided: The NAA did not provided these data
- Data not available: The NAA declared that these data are not available
- Data published: The NAA did not provided these data but the national aircraft register is published on their website

Note: CAT and GA aircraft are most of the time published in one single database.

5.2.2 Pilot licences

NAAs issue pilot licenses. The according data are kept up-to-date in a national register, which is not published in most of the States. The information is considered to be personal data and is therefore confidential. A single pilot can retain several types of licences, for example, having a light aircraft pilot licence and a commercial pilot licence. This implies that a single pilot can be registered several times in a national database. Therefore, it is impossible to deduct the number of GA pilots in Europe from the number of licences attributed or to the number of pilots referenced at CAA level.

The average age is not considered, in general, as relevant data by the States. These data could be provided on-demand, but this would require additional effort and an upgrade of the national database. However, the risk remains that these data, though collected, would be considered confidential and therefore not disseminated.

In some States, the delivery of certain types of licences is delegated to other entities e.g. in Austria.

In addition to the EASA class licences, some States deliver national licences e.g. UK delivers a National Private Pilot's Licence (NPPL), France delivers a Basic licence, which authorizes local flights only.

Data regarding pilot licences can be provided on-demand by the States but the use of these data should be compliant with the rules related to the protection of personal data.

5.2.3 Number of aircraft using advanced avionics

Data regarding on-board equipment of aircraft are not collected by the NAAs and therefore only few of them could provide this information. The States providing these data are Croatia, Hungary, Poland and Romania.

These data should be systematically collected from end users in order to ensure accuracy and consistency of the information detained.

5.2.4 Average distance flown for private, training and commercial flights

The average distance flown is not collected by NAAs or associations and is not considered to be relevant data.

5.2.5 Aerodromes

Depending on the States, aerodromes are managed by either the NAA, an airport service provider or a local/regional authority, which makes the process of data collection more complex.

On request of the LBA – acting on behalf of the Ministry of Transport and Digital Infrastructure – Jeppesen kindly accepted to provide its own data in the format requested for the survey. Further, GAMA publishes an estimate of the number of aerodromes with paved and unpaved runways and the number of heliports per country. However, these data contain some discrepancies. To illustrate those discrepancies, data provided from different sources are presented on the example of Hungary in Table 3:

Table 3: Discrepancy of aerodrome data in Hungary

	Terminal for GA/BA	Providing ATS	Providing ATIS	Operating 24/7	With paved runway	With unpaved runway	With CTR
CAA Hungary	7	6	0	0	17	62	0
Jeppesen	N/A	17	1	4	4	0	1
GAMA report	N/A	N/A	N/A	N/A	20	21	N/A

Private aerodromes are not registered in Latvia but a private individual maintains a website providing the list of facilities.

Accurate data should be provided only by the aerodromes' managers.

5.2.6 Aero clubs / Approved Training Organizations

Aero clubs

The number of aero clubs is not published. This information could be provided directly by the aero clubs or national associations. Part of this information can be found on the internet, but again, the quality of these data cannot be assessed. As an

example, eight Austrian aero clubs were identified via the internet, but this information could not be verified.

Based on the information received during the State visits, the number of aero clubs is:

- France: 3,476 associations are recorded[28], 600 regrouped under the FFA and 800 under the *Fédération Française d'ULM* (FFPLUM)[29];
- Latvia: 1;
- Poland: 63;
- Sweden: 180 for motor powered aircraft and 60 for sailplanes.

Approved Training Organisations (ATO)

ATOs are certified by NAAs and as such, a register is maintained by these authorities and published as well as certified maintenance companies. Non-certified training organisations are registered by the NAAs, but their list is not published.

5.2.7 Safety Management System

SMS are implemented in NAAs as required by EU Regulation as well as in certified maintenance companies.

The implementation of a SMS is considered to be a complex and expensive process, in particular for small entities with limited or non-permanent staff. The current regulation is complex and highly demanding in terms of resources and paper work and is not adapted to small entities.

Maintenance companies had to implement a SMS to be compliant with the regulation, which was not adapted to small entities represented by less than ten persons.

In France, the *Mission Aviation légère, générale et hélicoptères* (MALGH)[30] decided to support the aero clubs, under the authority of the *Direction Générale de l'Aviation Civile* (DGAC)[31], by developing dedicated manuals in close coordination with the national associations and federations. Around 100 training organisations under the FFA are certified.

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[28] DGAC (2015): *Observatoire de l'Aviation Civile 2014-2015 Tome 1 – Analyses* http://www.developpement-durable.gouv.fr/IMG/pdf/SDE1-2199_-

[29] FFPLUM is a French association advocating ultralight aviation, www.ffplum.info

[30] Mission placed under the authority of the Director of Civil Aviation in charge of GA in France for the Ministry of Transport

[31] French Civil Aviation Authority

Safety shall not be only paperwork demonstrating that processes are implemented and managed by a few people within an organisation. The implementation of a SMS does not guarantee that flight safety will increase. Efforts should focus on the development of safety culture from the very first stage of the training and should be included in the training programmes. Sharing and reporting experience is a first step for implementing safety culture.

NAAs do not have a mandate to support the development of safety culture or the implementation of a SMS. This is developed only by national and/or associations initiatives:

- EBAA is developing a reporting tool for sharing experiences, which is disconnected from the mandatory reporting process in case of incident or accident. This tool will be available and accessible to the members of EBAA on-line;
- In the UK, the CAA has funded an industry trialling of Quick Access Recorders (QARs) for BA in order to gather more safety data on the sector. The objective is to encourage the operators to use the recorded data for pilot education and provide information to non-UK based operators on UK specific issues;
- The UK CAA encourages the GA sector and its associations to take responsibility for those areas, where safety issues are identified;
- In France, the FFA developed a self-diagnosis and a self-evaluation process addressed to managers and instructors. The outputs provided are used to develop specific items for the safety campaigns initiated each year. In addition, a checklist is available on-line for the pilot to prepare his flight;
- A tool called *REX*[32] has been developed in cooperation with the DGAC (France) with the objective of sharing past experiences, describing situations and events linked to the use of an aircraft;
- In Sweden, the NAA created the GA safety council regrouping all organisations. Safety, regulations, cost, or any other items related to GA activities and issues are discussed through formal meetings three times per year.

A clear mandate could be given to NAAs to support their national associations/federations in implementing a SMS and in developing a safety culture. The example of what has been created in France could be the basis for developing these manuals and guidance. The reporting tools developed by EBAA and France could be promoted in all European countries.

[32] Retour d'Expérience (Feedback)

5.3 Economic analysis

As discussed above, the quantity and quality of available data does not allow for a thorough economic analysis of General Aviation. The following points of the study discusses briefly some economic indicators and presents the main bottlenecks for developing General Aviation.

5.3.1 Overview

Although reliable and representative data are not available, many indicators suggest that General Aviation activities have a significantly positive impact on the economy of the Member States of the European Union. Studies carried out in the UK and France suggest a total economic impact of approximately EUR 4.1billion in each of the two countries. The methodology of the estimate of economic impact in France has not been disclosed. It is therefore not possible to assess the validity of its estimates. The methodology used for the estimate of economic impact in the UK, however, considers costs as an equivalent of value, which is at least a critical simplification, if not wrong. Nevertheless, it is reasonable to assume that these numbers have some relevance. Figures provided by other States regarding economic relevance are even weaker with regard to their reliability. However, it is undeniable that General Aviation activities play a noteworthy role for the economy of many countries.

5.3.2 Main bottlenecks

The information gathered through the e-survey as well as through interviews suggest that there are three main bottlenecks for developing General Aviation:

- Regulation;
- Taxation;
- Access to services.

The responses received through the e-survey and the feedback acquired through the case study analyses suggest that regulation is the main burden for General Aviation activities. There is a consensus that the sector is overregulated. Further, the regulation appears to be a trimmed version of CAT regulations. The actors involved in General Aviation activities feel that there is a need for tailored regulation that specifically addresses General Aviation activities. Moreover, as the General Aviation sector is rather heterogeneous, a diverse set of regulations for the various sub-sectors of General Aviation might be taken into consideration.

Secondly, taxation is a huge burden for General Aviation activities. Taxation on fuel accounts for roughly 50% of the fuel price in most of the countries of this sample, in some cases it goes up to 60%. Operators might be able to somehow compensate the Value-added tax (VAT). However, considering that the bulk of General Aviation activities is carried out by private pilots for non-commercial reasons, it becomes apparent that this level of taxation is leading to a decrease in General Aviation activities.

Thirdly, access to services is to some degree considered to be a problem. Unlike the other two bottlenecks, the situation is somewhat more diverse in the respective countries. But there is consensus that airport charges on bigger airports considerably exceed a reasonable amount for General Aviation activities to take place. This leads to the impression that General Aviation activities are not welcomed by certain airports, mostly for economic reasons. While in some countries there are plenty of alternatives provided for General Aviation operations, countries such as Sweden indicated a huge problem regarding access to services.

Concerning the regulation of General Aviation activities, often considered by end users as the biggest burden in General Aviation development, a comparison with the United States of America is relevant. During consultations with various stakeholders, it has been mentioned that the regulations regarding General Aviation in the United States are much less strict. This leads to the fact that increasing numbers of European pilots register their aircraft in the United States, because this involves fewer obligations with regards to regulation. This tendency is considered to be highly undesirable, and it lead to the introduction of a charge on the import of an aircraft in Sweden[33].

5.4 Environment

Two different aspects were analysed:

- CO_2 emissions, analysing the impact of Directive 2003/87 on the end users; and
- Noise.

5.4.1 CO_2 emissions

The monitoring and reporting of Carbon dioxide (CO_2) emissions is not mandatory for GA, except for BA, which is impacted by Directive 2003/87 of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC[34]. Therefore, there is limited data available regarding CO_2 emissions for this specific sector. The main source identified is the study carried out by PriceWaterhouseCoopers (PwC)[35] and delivered in March 2014 to the European Commission.[36]The report shows that the

[33] See case study Sweden

[34] http://eur-lex.europa.eu/search.html?DTN=0087&DTA=2003&qid=1450877757315&DB_TYPE_OF_ACT=directive&CASE_LAW_SUMMARY=false&DTS_DOM=ALL&excConsLeg=true&typeOfActStatus=DIRECTIVE&type=advanced&SUBDOM_INIT=ALL_ALL&DTS_SUBDOM=ALL_ALL

[35] PwC is a multinational professional services network

[36] The European Commission contracted PwC to carry out a study titled ETS Aviation small emitters: Cost assessment of applying EU ETS on aviation small emitters and

average costs for monitoring and reporting emissions for small emitters was EUR 10,300 per process for 2013. Those processes include the development of a monitoring plan of annual emissions, the implementation of this plan, verification, registry costs and costs of buying allowances. Potential cost reductions were suggested, such as excluding small emitters from full EU Emissions Trading System (ETS) compliance.

BA emissions represents 0.26% of CO_2 emissions accountable to aviation in Europe. However, the impact of Directive 2003/87 is considered as high by BA companies. Two main issues are identified by EBAA in their annual review[37]:

- The regulation imposes a coverage of around 95% of their historic emissions, which is only 15% for airlines. However, BA activities are less predictable than CAT activities and major differences can be recorded between two consecutive years without any possibility to adjust permits. The non-commercial exemption threshold for operators emitting less than 1,000 tonnes of CO_2 is then highly welcome and is expected to be maintained;

- The costs for Registration and Monitoring & Verification (MRV).

It can be noted that limited initiatives are implemented in Europe regarding CO_2 emissions by GA. Luxembourg proposes incentive measures to GA pilots to renew their fleet. In France, the DGAC suggests that local flights are limited during peaks of pollution. However, there is no legislation implemented allowing NAAs to restrict or prevent GA activities in case of significant pollution. Furthermore, these measures would have a very limited impact on the quality of air in the cities.

Regarding the end users, 44% of the respondents consider that the environment is an important factor. Figure 7 presents the number of responses from the end users.

Figure 7: Environment: Number of responses from end users

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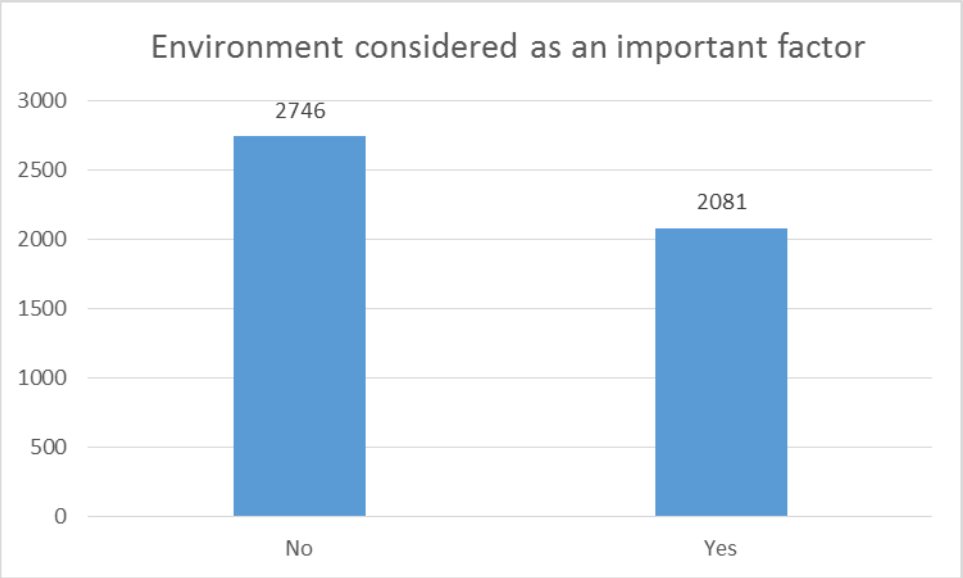
analysis of improvement potential by simplifications, alternative thresholds and alternative means of regulation. Ed. 25 March 2014.
http://ec.europa.eu/clima/policies/transport/aviation/docs/report_ets_avaiation_small_en.pdf

[37] EBAA Annual Review 2013/2014
http://www.ebaa.org/documents/document/20140515114212-ebaa-annual_review-2013-2014.pdf



However, the main obstacles raised by the end users to reduce CO_2 emissions are:

- The lack of more environment-friendly engines. In most cases, engines for single/multiple engine pistons are from the 1950s. The industry does not develop new engines. Electric engines are expected for gliders. However, this technology is not fully developed;
- If new engines exist, the costs are too high;
- These new engines are not powerful enough for certain types of aircraft, which could be a safety issue in some phases of the flight;
- The current regulation prevents any changes on certified aircraft. It is considered to be both too expensive and overly complicated;
- Some engines are not certified to use unleaded fuel.

Main expectations are focused on diesel engines or electric engines for gliders and ultralight aircraft and the possibility to use motor gasoline (MOGAS) to replace specific aviation fuel is considered too expensive.

5.4.2 Noise

NAAs do not record complaints from people living close to an aerodrome or airfield as in most of the cases these complaints are addressed to the police. However, the level of noise around aerodromes and airfields is considered to be a significant discomfort for the public and is taken into account by the aerodrome and airfield managers and by the NAAs.

Noise operating restrictions and operational procedures are implemented on busy aerodromes. Few States declared that they implemented specific measures:

- Switzerland implemented educational measures informing the pilots about noise reduction possibilities during the operation of aircraft. A training course is available on-line in English, French and German.

- In Czech Republic, negotiations are managed with the aerodrome manager and the operator in case a complaint is reported.

- In Ireland, a follow-up is organized via regulatory oversight with pilots involved for specific complaints.

5.5 Issues identified

Issues related to data collection are identified. They can be categorised as follows:

Definition of GA

- Lack of a common definition of GA: the understanding of GA operations differs among the MS, which affects the usability of the data. In particular, the feasibility of a supranational analysis of the data is therefore significantly limited. Some activities like air-taxi or ballooning are considered as CAT in few States.

Availability of data

- Lack of public data: the amount of data on-line is limited and only available for a few States, with the exception of GAMA, which publishes an annual report presenting partial GA data. The European GA associations do not collect data, mainly due to a lack of resources and the cost for developing and maintaining a database.
- Availability of data: Aircraft registration and delivery of pilot licences are the responsibility of NAAs. These data are recorded, which is not the case for all data defined in the survey, which limits the scope of the analysis.
- Hybrid operational concept, which allows the use of an aircraft for private or commercial purpose. Therefore, this prevents a valid analysis of GA activities.
- Economic data: Most of the economic data sought after are simply not available and certainly not in a format which would allow for intra-European comparison. Some data are available, but are considered to be confidential. Some information are available, but too complex to be provided for a general analysis.

  As a partial conclusion, in most cases availability of data is not a good guarantee for building solid conclusions.

Provision of data

- Lack of harmonisation: available data are not harmonised in the sense that the process of data collection differs significantly among the MS. Furthermore, the sub-categorisation within GA differs as well. Both impede a statistically valid data analysis. Figure 8 illustrates the categorisation applied by the UK. This table presents the data provided by UK CAA in response to the survey.

Figure 8: UK: GA aircraft categorisation by MTOM group

Registered Aircraft - by Maximum take-off weight group	2013	2014	Average 2008-2014
< 1 kg	123	120	132
1kg - 750kg	10895	10912	11061
751kg - 5700kg	7456	7419	7778
5701kg - 15000kg	175	163	180
15001kg - 50000kg	17	16	14
> 50000kg	2	2	2

Source: UK CAA, 2015

- Process of data collection: the organisations in charge of data collection vary among the MS. In some MS, the Civil Aviation Authority is responsible. In others, this process is assigned to a service provider or to several entities/associations depending on the type of data. Hence, there is uncertainty regarding under whose responsibility the collection of data falls;
- Data provision is voluntary: there is no obligation at either State or European level to provide these data. This is the main obstacle raised by Eurostat to develop and maintain an accurate database at European level. Some States request a payment to provide their data;
- Data protection: the legislation related to data protection can be an obstacle, particularly regarding collection of data from end users. Economic data can be considered commercially sensitive;
- Access of data from end users: some of the end users can be contacted through the associations, if they are members of these associations. However, others are not affiliated to any associations. It is not possible to estimate the fraction of the number of end users not affiliated to any association. The number of GA pilots is not recorded, only the number and types of licences are registered. A pilot can own several types of licences;
- Effort to compile these data: data are registered in different departments/divisions, involving approximately seven to ten persons with the obligation to identify and designate a responsible person;
- Difficulties completing the on-line survey: due to the number of department/divisions providing data, the on-line tool is not user friendly and requires many actions from the users;
- Difficulties in assessing and validating data provided on-line: the use of an on-line tool prevents the implementation of internal processes to verify and assess these data by the responsible person;
- Lack of interest from the end users due to the number of requests to provide data without receiving any feedback.

6 Recommendations

The recommendations are derived from the discussions with the associations and States and from the analysis of the data received.

6.1 Recommendations regarding data collection

The first step in eventually establishing a single Europe-wide database would be a common European definition of GA and GA operations. It is necessary to have a common basis for data collection to be able to process the collected data in a legitimate manner[38]. Based on this common definition, a user-friendly process to collecting these data in the future should be developed. To ensure the usability for both collecting authority and data provider, a specific on-line tool should also be developed. This tool should allow the provider to directly upload his own database, whilst the first steps in the process of data reception and processing should be automatized.

Based on the purposes of this database, the second step would be to define a list of data that would be required on a regular basis e.g. once a year. It is necessary to limit the extent of collected data, in order to avoid disincentives regarding data provision. It is important to appreciate the negative correlation between a comprehensive set of data and a high rate of participation. The identification of relevant data should hence be conducted thoroughly. Furthermore, it should be noted that some data are relevant for some activities, while totally irrelevant for others e.g. the number of hours flown per year is relevant for aircraft, helicopter or balloons but not for paragliding or parachute jumping, which is also considered as GA activity.

To ensure the consistency of this European database, harmonisation of the data to be collected should be envisaged. Some States have very detailed databases, while

[38] The process of creating a single Europe-wide definition of GA and GA operations should include the MS and their agencies. The consultant admits that this process might be protracted, however, it considers the acceptance of this common definition as a priority.

other group several types of aircraft in a single category, which prevents comparison between the States. The format of these data should be defined and agreed by the MS and associations as well as the frequency to provide these data. The study identified that depending on the State, the aircraft register is updated once a week, once a month or once a year.

The literature review has shown that minimal information is collected in a harmonised or centralised manner. Here there are two areas, which can be identified:

The first relates to data already collected by MS or other organisations (e.g. aircraft movements). The study has identified that such data are not harmonised. The recommendation of the consultant is that the Commission initiates a dialogue with the MS (possibly through already established committees) on the type of data needed and on the best way to harmonise the reporting[39]. This should contribute to the improvement of data completeness and facilitate future analysis. While this would require that some MS might have to adapt their existing procedures, it is felt that this soft approach could bring about quick and measurable results without significant administrative and financial burden.

The second part relates to data that has already been processed like those regarding economic and environmental factors. The study has identified only sporadic approaches in defining such impacts for GA. The methodology to estimate such impacts (in particular on the GDP) is by definition resource intensive and focuses on each Member State due to its particularities. The consultant considers that at this stage a Europe-wide approach would be quite time and resource consuming, beyond what is usually available for a normal study. In addition, given the wide range of GA end users, the risk of approaching a proper sample is important. If such an approach was envisaged to be undertaken at a regular times (annually, for example) the efforts would increase accordingly. In particular, the consideration of Eurostat to reduce the collection of economic related data for the CAT section is considered to be an indication of the difficulties to be encountered.

For this type of data, the consultant again takes the view that a soft approach would be the most resource efficient. By enlisting the support of existing committees (maybe also including industry stakeholders), the Commission and the different stakeholders can agree on the basic indicators to be collected from end users. In this way, a standardised questionnaire may be developed, which can be distributed on-line to end users with the help and assistance of the committee members and associations. Specialist support may be enlisted for the technical aspects and analysis of the information. The advantage of this approach is that it allows the stakeholders to take ownership of the approach and agree on common terms and indicators. This is very important in order to ensure comparison of results across the different MS. Existing electronic tools ensure that the data collection exercise

[39] This might be as simple as reclassification, or adaptation of the existing process to include some additional information.

need not be resource intensive, and focus could be required on the analysis of results (thus reducing costs). The consultant also considers that an annual collection of such economic data might not be needed. Rather, an approach of every two to five years might allow for the same quality of overview while reducing the costs. The work of the current study may be used as the basis for such an approach.

Finally, a reporting tool should be developed and accessible on-line to facilitate the process of reporting data e.g. *AERAL* developed in France.

6.2 Evaluation of possible data collection strategies

Several strategies for collected data were defined. For each of them, advantages, disadvantages, costs and benefits are illustrated and evaluated. Table 4 presents a summary of these strategies, including qualitative scoring (Chapter 6.2.6)

It should be noted that the first step when deciding to organise data collection is to strictly define which data should be collected and for what purpose.

6.2.1 Collection of data from identified sources

The approach used for this study was to collect data from identified sources, with the objective to identify which data are available. At a first step, the experts performed a review of existing literature and reports, discussed with some European associations and few State authorities and identified which data was published on official websites and by Eurostat.

Based on the findings and the requirements towards the study, a questionnaire was developed identifying possible sources for each of the data. Following this, the questionnaire was adapted to an on-line tool to ensure that the respondent would be directed to the appropriate questions.

Advantages/benefits

- Sources are identified;
- The questionnaire is built to target the appropriate source;
- Questions are adapted to existing data;
- The respondent has to respond to a limited number of questions;
- The effort and time to respond is limited;
- The collection of data can be supported by open source software.

