




FINANCIAL SIZE OF AVIATION: ESTIMATES FOR HELICOPTER, MAINTENANCE AND AERODROME SECTORS

FWC ASSESSII - SPECIFIC CONTRACT #04 Implementing Framework Contract No EASA.2015.FC41

Final Report

30th April 2020 – Version for Advisory Bodies

Executive summary

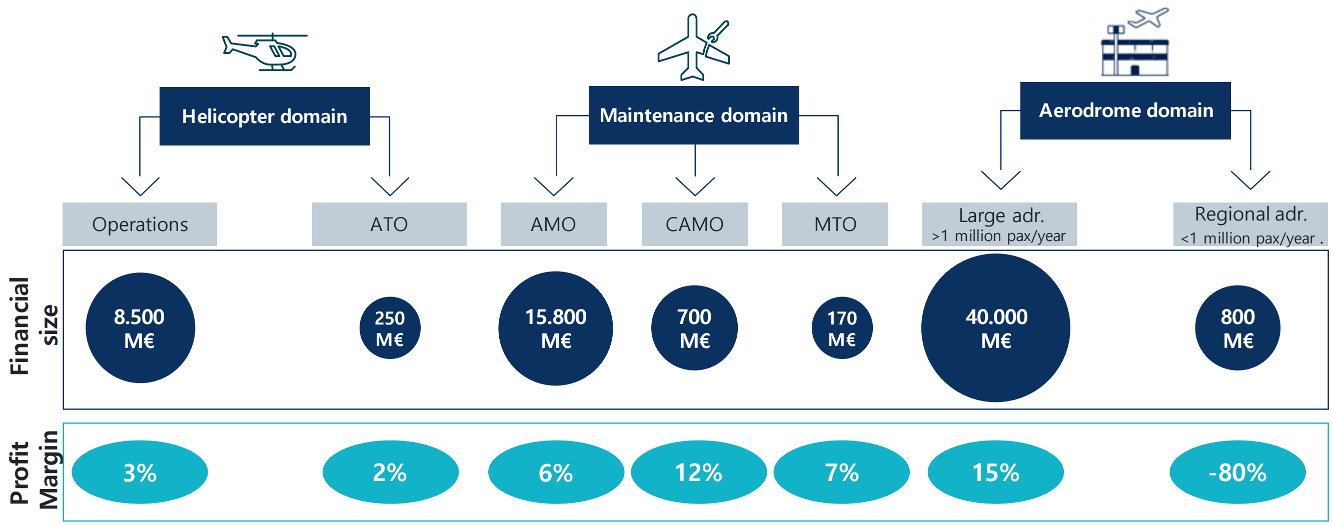
The present document is the Final Report submitted to the EASA by ALG for the "Financial size of aviation market II", under the Multiple Framework Contract "Support to Impact Assessment and Evaluation of EASA rules (ASSESS II)". The study is proposed in support of the impact assessment methodology used in the decision-making process put in place by EASA to justify opinions, decisions, acceptable means of compliance and guidance material for the application of the Basic Regulation and its implementing rules.

The objective of the study is to support this economic impact assessment methodology by estimating the financial size of the following aviation domains:

1. Helicopter operations and training organisations: including operations by all helicopters in-service registered in one of the EASA MSs holding a valid airworthiness certificate (excluding military operations) and Approved Training Organisations - ATO(H);
2. Maintenance organisations: Continuing Airworthiness Management Organisations (CAMO) approved under Part-M Subpart-G, Approved Maintenance Organisations (AMO) approved under Part-145 and AMO approved under Part-M Subpart-F, and Maintenance Training Organisations (MTO) approved under Part-147;
3. Aerodromes: economic data for single aerodrome in EASA scope with a focus on the financial sustainability of the smaller ones;

This document provides the description of the mathematical model, the inputs and assumptions used to estimate the financial size of these aviation sectors at EASA Member States level (globally and per MS), focusing on the three main components:

1. Financial sizing model: following a two-fold approach (bottom-up and top-down) for most of the domains analysed, to quantify their financial size both from an economic and from an operational perspective, based on correspondent data, in order to increase accuracy and robustness of results.
2. Information and evidences collection: the three main sources of information are the on-line survey, the interviews with targeted stakeholders, and a thorough desk research, extracting data from company house registers, public reports and companies' official websites.
3. Data processing and analysis: identification, collection and analysis of all the data used in the model, to ensure maximum transparency and the maintainability of the results;



Total financial size and profit margin for all EASA MS per domain (approximate figures, 2016-2018 average values).

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List of Acronyms

Acronym	Description
ACI	Airports Council International
AMO	Approved Maintenance Organisations
AOC	Air Operator Certificate
ARR	Attrition plus Retirement Rate
ATO	Approved Training Organisation
BR	Basic Regulation, i.e. Regulation (EU) 2018/1139
CAA	Civil Aviation Authority
CAMO	Continuing Airworthiness Management Organisation
CAT	Commercial Air Transport
CMPA	Complex Motor-Powered Aircraft
CofA	Certificate of Airworthiness
EAMTC	European Aviation Maintenance Training Committee
EFTA	European Free Trade Association
EHA	European Helicopters Association
ER	Exchange Rate
ESA	EFTA Surveillance Authority
FY	Fiscal Year
GAMA	General Aviation Manufacturers Association
IR	Instrument Rating
ME	Multi Engine
MTO	Maintenance Training Organisations
NDT	Non Destructive Testing
ppa	Passengers per annum
SE	Single Engine
TR	Type Rating

For more acronyms: https://www.easa.europa.eu/abbreviations

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1. Introduction

1.1. Purpose of the study

For the purpose of ensuring the proper development and maintenance of civil aviation safety, EASA is responsible for formulating opinions and for assisting the European Commission by preparing measures to be taken for the implementation of subject matters for which its competency is established by Article 1 of the EASA Basic Regulation, i.e. Regulation (EU) 2018/1139 (also abbreviated as BR in the following). In addition, the Agency is responsible for developing and adopting certification specifications, an acceptable means of compliance, as well as guidance material for the application of the Basic Regulation and its implementing rules.

Furthermore Article 86 of the BR foresees the possibility for the Agency to develop and finance research related to the improvement of activities in its field of competence.

On this basis, this study was launched in support of the impact assessment methodology used in the decision-making process to justify opinions, decisions, acceptable means of compliance and guidance material for the application of the Basic Regulation and its implementing rules.

The Agency has started to develop an economic impact assessment methodology to support their analysis when the Multi-Criteria Method is used to assess impacts. The scope of this study is to extend this methodology to aviation stakeholders for which the information is not sufficient or does not exist yet, namely helicopter operators and training organizations, maintenance organizations and aerodromes.

1.2. Geographical and technical scope of the evaluation

The data input for annual average considers the last 3 years of data: 2016, 2017 and 2018. The financial assessment aims to provide up-to-date results but at the time of the production of this report, financial information is available from the last consolidated fiscal year (2018) in most reviewed countries.

The geographic evaluation refers to all EASA Member States (MS)[1] before January 2020 (all EU MS, Iceland, Norway, and Switzerland). United Kingdom has been therefore included in the analysis.

[1] Other countries not being under EASA's scope, are not included in the analysis, including those having some degree of EASA supervision such bilateral agreements or technical cooperation arrangements (e.g. Albania, Canada, Montenegro, etc.). However, information from these regions may be used as a validation, comparison or contrast tool.

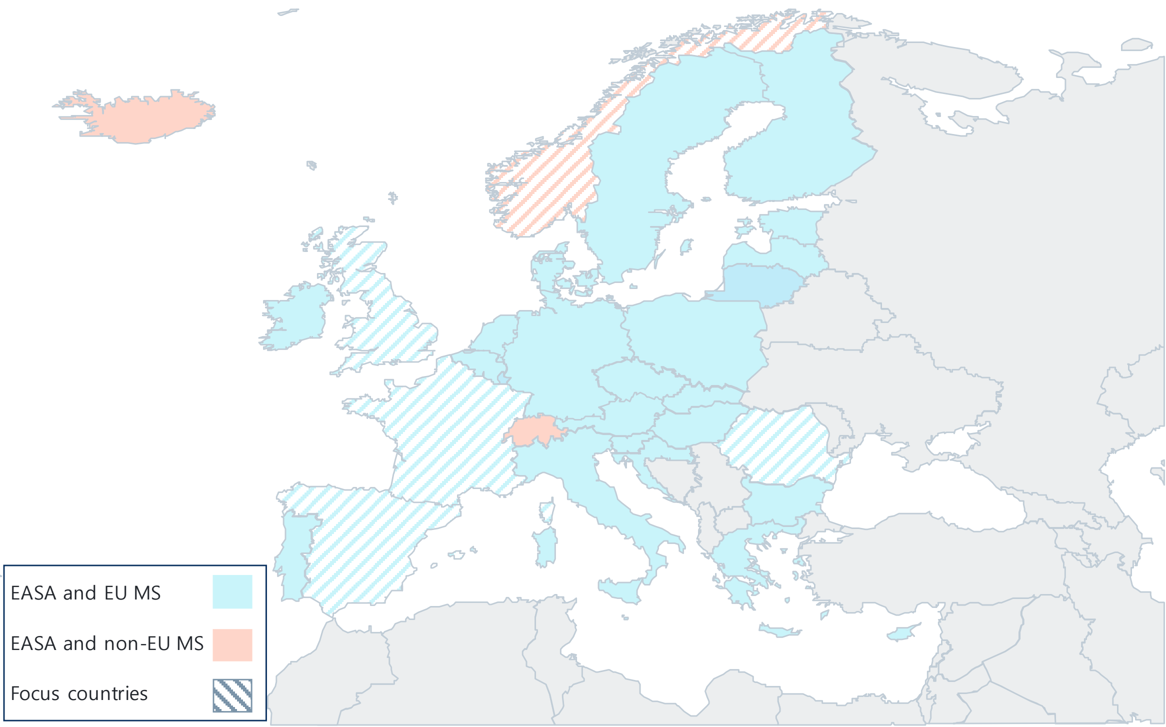


Figure 1. Geographical coverage of the assessment.

Source: ALG elaboration based on EASA MS list.

A short list of countries was selected to assess in more details the financial characteristics of the target sectors. This detailed assessment was used to define the significant indicators and related values to be extrapolated for the other countries.

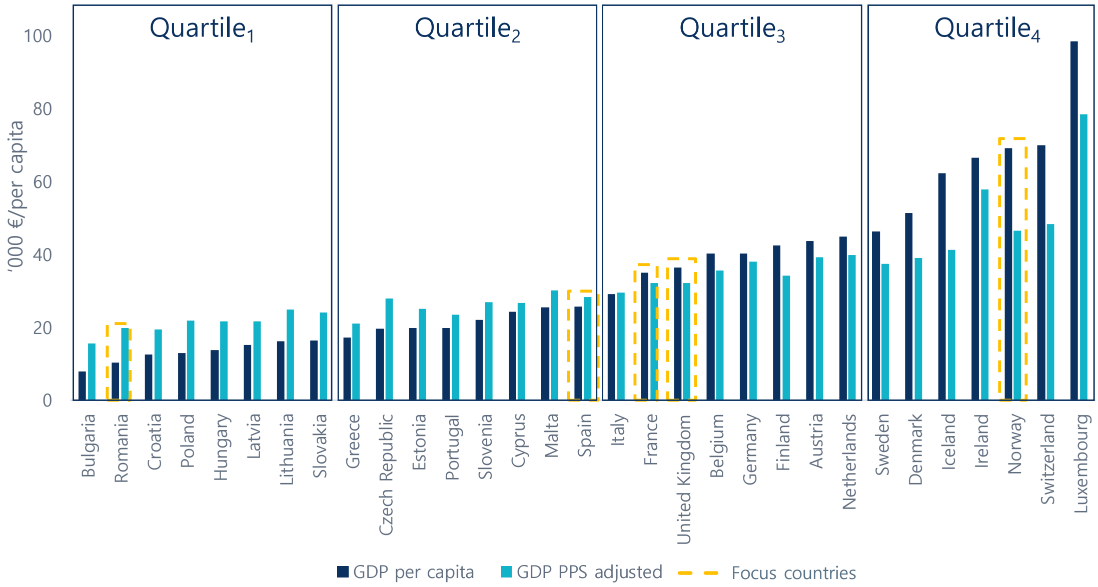


Figure 2. 2018 GDP per capita and PPS adjusted for EASA MS, in thousands of € per capita

Source: ALG analysis based on 2018 GDP per capita and PPS data from Eurostat.

An important criterion for the candidate selection is national economics, namely Gross Domestic Product (GDP) per capita as well as adjusted per Purchase Parity Standards (GDP PPS). The latter harmonizes per capita values according to individual country pricing standards, which harmonizes this indicator's reflectiveness of the spectrum of European member states. The graph above lists 31 EASA MS sorted by incremental GDP per capita (Liechtenstein is not included).

The following set of Countries (referred to as focus countries in the rest of the report) were selected since the inception of the study as important for each domain covered by the study, as justified below:

- Helicopter domain:
  - **UK** holds the largest group of helicopter operators with AOC and ATOs in the considered country list. Operations include offshore in the Northern Sea. It ranks in the middle on the GDP per capita list.
  - **Spain** is an important player, among the top-10 EU MS for number of ATOs (see Fig. 4) the).. Particular interest rests in the firefighting operations, for which this country stands out, as discussed with key stakeholders (European Helicopter Association (EHA), British Helicopter Association (BHA) and Deutscher Hubschrauber Verband (DHV)) in initial calls.
  - **Norway** is a particular member for its geography, location and climate. As the UK, several companies operate extensive service to oil rigs in the Northern Sea.
- Aircraft maintenance domain:
  - **UK** is again the leading country in total number of organisations with over 700 of them, comprising AMO, CAMO and MTO.
  - **Spain**: Analogously on the other treated domains, it plays an important role in the European context, listed TOP 5 in the count of CAMO/AMO and MTO, with a GDP sitting in the median of EASA MS.
  - **Romania**: In order to provide analytical variance and rigour to the dataset, Romania, a country with a substantial difference on GDP PPS with regard to Spain and the UK, is selected.
- Aerodrome domain:
  - **UK** is one of the countries with most aerodromes falling into EASA's Basic Regulation and representing one of the largest regarding the aviation sector in Europe.
  - **Spain** presents a dense network of aerodromes across the country. Available and public data, especially of the sole operator of the main facilities Aena SME, S.A., is publicly traded (which means there is public data for investors). This company operates under a network scheme 36 out of the 37 aerodromes reviewed in Spain. Of particular interest it is the cross-subsidizing model of their network (profit-making aerodromes subsidize loss-making ones).
  - **France** is the country with the largest number of small regional aerodromes and the fourth largest number of big airports being therefore the country with the highest overall number of aerodromes under scope (108).

1.2.1. Stakeholders' scope

This study spans to several domains of the European aviation. These are the ones under scope of this study:

- Helicopter domain:
    - Helicopter operators, including commercial and non-commercial operators
    - Approved Training Organisations for helicopter pilots (ATO(H)).
- Maintenance domain:
    - Approved Maintenance Organisations (AMO) approved under Part-145 and AMO approved under Part-M Subpart-F.
    - Continuing Airworthiness Management Organisations (CAMO) approved under Part-M Subpart-G.
    - Maintenance Training Organisations (MTO) approved under Part-147.
- Aerodrome domain.

1.2.1.1 Helicopter domain

Helicopters cover markets that would otherwise have no means of execution (see for example urgent medical evacuation or offshore facility service).

A breakdown is made, considering helicopter operations according to different missions and, on the other hand, the training centres forming helicopter pilots, both as ab-initio training and as professional pilots.

1.2.1.1.1 Helicopter operations

EASA classifies aircraft operations into several categories. Each one is regulated with its corresponding framework. According to the activity the aircraft is involved in, the aircraft and its operator falls into one of the following categories, introduced below:

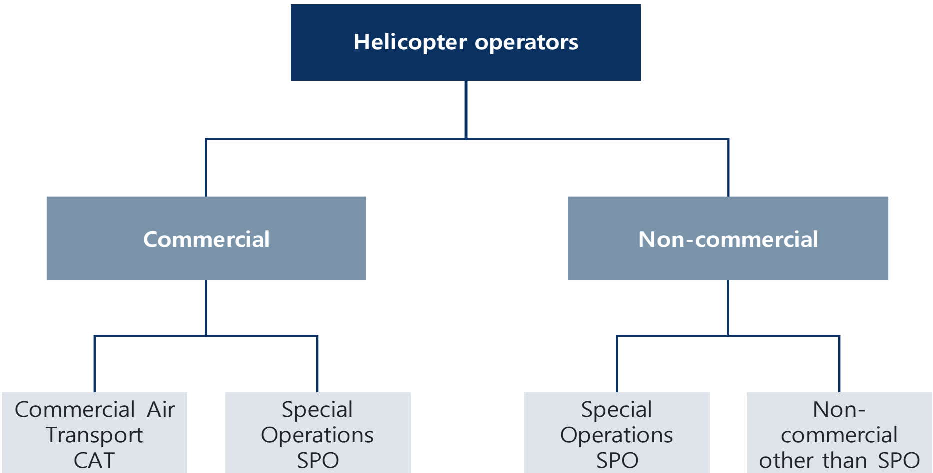


Figure 3. Breakdown of the helicopter operation categories regulated by EASA.

Source: ALG elaboration based on EASA SPO portal[2] on its website and UK CAA Part SPO workshop (Gatwick, 2016)[3].

The definitions, according to *Reg. (EU) No 965/2012* of the relevant fields shown in the figure above are:

- **Commercial operators**: operation of an aircraft, in return for remuneration or other valuable consideration.
- **CAT**: an aircraft operation to transport passengers, cargo or mail for remuneration or other valuable consideration.
- **SPO**: any operation other than commercial air transport where the aircraft is used for specialised activities such as:
    - Agriculture
    - Construction
    - Photography
    - Surveying
    - Aerial advertisement
- **Non-commercial operators:** the key difference is that the operation is not provided for a remuneration or paid service.

As it will be seen in later sections of this report, Cirium[4] has been used as themain database for aircraft registration information throughout EASA' MS.

1.2.1.1.2 Helicopter ATO

ATO(H) are tasked with the training of pilots. This is translated into courses which can occur once or periodically and can be addressed to candidates with no experience or to professionals.

Although there is a consistent supply of courses across Europe in general and EASA MS in particular, the specific offer is wide across Member States and there may be some courses that are only delivered in specific countries. In light of this, the categorisation used within the study is defined in Table below. Note that as explained later in this document, some of these courses and licenses have not be included in the assessment of this domain, due to the difficulties in gathering representative data.

[2] Link to the site: https://www.easa.europa.eu/easa-and-you/air-operations/specialised-operations-spo

[3] Link to the workshop presentation: https://publicapps.caa.co.uk/docs/33/CAP1452_PartSPOWorkshopSlides.pdf

[4] The information has been extracted from a Cirium product. Cirium has not seen or reviewed any conclusions, recommendations or other views that may appear in this document. Cirium makes no warranties, express or implied, as to the accuracy, adequacy, timeliness, or completeness of its data or its fitness for any particular purpose. Cirium disclaims any and all liability relating to or arising out of use of its data and other content or to the fullest extent permissible by law.

	License/Course	Study coverage
Initial training	Light Aircraft Pilot License, helicopters (LAPL/H)	not covered
	Private Pilot License, helicopter (PPL/H)	covered
	Commercial Pilot License (CPL/H)	covered
	Airline Transport Pilot Licence, helicopters (ATPL/H)	covered
	Flight Instructor Course, helicopter	not covered
	Specific helicopter type rating	covered
	Instrument Rating (IR/H)	covered
	Initial instrument rating course, helicopters (IR/H) (non integrated ATPL)	not covered
	Multi-crew cooperation course, helicopters, (MCC/H) (non integrated ATPL)	not covered
Recurrent training	Specific helicopter type rating	covered
	Instrument Rating	covered
	Operator conversion (not covered by this study)	not covered

Table 1. Licenses and training courses under the scope of the study.

Source: ALG elaboration.

Stakeholder consultation took place during the definition of this list. Although class rating exist in helicopter training, as a result of the complexity of these aircraft compared to airplanes, ratings are not generally cross-model certifications, but normally attached to each particular helicopter model in the shape of a type rating. Recurrent training is mandatory for pilots rated in a particular helicopter.

1.2.1.2 Maintenance domain

Maintenance is branched in three sectors: AMO and CAMO, both directed to maintenance activities on aircraft and MTO, dedicated to the training of aircraft maintenance technicians.

1.2.1.2.1 Approved Maintenance Organisations (AMO)

AMO companies can be further divided in this study according to the regulation part that regulates them. In other words, distinction is made between organisations approved under Part-145 or Part-M Subpart-F.

Part-M Subpart-F organisations are approved to carry out maintenance to non-Complex Motor-Powered Aircraft (CMPA) and neither to aircraft engaged in CAT operations. Part-145 AMO on the other hand, are not limited by these constrains and may maintain both CMPA and non-CMPA, based on the privileges of the Part-145 certifications.

Maintenance can cover a vast realm of services provided by AMO. In this study, these are categorised into line and base maintenance.

Line maintenance should be understood as any maintenance that is carried out before flight to ensure that the aircraft is fit for the intended flight (EASA, 2015). It could also be understood as the maintenance carried out in the operational involvement of the aircraft, outside the hangar. Examples of line maintenance are:

- Troubleshooting.
- Defect rectification.
- Component replacement.
- Scheduled maintenance and/or checks including visual inspections that will detect obvious unsatisfactory conditions/discrepancies but do not require extensive in-depth inspection.
- Minor repairs and modifications which do not require extensive disassembly and can be accomplished by simple means.

Base maintenance requires more in-depth procedures which require the aircraft to be taken out of the operational environment into a hangar or maintenance shop. Example are:

- Major maintenance checks (usually called C and D checks) which look into deterioration of the airframe, engines and systems, corrosion, fatigue…
- Removal of defects – implementation of Service Bulletins (SB) and Airworthiness Directives (AD), although this can also be done during Line maintenance.
- Technology upgrade, cabin reconfiguration, painting, etc.

Traditionally, "other maintenance" is also grouped into component and engine maintenance. Being the latter self-explanatory, component maintenance addresses the servicing, checking and repair of individual aircraft components.

In any case, in this study these other groups are also addressed as line or base maintenance referring to the definitions aforementioned.

1.2.1.2.2 Continuing airworthiness management organisations (CAMO)

Continuing airworthiness management are organisations or departments' whose goals are keeping track of the maintenance schedule and the general compliance of the aircraft with the regulatory instances and provisions. This translates in a periodical review of the aircraft airworthiness status, planning and check of the maintenance schedule, writing and issuing of the required legal documentation, like the Certificate of Airworthiness (CofA) for example.

Often, continuing airworthiness is a department of a multi service company. For instance, AMO include CAMO approval or even helicopter or aircraft operators provide these services to their customers. Nevertheless, some companies may be found which provide exclusively this type of CAMO services.

1.2.1.2.3 Maintenance Training Organisations (MTO)

Maintenance technician formation is approved under Part-147. These organisations offer several courses which enable technicians upon the completion of the course, to perform certain maintenance works, according to the privileges of the license. The course offer is diverse. In this study, the standard Part-66 license framework is used (see Figure 4~~Figure 4~~).

The entry-level course is the A license category. It entitles the holder to perform basic tasks in the daily operation of the aircraft, also known as line maintenance. These tasks include simple scheduled maintenance works as well as inspections and defect reparation, always under the scope of the authorization. This category is further split into 4 categories, depending on the aircraft maintained: A1 (turbine-powered airplane), A2 (piston-powered airplane), A3 (turbine-powered helicopter) and A4 (piston-powered helicopter).

The next step in proficiency is the B license category. These entitle technicians to perform significantly more in-depth maintenance, namely base maintenance. The course covers more than 2,000 teaching hours[5] (practice and theory) and spans usually two years. Due to the demand characteristics, it is common for centres to offer ab-initio B courses which already include A license theory and attributions. This category has three ramifications:

- **B1**: As in A category classification, this category is further split in B1.1, B1.2, B1.3 and B1.4. Maintenance is to be carried out in the airframe, engine, mechanical and electric systems.
- **B2**: Avionics.
- **B3**: Release into service of light piston-powered airplanes. They additionally must be non-pressurized and with a Maximum Take-Off Mass lower than 2.000 kg.
- **C**: a maintenance licence category rated on aircraft model and necessary to release to service after a base maintenance check.

[5] 2.400 hours B1.1 course in Aviation Group and Cesur and 3.350 hours B1.1+B1.3 course in Pegasus Aviación (Spain), 2.400 for B courses in Air Service Training (united Kingdom) and 2.400 hours in ESMA Aviation Academy (France).

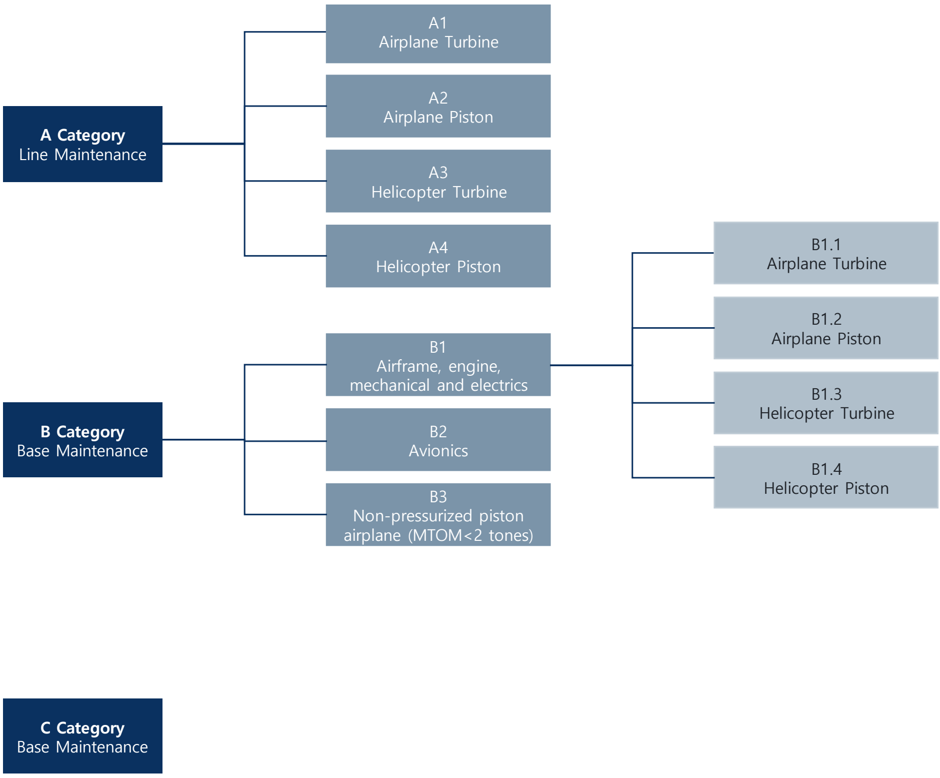


Figure 4. Aircraft maintenance license structure used in this study.

Source: Opinion No 05/2009 of EASA[6] and explanatory page in Air Service Training (MTO company in the UK)[7].

1.2.1.3 Aerodrome domain

The European aerodrome network is dense and counts with a rich combination of major international hubs and small local and regional aerodromes which play a key role in supporting local communities' economy.

The list of aerodromes covered by the study are those falling in the scope of Regulation (EU) 2018/1139. According to Art.2 of this regulation, it shall apply to those aerodromes that:

i. Are open to public use.
ii. Serve commercial air transport and
iii. Have a paved runway of 800 meters or more, or exclusively serve helicopters using instrument approach or departure procedures.

MS may choose to exempt an aerodrome under their jurisdiction to comply with these rules. According to Art.2, Paragraph 7:

"*Member States may decide to exempt from this Regulation the design, maintenance and operation of an aerodrome, and the safety-related equipment used at that aerodrome, where that aerodrome handles no*

[6] Link to the publication: https://www.easa.europa.eu/sites/default/files/dfu/Opinion%2005-2009.pdf

[7] Link to the page: https://www.airservicetraining.co.uk/aircraft-engineering-training/become-an-aircraft-engineer

more than 10 000 commercial air transport passengers per year and no more than 850 movements related to cargo operations per year, and provided that Member States concerned ensure that such exemption does not endanger compliance with the essential requirements referred to in Article 33."

The resulting country-by-country aerodrome count results are indicated in Figure 5~~Figure 5~~ below.

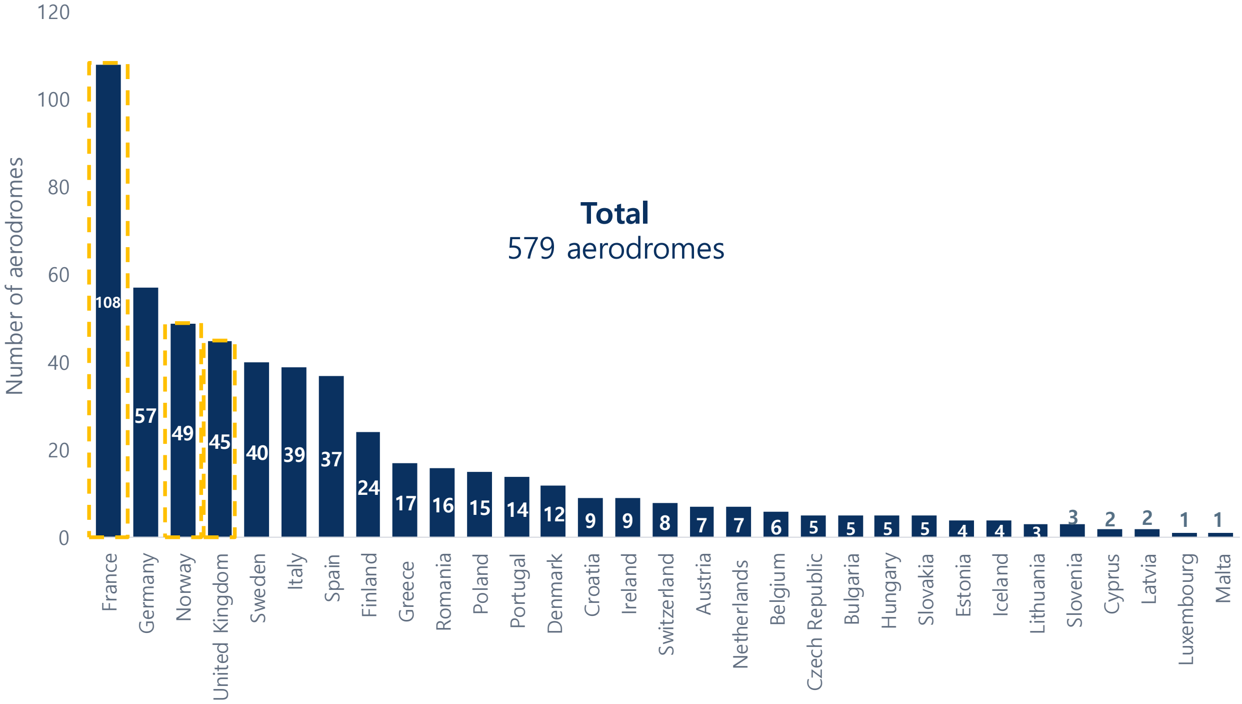


Figure 5. Number of aerodromes in EASA MS falling in the scope of the Basic Regulation as of 2018. Note that the dashed columns belong to the focus countries. Source: ALG elaboration based on EASA data.

The income and costs of the aerodrome sector is discussed in Sections 3.3 and 5.3. There is a substantial level of standardization in the industry as how these categories are defined and what each one includes. This study bases its income and cost categorization with that of Airport Council International (ACI), the global trade representative of the world's airport authorities.

Income is traditionally split into:

- Aeronautical income. As defined by ACI, it is generated from an array of charges and fees that are levied on users of airport facilities and services. The users require these facilities and services to perform their aeronautical activities. At a large majority of airports, aircraft-related revenues derive from two main sources of aeronautical charges: landing charges, which are usually based on aircraft weight; and aircraft parking charges, which are usually also based on aircraft weight but can vary depending on the length of time an aircraft is parked. Hence, the biggest contributors to income can be classified as:
    - Passenger charges.
    - Landing charges.
    - Terminal rentals, paid by airlines to use the terminal space.
    - Security charges.

  - Ground handling charges, which cover the use of the ground handling services of airplanes and passengers.

- Non-aeronautical income. This share is becoming more and more important as aerodromes or external companies based at the aerodrome, provide a wide variety of services to the passenger and other companies. As ACI highlights in its 2017 Airport Economics Report, these activities bear larger profit margins than those related to aeronautical income, thus their ever-increasing relevance to aerodrome operators. The prime examples of these non-aeronautical income streams are:
  - Retail concessions.
  - Car parking.
  - Property and real estate income or rent.
  - Rental car concessions.
  - Food and beverage.
  - Advertising.

  It is interesting to focus in particular on ground handling concessions (not to be confused with ground handling charges attached to aeronautical income). These concessions are paid by specialized ground handling operators to the aerodrome operator in order to be allowed to operate and offer their services to airlines. As in retail concessions, ground handling ones are conceptually a non-aeronautical income. However, it has been traditionally reported separately. Furthermore, the impact of ground handling varies according to the aerodrome size. While larger airports have externalized its ground handling services to dedicated companies, smaller-local facilities may be providing them themselves. This study is able to breakdown the income in aeronautical and non-aeronautical and only for larger aerodromes, further into handling concessions and other (see Figure 53~~Figure 53~~).

Cost on the other hand, is split by operating and capital costs, also named OPEX and CAPEX. They are defined as:

- Operational cost, defined as the expenses incurred in the operation of the aerodrome, which includes:
  - Personnel expenses.
  - Contracted services, i.e., payments to third-parties to provide an externalized service.
  - Communications, utilities, energy and waste.
  - General and administration expenses.
  - Lease, rent and concession fee payments, the latter being the payment of the aerodrome operator to the aerodrome owner. Typically, this takes place when a private operator pays a public administration (which owns the aerodrome) to run an aerodrome.

- Capital cost, being aerodromes a capital-intensive business and requiring high investment in infrastructure and equipment, this is an important share of the total cost. It can be subdivided in:
    - Interest expenses, stemming from the loans incurred.
    - Depreciation and amortization, a very significant part due to the infrastructure required to run an aerodrome: runways, terminal buildings, navigation and communication equipment, etc.

2. Assessment methodology

2.1. Data sources

The assessment of the financial size of the domains being reviewed in this study requires a wide range of information sources. These can be divided between internal desk research which spans for the entire duration of the project and two external input from the online survey and interviews with key relevant stakeholders:

- Desk research. This effort run from the launch of the project and includes the analysis of company registries, reports from previous studies and queries to sector databases
- An online survey. The purpose of this questionnaire was to reach out to a vast pool of potential participants from the relevant industries under scope, including companies, regulatory agencies, management teams, etc. The dissemination of this survey leverages on representative bodies of each stakeholder group to maximize its reach.
  This survey was available on the European Commission's EU Survey portal from 11th December 2019 to February 17th 2020.
- Interviews with relevant stakeholders. These meetings were set to discuss with industry experts the estimations and figures of the industry and validate the results from the desk research and online survey.

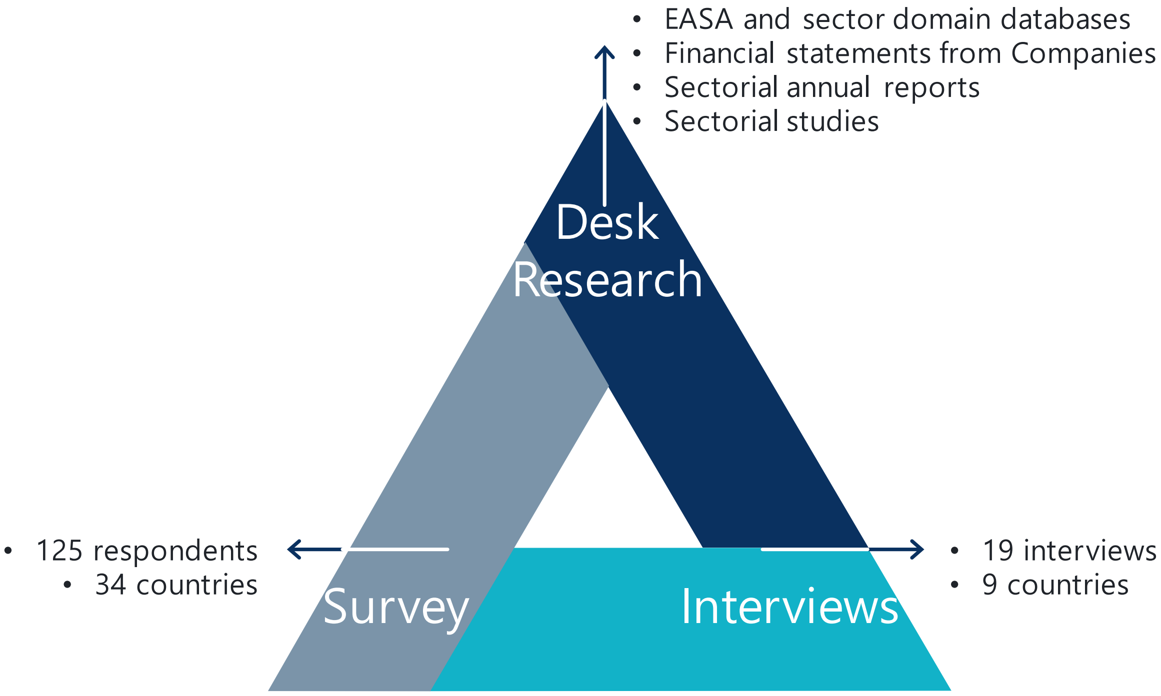


Figure 6. Data pillars of the study.

Source: ALG elaboration based in survey and interview results and desk research sources.

2.1.1. Desk research

The research effort has involved the consultation of many information sources. Some serve as background information and general knowledge while others really are present in this study. Of the latter, these can be divided in cross-domain sources and domain-specific sources:

- Cross-domain sources:
    - National companies' registry. These sites are a source of financial information, where income statements, balance sheets, etc. can be obtained under the payment of a small fee or free of charge. Spanish registry is accessed via Sabi, Companies House in the UK, and using Largest Companies, the Brønnøysund Register in Norway, and Romanian Companies for this country's companies. However, not all companies are required to provide a full financial statement including a profit and loss statement. In fact, smaller companies meet the required standards by producing a simplified balance sheet. This limits the assessment of national industry, since only the data for bigger companies can be fully obtained and analysed from national registries.
    - Annual reports where large or public companies usually publish their annual performance to the public and investors. Besides financial performance analysis, these reports provide further operational information.
    - National public contracts registry. These portals list all the tenders and awarded contracts of a certain country (contracts above a certain threshold, GBP 10,000 in the United Kingdom).
    - CIRIUM fleet database: this tool has a comprehensive listing of the global aircraft fleet (apart from General Aviation).
    - General Aviation Manufacturers Association (GAMA) 2019 databook on GA worldwide shipments and fleet. This source helps complement Cirium in the field of GA airplanes. GAMA is an industry leading representative association.

- Domain-specific sources:
    - Helicopter domain:
        - European helicopter pilot license census (provided by EASA) with data from 2013 to 2019.
        - Industry reports published by several agencies and associations regarding the status, future outlooks and analysis of the sector. For instance, a thorough report on helicopter firefighting operations in Spain published by AECA & Helicópteros association (Itor Martin, 2017). All relevant industry stakeholders participated with updated and precise economic data.
    - Maintenance domain
        - Number of AMO, CAMO and MTO organisations provided by EASA.

    - EASA airworthiness maintenance license census provided by EASA.
    - Maintenance cost assessment reports for several models of aircraft.
    - Maintenance technician licenses statistics from national CAAs.
- Aerodrome domain
    - List of aerodromes in the scope of the study as provided by EASA.
    - 2017 ACI Europe Economics Report. An in depth economic study carried out by Airports Council International (ACI), a large representative of global aerodrome operators.

2.1.2. Online survey

The online survey was launched to collect the opinion of a vast number of stakeholders, to feed the economic model and validate the financial figures obtained.

The questionnaire was divided into several sections, each addressing a specific study domain. From a set of introductory questions which aim to identify the stakeholder (name, country of origin, contact information...), further specific questions per stakeholder group were then displayed: e.g. key financial information per company (revenue, operating costs, etc.) from 2016 to 2018.

The survey questions and structure may be reviewed in Section 7.3.

2.1.2.1 Survey respondent profiling

Figure 7~~Figure 7~~ and Figure 8~~Figure 8~~ sum up the participation of the different respondents by their companies' sector and country of registration.

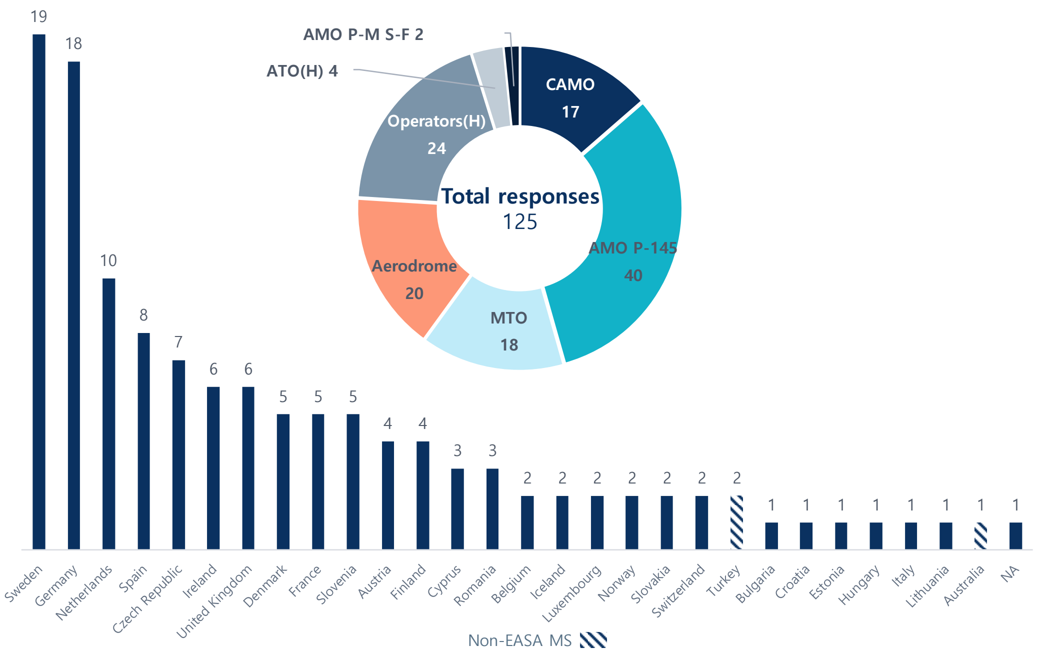


Figure 7. Statistics on country representation from the online survey.

Source: ALG elaboration based on survey response data.

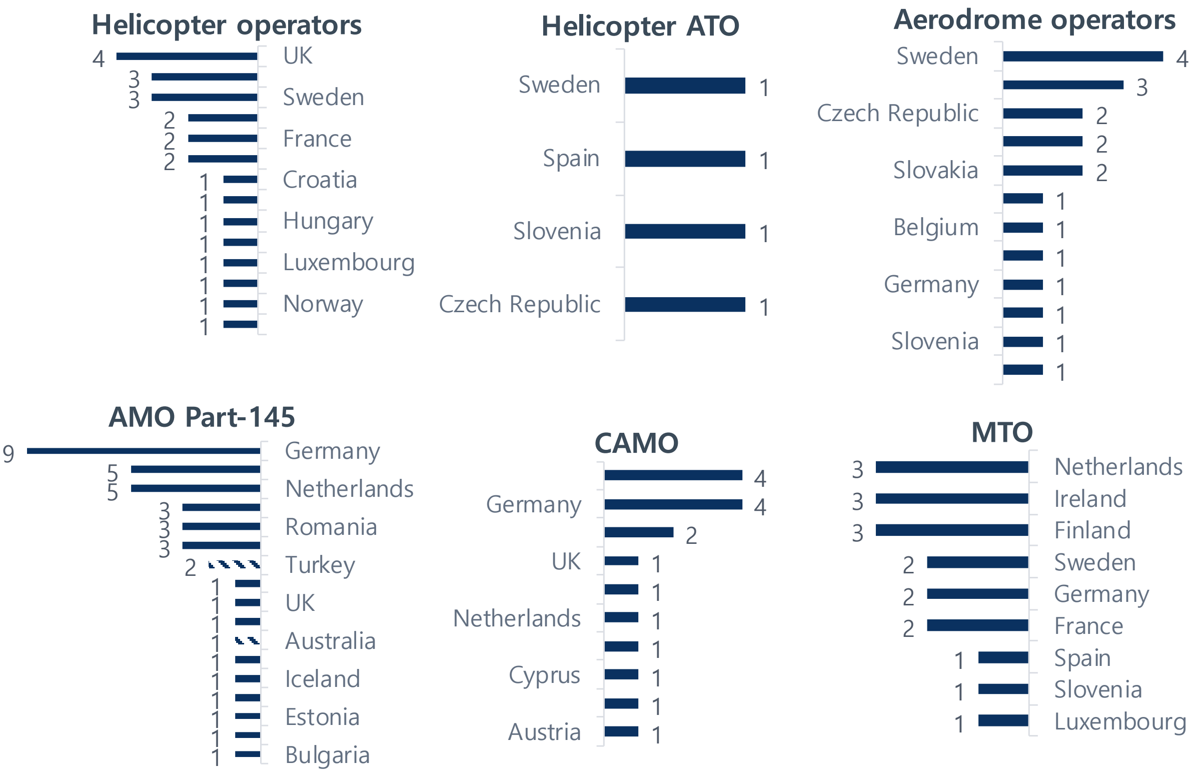


Figure 8.. Review on the number of survey responses by country per domain.

Source: ALG elaboration based on survey response data.

Please note that AMO Part-M Subpart-F responses have not been included since only two companies responded under this definition, one Spanish and one Czech. In addition ten helicopter operators also declared as a helicopter ATO.

Although not all domains are equally represented and neither are all EASA MS (there was no survey engagement of companies from Greece, Latvia, Liechtenstein, Malta, Poland or Portugal), it needs to be stressed once more that this constituted only one of the sources of information used in the study, being complemented by desk research analysis and interviews.

2.1.3. Interviews with key stakeholders

A set of interviews was been arranged with key agents of the respective stakeholders. The reason for these meetings was to get a closer and more detailed understanding of several actors within each domain to better profile the industry. In that sense, apart from providing the inputs as requested in the survey, the interviewee could provide further information and data wider in scope than what the interviewer may anticipate.

There was a particular interest to include interviewees from the selected deep-dive countries in the agenda. However, participants from countries outside these or even from outside EASA MS scope were contacted. Figure 9~~Figure 9~~ below paints a big picture of the participation numbers of the interview campaign.

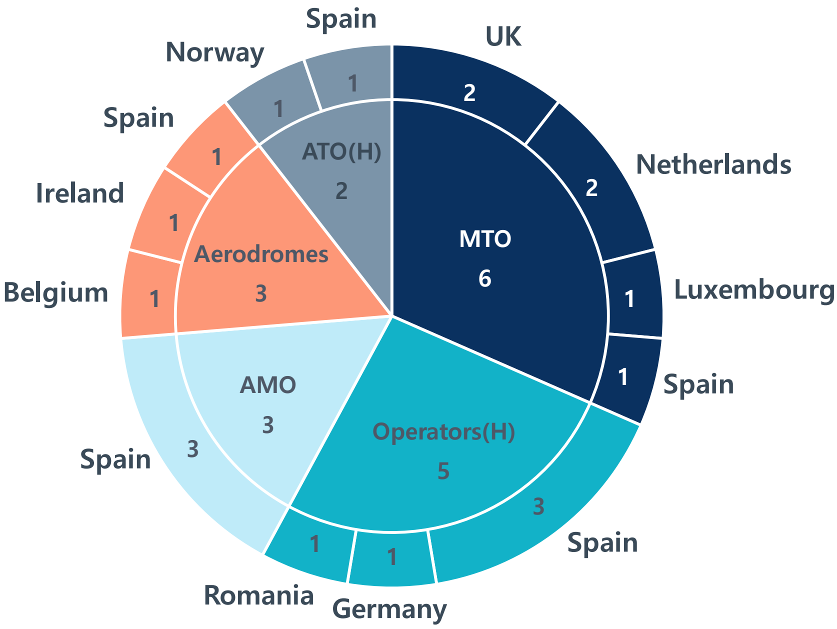


Figure 9. Stakeholder interviewed according to their domain and country.

For those whose companies are involved in several of the interviewed domains, the main business has been selected for their categorization. Source: ALG elaboration.

3. Model explanation

The core task of this study is to setup a modelling tool to estimate the financial size of the targeted aviation sectors based on transparent assumptions. Despite datasets of approved organisations being available, these typically cover only a fraction of the desired geographical and temporal scope of the study.

Complementary information not readily at reach needs to be estimated, consulted to external players (via surveys and interviews) and extrapolated through a solid mathematical modelling tool, based on transparent and parametrised assumptions.

This modelling tool needs also to be easily updated in view of the future evolution of the aviation sector.

To mitigate the uncertainty about results, two assessment approaches are supported by the model, allowing to approach the result evaluation from two perspectives. Namely, a top-down and bottom-up approaches are proposed.

A top-down methodology addresses a market by first looking the general economic data of the companies in the scope, such as income, cost of sales, Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA), etc. It offers a straightforward evaluation of an economic domain, especially if a company census is available. Financial statements include this information aggregated by general terms, which often dilute specifics which may be of interest.

A bottom-up approach relies instead on the operational data from a set of companies. This operational information is compiled for a group of companies and later scaled according to particular market characteristics. This approach is underpinned by base-level analysis that depicts faithfully the operational environment of the stakeholders. This approach requires an extensive effort in the obtainment of the related information. Direct contact with the addressed stakeholders is needed in most of the cases. Either by a survey or an interview, participants are queried for their companies' data. Only when reviewing large corporations (with high market shares but low in population numbers), these numbers may be obtained accessing their annual reports or operational filings.

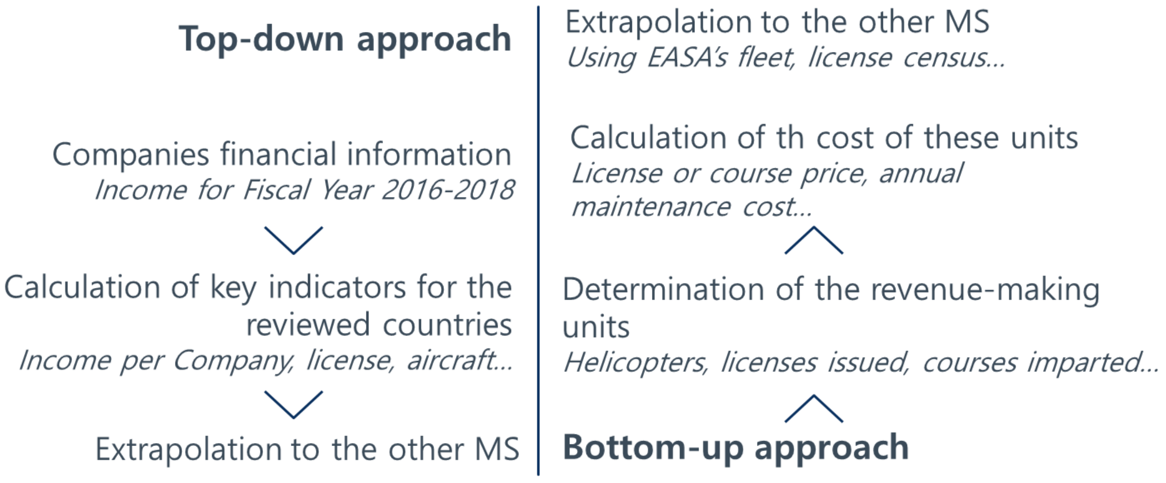


Figure 10. Top-down and bottom-up approach schematic representation.

Source: ALG elaboration.

In both approaches, the basic relationship between income-cost-(profit)margin is used for the sake of simplicity, as represented in the diagram below.

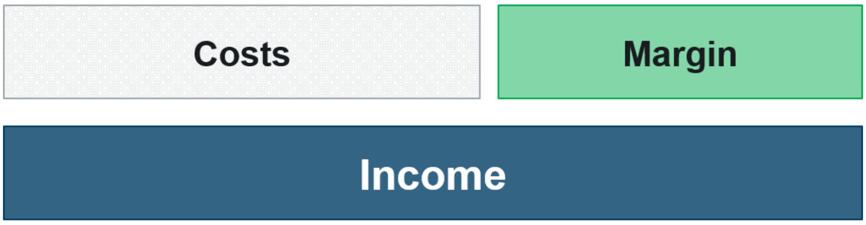


Figure 11. Coupling of income, cost and profit margin for the proposed model, showing a profitable (positive profit margin = earnings) in this case.

Source: ALG elaboration.

3.1. Helicopter domain

3.1.1. Helicopter operations

The development of the model is presented in the following table.

Helicopter domain – Helicopter Operators

Bottom-Up Approach

Helicopter fleet in each EASA MS (1) × Annual flight hours per type of operation (2) × Economic figures per flight hour (3) = Helicopter operators financial size **8 492 M€**

Item	Main hypothesis and sources
1	From Cirium. Sorting by In service helicopters, excluding military categories and in-storage helicopters
2	Relying on interviewee (including EHA), survey inputs, and industry reports
3	A reference helicopter model per category of operation is selected. Relying on interviewee (including EHA) and survey input, and industry reports

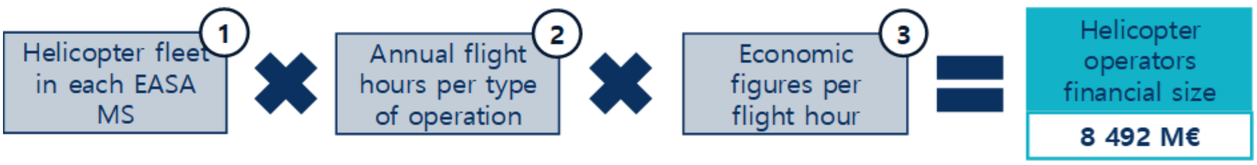
Top-Down Approach

Analyzed companies' average income per helicopter in the reviewed countries (1) → Weighted average of income per helicopter in the reviewed countries × Helicopter fleet in each EASA MS (2) = Helicopter operators financial size **8 658 M€**

Item	Main hypothesis and sources
1	Data from business registries, survey and annual reports
2	From Cirium. Sorting by In service helicopters, excluding military categories and in-storage helicopters

Table 2. Model explanation of the helicopter operator domain.

3.1.1.1 Bottom-up approach



3.1.1.1.1 Helicopter fleet in each EASA MS

First, the fleet under EASA MS jurisdiction has been sorted by country and Primary Usage (using the classification provided by Cirium) as indicated in the table below. This set is further filtered by helicopter being in service (not in storage). Also, military categories are discarded, being outside the scope of this analysis.

The helicopter model used for a given operation and its equipment largely determine the cost per flight hour. As a result, a reference helicopter model is used to representatively assess each operation and its financial size. Table 3~~Table 3~~ shows the considered categories with their associated helicopter fleet.

Primary usage	Fleet	Primary usage	Fleet
Business - Air Taxi/Air Charter	909	Police Air Support/Law Enforcement/Border Patrol	678
Business - Private Company Use	1 262	Private Use	639
Company Demonstrator	9	Search & Rescue / Coast Guard	241
Crop Dusting / Agricultural Spraying / Seeding	37	Sightseeing / Tourist	7
Experimental / R&D / Prototype / Mfr-Design Bureau	39	Skydiving / Parachuting	2
Fire Fighting (Utility Role)	146	Surveying / Mapping & Power/Pipeline Inspection	32
Heavy-Lift Ops / Under Slung Loads / Logging	14	Trainer / Training School Aircraft	508
Medevac / Air Ambulance / EMS / Airborne Hospital	664	Utility (Civil Multi-Role)	1 001
News Media / Camera Equipped	41	VIP / Head of State / Government operated	27
Off-Shore-Wind Farm/Other Support	14	Water-Bomber / Chemical Spray	6
Off-Shore / Oil & Gas Support	214	Weather / Atmospheric / Geo & Environmental	1
Passenger	30		

Table 3. Fleet by operation category (Primary Usage in Cirium nomenclature).

Source: Cirium database for all EASA MS helicopter fleet on 2017, excluding military operations and in-storage units.

Table note: Utility (Civil Multi-Role) stands out as the second in terms of helicopters abiding by this operation. This category encompasses different helicopters which are not exclusively dedicated to a single operation, thus large number since it is common for operators to flexibly operate their aircraft according to the market demand.

3.1.1.1.2 Commercial and non-commercial operations

Prior to the collection of the hourly financial figures per operation, a distinction is made between the commercial or non-commercial nature of an operation. As described in Figure 3~~Figure 3~~, whether an operation is profit-seeking or not, determined the regulation operators must abide by. This has further implications when determining the financial size of the market. Helicopters operated by a public administration for a particular mission do not include a profit margin as a private company would thus affecting the overall size of the market.

To cater for that, those operations typically operated by private companies (for-profit) are addressed taking into account income per flight hour. This is approximated by taking the profit margin out of the income figures per flight hour. Desk research and interviewee consultation has allowed to determine a typical value of 6% profit margin. Others typically run by an administration, are evaluated in terms of cost, although for simplicity we uniquely refer to income when presenting results.

Some operations are traditionally operated by either public or private companies. However, in the past decades, private companies have been increasingly supplying helicopter services to missions that were before exclusively operated by public operators, such as firefighting or coast guard. To include this duality, in these categories, 50% is considered as being operated by non-commercial operators (public administrations) and 50% by private companies. Table 4~~Table 4~~ below presents the categories and the criteria used to evaluate its financial size. Note that Trainer / Training School Aircraft is deducted from the total so as to avoid double counting with ATO(H) financial size assessment.

Primary usage	Commercial/non-commercial operation
Business - Air Taxi/Air Charter	Commercial operation
Business - Private Company Use	Commercial operation
Company Demonstrator	Commercial operation
Crop Dusting / Agricultural Spraying / Seeding	Commercial operation
Experimental / R&D / Prototype / Mfr-Design Bureau	Commercial operation
Fire Fighting (Utility Role)	Commercial operation / Non-commercial operation
Heavy-Lift Ops / Under Slung Loads / Logging	Commercial operation
Medevac / Air Ambulance / EMS / Airborne Hospital	Commercial operation / Non-commercial operation
News Media / Camera Equipped	Commercial operation
Off-Shore - Wind Farm / Other Support	Commercial operation
Off-Shore / Oil & Gas Support	Commercial operation
Passenger	Commercial operation
Police Air Support / Law Enforcement / Border Patrol	Commercial operation / Non-commercial operation
Private Use	Non-commercial operation
Search & Rescue / Coast Guard	Commercial operation / Non-commercial operation
Sightseeing / Tourist	Commercial operation
Skydiving / Parachuting	Commercial operation
Surveying / Mapping & Power/Pipeline Inspection	Commercial operation
Trainer / Training School Aircraft	Commercial operation (hatched)
Utility (Civil Multi-Role)	Commercial operation
VIP / Head of State / Government operated	Non-commercial operation
Water-Bomber / Chemical Spray	Commercial operation / Non-commercial operation
Weather / Atmospheric / Geo & Environmental	Commercial operation / Non-commercial operation

Commercial operation   Non-commercial operation

Table 4 . Considered operation categories or Primary Usages (Cirium nomenclature) and their classification on commercial/non-commercial operation. Source: ALG elaboration based on Cirium database for EASA MS in 2017.

3.1.1.1.3 Annual flight hours per type of operation

The next step is to determine the average annual flight hours for a helicopter operating in each category. In this phase, the analysis focused on the helicopter usage instead of the specific helicopter model. An effort has been made in order to implicate as many stakeholder input as possible, combining desk research results, expert judgement, interviewee input and survey results. Table below provides a synthesis of the values used in the model. As it can be seen, several categories have been addressed by an average-proxy value. This implies that based on the experience collected during the interviews and similarity of operations (Company Demonstrator and Experimental/R&D for instance), a representative average value for the operational category has been established.

Operation	Annual flight/hours	Source
Business - Air Taxi/Air Charter	600	Average-proxy value
Business - Private Company Use	450	From EHA input
Company Demonstrator	200	Average-proxy value
Crop Dusting / Agricultural Spraying / Seeding	350	Average-proxy value
Experimental / R&D / Prototype / Mfr-Design Bureau	200	Average-proxy value
Fire Fighting (Utility Role)	350	Interviewee #2
Heavy-Lift Ops / Under Slung Loads / Logging	600	Interviewee # 5
Medevac / Air Ambulance / EMS / Airborne Hospital	600	From EHA input
News Media / Camera Equipped	350	Interviewee #5
Off-Shore - Wind Farm / Other Support	600	From Bristow Group 2017 Annual report
Off-Shore / Oil & Gas Support	1250	From EHA input
Passenger	600	Average-proxy value
Police Air Support / Law Enforcement / Border Pat	410	Average from 2018 contract for Customs helicopter operation awarded to Babcock in Spain (480 fh) and 2016 Revues de Dépenses-Gendarmerie nationale in France (18.737fh/56 helicopters=335 fh per helicopter)
Private Use	80	Average-proxy value
Search & Rescue / Coast Guard	500	Interviewee #2. Average from 12 hour and 24 hour operational bases. Approx. 100 annual fh operational plus a lot of training. Confirmed by Bristish SAR data (operated by Bristow) of 200 fh for each of the 22 helicopters.
Sightseeing / Tourist	300	Average-proxy value
Skydiving / Parachuting	200	Average-proxy value
Surveying / Mapping & Power/Pipeline Inspection	200	Sames as in Heavy-Lift Ops / Under Slung Loads / Logging
Trainer / Training School Aircraft	425	From inteviewee #8. Total of 5.100 fh for a 12 hellicopter fleet.
Utility (Civil Multi-Role)	500	Average-proxy value considering firefighting, law enforcement, etc
VIP / Head of State / Government operated	200	Average-proxy value
Water-Bomber / Chemical Spray	350	Same as Firefighting
Weather / Atmospheric / Geo & Environmental	200	Average-proxy value

Table 5 Annual flight hours per type of operation used in the model.

Source: ALG elaboration based on the sources indicated in column 3.

3.1.1.1.4 Economic figures per flight hour

An average income per flight hour is obtained using the same sources as for the annual flight hours by operation category, namely survey and interviewee input, industry reports, annual accounts of big operators, etc.

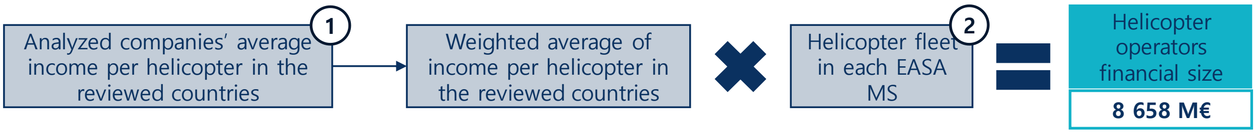
Operation	Income (€/flight hour)	Source
Business - Air Taxi/Air Charter	2030	Average from interviewee #4 and #5 1.500 €/fh response and 3.110 €/fh value from Aeca & Helicopteros 2017 helicopter firefighting report for a 5,5 month 25 fh per month campaign
Business - Private Company Use	2030	Average from interviewee #4 and #5 1.500 €/fh response and 3.110 €/fh value from Aeca & Helicopteros 2017 helicopter firefighting report for a 5,5 month 25 fh per month campaign
Company Demonstrator	5000	Interviewee #4
Crop Dusting / Agricultural Spraying / Seeding	800	Average-proxy value
Experimental / R&D / Prototype / Mfr-Design Bureau	3660	IAOPA and GAMA survey for aircraft operating costs provides values of 3.500 and 4.000 € from two Italian companies. Plus, interviewee #2 expressed that is equivalent operationally to the Bell 412. Thus, the same value for this helicopter on Fire Fighting (utility role) is taken. Averaging all the responses yields
Fire Fighting (Utility Role)	3385	Average from interviewee #2 and #4= 2.500 and 3.500 plus the 4.155 from Aeca & Helicopteros 2017 helicopter firefighting report for a 5 month 200 fh campaign
Heavy-Lift Ops / Under Slung Loads / Logging	6000	Interviewee #2
Medevac / Air Ambulance / EMS / Airborne Hospital	3050	Average rom TAF Helicopters public contract to provide HEMS service to the Catalan government with 4 EC135 and 3.500 value for a similar helicopter EC145
News Media / Camera Equipped	2030	Average from interviewee #4 and #5 1.500 €/fh response and 3.110 €/fh value from Aeca & Helicopteros 2017 helicopter firefighting report for a 5,5 month 25 fh per month campaign
Off-Shore - Wind Farm / Other Support	5000	Interviewee #4
Off-Shore / Oil & Gas Support	8000	Interviewee #4
Passenger	2030	Average from interviewee #4 and #5 1.500 €/fh response and 3.110 €/fh value from Aeca & Helicopteros 2017 helicopter firefighting report for a 5,5 month 25 fh per month campaign
Police Air Support / Law Enforcement / Border Pat	3050	Average rom TAF Helicopters public contract to provide HEMS service to the Catalan government with 4 EC135 and 3.500 value for a similar helicopter EC145
Private Use	800	Average-proxy value
Search & Rescue / Coast Guard	5000	Interviewee #4
Sightseeing / Tourist	2030	Average from interviewee #4 and #5 1.500 €/fh response and 3.110 €/fh value from Aeca & Helicopteros 2017 helicopter firefighting report for a 5,5 month 25 fh per month campaign
Skydiving / Parachuting	8000	Lack of data being a rare and Russian built model. Values from Sikorsky S96 taken being similar aircraft.
Surveying / Mapping & Power/Pipeline Inspection	2030	Average from interviewee #4 and #5 1.500 €/fh response and 3.110 €/fh value from Aeca & Helicopteros 2017 helicopter firefighting report for a 5,5 month 25 fh per month campaign
Trainer / Training School Aircraft	800	Average-proxy value
Utility (Civil Multi-Role)	2030	Average from interviewee #4 and #5 1.500 €/fh response and 3.110 €/fh value from Aeca & Helicopteros 2017 helicopter firefighting report for a 5,5 month 25 fh per month campaign
VIP / Head of State / Government operated	8000	Lack of data being a rare and Russian built model. Values from Sikorsky S96 taken being similar aircraft.
Water-Bomber / Chemical Spray	6000	Due to lack of data, same value as Eurocopter AS332 being both heavy lift helicopters
Weather / Atmospheric / Geo & Environmental	3050	Average rom TAF Helicopters public contract to provide HEMS service to the Catalan government with 4 EC135 and 3.500 value for a similar helicopter EC145

Table 6 Income per flight hour used in the model for each type of operation

Source: ALG elaboration based on the sources indicated in column 3.

Finally, by multiplying the fleet present in each country by the financial figures per flight hour and the annual flight hours by operation category, the financial size is obtained.

3.1.1.2 Top-down approach



3.1.1.2.1 Average income per helicopter

A multi-source listing of reviewed companies has been created. Combining the data from desk research based on Company Registries, interviews and survey input, data from 44 companies (including CAT, SPO and other commercial operations) have been obtained overall. These companies belong to the three deep-dive MS plus Sweden, due to the engagement of this country's in the survey and availability of financial data. The overall inclusion in this listing can be seen in Figure 12~~Figure 12~~ below. Unfortunately half of the responses obtained through the survey for these four MS in this domain could not be retained, since they were only partially provided or included errors.

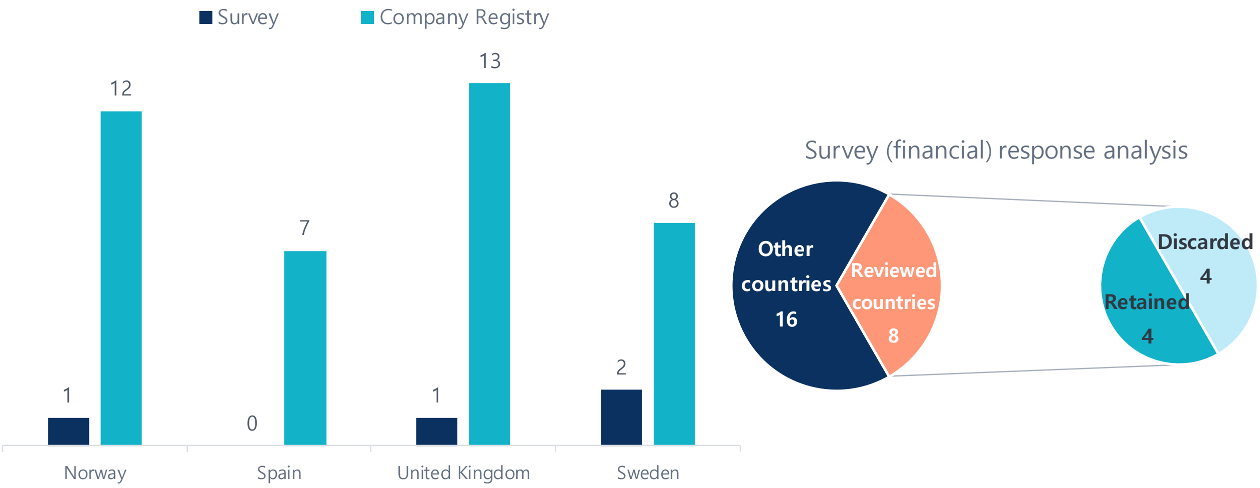


Figure 12. Sources of data used to obtain the Operators(H) financial data listing.