Disadvantages

- Specific effort for the data collector to develop and maintain a database with PoCs identified for each source. This can cause further issues, when responsibilities switch in the source organisation and those changes are not reported accordingly;

- The completeness of data cannot be ensured as data are provided only by identified sources;
- The amount of data collected has to be limited in order to ensure a high rate of responses;
- There is no obligation for the source to respond.
- Single end users cannot be identified.

Costs

- From the data collector, human resources are required to identify and maintain up-to-date the PoCs, prepare/update the questionnaire, aggregate the responses and update the database.
- From the respondents, human resources are required to provide these data.

6.2.2 Legal obligations to collect and provide data

Implementing legal obligations to collect and provide data would ensure that a European database related to GA is up-to-date and can serve for the understanding of GA operations. For this, a European legal framework should be defined. This legal framework should include sources to collect and provide these data, the list of data to be provided and their format. The process and the frequency to provide these data should also be described. Prerequisites for implementing legal obligations to collect and provide data:

- Sources are identified and listed into such legal framework;
- Data are defined including the format in which they have to be provided;
- Data providers have time to adapt their internal processes to collect those data;
- A reporting tool is developed.

Advantages/benefits

- Sources are defined;
- There is no need for the data collector to develop/send a questionnaire;
- Data are harmonized, which facilitates the analysis;
- Completeness of data from these designated sources is ensured.

Disadvantages

- The list of sources shall include national specificities. In few cases, the aircraft registration or the delivery of licences is delegated to a national association;
- Tabling and implementing a new legislative framework is a long process and subject to consultation and approval of MS;
- A reporting tool should be developed to ease the data collection;
- Sources of data and data providers need additional time to adapt their internal processes;

- An upstream process should be implemented at national level to collect these data from the end users, which would be additional effort for Small and Medium Enterprise (SMEs) and associations managed by volunteers.

Costs

- A specific effort is required from the EC, EASA, the stakeholders and lawyers to develop such a legislative framework;
- A reporting tool shall be developed and maintained;
- The costs for collecting and providing data could be transferred to the end users with an increase of burden of registration/certification.

6.2.3 Data collection is managed by the EC/EASA on a case-by-case basis

The collection of data would be organized to support specific studies or projects but a European GA database would not be maintained on a regular basis.

However, before implementing specific measures or developing initiatives like the GA roadmap, and in order to maximise the relevance of the measures taken, specific databases should be established to capture the current situation. The collection of data in this domain would be initiated either directly by the EC, EASA or subcontracted to a private company. A specific questionnaire would be developed for this purpose following the main principles developed for this study and presented above.

Advantages/benefits

- There is no need for dedicated human resources to collect and aggregate data or maintain a database.

Disadvantages

- Data collected present a snapshot of the situation with limited history, which could prevent or limit the added value, if decisions are taken based only on these data;
- Each time a data collection is organised, the responsible person/team has to identify the sources, develop a questionnaire, aggregate and analyse the data received;
- The rate of responses can be low, which makes a thorough analysis impossible;
- The completeness of data cannot be ensured if some sources are not identified;
- End users and SMEs that are not members of an association are hard to reach.

Costs

- The EC/EASA needs to mobilize a team to manage this data collection process and a significant cost is attached to this kind of operation given its characteristics.

6.2.4 Voluntary approach from the stakeholders

The interviews with NAAs and associations demonstrated a strong need for a European database. Such a database would form the basis for future decisions to implement specific measures to support or promote GA in Europe, supporting the research for e.g. more efficient engines or electric engines, developing specific campaigns for the safety of GA operations or manuals/ guidance to comply with the regulation or revise existing regulations.

Lack of resources is the main difficulty for the associations to collect data. Most of these associations are managed by a very limited number of permanent people, supported by volunteers.

NAAs do not have a specific mandate to collect GA data, with the exception of a few States, where initiatives are implemented to support GA e.g. France, UK or Sweden.

Advantages/benefits

- For the EC/EASA, there is no need to implement specific processes or designate experts to manage the collection of data;
- Data are provided by the stakeholders on a voluntary basis;
- GA activities are accurately monitored and analysed by MS and EU authorities;
- Specific actions conducted at national or European level are adequately adapted, based on appropriate information retained on the sector.

Disadvantages

- There is no overview of GA operations at European level;
- This is an approach with no improvement compared to the current situation;
- As with any strategy, it may prove to be difficult to reach private owners or SMEs that are not member of an association;
- As data provision is voluntary, the completeness/quality of data cannot be guaranteed.

Costs

- A reporting tool should be developed and maintained for the volunteers to provide their data to the EC.
- The EC/EASA would have to designate experts to extract/analyse these data or part of these data only for the purpose of specific studies. Therefore, there is no need for dedicated permanent staff, which reduces the costs.

6.2.5 Cooperative approach with stakeholders

A cooperative approach could contribute to an improvement of the current situation while limiting the impact in terms of resources for the end users and associations as well as for NAAs, who, together, would define procedures to collect these data,

each of them providing part of the resources required. These data could be then reported to the EC through a specific tool.

Advantages/benefits

- For the EC/EASA, there is no need to implement specific processes or designate experts to manage the collection of data;
- A database for GA is available;
- The collection of data is federated and requires smaller effort for each stakeholder;
- An overview of GA operations is available in each MS;
- The cooperation between NAAs and associations is reinforced at State level, allowing specific initiatives to improve the current situation of GA in each State;
- The cooperation between national and European associations is reinforced.

Disadvantages

- As with any strategy, it may prove difficult to reach private owners or SMEs that are not member of an association;
- This is a complicated process. A formal cooperative agreement would have to be signed to make the process safe. This agreement would have to define specific corrective measures should one of the member fail to make the required effort;
- NAA and associations should have the drive to develop and implement this cooperative approach.

Costs

- A reporting tool for the volunteers to provide their data to the EC should be developed and maintained;
- The EC/EASA would have to designate experts to extract/analyse these data or part of these data only for the purpose of specific studies. Therefore, there is no need for dedicated permanent staff, which reduces the costs;
- The effort for collecting data is transferred to the associations and NAAs, which puts some level of burden on them.

6.2.6 Summary of the evaluation of strategies

Table 4 below presents a qualitative scoring of the five different strategies presented above. Results are presented from the EC's point of view, which could differ from the end users' perspectives.

Table 4: Summary of the evaluation of strategies

	Data completeness	Ease for collection	Quality of data	Cost	HR
Collection of data from identified sources	-	+	++	-	-
Legal obligation to collect data	++	++	++	--	--
Data collection on a case-by-case basis	+	-	++	-	+
Voluntary approach	+	++	-	++	++
Cooperative approach	+	++	++	++	++

- ++ Achievable with limited effort,
- + Easily achievable with the establishment of specific processes,
- - Difficult to achieve,
- -- Not achievable.

6.3 Recommendations with regard to data management and analysis

The analysis of data collected by the EC should be developed in an annual report. The analysis should focus on:

- The evolution of the fleet:
  - Increase/decrease of the number of aircraft registered in total and by category;
  - Analysis of cause e.g. economic situation, new regulation, specific meteorological or natural phenomena preventing flights e.g. volcanic eruption, etc.
- The evolution of the number of accidents/incidents and their severity in order to identify main causes and possibly develop specific safety campaigns to prevent these accidents/incidents. Safety indicators should be adapted on the activity performed e.g. for aerobatics, the number of hours flown per year is not fully relevant. It is more interesting to know the average duration of one single flight or the number of exhibitions per year, this activity being more demanding in terms of physical effort than a flight from A to B;
- The evolution of the number of platforms;
- The evolution of the number of pilot licences delivered per type;

› The evolution of complains for noise/pollution in the surrounding of aerodromes.

The analysis would also recommend measures in the event that an issue is identified. These measures could include incentive measures to implement noise reduction procedures, renew the fleet, etc., the development of guidance to comply with the regulation or the revision of the regulation if it is found that the reason for a decrease of GA operations is due to a regulation not adapted to the specificities of GA.

There was a broad consensus among the stakeholders that it is neither feasible nor of highest relevance to collect economic data on a regular basis e.g. annually. The analysis showed that most of the data needed to carry out a thorough analysis is not available as such. Bearing in mind that any attempt to collect the necessary data for a valid economic analysis would impose huge burdens on people involved in General Aviation, it is not recommended that data is collected regularly.

If the EC/EASA were to collect economic data Europe-wide, it should not do so more frequently than every five years. Further, which data are available for collection should also be taken into consideration, which deduction can be made from those data and to what extent this collection of data would impose burdens on the General Aviation community.

It is recommended that a database is based on a standard taxonomy where data can be exported in a standard format to be included in a EU database with access to data by NAAs and relevant EU bodies.

6.4 Recommendations with regard to existing regulations

Current regulations are defined without consideration of the size of the respective operation. For SMEs, the regulations are too prescriptive and require specific and costly efforts in terms of human resources to be compliant. These companies do not have the financial capacity to employ dedicated staff to implement a SMS. This is also true for aero clubs, which are managed mainly by volunteers. The implementation of a SMS in any single SME/aero club would not contribute automatically to an improvement of flight safety or a decrease of incidents/accidents, mainly because the pilots are not all flying on a regular basis. It is not advisable to ask them to follow lengthy procedures and to spend time filling in forms and reports. Simple safety campaigns are more effective.

Focus should be put on safety culture at the early stage of the training, with simple tools available to report and share experiences through applications available on tablets or smartphones.

Furthermore, reporting schemes - as defined in Regulation (EC) 376/2014 of 3 April 2014 on the reporting, analysis and follow-up of occurrences in civil aviation amending Regulation (EU) No 996/2010 of the European Parliament and of the Council and repealing Directive 2003/42/EC of the European Parliament and of the Council and Commission Regulations (EC) No 1321/2007 and No 1330/2007 -

should take into account the different types of activities under GA operations e.g. aerobatics might not be considered as an unusual operation.

To be efficient, regulations ought to be applicable by any of the targeted persons/companies, rules could differ for SMEs, which cannot adapt their structure easily. When drafting regulations, the following questions should be asked:

- What is the objective of the regulation?
- What do we want to improve?
- What are the risks, if this regulation is not implemented, among others, in terms of safety, efficiency and/or the environment?
- Are we sure that the implementation of a SMS will contribute to the improvement of flight safety?

6.5 Recommendations with regard to environmental aspects

The impact of human activities on the environment has been thoroughly analysed and measures have been taken to limit negative impacts. However, these measures might be too rigid with regard to the evolution of GA activities, in particular with regard to BA. BA companies ought to be able to react immediately to market changes and adapt their operations, which is currently not always feasible.

In case of peak of atmospheric pollution, one of the suggestion could be to reduce temporally GA activities on or around the aerodromes until situation improves.

End users complain about the lack of efficient engines for their aircraft and on the obligation to use leaded fuel. Some engine companies are reluctant to certify their engines with unleaded fuel. Measures should be taken to improve this situation. The GA industry in Europe is experiencing difficulties with only a few constructors. This industry should be supported through specific research programmes focusing on the development on new efficient engines or electric engines for gliders and ultra-light aircraft.

6.5.1 Indicators related to CO_2 emissions

Specific indicators should be developed for monitoring CO_2 emissions from GA. Two indicators linked to the impact of Directive 2003/87 of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC could be defined for the monitoring of BA activities:

- The amount of penalties applied to BA for exceeding their allowance;
- The number of auctioned allowances paid by BA.

A specific indicator could be defined to monitor fuel consumption and therefore define CO_2 emissions from GA activities. The amount of fuel could be provided by either the end users or the gas companies.

6.5.2 Indicators related to noise

Incentive measures to promote GA on small airfields should be proportionate to avoid an increase of noise pollution. Indicators to monitor this could be:

- The number of complaints for noise received by the aerodromes;
- The number of aerodromes/airfields with noise operating restrictions.

6.6 Proposals for future collection, management and analysis of data

Preliminary suggestions are presented in this section in a list of relevant data to be collected on a yearly basis to have an overview of GA operations in Europe and allow the development of initiatives or measures to support GA, share best practices or defined corrective measures in case of negative analyses.

6.6.1 Relevant data for an overview of GA operations

During the study it became clear that the data available are currently collected in a fragmented and problematic manner, so not easy for analysis. Based on the various models available and discussions conducted with the various stakeholders, the recommendation is to establish, at EU level, a formatted model that will contain a set of necessary data favouring the appropriate management and study of GA data in a single European database.

Depending on their nature, GA data should be provided either by NAAs, aero clubs, aerodrome managers and/or end users (Chapter 4).The following list of data is considered as the minimum relevant information to be gathered in order to capture a good overview of GA operations in Europe. However, eventually the EC/EASA should decide on a cost-effectiveness-basis, which core data should be collected.

Aircraft registered and aircraft operations:

These data could provide an overview of the evolution of the activities including the transfer of activities or the development of some categories of activities.

- Number of aircraft per category and average age of aircraft Fixed wing aircraft (piston, turboprop and jet), rotary wing aircraft, glider, micro light, balloon, airship;
- Number of hours flown per category;
- Number of hours flown per types of activities:
  - Local flights (less than ten Nautical Miles (NM) from the aerodrome);
  - Sightseeing and leisure A to A flights;
  - Private travel A to B flights;
  - Air sport (non-commercial);
  - Air sport (commercial e.g. exhibitions, air shows);

- Flight training;
- Aerial work;
- Air transport:
  - Executive;
  - Corporate;
- Emergency Medical Service;
- Other e.g. forest monitoring;

- Number of IFR flights;
- Number of litres of fuel burned:
  - Per type of fuel;
- Cost for a flight hour: including a definition of the costs considered to calculate the cost for a flight hour e.g. rental cost, fuel, insurance, maintenance, ground handling, ATS fees, CO_2 allowance fees, etc.

Aerodromes:

The evolution of the number of aerodromes could be considered a good indicator for the development of a region, particularly in low density areas with limited road infrastructures.

- Number of aerodromes with dedicated BA/GA terminal;
- Number of aerodromes predominantly used for GA:
  - Number of aerodromes providing ATS;
  - Number of aerodromes with unpaved runway.

6.6.2 Data management

An annual report could be published, presenting the information received including a comparison with previous years.

This report should include initial conclusions of the state of play of GA operations allowing the States, the associations and/or the EC to initiate actions to correct negative data or launch dedicated initiatives.

This report should also present the outputs from existing task forces/working groups at either national or European level and share best practices. These should contribute to improvement of safety but also ensure a high rate of responses to specific surveys in the future.

The establishment of a European database shall have to take into consideration the possible concern of national or international associations with regard to dissemination and possible use of data collected. The design of the future database should involve all the relevant stakeholders to ensure the commitment of the sector to provide data on a regular basis.

6.6.3 Data analysis

The analysis presented in the annual report should present:

- The evolution of the fleet:
  - Increase/decrease of the number of aircraft registered in total and by category and age of the fleet;
  - Analysis of cause e.g. economic situation, new regulation, specific meteorological or natural phenomena preventing flights e.g. volcanic eruption, etc.

  The output should identify specific measures to maintain or renew the fleet or to adapt the regulation if it seems that some activities are over regulated.
- The evolution of the number of accidents/incidents and their severity, to identify main causes and possibly develop specific safety campaigns to prevent these accidents/incidents. Safety indicators should be adapted on the activity performed e.g. for aerobatics, the number of hours flown per year is not fully relevant. It is more interesting to know the average duration of one single flight or the number of exhibitions per year, this activity being more demanding for the body than a flight from A to B;
- The evolution of the number of aerodromes/airfields. In case of a decrease, the access to parts of some countries could no longer be ensured, which could cause problems to the population, if the road infrastructure is bad and prevents the development of these regions;
- The evolution of the number of pilot licences delivered per type. The output should contribute to the development of campaigns to promote GA in schools, through air shows, exhibitions, etc.;
- The evolution of complaints for noise/pollution in the areas surrounding aerodromes. The output should contribute to the development of specific procedures for noise reduction or suggestive measures to limit activities in cases of peak pollution.

7 Conclusion

The main conclusions of the study is that for GA, the volume and the quality of information available is still limited, both at NAA and association levels. In that context, it is still difficult to develop statistics and to draw conclusions on activities, practices and the organisation of the sector. The results of the interviews and answers to the questionnaires, however, have provided some interesting data to be analysed and have allowed the identification of relevant information to be collected in the future at national and European level on a permanent and continuous basis.

It is clear that there is a need to establish a European database, to be built in close cooperation with the GA community, relevant associations and national authorities. This requires a process of identification and selection at European level of the various elements that should be collected and monitored. Furthermore, a certain number of tools and harmonised processes should be set up to ensure completeness and accuracy of data gathered.

Regular reports and feedback should be provided to the NAAs and end users in support of the development of specific measures to promote GA or to improve the safety of operations.

Appendix A Case Studies

The collection of data was organized in two steps:

› Collection of data through an on-line questionnaire; and

› Interviews and site survey in selected States to complement the database and provide an overview of GA in these States through case studies.

The criteria defined to select these States were:

› Availability of data;

› Relevance for the GA sector;

› Geographical coverage;

› Representativeness.

Following the verification of the quality and relevance of the different data obtained from the main stakeholders, eight countries were selected for the development of case studies: Germany, France, Latvia, Poland, Romania, Spain, Sweden and United Kingdom.

A specific methodology was developed for these interviews. Based on the initial analysis of data received, the consultant developed two specific sets of questions, one addressed to the NAA and one to the associations. These questionnaires were sent to the participants prior to the meetings in order to maximise the quality of the results.

A different approach was developed for Germany and UK because they had provided detailed data through the e-survey. For these two States, specific interviews with their national stakeholders were not necessary.

For each country, the case study presents:

› An overview of GA in the country,

› Data collection, analysis, monitoring and reporting practices;

› The effectiveness of data collection;

› Success and failures factors;

› Replicability of best practices to another country;

› Situation related to safety, environment and economy;

› The initiatives to promote GA if any; and

› A conclusion.

A.1 Case Study: France

A.1.1 Context

GA regroups recreational flying and sport aviation excluding CAT and aerial work. GA aircraft are defined as aircraft with a MTOM not exceeding 2.7 tonnes for the helicopters and 5.7 tonnes for the aircraft.

GA associations are under the tutelage of the Ministry of Transport and the Ministry of Education.

GA in France is very active with around 3,476 associations and 131,600 members.

In 2008, a specific unit was created within the Ministry of Transport as the focal point for the aero clubs and GA end users. Its mission is to gather the requests of those users, monitor the progress and record their replies. Further, it is its obligation to advise the Director General of Civil Aviation on the policies to be implemented vis-a-vis these users and to follow up on the implementation of these policies.

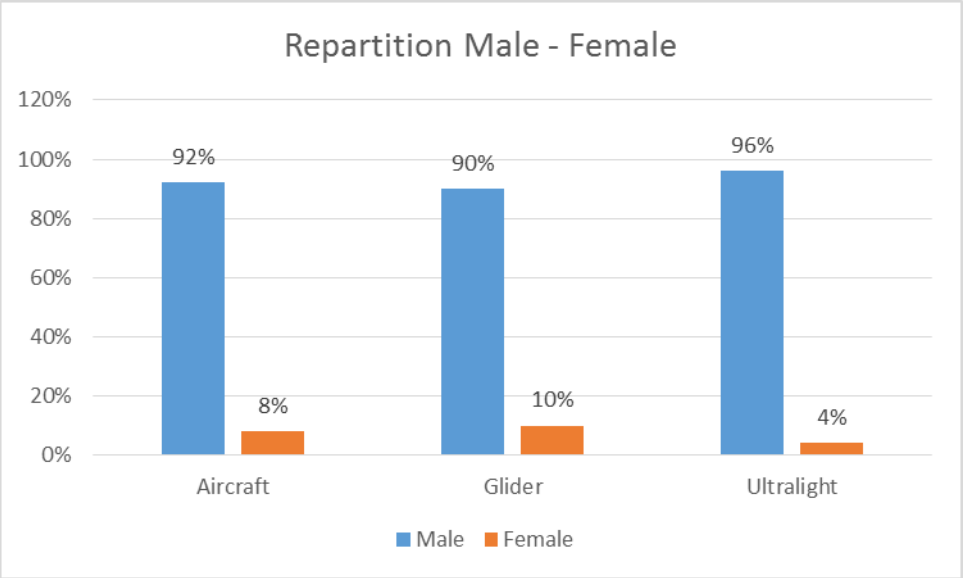
Recreational flying is practiced by individual users or grouped in aeronautical associations in about 330 aerodromes open to public air traffic, 200 airfields with restricted access, 380 privately used airfields, more than 830 airfields dedicated to Ultra-Light Motorized (ULM) activities and over 950 take-off areas.

Flight training is organized mainly within the aero clubs. The *Fédération Française Aéronautique* (FFA)[40] regroups 600 aero clubs, 500 of them are training centres and according to the FFA, around 100 are certified. 122 ATOs are registered for GA and 79 for professional pilots. 90% of the instructors are volunteers. The *Fédération Française d'ULM* French Federation of ULMs (FFPLUM) regroups 800 clubs which represent 15,000 pilots and 14,000 ULM.

40,000 pilots are recorded in France, including commercial pilots and trainees. The number of licenses is stable. However, the number of ULM licences is growing while aircraft licences are decreasing. Figure 9 illustrates that most the pilots are male (92% for aircraft, 96% for ultralights and 90% for gliders). With regards to aircraft, female pilots represent 8% of the total but 14% of the pilots under 25 years old. The MALGH (see section 5.2.7) indicated that the average age of the pilots is around 50 years for pilot aircraft, 40 years for helicopter pilots and 70% of the glider pilots are above 25 years old and 25% of them are over 60 years old.

[40] www.ffa-aero.fr

Figure 9: Repartition Male-Female



The number of aircraft registered has been stable for the last five years. However, the MALGH could identify a transfer of activities with a decrease of the number of helicopters and aircraft and an increase of ultralights registered. It should be noted that not all ultralights are registered.

The associations pointed out two main barriers to the growth of the sector:

- The medical aptitude cost: the medical check is expensive and shall be conducted by doctors specialized in aeronautics. More flexibility should be provided to allow this medical check by a generalist.
- The cost of fuel due to the high rate of taxes.

A.1.2 Data collection

Data are collected by the main associations. The reporting is made on a voluntary basis but is strongly recommended by the associations. It can be noted that ULM pilots do not have the obligation to report their activities in a flight book. Therefore, the number of hours flown and number of flights should be considered an estimate.

The associations have the obligation to report their activities to the MALGH once a year. An on-line tool is available on the DGAC website. The tool is called AERAL and was developed by MALGH in close cooperation with the associations.

These data contribute to the development of GA in France. Based on the analysis of these data, specific initiatives can be initiated e.g. safety campaigns, promotion, etc.

A.1.3 Data analysis, monitoring and reporting

Data are analysed by the associations and by the MALGH. Information is provided by the associations through regular publications and their websites.

The DGAC issues an annual report *"Observatoire de l'Aviation Civile"* describing the situation of civil aviation in France and in the world and it includes data related to GA in France.

This report is published by the DGAC and available on their website.

A.1.4 Costs/Efforts

The MALGH is composed of seven persons. The associations have a limited number of employees (11 for the FFA and seven for the FFPLUM).

The MALGH is the focal point of contact to provide GA data. The format of the data provided was not compatible with the format defined in the survey and it was therefore not included in the database. If data should be provided to the EC on a regular basis, the AERAL tool should be updated to be compliant with the structure and categorization required.