Source: ALG elaboration based on business registry financial data (2016-18) and survey analysis.

In order to set a representative value for every reviewed country, a common approach in this study has been to carry out an average income per helicopter value only focusing on representative companies. To this aim the first step was excluding outliers, by filtering out the data exceeding a distance of 1.5 times the inter-quartile range below the 1st quartile or above the 3rd quartile for each MS. The following boxplot represents this distribution, where a red-dot indicates the average for the retained sample after eliminating outliers in each data series.

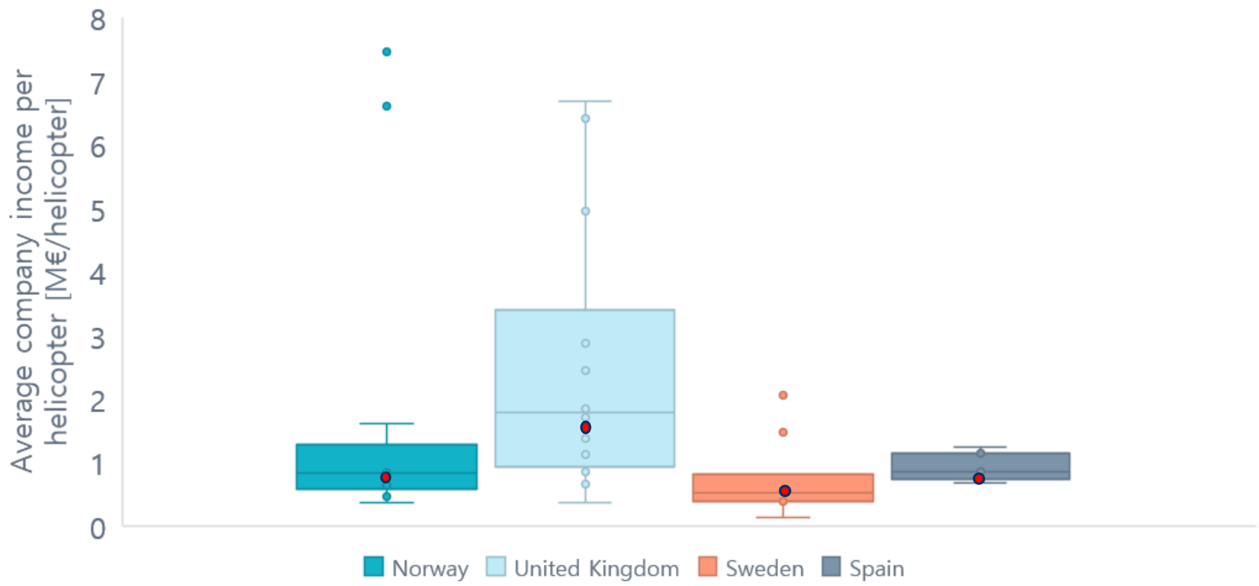


Figure 13. Income per helicopter distribution for the 2016-2018 time scope of the study, in €.

Source: ALG elaboration based on the financial data extracted from business registries and survey response.

The next step was to calculate for each focus country an average income per helicopter, by multiplying the average income for the retained companies in each country by the total registered fleet in such country. Finally an overall average figure of income per helicopter has been obtained by weighting each country average by its ratio of the fleet over the total for these four countries. The results for each of the reviewed countries are shown in Table 7~~Table 7~~ below.

Country	Sum of evaluated companies' income per helicopter [€]	Number of evaluated companies	Average income per helicopter [€]	Country fleet	Weighted average income per helicopter [€]
Norway	5 711 117	7	803 196	242	**1 327 737**
Spain	2 546 720	3	848 907	491	
United Kingdom	14 809 301	8	1 851 163	1 020	
Sweden	3 102 752	6	517 125	212	

Table 7. Summary of the average annual income per company in €.

Values from the average 2016-18 financial figures.

Source: ALG elaboration based on Cirium and business registry data.

After this analysis, the average revenue per year and helicopter is deemed at 1,328 million € (see table 5).

3.1.1.2.2 Helicopter fleet in each EASA MS

Finally, the average revenue value obtained is multiplied by the EASA MS helicopter fleet estimated at 6.521 helicopters. This leads to the estimated financial size for the helicopter operator domain. The detailed results may be found in Section 0 and in more details in Section 7.1.1.1.

3.1.1.3 Profit margin calculation

As it has been introduced in the bottom-up approach modelling of this sector, a 6% profit margin value has been selected.

3.1.1.4 Model limitations and further work

- The top-down model focuses prevalently on commercial operators, although private use and public operators are factored in the analysis through the bottom-up approach. This is due to the nature of the top-down approach, which starts from the analysis of financial statements of commercial companies.
- The profit margin figure for the bottom-up approach is obtained from a handful of interviews and approximated to a single value (i.e. 6%). This value can highly varies according to the operator and the type of operations. A specific study would be needed to be run only to cover this aspect.
- The costs of a public operator are not necessarily those of a private one minus the profit margin. In fact, a public operator may not be able to use its fleet in other business areas or flexibly adapt it to other markets as a private one can do. Also, employee costs are not usually the same in both contexts. Therefore, it could be argued that a different approach could be set in place to estimate the financial size of these public operators.

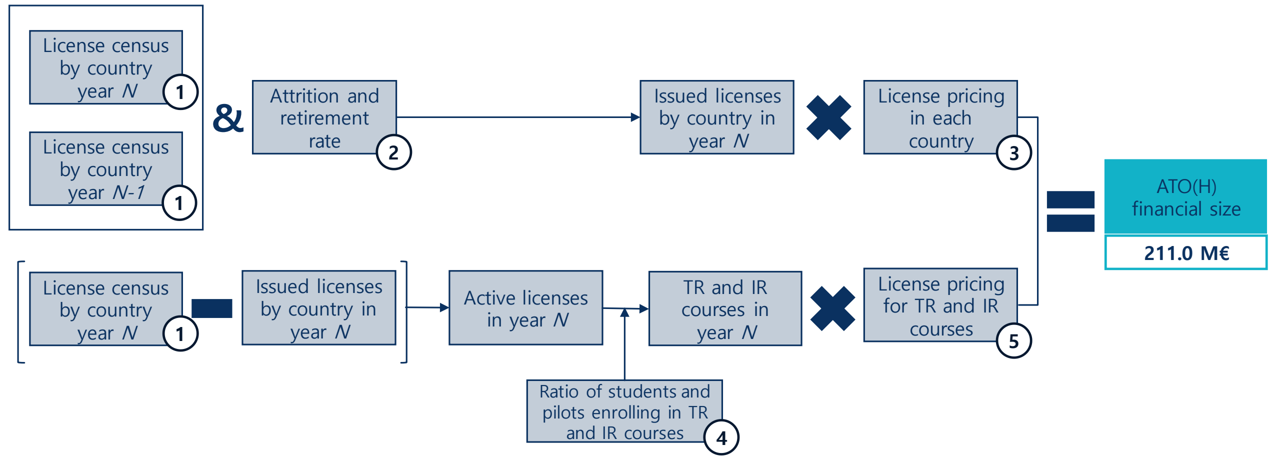
- The dataset of reviewed countries could be extended to other regions in order to have a wider look into different economies and be able to extrapolate the income per helicopter indicator to all MS.

3.1.2. Helicopter ATO

The development of the model is presented in the following table.

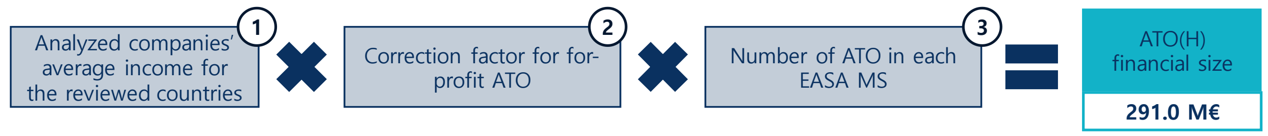
Helicopter domain - ATO

Bottom-Up Approach



Item	Main hypothesis and sources
1	EASA-provided license census for PPL(H), CPL(H) and ATPL(H) between 2015-2019 and EASA data (2018) of licenses by country used to establish each MS share of licenses out of the total number for all EASA MS
2	Based on industry reports and interviewee input
3	Based on commercial information on ATO's websites, and survey and interviewee input
4	Based on interviewee input
5	Based on commercial information on ATO's websites, and survey and interviewee input

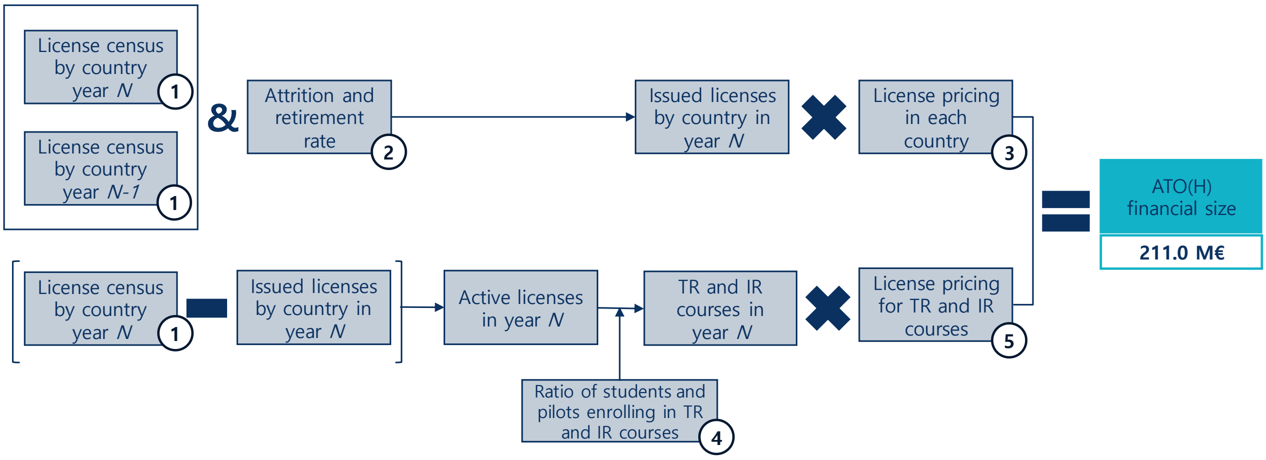
Top-Down Approach



Item	Main hypothesis and sources
1	Data from business registries, survey and annual reports
2	From Norway, Romania, Spain and the UK approved ATO lists published by the respective national CAA
3	EASA data

Table 8. Model explanation for the ATO domain.

3.1.2.1 Bottom-up approach



3.1.2.1.1 License Census by country

EASA data have been used to calculate the country-by-country distribution of the license census and licenses issued. As a second important note, a data gap for PPL(H) licenses has been found for Germany. To solve this, the most recent values published by the Luftfahrt-Bundesamt for 2015, totalling 1 050 PPL(H) licenses in the 16 German Länder. This values I assumed constant for the 2015-2019 period[8].

Two major training areas are covered in this approach:

- Initial license training, i.e., pilot formation leading to the achievement of a pilot license, including PPL(H), CPL(H) and ATPL(H)
- Type Rating and Instrument Rating initial training.

There are of course other courses such as Instructor Training, Multi-Crew Coordination course, etc. Surveyed stakeholders were asked specific inputs to cover these formation courses.

Initial training modelling is based on the provided census. As

[8] Link to the database: https://www.lba.de/DE/Presse/Statistiken/LizenzenDeutschland_node.html

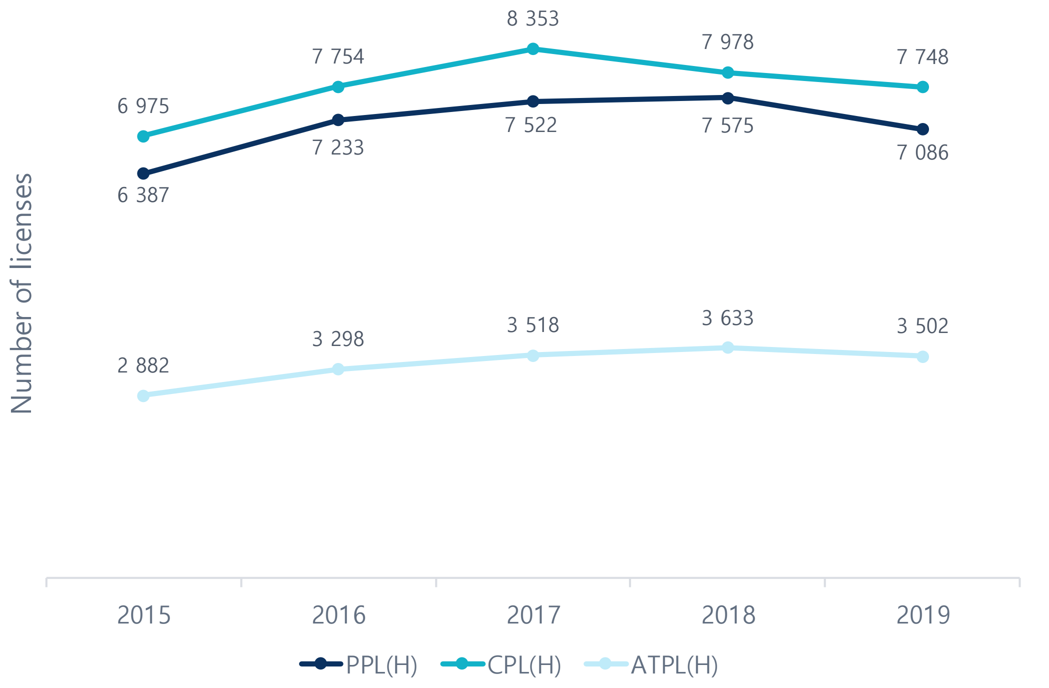
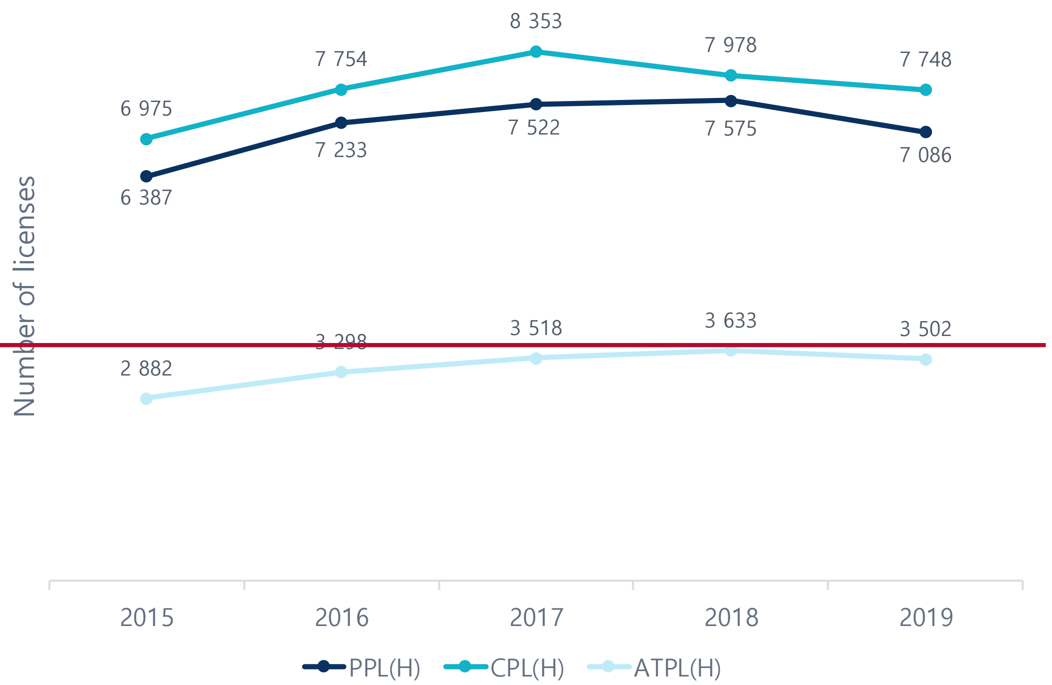


Figure 14



~~Figure 14~~ represents, license census trends for the main license types, i.e. PPL(H), CPL(H) and ATPL(H) have become flat or even start to show a decrease in license population in 2019.

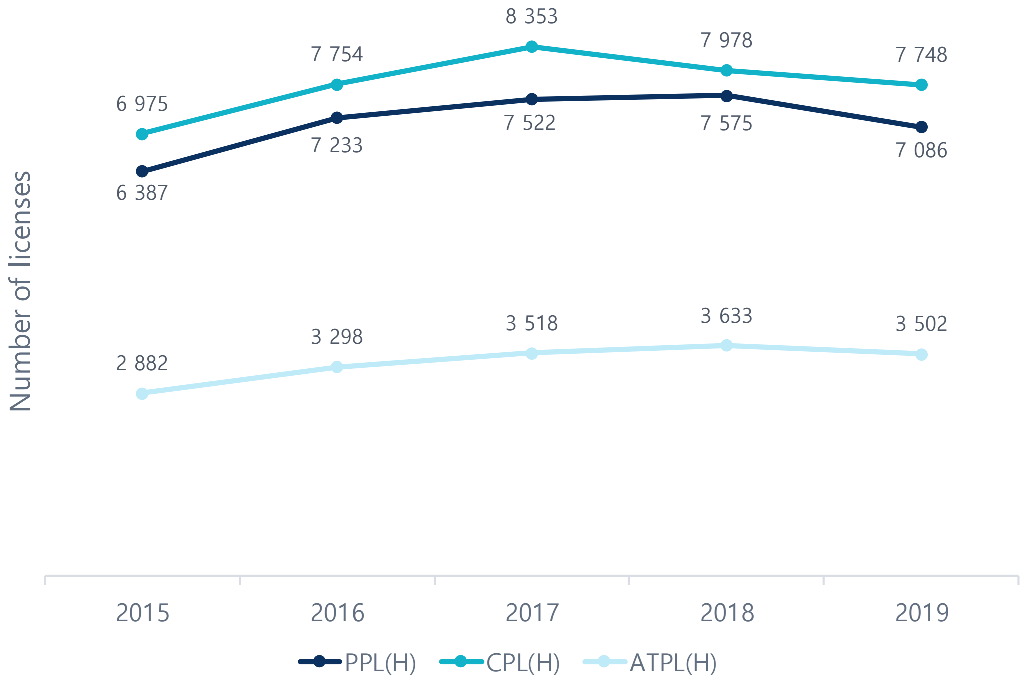


Figure 14. License census for PPL(H), CPL(H) and ATPL (H) in EASA MS, from 2015 to 2019. Source: EASA.

As highlighted in the figure above, helicopter pilot licenses are predominantly directed to professional activities. As it will be seen in this study, helicopters are heavily engaged in professional operation, being it aerial work, CAT or SPO such HEMS, firefighting, etc. This can be attributed to the suitability of the flying characteristics and hovering capabilities of these aircraft. Also, recreational flying, associated to PPL(H) licenses, faces proportionally higher operational costs compared to a comparable airplane in terms of size, payload, passenger carrying capability, etc.

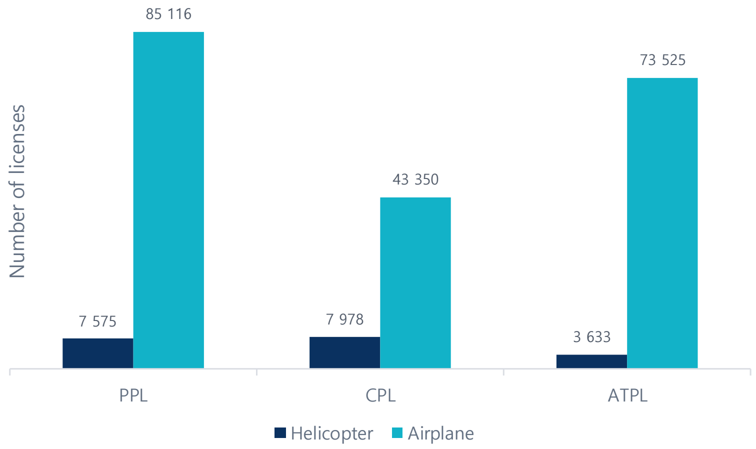


Figure 15. License census for the main license types in EASA MS on 2018. Comparison between airplane and helicopter licenses. Source: EASA.

3.1.2.1.2 Retirement and attrition rate

Based on

Figure 15

~~Figure 15~~, it is evident that the population of the helicopter versus aeroplane pilots have a clear impact in the ATO(H) industry. In anticipation of this domain's results presented further down in the document, the analysis has shown that even in large countries, ATOs devoted specifically to helicopter training are only a few. Most commonly, these centres offer both aeroplane and helicopter formation.

With all the aforementioned, the following modelling of the license issuing is proposed.

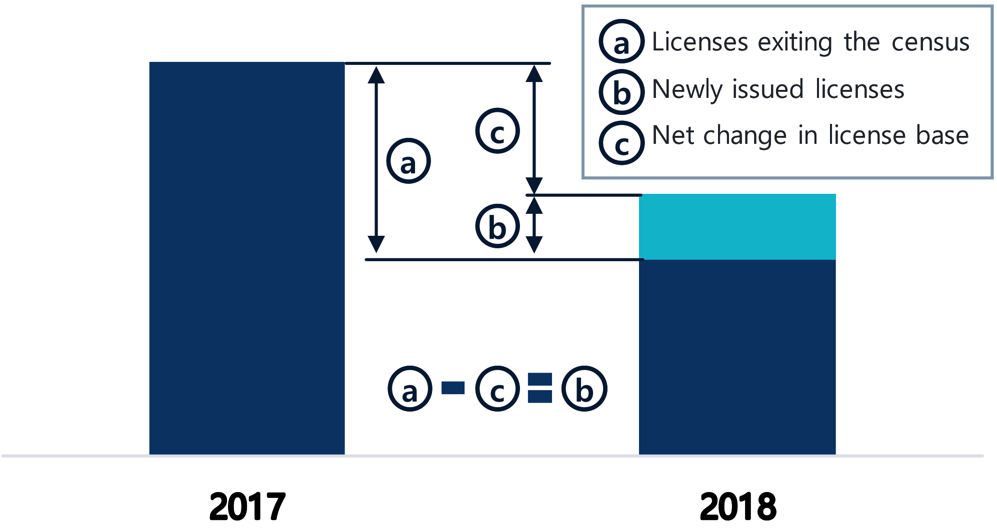


Figure 16. Modelling of the year-on-year license variation and the newly issued licenses (in this example 2017 and 2018).

Source: ALG elaboration.

This diagram represents the modelling of newly issued licences for two consecutive years. As depicted, net or total change in the license census is a function of:

a) Outgoing licences: due to retirement and attrition, e.g., pilots seeking other professional careers. This value was set to 10% as explained below.
b) The newly issued licences implied by new pilot graduation to meet market demand. This value is calculated.
c) The net change on active licenses, i.e. the Year-on-Year (YoY) pilot base change. In this particular example it is assumed that there is negative growth (decrease) in the total active license population. This was an input from licence census.

Using this approach, it is assumed that pilot placement upon graduation is immediate. This assumption, although not fully realistic is well aligned with expert inputs and industry outlooks forecasting a pilot shortage for the upcoming years whose effect is already being felt today (see in particular (Boeing, 2018), (University of North Dakota and Helicopter Association International, 2018)).

In conclusion, this model states that, in this case, a decrease in license census is mitigated by new licenses being issued every year. What dictates whether the total licence population increases or decreases is the difference on the licenses being issued minus those exiting the market.

To evaluate the number of issued licenses, a modelling of the outgoing and newly issued licenses was required. A rate is set to group the outgoing licenses due to retirement and attrition (i.e. pilots seeking other professional careers), named Attrition plus Retirement Rate (ARR). This ratio is difficult to calculate based on helicopter pilot retiring statistics, which are scarce. A 10 % value based on expert judgement collected during the interviews. Although it is a particularly high value, key industry actors, and manufacturers' forecasts (Boeing Pilot and Technician outlook mentioned previously) give warning signs of an already declining pilot base. This has been further corroborated by interviewee input. It is further assumed that ARR prevail for PPL(H) licenses which are leisure-oriented.

3.1.2.1.3 Newly issued licences

With the proposed model, the license census (provided by EASA on a specific request) and the ARR, the number of license newly issued per category can be evaluated. The table below provides a look into the variation of license base and

License	2017 census	2018 census	2017-2018 variation	% of newly issued licenses	Licenses issued in 2018
PPL (H)	7 522	7 575	0.7%	10.7%	805
CPL (H)	8 353	7 978	-4.5%	5,5%	460
ATPL (H)	3 518	3 633	3.3%	13,3%	467
Attrition and Retirement Rate = 10%					

Table 9. Calculation of the licenses issued in all EASA MS. Results shown for 2018.

Source: ALG elaboration based on EASA data and interviewee input.

As mentioned before, EASA data is used to distribute this licenses among the different MS. The ratio of each country license to the overall was used.

Using these ratios, the number of issued licenses by country and license type are calculated. Note that even though the ratio of licenses are based on 2018 data, they are used to calculate the issued ones from 2016 until 2018.

3.1.2.1.4 Licence pricing

License pricing in EASA MS has been derived, based on a combination of several information sources. Helicopter licenses are valid across EASA MS thus, commercial information is available on several ATO websites. Figures below show the license pricing data per country as well as the linear regression with GDP PPS for each license type.

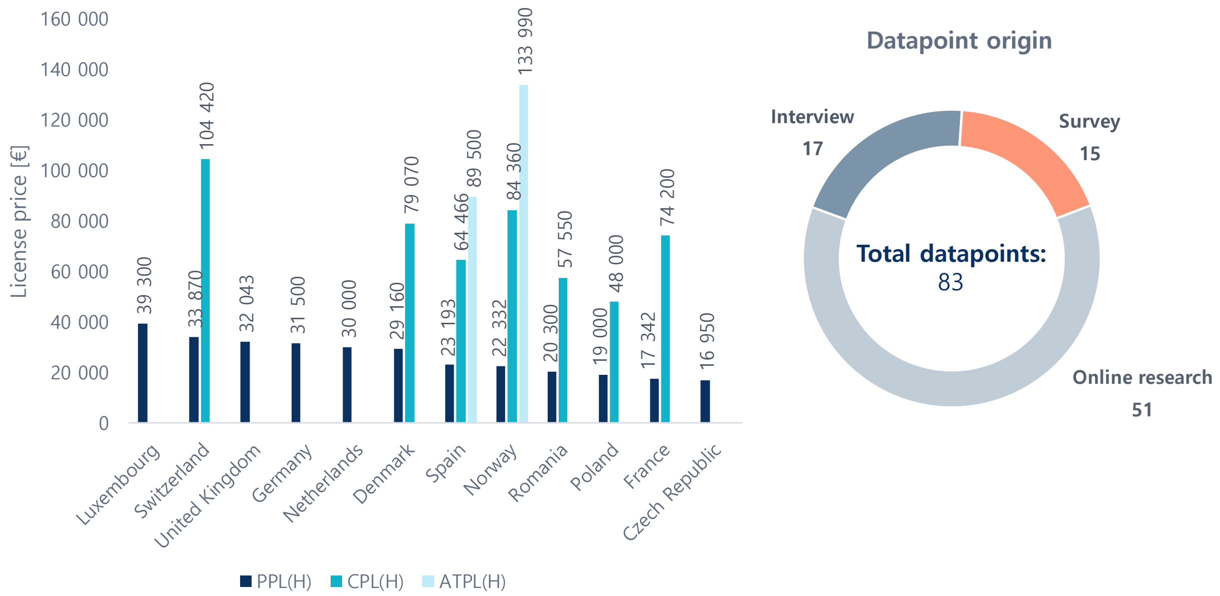


Figure 17. Average license price, in €, of PPL(H), CPL(H) and ATPL(H) licenses obtained from the research on EASA MS based on the data points shown in the chart on the right of the figure. 2020 course price values as per the companies' websites.

Source: ALG elaboration based on online research, and survey and interviewee input.

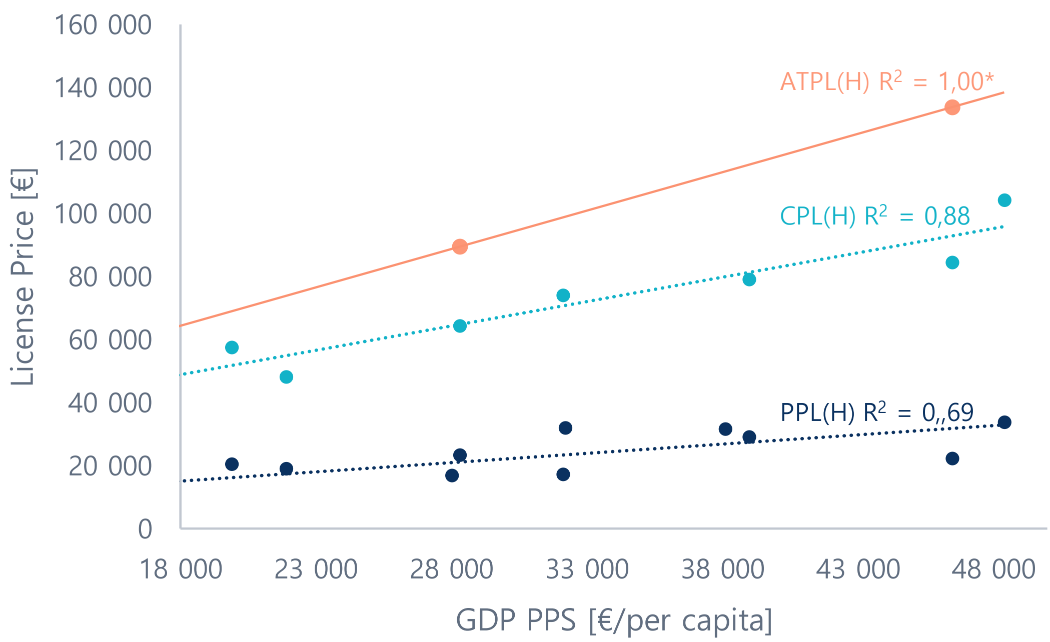


Figure 18. GDP per capita in PPS vs average MS license price regression.

Source: ALG elaboration based on online research, and survey and interviewee input. License price according to companies' 2020 online brochure.

This regression yields three formulae which have allowed to extrapolate the prices for each license type at each country, simply by using the country GDP PPS value in each of them.

$$\text{PPL(H) license price [€]}=0.568\cdot(\text{GDP PPS})[€]+4\ 584$$

CPL(H) license price [€]=1.549·(GDP PPS)[€]+20 908

ATPL(H) license price [€]=2.44·(GDP PPS)[€]+20 320

Note that due to only having 2 entry points, ATPL(H) regression yields a correlation factor equal to 1.

Applying these formulae, the price matrix presented in Table 10 below has been obtained.[9]

Country	GDP PPS [€/capita]	PPL(H) license Price ['000 €]	CPL(H) license Price ['000 €]	ATPL(H) license Price ['000 €]
Austria	39 300	26.9	81.8	116.4
Belgium	35 700	24.9	76.2	107.6
Bulgaria	15 500	13.4	44.9	58.2
Croatia	19 500	15.7	51.1	68.0
Cyprus	26 800	19.8	62.4	85.8
Czech Republic	28 000	20.5	64.3	88.8
Denmark	39 000	26.7	81.3	115.7
Estonia	25 100	18.8	59.8	81.7
Finland	34 200	24.0	73.9	103.9
France	32 100	22.8	70.6	98.8
Germany	38 100	26.2	79.9	113.5
Greece	21 000	16.5	53.4	71.7
Hungary	21 700	16.9	54.5	73.4
Iceland	41 200	28.0	84.7	121.0
Ireland	57 800	37.4	110.4	161.6
Italy	29 500	21.3	66.6	92.4
Latvia	21 700	16.9	54.5	73.4
Lithuania	24 900	18.7	59.5	81.2
Luxembourg	78 500	49.2	NA	NA
Malta	30 200	21.7	67.7	94.1
Netherlands	39 900	27.3	82.7	117.9
Norway	46 500	31.0	92.9	134.0
Poland	21 900	17.0	54.8	73.9
Portugal	23 400	17.9	57.2	77.5
Romania	19 900	15.9	51.7	69.0
Slovakia	24 000	18.2	58.1	79.0
Slovenia	27 000	19.9	62.7	86.3
Spain	28 300	20.7	64.7	89.5
Sweden	37 400	25.8	78.8	111.7
Switzerland	48 400	32.1	95.9	138.6
United Kingdom	32 200	22.9	70.8	99.0
License avg. price		**22.4**	**64.6**	**90.1**

Table 10. Price for newly issued licences in thousands of € calculated from the GDP PPS-based regression for all EASA MS.

Source: ALG analysis based on Eurostat data for GDP PPS on 2018, EASA data, and survey and interviewee input for license pricing.

The final step for the assessment of pilot license initial training, is multiplying the newly issued license distribution by its average price for each MS. See the results in Section 4.2.2

[9] Note that Liechtenstein prices are set to zero to enforce that the condition of zero financial size value for this country. Similarly, as EHA pointed out, CPL(H) and ATPL(H) license price are displayed as Not Available in Luxembourg since only after 2018 this country's ATO(H) lacked approval to conduct these courses.

3.1.2.1.5 Ratio of students and pilots enrolling in instrument rating and type rating

As introduced before, this approach also assesses the financial size stemming from IR and TR initial training.

First of all, the number of active licenses, i.e., the ones associated to operating pilots, has to be calculated. In order to do that, relying on the scheme presented in Figure 16~~Figure 16~~, the number of issued licenses on a given year is subtracted from that year's license census, yielding the number of active licenses for that year.

Once this step is completed, the number of graduating pilots (associated to the licenses issued) and the number of the active pilots (associated to the active licenses) enrolling in IR and TR courses has to be calculated.

This has been achieved by setting a ratio of the number of student/pilots who will be enrolling these courses on a given year. The values have been converged after numerous meetings with interviewees and validation from EHA. The resulting figures are shown in Table 11~~Table 11~~ below.

License type	License holder	Graduating pilots (students)	(Already) certified pilots
Instrument Rating	PPL(H)	0%	1%
	CPL(H)	0%	5%
	ATPL(H)	0%	20%
Type Rating	PPL(H)	0%	3%
	CPL(H)	50%	4%
	ATPL(H)	50%	4%

Table 11. Ratios of student and certified pilots enrolling in IR and TR courses in EASA MS. Figures valid for the reviewed years (2016-2018).

Source: ALG elaboration based on interviewee input and EHA validation.