The end users were not very active in providing data nor responding to the survey. The consultant received only 124 responses.

General data were available on the MALGH database except the average age of the pilots.

A.1.5 Effectiveness of the process currently employed in the country

The NAA and the national associations identified the need for a national GA database. Therefore, they defined a list of relevant data to collect and developed a tool for data collection. This tool is an on-line tool and the associations provide their data once a year. The completeness of data cannot be ensured, as flying clubs do not have any obligation to provide these data to the associations. However, missing data represent a very limited percentage of the data collected and it can be considered negligible.

The associations have one dedicated point of contact in the NAA with the MALGH, which contributes to a fair and fruitful dialogue to discuss issues related to GA operations and to agree in processes and actions to promote GA. However, the MALGH does not have any mandate to address BA issues. As such, the GA community is not fully represented in the statistics published in the DGAC annual report.

A.1.6 Effectiveness of the process applied for this study

The MALGH is the focal point of contact in France to provide GA data except BA data collected together with CAT data. Therefore, the MALGH could provide most

of the data required for the study. However, the MALGH chose to provide their data in their own format, which is different from the format defined for the survey. Data were provided via email. The MALGH did not provide data related to the age of the pilots. These data are considered not relevant by the MALGH and therefore not collected. The associations collect these data and use these in their promotion campaigns to attract young pilots.

GA is a very active sector in France. Despite this, responses to Questionnaire B were very limited with only 124 responses. Compared to the 40,000 pilots identified, this represents only 0.03% of the pilots.

Three factors have led to the collection of data with a high level of quality and usability in France:

- Most of the data requested are collected by the associations and the MALGH.
- A Mission dedicated to GA is implemented within the Ministry of Transport.
- A significant number of pilots are member of an association (e.g. 15,500 pilots are members of the FFPLUM, which represents 38.75% of the pilots registered in France.).

A.1.7 Replicability of best practices

The initiatives launched as a cooperation between the associations and the MALGH for the development of specific on-line tools for data collection and reporting could easily replicated in any other country. These tools are on-line. To increase the reporting process, an application could be developed for smartphones and tablets.

A.1.8 Safety

A SMS is implemented within the CAA and within the two associations visited (FFA and FFPLUM). For these two associations, safety is organized through a national committee and regional and local committees.

Manuals and guidance have been developed in cooperation between the MALGH and the associations to support the implementation of SMS and ensure compliance with the Regulation.

In addition, the FFA developed several types of tools contributing to the development of the safety culture:

- A self-diagnosis and a self-evaluation process for the managers and instructors to allow them to check their ability to apply the procedures according to level of quality expected in their activities;
- An on-line checklist available for pilots to prepare their flight to ensure they do not miss an important step;
- An additional on-line tool is under development with the support of the MALGH to report any experience, which is not an incident or an accident.

The information provided by the end users are analysed by the committees allowing the development of specific campaigns.

The FFPLUM publishes a monthly newsletter in relation to the incidents reported by the pilots.

An issue was raised by the FFA regarding the bureaucracy associate with the maintenance of aircraft. To avoid this bureaucracy and avoid extra costs, some pilots choose a FAA certificate for their aircraft. The maintenance is less heavy but still with a high level of safety and it is less expensive. The average of FAA certified aircraft could not be provided.

A.1.9 Environment

Associations and the Ministry of Transport expressed their concern related to the environment. Two aspects are considered:

- CO_2 emissions;
- Noise pollution.

CO_2 emissions by GA are very limited and represents around 80,000 tonnes of CO_2 per year. The emissions are not monitored as it is not mandatory for GA. However, the MALGH suggests a reduction in activities around the aerodromes in case of pollution peak periods.

The main obstacle to modify the existing fleet is the current regulation for certified aircraft. The certification process defined in the regulation is considered too rigid by the end users.

Another obstacle is the lack of alternatives for the engines. The GA industry in France is dying and the existing manufacturers are less interested in developing new engines because of its small market size.

Airbus and *Aéroports de Paris* (ADP) launched a research programme named “e-fan” for the development of electric engines. The FFA is involved in this programme.

Noise pollution is considered more important for GA activities as this can become an obstacle for the development of an aerodrome. The location of those aerodromes in densely populated areas is challenged by local associations defending the environment. This situation becomes critical for few aerodromes around Paris and big cities which are now surrounded by residences.

End users have high expectations with regards to electrical engines for gliders in a near future.

A.1.10 Economy

Impact on GDP

The General and Business Aviation Commission of French aviation industry federation (FNAM) published a study on the socioeconomic impact of General and Business Aviation in France[41]. The study uses a quantitative and qualitative approach and gives on overview on several key indicators of the GA sector in France: At the time of the study, there were 8,122 aircraft registered in GA, which account for 91% of all aircraft registered in France. Annual flight hours add up to 18,650,000 and there are 40,400 pilots of airplanes in France. Furthermore, there are 660 aerodromes and airfields in the country. The study also provides some economic figures: GA accounts for a total impact on the economy of approximately EUR 4.14 billion. This figure can be further broken down in direct impact (≈ EUR 2 billion, EUR 610 million of which are internal consumption), indirect impact (≈ EUR 0.9 billion) and induced impact (≈ EUR 1.16 billion).

According to the study, there are four certified General Aviation aircraft manufacturers in France (Daher-Socata, Dassault Aviation, Robin Aircraft and Issoire Aviation), which have acquired a market share of 65% in Europe. This accounts for a commercial value of EUR 580 million generated in 2010. Companies performing ground, flight or training activities account for a total economic impact of EUR 1.21 billion and create 6,685 jobs, 3,780 of which created directly. The largest share of economic impact is categorised as an indirect impact (≈ EUR 680 million).

According to the study, more than 17% of business flight departures in Europe originate in France, which is the largest proportion of all European countries. The total economic impact of Business Aviation (BA) amounts to EUR 2,154 billion (EUR 1,047 billion of direct production) and there are around 9,000 jobs in BA, 3,780 of which were created directly.

Table 5 provides some information and key indicators on the airport "Paris le Bourget" to illustrate one of the most important aerodromes in the General Aviation sector.

[41] Fédération Nationale de l'Aviation Marchande (2013): *The first study on socioeconomic impact of general aviation and business aviation in France*

Table 5: Example – Paris le Bourget

Paris le Bourget Airport:

General Information:

- First Business Aviation Airport in Europe
- Solely dedicated to Business Aviation
- Only aircraft with less than 19 passenger seats are permitted
- Only non-scheduled flights

Infrastructure:

- Three Runways
- 30,000 square meters of hangars
- 7,500 square meters of office space

Activities:

- Public and private transportation
- Handling and aircraft assistance
- Maintenance
- Training
- Aircraft repairs and refurbishment

Key Figures:

- 2,650 on site jobs
- 159,000 passengers in 2010
- 58,000 movements in 2010
- EUR 603 million of added value
- Direct economic impact in France: EUR 306 million (in 2010)
- Indirect economic impact in France: EUR 153 million (in 2010)
- 75 companies (8 ground handlers, 15 airline operators, training organisations, maintenance and repair companies and training companies)

Source: BIPE, 2011[42]

Bottlenecks for developing General Aviation

Quality and complexity of regulations are considered the major bottlenecks for General Aviation in France. Alongside the typical issues of overregulation, there is a country-specific aspect, in that national authorities have delegated their responsibility to local authorities, which makes the application of regulations even more complex.

[42] BIPE (2011): Evaluation des impacts économique et social des aéroports Paris - Charles de Gaulle, Paris - Orly, Paris - Le Bourget

This also leads to a second bottleneck, as local authorities tend to lack funding and therefore lack the ability to maintain airfields and to develop them. According to the GA community, low-cost airlines activities have a positive impact on General Aviation in France. Low-cost airlines tend to offer their services in remote areas and thereby keep profitable aerodromes that are also used for General Aviation purposes.

A third major bottleneck in France are global costs, which include taxation of fuel as well as certification and registration costs[43]. Taxation accounts for roughly 60% of the price of AvGas in France. Although airport charges (landing fees, route fees) are part of global costs, they are not particularly considered a huge problem for General Aviation activities. Their considerably low level is due to the large number of aerodromes in France.

A.1.11 Initiatives to promote GA

France can be considered as a good example, as many initiatives and incentive measures are implemented to promote GA:

- A step-by-step approach with a special licence dedicated to young pilots, and a basic licence allowing local flights only;
- Two specific examinations are organized in cooperation with the Ministry of Education:
  - *Brevet d'Initiation Aéronautique* (BIA)[44] is addressed to young people between 13 and 18 years old. The goal is to discover aeronautics in general and / or engage in a career oriented to aeronautics. With this examination, they can receive financial aid and course materials to start flying. 6,604 certificates have been delivered in 2013;
  - *Certificat d'Aptitude à l'Enseignement Aéronautique* (CAEA)[45] is a certificate is delivered to students, teachers and professors to teach young people for the BIA. 196 certificates have been delivered in 2013.
- A large number of shows and events are organised. In 2013, the DGAC recorded 1,102 air shows including flights to discover aviation and large air shows;
- Associations receive subsidies from the two Ministries (around EUR 2 million per year are distributed to the associations). These subsidies are used to support young pilots (BIA), the organisation of competitions, etc.
- Campaigns are organised by the associations to promote GA.

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[43] The amount of certification costs is based on a variety of aspects and differ considerably throughout the country, which is why it is not feasible to illustrate those in this report.
[44] Certificate introducing aeronautics
[45] Certificate of aptitude for teaching aeronautics

A.1.12 Conclusion

France is one of the most active countries regarding GA activities. Aviation and GA are popular. This is mostly due to historical reasons with pioneer pilots, existence of manufacturers and a large number of aero clubs and airfields opened to GA. Pilots consider that it is easy to find an airfield close to their final destination.

The Ministry of Transport (MALGH) and the Ministry of Education supporting GA activities have an active policy regarding GA, leading to specific actions at national and local level. The promotion of GA is organized by the associations and the pilots generally obtain very good results in European and international competitions. This contributes to the promotion of GA.

A.2 Case Study: Germany

A.2.1 Context

AOPA Germany provides some general information about the sector in the country. Almost 400 airports are used almost exclusively for General Aviation operations. Furthermore, there are approximately 250 aerodromes used exclusively by sailplanes and approximately 100 aerodromes used exclusively by helicopters.

In 2013, GA represented 1,065,840 movements divided into:

- 206,494 movements with motorized aircraft;
- 597,459 movements with gliders;
- 502,714 movements with ultralights;
- 1,486 movements with balloons.

In 2009, BA represented 333 flights per day.[46]

With regards to this study, the LBA acting on behalf of the BMVI provided the required data supported by:

- several departments of the LBA;
- several departments of the BMVI;
- the Federal Authority for Air Navigation Services (BAF) and the German ATC GmbH (DFS);
- the Federal Environment Agency (UBA), especially the German Emissions Trading Authority (DEHSt);
- the Federal Statistical Office (Destatis);
- AOPA and Jeppesen.

This methodology applied by LBA was unique to this survey.

The end users were the most active, with 715 responses among all the responses received to Questionnaire B.

A.2.2 Data collection

LBA does not currently collect GA data as such. For the purpose of this study, the LBA contacted several national entities, associations and private company to provide the data requested.

[46] Eurocontrol Trends Air Traffic Volume 6 (2009): *Business Aviation in Europe 2009*

It might be noted that the aircraft categorization does not strictly follow the categorisation defined for the survey. Turbojet and turbofan are one single type of engine. A specific category is defined for motorized sailplanes.

In 2014, the GA fleet represented 31,756 aircraft. In 2013, 87,203 licences have been recorded, including 62,800 Private Pilot Licence (PPL) and 3,212 Light Aircraft Pilot Licence (LPAL).

Data related to aerodromes was provided by Jeppesen, a private company producing aeronautical charts and procedures, on request of LBA. Jeppesen provided these data for all European countries (see Section 4.1.2).

A.2.3 Data analysis, monitoring and reporting

Only the number of aircraft registered and the number of pilot licences are collected and available in a database.

GA activities, particularly the number of movements per aircraft type and type of flight are reported to the *Statistisches Bundesamt*[47], which publishes a report on an annual basis. This report includes both GA and commercial activities.

A.2.4 Costs/efforts.

The process for collecting data took more than 2 months and involved several entities external to the NAA. Data were provided without cost. Only costs related to human resources could be identified.

A.2.5 Effectiveness of the process currently employed in the country

LBA do not collect GA data as such. Therefore, they had to implement a dedicated process to collect and provide the requested data. Seven different entities and several departments in some entities were involved in the provision of data.

The end users questionnaire did not present any difficulties to the respondents. The number of rejected responses was limited (3.6%) and the main reason was the format used to provide the average age of the aircraft.

A.2.6 Effectiveness of the process applied for this study

Without the process implemented by LBA to provide the required data, LBA could provide the number of aircraft registered and the number of pilot licences, extracted from their national database. The data format is slightly different from

[47] Federal Statistical Office of Germany

the format defined for the survey. Turbojet and turbofan are considered as one single category.

LBA identified all relevant entities able to provide the required data and took the initiative to contact them and act as focal point of contact for Germany. This process would be too complicated and time consuming (the data collection took 2 months) to be repeated on an annual basis.

Due to the large number of entities involved in the collection process, the use of the on-line survey was not considered relevant by the LBA, which requested the questionnaire in another format. Except aerodrome data provided in a separate file, LBA used an Excel® sheet provided by the consultant to respond to Questionnaire A.

A.2.7 Replicability of best practices

The methodology implemented by LBA was adapted to Germany and it could not be easily replicated in other States. However, it is important to highlight that the data are already collected by several specific German entities.

A.2.8 Safety

LBA does not have information regarding the implementation of SMS within GA associations.

A.2.9 Environment

An evaluation of all relevant GA operators revealed that in the past there was no need for emissions trading. Currently, three operators are under closer evaluation as they might exceed the limits in the future. In light of this, no GA operator is forced to monitor the quantity of CO_2 emitted.

PwC was contracted by the EC to produce a report in 2014[48]. This report shows that the average costs for monitoring and reporting emissions for small emitters was EUR 10,300 for 2013. The monitoring process includes the development of a monitoring plan of annual emissions, the implementation of this plan, the verification and registry costs and costs of buying allowances. Potential cost reductions were suggested, such as excluding small emitters from full EU ETS compliance (71% of costs incurred by States is to regulate 0.8% of aviation

[48] The European Commission contracted PwC to carry out a study named ETS Aviation small emitters: Cost assessment of applying EU ETS on aviation small emitters and analysis of improvement potential by simplifications, alternative thresholds and alternative means of regulation. Ed. 25 March 2014. http://ec.europa.eu/clima/policies/transport/aviation/docs/report_ets_avaiation_small_en.pdf

emissions or for the operator to outsource the monitoring, reporting, verification and registry compliance to a service company and the harmonisation of fees between Member States).

Noise complaints are, in general, addressed directly to the aerodromes or to the police. Only in few cases, the Ministry of Transportation is contacted for noise complaints. Therefore, they do not have any data related to noise pollution and they are not the responsible authority to address these complaints.

A.2.10 Economy

Overview

According to AOPA, General Aviation in Germany generates an annual turnover of more than EUR 500 million and almost 10,000 people are directly employed in activities linked to General Aviation.

Charges, Taxation and other Expenses

Basic certification fees range from EUR 150 (Balloons) to EUR 1800 (aircraft with MTOM above 5000 kg), in addition there is an hourly rate to pay by the GA operator to the State. Changes of the type of certification involve costs ranging from 10% to 50% of the basic certification fee plus hourly rate. Registration fees range from EUR 80 to EUR 800 depending on the type of aircraft.

There is no domestic production of aviation fuel in Germany, so it has to be imported. In 2014, 100% of these imports originated from other EU countries. When analysing the amount of aviation fuel sold, a slight but constant decrease can be identified in the years from 2008 to 2014 – with 15,000 tons in 2008 and 11,000 tons in 2014[49]. As already identified through the desk research, taxation is an issue for General Aviation activities. AvGas is taxed both through an Energy Tax as well as through VAT. Taxation accounts for approximately 50% of the price of AvGas. However, there is a tax exemption for activities, which involve the transport of passengers (e.g. air taxi services, parachuting).

Impact on GDP

In 2014 there were 107 companies listed in a registry of the *Luftfahrt-Bundesamt*, with an average turnover of approx. EUR 7 million in the evaluation. The companies in question are only those which have received a license according to the mentioned regulation and which are under responsibility of the German CAA. For most companies, there are only sales data available because Article 8 (8) of the Regulation (EU) 1008/2008[50] merely calls for a net capital proof in amount of EUR

[49] Annual report of the association of the German petroleum industry. http://www.mwv.de/upload/Presseinformation/Pressemeldungen/Meldungen/MWV-JB_Web_2014_YyMtkGHT53tFbHd.pdf

[50] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:293:0003:0020:en:PDF

100,000 for small operations. Corporate aviation, aerial work, leisure flights, aerial sport and training flights are not included in Table 6.

Table 6: Turnover Germany

Companies with a turnover	Number of companies	Percentage	Average turnover	Number of aircraft	Number of helicopter
< EUR 10 million	85	79%	EUR 2.54 million	160	182
EUR 10 million < X < EUR 20 million	14	13%	EUR 13.11 million	69	32
> EUR 20 million	8	8%	EUR 43.85 million	97	0

Source: Luftfahrt-Bundesamt Germany, 2015

Access to services

General Aviation operations are undertaken on a variety of aerodromes, ranging from major airports like Frankfurt Airport over small airports both used for Commercial and General Aviation, as well as aerodromes solely used for GA purposes. The airport charges vary among the different aerodromes. While the usage of the General Aviation terminal of Frankfurt Airport costs EUR 183 for aircraft with a lesser MTOM than 5.7 tonnes and EUR 264 for rotary wings and sailplanes[51], the costs on the airport in Dortmund (a middle sized airport) for non-scheduled aircraft operations are within a range of EUR 6-50 per departure according to the MTOM[52]. *Flugplatz Schönhagen* is an aerodrome exclusively used for GA operations. Ground handling costs amount to EUR 25 to EUR 50 per hour depending on the MTOM of the airplane. The costs per landing vary from EUR 2 to EUR 200 depending on MTOM and specific aspects of the aircraft. Fuel prices are 2.38 EUR/litre for AvGas 100 LL (including VAT and energy tax), 1.7 EUR/litre for JET A and 2.31 for AvGas UL 91 EUR/litre. The prices for oil vary from EUR/litre to 12 EUR/litre including VAT[53].

A.2.11 Initiatives to promote GA

There is no initiative at Federal level to promote GA.

A.2.12 Conclusion

Gliding is the most popular activity in Germany with more than 38% of aircraft registered and 597,459 movements in 2013. End users are quite active and easily respond to surveys thanks to a strong involvement of IAOPA. LBA took the

[51] Fraport AG: http://www.fraport.de/content/fraport/de/misc/binaer/kompetenzen/aviation-services/flug--und-terminalbetrieb/nutzungsbedingungen-und-entgelte/jcr:content.file/2013-nutzungsbedingungen-gat-deutsch.pdf
[52] Dortmund Airport: https://ip-assets.s3-eu-west-1.amazonaws.com/public/airportdtm/1cb040143d526eef/90f5a0adb00a6449e29b1dd86abca9e7/Dortmund_Airport_Entgeltordnung_01-11-2011.pdf
[53] Flugplatz Schönhagen: http://www.flugplatz-schoenhagen.aero/en/for-pilots/the-airport/fuel-prices.html

initiative to contact the different entities collecting part of the data required for the survey. However, there is no dedicated process implemented in Germany to collect these data on regular basis.

A.3 Case study: Latvia

A.3.1 Context

In Latvia, the consultant met the NAA, a flight school, a maintenance company (SME) and a private pilot, an instructor in an aero club.

GA in Latvia was strongly impacted by the financial crisis of 2008. For the last three years, activities have increased slightly but they are still limited, with only 249 pilots identified. Apart from the financial situation, the main obstacle is the requirements set up by the regulation setting up the conditions of the aircraft certification. Ultralight activities are growing faster than other activities. There is no dedicated licence to fly light aircraft (LPAL) in Latvia. Private pilot licences (PPL) allows the use of light aircraft. Aerial work is not considered a GA activity.

Most small companies consider irrelevant to be member of a national association (too expensive and does not provide added value for their business), which limits their development. There is no aviation industry in Latvia.

The maintenance company have implemented a SMS in compliance with EU legislation. In order to reduce the cost of establishing and running a SMS, companies are sharing the employment of a single employee serving each of them.

The flight school consulted in Latvia is not member of an association and does not receive any subsidies; they operate three aircraft: two single engine piston and one multi engine piston. Their presence on the airfield is challenged by the presence of hydrocarbon storage facilities on the airfield and by the operational constraints related to Riga International Airport activities.

Aero club of Latvia regroups 1,314 members divided in eight federations.

The most popular activity is leisure flight from A to B.

In 2015, four training organisations were registered and only one certified. Seven maintenance companies are currently certified.

13 aerodromes are predominantly used by GA. Around 100 small private airfields are recorded. These airfields are not certified but information on these airfields is available on a dedicated website (www.myairfield.com) which is maintained by a private operator.

A.3.2 Data collection

The NAA collects most of the data required for the survey, including the number of hours flown. However, this information is provided on a voluntary basis only and should not be considered as complete. Take-off and landings data were provided for on-demand activities only.

The average age of the pilots was calculated on request for the consultant but this is not collected and is considered to be personal data.

A.3.3 Data analysis, monitoring and reporting

Data are analysed annually by the NAA for safety reasons. Safety indicators are implemented and monitored.

The NAA do not produce any report on GA activities.

A.3.4 Costs/efforts

The collection of data involved several departments in the NAA representing around ten persons. No cost can be associated with this effort.

Specific efforts were required to extract the number of GA aircraft from the register and to calculate the average age of the pilots.

This could be done on an annual basis. However, the pilot database should be updated if the EC wishes to include the average age of the pilots included in the list of data collected. This has a cost but it cannot be estimated at this stage. Due to budget constraints, this could represent an issue.

A.3.5 Effectiveness of the process currently employed in the country

The NAA is a small entity and GA activities are limited in Latvia. It is then possible to extract these data from the national database with limited effort. Regarding MTOM, the aircraft register is common for GA and commercial aircraft without distinction. A specific effort was required to extract GA aircraft from the register. Therefore, the accuracy of data cannot be ensured.

The process implemented to collect end users data (number of hours flown) is a manual process. The end users can choose to provide these data via email or mail to the NAA and there is no legal obligation to provide these data.

The NAA does not collect the age of the pilots, which is considered to be personal data and not relevant.

It might be also noted that commercial pilots can also own a private licence, what could impact the accuracy of the results related to the total number of pilots.

A.3.6 Effectiveness of the process applied for this study

The NAA chose to respond to the questionnaire using the Excel sheet, which was considered an easier way to collect data from the different departments than other solutions.

It can be noted that commercial pilots can also own a private licence. Therefore, the number of pilots cannot be calculated with accuracy.

The consultant received only one response from a private owner on the end users questionnaire. This can be explained by the fact that most of the GA actors are not members of associations. Aero club of Latvia was contacted but did not disseminated the questionnaire to its members. The aero club of Latvia did not provided any reason for that.

A.3.7 Replicability of best practices

The methodology implemented by the NAA was adapted to Latvia and was a manual process. GA data are not collected as such. They are part of the data detained by the NAA within the national databases. This cannot be transferred to other States.

A.3.8 Safety

A SMS is implemented within the NAA with dedicated personal responsible for the monitoring of safety and safety oversights. Safety is monitored through seminars, risk assessments and inspections.