Relevant comments from this table are pointed out, after interviewee and EHA consultation:

- Due to the cost of TR and IR courses, newly graduating pilots typically will not be willing to enrol into IR courses. The same applies for PPL(H) students. CPL(H) and ATPL(H) students however, will typically go through TR training since it is cheaper than IR (especially for lighter helicopters) and is an added value when applying for a job offer.
- For already certified pilots, an indicative 1% of the active license base is considered to be trained in an IR course attached to a PPL(H) license. This caters for the reduced number of leisure pilots who fly instrument rated helicopters (more expensive to operate).
- Given that IR is required by the industry for an ATPL(H) pilot, it is considered that indicatively 20% of the active licenses will enrol in this training every year. In other words, using this ratio, all active

licenses will have gone through IR initial training within 5 years (5x20%=100%) to conduct CAT operations. On the other side CPL(H) pilots will enrol in this training courses once every 20 years, since many operations conducted by a CPL(H) pilot do not require an IR rating (e.g. firefighting, crop-dusting). The same scheme applies for TR coursed addressed to certified pilots.

Considering these points, the number of initial IR and TR courses delivered from 2016 to 2018 can be calculated. Table 12~~Table 12~~ below presents these results.

Country	2016		2017		2018	
	# initial training IR courses	# initial training Type rating courses	# initial training IR courses	# initial training Type rating courses	# initial training IR courses	# initial training Type rating courses
Austria	15	44	16	44	17	27
Belgium	7	17	8	17	9	13
Bulgaria	4	6	5	6	5	4
Croatia	2	3	2	3	2	2
Cyprus	0	0	0	0	0	0
Czech Republic	8	23	9	23	10	17
Denmark	21	33	24	31	26	23
Estonia	2	4	3	4	3	3
Finland	10	20	11	19	11	13
France	84	208	95	205	102	137
Germany	124	221	140	210	150	152
Greece	16	32	18	31	20	21
Hungary	3	11	3	11	4	7
Iceland	2	3	2	3	2	2
Ireland	18	23	21	21	22	17
Italy	111	199	126	191	135	136
Latvia	2	3	2	3	2	2
Lithuania	2	5	2	5	2	3
Luxembourg	0	2	1	2	1	1
Malta	0	0	0	0	0	0
Netherlands	27	45	31	43	33	31
Norway	63	96	72	90	77	63
Poland	12	33	13	32	14	21
Portugal	24	36	27	33	29	23
Romania	6	16	7	16	7	10
Slovakia	3	7	3	7	3	5
Slovenia	10	16	12	15	12	11
Spain	53	104	60	99	64	63
Sweden	27	53	30	51	32	34
Switzerland	34	80	38	79	41	53
United Kingdom	169	276	192	264	205	203
Total	**862**	**1 621**	**976**	**1 558**	**1 043**	**1 097**

Table 12. Number of initial IR and TR courses in all EASA MS between 2016 and 2018.

Source: ALG analysis based on course enrolment ratios and EASA data.

The final step of the model consists in determining the price of these courses in all EASA MS. Unfortunately, the availability of price information is reduced, with many ATO(H) not publishing the TR prices in their brochures. Furthermore there is a significant dispersion regarding the price of a TR course (also true for IR) due to the impact on the price that the helicopter on which the pilot is being rated has. As a result, the collected data comes from fewer countries and for diverse helicopter models. Therefore, an average value is established, acknowledging that is an industry representative figure. The obtained prices are 36.680 € for an initial IR course and 6.598 € for an initial TR course. Table 13~~Table 13~~ below presents the course price for all EASA MS. The extrapolation has been made using the country's GDP PPS to EASA MS average GDP PPS ratio using the following formula:

$$\text{TR course price in country A [€]} = 6\,598\,[€]\,\frac{\text{Country A GDP PPS}}{\text{average EASA MS GDP PPS}}$$

$$\text{IR course price in country A [€]} = 36\,680\,[€]\,\frac{\text{Country A GDP PPS}}{\text{average EASA MS GDP PPS}}$$

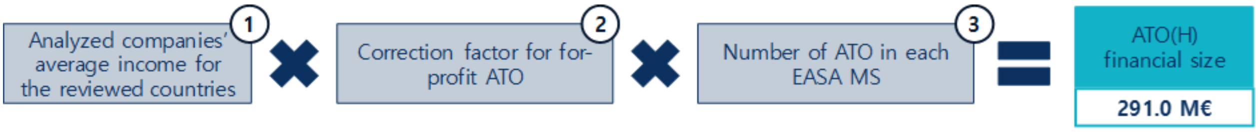
Country	Initial IR course price ['000 €]	Initial TR course price ['000 €]
Austria	41.0	7.4
Belgium	37.2	6.7
Bulgaria	16.2	2.9
Croatia	20.3	3.7
Cyprus	27.9	5.0
Czech Republic	29.2	5.2
Denmark	40.6	7.3
Estonia	26.2	4.7
Finland	35.6	6.4
France	33.4	6.0
Germany	39.7	7.1
Greece	21.9	3.9
Hungary	22.6	4.1
Iceland	42.9	7.7
Ireland	60.2	10.8
Italy	30.7	5.5
Latvia	22.6	4.1
Lithuania	25.9	4.7
Luxembourg	81.8	14.7
Malta	31.5	5.7
Netherlands	41.6	7.5
Norway	48.5	8.7
Poland	22.8	4.1
Portugal	24.4	4.4
Romania	20.7	3.7
Slovakia	25.0	4.5
Slovenia	28.1	5.1
Spain	29.5	5.3
Sweden	39.0	7.0
Switzerland	50.4	9.1
United Kingdom	33.6	6.0
Average price	**36.7**	**6.6**

Table 13. Course prices, in thousands of €, for initial IR and TR courses for all EASA MS.

Sources: ALG elaboration based on online research (announced web prices as of 2019-2020), and survey and interviewee input.

Finally, the last step of this approach is based on multiplying the number of courses offered each year on each country by the calculated course pricing.

3.1.2.2 Top-down approach



The analysis of the financial figures of the helicopter ATO is undermined by the low number of companies delivering solely helicopter training.

According to EASA data, there were 326 helicopter ATO(H) across EASA MS, which average merely 10 companies per country.

Furthermore, based on the deeply analysed Countries (Norway, Spain and the UK), the ATOs which are part of an operator or a public organisation such as National Police or Road Traffic patrol service, are considered non-profit companies. In other words, their pilot training is an internal service of the company. After a company by company analysis, it has been determined that as a weighted average of the reviewed countries, only 67% of ATO(H) are considered as commercial or for-profit.

Consequently this correction factor to cater for the dedicated helicopter ATO has been applied to all MS (EASA source).

The analysis proceeds analogously as in the top-down approach for helicopter operators, i.e. eleven ATOs financial statements have been analysed, complemented by 1 survey respondent and two bilateral interviews. The average income value of the companies within the first and third quartile has been made, In this case however, there is just one data series, comprising all the reviewed countries. The average income per company is calculated at 1.325.472 € as indicated by a red dot in Figure 19~~Figure 19~~ below. The last step to obtain a MS-level result is to multiply this value by the corrected number of helicopter ATO, shown in Table 14 (third column). The detailed results are available in Section 3.1.2.2

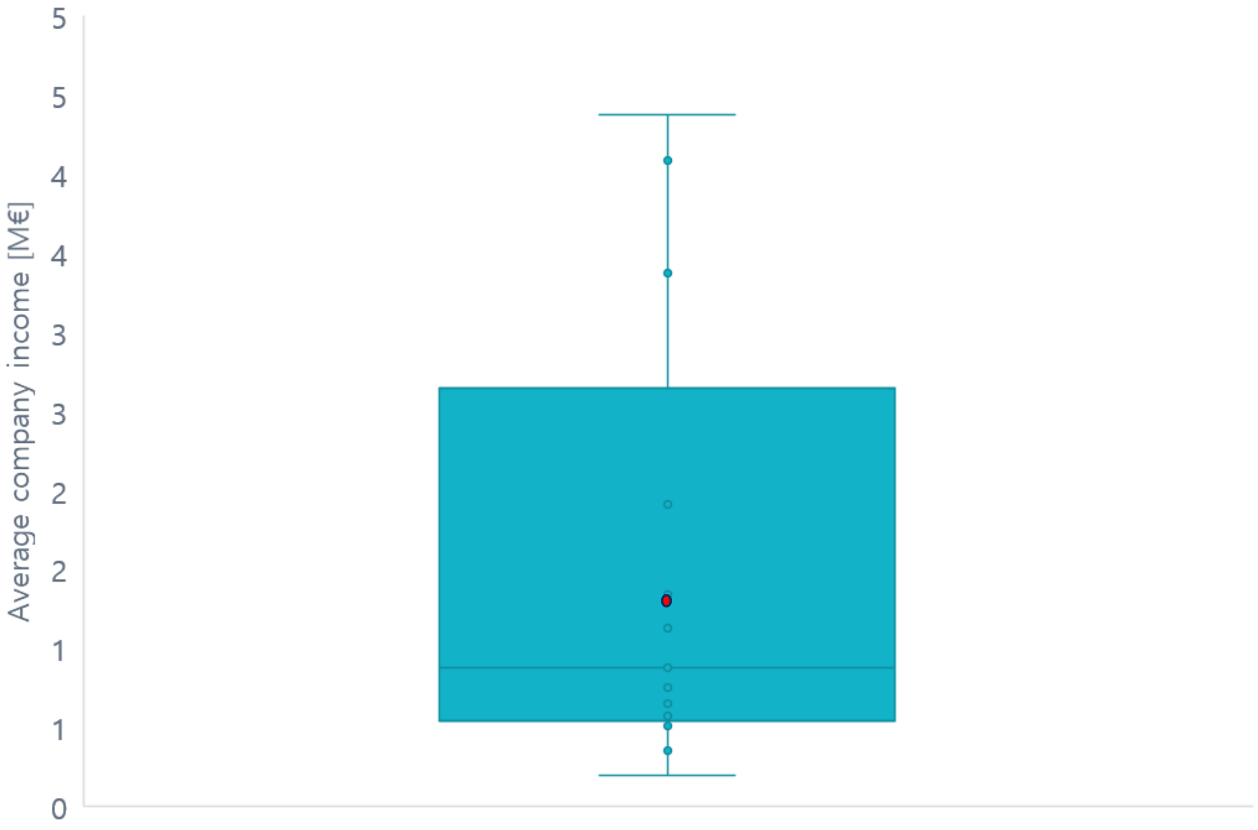


Figure 19. Income, in €, per ATO(H) in the reviewed countries, averaged on the 2016-18 period.

Source: ALG elaboration based on the financial data extracted from business registries and survey response.

3.1.2.3 Profit margin calculation

The profit margin of this sector is calculated using an analogous methodology as the top-down approach modelling of this sector (averaging the profit margin results of the companies falling within the first and third quartile). Using the financial listing of the reviewed companies, an average profit margin for the 2016-2018 period is calculated at 2.1%.

3.1.2.4 Model limitations and further work

- There is a share of the formative offer which is not covered in this analysis. For instance, recurrent-simulator training, operation-specific training, MCC or instructor formation. Even though the considered courses in this analysis make up an important share of the industry, including those aforementioned would give a more rounded view of the market.
- The attrition and retirement rates have been calculated through a basic model based on a few inputs from stakeholders. It would be worth to be further detailed and validated.
- The bottom-up approach considers that all licenses are active. In other words, that all pilots are not unemployed. Addressing this via an unemployment rate could improve the model's accuracy.

- A more diverse and populated dataset of ATO(H) financial information would provide more accurate results in the top-down approach.
- Assess more accurately the ATO(H) that are dedicated to external pilot formation or even identifying the business share in terms of income of:
    - ATO providing both airplane and helicopter pilot formation.
    - Companies providing several services such helicopter operation, maintenance… and ATO.

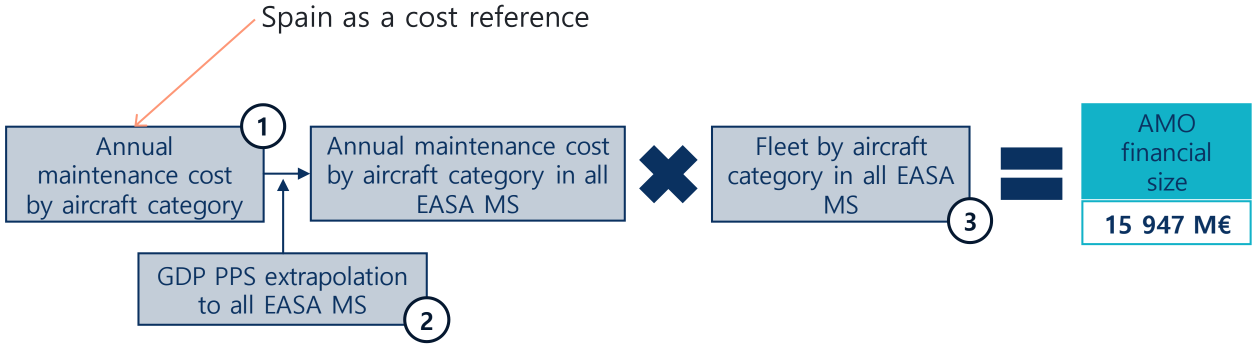
3.2. Maintenance domain

3.2.1. AMO

The development of the model is presented in the following table.

Maintenance domain – AMO

Bottom-Up Approach



Item	Main hypothesis and sources
1	Interviewee and survey input, research articles, industry reports and Cirium database
2	Based on Eurostat GDP PPS data
3	Cirium database and GAMA 2019 databook data

Top-Down Approach

Item	Main hypothesis and sources
1	Data from business registries, survey and annual reports
2	EASA data
3	From Cirium. For helicopters, sorting by In service helicopters, excluding military categories and in-storage. For airplanes, Cirium data plus GAMA 2019 databook

Table 14. Model explanation for the AMO domain.

This section of the analysis is probably the most demanding in terms of data required and expert input. Several reasons contribute to this, especially due to:

- The wide range of services and products offered by the industry, i.e., although there are determined maintenance works or tasks required for every aircraft, maintenance works comprise these plus additional tasks such as defect correction, interior overhaul, aesthetics modifications, etc.
- There is not a consolidated European aircraft fleet database. As a matter of fact, several sources have been used in order to build a complete listing. Helicopters are fairly represented in Cirium, and so do the majority of airplanes. This database, however, misses an important share of the single engine piston (SE piston) fleet in EASA MS. Among all the categories used by Cirium for airplane classification, 3 are directed to piston airplanes, two of which are for SE piston.

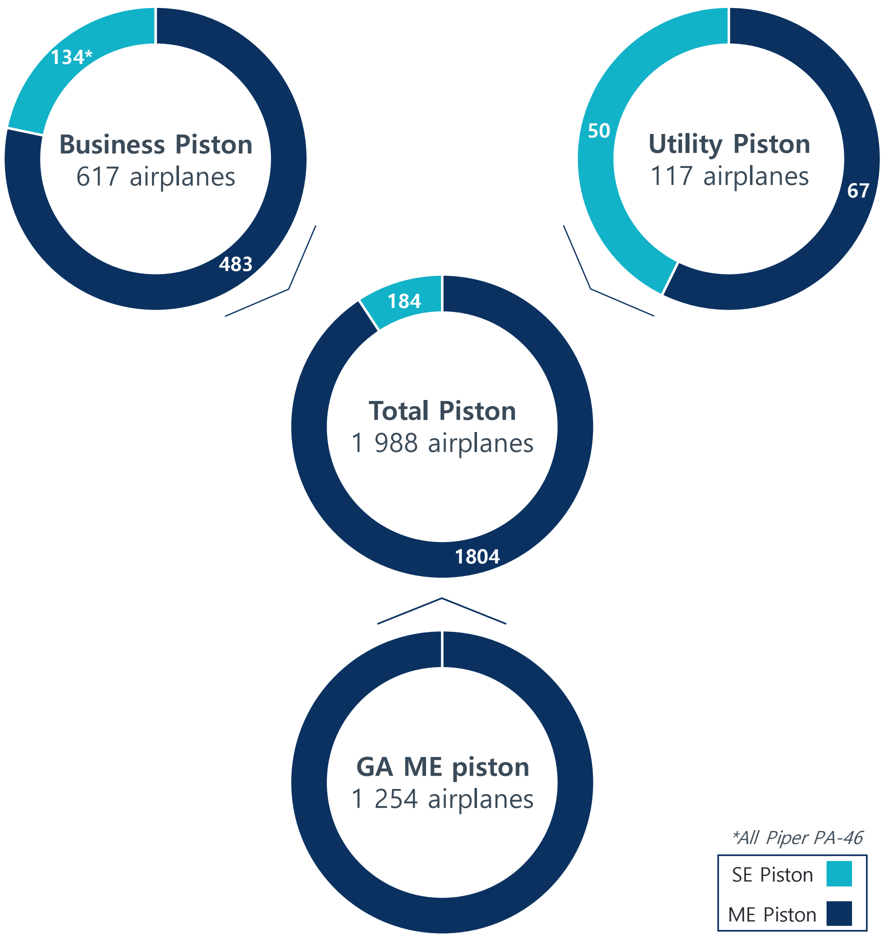


Figure 20. Analysis of the piston airplane fleet data, in all EASA MS, as provided by Cirium (2017). Only in service airplanes are counted (in storage excluded).
****Please note that in Business Piston category all SE airplanes are Piper PA-46.***
Source: ALG analysis based on Cirium database.

Looking at the previous figure, it can be seen that the number of SE piston airplanes in Cirium is very low. This is due to the fact that Cirium does not include SE piston GA airplanes, which make up a big share of the European fleet (popular models such as the Cessna 170, family just to name an example, is not listed). In order to complement this gap, GAMA 2019 databook[10] has been used in order to extract the fleet numbers required. Combining both Cirium and GAMA data, the European fleet composition for this report can be seen in Figure 21~~Figure 21~~.

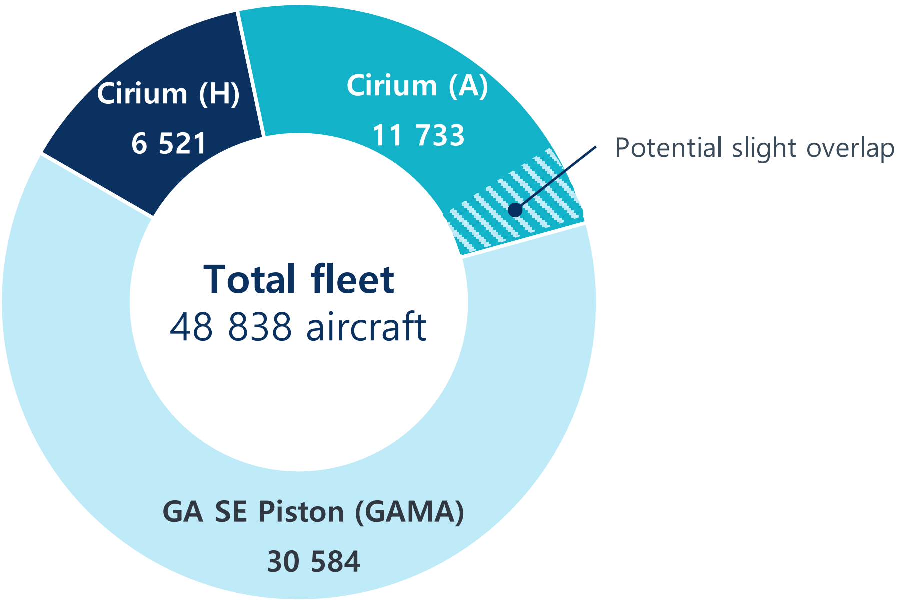


Figure 21. Composition of the EASA MS aircraft fleet used in this study.

Cirium data is from 2017 and GAMA 2019 databook from 2018 (in some MS there was no 2018 data. In these cases, the most recent year was selected).

Source: ALG elaboration based on Cirium and GAMA 2019 databook.

As seen in the figure above these lines, a slight overlap is indicated. This is due to the composition of a general fleet picture from two sources. As discussed with GAMA, listing the registered GA aircraft in all countries can be difficult due to several reasons. First of all, the assembly of the multi-state database relies on the reporting and counting criteria of each country. Some of them categorise their national fleet differently than others. For instance, Switzerland reports their fleet numbers in the databook sorting the airplanes between 450-5.700 kg by SE and ME. The UK on the other hand, divides this group in 750 kg and below and 751-5.700 kg, without differentiating between SE and ME.

[10] Link to the databook: https://gama.aero/wp-content/uploads/GAMA_2019Databook_ForWebFinal-2020-02-19.pdf

The composition of the European aircraft fleet using Cirium database and GAMA 2019 databook figures is shown in Figure below**Error! Reference source not found.**.

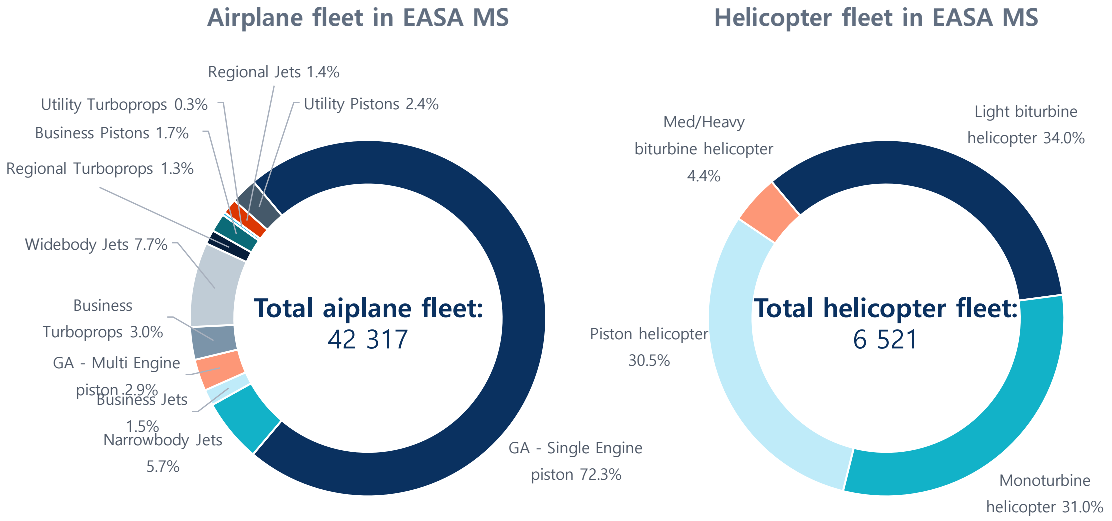


Figure 22 . Airplane and helicopter fleet and their distribution for all EASA MS, using 2017 data for helicopters and airplanes except for GA SE Pistons, which is from 2018.

Source: ALG elaboration based on Cirium data and GAMA 2019 databook.

As detailed in the introduction of this report, two type of maintenance organizations are considered: those falling within Part-145 and those within Part-M Subpart-F. Analysing the latter has proven difficult for many reasons. First of all, obtaining data has proven difficult both in the bottom-up and top-down approach. There are not as many organisations of this type as in the case of Part-145. In Spain for example, there are 99 Part-145 and 15 Part-M Subpart-F[11]. At EASA MS level, this ratio is 489 Part-M Subpart-F to 1926 Part-145 organisations. Tracking Part-M Subpart-F organisations has proved challenging as a result, and so has extracting valuable financial information from business registries. Unfortunately, survey engagement of these companies has not solved these limitations, being Part-M Subpart-F the lowest engaging stakeholder group in the survey, with only 2 responses out of the total 125 entries.

EASA regulation establishes that Part-M Subpart-F AMO are bounded to maintain non-CMPA and non-CAT aircraft. This does not necessarily means that Part-145 AMO cannot maintain this smaller aircraft. As a matter of fact, the industry review based on several MS CAA approved AMO listings plus the interviews to Part-145 AMO, has proved the opposite. It is thus common that Part-145 AMO cover both large CAT aircraft but also smaller/recreational/SE piston aircraft.

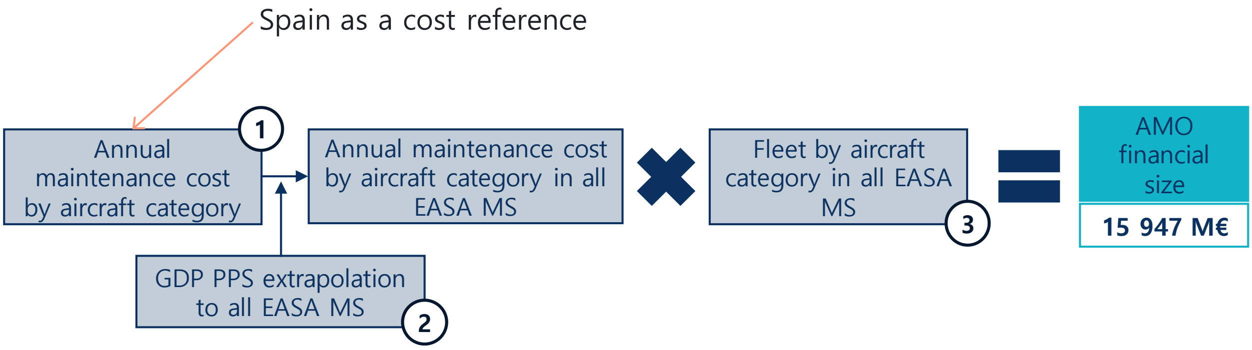
With this in mind, it has been decided not to explicitly consider Part-M Subpart-F AMO organisation in this modelling, focusing the efforts on Part-145 organisations instead. Even though this overlooks a share of the financial size of the AMO domain, the impact of this exclusion is considered to be limited first of

[11] Spanish CAA (AESA) listings of approved Part-145 and Part-m Subpart-F organisations, as of January 2020: https://www.seguridadaerea.gob.es/media/4130733/listado_organizaciones_145.pdf and https://www.seguridadaerea.gob.es/media/4131015/listado_organizaciones_mf.pdf

all due to the lower number of these organisations across all EASA MS as mentioned above. Secondly, Part-M Subpart-F often maintain lighter and less complex aircraft, categorised as Annex I (of the Basic Regulation 2018/1139), or non-EASA regulation compliant, and thus are left out of the scope of the study.

As a final introduction point, the assessment of the financial size has been approached by an industry standard of cost. In fact, when aircraft's direct operating costs are reviewed, they are considered as a maintenance cost per year or flight hour. Depending on the provider of the maintenance services, i.e., internal fleet maintenance or private AMO company, a profit margin has to be factored in for the latter ones.

3.2.1.1 Bottom-up approach



3.2.1.1.1 Annual maintenance cost by aircraft category

The fleet categorization used in this study is presented in Table 15~~Table 15~~ below.

Aircraft Category	Remarks	Source	Fleet in all EASA MS
GA SE pistons	Category created due to Cirium lacking it	GAMA 2019 databook and Cirium	30 584
Business Jets	-	Cirium	2 432
Business Pistons	-	Cirium	617
Business Turboprops	-	Cirium	1 217
GA ME pistons	-	Cirium	1 254
Narrowbody Jets	-	Cirium	3 254
Regional Jets	-	Cirium	544
Regional Turboprops	-	Cirium	704
Utility Pistons	-	Cirium	117
Utility Turboprops	-	Cirium	577
Widebody Jets	-	Cirium	1 017
Piston helicopter	Grouping Cirium Civil Piston Single&Multi categories	Cirium	1 992
Monoturbine helicopter	Grouping Cirium Civil Turbine Single Medium&Intermediate categories	Cirium	2 021
Light biturbine helicopter	Grouping Cirium Civil Turbine Multi Light&Medium categories	Cirium	2 218
Med/Heavy biturbine helicopter	Grouping Cirium Civil Turbine Multi Super Medium&Heavy categories	Cirium	290

Table 15. Sources of data, remarks and fleet in all EASA MS of the aircraft categorization used in this study. Total fleet is 48.838.

Source: ALG elaboration based on Cirium (2017 data) and GAMA 2019 databook.

An expansion of the table above displaying the fleet in each EASA MS according to the aircraft categorisation may be consulted in Table 36~~Table 36~~.

For the lighter less-complex aircraft there are no consolidated databases for the annual flight hours. Instead, many times the industry relies on reports and surveys which present representative figures. Cirium on the other hand, provides annual flight hour data for larger commercial aircraft. The categories whose annual flight figures have been extracted from Cirium are:

- Business Jets
- Business Turboprops
- Narrowbody Jets
- Regional Jets
- Regional Turboprops
- Widebody jets

As for the rest of the airplane and helicopter categories, the annual maintenance cost has been addressed directly. Nevertheless, this metric has also been obtained for consistency. The same principle applies to maintenance cost per flight hour.

Given that many interviewed stakeholders are from Spain and the survey input belong also to a Spanish company, this country has been set as a reference. These reference values have been then extrapolated to other EASA MS via a GDP PPS ratio of a given state to Spain.

Thus, with these precedents, the annual maintenance costs per aircraft can be calculated. The information is presented in Table 16~~Table 16~~ below. As it can be seen thanks to the colour coding used in the table, missing data has been proxied by aircraft similarity of the unknown category to a known one.

Aircraft Category	Annual flight hours	Maintenance cost per flight hour [€/fh]	Annual line maintenance cost [€]	Annual base maintenance cost [€]	Total annual maintenance cost [€]
GA SE Pistons	80	-	210	1 000	1 210
Business Jets	376	-	20 000	80 000	100 000
Business Pistons	410	-	3 000	20 000	23 000
Business Turboprops	319	189	12 073	48 290	60 363
GA ME Pistons	80	-	700	1 900	2 600
Narrowbody Jets	2 868	697	228 000	1 770 945	1 998 945
Regional Jets	2 074	523	123 724	961 005	1 084 729
Regional Turboprops	1 552	523	92 560	718 942	811 502
Utility Pistons	610	-	3 000	10 000	13 000
Utility Turboprops	401	189	15 193	60 773	75 966
Widebody Jets	4 364	872	588 000	3 217 292	3 805 292
Piston helicopter	400	-	3 000	32 800	35 800
Monoturbine helicopter	400	-	4 380	32 800	37 180
Light biturbine helicopter	400	-	4 380	116 000	120 380
Med/Heavy biturbine helicopter	400	-	4 380	116 000	120 380
Average	**982**	**499**	**73 507**	**479 183**	**552 690**

Sourced   Proxied

Table 16 . Figures by aircraft category used to calculate annual maintenance cost of the fleet in EASA MS.

Costs are for Spain. Whenever the third column presents no values, maintenance costs have been obtained directly as an annual value.

Source: ALG elaboration based on interviewee input, Cirium (2017) data and reports. Data refer to 2018 or the most recent year available. In these cases, values are adjusted for inflation and if required, converted by the currency ER into 2018 €.

As a matter of fact, several sources and data have been merged in order to obtain the values presented in the table above these lines. For a further review, the reader may refer to Section 7.2.2.1. Even though, some important points are highlighted. Regarding annual flight hour figures:

- Annual flight hours GA SE and ME Pistons are obtained from the join IAOPA and GAMA European General Aviation survey 2019. It is indicative value since the annual maintenance cost is obtained directly from the survey.
- Annual flight hours figures for all the helicopter categories are obtained as an average from the flight hour by operational category. It is indicative value since the annual maintenance cost is obtained directly from the survey.

As for maintenance costs per flight hour

- The Pilatus PC-12 NGX has been selected as a representative aircraft of Business Turboprops and as such, an operational cost review has been used to obtain the maintenance cost per flight hour. Due to the prices being from a Danish company, the value has been adjusted with Danish-Spanish GDP PPS ratio. This cost per flight hour has also been used in the Utility Turboprops category.
- The maintenance cost per hour for Regional Jets has been set as the same as for Regional Turboprops.

Regarding annual line maintenance cost:

- The share between line and base maintenance for Business Turboprops has been obtained applying the line to total maintenance ratio of Business Jets:

$$\text{Annual line maint. cost for Business Turboprops [€]} = \text{Cost/fh} \cdot \text{Annual fh} \frac{\text{Annual Business Jets line maint. cost}}{\text{Annual Business Jets total maint. cost}}$$

- In order to involve as many sources as possible, annual line maintenance cost per Narrowbody and Widebody Jets has been obtained from survey input. The values are obtained from a monthly cost (19.000 €/month·12 months and 49.000 €/month·12 months).
- The line maintenance cost for Regional Turboprops is calculated based on the line to total maintenance ratio of Narrowbody Jets.

Regarding annual base maintenance cost:

- The base maintenance cost for Business Turboprops is calculated based on the base to total maintenance ratio of Business Jets.
- The base maintenance cost for Regional Turboprops is calculated based on the base to total maintenance ratio of Narrowbody Jets.
- For Narrowbody and Widebody Jets, annual base maintenance cost is calculated by calculating the total cost and subtracting the line maintenance cost obtained via survey input.

With these points in mind, the extrapolation of the total maintenance costs by aircraft category is performed to the rest of EASA MS via a GDP PPS ratio of a given state to Spain. The obtained annual maintenance costs by aircraft category and MS can be consulted in Table 37~~Table 37~~.

Thus, to finally calculate the financial size, these costs are multiplied by the fleet in each MS, sorted by aircraft category.

3.2.1.2 Top-down approach

3.2.1.2.1 2016-18 average income of reviewed AMO companies in each of the reviewed countries

For this analysis an initial database of AMO companies' financial information has been set up. This listing includes entries from company registries as well as the input provided by survey participants.

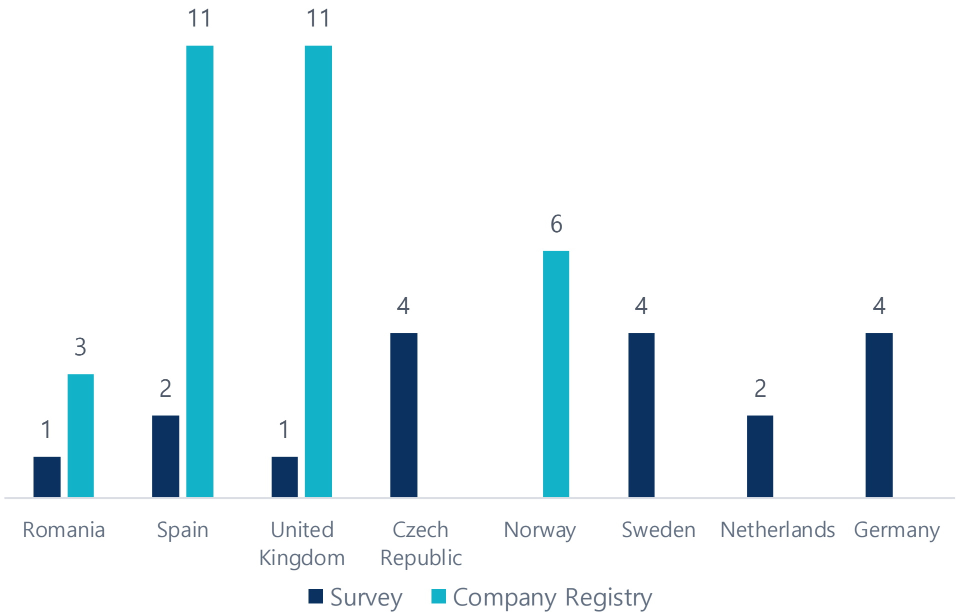


Figure 23. Sources for the financial information listing.

Source: ALG elaboration based on business registry desk research and survey response analysis.