The certified ATO and maintenance companies are compliant with the regulation with a SMS implemented. However, the regulation is considered to be an issue for the aero clubs delivering training by volunteers. Two ATOs stopped their activities due to the regulation, which is considered too demanding for small entities.

Other issues raised were medical aptitude, which is considered too rigid for private pilots and the mandatory language proficiency in particular for pilots operating local flights.

A.3.9 Environment

Emissions from GA activities are not monitored. Further, the impact on environment is considered negligible due to the limited number of hours flown. (Around 4,011 flight hours in 2014 recorded by the NAA).

Operational procedures are implemented on the aerodromes where noise complaints are recorded.

A.3.10 Economy

Access to services

There is only one airport in Latvia providing the following ground handling services: ground administration and supervision, passenger handling, baggage handling, freight and mail handling, ramp handling, aircraft services, fuel and oil handling, aircraft maintenance, flight operations and crew administration, surface transport and catering services.

Charges, Taxation and other Expenses

In Latvia, the level of taxation is regarded as a bottleneck for the development of General Aviation. While there is no tax on possession, luxuries or operations according to the Latvian CAA, the level of taxation on Aviation Fuel as well as the level of VAT is a problem. Furthermore, there is no exemption of VAT on Aviation Fuel or on Jet Fuel.

The high level of charges on ground handling at Riga Airport are considered another burden for actors involved in General Aviation. Further, there is a tax exemption for certain ground handling services for international operations. The level of charges for ground handling services as well as the indication of charges that have a tax exemption for international flights can be seen in Table 7:

Table 7: Example handling costs Riga

	Unit price	Quantity	Amount	VAT	
Capital Handling services				**Domestic**	**International**
Handling	EUR 250.00	*1 Each*	EUR 250.00	EUR 52.5	EUR -
Third party services					
Airport fees	EUR 80.00	*1 occ*	EUR 80.00	EUR 16.8	EUR -
Landing/Take-off	EUR 2.05	*3,885 tons*	EUR 7.96	EUR 1.67	EUR -
Parking	EUR 0.14	*10 hours*	EUR 30.00	EUR 6.3	EUR -
Terminal Navigation	EUR 15.10	*1 occ*	EUR 15.10	EUR 3.17	EUR 3.17
GPU	EUR 25.00	*1.5 hours*	EUR 37.5	EUR 7.88	EUR -
			EUR 420.56	EUR 88.32	EUR 3.17
				EUR 508.88	
					EUR 423.73

Costs for certification and registration are divided into two groups: Below and over 700 kg MTOM. Certification of an aircraft with a MTOM of less than 700 kg costs EUR 71.14, while the registration of such aircraft implies costs of EUR 49.80. For aircraft with a MTOM of more than 700 kg, certification costs EUR 213.43, while registration costs EUR 128.06.

A.3.11 Initiatives to promote GA

There is no initiative from the NAA to promote GA. This is not in their mandate and there is no budget allocated for this. In case of modifications in the regulation, the NAA organizes a seminar. However, this seminar does not regroup all GA actors.

A.3.12 Conclusion

GA activities are limited in Latvia mainly due to the economic crisis and the lack of subsidies.

Ultralight activities are growing faster than other activities due to more flexible regulation. BA is limited. Only six BA aircraft were recorded in 2009.[54]

[54] Eurocontrol Trends Air Traffic Volume 6 (2009): *Business Aviation in Europe 2009*

A.4 Case study: Poland

A.4.1 Context

In Poland, the consultant only met the NAA. Meetings requests were sent to AOPA Poland and *Aeroklub Szczcinski*. This last entity provided data for the main questionnaire. However, these meetings could not be organized. With the support of the NAA, AOPA Poland has been reached and the questionnaire has been sent but the replies have not been received at the date of drafting this study.

GA definition is considered accurate. However, RPAS are defined as GA activities in Poland and represent 1,700 users. For the purpose of this study, these activities were not counted.

In 2014, 2,728 aircraft are registered (22 BA aircraft in 2009). Pilots holding GA licenses are 6,265. More than 92% are male.

Based on the number of licenses, the most popular activity is gliding.

99 ATOs operate in Poland. Maintenance companies are divided as follow:

- Maintenance organizations certified according to EASA regulation;
- Maintenance organizations certified according to the national regulation.

18 Approved Maintenance Training Organizations (MTO) are registered. Two of them are Approved Training Organizations providing training for national licenses (Maintenance Mechanic Licence) and eight training organizations for certificates of qualification (Maintenance Manager (MM)).

Regarding the aerodromes, 44 aerodromes are registered with dedicated terminal and 280 airfields recorded. These airfields are not published in the national Aeronautical Information Publication (AIP[55]). There is no obligation to declare an aerodrome to the CAA if it is operated less than 14 days per year. 12 aerodromes are equipped with a paved runway and 32 with unpaved runway.

A.4.2 Data collection

The NAA collects most of the data required for the survey. These data are from the national register (aircraft registered and pilot licences), associations, flying clubs and private owners.

[55] AIP: ICAO definition: publication issued by or with the authority of a state and containing aeronautical information of a lasting character essential to air navigation. It is designed to be a manual containing thorough details of regulations, procedures and other information pertinent to flying aircraft in the particular country to which it relates. It is usually issued by or on behalf of the respective civil aviation administration

The age of the pilots is not collected and this is considered to be personal data.

The NAA highlights that in case data should be provided on an annual basis, the different processes of data collection of the sector should be harmonised within the EC in order to limit the effort required for providing these data.

A.4.3 Data analysis, monitoring and reporting

Data are analysed by the NAA for safety reasons once a year. Safety indicators are implemented and monitored.

The NAA do not produce any report on GA activities.

A.4.4 Costs/efforts

The NAA has no specific mandate to control GA activities in Poland. Therefore, the NAA do not collect GA data in a dedicated database. The collection of data for this study involved several departments in the NAA. Around ten persons were involved in the process of collecting data. The NAA is not currently able to identify clearly the effort required for this task and the associated costs.

Specific efforts were required to calculate the average age of the pilots which is not calculated in their database. This could be done annually. However, the pilot database should be updated if the EC wishes to include the average age of the pilots included in the list of data collected. The related cost cannot be estimated at this stage but in a period of budgetary constraints, this could represent an issue.

A.4.5 Effectiveness of the process currently employed in the country

The NAA collects most of the data required and the associations and aero clubs provide their data. However, the process to collect these data was not provided to the consultant.

A.4.6 Effectiveness of the process applied for this study

The NAA collects most of the data required and the associations and aero clubs provide their own data.

The NAA chose to respond to the questionnaire on-line. However, the NAA requested the questionnaire in another format to ease the process of collecting and gathering data before filling the on-line survey considered not user-friendly.

According to the NAA, aircraft operators should be divided in several sectors to provide a more accurate picture and the type of data collected for each of them adapted. It is considered that the number of hours flown is not accurate for parachuting.

The scope of data to be provided was considered too large, required an important effort for the NAA and involved around ten persons from eight different departments.

The age of the pilots is considered as personal data and considered not relevant; therefore these data is not collected but could be provided on request.

The consultant received a limited number of responses from the end users (14 responses only). However, it was not possible to identify clearly the issue, as the associations contacted did not reply to our request for a dedicated meeting.

A.4.7 Replicability of the best practices

The methodology implemented by the NAA is adapted to Poland and to the specific needs of the NAA. This cannot be replicated to other States.

A.4.8 Safety

A SMS is implemented within the NAA and dedicated persons designated. The CAA holds the annual conferences on aviation safety and for specific topic dedicated workshops. The CAA has also recently introduced the information campaign on the safe use of unmanned aerial vehicles (UAVs).

A.4.9 Environment

Emissions from GA activities are not monitored. There are only very arbitrary and rudimentary estimation for the purpose of the country emission inventory. Rather, they are, as a minor item not worthy of particular attention or comprehensive studies.

Noise operating restrictions and operational procedures are implemented to reduce the impact of noise on the aerodromes.

A.4.10 Economy

Workforce

The Polish CAA provided some figures based on the number of valid licences in specific categories. It is likely that they differ from the actual numbers. According to those figures, there are 1,500 pilots directly employed in GA in Poland, 650 people are directly employed in Air Traffic Services and 1,700 people are in Maintenance[56].

[56] Those numbers are expressed as full-time equivalent (i.e. if two person were half-time working for GA purposes, that would be one person directly employed for GA activities)

Charges, Taxation and other Expenses

The CAA considers the taxation of exclusive-use airports to be a bottleneck in developing GA. Polish tax regulations distinguish between public-use and exclusive-use airports, where a public-use airport is an airport open to all aircraft. Public-use airports are exempted from property tax for the restricted part of the aerodrome which is permanently used for take-off and landing of aircraft and their movement, including any installations and equipment used for the movement thereon, while exclusive-use airport pay property tax – in this case the amount of tax is defined by local authorities (while national-wide regulation defines only the maximum level of the tax). The level of taxation is set by the local authorities, the national government only sets a tax ceiling. The relevant taxes are VAT (23%), and the property tax on buildings of EUR 5.56 per square meter. Taxation on AvGas and Jet Fuel was not considered a major issue, as a VAT exemption exists in Poland for those. Airport charges, particularly for landing and handling at international airports are considered a major bottleneck for developing GA in Poland. Fees for certification depend highly on the size and type of aircraft. Registration fees range from approximately EUR 10 (gliders, balloons) to approximately EUR 75 for airplanes and rotorcraft with a MTOM from 1,000 – 5,700 kg. Fees for certification of airworthiness range from about EUR 30 (parachutes) to about EUR 750 for airplanes and rotorcraft with a MTOM higher than 2,730 kg.

Access to services

The CAA Poland indicates the following numbers for ground handling services in Poland:

Table 8: Ground handling services in Poland

	number of airports/ aerodromes offering the respective service	year the data is provided for
Ground administration and supervision	44	2014
Passenger handling	14	2015
Baggage handling	14	2015
Freight and mail handling	12	2015
Ramp handling	14	2015
Aircraft services	44	2014
Fuel and oil handling	13	2015
Aircraft maintenance	44	2014
Flight operations and crew administration	14	2015
Surface transport	14	2015
Catering services	13	2015

*Data for 2015 are provided only for public-use airports

Source: CAA Poland, 2015

A.4.11 Initiatives to promote GA

Promotion of flying in general is not one of the tasks of the Polish CAA so there are problems with financial means and resources allocation for this purpose (theoretically the CAA is not supposed to spend taxpayers money on tasks not listed in the Aviation Law). However, the CAA joins various events that aim to promote aviation.

The CAA is supporting financially the work of the "*Latajmy bezpiecznie*[57]"-team that fulfils the role of independent Voluntary Occurrence Reporting Scheme.

A.4.12 Conclusion

Most of GA activities are conducted with airplanes (71,000 hours, which represents 56% of GA activity).

The main issue raised by the NAA to develop GA is the regulation, which should have been developed separately from CAT from the outset.

[57] "Let's fly safely"

A.5 Case study: Romania

A.5.1 Context

According to the definition of General Aviation on Romanian territory, General Aviation Operations can be performed with the following aircraft types:

A. Complex motor powered aircraft:

1. Airplanes
a. With a maximum take-off mass exceeding 5,700 kg; or
b. With a maximum approved passenger-seating configuration of more than 19 passengers; or
c. That require more than one pilot; or
d. Equipped with single or multi-engine aeroplanes powered by turbo propeller engines.

2. Helicopters
a. With a maximum take-off mass exceeding 3,175 kg; or
b. With a maximum approved passenger-seating configuration of more than nine passengers;
c. That require more than one pilot.

3. Tilt Rotor aircraft.

B. Non-complex motor powered aircraft:

Non-complex aircraft means aircraft other than aircraft specified at A, except ultralight aircraft.

C. Ultralight aircraft

For statistical purposes, the definition of General Aviation presented in the ICAO Doc 9060/5 is used instead, where air taxi and BA are considered CAT operations.

The most common General Aviation activities in Romania are training flights, aerial work and ultralight flights. Other activities include hand gliding, paragliding and skydiving. Air taxi operations are decreasing due to the competition with other transport services and the high costs involved.

As also identified in other countries, General Aviation is recognized as an important sector for training future commercial pilots.

There are 38 private aero clubs in the country, which represent around 60% of pilots. In 2012, Romania had 1,547 registered pilots, i.e. 280 PPL-A (Private Pilot License for Airplanes), 23 PPL-H (Private Pilot License for Helicopters), 450 ULM, 540 paragliding, 14 balloons and 240 gliders. According to information provided by *Aeroclubul Romaniei*, there was a considerable increase in the number of paragliding and hand gliding pilot registrations in 2015, reaching 1,271 in total.

The operators and users have identified the airspace structure as one of the most important bottlenecks for the sector. Most of the country is under controlled airspace and requesting access to those has proved to be a very bureaucratic process. Ultra-light aircraft flying under Romanian Aero club does not need to

prepare flight plans. All other aircraft in General Aviation have to submit one. Information regarding the restricted areas is not available.

General Aviation is treated like CAT with regards to security regulations.

The lack of infrastructure dedicated to General Aviation is also a bottleneck for the development of the sector.

A.5.2 Data collection

The Romanian Civil Aviation Authority (RoCAA) is the institution responsible for the data collection in the aviation sector. The data collection and analysis is distributed in different departments of the institution and the data are not compiled in a unique database.

The data are collected for safety analysis only. Data on the number of hours flown is available per type of activity and per category. Operators are required to complete an Excel form on a yearly basis with information related to the type of flights, number of hours flown and type of aircraft. The form was developed based on the Form D of the Statistical Air Transport Reporting Forms published by ICAO.

The number of aircraft registered in the country has not been communicated ahead of the date of publication of the study.

It is estimated that there is a considerable number of General Aviation activities that are not recorded as they are performed at non-certified aerodromes.

The size/importance (in terms of social and economic value) of the GA sector in the country cannot currently be accurately specified. This reduces the opportunities of changing the regulations to improve the conditions for operating GA in Romania.

For small operators, data collection could be an extra burden. Nevertheless, operators could participate in this data collection if the benefits are presented to them.

RoCAA is also responsible for the pilot license registration. Information on the number of pilot licenses is recorded by RoCAA but it has not been communicated to the consultant to the date of publication of the study.

A.5.3 Data analysis, monitoring and reporting

The data collected is only used for safety analysis purposes, which is carried out by RoCAA.

A.5.4 Costs/Efforts

Although there are at least four departments of RoCAA involved in the data collection and analysis, the data management does not require considerable efforts.

Pilots and small operators took the view that additional regulations and procedures to ensure data collection could have a strong impact on the end users. If data collection is to be enforced, only essential data should be requested on a regular basis to minimize the impact on the end users.

A.5.5 Effectiveness of the process currently employed in the country

The data collection system in place requires the operators to complete the information with regards to the flight information and purpose. Data management by RoCAA does not require significant effort.

In Romania, the data collected is limited to aircraft operations and to activities on the 41 certified aerodromes in the country. Data on the non-certified aerodromes are not available. Therefore, the data are only indicative and might not represent the real situation across the entire sector.

The data are inserted in an Excel form directly by the operator on an annual basis, which could result in some errors during the completion of the forms. Nevertheless, as the data received for Romania were provided by RoCAA, we assume that these have been checked and are accurate.

The data are provided directly by the operators in a standard format that facilitates their compilation and management.

Data collection is not comprehensive and fails to collect data from a considerable number of aerodromes. The form is completed in Excel format directly by the operators, which could result in some mistakes during the completion of the form.

A.5.6 Effectiveness of the process applied for this study

The data collection process involved several departments within RoCAA, because data is not compiled in a unique database. The different definition of GA in the country obliged RoCAA to adapt the existing data to comply with the requirements of the study.

The active participation of GA stakeholders and end-users during consultation meeting led by RoCAA and the Consultant was important not only to highlight the challenges faced by the sector but also to confirm the willingness of the stakeholders to contribute to the development of GA in the country.

A.5.7 Replicability of the best practices

The process applied in the country is not replicable.

A.5.8 Safety

In 2014, the safety monitoring resulted in the registration and investigation of 1,075 occurrences (as compared to 935 in 2013). The 1,075 reported safety occurrences comprised 502 operational safety occurrences, and 244 technical safety occurrences.[58]

Safety culture is promoted to the operators and pilots via trainings, workshops and conferences organised by General Aviation associations and national authorities. Nevertheless, according to the RoCAA, private owners do not generally participate in these events.

The lack of updated VFR Chart about the existing aerodromes in Romania is one of the key issues identified by some stakeholders. According to the Romanian AIP, there are 23 registered aerodromes. Nevertheless, stakeholders identified additional 41 aerodromes in activity in the country. Various aerodromes are not certified/registered at RCAA because the certification process is lengthy and costly.

As there are no safety regulations for skydiving in Romania, the operators tend to use the USA regulation. According to the RoCAA, new EU regulations shall be applied from 2017. In order to promote safety in the sector, some aero clubs organise Safety Days for skydiving enthusiasts where the best practices around the world are shared.

A.5.9 Environment

Few flights of aircraft belonging to the RoCAA were impacted by the Commission Directive 2003/87/EC[59]. Between 1 January 2013 and 31 December 2020, the obligations of this Directive are not applicable to the RoCAA aircraft flights, due to the provisions of Art. 1(2) of Regulation (EU) No. 421/2014 of the European Parliament and of the Council[60] exempting non-commercial aircraft operators emitting less than 1,000 tonnes CO_2 per year from that Directive.

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[58] ROMATSA (2015): *Annual Report 2014* http://www.romatsa.ro/files/Annual_Report_2014_ENG.pdf

[59] Commission Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC,OJ L 275, 25.10.2003, pp. 32-46. available at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:275:0032:0046:en:PDF

[60] Commission Regulation (EU) No 421/2014 of the European Parliament and of the Council of 16 April 2014 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in view of the implementation by 2020 of an international agreement applying a single global market-based measure to international aviation emissions, OJ L 129, 30.04.2014, pg. 1. available at http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0421&from=EN

RoCAA does not receive ETS/allowances for its aircraft flights. While allowances have to be auctioned, the costs are generally not higher than 35 EUR per tonne of CO_2.

A.5.10 Economy

The economic relevance of the sector is low in comparison with other EU countries with similar geographical and socio-economic characteristics. The current set of regulations and taxation creates little incentives to become involved in the GA sector.

Economic data are not collected at national level. Operation costs for airports are not collected and a bottom-up approach would be necessary in order to identify those.

There are 32 certified maintenance companies in Romania for commercial and general aviation[61].

Taxes and charges

CAT, BA and air taxis are exempted from paying fuel tax. Nevertheless, this exemption is not extended to the other General Aviation activities such as private and tourist flights.

The charges applied in the airports in Romania can be considered high in comparison to other airports in Europe. Most common charges applied in the airports in Romania are summarized below:

Table 9: Overview of charges

Type of charge	Unit price (Range: cheapest airport to most expensive airport)
Landing	4.00 – 8.50 (EUR/ton)
Lighting	1.25 – 2.50 (EUR/ton)
Parking charge	0.04 – 0.15 (EUR/ton/hour)
Passenger services	4.00 – 15.00 (EUR/passenger)
Airport security	3.00 – 7.00 (EUR/passenger)
Transit	1.00 – 1.50 (EUR/passenger)
Transfer	1.50 (EUR/passenger)

Source: RoCAA, 2012

Regarding fuel, according to the provided information, AvGas is available in two airports, at a cost of EUR/litre 2.31 (+24% VAT). The VAT is not applied if the

[61] RoCAA: *List of certified maintenance companies* http://www.caa.ro/media/docs/SN-RO.145_2015.06.24_CL.pdf

flight is over Romanian borders. Jet fuel is reported as being available in all international airports.

Regulations

Legislative framework is considered an important bottleneck for the development of GA in Romania. GA is treated as CAT. Moreover, aerodromes certification cost can prevent aerodrome owners who do not have the financial means from certifying their aerodrome. In addition, the certification process is considerably slow due to the present regulations and practices.

The Ministry of Transportation, the regulatory authority, has provided financial support only to the large certified airports, slowing the growth of small private owned aerodromes.

Handling

The ground handling services are provided by six companies to 17 airports in Romania. Services cover a range of activities, including ground power support, passenger handling, aircraft safety control, water management and cleaning.

A.5.11 Conclusion

The main challenges faced by the GA in Romania are related to the restricted airspace structure, the lack of appropriate airport infrastructures and the regulation and taxation regimes applied. These barriers have been of major importance for slowing down the development of General Aviation sector in Romania.

Data are collected for safety analysis only. If data collection is to be enforced for General Aviation users, a preliminary assessment should be carried out to identify the essential information and the cost benefits of such practices.

A.6 Case study: Spain

A.6.1 Context

The geographic location and the large tourist industry in Spain can support strong arguments in favour of significant potential for the development of General Aviation in the country.

There is no clear definition of General Aviation in Spain. The lack of a common definition makes it complicated to create a set of taxes and charges tailored to the sector, to help reduce burdens for GA activities.

General Aviation accounts for the majority of registered aircraft in Spain, representing 80% of the more than 7,000 registered aircraft in the country[62].

There are over 200 aerodromes and heliports registered in Spain[63]. These airfields can be subdivided into two main categories: i) public airfields belonging to State owned Aena[64] and ii) other restricted airfields managed, mostly, by private operators.

Aena manages a network of 46 aerodromes and two heliports, which operates scheduled, non-schedule and GA traffic. In 2014, GA represented 12% of the total number of operations in Aena's network, accounting for more than 175,000 operations. The majority of the movements are related to training (42%) followed by private flights (25%), air taxi (17%) and other activities (16%).

Some of Aena's airports are especially dedicated to General Aviation. In these airports, the sector is responsible for a considerably larger number of the movements. In the aerodromes of Son Bonet, Huesca-Pirineos and Madrid *Cuatro Vientos*, for example, General Aviation operations account for more than 90% of the total. Dedicated General Aviation airfields serve mainly small aircraft, with 97% of operations performed by aircraft with a MTOM of less than 3 tonnes. Single piston aircraft with an average weight of 1.4 tons are the most used.

The Madrid-*Cuatro Vientos* Airport is the oldest and most important airport for GA operations in the Aena network. In 2014, the airport registered over 33,000 GA operations, mostly related to training flights. All Aena airports apply regulations according to international standards and are somewhat stricter than in other private owned restricted aerodromes that do not necessarily follow all international standards.

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[62] AESA (2015): *Aircraft registrations, November 2015*
http://www.seguridadaerea.gob.es/media/3748914/aeronaves_inscritas.pdf
[63] Aena: http://www.aena.es/csee/ccurl/349/11/LE_AD_1_3_en.pdf
[64] Aena is a Spanish corporation that manages airports and heliports in the general interest of the Kingdom of Spain.

There are 147 restricted airfields (60 aerodromes and 87 heliports) registered in the country. Although official data are not available, Aena estimates that the number of General Aviation operations in those airfields is considerably higher than in Aena's network of airports. The aerodrome of *Casarrubios del Monte* is estimated by Aena to be the busiest, with similar number of general operations as in *Cuatro Vientos*.

Since 2008, the number of GA operations has constantly decreased in the country. Nevertheless, the sector has experienced growth of over 10% in 2015, in comparison to the same period of the previous year, mostly related to training flights. The GA sector has an important role to play in training pilots that will become CA pilots in the future. Therefore, the recent growth of the training flights points to signs of high demand for pilots in the CA sector after the recovery of the country from the recent economic crisis.

A.6.2 Data collection

In Spain, data collection is mostly organised by State-owned organisations Aena and the Spanish Aviation Safety Agency (AESA).

Aena only collects data related to operations in those airports managed by this entity. The airport operators are required to enter the data for each flight directly in the statistical airport operational system developed by Aena. This operation system is implemented in all Aena airports. The data are transmitted directly to the main database managed by Aena, allowing them to control the activities in the airports daily, if required. Data are available per aircraft and per airport. Air taxi services are counted separately.

Data regarding operations in the other restricted aerodromes is not available.

AESA collects data related to safety aspects in General Aviation, including aircraft registration, number of pilot licenses and number of accidents and incidents.

Aircraft registration data includes the model of the aircraft, the year of manufacture, the year of registration and maximum take-off weight.

Pilot licenses are collected by category but do not include the age of the pilots.

A.6.3 Data analysis, monitoring and reporting

Aena analyses the operations in their airports for internal purposes only. They are able to analyse the trends in the sector and the impact of new regulations and tariffs. Nevertheless, no economic data are collected.

The information related to accidents and incidents is published annually by AESA through the CIAIAC (Commission for Investigation of Accidents and Incidents in Civil Aviation).

A.6.4 Costs/Efforts

The initial cost of the development of the airport operation system in the Aena network was not disclosed. No considerable efforts are required from Aena for the update and maintenance of the database. The responsibility for inputting the data in the operation system is transferred to the airport operators.

The efforts and burdens related to the data collection by the end users in Spain could not be measured and it should be subject of a specific study.

A.6.5 Effectiveness of the process currently employed in the country

The implementation of a system that obliges the airport operators to complete a questionnaire prior to each flight has demonstrated to be effective. The information is updated regularly, what allows Aena to have a steady overview of the aircraft operations.

The data collection is not centralized in one institution and there is no general database providing such information.

Aena provides training to the personnel responsible for using the airport operational system for data entry and analysis to enhance the user capabilities.

The system is user-friendly and it allows for analysis of data related to the management, quality control and optimisation of the airports and aircraft operations.

Aircraft registration data are complete but data on private restricted aerodromes is not collected, which make estimations of the real size of the General Aviation sector in Spain impossible.

The system put in place by Aena for the data collection of flight operations in its airports can be considered a success, as it requires minimum efforts from Aena for its collection, management and analysis while providing important information concerning the operations in its airports.

Only official data provided by the public organisations have been considered for Spain. Therefore, we consider the data to be accurate.

A.6.6 Effectiveness of the process applied for this study

Aena supported the study by providing data related to the airports managed by them. Although some data was introduced directly via e-survey, most of data related to aircraft operations was extracted directly from their database and sent via email. Aena also provided the points of contact for other relevant organisations at national level.

Data regarding aircraft operations only cover Aena airports and the data related to other restricted aerodromes is not collected. Therefore, it is not possible to quantify

the total number of movements related to General Aviation activities in the country.

Applying a standard procedure for the data collection for all aerodromes could be an alternative for ensuring the representativeness of the sector in the future.

A.6.7 Replicability of best practices

The data collection method applied in Aena airports could be easily transferred to other countries.

A.6.8 Safety

According to a study[65] published by the Ministry of Development of Spain, more than 95% of the accidents investigations in Spain are related to the GA.

The study states that on various occasions, accidents and serious incidents could have been prevented simply by the application of basic principles and good practice of aircraft flight safety.

Since most of operations are for private purposes, the proactive approach to aviation safety management based primarily on the identification and mitigation of the risks and on the dissemination of safety information to the end-users is essential.

Safety Management Systems (SMS) are implemented in all Aena airports. The SMS has been developed according to the ICAO Annex 14 SMS Framework[66] and it covers 1) Objectives and Policies related to Safety; 2) Safety Management; 3) Safety Monitoring and 4) Safety Promotion.

Aena airports have implemented a non-punitive reporting system for safety reporting. This can be done through safety post-box, safety reporting form or safety mailbox. Safety in Aena airports is also promoted via Safety Newsletters, workshops and meetings.

Aena has also created the Apron Safety Guidelines, presenting the rules and procedures to ensure safe and efficient performance of ground operations.

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[65] CIAIAC - Comisión de Investigación de Accidentes e Incidentes de Aviación Civil (2014): Estudio de prevención de accidentes de Aviación General http://www.fomento.gob.es/NR/rdonlyres/18A2DC46-935D-4699-8CEA-5927EC5DB5B5/126833/Estudio_prevencion_2014.pdf

[66] ICAO Annex 14 is named Aerodromes and it has two volumes: Volume I: Design and Operations, Volume II: Heliports

A.6.9 Environment

Estimation of the CO_2 emissions of the sector in Spain is unknown.

Nevertheless, Aena carried out a study[67] in 2011 to analyse the environmental performance of the airport of Son Bonet.

The study used the software EDMS (Emissions and Dispersion Modelling System)[68] to calculate the emissions.

Table 10 Emissions by type of fuel in the airport of Son Bonet, 2010

Energy source	**Source type**	**Consumption**	**Unit**	**CO_2 Emissions (ton/year)**
Electricity	-	499.224	kWh/year	136
Kerosene	Aircraft	80	ton/year	252
	APU (Auxiliary Power Unit)	0	ton/year	0
Gasoil	Fire brigade training	250	litres/year	0,63
	Vehicles	3.523	litres/year	1
	Generators	0	litres/year	0
	GSE	762	litres/year	2
Gasoline	Vehicles	445	litres/year	9

Source: Aena, 2011.

According to the study, the total emissions of the airport in 2010 was 401 tons of CO_2 (20,994 kg CO_2 per passenger) due to the airport activities. The high amount of CO_2 emissions per passenger is due to the fact that General Aviation is the most common activity in Son Bonet airport.

Another interesting finding of the study is that although the aircraft are the most critical elements concerning CO_2 emissions, the amount and type of electricity used also has a considerable impact (see Table 10). These findings are in line with the meetings carried out with the stakeholders, which have indicated that the Commission Directive 2003/87/EC of the European Parliament and of the Council

[67] Aena (2011). *Informe inicial de cumplimiento de las Memorias Ambientales de los Planes Directores. Índices de cambio climático.*

[68] EDMS is one of the few tools for the evaluation of air quality specifically designed for airports. It disposes of calculation modules for emission and dispersions, a database of factors emission aircraft, as well as a database of ground support equipment and auxiliary power units. In addition to the emissions by the aircraft, the software takes into account mobile and stationary sources of CO_2, including ground handling services.

of 13 October 2003[69] affected the airports of Barajas and Barcelona due to its energy plants and generators.

A.6.10 Economy

Taxes and charges

Aena has put efforts into adapting the taxes and charges to the demands of General Aviation in order to remain competitive with the other aerodromes. In the last three years, the minimum charges for operations in the airports have been reduced at rates varying between 41% and 64%, depending on the airport.

Aena has excluded the security and persons with reduced mobility (PRM) charges for passengers in private flights with aircraft of less than five tons MTOM. The taxes and charges will be frozen in 2016.

Regulations

The regulations related to General Aviation in Spain have experienced considerable changes in the last 15 years. The process of application of EU regulations in Spain affected the sector negatively due to the constant adjustments of the minimum equipment required in an aircraft (due to the stricter safety regulations) during this period. These technical adjustments together with the rise of the airport taxes have contributed to increase around 90% the operational costs of General Aviation during the same period.

Handling

The Aena airports are classified in three categories with regards to handling for General Aviation:

- Airports where handling is not required;
- Airports where handling is required for some operations;
- Airports where handling is required to all operations.

The methodology applied was developed by taking into account the technical standards of design and operation of airfields approved by the Royal Decree 862/2009 of the Government of Spain[70] concerning Airport Certification, which

[69] Commission Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC (OJ L 275, 25.10.2003, pg. 32) available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:275:0032:0046:en:PDF

[70] Real Decreto 862/2009, *de 14 de mayo, por el que se aprueban las normas técnicas de diseño y operación de aeródromos de uso público y se regula la certificación de los aeropuertos de competencia del Estado.* http://www.fomento.gob.es/NR/rdonlyres/75EC57E5-A0BD-451B-926A-DF46EB9002F2/134380/RD862_2009_Consolidado1.pdf

aims to keep risks at the lowest level reasonably practicable. The criteria for analysis consider the platform features and operations, the type of aircraft and the flight reasons.

The selection of the companies to carry out the ground handling services in Aena airports is achieved via public tender. The concession period is seven years.

A.6.11 Conclusion

Most General Aviation activities in Spain relate to training flights. The sector has suffered with the recent economic crises that affect Europe, but it seems to be recovering in recent years.

Data collection methods in the country are replicable to other places in Europe. Nevertheless, an approach to collect data related to aerodromes outside the Aena network should be pursued.

A.7 Case study: Sweden

A.7.1 Context

In Sweden, the consultant met the NAA and representatives from AOPA Sweden. The *Kungliga Svenska Aeroklubben* (KSAk) was contacted at a later stage.

Air taxi is considered to be a commercial activity in Sweden.

3,000 aircraft effectively flying and 1,700 non-flying aircraft are registered. The fleet in Sweden is around 45 years old. For the last three years, GA activities were transferred from single engine piston to ultralight, which is cheaper and less regulated. It can be noted that some private pilots perform public mission e.g. fire prevention. In Sweden, a specific law exists preventing the use of aircraft not registered in the country of operation. An aircraft operating permanently in Sweden shall be registered in Sweden. A large number of the aircraft registered in Sweden are part of the group defined in Annex II[71] of the Regulation (EC) No 216/2008 [72] e.g. historic aircraft or aircraft built by an amateur.

Most of the private helicopters are operating mixed operations and 99% of the balloons are operated for commercial purposes.

180 aero clubs are recorded operating motor powered aircraft and 60 sailplane clubs. Gliding is considered as a popular activity.

22 ATOs are certified and 47 registered but not certified and should become ATO in the future. Changes in the Regulation (EC) 1178/2011[73] is considered an important improvement for the aero clubs.

Maintenance companies are divided into 48 approved organizations, 14 approved organizations for aircraft below 5,700 kg used in non-commercial environment and 22 national approved companies dedicated to Annex II aircraft.

In Sweden, 4,505 pilots are identified and registered. There is a large majority (around 95%) of male pilots. The average age is above 50. It is difficult for the

[71] Regulation (EC) No 216/2008 in its Annex II defines the categories of aircraft to which Article 4 “Basic principles and applicability” do not apply e.g. historic aircraft or built by an amateur

[72] Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC

[73] Commission Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council

associations to attract young people mainly due to the costs for aircraft certification, licences and taxes.

Issues were raised by the associations regarding access to the aerodromes and airports. Bromma, which is the city airport of Stockholm, is no longer accessible by neither GA nor BA. Furthermore, some platforms could be closed, mainly in the North of the country where GA activities are limited, fuel delivery being regarded as not providing sufficient profits to oil companies.

In 2007, Sweden, together with Finland, Denmark, Ireland, France and the UK, introduced a request to the EC to apply a reduced tax to fuel used for the purpose of private pleasure flying. This request was rejected by the EC. In its Communication, the EC explained that "the Council deliberately chose to subject private pleasure flying and private pleasure navigation to standard taxation. Moreover, the interests and policies referred to in its provision, relating to the internal market, fair competition, environment, energy and transport aspects clearly plead against the granting of the derogations requested."[74]

A GA safety council led by the NAA and regrouping national GA associations has been established with the task to address any question related to GA operations in Sweden.

A.7.2 Data collection

Except economic and environmental data, the NAA collects most of the data required for the survey and can provide these data on a yearly basis.

End users are very active and are happy to provide their data. Sweden was in the top three with 232 responses. This can be explained by the fact that aircraft owners have the obligation to report their activities to the NAA.[75]

A.7.3 Data analysis, monitoring and reporting

Data are monitored and analysed by the NAA and reported and discussed with the stakeholders through the GA safety council. The Safety council was established by the NAA with the aim to discuss all aspects related to activities of general aviation in Sweden like regulations, safety, economic issues, etc. All Swedish GA associations are invited to participate. The Council meets three times a year. The agenda is consolidated in coordination with these associations.

The development of a European GA database is considered useful.

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[74] COM (2007) 107 Final - COMMUNICATION FROM THE COMMISSION TO THE COUNCIL in accordance with Article 19(1) of Council Directive 2003/96/EC (operation of private pleasure craft and private pleasure-flying)

[75] http://www.transportstyrelsen.se/TSFS/LFS%202007_18.pdf

A.7.4 Costs/efforts

The process implemented for collecting data involved five different departments inside the NAA and external entities for data related to experimental aircraft and gliders, which are not collected by the NAA. This process has a cost, which shall be transferred to aircraft operators and private owners by law if the provision of data shall be repeated once a year.

A.7.5 Effectiveness of the process currently employed in the country

End users and associations have the legal obligations to report their activities to the NAA on a yearly basis. The CAA has a good communication with the stakeholders through the Safety council, which facilitates the access to data.

A.7.6 Effectiveness of the process applied for this study

The process for data collection is heavy burden involving around 10 persons within the NAA. The NAA chose to provide data on-line, which was considered easy to use. In case, the EC would implement a European database and mandatory reporting, it is expected that this would be done through an on-line template. However, the cost for providing GA data to the EC shall be supported by the end users according to the national law.

A.7.7 Replicability of the best practices

The process developed in Sweden is a manual process, which cannot be transferred to any other country. A good cooperation between the NAA and national GA associations is organised in Sweden through the Safety council. This initiative contributes to the development of GA in Sweden and to the definition of a national position when actions at European level are initiated.

A.7.8 Safety

Safety is promoted through the GA Safety Council. The CAA leads this initiative. This council addresses any question related to GA operations in Sweden, the impact of new regulations or any other subject proposed by either the NAA or the end users.

The associations promote safety though specific information and sometimes through dedicated projects. Only few aero clubs have implemented a SMS.

A.7.9 Environment

Gas emissions from GA activities are not monitored.

Noise operating restrictions and operational procedures are implemented on the aerodromes in the event of noise complaints.

A.7.10 Economy

Charges, Taxation and other Expenses

Taxation on AvGas is considered a major bottleneck for developing General Aviation in Sweden, which accounts for almost 60% of the price of AvGas. Further, airport charges are too high for General Aviation operations.

The registration costs in Sweden range from approximately EUR 267 to EUR 855 depending on the type of aircraft. Table 11 provides an overview on the costs of certification and costs for the import of aircraft per category.

Table 11 - Fees for GA purposes in Sweden

	Certification of airworthiness (annual fee)	Import of aircraft
Sailplanes	EUR 107	EUR 35
0-2.73 Tons	EUR 342	EUR 353
2.74 -5.7 Tons	EUR 1 229	EUR 1 037
5.71 - 10 Tons	EUR 3 452	EUR 2 597
Over 10 Tons	EUR 6 091	EUR 7 214

Source: Transportstyrelsen, Sweden[76]

Access to services

Access to services is also considered a major bottleneck for developing General Aviation in Sweden. There is a tendency to increase prices for small operations to make airports unattractive for General Aviation operations. In Stockholm, there is no airport for General Aviation operations. Stockholm Bromma airport, which could be seen as a suitable airport for General Aviation purposes has evicted around 50 General Aviation operators, as they did not provide a sufficient level of economic benefit.

A.7.11 Initiatives to promote GA

The main initiative is the creation of the GA Safety Council. This council addresses any aspects of GA activities and any item requested by the stakeholders. The CAA does not have specific budget to promote GA or for implementing incentive measures. Workshops and information papers are supported by sponsors.

A.7.12 Conclusion

GA in Sweden is active with more than 3,000 aircraft registered and more than 4,500 pilots. The average age of pilots is 50 plus. Costs associated with rigid regulations prevent the development of GA in Sweden despite the strong involvement of associations in promoting GA and the creation of the GA Safety Council, which contribute to define national positions, which are discussed in the European institutions.

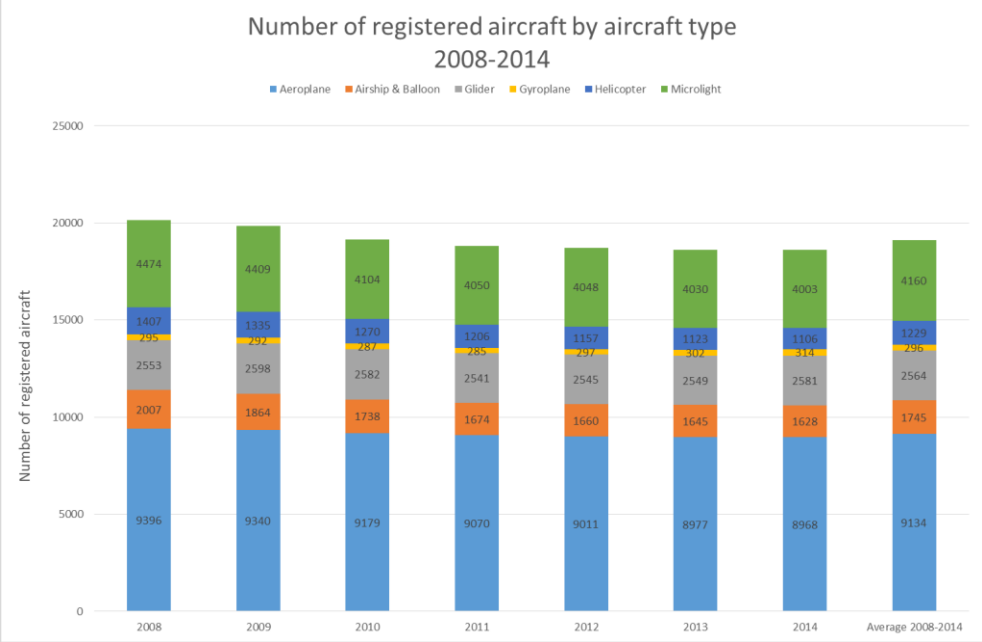
[76] Swedish Transport Agency

A.8 Case study: United Kingdom

A.8.1 Context

The UK is one of the most active countries with 18,632 aircraft registered and more than 1,000,000 of hours flown by 58,725 pilots. More than 95% of the pilots are male. Figure 10 below presents the number of registered aircraft per aircraft type and the evolution since 2008. (Source UK CAA).

Figure 10: Evolution of aircraft registered in UK between 2008 and 2014



Source: UK CAA, 2015

The average age of the fleet is around 27 years old.

For the purpose of this study, GA includes all UK-registered aircraft engaged in non-commercial and non-military operations (including State flights) with a capacity of less than 19 passengers. Data provided includes on-demand activity (i.e. business/corporate aviation), aerial work, and training flights. It also includes offshore helicopter operations. EASA CS-25 aircraft over 50,000 kg MTOM are excluded while historic/ex-military aircraft are included in the notion of GA.

It might be noted that under certain circumstances, the same aircraft can present a hybrid operational concept (scheduled commercial operations and on-demand activities). In such cases, the aircraft was included in the lists presented.

The definition of a microlight aeroplane was detailed as follow:

A microlight aeroplane is one designed to carry not more than two persons, which has a Maximum Total Weight Authorised (MTWA) not exceeding:

› 300 kg for a single seat landplane;

- 290 kg for a single seat landplane for which a UK Permit to Fly or Certificate of Airworthiness was in force prior to 1st January 2003;
- 450 kg for a two seat landplane;
- 330 kg for a single seat amphibian or floatplane;
- 495 kg for a two seat amphibian or floatplane.

A microlight must also have either a wing loading at the MTWA not exceeding 25 kg per square metre or a stalling speed at the maximum weight authorised not exceeding 35 knots calibrated speed. All UK registered aeroplanes falling within these parameters are Microlight aeroplanes.

Balloons are considered to be commercial activity.

For the purpose of this study, the UK CAA cooperated closely with the Ministry of Transport.

A.8.2 Data collection

Data are generally collected at the renewal of the Certificate of Airworthiness or Certificate of validity period. Data are collected from members, organisations and individual applicants.

Annual statistics related to pilot licences are produced. They are based on the pilot licence initial application and pilot rating. The data are collated by the UK CAA during the initial application, revalidation or renewal process.

Additional data (i.e. number of members of a particular association over a period of time) is obtained upon request only.

GA activities are recorded on 65 aerodromes. Data related to aerodromes are not regularly available for unlicensed airfields.

A.8.3 Data analysis, monitoring and reporting

Data are analysed on a yearly basis by the UK CAA and published through public reports.

A.8.4 Costs/efforts.

The provision of data required more efforts than initially evaluated and took two months to gather all data from different departments. No cost can be associated to this effort. Three internal departments were directly or indirectly involved. The Department for Transportat also supported the process.

A.8.5 Effectiveness of the process currently employed in the country

There is a department within UK CAA dedicated to GA. The UK CAA collects GA data at least on a yearly basis. There is a good communication with the stakeholders.

A.8.6 Effectiveness of the process applied for this study

The UK CAA collects GA data at least on a yearly basis. There is good communication with the stakeholders.

UK CAA chose to provide its own database via Email regardless the format defined for the survey, which was considered more user friendly than the on-line survey in particular because most of the data are already in specific database. It would have been too complicated to extract data from this database to fill in the on-line survey.

Data related to uncertified airfields are not collected on a regular basis.

A GA unit is implemented within the UK CAA.

A.8.7 Replicability of the best practices

The process implemented to collect those data was is adapted to UK. This can be transposed to any other country. Without a dedicated unit within the CAA, it would be difficult to replicate this process.

A.8.8 Safety[77]

The CAA has funded an industry trialling of Quick Access Recorders (QARs) for BA in order to gather more safety data on the sector. The objective is encourage the operators to use the recorded data for pilot education and provide information to non-UK based operators on UK specific issues.

For GA, the UK CAA aim is to regulate only when and where it is absolutely required. The CAA encourages the GA sector and its associations to take responsibility for the areas where safety issues are identified.

The CAA GA unit conducted an internal review of the regulation of recreational aviation in 2012. The following recommendations resulted from this review:

› Airspace infringements – continued emphasis on GA stakeholder communications, particularly through CAA-funded GASCo[78] Safety programme and Clued Up magazine (ongoing);

[77] Source : UK CAA Safety Plan 2014 – 2016 (Updated May 2014)

- Airborne conflict events – e.g. implementation of the simplified approval process for hand-held radios completed in November 2013, and review of low-cost conspicuous opportunities (ongoing);
- Controlled flight into terrain – e.g. permitting Instrument Flight Rules (IFR) operations for certain permit aircraft (in progress), and simplified process for Instrument Approach Procedure (IAP) approvals (June 2014);
- Loss of control in flight, runway excursions and human factors in the GA cockpit – enhancement to Part-Flight Crew Licensing (FCL) training syllabus (June 2014), and in-depth 10-year review of GA safety data (March 2014).

Under-pinning these specific initiatives, the GA Unit will adopt as its guiding principle a performance-based approach to regulatory oversight, working in conjunction with stakeholders to target resources towards areas of greatest safety opportunity, whilst reducing the regulatory burden where possible.

A.8.9 Environment

UK CAA does not monitor CO_2 emissions from GA activities as it is not mandatory and there is no resource available. CO_2 emissions measures are organized around the main airport.

Incentive measures are implemented for the aero clubs to renew their fleet.

Noise operating restrictions and operational procedures are implemented to reduce the impact of noise around the aerodromes.