The assessment of the financial figures of these companies called for a cautious evaluation in order to obtain representative values. Several factors justify this:

- Existence of outliers. It is crucial to exclude outliers from the analysis, i.e. those companies that deviate significantly from the rest of the population and that may distort the evaluation of the country outlook. The main example of this is the case of General Electric Engine Services Ltd in the UK. This company declares an average 3.438.381.724 € for the 2016-2018 fiscal years. This is orders of magnitude away from the rest of entries of the database (see Figure 24~~Figure 24~~).

- Account publishing policy. Governments dictate which financial documents must be published by the reporting companies, i.e., profit and loss account and balance sheet. The UK has a remarkably transparent and accessible platform (Companieshouse.gov.uk) which lists all the financial documentation of the registered companies. However, small companies are exempted from publishing thorough reports, excluding profit and loss accounts from the published information. Therefore the listing of UK's companies is biased towards bigger corporations with complete publications.

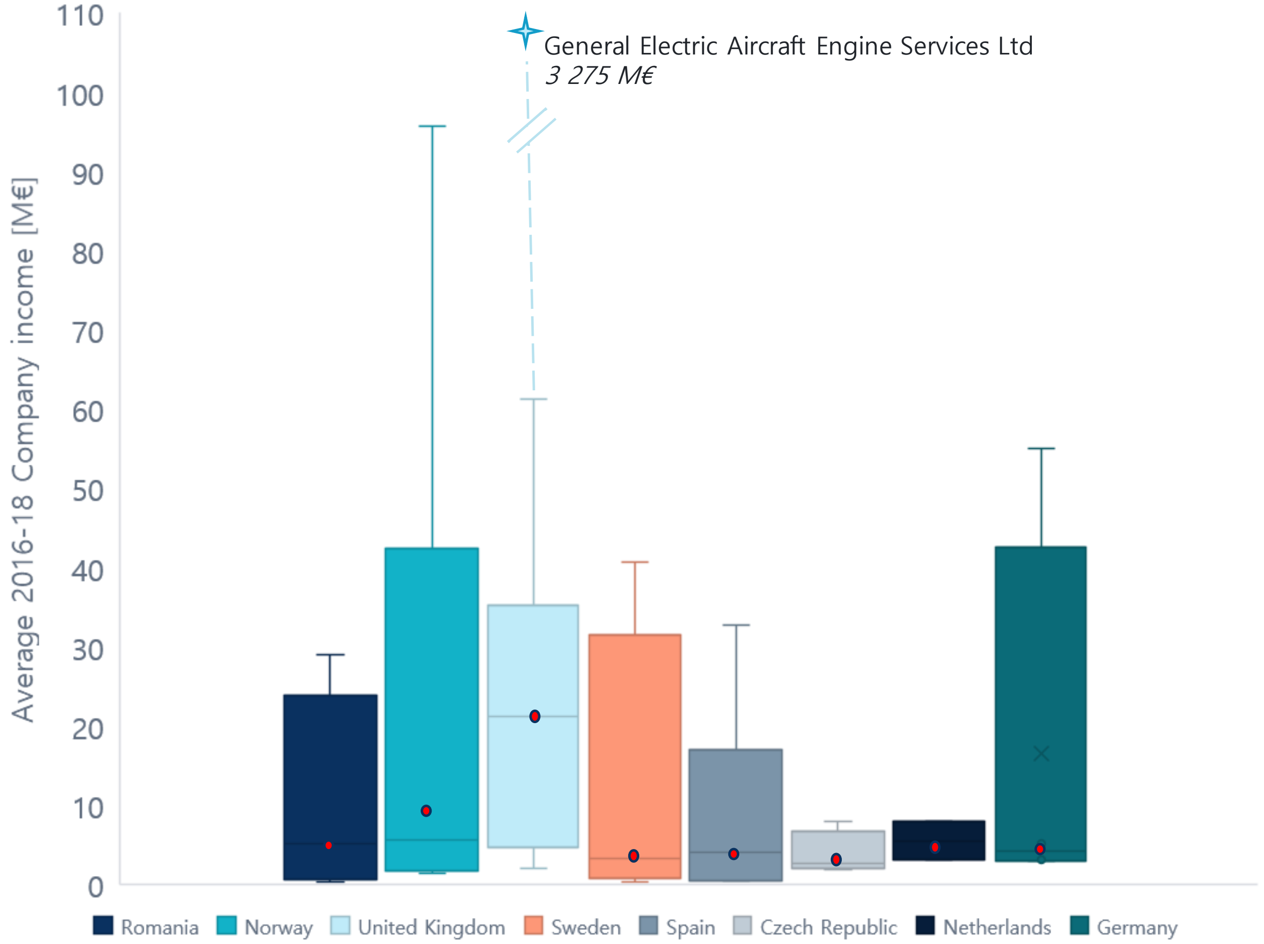


Figure 24. Box plot of the income distribution of the analysed companies in the reviewed MS, in millions of €. Note the UK's outlier belonging to GE Aircraft Engine Services Ltd.

Source: ALG elaboration based on 2016-18 financial information sourced from business registries and survey data.

For the calculation of an average income of an AMO company in each of the reviewed MS, only the values falling within the first and third quartile, $Q_1 - Q_3$, of the country's distribution (see Figure 25 above) have been considered.

Once this value is obtained, an initial estimation of the average income (financial size) for each of the reviewed MS at national level is obtained by multiplying the average income per company by the number of AMO companies in each MS, obtained from EASA data.

Finally, this country-level estimation is divided by the aircraft fleet in each MS, obtaining an average country income per aircraft. The process described is reflected through the values presented in Table 17~~Table 17~~ below.

At this stage the final step to obtain the financial size in a country-by-country basis is multiply the average income estimation obtained per aircraft (321.314 €) by the fleet in each of the EASA MS's (see Table 39). The results can be reviewed in Section 0.

Country	2016-18 average income per AMO company [€]	Number of approved AMO companies in the MS	Initial country income estimation from AMO companies [€]	Country fleet	Initial country income estimation from AMO per aircraft [€/aircraft]
Czech Republic	2 737 156	70	191 600 908	1 288	148 758
Germany	4 216 908	314	1 324 109 112	9 140	144 870
Netherlands	5 541 333	54	299 232 000	805	371 717
Norway	9 402 750	29	272 679 750	962	283 451
Romania	5 173 792	28	144 866 181	216	670 677
Spain	3 625 507	103	373 427 246	2 826	132 140
Sweden	3 236 014	48	155 328 656	1 367	113 660
United kingdom	22 104 690	355	7 847 164 990	11 127	705 236
Average	-	-	-	-	**321 314**

Table 17. Financial, company and fleet data, in €, used to calculate the average country income per aircraft in EASA MS.

Source: ALG elaboration based on the collected financial data from business registries and survey (averaged in the 2016-18 period), EASA data for number of AMO per country and Cirium and GAMA 2019 databook for aircraft fleet.

3.2.1.3 Profit margin calculation

The profit margin calculation follows the already introduced approach for the helicopter domain. In this case, an extensive financial listing provides an average profit margin of 5.6% for the 2016-2018 period.

As a comparison exercise, this values is compared with the results of a previous study by ALG, already focused in the assessment of several aviation sectors[12]. In this report, the profit margin provided for this sector stands at 9%, in close proximity of this study's result.

3.2.1.4 Model limitations and further work

- A populated dataset of maintenance cost by aircraft category and in different MS would improve the accuracy of the bottom-up approach model.

[12] Regulatory Impact Assessment (RIA) to support the RMT.0679 – Revision of Surveillance Performance and Interoperatibility

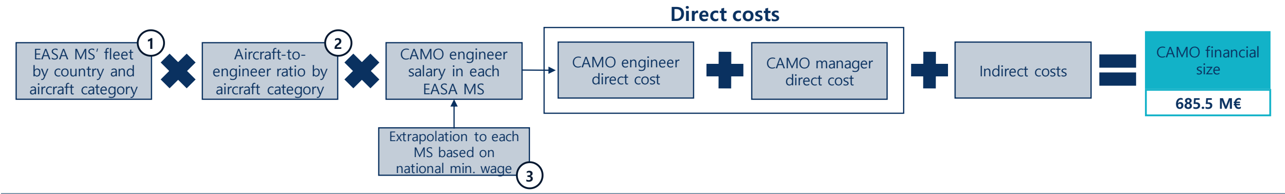
- Even though the overall results for all EASA MS are properly evaluated, using an average income per aircraft for all MS in the top-down approach may cause some under/over estimation of the financial size at a particular MS. Increasing the granularity of this variable would more accurately model each MS's industry.
- Similarly as in the point above, improving the granularity when rationalizing a country's income by its fleet, i.e., dividing not just by the total number of aircraft but factoring in the fleet categorization as in the bottom-up approach, would yield more precise assessments.

3.2.2. CAMO

The development of the model is presented in the following table.

Maintenance domain – CAMO

Bottom-Up Approach

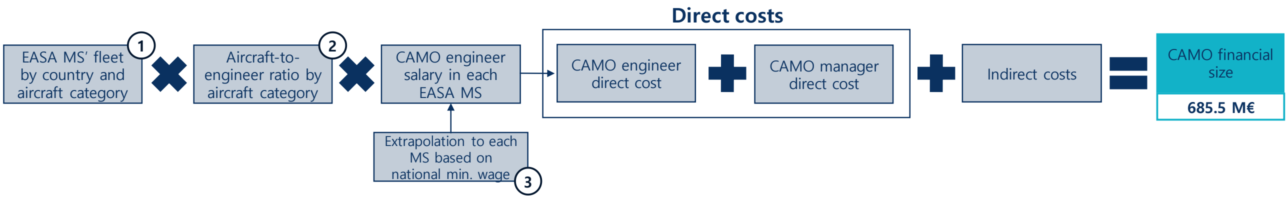


Item	Main hypothesis and sources
1	From Cirium database coupled with GAMA 2019 databook to include GA SE piston airplanes
2	Converged values from interviewee input
3	Extrapolation based on each MS minimum wage, obtained from Eurostat

Table 18. Model explanation for the CAMO domain.

Continuing airworthiness management organizations have proven to be one of the most variegated across the domains. A careful review of the business activities of the approved CAMO organizations for each deep-dive country revealed that a CAMO is often a branch of an aircraft maintenance company or used for a particular firm, e.g., an airline, to fulfil the continuing airworthiness duties internally. Even though there are companies that are exclusively dedicated to provide CAMO services, a thorough review based on approved CAMO listings published by EASA MS' CAAs has revealed that they represent a minority of the industry.

3.2.2.1 Bottom-up approach



3.2.2.1.1 Aircraft to engineer ratio

Although initially an analogous bottom-up approach to that of AMO was proposed, expert consultation and interview input suggested another approach to the assessment. CAMO requires for a continued control of the airworthiness status of a managed aircraft, preparation of the maintenance manuals, maintenance tasks scheduling, etc. This job corresponds to the CAMO department. By regulation, it is composed of Quality, Airworthiness Management and Airworthiness Maintenance managers plus the rest of engineers at their command. The regulation however, allows for the companies to concentrate these positions in two persons.

Thus, according to this structure, the nature of this activity can be linked to the human capital needed to perform this tasks plus an extra, overhead implied by administrative and infrastructural overhead to cover this operation. This is has led to the assessment of this domain using the direct costs of employment of these professionals plus the indirect ones, associated to this overhead. Therefore, the financial assessment of the CAMO sector will be cost-based as opposed to other approaches' income-based model. This scheme used can be seen in Figure 25Figure 25.

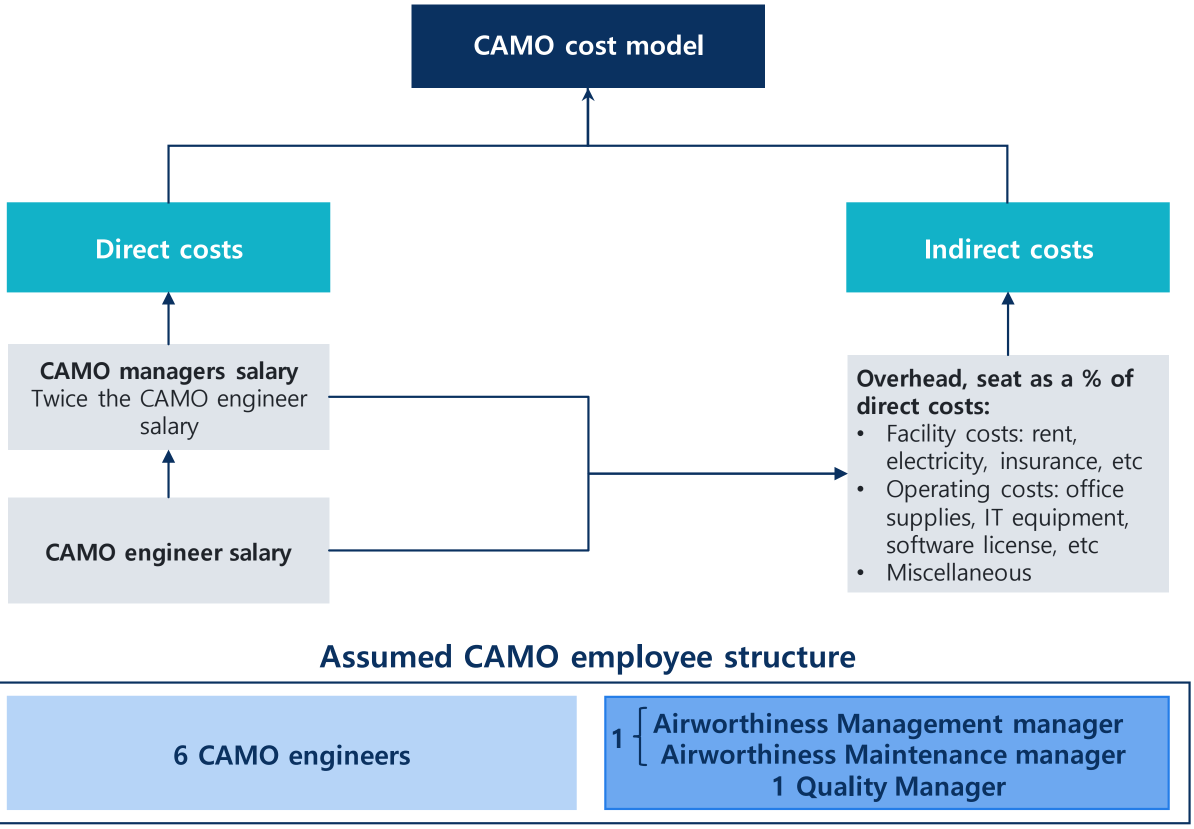


Figure 25. Cost modelling for the CAMO domain.

Source: ALG elaboration.

In the light of the structure presented Figure 27, in order to assess the costs of the domain, some parameters must be determined:

- CAMO engineer salary, obtained from interviewee input and extrapolated to all EASA MS (see Table 38Table 38).
- CAMO manager to engineer ratio. Using interviewee input (see Section 7.2.2.2), it has been determined that a manager salary is twice that of an engineer.
- Overhead. It has been set at a 15% of the direct costs, based on interviewee inputs and converged with values of public tenders (Gobierno de la Rioja, 2018), a value of 15% has been determined (see Section 7.2.2.2).
- CAMO employee structure. In order to calculate the managers' direct cost from their salary, a typical company structure in terms of personnel must be determined. It has been assumed an

average size of 8 employees, two being managers and 6 base engineers. This implies that a quarter of the whole engineer census in EASA MS are managers and the rest base engineers. By selecting this company structure, a trade-off is assumed since larger CAMO will employ many CAMO base engineers and have several management positions. A face-to-face interview with a Spanish airline, revealed that its CAMO department extended to 35 positions (Interviewee ID: 14) whereas the input from a small AMO-CAMO interview (Interview ID: 07) revealed that only the minimum required management positions were included in the CAMO (2). Thus, leveraging on the outcome of the interviews and the CAMO employee structure of a mid-size organisation (Interview ID: 04), a representative structure of 6 CAMO base engineers plus 2 managers has been chosen.

3.2.2.1.2 Aircraft-to-engineer ratio by aircraft category

Using interview inputs, the ratio of number of aircraft managed per CAMO engineer is determined, based on the same fleet categorisation used in the AMO bottom-up modelling (see Table 36~~Table 36~~). For some aircraft types, the same ratio has been assumed, based on their similarity in terms of maintenance needs. Table below, represents these ratios as well as indicates those calculated thanks to interviewee input.

Aircraft catgeory	Number of aircraft to engineer ratio
General Aviation SE Piston	20
Business Jets	8
Business Pistons	20
Business Turboprops	8
General Aviation ME Piston	20
Narrowbody Jets	2
Regional Jets	2
Regional Turboprops	2
Utility Pistons	20
Utility Turboprops	8
Widebody Jets	2
Piston helicopter	8
Monoturbine helicopter	8
Light biturbine helicopter	8
Med/Heavy biturbine helicopter	8
Interviewee input	Proxied based on similarity

Table 19 . Number of aircraft managed by a CAMO engineer ratio.

Value of 2 for Narrowbody, Regional and Widebody jets as well as for Regional Turboprops is rounded from the 1,6 input from interviewee. Color coding indicates those categories where a precise ratio has been obtained thanks to interview input and others that are proxied based on aircraft similarity. Source: ALG elaboration based on interviewee input.

3.2.2.1.3 CAMO engineer salary in each EASA MS

CAMO engineer salary is the remaining side that has to be addressed. From interview and expert judgement, a typical CAMO engineer salary is obtained. By means of a linear regression the remaining values for other MS is obtained. This has been achieved based on minimum wage by country published by Eurostat. The extrapolation results may be reviewed in further detail in Figure 55~~Figure 55~~.

Using the input from a Spanish interviewee, the base salary for a CAMO engineer is set at 37.300 € per year. On top of that, social contributions at the expense of the employer have been added, at an average value of 35% of the base salary (thus, in Spain the company expense for a CAMO engineer totals 50.355 €).

Given that there is data available for two thirds of the countries, it has been decided to keep its initial values for minimum wage and use the regression formula for the missing ones.

3.2.2.2 Top-down approach

This approach suffers from the aforementioned sector's specificities. CAMO is often tied to an operator, which covers its continuing airworthiness regulation requirements of its own fleet, to a broader company usually offering AMO and CAMO services, often embedded into a larger organisation.

This yields a very short list of companies to be reviewed that primarily focus on providing CAMO services. Adding to that, separating the business share of revenue from CAMO has proven impossible for the few examples of companies found. Therefore there is no application of the top-down approach for CAMO.

3.2.2.3 Profit margin calculation

It is worth mentioning that, as mentioned in the introduction of this model explanation chapter, the CAMO sector is primarily addressed by cost due to the business specificities it has. However, it is worth obtaining a profit margin for those companies that are primarily focused on CAMO as well as for the CAMO departments embedded into larger companies.

The financial listing in this case, provides few examples of companies focused or that their main income stream are CAMO services. Three companies have been selected, and their average profit margin is 15.0%. On the other side the report already used in Section 3.2.1.3 determines a 9% margin for CAMO companies. Therefore averaging these two results a 12.0% profit margin is considered indicative for the CAMO domain.

3.2.2.4 Model limitations and further work

- The approach addresses the sector with the proposed approach since the analysis, resting on interviewee judgement, has concluded that CAMO is a labour-intensive domain. Of course, other strategies could assess the financial size taking other paths.
- Some managed aircraft per CAMO engineer ratios have been extrapolated by similarity due to the lack of data.
- The same ratios, for a given category, are assumed in all MS.

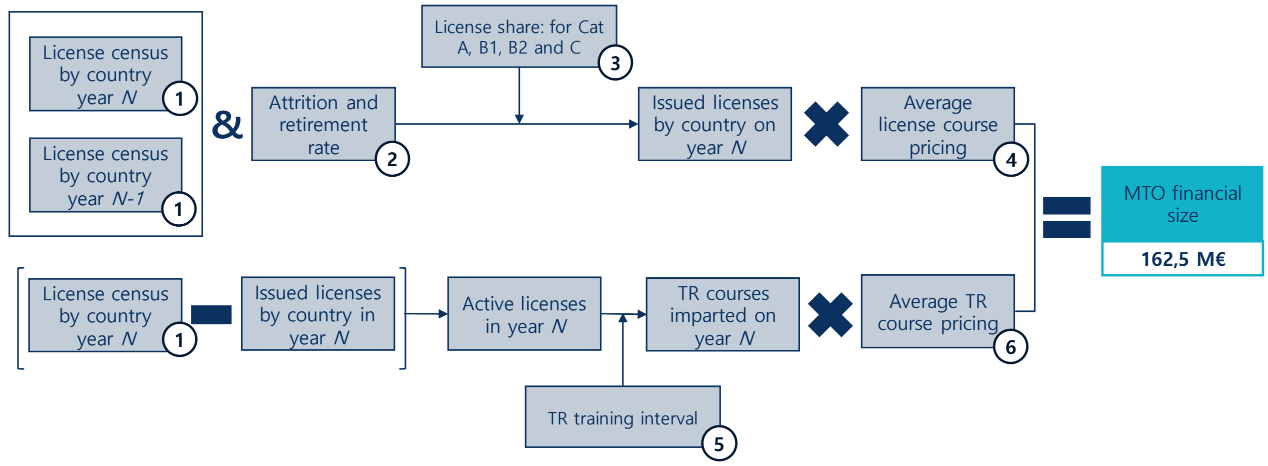
- Even though the salary extrapolation underpinned on MS' minimum wage and correlation is high, a country by country review of the salaries of CAMO engineers would improve the model's accuracy.
- Increasing the granularity when determining the CAMO structure would increase the representativeness and accuracy of the model. Three CAMO sizes could be proposed: small, the most usual, medium and large. The latter would properly cover the operational reality of airline CAMO departments.

3.2.3. MTO

The development of the model is presented in the following table.

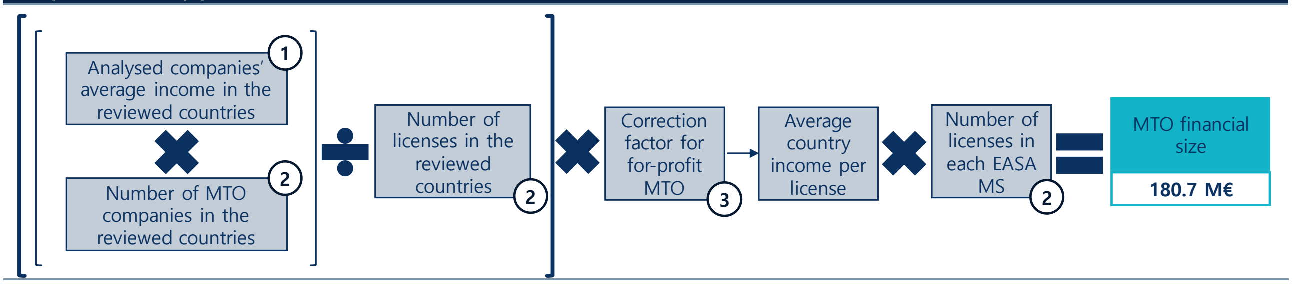
Maintenance domain – MTO

Bottom-Up Approach



Item	Main hypothesis and sources
1	From EASA data
2	From UK CAA aircraft maintenance engineer statistics, later validated with interviewees (including EAMTC)
3	Converged shares after iteration and validation with interviewees (including EAMTC)
4	From survey and interviewee input, validated also with the latter (including EAMTC)
5	Converged interval after iteration and validation with interviewees (including EAMTC)
6	From survey and interviewee input, validated also with the latter (including EAMTC)

Top-Down Approach



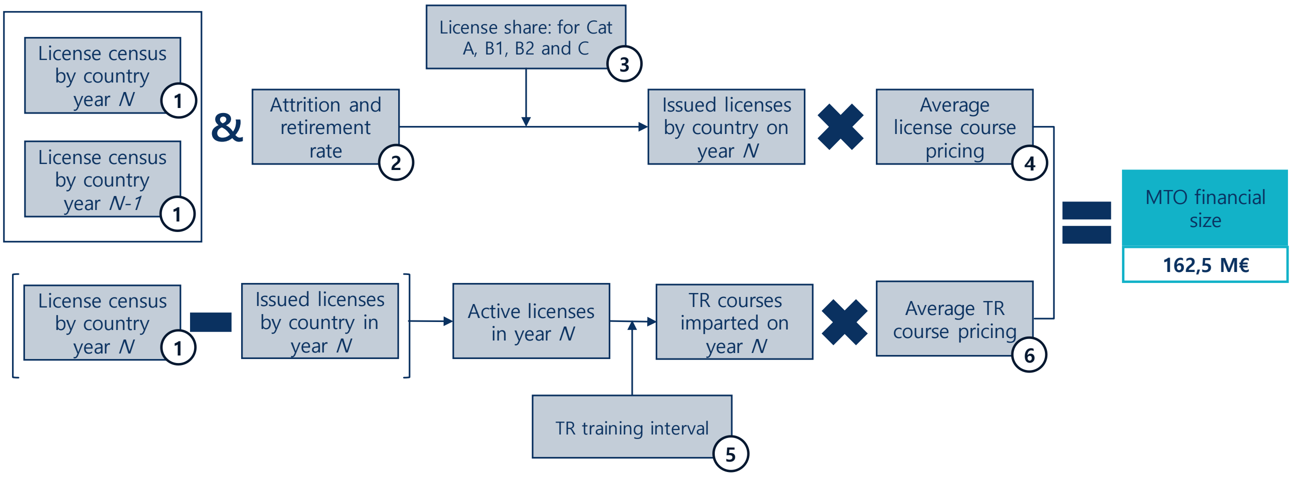
Item	Main hypothesis and sources
1	Data from business registries, survey and annual reports
2	From EASA data

3	From French, Norwegian and Spanish approved Part-147 organisations list. Excluding vocational schools, vocational training centres, etc.

Table 20. Model explanation for the MTO domain.

It is relevant to point out that maintenance training is carried out both by maintenance training-oriented companies as well as airlines which carry out training mainly internally.

3.2.3.1 Bottom-up approach



Two formation branches fall within the scope of this approach:

- Basic training: this is the first step for trainees or mechanics who pursue a license.
- Type rating training: specific training that entitles a license holder to perform specialised work on a particular aircraft or engine.

Even though maintenance training covers a vast realm courses, as mentioned above, only basic and type rating training are covered in this study. Recurrent training and other specialised courses such as Non Destructive Testing (NDT), defect reparation… are not assessed in the bottom-up approach.

Basic training financial size is addressed first. The model is structured analogously as in ATO(H) (see Section 0). Thus, the first step is to evaluate the yearly license census variation. The number of maintenance licenses for the 2013-2019 period and its yearly variation is presented in Figure 27 (although the calculation of the financial size only covers up to 2018 for consistency)**Error! Reference source not found.**.

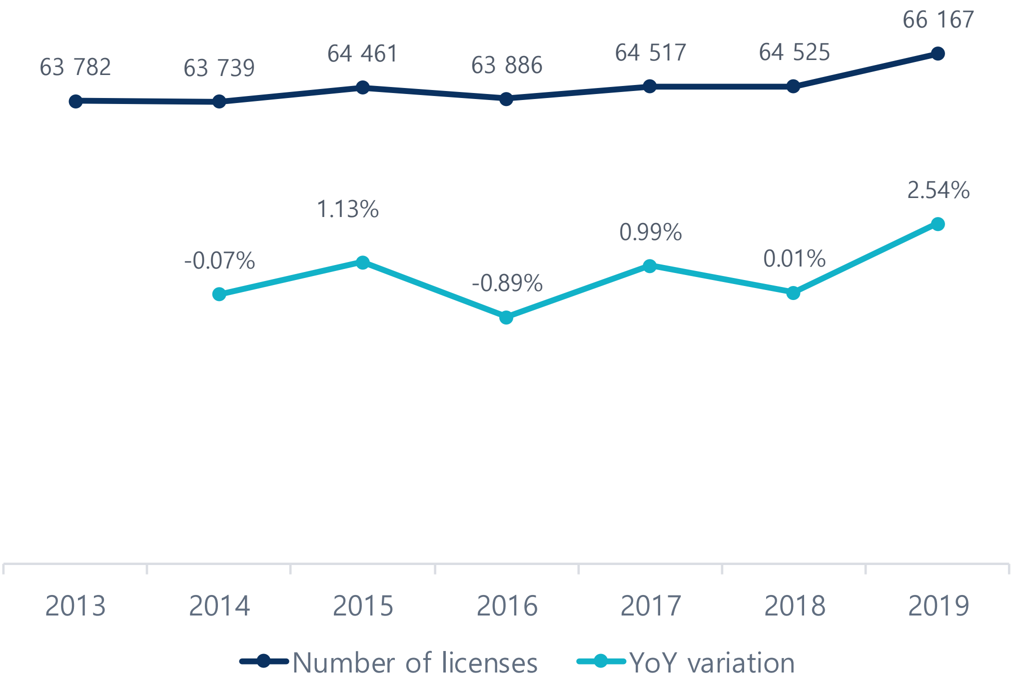


Figure 26. Number of EASA aircraft maintenance licenses and the YoY variation for the 2013-2019 interval, in all EASA MS. Source: EASA data.

Leveraging on the proposed model, there is another important variable to set: the newly issued yearly licenses. In this case, the setting of this parameter has been primarily based on UK CAA published data on aircraft maintenance license.

3.2.3.1.1 Attrition and retirement rate

Similarly as proceeded in the ATO(H) bottom-up approach, it is necessary to model the number of licenses that will leave the census in each of the reviewed years. This enables to establish a balance between two consecutive years and later calculate the number of issued licenses. In order to do that, aircraft maintenance statistics from the UK (the MS with the largest license census of the scope) have been used. This data is joined with interviewee input in order to calculate the equivalent license attrition and retirement rate. This term differs from a standard rate because it refers to licenses leaving the census, not technicians/engineers. For further insight, the reader may refer to Section 7.1.2.3.1 for further detail.

It is important to note that license data is considered at the year closure, evaluating all the license issuing during the entire year being analysed.

3.2.3.1.2 License share

In order to evaluate the number licenses issued by each country and by license category, the average license share in EASA MS has been established based on expert judgement and interviewee opinion. These stakeholders agree on the low penetration of the B3 license. The share by category is shown in below.

License type	A	B1	B2	B3	C
Share [%]	13	50	20	2	15

Table 21. License share by license category. Source: MTO interviewees (including validation from EAMTC).

Combining the maintenance license census, the share according to each license category and the ratio of licenses to the overall EASA MS license census, the number of issued licenses for each MS is obtained.

3.2.3.1.3 Average license course pricing

Finally, the results from **Error! Reference source not found.** are multiplied on a license-by-license basis in order to obtain the financial size for each MS. The course pricing is obtained from survey and interviewee input. The values are intended to represent a representative average across all MS (seen in Table 22~~Table~~

License type	A	B1	B2	B3	C
Price [€]	9 000	25 000	25 000	10 500	-

~~22~~ below).

Table 22. Average course price in € for the reviewed categories.

Note that price for C course price it is not considered since this license it is acquired solely by working experience (no course required). Source: MTO interviewees (including validation from EAMTC).

It is worth noting that due to B3 courses being relatively recent and its low market penetration, obtaining course price has proved difficult. Furthermore, interviewees have not been able to give a representative value. Thus, the price has been calculated by adjusting it proportionally to the B1 course price using the course length in hours (practical and theory training)[13].

Type rating training is assessed next. As learned from the sector review and the input from the interviewed MTO stakeholders, B1, B2 and B3 licenses are those which can further lead to type rating training.

Consequently, the approach evaluates the number of active B1, B2 and B3 license for a given year. This implies that the issued licenses for that period of time must be subtracted from the license census of that year and that it is assumed that a technician/engineer who has graduated in a given year will not enrol in a type training course until (at least) the following year.

3.2.3.1.4 TR training interval

Once the license base to be evaluated is obtained, the number of TR courses per year has been calculated. Based on the recurrence of these class of formation, e.g., training required when new aircraft variants are introduced or new engines are installed in newer airplanes, a training frequency has been introduced. It represents the average time between two consecutive training courses attended by a given engineer.

An interval of 6 years has been validated and agreed upon with the different interviewed stakeholders. Coupling this period with the typical career span calculated before, total 7 type training courses attended by an engineer during his/her career. Therefore, assuming a random distribution, it is assumed then that 1/6 of the active engineer population will be trained each year.

Thus, the number of trained engineers in type rating courses from 2016 to 2018 is shown in Table 23~~Table 23~~ below.

[13] B3 course spanning 1 014 hours versus a 2 400 hour B1 course. Link to a B3 course description from a Romanian MTO: https://www.aviationinstitute.eu/easa-part-66/full/maintenance-certifying-technician-mechanical-category-b3/

Country	Type rating courses by license category on 2018			Total by country
	B1	B2	B3	
Austria	78	31	3	113
Belgium	61	25	2	88
Bulgaria	90	36	4	130
Croatia	29	12	1	42
Cyprus	7	3	0	9
Czech Republic	104	42	4	150
Denmark	80	32	3	115
Estonia	14	6	1	20
Finland	61	24	2	88
France	616	246	25	887
Germany	690	276	28	994
Greece	261	104	10	376
Hungary	64	26	3	93
Iceland	50	20	2	72
Ireland	122	49	5	176
Italy	187	75	7	269
Latvia	30	12	1	44
Lithuania	32	13	1	45
Luxembourg	19	8	1	27
Malta	24	9	1	34
Netherlands	266	107	11	384
Norway	81	33	3	117
Poland	116	46	5	167
Portugal	118	47	5	170
Romania	83	33	3	120
Slovakia	35	14	1	50
Slovenia	40	16	2	57
Spain	320	128	13	461
Sweden	103	41	4	148
Switzerland	153	61	6	220
United Kingdom	1 009	404	40	1 454
Total	**4 946**	**1 979**	**198**	**7 123**

Table 23. Number of type training courses (only showing 2018 data) for all EASA MS.

Source: ALG elaboration based on EASA data.

3.2.3.1.5 Average TR course pricing

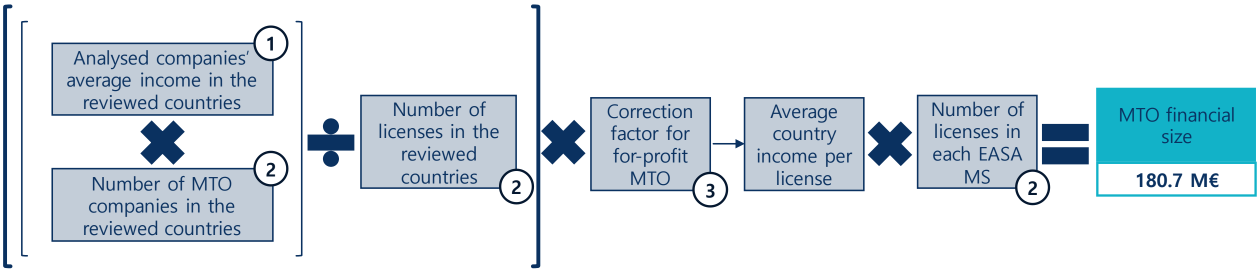
Interviewee input has been used to calculate type rating courses pricing. Interviewee input for different courses and aircraft categories has been weighted with the aircraft category's fleet in all EASA MS. Again, there was no information for B3 TR courses. Hence, the same approach as in B3 license course has been used.

Type rating course	B1	B2	B3
Price [€]	8 875	10 400	3 750

Table 24. Type rating course pricing according to license category.

Source: ALG elaboration based on weighted average with fleet of the values provided by interviewees for different aircraft categories.

3.2.3.2 Top-down approach



As in other domains, a listing of MTO companies' financial data is the first step of this approach. Similarly to CAMO, several factors challenge the compilation of relevant financial data:

- There are few approved organisations which primarily focus their business on training formation, the majority of which present relatively modest income figures. In the case of the United Kingdom, the country with the highest number of MTO in Europe, only mid-to-large companies are required to present detailed financial information. Thus, many of the potential entries to the listing are excluded.
- Many MTOs are attached to an operator, as it is the case of airlines. Even though these companies publish annual reports, precise income share for the MTO business branch has not been found.
- Commonly on many MS, several MTOs are public or secondary schools providing vocational/professional training (in France for instance, 9 out of 36 MTO are schools[14] and 2 out of 7 in Norway[15]) . Given the nature of these institutions, they do not provide financial information as privates companies do.

3.2.3.2.1 Analysed companies' average income in the reviewed countries, number of MTO companies in the reviewed countries and number of licenses in the reviewed countries

In the light of this, for MTOs a shorter list than in other domains has been assembled.

[14]Approved French MTO: https://www.osac.aero/orgaformation147

[15]Approved Norwegian MTO:https://luftfartstilsynet.no/en/forms_organisation/luftdyktighet/part-147-maintenance-training-organisations-mtoa/

Country	Number of listed companies	Source	2016-18 average company income [€]	2016-18 average number of MTO companies	2016-18 country income [€]	2016-2018 average number of licenses	2016-18 average income per license [€]
Finland	2	Survey	1.025.892	8	8.380.520	828	10.117
Spain	4	Bussiness registry	867.242	16	14.164.957	4.064	3.486
United Kingdom	3	Bussiness registry	769.235	54	41.538.711	13.295	3.124

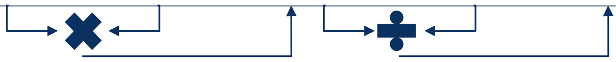


Table 25. MTO financial listing results, in €, averaged for the 2016-18 period.

Source: Survey and business registries for income figures and EASA data for number of licenses.

A representative country income per license has been obtained by extrapolation, based on the values calculated for Finland, Spain and the UK. This is done using the following formula:

$$\text{Average country income per license } [€/\text{license}] =$$

$$= \frac{\text{Average income of the reviewed companies} \cdot \#\text{MTO in the reviewed countries} \cdot \text{Correction factor}}{\text{Sum of country licenses of the reviewed countries}}$$

3.2.3.2.2 Correction factor for for-profit MTO

Observing the previous formula, a correction factor is applied to the income of the listed companies. This is done after reviewing the approved MTO (Part-147) listings of France, Norway and Spain. An individual review is done for each company, listing those that are not for-profit. Table 26~~Table 26~~ represents the results from this analysis.

Country	Number of MTO	Number of for-profit MTO	For-profit to total number of MTO ratio
France	36	27	0.75
Norway	7	4	0.57
Spain	17	14	0.82
Weighted average	**-**	**-**	**0.75**

Table 26. Number of approved MTO as of 2020 for France, Norway and Spain.

The third column includes de reduced list after discarding the non-profit MTO (public and vocational schools generally). Source: ALG elaboration based on online research and national CAA approved MTO (Part-147) listings[16],[17],[18].

Applying the calculated 0.75 correction factor to the calculated average country income per license, a value of 2.810 € per license is obtained.

[16]Link to France's approved MTO list posted on French CAA: https://www.osac.aero/orgaformation147

[17]Link to Norway's approved MTO list posted on Norwegian CAA: https://luftfartstilsynet.no/en/forms_organisation/luftdyktighet/part-147-maintenance-training-organisations-mtoa/

[18]Link to Spain's approved MTO list posted on Spanish CAA: https://www.seguridadaerea.gob.es/media/4433286/organizaciones_147_aprobadas.pdf

Finally, multiplying this calculated value by the number of licenses in each EASA MS, the financial size is obtained.

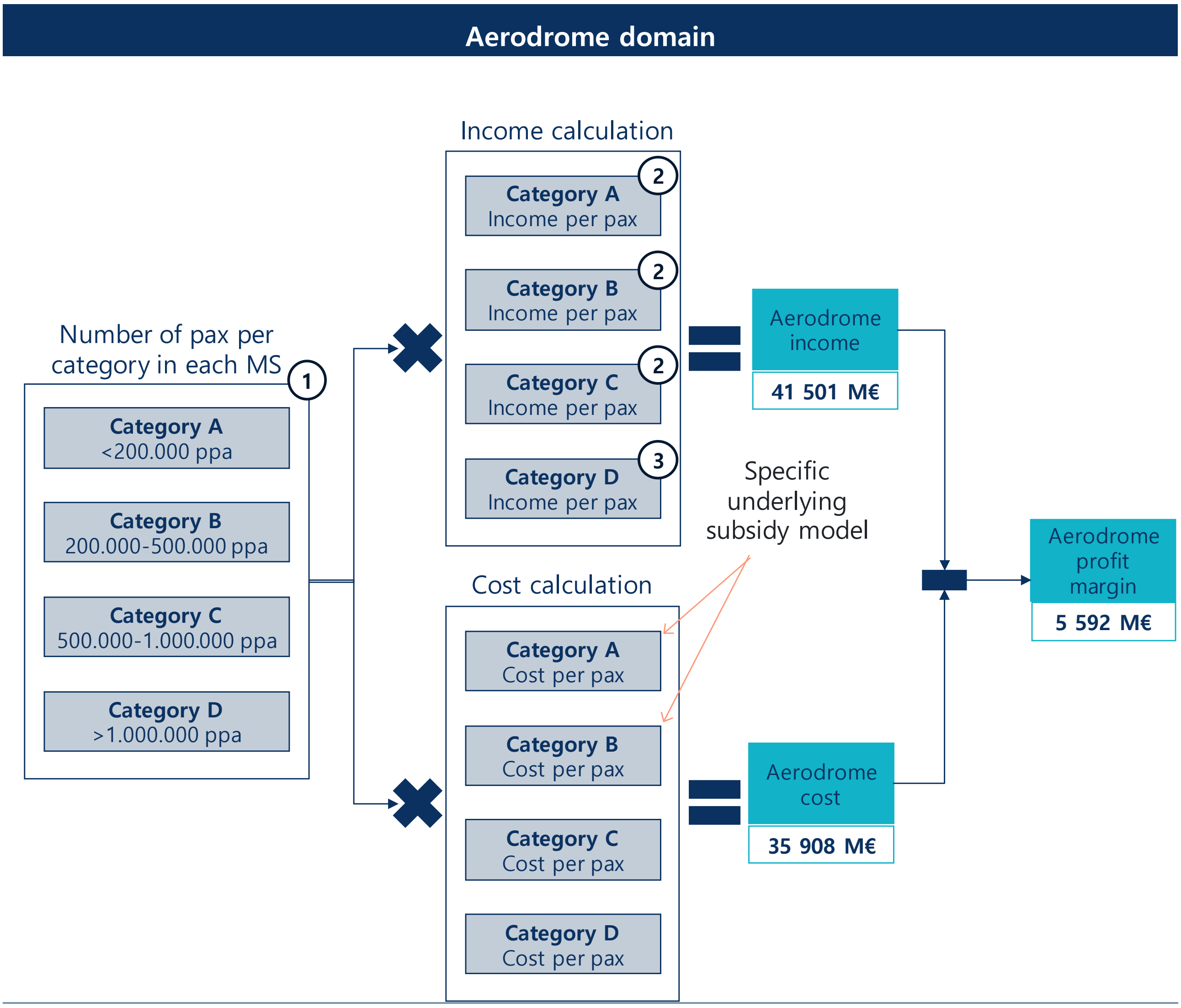
3.2.3.3 Profit margin calculation

The financial analysis of the selection of MTO companies assessed yields to a 7.3% profit margin result on average.

3.2.3.4 Model limitations and further work

- There is no distinction when computing the financial size whether a given training is provided to an internal trainee (usually an AMO employee) or an external one. Usually, the latter's formation expenses are covered by the company whereas the former's are not.
- It is assumed that licenses (excluding C) are obtained through maintenance courses. The regulation states that working experience can replace this requirement, even though it is usual for trainees to follow the first path. Further tackling this possibility would increase the study's representativeness.
- Retirement rate is calculated based on the UK CAA data. Despite being a suitable state to base the approach on given it is the one with more licenses, an analogous study could be performed on other countries with different maintenance and MTO industry characteristics.
- Maintenance course pricing is given as representative average for EASA MS. In order to improve the model, a further study could apply the same methodology for each MS. The same applies for type rating formation price, with further granularity on aircraft category, aircraft vs engine, etc.
- Unemployment has not been factored in. Sector specific values could fine tune the results, especially in type rating training.
- In the bottom-up approach, only Part-66 training is considered. Recurrent training and other types of training being non-compliant with EASA regulation are not contemplated.

3.3. Aerodrome domain



Item	Main hypothesis and sources
1	From EASA Standardisation and Eurostat data
2	From The European Commission's consultation on the 2014 Aviation State Aid Guidelines. An economic analysis of airports' profitability, by Oxera
3	ACI Europe 2017 Economics report

Table 27. Model explanation for the aerodrome domain.

The specificities of this sector, namely: the high degree of public involvement in its operation, relevance in terms of economic size and employment figures, strategic importance within the tourist and business sectors, etc. lead to an abundant amount of literature being accessible for model building and validation.

Addressing Europe in particular, there are several industry representative bodies, agencies and associations regularly publishing forecasts, outlooks and reports on the status of the sector in Europe. These entities typically collect data from their members, process it and provide figures of economic and financial performance of the aerodromes they represent, at different granularities.

As a consequence, the aerodrome financial size modelling has not been divided between a top-down and bottom-up approach as for the other domains.

3.3.1. Number of passengers per year

In Section 1.2.1.3, there is an explanation of the aerodrome selection that falls in this study's scope, i.e., the 579 aerodromes in EASA MS covered by Regulation (EU) 2018/1139.

This criterion results in a comprehensive listing of European aerodromes ranging from major international hubs in the tens of millions of annual passengers to regional/local facilities with low or very low commercial traffic.

This distinction is key since industry leading publications tend to represent aerodromes sitting at the higher end in terms of capacity and revenue. According to Airports Council International (ACI), most of the aerodromes responding to their evaluation surveys handle above 5 million pax *per annum* (mppa), and their data is particularly representative for aerodromes above 1 mppa. Therefore 1 Mppa is set in this study as the threshold separating larger aerodromes and local/regional ones[19].

The value of the proposed approach rests in the analysis of regional and/or low traffic aerodromes, which amount to a significant number across all the studied states. Albeit their financial size may not be a big share of the overall in the European context, they present some relevant characteristics of interest for this study. To name some of the most relevant:

- They are the backbone of the local aviation industry activity at or nearby the aerodrome: aircraft manufacturers, maintenance and scrapping companies, etc.
- They provide significant regional development opportunity to many communities across Europe, which is tangible although sometimes difficult to assess.
- They are subject of public aid via different mechanisms: grants, fund injections, fare discount, etc.

3.3.2. Aerodrome subsidy model

The modelling follows an approach based on assembling the available inputs from sectorial reports for larger aerodromes complemented by an estimation of public funding practices for regional aerodromes.

As a matter of fact, the European Commission has taken decisive action into the regulation of the public intervention into the funding of public, mixed and private aerodromes across its MS.

[19] ACI, focusing primarily on large aerodromes, considers the following ranges for aerodromes over 1 Mppa: 1-5 Mppa, 5-15 Mppa, 15-25 Mppa, 25-40 Mppa and over 40 Mppa.

More precisely, in Guidelines on State aid to airports and airlines 2014/C 99/03[20], the European Commission lays down the framework for public institutions to offer aid to regional aerodromes, whose presence and use is defined in the guidelines. The Commission expects that through this funds, the addressed aerodromes will be able reach self-sustainability within a 10 year horizon (2014-2024). There are three key points to extract from it that have been considered in the model:

1. There is a precise description of the concept of public funding granted to aerodromes (making no distinction on whether they are public or private undertakings). Generally speaking however, private involvement in aerodrome management or operation occurs in larger aerodromes, being the regional/local ones under the responsibility of a public administration.
2. Aid is categorized either as operational or investment:
   a. Operational aid is the share of the operating costs of an aerodrome not covered by its revenues, namely *"the operating losses of an airport over the relevant period, discounted to their current value using the cost of capital, that is to say the shortfall (in Net Present Value terms) between airport revenues and operating costs of the airport."*
   b. Investment aid is targeted for infrastructure that is genuinely needed and that does not create redundancy with coexisting aerodromes within the same catchment area. Similarly, the intensity of this class of aid is categorized according to aerodrome size in terms of annual passengers.

   Due to the nature of this study, aimed at assessing the financial size of aviation stakeholders, focusing on their operations, only the operating aid have been included in the model.
3. The amount of aid or the percentage of this gap that can be covered by means of public funding is defined as aid intensity, namely *"the total aid amount expressed as a percentage of eligible costs, both figures expressed in net present value terms at the moment the aid is granted and before any deduction of tax or other charges."*

According to these guidelines, the Commission defines four aerodrome categories as a function of their annual passenger's volumes. Each category is associated to a maximum percentage of aid intensity that can be provided. The thresholds and percentages can be reviewed in Table 28~~Table 28~~ below:

[20] Link to EU guidelines: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.C_.2014.099.01.0003.01.ENG

Category	Annual passengers	Maximum operating aid intensity
1	<200 000	100%
2	200 000-500 000	80%
3	700 000-3 000 000	50%
4	>3 000 000	0%

Table 28. Aerodrome categorization for state aid allocation purposes, as defined by the European Commission. Source: Guidelines on State aid to airports and airlines 2014/C 99/03.

These thresholds leverage on academic and industry literature seeking to establish the barrier in terms of annual passengers based on which aerodromes can cover their operating costs and be profitable. Several authors have proposed several thresholds, which are also dependent on the reviewed country or countries. There is a general consensus that this threshold lies between 0,5 and 1 Mppa: 460 000 ppa (Adler, Liebert, & Yazhemsky, 2013), 500 000-700 000 ppa (Fageda & Voltes-Dorta, 2012), and 1 Mppa according to ACI.

The model developed for this study similarly splits the aerodromes under scope according to their passenger volumes per year. For larger-sized aerodromes, ACI Europe Economics Report 2017 is used for aerodromes with more than 1 Mppa (Category D). Below this line, three groups have been established. These are: below 200.000 ppa (Category A), between 200 000 and 500 000 ppa (Category B) and between 500 000 and 1.000 000 ppa (Category C).

Table 29~~Table 29~~ below represents the proposed categorization, the average passengers per category using the described sources as well as the number of aerodromes by category.

Aerodrome categroy	Subcategory	Ppp range	Number of aerodormes	Sum of subcategory's ppa	Average ppa per aerodrome
A	A.1	0-100 000	203	4 263 141	21 001
	A.2	100 000-200 000	48	6 583 101	137 148
B	B.1	200 000-300 000	35	8 829 513	252 272
	B.2	300 000-400 000	18	6 426 171	357 010
	B.3	400 000-500 000	24	10 626 588	442 775
C		500 000-1 000 000	27	18 657 542	691 020
D		>1 000 000	186	1 815 428 435	9 760 368
No data		-	38	-	-
Total		-	**579**	**1 870 814 491**	-
	EC guidelines	*1 000 000-3 000 000*	*74*	*135 034 358*	*1 824 789*

Table 29. Aerodrome count and passenger figures for the proposed category.

In the last row, data for the 1-3 Mppa range used by the EC .

Source: ALG analysis based on 2018 EASA data for aerodromes. When 2018 data is missing, 2017 data has been used. If neither is available, Eurostat 2018 data has been employed as a last resort.

This categorisation differs from that proposed by the Commission, and rather reflects the preliminary analysis on the operating aid granted to 14 French aerodromes, based on Transport and Environment review of the aid allocated to regional aerodromes where Ryanair operates[21]. From this report's data, subsidies per passenger (€/pax) have been benchmarked. The correlation analysis has provided interesting results, shown in Figure 27~~Figure 27~~ below.

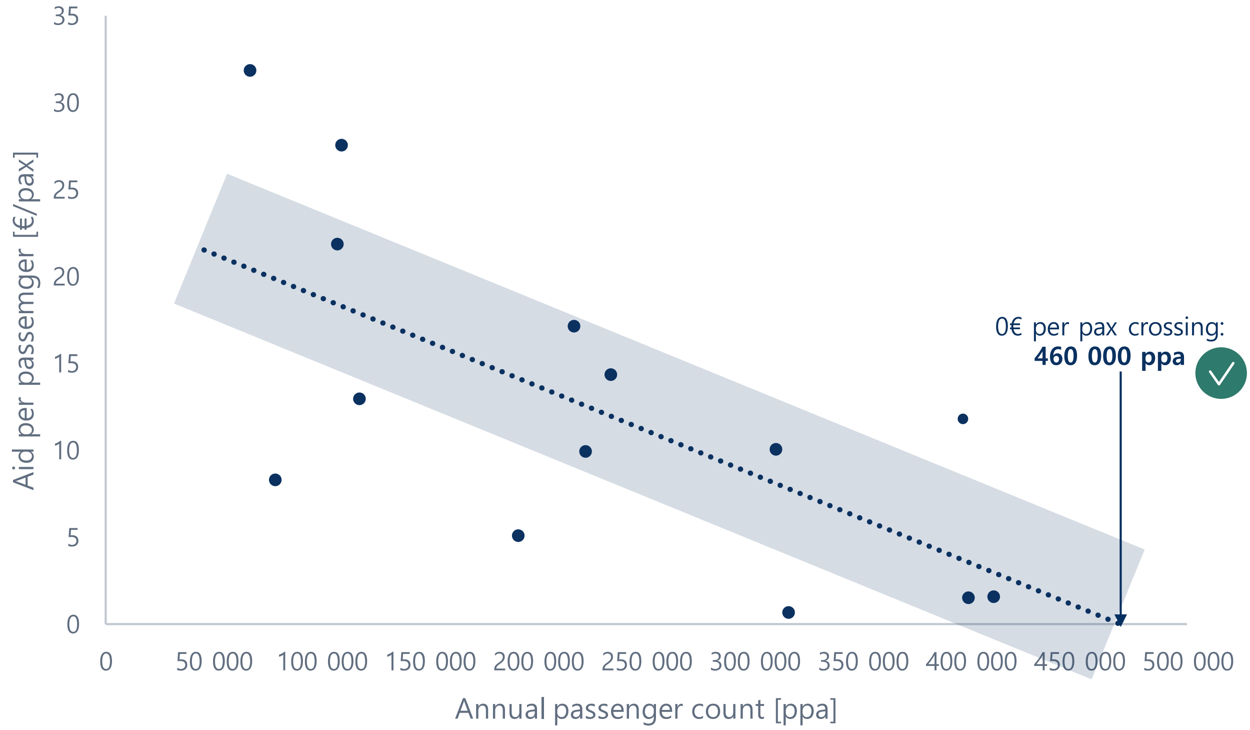


Figure 27. Regression study of state aid to French regional aerodromes, highlighting the 0 € per pax crossing at 460.000 ppa. Values in €/pax.

Source: ALG elaboration based on T&E report and passenger figures from

Category A is justified by the regulatory provision of 100% coverage of the funding gap. Category B applies for aerodromes that can be aided up to 80% and stretches to 500.000 ppa since it is the threshold obtained with the regression analysis (for the sake of granularity, A and B categories have been subdivided in order to obtain a more progressive visualisation of the model as ppa numbers increase). This approximation is combined with empirical evidence proving some aerodromes applying for funding above this threshold, Category C, by assuming that these aerodromes barely match their operational costs with their income. Finally, Category D aerodromes are modelled as typically sustainable commercial entities.

At his stage, it is clear then that the categorisation put in place by the EC and that of this study differ. Moreover, by enforcing the condition of a 0.5 Mppa threshold for subsidies, the impact of them on larger aerodromes is not computed. In order to validate this assumption, an analysis has been carried out in order to validate the appropriateness of this statement.

[21] Link. https://www.transportenvironment.org/sites/te/files/publications/2019_07_Report_analysis_state_aid_Ryanair_airports.pdf

As reported in the modelling chapter for the aerodrome domain in this study (see Section 0), it is assumed that only Cat. A and B aerodromes receive public aid. As mentioned, this is an approximation since it enforces that aerodromes in the range of 0,5-3 Mppa will not receive any kind of public aid. Even though a share of subsidies is overlooked, evidence proves that the major share of public aid is destined to Cat. A and B aerodromes. According to a financial report on the French aerodrome network commissioned by the government, it is highlighted that the budgetary balance between 0,5 Mppa is uncertain, while below 0,2 Mppa it is very unlikely (CSAC, DGAC, & CGET, 2017). Furthermore, the Competition Directorate-General of the European Commission briefed the new implementation of the introduced Guidelines for state aid to aerodromes in the EU[22]. It found that the recipients of aid were distributed according to the aerodrome size as displayed in Figure 29**Error! Reference source not found.** below.

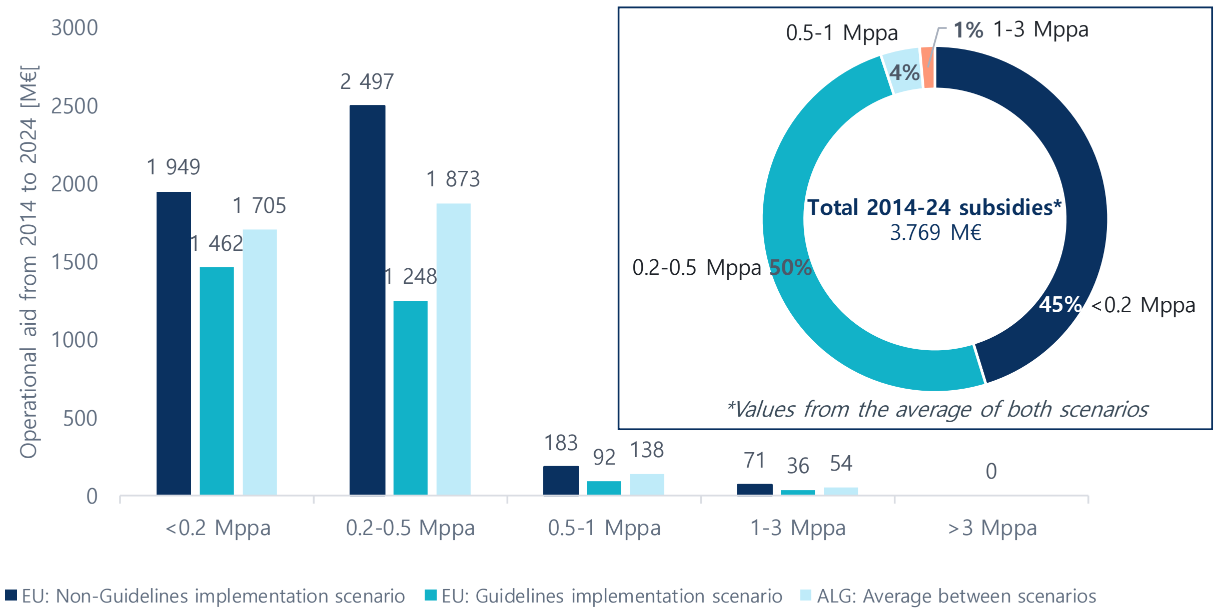


Figure 28. State aid previsions, in M€, of the EU Commission on the amount of state aid granted to EU aerodromes in the 2014-24 period.

Source: ALG elaboration based on the EU Commission briefing.

As evidenced, aerodromes below 0,5 Mppa receive 95% of all the state aid allocated in EASA MS. Therefore, the proposed model covers close to the entirety of these funds. To further check the accuracy of the results, in Figure 30 the yearly subsidies allocations calculated by the EU Commission and the model are compared.

[22] Link to the EU Commission briefing: https://ec.europa.eu/competition/publications/cpb/2014/002_en.pdf

Figure 29. Comparison between the EU Commission and model estimates of yearly state aid allocation to aerodromes in Europe, in M€..

Source: ALG elaboration based on EU Commission's briefing on state aid to aerodromes and the sources mentioned in the model.

In the light of these results, the subsidy model is deemed to properly assess the framework in EASA MS. It is important to note that even though the Guidelines stem from the European Commission, they apply as well to the rest of the non-EU EASA MS namely, EFTA MS. As a condition of the free trade agreement, Iceland, Liechtenstein, Norway and Switzerland are subject to this regulation. Their compliance is tracked by the EFTA Surveillance Authority (ESA)[23].

3.3.3. Income calculation

Income per passenger figures are obtained from different sources in an effort to involve diverse country data. For Cat. A aerodromes, income per pax figures has been obtained from a benchmark of the Norwegian aerodrome network, with many aerodromes in this ppa range and a dense network of regional aerodromes in remote areas (German Airport Performance, 2012). For Cat. B and C, an industry report prepared by Oxera on the profitability of regional aerodromes is employed (Oxera, 2019). Finally, ACI is the source for large aerodromes (Cat. D) due to their expertise in this field (ACI Europe, 2017). It must be noted that all the values have been converted to €, if required, using mid-year exchange rates. Also, values have been adjusted for inflation to 2018.

Regarding costs modelling, the proposed distinction presented in Section 1.2.1.3 is followed. Thus, they are separated in operational and capital costs. Operational costs are modelled using the proposed subsidy model and the aid intensity applied to each category to fulfil its operational gap. Capital costs are modelled thanks to ACI publications. Capital costs for Cat. A, B and C aerodromes are obtained from ACI Airport Economics 2017 report. In particular, the ratio of capital to operational costs is used, resulting in a 0.21 (Airports Council International, 2017). The same approach is used for Cat. D aerodromes, resulting in a 0,49 ratio, based in this case in (ACI Europe, 2017). Thus, the total costs are obtained by adding the value of operational and capital costs.

The summary of the income, cost, subsidy and profit margin calculation may be reviewed in Table 30~~Table 30~~.

[23] Link to the ESA website section where applicable State Aid guidelines to EFTA members are listed. Note that when selecting State aid to Airports and Airlines, the user is automatically redirected to the EC's portal. http://www.eftasurv.int/state-aid/legal-framework/state-aid-guidelines/

	Category A	Category B	Category C	Category D
Income	Avinor's network report: 13.40 €/pax	Oxera report: 14.53 €/pax	Oxera report: 14.53 €/pax	ACI Europe report: 22.42 €/pax
Subsidies	Subsidy per pax regression formula: $Subsidy\left[\frac{€}{pax}\right] = -0.00005\left[\frac{€}{pax}\right] \cdot Average\, Cat.ppa + 23.41€$		Able to cover op.costs: 0 €/pax	Self sustainable: 0 €/pax
Operational costs	Costs per pax formula: Aid intensity [Cat.A, Cat.B]=[100%, 80%] $Op.\ costs\left[\frac{€}{pax}\right] = Income + Subsidy/Aid\ intensity$		Equal to income: 14.53 €/pax	ACI Europe report: 12.78 €/pax
Capital costs	ACI Airport Economics report: $\text{Capital } costs\left[\frac{€}{pax}\right] = 21\%\ of\ operational\ costs$			ACI Europe report: 6.21 €/pax
Profit margin	Profit margin per pax formula: $Margin = Income\ -\ Costs = Income\ -\ (operational + capital\ costs)$			

Table 30. Detail of the different financial model of income, subsidies, cost, and margin per pax for each aerodrome category.

All values are adjusted for inflation and exchanged at that year ER. Source: ALG elaboration based on EASA Standardisation and Eurostat data on passengers transported per year and the industry reports mentioned in the chart.

Translating this model to the different categories used, the following income-cost margin evolution is obtained, represented in Figure 30 ~~Figure 30~~ below.

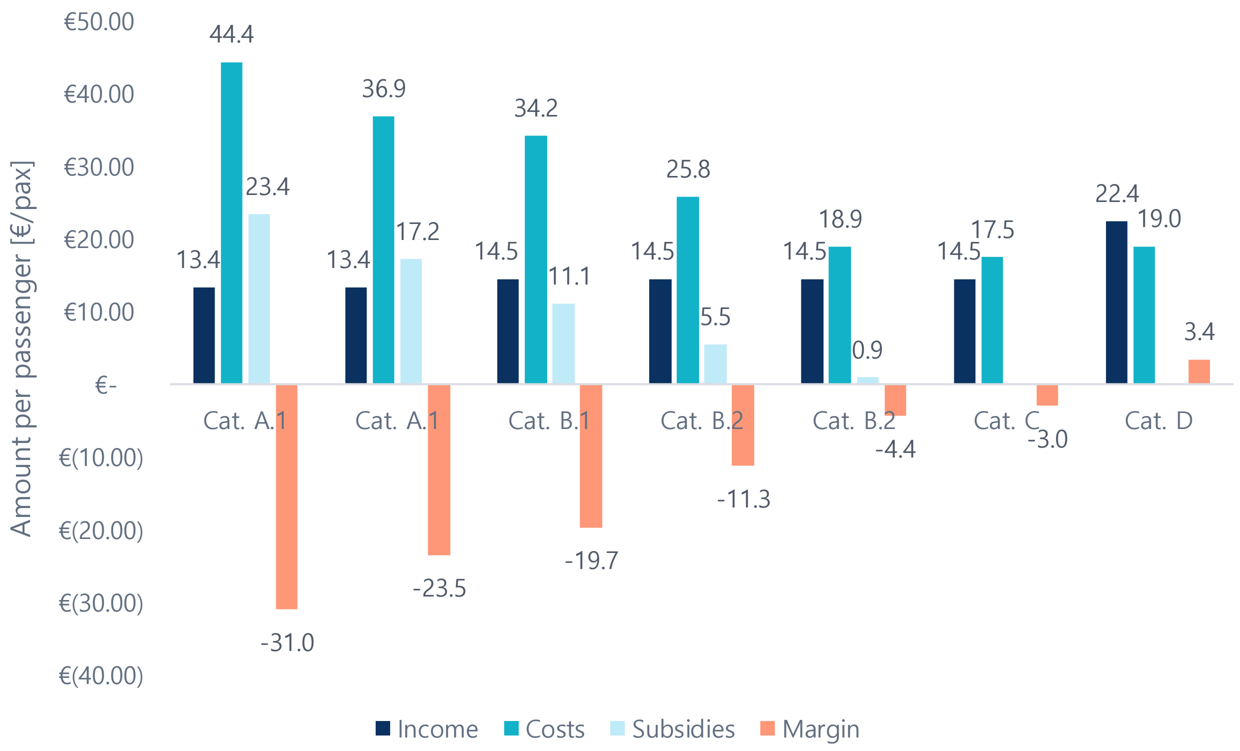


Figure 30. Income, cost and margin according to the different aerodrome categories, in € per pax.

Source: ALG elaboration based on EASA Standardisation and Eurostat data on passengers transported per year and the industry reports.

As anticipated, only Cat. C and D aerodromes are able to match their operational costs, with only the latter posting a profit for the 2018 year. The choice of this approach implies that:

- Income is considered as the turnover stemming from the aerodrome operation for the reviewed time frame.
- As explained, only operational costs are tackled by the subsidy model. Capital. Only for Cat. A aerodromes, the funding gap is completely covered. As indicated on the previous figure, in Cat. B aerodromes (Cat. B.1, Cat. B.2 and Cat. B.3) subsidies do not cover the losses since only an 80% of the funding gap may be covered with subsidies, unlike Cat A. which may be covered completely.

At this point, aerodrome categorisation has been performed and passenger financial figures obtained. Merging both enables the assessment of the economic size of each aerodrome category in all EASA MS[24]. The detailed results from the approach may be reviewed in Section 0.

[24] Note that Liechtenstein is not listed in the aerodrome under scope. Consequently, its financial in this domain equals to 0 €.

3.3.3.1 Profit margin calculation

This particular sector requires splitting the profit margin review for larger and regional/local aerodromes. Thus, margin has been calculated for Cat. A to C and Cat. D separately:

- Profit margin for regional/local aerodromes: the calculated value stands at -79.8%, consistent with the results of these loss-making aerodromes.
- Profit margin for large aerodromes: the profit margin for these aerodromes is 15.2%.

3.3.4. Model limitations and further work

- Only operational aid is considered in this study. It would also be meaningful to include investment aid although this was excluded due to the operational focus of the study.
- Even though it is not aid directly related to aerodromes, start-up aid to airlines for opening new routes in (as in almost all cases) regional aerodromes and Public Service Obligations routes could also be factored in since they indirectly affect aerodrome operations. This typically occurs in fee discount, exemption of some charges, etc.
- Income, cost and profit margin per pax figures are set as an average for all EASA MS. Further granularity in a country-by-country basis would improve the accuracy of this assessment and better capture specificities of each country, for instance, the revenue model of tourist-attracting countries such as Spain or Greece as opposed to Iceland or Norway.
- Subsidies are considered for Cat. A and B aerodromes. Although the European Commission' analysis confirmed that this group of aerodromes (below 500.000 ppa) attract most of the aid, including the subsidies granted to larger aerodromes would improve the precision of the model.
- Aerodrome income has been split in aeronautical and non-aeronautical. Ground handling and other miscellaneous sources, e.g. facility management or special guest services, are only specified for larger Cat. D aerodromes.
- It must be noted that the ownership and operational configuration that the reviewed states have in their aerodromes affects the source of the subsidies. In Europe, two main models can be found:
  - Network model. A single operator holds the ownership and operates all or the majority of the aerodromes in a particular company. Under this scenario, profitable aerodromes (usually the larger ones) cross-subsidize the loss-making ones (usually the regional or local aerodromes) in order to cover their deficit. This model is applied in several MS. The most prominent network operators are AENA in Spain, operating 47 aerodromes and two heliports out of the total 53 commercial aerodromes/heliports in Spain. Avinor is the network operator in Norway, managing 43 out of the 49 aerodromes falling under EASA BR. Other examples are Finavia in Finland and Tallinn Airport Group in Estonia. These type of operators have traditionally been public owned enterprises, some having opened the door to private investment in the recent years (AENA sold a 49% stake to investors in 2015).

- Independent management. In this case, an independent company operates a single aerodrome or a small group of them. In Europe, this model is shaped in different ways. It is common for local governments to operate their aerodromes through a local public enterprise, usually in conjunction with other administrative bodies such regional councils. Ever increasingly, Public-Private Partnership (PPP) models are applied to these infrastructures. Public subsidies for these aerodromes are granted by state institutions since they lack the support of a network.