A.8.10 Economy

The Department for Transport commissioned a survey on the economic value of General Aviation in the UK[79]. The final version of this survey was published in February 2015 and provides numerous relevant data. According to the report, the total impact of GA on the UK economy is approximately GBP 3 billion (≈ EUR 4.1 billion) in terms of Gross value added (GVA). This number can be further stripped down: Both, GA flying operations and the export fraction of GA manufacturing account for approximately GBP 1.1 billion each (≈ EUR 1.5 billion) of GVA, while additional benefits – possibly deriving from the use of BA – account for at least GBP 0.8 billion (≈ EUR 1.1 billion). Furthermore, GA flying activities support approximately 9,700 jobs, while GA manufacturing supports approximately 28,400 jobs, making a total in excess of 38,000 jobs supported.

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[78] GASCo: General Aviation Safety Council: http://www.gasco.org.uk/about/history.aspx
[79] Department for Transport UK (2015): *The economic value of general aviation in the UK*, York Aviation LLP. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/417060/Economic_Impact_of_General_Aviation_in_the_UK.pdf

Considerable wider economic impacts stem from the use of GA aircraft for BA operations, such as on-demand services. Those services offer an additional connectivity over both commercial air transport and surface transport modes. Quantifying these economic values is considered to be problematic given the lack of data. However, the authors tried to estimate the long run impact on inward investment, trade and productivity, which amounts to a GBP 815 million per year from BA only.

Although GA is an important factor for the UK economy, there has been a continual decline in activity following the financial and economic crisis in 2008. This decline in total flying activity has stemmed primarily from a decline in aero club and private flying of around 45% since 2005. On the contrary, on-demand flying activities have experienced a growth in movements of around 7% since 2005.

This decline in flying activities evidently affects the economic impact of GA. While the economic value of GA was estimated to be around GBP 1.7 billion in 2005 depicted in 2013 prices (≈ EUR 2.34), which denotes a fall in economic values of around 39%.

For the purpose of estimating fuel consumption and the related costs, an average cost per litre was identified: Avgas (2.01 GBP/litre), Jet A1 (0.94 GBP/litre).

A.8.11 Initiatives to promote GA

UK CAA and the Department for Transport are involved in operations with the stakeholders. The Air Navigation Order was revised in 2013 according to a performance-based approach.

Incentive measures are implemented to the aero clubs owner to renew their fleet.

A.8.12 Conclusion

GA in UK is a popular activity supported by the Department for Transport and the UK CAA with a dedicated unit. Initiatives are taken to better regulate GA in UK.

Measures are implemented for safety with a specific tool developed for BA. This initiative could be adopted by other States and aligned with the initiative launched by EBAA. 382 end users provided their data.

A.9 Other States (economic analysis only)

Information identified at different stages of this study falling in the scope of economic analysis is presented below:

A.9.1 Austria

According to AOPA Austria, there are more than 800 aircraft registered for GA operations. Furthermore, GA accounts for a significant share of the annual turnover (≈ EUR 4 billion) in the whole aviation sector[80]. A statistical report provided by IAOPA 2014 specifies that "in 2013, there were 893 active GA aircraft. The number of airports and landing facilities in Austria amounts to 51, the number of licensed civil pilots was 3,000"[81].

A.9.2 Cyprus

For Cyprus, information from the department of civil aviation[82] indicates that the registration fees for aircraft amount to EUR 85.43 for aircraft and balloons of a maximum all up weight of up to 15 tons and EUR 170.86 for aircraft of a maximum all up weight of over 15 tons.

The AOPA Cyprus site[83] provides the information that two airports (Larnaca and Paphos) are served by more than two ground handling companies, while information on maintenance is mentioned only for Larnaca. In both airports both Jet fuel and AvGas is available.

A.9.3 Croatia

The Croatian CAA does not collect data related to economic indicators, but tried to collect some economic data for the purposes of this study.

The Croatian CAA identifies regulation, taxation and capacity as the three main bottlenecks in developing General Aviation. According to the Croatian CAA, EU regulations are changing too fast for the General Aviation community. Most PPL-holders only keep up the minimum flying hours to renew their rating. Further, the cost of fuel is too high as well as the level of taxation. Capacity is only a problem in the summer period for certain airports. Generally, airport charges are considered to be too high for General Aviation purposes, particularly at Zagreb airport.

The Croatian CAA provides some figures on fuel consumption: In 2014, there have been 1,470 tons of Jet fuel used for General Aviation purposes. In the same year,

[80] AOPA Austria: http://www.aopa.at
[81] IAOPA (2014): Statistical Report - World Assembly
[82] Department of Civil Aviation, Cyprus: http://www.mcw.gov.cy/mcw/dca/dca.nsf/DMLregister_en/DMLregister_en?OpenDocument
[83] AOPA Cyprus: http://www.aopa-cyprus.org/

there have been 387 tonnes of AvGas used for General Aviation purposes. These data are usually not collected in Croatia and have been obtained specifically for the purposes of this study.

A.9.4 Greece

AOPA Greece website[84] provides some general information. In particular, regarding handling services, 23 airports have three handlers, one airport with two handlers and 15 airports with one handlers. According to Greek rules, handling services at major airports are obligatory. Reported handling prices range from EUR 18 to 35 plus VAT.

Regarding access, nine aerodromes accept GA flights only in exceptional cases after permission from the military, prior permission is required for eight airports (including Athens), while prior notice is required in further nine airports.

Aviation Gas is available in seven airports (two with some limitations), and prices range from EUR 2.7 to 3.0 per litre, VAT included (May 2015). JETA1 fuel for turboprops is available at most airports with the exception of small airfields. MOGAS is allowed to be brought in the apron by the pilot for self-service refuelling, but it is complicated for anyone who is not based at the airport to get the permission to perform the operation.

Regarding airport charges, AOPA reports that landing and parking fees are waived by the government to promote GA traffic (with the exception of Athens International, where total charges for light aircraft are estimated at EUR 230 for the first day and EUR 70-80 for the following days). An airport development charge is applied for passenger services to the rate of EUR 12 per passenger departing with final destination Greece or the EU and EUR 22 for outside EU.

While no reports were identified regarding the impact of GA on the Greek economy, a contribution in a 2011 conference[85] links the development of GA to the development of the tourist business on Greek islands. While it acknowledges improvements in the infrastructure, it identifies capacity constraints (in the form of parking spaces and airport operating hours) as well as bureaucratic procedures and lack of advertising as the main factors hindering GA development.

A.9.5 Ireland

For Ireland, information on GA has been published online by the Irish Aviation Authority[86]. According to this information, there are three State airports in the

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[84] AOPA Greece: http://www.aopa.gr/aopa/
[85] Hellenic Aviation Society: http://www.aviationsociety.gr/aviation/index.php?option=com_content&view=category&id=53&layout=blog&Itemid=74
[86] Irish Aviation Authority: https://www.iaa.ie/

country, 12 public aerodromes and 13 private aerodromes. Of the above, ten of also accept international flights. According to information provided, prior approval is required for operations from the State airports.

Regarding fees and charges, aircraft registration fees are calculated based on aircraft type and type certificated maximum take-off mass (MTOM) of the aircraft, with ranges varying between EUR 70-650. There are also fees for certification of airworthiness, which is a flat fee for balloons and gliders (EUR 210) and ranges per weight for other categories of aircraft. A flight permit fee also applies (between EUR 100-330 depending on whether the aircraft is under the control of an approved organisation or not). A full description of the fees is presented in Irish Aviation Authority (Fees) (No. 2) Order 2007 S.I. 805 of 2007[87].

According to the information provided, there are four approved maintenance organisations, and two with production organisation approvals.

A.9.6 Malta

For Malta, information was provided online by the Transport Malta authority[88]. According to this, GA aircraft are subject to fees on registration based on the maximum take-off mass of the aircraft ranging between EUR 58-700. An airworthiness certification fee applies based on maximum take-off mass ranging from EUR 116 to more than EUR 3,000 for aircraft of more than 10,000 kg. Air operator's certificate and air operator licence fees may also apply and vary depending on maximum total weight and seating capacity of aircraft, which can also vary depending on a number of other factors (such as whether it is initial issuing or annual fee, etc.).

A.9.7 Switzerland

AOPA Switzerland provides some basic data on General Aviation in Switzerland[89]. There are more than 2,700 aircraft registered in Switzerland for GA purposes. There are more than 8,000 private pilots in Switzerland and more than 2,000 workers employed in ground handling services[90]. The total turnover stemming directly from GA operations amounts to around one billion Swiss Francs (≈ EUR 960 million).

[87] http://www.irishstatutebook.ie/eli/2007/si/805/made/en/pdf
[88] Transport Malta: http://www.transport.gov.mt/
[89] AOPA Switzerland: http://new.aopa.ch/public/aopa-switzerland/was-ist-aopa.html
[90] Those employees cannot unambiguously allocated to GA operations.

A.9.8 Australia

Information on GA in Australia was identified by the Australian government[91]. According to a 2012 report[92] the hours flown in the GA sector decreased by 3.8% in 2012 from 2011, registering 1.7 million hours. The GA fleet also decreased during this period by 2.3% reaching 12,430 aircraft in the regional and GA registers, with an average age of 27.7 years.

The information in the report was collected through survey questionnaires to owners or operators of all aircraft listed in the register. Information on ultralight, gliders, weight shift aircraft and gyrocopters was obtained through their respective associations, as these are not in the civil aircraft register.

In 2008, a report on the Action Agenda on the GA industry was published[93] by the Strategic Industry Leaders Group. While based mainly on qualitative data and the expertise of the contributors, the report considered the GA industry in Australia to be in a state of transition, as some sectors were growing (recreational part, professional flight training), while others declining. Access to airports (through long term agreements with the tenants) is among the issues affecting the development of GA. Regarding the human factor, the need to adapt to a shortage of instructors is mentioned along with the need for proper training of aviation maintenance engineers. On examining the regulatory framework, the report notes that the industry has little support of self-regulation stating that: "*As well as the risks to the public, there was recognition that low levels of safety compliance could result in unhealthy, unsustainable competition between operators. There was qualified support for self-administration under the oversight of CASA but generally only for private, non-commercial operations*". In addition, the age of the fleet is considered to be an issue, particularly as the small size of many GA companies and the intensely competitive environment does not allow the financial margin for investments in new aircraft.

The report concluded with a number of recommendations for the development of GA in Australia.

A.9.9 Brazil

Some general information on the Brazilian GA market was identified through the US Department of Commerce[94]. According to this source, Brazil has a large number of airports (700 public and 2,800 private airports and airstrips) and a total

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[91] Department of Infrastructure and Regional Development: http://www.infrastructure.gov.au/aviation/general/
[92] Bureau of Infrastructure, Transport and Regional Economics (2015): *General aviation activity 2012, Statistical Report*
[93] Bureau of Infrastructure, Transport and Regional Economics (2008): *The General Aviation Industry Action Agenda, Strategic Industry Leaders Group*
[94] Department of Commerce, United States of America: http://trade.gov/mas/manufacturing/OAAI/build/groups/public/@tg_oaai/documents/webcontent/tg_oaai_005303.pdf

General Aviation fleet of 13,094 aircraft in 2011. Regarding manufacturing, "*Brazil has been one of the top 10 destinations for US exports of manufactured aerospace products. Similarly, Brazil has been a top 10 supplier of manufactured aerospace products to the US*". However, the exports from the US to Brazil have increased significantly over the years, so that "*the overall U.S.-Brazil aerospace manufacturing trade balance shifted from a deficit of USD 364 million in 2003 to a surplus of USD 5.7 billion in 2012*".

A presentation made in the 2011 EBACE meeting[95], describes Brazil as representing 5% of the world's BA market[96] and having the 2nd largest fleet. There are more than 4,000 aerodromes, 726 of which with paved runways. The GA fleet has increased between 2009 and 2010 by 6% to 12,614 aircraft. Piston aircraft are 74% of those and helicopters 12%. 62% of the fleet is utilised for private aerial service, 12% for air taxi, 11% for instruction, 9% for agricultural aviation and 6% for other activities. The presentation mentions some challenges for GA: saturated capacity of infrastructure, competition with CAT, lack of skilled labour and complex regulations (with regards to the import of spare parts).

A.9.10 Canada

From Canada, a report from 2009[97] characterizes GA as second most important air transport sector, with 28% of total itinerant aircraft movements in Canada. However, it has to be noted that this definition of GA includes government-civil and government-military aircraft. Of the identified GA components in the definition applied, the other commercial/private category has an average share of 80%. The report was forecasting a decline in GA movements as a consequence of increasing fuel prices and the economic situation of 2009, but still expects a long term growth to 1.6 million movements in 2022 (from 1.4 in 2008).

Regarding the impact of GA airports, the COPA[98] provides links to a number of studies estimating the socio-economic impact from 14 individual airports and one on the Saskatchewan region. The period of these reports ranges between 2002 and 2009. These reports highlight the socioeconomic impact of these airports with different levels of detail, focusing on monetary and employment-related aspects. They generally conclude that these airports are important for the regional development, and highlight different areas of concern, particularly related to funding, infrastructure deficiencies, and capacity constraints.

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[95] Associação Brasileira de Aviação Geral: http://www.nbaa.org/events/amc/2011/news/presentations/1010-Mon/NBAA2011-lyra-brazilian-general-aviation-challenges-opportunities.pdf
[96] This figure could not be further specified.
[97] Transport Canada (2009): *Aviation Forecasts 2008-2022*
[98] AOPA Canada: https://www.copanational.org/EconomicImpact.cfm

A.9.11 United States

GAMA provides a comprehensive annual survey on General Aviation activities. According to the most recent edition, the total economic output supported by General Aviation in the US amounts to USD 219 billion[99]. There are 1.1 million jobs in General Aviation, including direct, indirect, induced and enabled jobs in the United States. 102,600 of those employees are directly employed by the General Aviation manufacturing industry, earning an average salary of USD 112,000 per person. Labour income in General Aviation in the US adds up to USD 69 billion.[100] In 2014, there have been 3,425 new type-certificated airplanes and rotorcraft delivered, having a total value of USD 29.4 billion.

[99] General Aviation Manufacturers Association (2014): *General Aviation Statistical Databook & 2015 Industry Outlook*
http://www.gama.aero/files/GAMA_2014_Databook_LRes%20-%20LowRes.pdf

[100] See also: PwC (2014): Contribution of general aviation to the US economy in 2013
https://www.nbaa.org/business-aviation/2015-general-aviation-contribution-to-US-economy.pdf

Appendix B Analysis of end users data

B.1 Introduction

In parallel to Questionnaire A sent to NAA in the 32 EASA MS and to GA European associations, the EC and EASA requested the development of a specific questionnaire targeting the end users.

The questionnaire was developed by EASA with the support of IAOPA and assessed by the consultant to ensure the consistency between the two questionnaires and avoid duplication of questions. To ensure a large participation from the end users, this questionnaire has been translated into 20 languages.

The list of information requested were:

- Ownership category:
  - Private owner;
  - Shared private owner;
  - Flying club;
  - Flight school;
  - Non-commercial operator;
  - Commercial operator;
- Number of aircraft owned;
- Average age of the aircraft;
- Average cost per flight hour (in EURO);
- Total number of hours flown;
- Total number of flights;
- Consumption;
- Equipment;
- Main place of activity;
- Number of aircraft not registered in the country of activity;
- Number of aircraft registered in a non-European State;
- Change of hourly costs for the last five years (percentage);
- Number of hours flown and number of flights per type of flight:
  - Local flights – Sightseeing and Leisure A to A flights;
  - Private travels – Leisure A to B flights Sightseeing;
  - Air sport (non-commercial);
  - Aerial work;
  - Air transport (executive/corporate/public);

- Emergency medical service;
- Other.

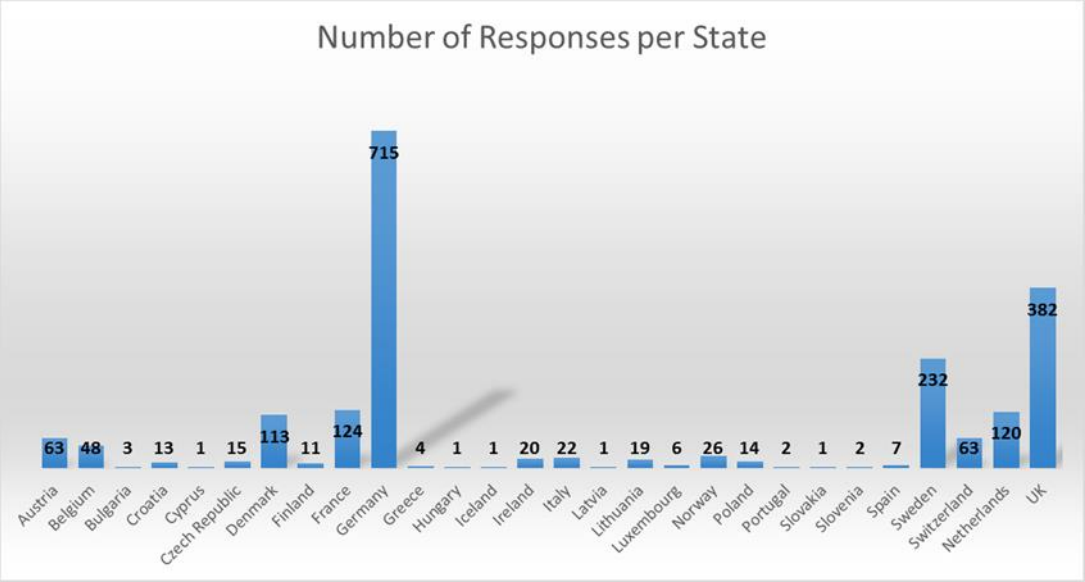
- Percentage of hours flown under IFR;
- Average number of persons on board (pilot + passengers);
- Number of aircraft certified to operate under IFR;
- Change in the annual flight time for the last five years (Percentage);
- Consideration on the environment.

The survey was officially launched the 15th of June with a deadline the 16th of August. However, GA activities are mainly conducted during the summer period. To ensure a high rate of responses, it was agreed with the EC and EASA that the survey would remain open until the 30th of September.

This questionnaire was addressed to 61 national associations identified as a member of a European association or by dedicated search on Internet.

In total, 2,029 responses were received with a disparity between the States.Figure 11 illustrates the number of responses received per State.

Figure 11: Number of responses received per States



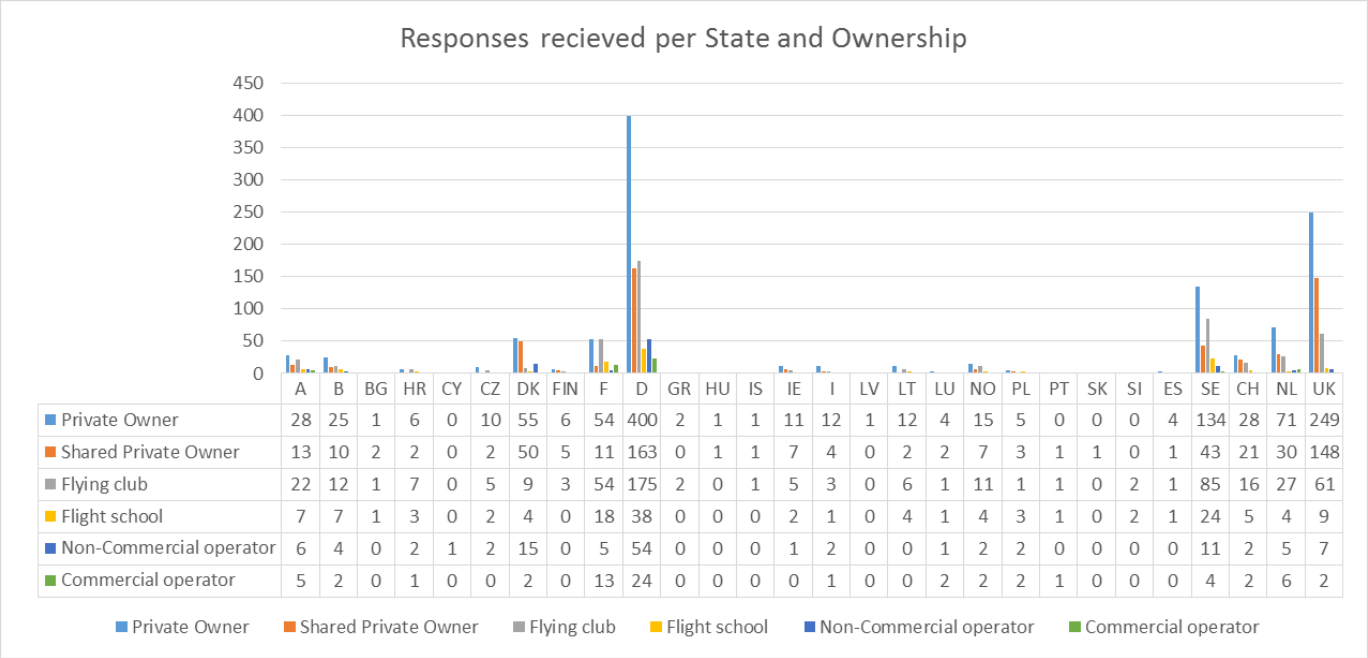
The rate of responses is considered low, particularly for some States like France with 40,000 pilots identified. Several reasons can explain this low rate:

- The period of the year. The survey was launched in summer when GA activities are very high, limiting the availability of pilots to respond to such survey. To ensure a large participation, the survey was open until the end of September;
- The limited delay to respond. The pilots initially had two months to respond. This was extended for one and a half additional months but still during the summer period;

- Impossibility to reach the private pilots/associations who were not members of an association;
- Lack of communication from the associations to promote this survey;
- Difficulty to identify national associations for the consultant;
- Misunderstanding of some associations which did not relay this survey to their members.

The majority of responses were provided by private owners (55.9%), followed by shared private owners (26%) and flying clubs (25%). Figure 12 presents the number of responses per State and ownership.

Figure 12: Number of responses received per State and ownership

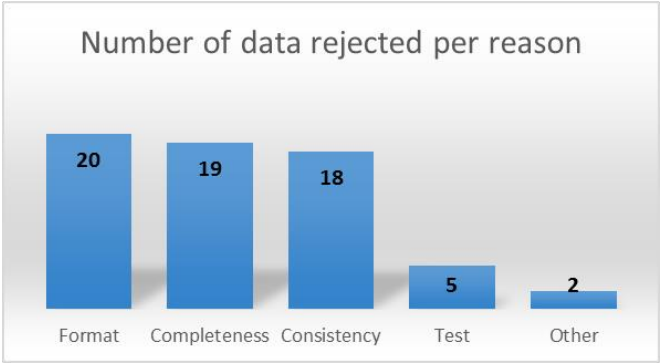


	A	B	BG	HR	CY	CZ	DK	FIN	F	D	GR	HU	IS	IE	I	LV	LT	LU	NO	PL	PT	SK	SI	ES	SE	CH	NL	UK
Private Owner	28	25	1	6	0	10	55	6	54	400	2	1	1	11	12	1	12	4	15	5	0	0	0	4	134	28	71	249
Shared Private Owner	13	10	2	2	0	2	50	5	11	163	0	1	1	7	4	0	2	2	7	3	1	1	0	1	43	21	30	148
Flying club	22	12	1	7	0	5	9	3	54	175	2	0	1	5	3	0	6	1	11	1	1	0	2	1	85	16	27	61
Flight school	7	7	1	3	0	2	4	0	18	38	0	0	0	2	1	0	4	1	4	3	1	0	2	1	24	5	4	9
Non-Commercial operator	6	4	0	2	1	2	15	0	5	54	0	0	0	1	2	0	0	1	2	2	0	0	0	0	11	2	5	7
Commercial operator	5	2	0	1	0	0	2	0	13	24	0	0	0	0	1	0	0	2	2	2	1	0	0	0	4	2	6	2

B.2 Quality Analysis

A quality assessment was performed before analysing the responses. Responses considered inconsistent or provided in a format which was not understandable, or were rejected e.g. average age defined as 3,000. Figure 13 shows the number of responses rejected and the reasons.