Having this categorisation in mind, the comparison performed in Figure 29~~Figure 29~~ must be understood as a validation tool of the approach. However, given that some aerodromes in particular MS are cross-subsidised by their profit-making counterparts, the result of 356 M€ is subject to variation.

4. Model results

4.1. Overview

The implementation of the models described in chapter 3 provides these financial estimates for the EASA Member States which can considered as reference values for the year 2019.

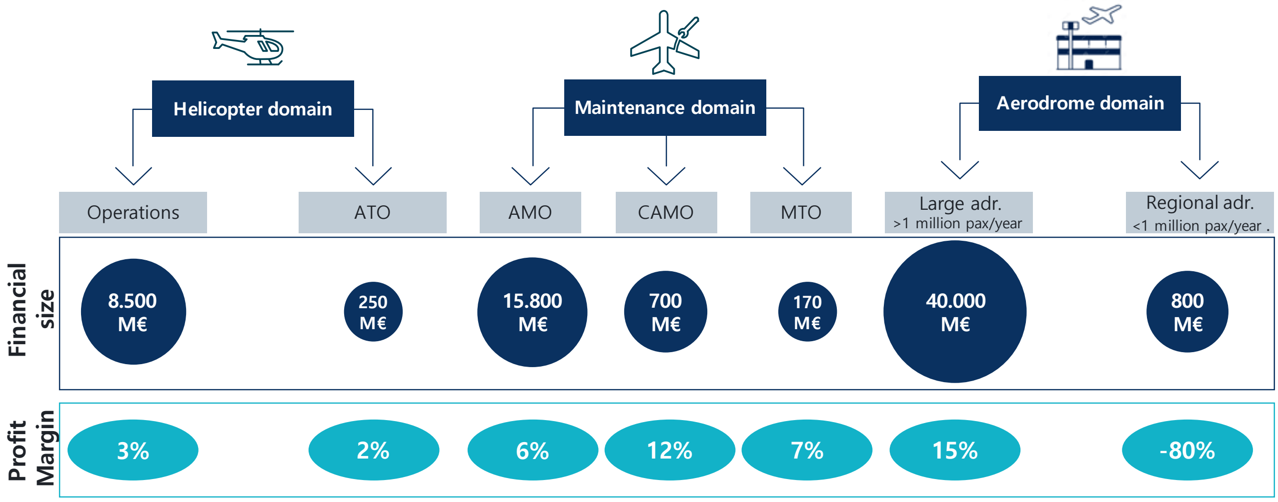


Figure 31. Total financial size and profit margin for all EASA MS per domain (approximate figures, 2016-2018 average values).

Source: ALG elaboration based on the operational and financial sources mentioned in the modelling sections.

4.2. Results for helicopter domain

4.2.1. Helicopter operators

4.2.1.1 Bottom-up approach

The financial size according to each of the considered operation categories is presented in Figure 32Figure 32 below.

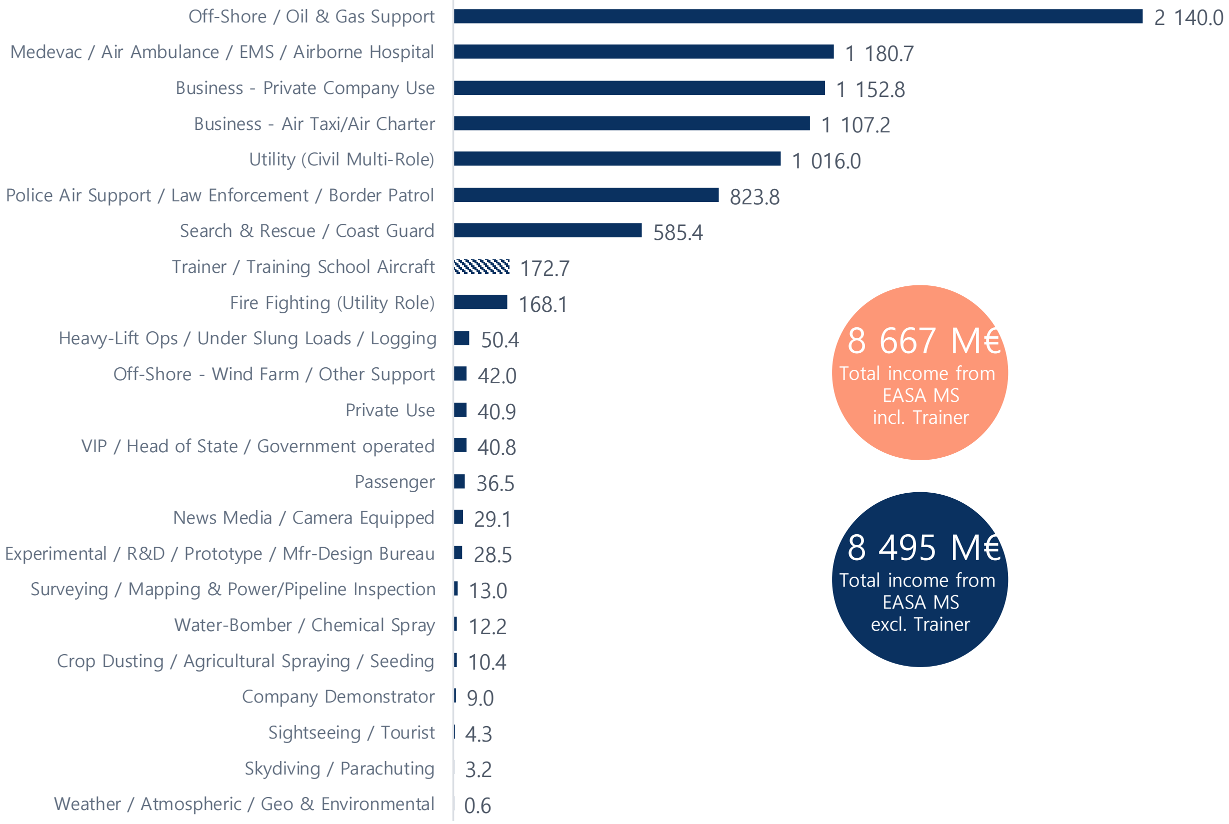


Figure 32. 2018 income according to each of the considered operation categories, in M€, in all EASA MS. Note that the total result is provided both including and excluding Trainer operation. Source: ALG analysis.

Finally, Figure 33~~Figure 33~~ represents the income from helicopter operations in all EASA MS.

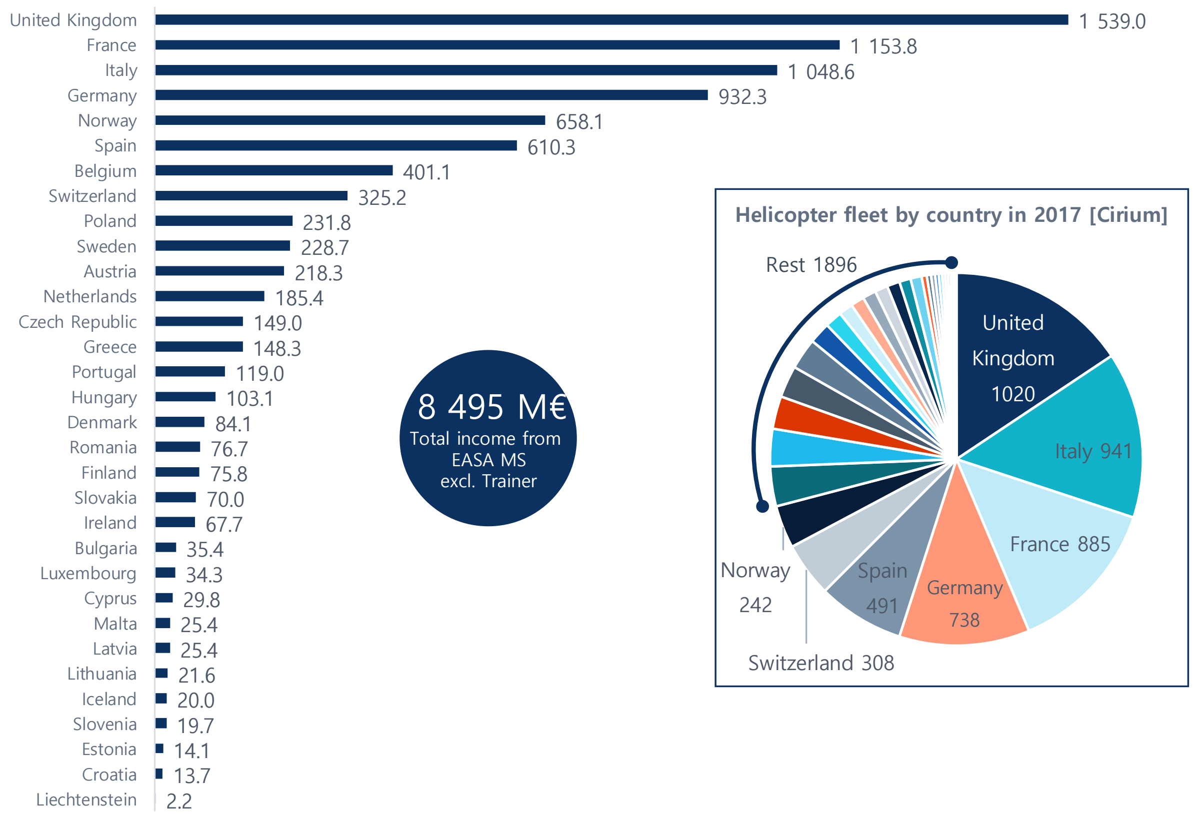


Figure 33. 2018 income, in M€, in all EASA MS from helicopter operations.
In the right, classification of the top ranking MS in terms of helicopter fleet.
Source: ALG analysis based on the cited sources in the model section.

4.2.1.2 Top-down approach

In this section, the average 2016-18 income from helicopter operations is presented for all EASA MS.

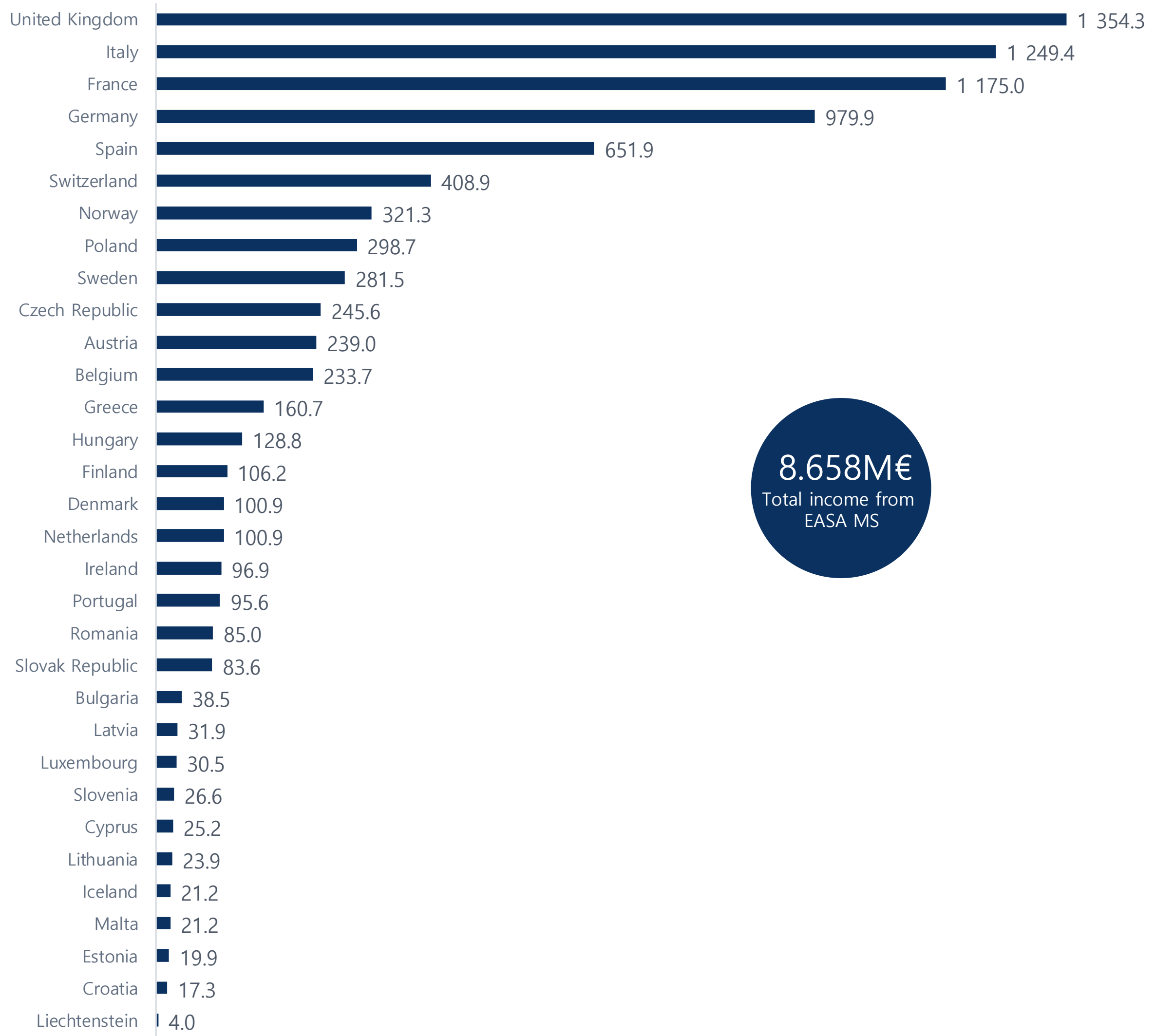


Figure 34. Income, in M€, from helicopter operations in all EASA MS.

Average values from 2016-18.

Source: ALG analysis based on the cited sources in the model section.

4.2.2. Helicopter ATO

4.2.2.1 Bottom-up approach

First of all, a review of the evolution of the financial size, in this case assessed as the domain's income, is proposed. The income values for all EASA MS between 2016 and 2018 are represented in Figure 35Figure 35 below, sorted by income from initial license training (PPL(H), CPL(H) and ATPL(H)) and IR and TR training.

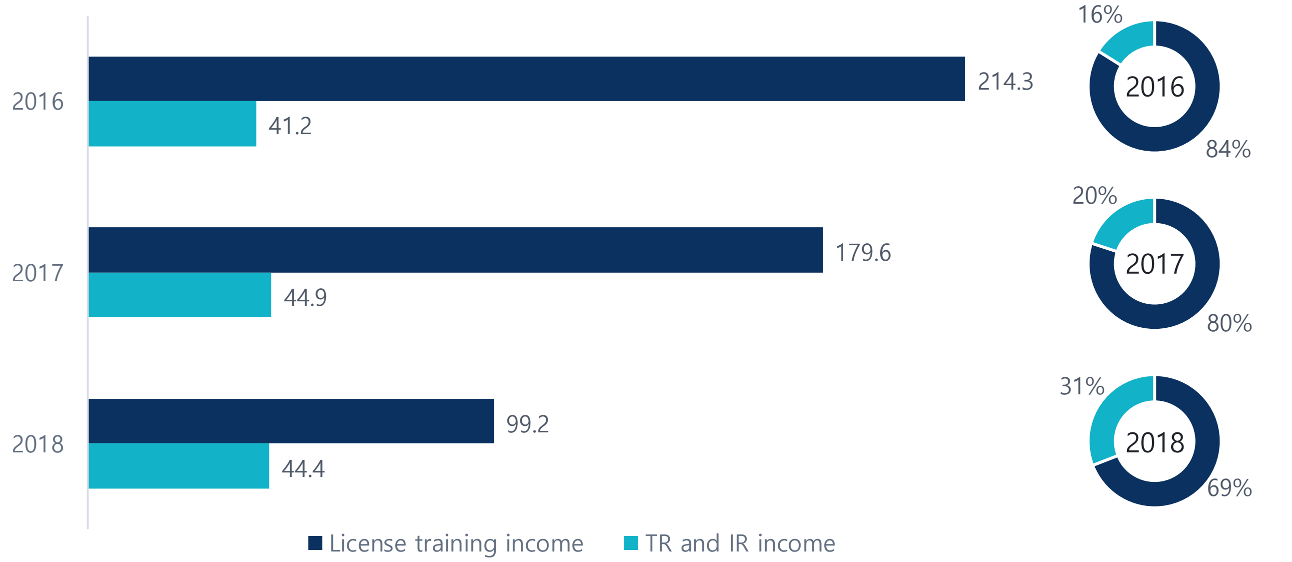


Figure 35. 2016-18 evolution of the ATO(H) financial size, represented as the income (in M€), for all EASA MS, of initial license training and IR and TR training.

Source: ALG analysis based on the cited sources in the model section.

As it can be seen, the financial size for this industry has steadily decreased for the reviewed years. It can be explained by the reduction or stagnation of the license census for the different license types. Since the growth is becoming nearly zero (flat curve) or even decreasing, the number of required licenses to compensate the outgoing ones is reduced. This is exemplified by

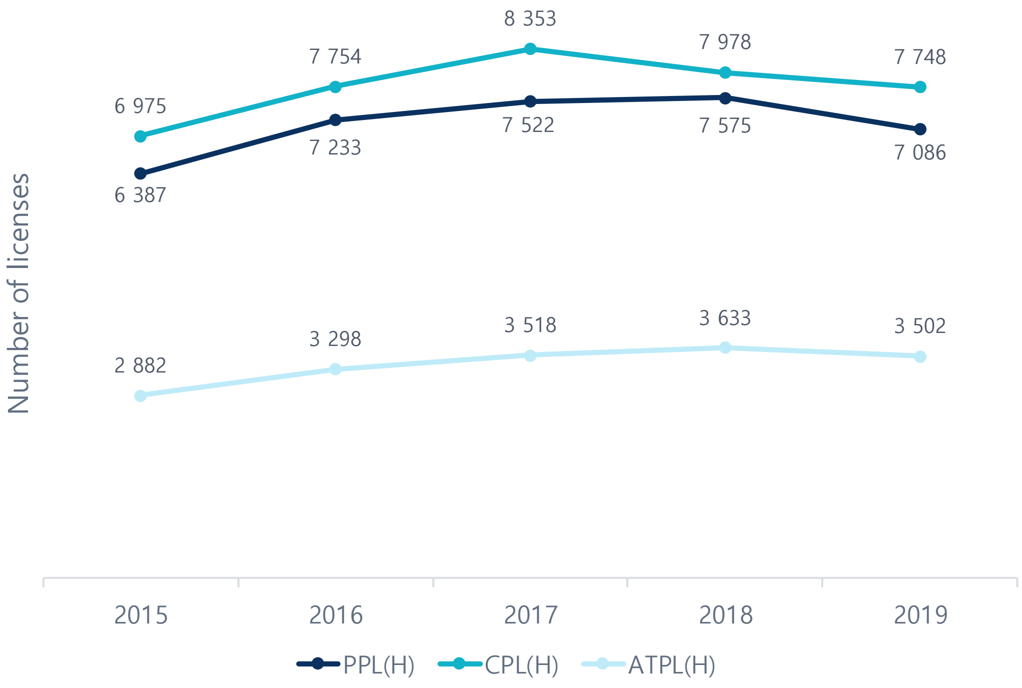
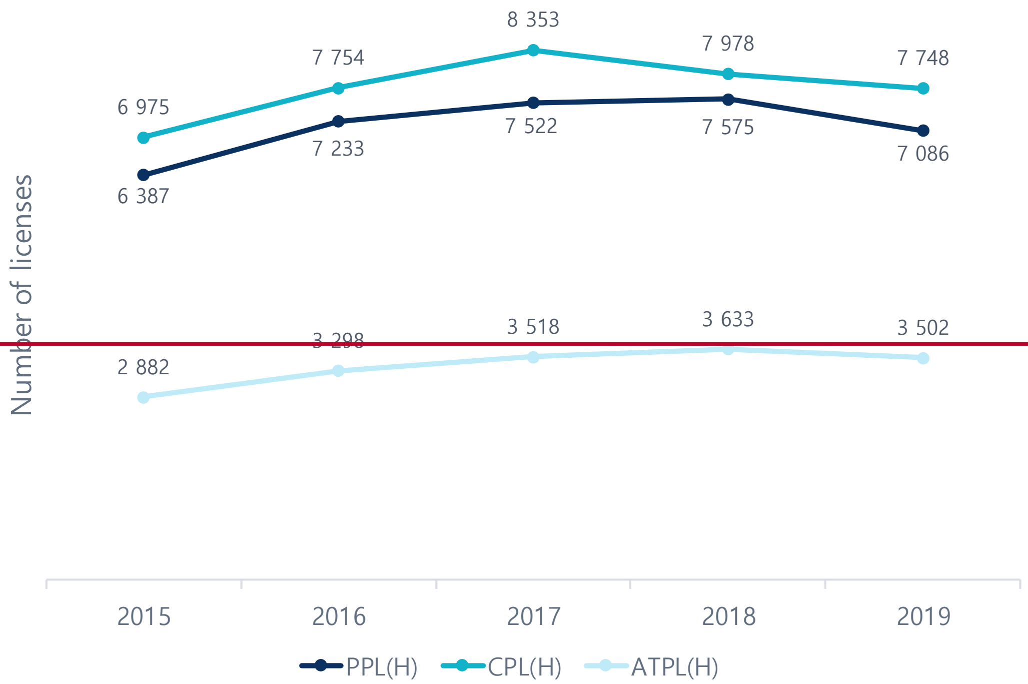


Figure 14



~~Figure 14~~, where the license census evolution can be seen.

A general picture of the income distribution by country is presented in Figure 36Figure 36.

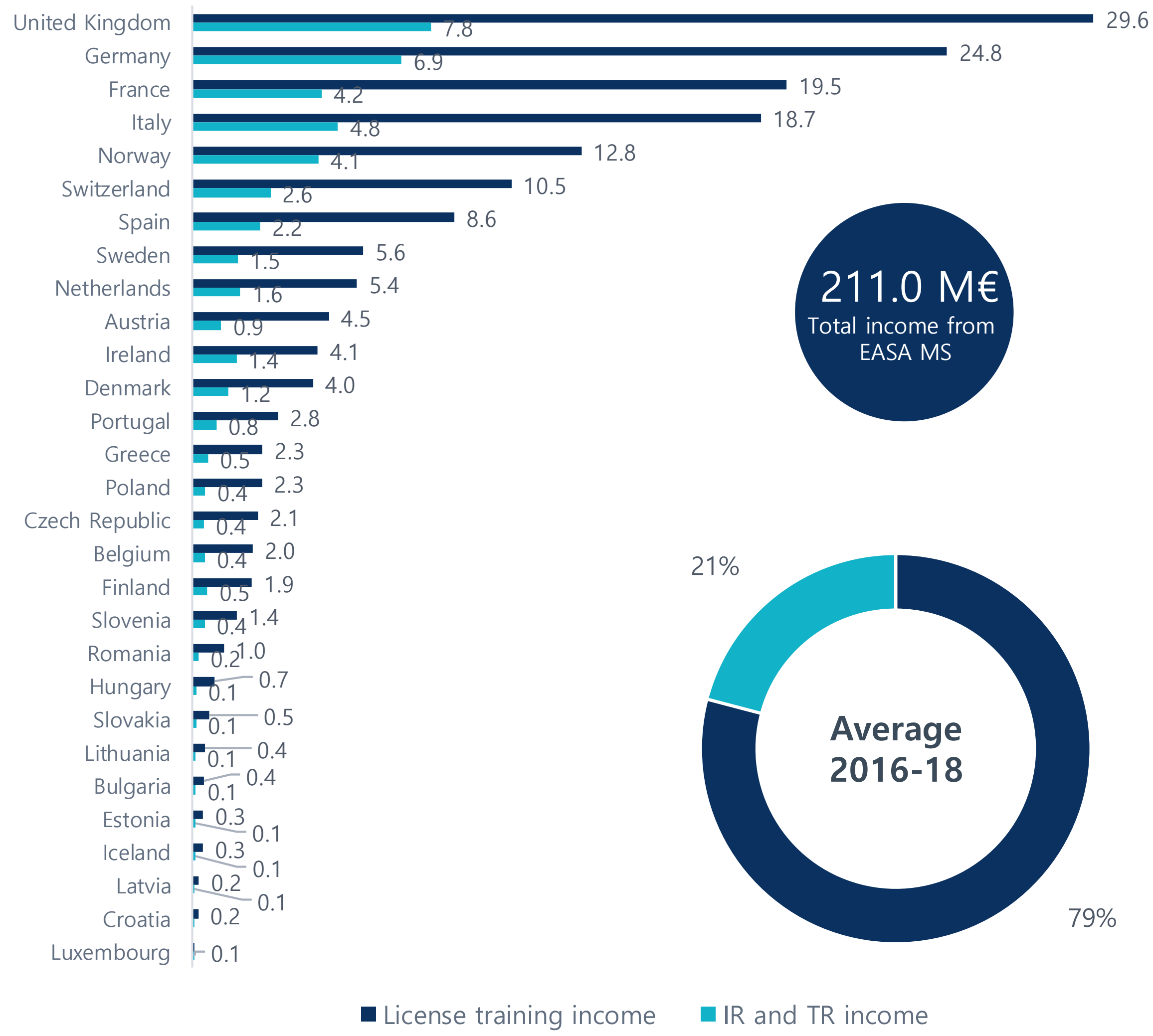


Figure 36 . Average 2016-18 income by country, in M€, from initial license and IR and TR training, covering all MS (excluding MS with no income from ATO(H)).

Source: ALG analysis based on the cited sources in the model section.

As a review of the income from initial license training, Figure 37Figure 37 represents the share of each license's income for the three reviewed years.

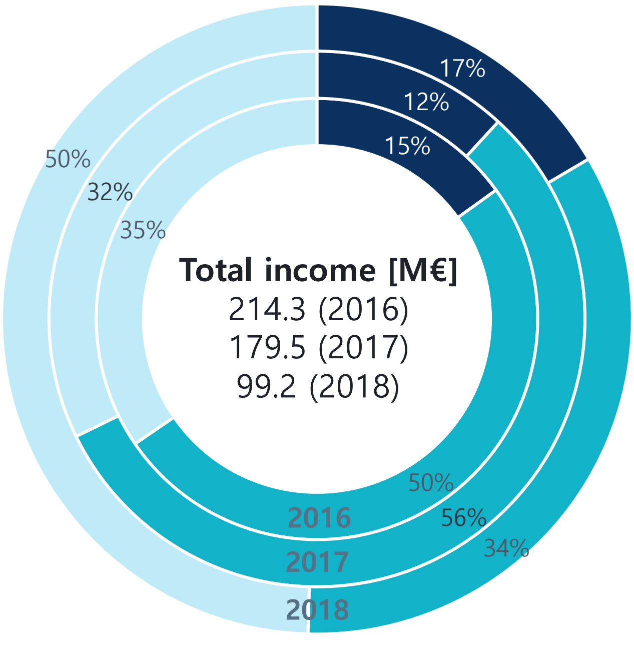


Figure 37. Share of income for the different reviewed license types (PPL(H), CPL(H) and ATPL(H)) in all EASA MS.

Source: ALG analysis based on the sources mentioned in the model explanation section for ATO(H).

4.2.2.2 Top-down approach

Adding to the relevant information already presented in the model explanation sector, the average 2016-18 income for all EASA MS can be seen. Interestingly, the approach yields a leading position for France in terms of financial size (the UK leads in the results of the bottom-up approach).

Figure 38. Average 2016-18 income, in M€, in all EASA MS form ATO(H)

Source: ALG analysis based on the cited sources in the model section.

4.3. Results for maintenance domain

4.3.1. AMO

4.3.1.1 Bottom-up approach

The analysis of the financial size according to the income by aircraft category can be reviewed in Figure 41.

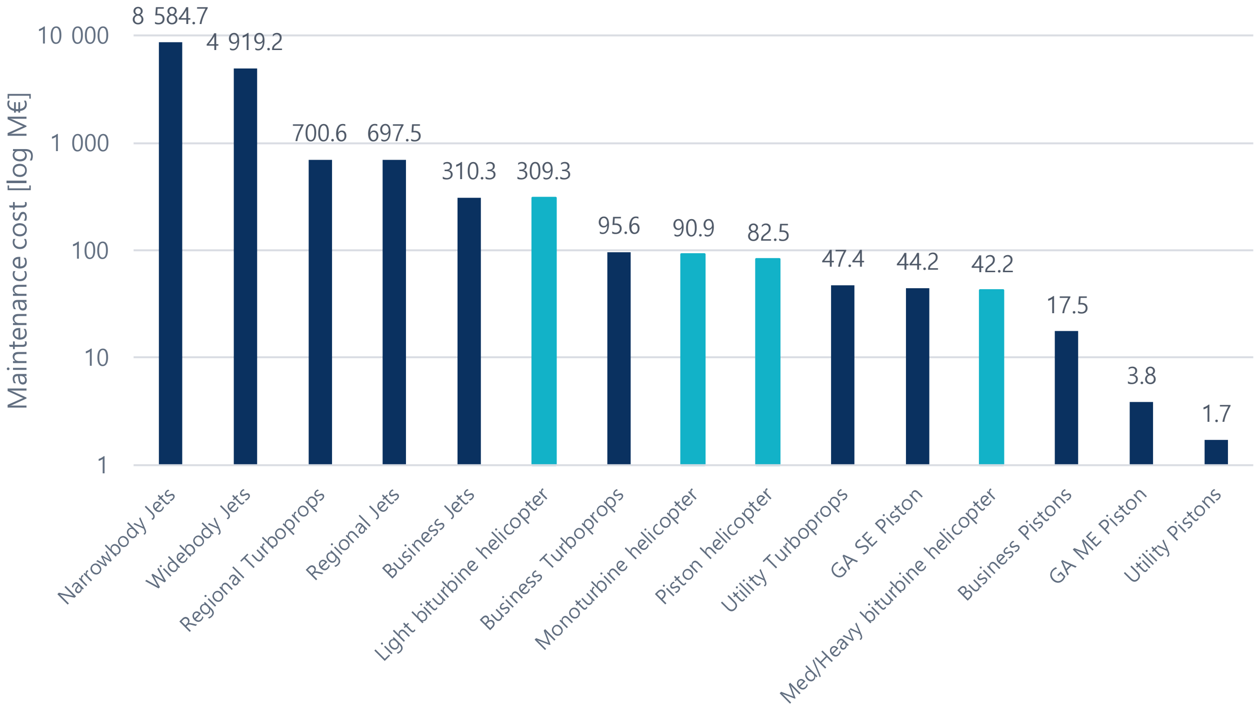


Figure 39. 2018 maintenance cost, in M€, by aircraft category in all EASA MS.

Source: ALG elaboration based on Cirium data and GAMA 2019 databook and maintenance price extrapolation sources detailed in the model section.

As it has been introduced in Section 3.2.1, a decision has been taken to allocate the financial size of this sector to Part-145 AMO, excluding Part-M Subpart-F, based in the reasoning provided. It is important to note however that part of the financial size seen in Figure 39~~Figure 39~~, could be attributed assuming that indeed, Part-M Subpart-F AMO will be present in some of the categories above. Potentially, in the categories of Piston Helicopter, GA SE piston and GA ME piston.

The following figure represents the income for each of the reviewed countries.

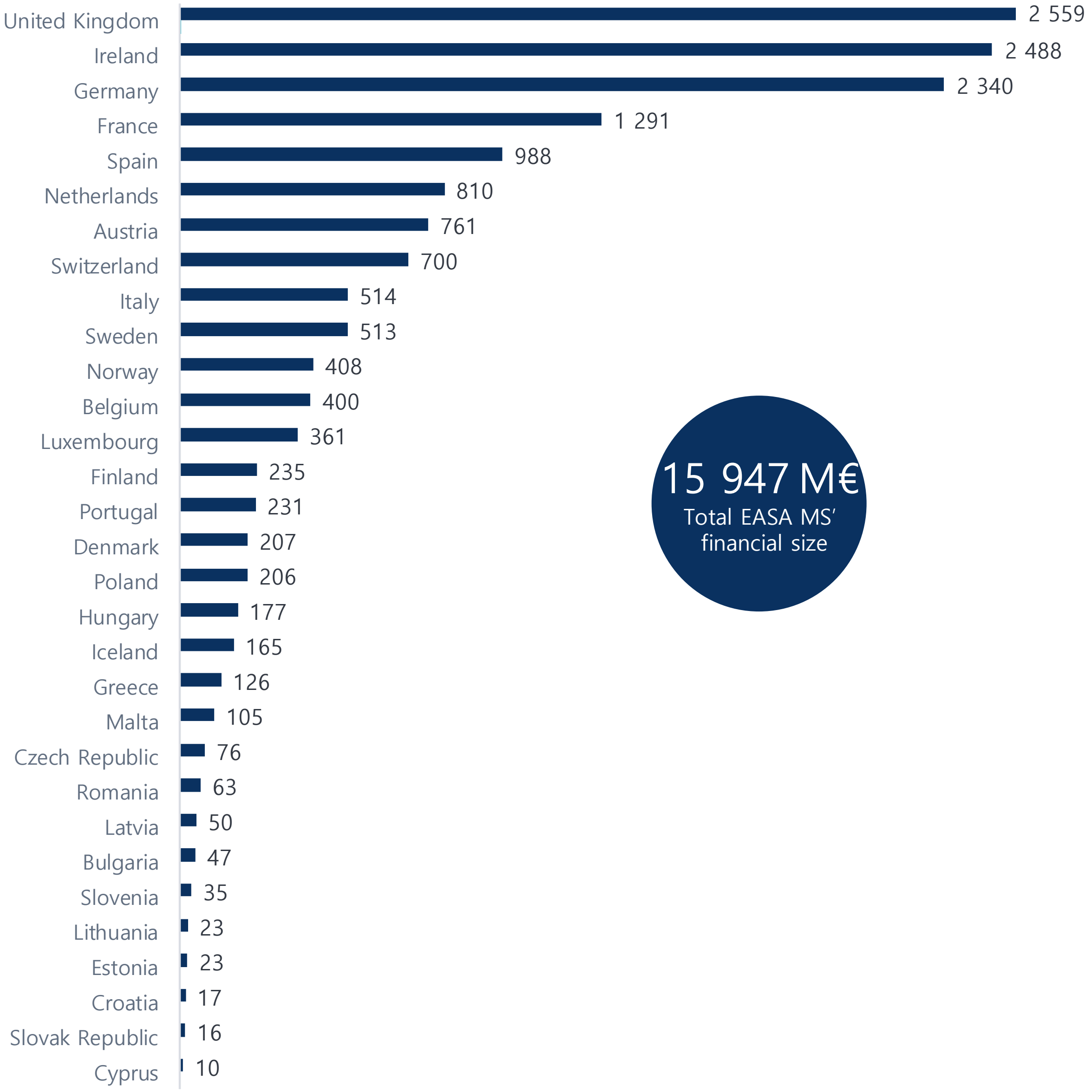


Figure 40. AMO financial size in M€, averaged from 2016 to 2018 values, for all EASA MS.