Figure 13: Number of responses rejected per reason



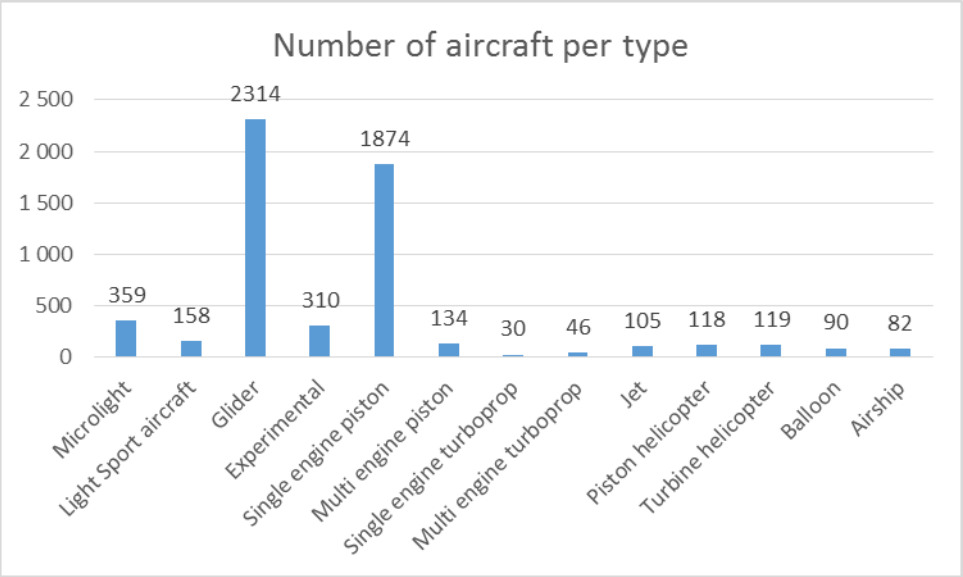
In some cases, the responses (in total 329) provided were incomplete. However, the data provided were considered relevant. Most of the missing data were the total number of hours flown (48%) and the total number of flights 53%). The detailed number of hours flown per type of activity was provided.

B.3 Analysis of data

B.3.1 Aircraft declared

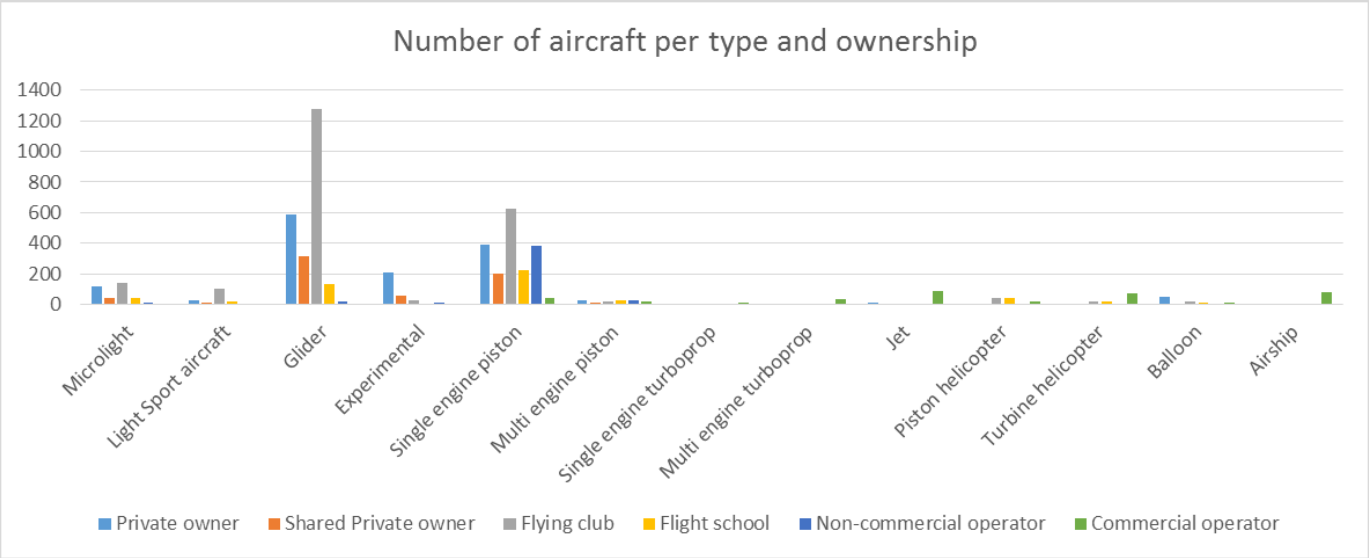
The total number of aircraft declared by the respondents is 5,739. 40% of the aircraft are gliders and 32% are single engine piston. Figure 14 presents the number of aircraft per type.

Figure 14: Number of aircraft per type



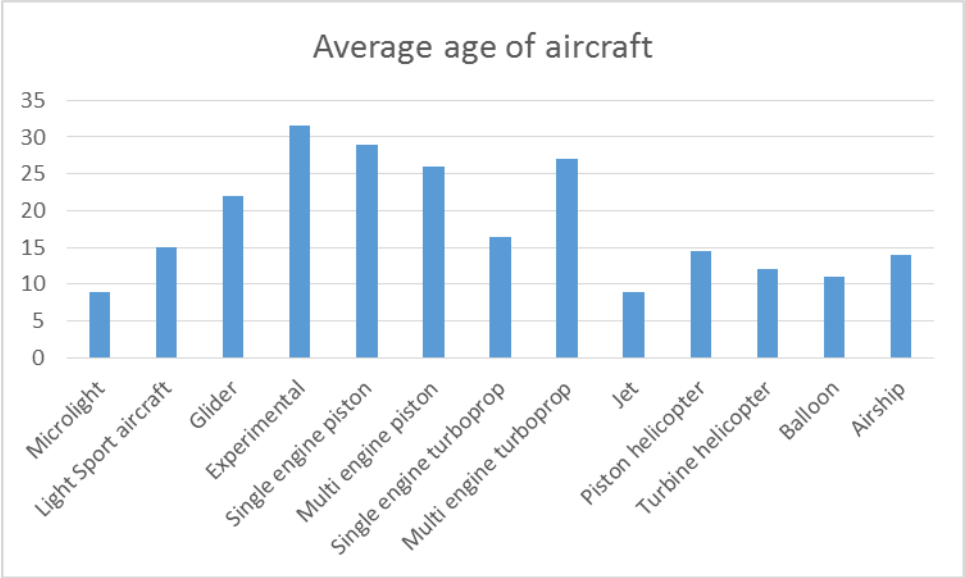
Gliding is the most popular activity for private owners and flying clubs, followed by single engine piston. Figure 15 presents the number of aircraft per type and ownership.

Figure 15: Number of aircraft per type and ownership



The average age of the fleet is 18 year old with a large difference between microlight aircraft and jet with an average of nine years and experimental, single and multiengine aircraft with an average of 22 years. Figure 16 illustrates the average age of the fleet per aircraft type.

Figure 16: Average age of the fleet



B.3.2 Costs

The average cost of a flight/hour presented a large difference depending on the respondent. These differences identified could be explained by the process of calculating the cost. No guidance was provided to the end users. It is assumed that some of them calculated only the cost of fuel, whilst others included any cost like aerodrome fees, insurance, rental cost, etc. Due to the large differences identified, the consultant decided not to provide any figures, as they could be wrongly interpreted.

Therefore, it is recommended that a proposal to define calculations for any cost to be included in any future survey.

B.3.3 Activity

The total number of hours flown declared is 1,336,624 for 929,117 flights. The average duration of a flight is 1.4 hours. Figure 17 and Figure 18 present the number of hours flown and the number of flights per type of activity.

Figure 17: Number of hours flown per activity

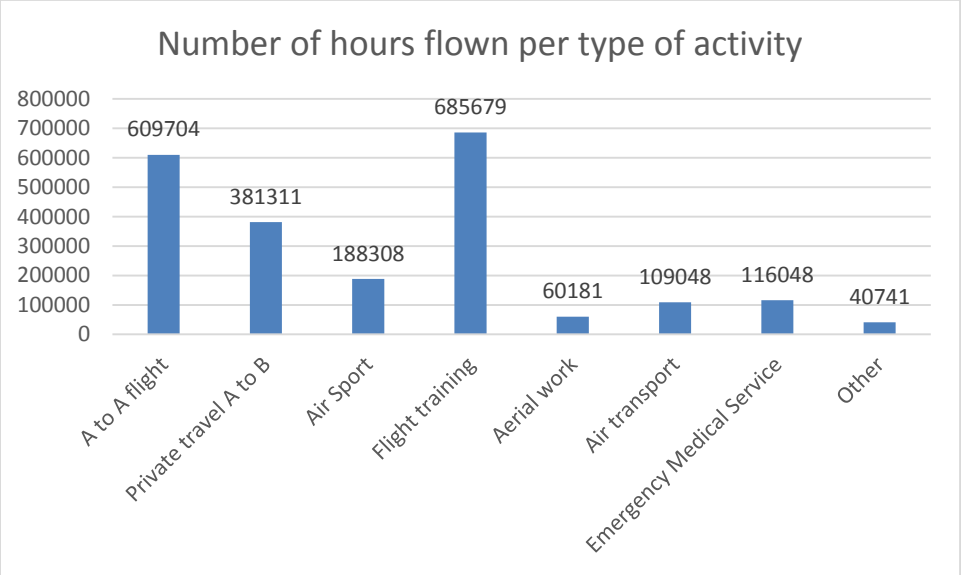
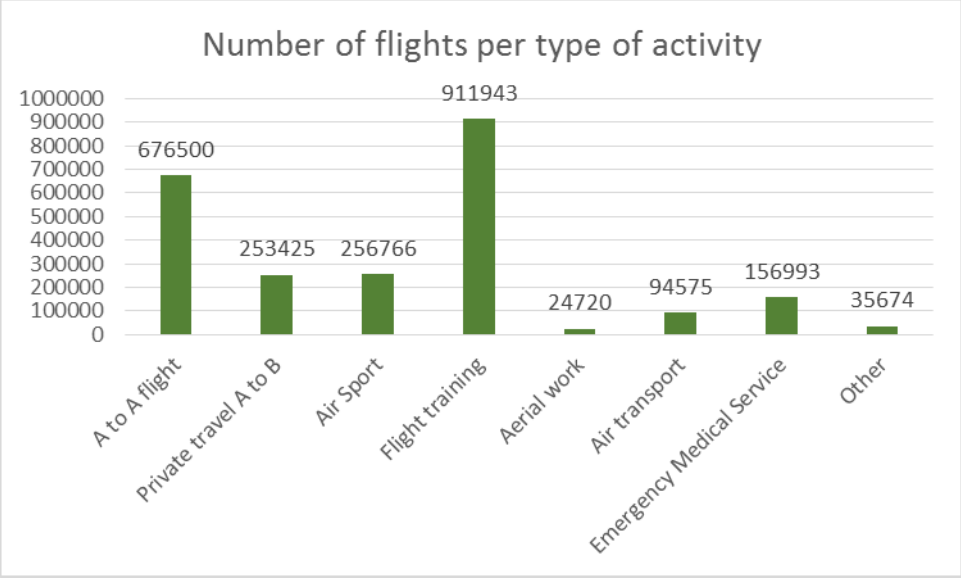


Figure 18: Number of flights per activity



B.3.4 Equipment

The equipment was provided only by private owners, shared private owners, flying clubs and flight schools.

Microlight aircraft are equipped mainly with one radio, a GPS VFR, a transponder Mode A/C, FLARM, ELT 406 MHz and PLB. For those equipped with Transponder Mode S, only 12% are equipped with a transponder Mode S Extended squitter/ADS-B.[101]

Light sport aircraft are mainly equipped with one radio, one VOR/ILS[102] receiver, GPS VFR, Transponder Mode A/C, DME, ADF[103], ELT 406 MHz and PLB.

Gliders are equipped with one radio, a GPS VFR, Transponder Mode S, FLARM, ELT 121.5 MHz and ELT 406 MHz in the same proportion and PLB.

Experimental aircraft are equipped with one radio, GPS VFR, Transponder Mode A/C and Mode S, ELT 121.5 MHz and ELT 406 MHz in the same proportion and PLB.

Single Engine Piston aircraft are equipped mainly with one radio, one NAV VOR/ILS receiver, GPS VFR, Transponder Mode A/C and Mode S, FLARM, DME, ADF, ELT 406 MHz.

Multi engine piston aircraft are equipped with two radios, redundant NAV VOR/ILS, GPS VFR, Transponder Mode S and ELT 406 MHz.

Single engine turboprop are equipped with one radio 25 kHz and two radios 8.33 kHz, redundant VOR/ILS, GPS VFR and IFR, Transponder Mode S and ELT 406 MHz.

Multi engine turboprop are equipped mainly with one 8.33 kHz radio, GPS VFR and IFR, Transponder Mode S, TCAS and ELT 406 MHz.

Jet aircraft are mainly equipped with two 8.33 kHz radios, redundant VOR/ILS, Transponder Mode S, TCAS[104], DME, ADF, ELT 121.5 MHz and ELT 406 MHz.

Piston Helicopter are equipped with one 25 kHz and one 8.33 kHz radios, GPS VFR, Transponder Mode S and ELT 406 MHz.

Turbine helicopter aircraft are equipped with 8.33 kHz radios, GPS VFR, Transponder Mode S and ELT 121.5 MHz.

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[101] Standard equipment of an aircraft comprises, communication systems (radio), navigation (e.g. Global Positioning System (GPS) and landing (Instrument Landing System (ILS) systems, aviation transponder/interrogation modes for aircraft identification (Mode A, Mode S) and emergency and alert systems (FLARM: Flight & Alarm system alerting a pilot to potential collision between aircraft, emergency beacon e.g. Emerging Lifesaving Technology (ELT 406 MHz) or Personal Locator Beacon (PLB)

[102] VOR: VHF Omnidirectional Range – ILS: Instrument Landing System

[103] DME: Distance Measuring Equipment – ADF: Automatic Direction Finder

[104] TCAS: Traffic Collision Avoidance

Balloons are equipped with 8.33 kHz radio, NAV VOR/ILS, Transponder Mode S and PLB.

Airships are equipped with one radio and GPS VFR.

The following figures present the equipment per aircraft type.

Figure 19: Equipment of aircraft per type of aircraft – Radios

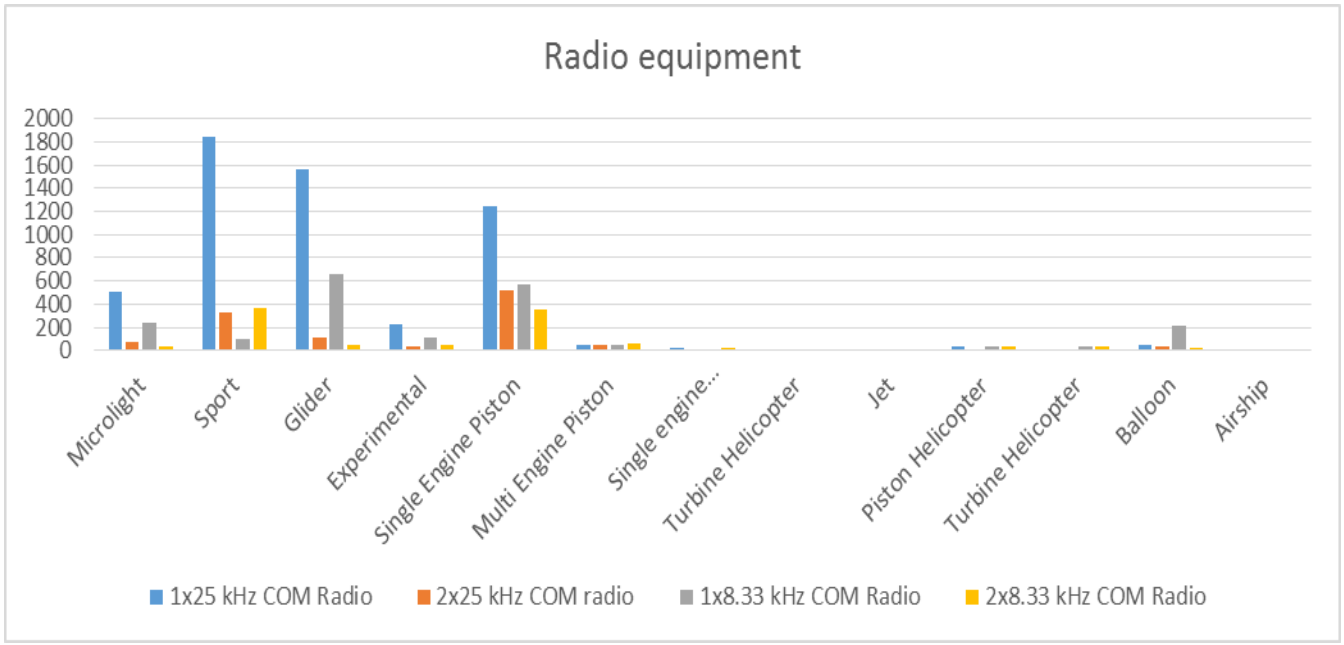


Figure 20: Navigation equipment

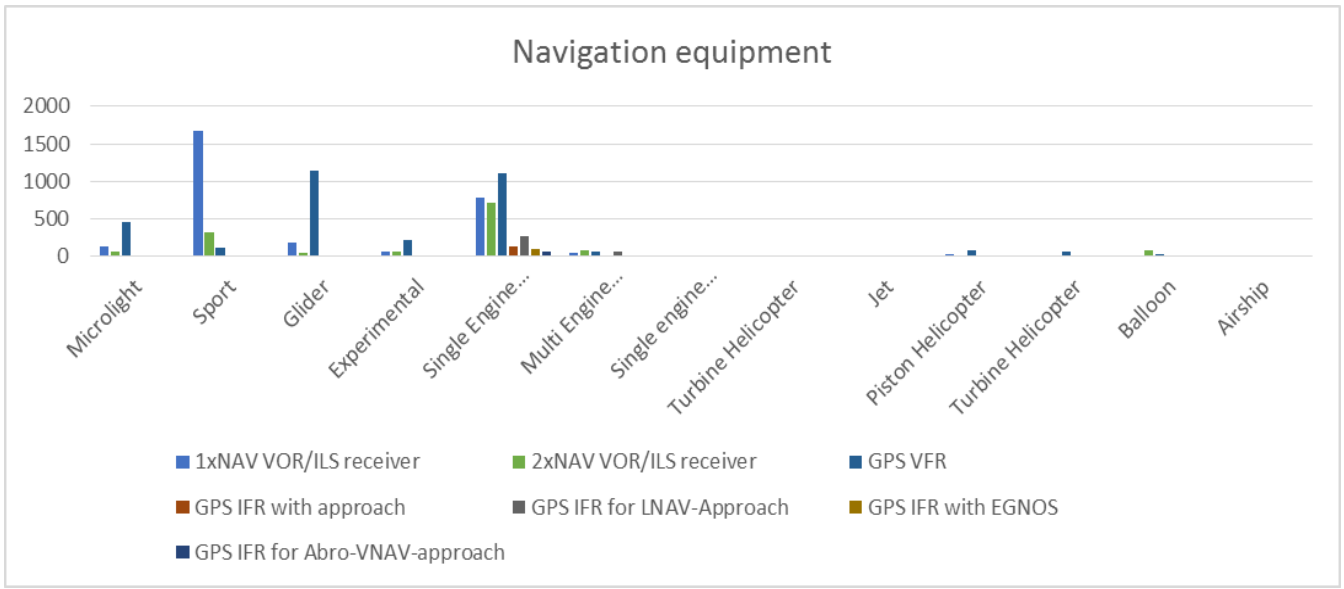


Figure 21: Transponder

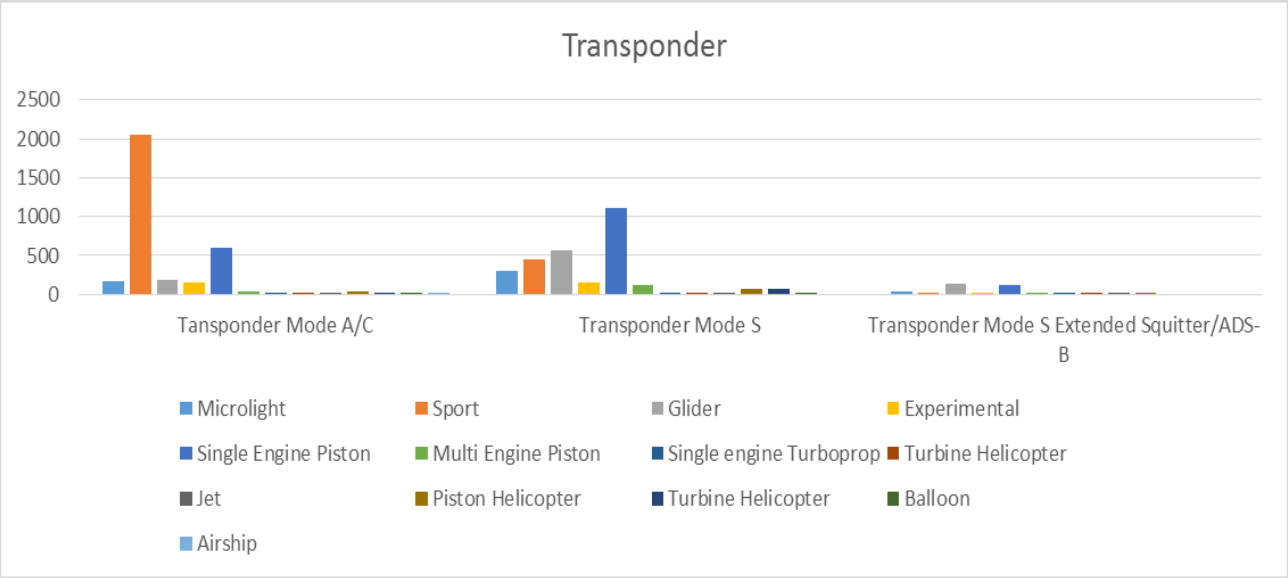


Figure 22: FLARM & TCAS

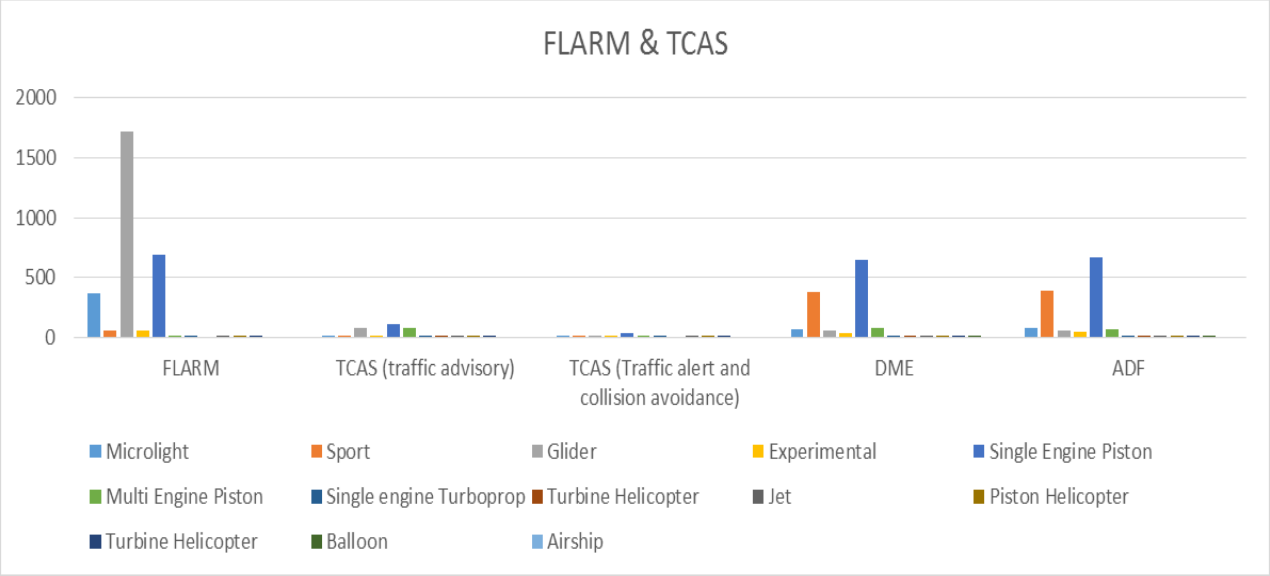
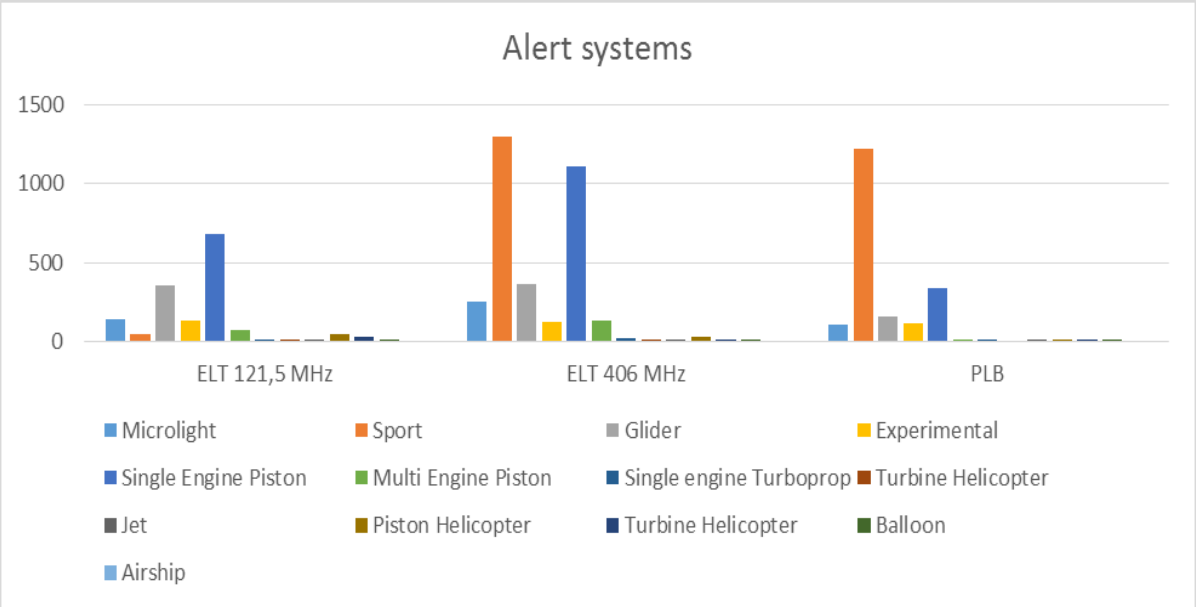


Figure 23: Alert systems



B.3.5 Aircraft place of registration

The number of aircraft not registered in the country of activity is 572, which represents 14.3% of the aircraft declared. 5.08% are registered in a non-European State.

B.3.6 Evolution in costs and flight time

For the last 5 years, the respondents declared an increase of 1.17% of hourly costs and a decrease of -0.1% of the annual flight time.

B.3.7 IFR Certification

The end users were requested to provide their percentage of flights performed under IFR and the number of aircraft IFR certified.

The first question was interpreted in different ways by the end users. Therefore, it is difficult to estimate the average number of flights performed under IFR.

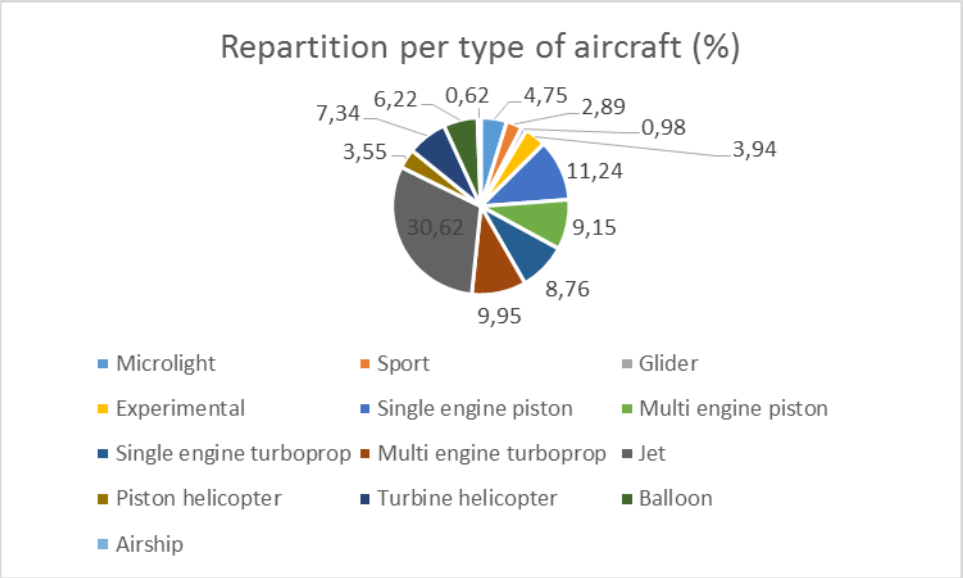
It is recommended that a number of flights are requested, rather than a percentage, for future surveys, so that the percentage can be then calculated by the analyst.

To the second question the respondents declared 1,875 aircraft certified and maintained to operate under IFR which represents 32.6% of the aircraft declared.

B.3.8 Fuel consumption

The end users declared a consumption of 29,387 of litres. Only 1.4% of the gliders declared are motorized gliders. Figure 24 shows the percentage of fuel burned per type of aircraft.

Figure 24: Repartition of fuel consumption per type of aircraft



B.4 Comparison with data received from NAA

Due to the limited number of responses received from the end users, comparisons between the responses received from the NAA and from the end users were difficult.

It was expected that the NAA could provide the number of pilots. However, these data were not considered accurate, the NAA collecting only the number of licenses per type. A pilot can own several types of licences and therefore been counted several times.

Only a few NAAs could provide the number of hours flown and they do not have any data regarding the number of aircraft certified IFR or the equipment of those aircraft.

A comparison was possible between the number of aircraft registered and the number of aircraft declared. The result provides the evidence that a limited number of end users responded to the survey.

Table 12: Number of aircraft registered vs number of aircraft declared

State	Registered	Declared	Percentage
AT	175	298	170[105]

[105] In Austria, gliders and microlight aircraft are registered by the Austrian Aeroclub, which are not included in the national register published by Austro Control.

BE	3,311	126	4
BG	Not available	1	
HR	145	64	44
CY	101	3	3
CZ	Not available	99	
DK	1,562	169	11
FIN	Not available	25	
FR	26,851	360	1
DE	31,756	2,033	6
GR	Not available	15	-
HU	1,206	2	0,17
IS	200	1	1
IE	457	40	9
IT	Not available	29	-
LV	591	1	0,17
LT	0	72	-
LU	288	38	13
NO	Not available	76	-
PL	2,728	45	2
PT	Not available	9	-
RO	Not	No responses	-

	available	received	
SK	Not available	1	-
SI	Not available	17	-
ES	6,812	12	0,18
SE	4,700	824	18
CH	3,548	166	5
NL	Not available	346	-
UK	18,632	897	5

B.5 Conclusion

The end users' survey did not provided the expected results, mainly due to the time of year, and the length of time, which was considered too short by the associations and due to the impossibility of contacting any single end users.

Positive results can, however, be identified:

- The quality of responses was good, with a very limited number of responses incomplete or rejected. Rejected responses are mainly due to the format in which the answer was provided. This issue was identified mainly for the average age of the aircraft.
- Responses were received from different organizations including private owners who are, in principle, the most difficult to contact. This demonstrates that AOPA is very active and can mobilize its members.
- The associations contacted for the development of case study supported this process and accepted to respond to additional questions.
- The main European associations supported the study and provided their data.

Appendix C Estimating GDP

This section describes the methodology developed in this study in estimating the impact of GA on GDP.

C.1 Definition of GDP and approaches to measurement

In this project, we follow Eurostat's definition of GDP, for reasons of internal consistency of the Commission's work, and because Eurostat's definition follows the mainstream international definitions used for purposes of national accounting.

Eurostat defines GDP in the following way[106]:

GDP is a measure of the total economic activity, taking place on an economic territory, which leads to output meeting the final demands of the economy. There are three ways of measuring GDP at market prices:

- The production approach, as the sum of the values added by all activities which produce goods and services, plus taxes less subsidies on products;
- The expenditure approach, as the total of all final expenditures made in either consuming the final output of the economy, or in adding to wealth, plus exports less imports of goods and services;
- The income approach, as the total of all incomes earned in the process of producing goods and services plus taxes on production and imports less subsidies.

Economic activity is transactions between different institutional units. A transaction can involve the exchange of goods, services, or cash. It may be a something-for-something transaction where one unit provides something for the other and receives something in return or a something-for-nothing transaction where one unit provides something for another without receiving anything in return. An institutional unit is something, which can own goods and assets, incur liabilities and engage in activities and transactions with other units in their own right. Eurostat distinguishes between five types of institutional units: Households, Government, Corporations, Non-profit institutions and Rest of World. For the purpose of this study, the economic territory is the territory of EU28.

The three approaches to measuring GDP reflect that GDP is a measure of an economic surplus from producing goods and services. The production approach consists in measuring the surplus by valuing the goods and services produced and deducting the value of the materials used to produce them. The income approach measures GDP by looking at the recipients of the economic surplus. The economic surplus from production is divided between the owners of the institutions, which

[106] Eurostat and European Commission (2010): *European system of accounts – ESA 2010*

produce the products,[107] and the employees at the units (and the government, which taxes corporations' profits). The expenditure approach on the other hand, builds upon the balance between production and use. A product, be it produced by domestic units or imported, may either be used as an intermediate input to firms, consumed by consumers, used to build up capital stocks at firms, consumed by government or exported.

C.2 Direct and indirect effects on GDP

GDP is a well-defined concept, but one can delimit the GDP impacts one wishes to measure in different ways. Some commonly used delimitations are:

- Direct impact: The GDP created at the units, which perform activities within a specific sector, in this case the General Aviation sector.
- Indirect impact: There are different interpretations of this concept. For this project, we follow PwC (2008) and define the indirect impact as the GDP generated at the companies, which supply goods and services to companies in the General Aviation. Another definition is used by OECD (2013), which defines the indirect impact as the consumer surplus and welfare gains, generated by an activity.
- Induced impact: GAMA (2006)[108], PwC (2008)[109] and FNAM (2013)[110] consider the induced impact to be the economic output created in other industries by the expenditures of wages earners employed in relation to General Aviation.
- Catalytic impact: ATAG (2004)[111] defines the catalytic impact as the impact, which the transport industry has on the performance of other industries in enabling economic activity.

C.3 Challenges to measurement

We want to measure the GDP contribution of a sector, which does not have a clear definition in the commonly used industry classifications Industry Standard Industrial Classification (ISIC)[112] and Statistical Classification of Economic

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[107] A product can be a good or a service.
[108] General Aviation Manufacturers Association (2006): *General aviation's contribution to the U.S. Economy*
[109] Price Waterhouse Copper (2008): *The economic impact of business aviation in Europe*
[110] Fédération Nationale de l'Aviation Marchande (2013): *The first study on socioeconomic impact of general aviation and business aviation in France*
[111] Air Transport Action Group (2004): *The economic & social benefits of air transport* http://www.icao.int/Meetings/wrdss2011/Documents/JointWorkshop2005/ATAG_SocialBenefitsAirTransport.pdf
[112] Industry Standard Industrial Classification, commonly referred to as ISIC, is a United Nations industry classification system.

Activities in the European Community[113]), and for which there is no existing national accounting information from official bodies such as Eurostat.

We have two overall approaches to do this:

- A top-down approach, where we start from official GDP estimates and estimate the GDP contribution of General Aviation as a share of the official GDP estimates. Information about which shares are relevant might be found in the literature.
- A bottom-up approach, where we identify the constituent parts of General Aviation, estimate their GDP contributions and add them together.

We choose the bottom-up approach, because the estimates of GDP contributions from General Aviation in the available literature have been made for France and USA. These two countries have aircraft manufacturing industries which constitute a much larger share of the countries' economies than is the case for most EU28 Member States. Estimates of the GDP contribution of the General Aviation industry based on studies of this industry in France and USA will therefore not be valid for EU28.

There are specific challenges to measuring the GDP contribution from General Aviation, which do not arise when measuring other private sector activities:

- Some General Aviation services are not traded against money in markets. This implies that one cannot look up the value of outputs in official income accounts of corporations. For example, non-commercial BA services are provided by one part of a corporation to another part of the corporation, and if there is a price for the services, it cannot be found in any official documents.
- Some General Aviation services are not traded at all. For example, leisure flying is a service provided by a household to itself – a household owns an aircraft, which it makes available to itself for leisure flying. There is no price paid for this service, and its value is not recorded in any documents.

Besides the challenges specific to General Aviation, there are some general challenges as well:

- Some corporations, which provide General Aviation products, also provide products, which are not General Aviation, and it is a challenge to estimate the share of the corporations' output, which is related to General Aviation. For example, aircraft manufacturers, which contribute indirectly to General Aviation's GDP, also produce aircraft for CAT.

[113] The Statistical Classification of Economic Activities in the European Community, commonly referred to as NACE, is the industry standard classification system used in the European Union

- Many corporations do not report output and intermediate inputs in a form, which is optimal for estimating GDP through the production approach, and many corporations do not report wages, making it difficult to use the income approach. Furthermore, it is difficult to estimate product taxes and subsidies based on corporations' income accounts.

C.4 GDP components

The so-called supply-use tables are a consistent framework for analysing the GDP of different sectors and industries of the economy. The supply-use tables contain information allowing for estimation of GDP using all three approaches: production, expenditure and income.

Eurostat defines the following components:

- Transactions in products
  - Output
  - Intermediate consumption
  - Final consumption
  - Gross capital formation
  - Exports and imports of goods and services
- Distributive transactions (transactions whereby the value added generated by production is distributed to labour, capital and government, and transactions redistributing income and wealth).
  - Compensation of employees
  - Taxes and social contributions and other current transfers
  - Subsidies
  - Property income

The following relationships hold:

- For each industry, gross value added equals output less intermediate consumption
- Gross value added is identical to the sum of compensation of employees, consumption of fixed capital, net operating surplus, and other taxes less subsidies
- GDP equals gross value added + taxes on products less subsidies on products

At the industry level, it is possible to check GDP estimates from the production and income approaches, because the two approaches are equivalent at the industry level. However, at the industry level we cannot be sure that GDP as measured using the production approach equals GDP estimated using the expenditure approach.

C.5 Implications for measurement

We do not distinguish between gross value added and GDP, because we assume that there are no significant product taxes or subsidies on General Aviation products, so we estimate GDP on the basis of output and intermediate consumption and compensation of employees, consumption of fixed capital and net operating surplus.

C.6 Types of output

Eurostat and the European Commission (2008)[114] distinguish between three types of output:

- Market output: Output that is disposed of on the market or is intended to be disposed of on the market.
- Output produced for own final use: Goods or services that are retained either for own final consumption or for capital formation by the same institutional unit.
- Non-market output: Output, which is provided to other units free, or at prices that are not economically significant.

The different parts of General Aviation may produce different kinds of output. For example, non-commercial business aviation will produce non-market output, whereas air taxis will produce market output. Below is a list of our understanding of the parts of General Aviation:

[114] Eurostat (2008): *Eurostat Manual of Supply, Use and Input-Output Tables* http://ec.europa.eu/eurostat/documents/3859598/5902113/KS-RA-07-013-EN.PDF/b0b3d71e-3930-4442-94be-70b36cea9b39?version=1.0

Table 13: General Aviation activities, GDP components, type of output, institutions and valuation approaches

Activities	GDP component	Type of output	Types of Institutional units	Possible approaches
		Direct impact		
On Demand activities	Output, intermediate consumption, earnings, profits	Market output	All	Production, income, expenditure
Aerial work	Output, intermediate consumption, earnings, profits	Market output, output produced for own final use	All	Production, income, expenditure
Corporate aviation	Intermediate consumption, earnings	Market output, output produced for own final use	Corporations, government, non-profit organizations	Income, expenditure
Leisure flights	Final consumption expenditure	Non-market output	Households	Expenditure
Training flights	Output, intermediate consumption, earnings, profits	Market output, output produced for own final use	All	Production, income, expenditure
		Indirect impact		
Manufacturing of aircraft	Output, intermediate consumption, earnings, profits	Market output	Corporations	Production, income, expenditure

Appendix D Links to national databases

Cyprus	http://www.mcw.gov.cy/mcw/dca/dca.nsf/All/0A9285F23A7B6091C2257E2F0035C5C2/$file/AIRCRAFT%20REGISTER%20%2031%20MAR%20%202015%20public%20%283%29.pdf
Estonia	http://www.ecaa.ee/aircraft-register
Finland	http://www.trafi.fi/en/services/statistics/aviation_statistics
France	http://www.developpement-durable.gouv.fr/Statistiques-generales-de-l.html
Germany	http://www.lba.de/SharedDocs/Downloads/DE/SBl/SBl3/Publikationen/Jahresberichte/Bericht_2012_2013_en.pdf?__blob=publicationFile&v=1
Iceland	http://www.icetra.is/aviation/aircraft/register/#
Ireland	https://www.iaa.ie/index.jsp?p=469&n=471
Italy	http://www.enac.gov.it/Servizio/Info_in_English/National_Aircraft_Registry_-_N-9-A-9-R-9-/index.html
Luxembourg	http://www.dac.public.lu/documentation/aeronef/extrait_registre.pdf
Malta	http://live.transport.gov.mt/admin/uploads/media-library/files/Query%20Registration%20-%205%20May%202015.pdf
Spain	http://www.seguridadaerea.gob.es/media/3748914/aeronaves_inscritas.pdf
Switzerland	http://www.bfs.admin.ch/bfs/portal/fr/index/themen/11/03/blank/02/02.html
UK	http://www.caa.co.uk/docs/56/Reg%20Totals%20with%20CofA%20010115.pdf

Appendix E References

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Aena: http://www.aena.es/csee/ccurl/349/11/LE_AD_1_3_en.pdf

AOPA Austria: http://www.aopa.at

AOPA Canada: https://www.copanational.org/EconomicImpact.cfm

AOPA Cyprus: http://www.aopa-cyprus.org/

AOPA Greece: http://www.aopa.gr/aopa/

AOPA Romania: http://www.aoparomania.ro/

AOPA Romania:
http://www.aoparomania.ro/Resources/Documents/LR_GEN_4_1_en.pdf

AOPA Switzerland: http://new.aopa.ch/public/aopa-switzerland/was-ist-aopa.html

Associação Brasileira de Aviação Geral:
http://www.nbaa.org/events/amc/2011/news/presentations/1010-Mon/NBAA2011-lyra-brazilian-general-aviation-challenges-opportunities.pdf

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Bureau of Infrastructure, Transport and Regional Economics (2015): *General Aviation activity 2012, Statistical Report*

Central Intelligence Agency (2015): Factbook
https://www.cia.gov/library/publications/the-world-factbook/index.html

CIAIAC - Comisión de Investigación de Accidentes e Incidentes de Aviación Civil (2014): Estudio de prevención de accidentes de Aviación General
http://www.fomento.gob.es/NR/rdonlyres/18A2DC46-935D-4699-8CEA-5927EC5DB5B5/126833/Estudio_prevencion_2014.pdf

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Department of Civil Aviation, Cyprus:
http://www.mcw.gov.cy/mcw/dca/dca.nsf/DMLregister_en/DMLregister_en?OpenDocument
Department of Commerce, United States of America:
http://trade.gov/mas/manufacturing/OAAI/build/groups/public/@tg_oaai/documents/webcontent/tg_oaai_005303.pdf

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http://www.infrastructure.gov.au/aviation/general/

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http://www.developpement-durable.gouv.fr/IMG/pdf/SDE1-2199_-_OAC_2015_T2complet_VF.pdf

Dortmund Airport: https://ip-assets.s3-eu-west-1.amazonaws.com/public/airportdtm/1cb040143d526eef/90f5a0adb00a6449e29b1dd86abca9e7/Dortmund_Airport_Entgeltordnung_01-11-2011.pdf

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http://easa.europa.eu/easa-and-you/aviation-domain/general-aviation?page=general-aviation-road-map

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http://www.ebaa.org/documents/document/20140515114212-ebaa-annual_review-2013-2014.pdf

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Eurocontrol Trends Air Traffic Volume 6 (2009): *Business Aviation in Europe 2009*

Eurostat and European Commission (2010): *European system of accounts – ESA 2010*

Federal Ministry of Finance, Germany:
http://www.zoll.de/DE/Fachthemen/Steuern/Verbrauchsteuern/Energie/Grundsaetze-Besteuerung/Steuerhoehe/steuerhoehe_node.html

Fédération Nationale de l'Aviation Marchande (2013): *The first study on socioeconomic impact of General Aviation and business aviation in France*

Flugplatz Schönhagen: http://www.flugplatz-schoenhagen.aero/en/for-pilots/the-airport/fuel-prices.html

Fraport AG:
http://www.fraport.de/content/fraport/de/misc/binaer/kompetenzen/aviation-services/flug--und-terminalbetrieb/nutzungsbedingungen-und-entgelte/jcr:content.file/2013-nutzungsbedingungen-gat-deutsch.pdf

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http://www.gasco.org.uk/about/history.aspx

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http://www.gama.aero/files/GAMA_2014_Databook_LRes%20-%20LowRes.pdf

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Transport Malta: http://www.transport.gov.mt/

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UK CAA: Safety Plan 2014 – 2016 revised 2014

Appendix F Questionnaires

The Questionnaires are provided as separate files.

Appendix G Database

The database has been created in Microsoft Excel® format and is provided as a separate file.

Appendix H User's Guide for the Database

The user's guide is provided in a separate file.

Appendix I List of associations supporting the study

The main European associations supporting the study were:

- EBAA
- ECOGAS
- GAMA
- Europe Air Sport
- IAOPA

The associations contributing to the case study were:

- France:
  - Aero Club de France
  - Fédération Française Aéronautique (FFA)
  - Fédération Française d'ULM (FFPLUM)
- Germany
  - IAOPA
- Poland
  - AOPA Poland
- Romania:
  - RCCA
- Sweden:
  - AOPA Sweden
  - Kungliga Svenska Aeroklubben (KSAK)
- Spain:
  - Aena
  - AESA