Source: ALG elaboration from EASA and sources mentioned in the model section of AMO.

The UK Department for Business Innovation & Skills published a report which analysed the national industry of aircraft Maintenance, Repair and Overhaul (MRO), and Logistics. Regarding the repair and maintenance of aircraft and spacecraft, the study finds that this industry income totalled four thousand million pounds in 2016[25] (which translates into 4.892 M€ using a 1,223 GBP to EUR exchange rate[26]).

Considering that this calculation includes a services to spacecraft and the differences in the model used to assess this market, the results from this study are found to be in line with those calculated in this report (UK's income from AMO domain is assessed to be 3.792 M€, see Figure 40~~Figure 40~~).

[25] Link to the report (page 7): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/502588/bis-16-132-uk-mrol-analysis.pdf

[26] UK's Office for National Statistics: https://www.ons.gov.uk/economy/nationalaccounts/balanceofpayments/timeseries/thap/mret

4.3.1.2 Top-down approach

Following the steps presented in Section 3.2.1.2, the income results for the AMO domain for each MS are presented in the following figure. Additionally, a correlation analysis versus country population, area and GDP has been carried out. Interestingly, the correlation of each country's income with its GDP is high (0.85) as opposed with country's area (0.27).

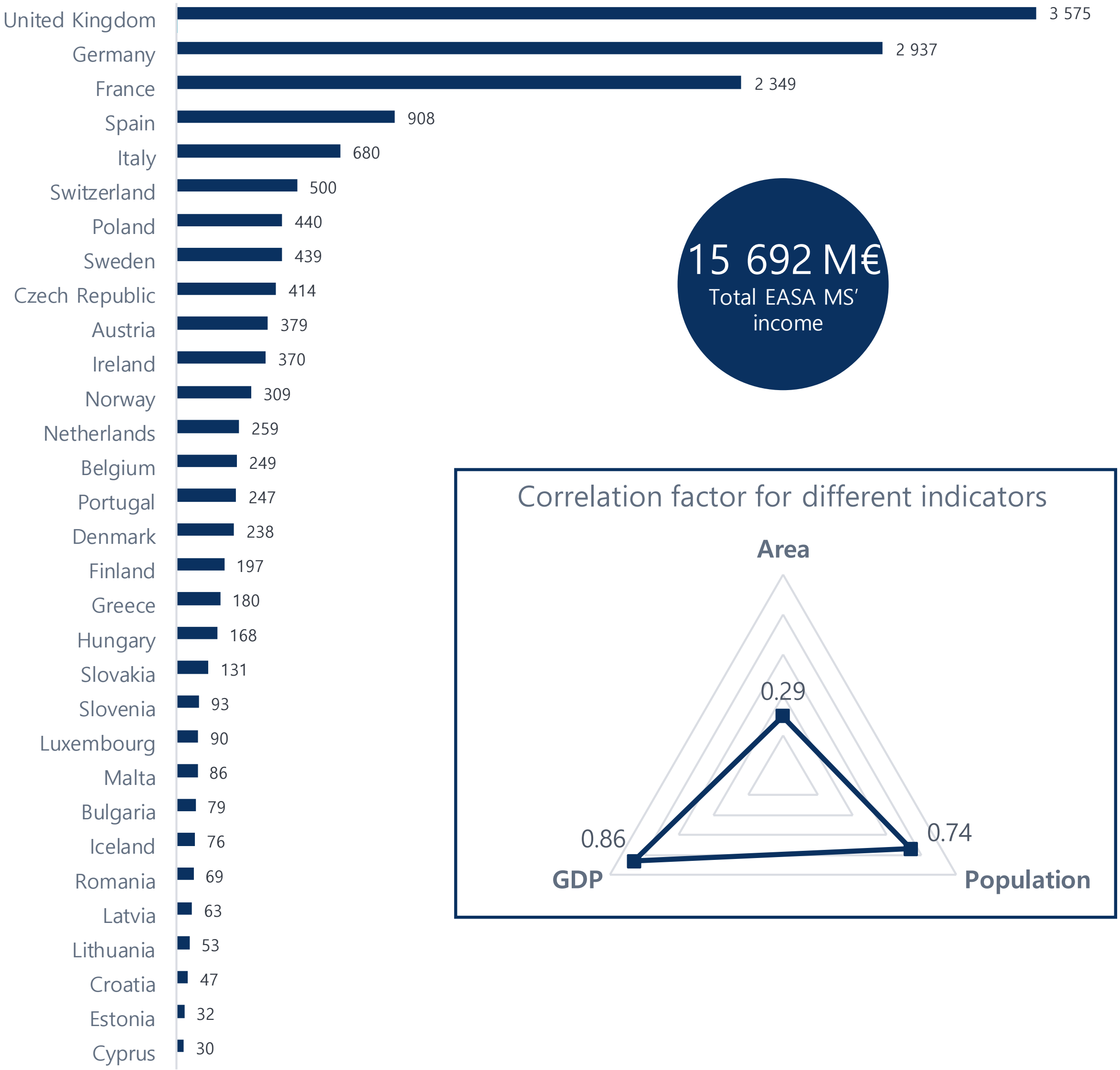


Figure 41. AMO financial size in M€, averaged from 2016 to 2018 values, by country for all EASA MS.

Also, correlation analysis with country Area, Population and GDP (2018 data). Source: ALG elaboration based on EASA data, relevant sources mentioned in the model section of AMO and Eurostat data (2018) of population, GDP and area.

4.3.2. CAMO

First of all, the number of CAMO engineers and managers by country is shown in Figure 42~~Figure 42~~ below.

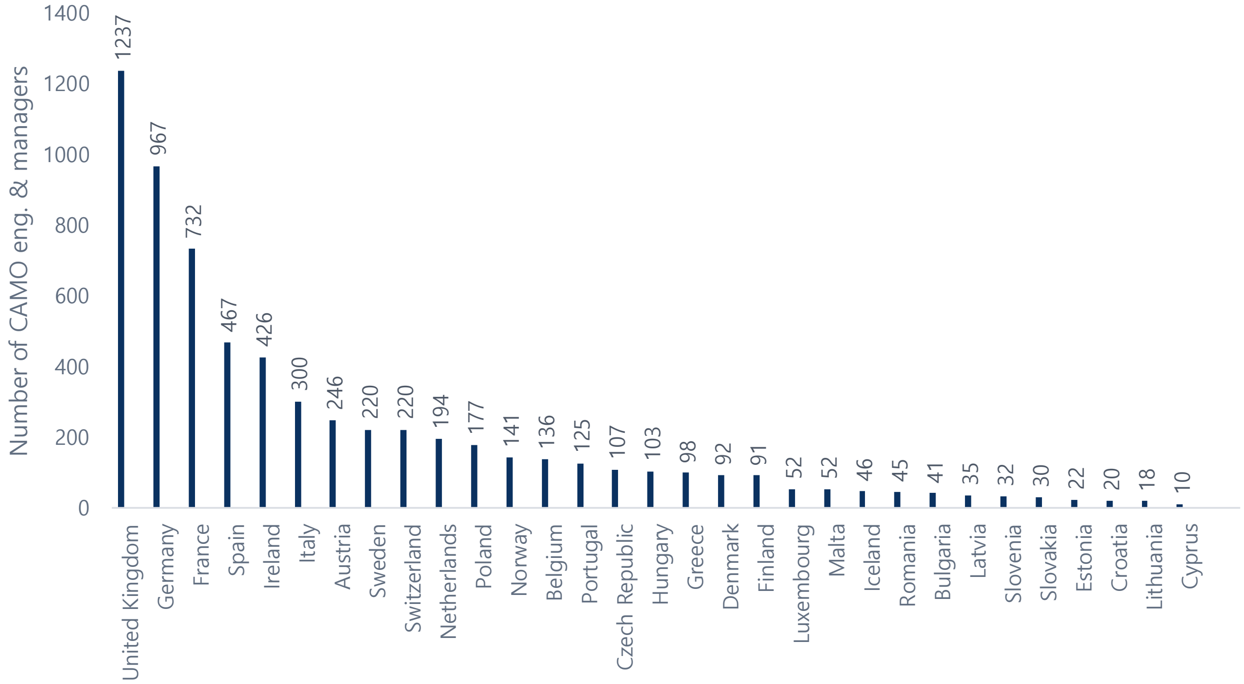


Figure 42. Number of CAMO engineers and managers by country.

Source: ALG elaboration using Cirium fleet database (2017 data) and GAMA 2019 databook for aircraft fleet and interviewee input for number of aircraft managed per engineer ratio.

Cost by country is determined of course by the CAMO engineer and manager salaries but also the number of required engineers and manager. This ultimately is a function of the fleet in each MS but also its composition since different aircraft categories demand different numbers of engineers and managers. The country-by-country distributions of cost is present in Figure 43~~Figure 43~~.

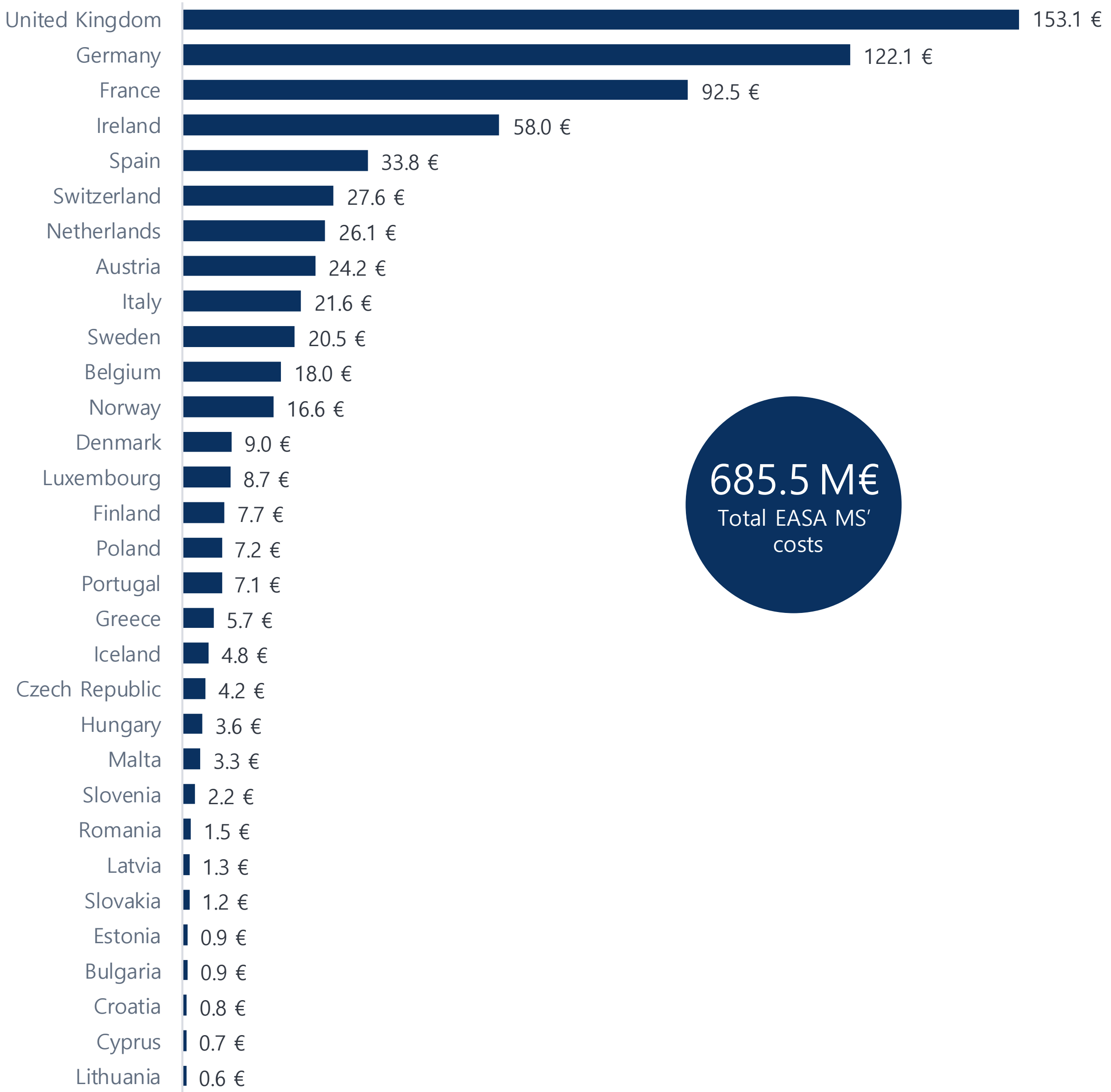


Figure 43 . Distribution of CAMO cost, in M€, by country and by aircraft category.

Source: ALG elaboration using Cirium fleet database (2017 data) and GAMA 2019 databook for aircraft fleet, interviewee input for number of aircraft managed per engineer ratio and Eurostat minimum wage data for 2018 for salary extrapolation.

Figure 44~~Figure 44~~ represents the cost for all MS according to aircraft category.

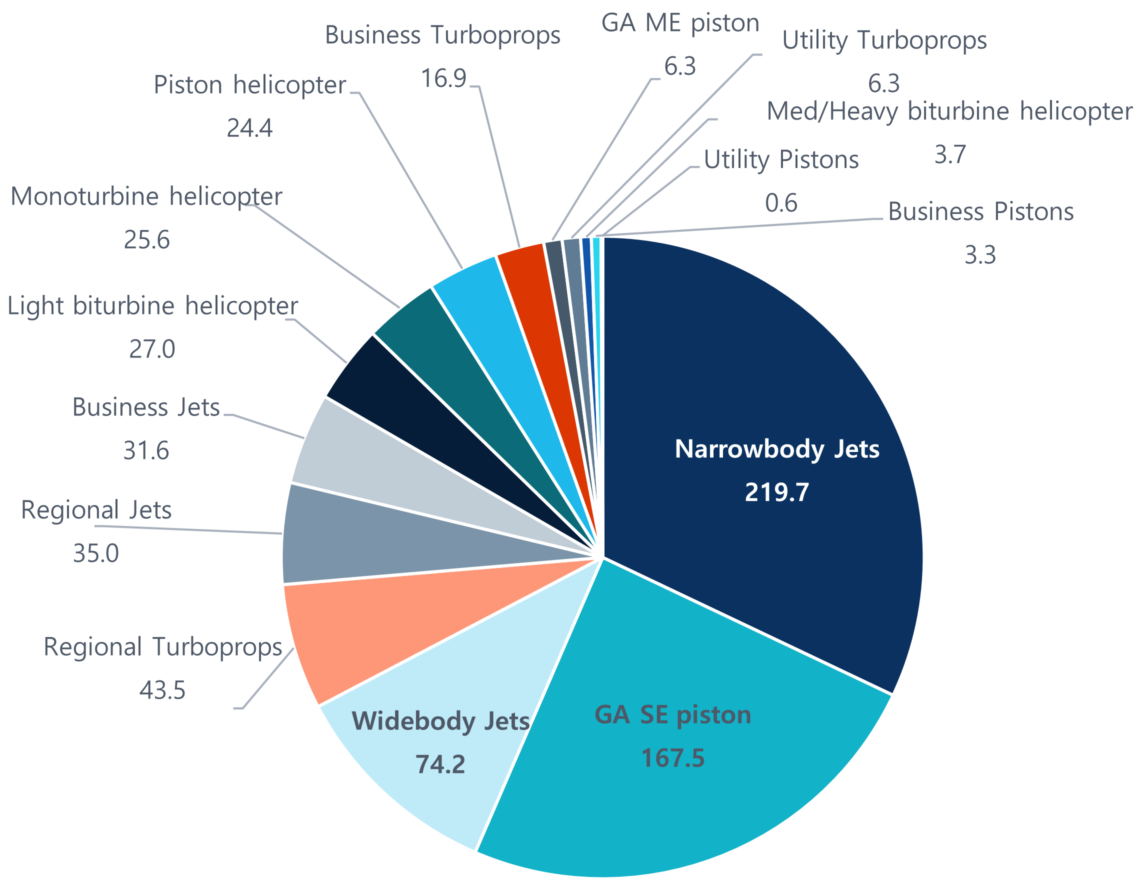


Figure 44. CAMO domain cost, in M€, according to each of the reviewed categories in all MS, using 2018 salaries for CAMO engineers and managers.

Source: ALG elaboration using Cirium fleet database (2017 data) and GAMA 2019 databook for aircraft fleet, interviewee input for number of aircraft managed per engineer ratio and Eurostat minimum wage data for 2018 for salary extrapolation.

4.3.3. MTO

4.3.3.1 Bottom-up approach

As a general snapshot of the distribution of the assessed training markets (basic and type rating training) in terms of income, is provided in Figure 45~~Figure 45~~.

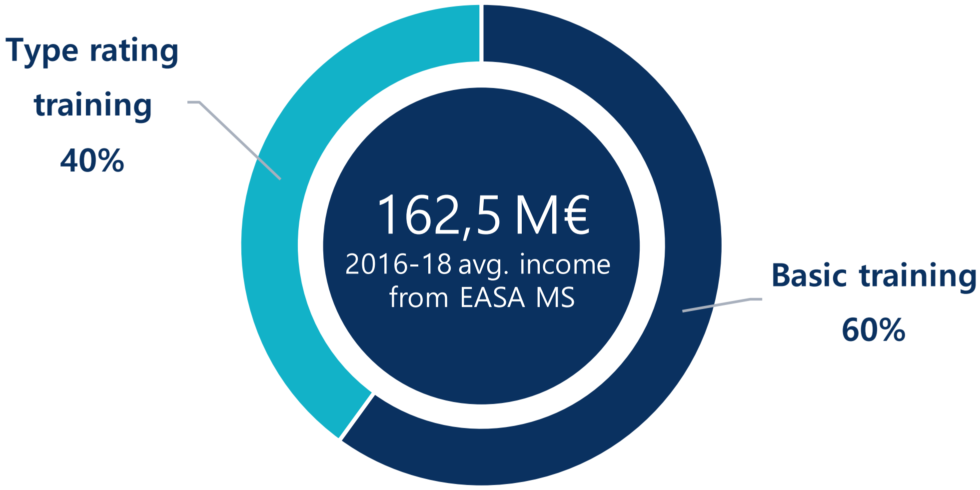


Figure 45. 2018 total income, in M€, and its share among basic and type rating training in EASA MS.

Source: ALG analysis based on EASA data, and interviewee and survey input.

The evolution of income for each class of addressed training during the reviewed period is presented in Figure 46~~Figure 46~~.

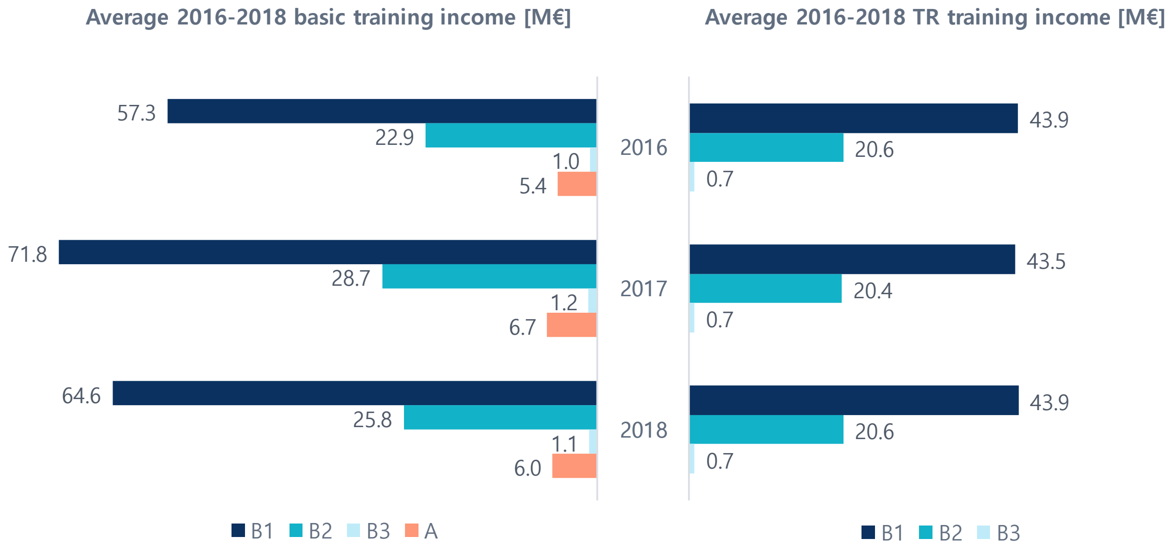


Figure 46. Basic and type training income evolution, in M€, between 2016 and 2018 in EASA MS.

Note that A licenses are not computed in type rating training assessment and neither C licenses in any training.
Source: ALG analysis based on EASA data, and interviewee and survey input.

Finally, the country by country results are represented in terms of the average income for the 2016-18 period.

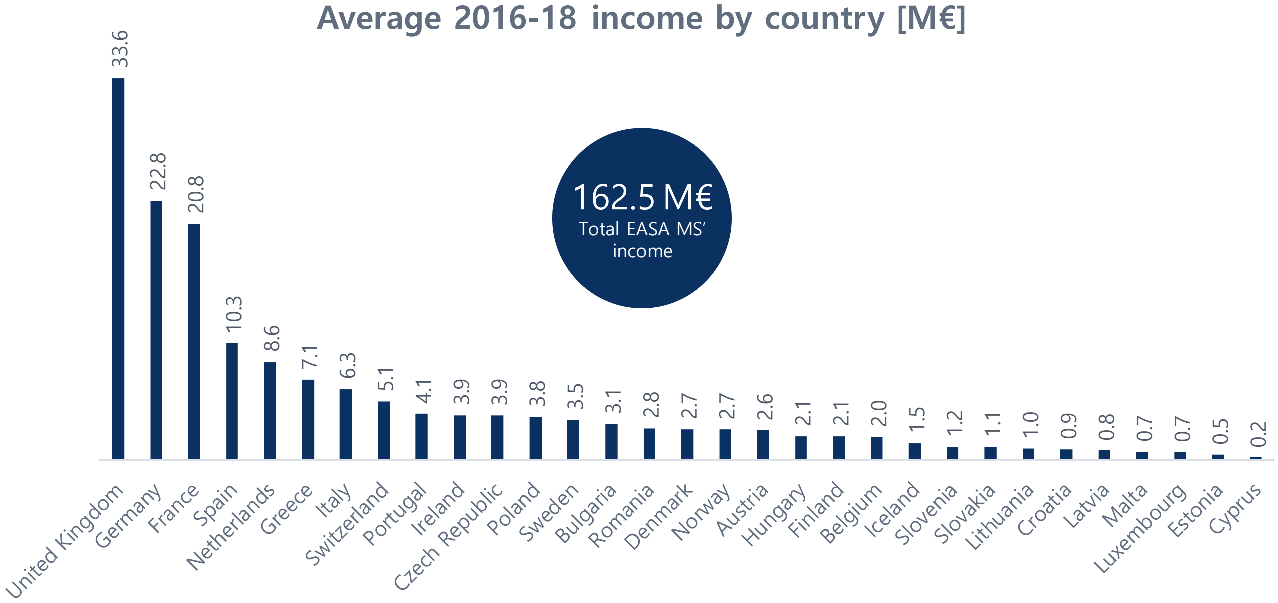


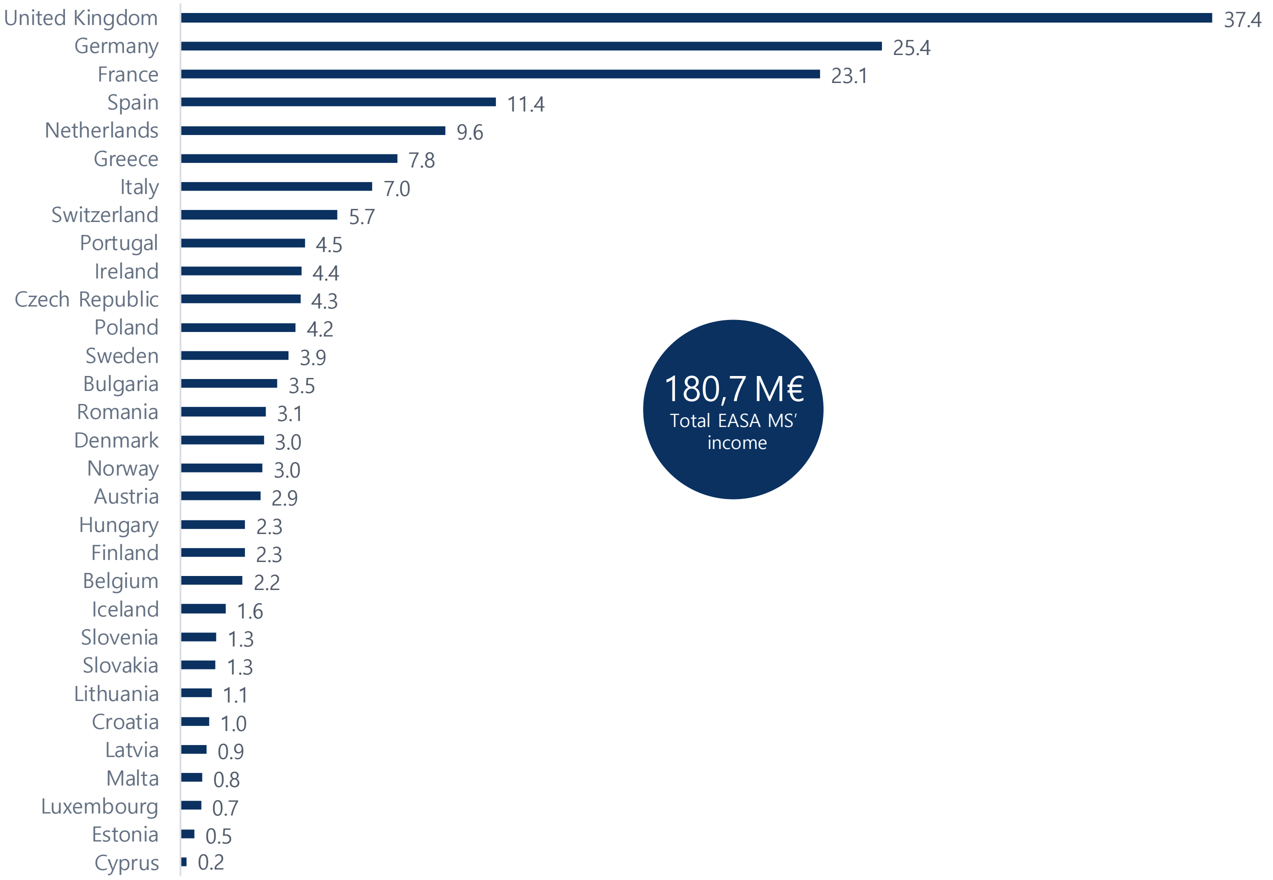
Figure 47. MTO domain income by country, in M€, in all EASA MS.

The yearly values are averaged over the three year period.

Source: ALG analysis based on business registry and EASA data.

4.3.3.2 Top-down approach

Similarly, the results for all MS stemming by the top-down approach are represented in Figure 48Figure



48.

Figure 48. MTO domain income by country, in M€, in all EASA MS.

The yearly values are averaged over the three year period.

Source: ALG analysis based on business registry and EASA data.

4.4. Results for aerodrome domain

Moving deeper into the distribution of public funds or subsidies to the different MS, the following analysis has been performed where the income and costs for the reviewed aerodrome categories are shown.

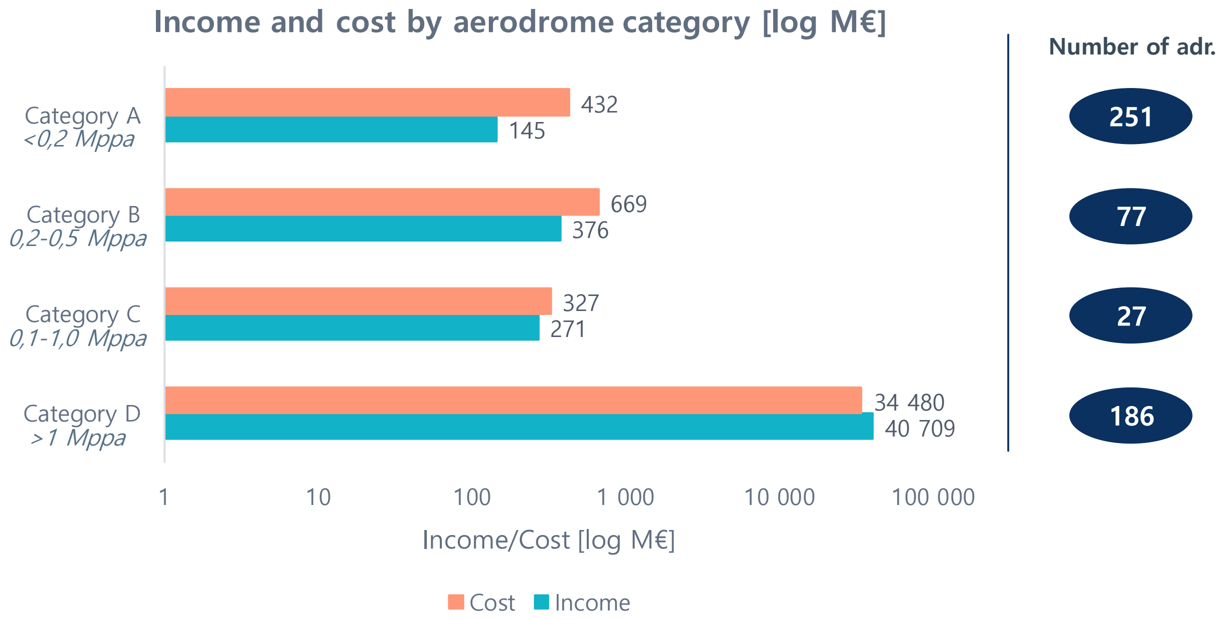


Figure 49. Cost and income in all EASA MS by each aerodrome category (2018 values), in M€.

Note that the graph scale is logarithmic.

Source: ALG elaboration based on per pax financial figures from (ACI Europe, 2017), (Oxera, 2019) (German Airport Performance, 2012), and (Transport and Environment, 2019), passenger data from EASA Standardisation and Eurostat.

Next on, an analysis on the subsidies granted to each MS' aerodromes has been undertaken. In order to properly size these allocations, subsidies (negative profit margin for regional/local aerodromes) as a ratio of profit and total income is presented in Figure 50Figure 50 below.

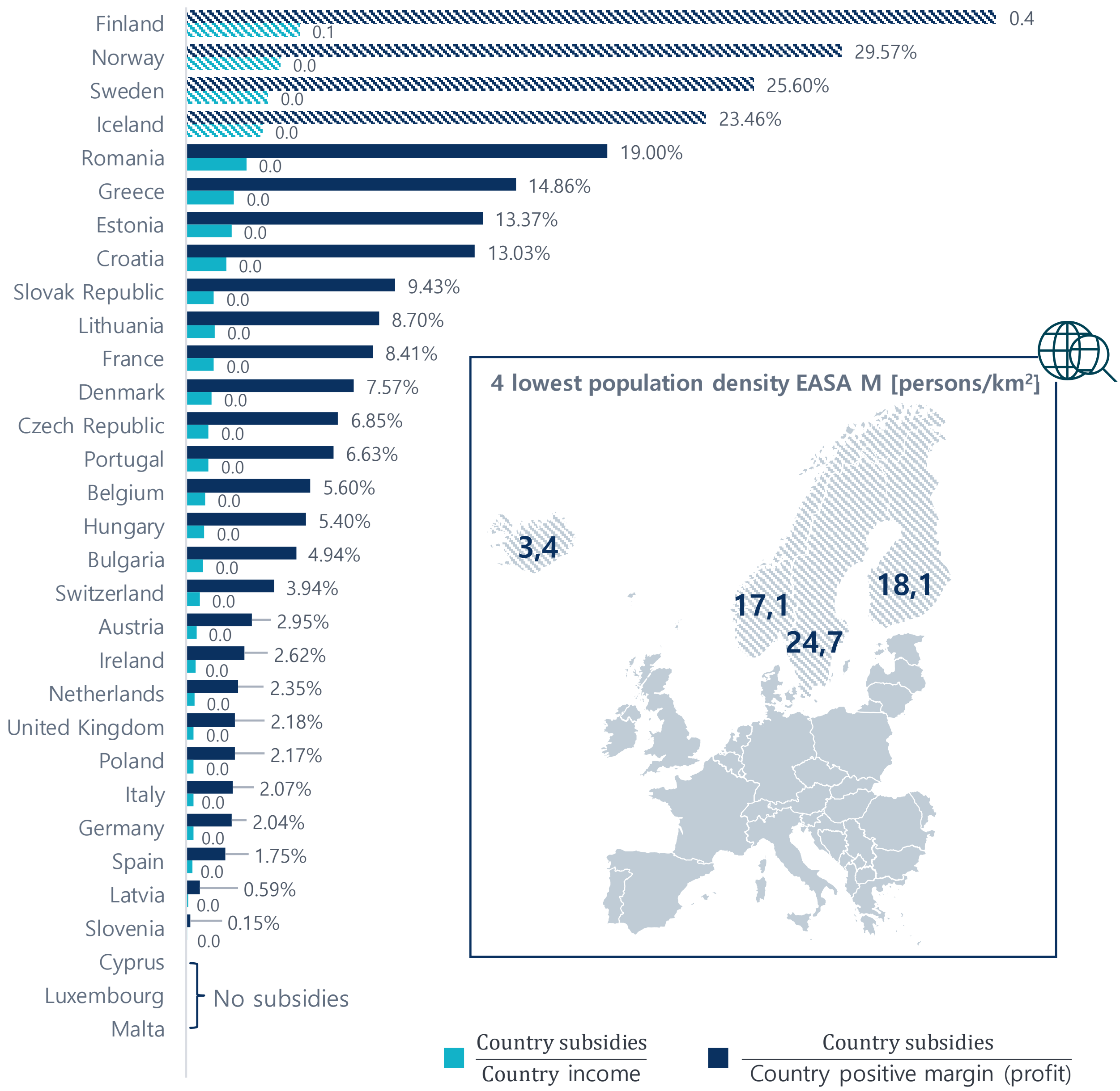


Figure 50. Negative margin (subsidies for regional/local aerodromes) to total country income and negative to positive margin ratios for all EASA MS (excluding Liechtenstein due to lack of adr.).

Values in M€. Note that there is a significant correlation between population density and the depicted ratios. Source: ALG elaboration based on per pax financial figures from (ACI Europe, 2017), (Oxera, 2019) (German Airport Performance, 2012), and (Transport and Environment, 2019), passenger data from EASA Standardisation and Eurostat and population density from Eurostat (2018).

Supporting the information aforementioned, Figure 51~~Figure 51~~ adds prospective into the share of aerodromes for low and high ranking countries in terms of subsidy ratio. As it can be seen, the countries with a prevalence of Cat. A and B aerodromes in the countries which present higher subsidy ratios and the opposite is true for countries with lower subsidy ratios.

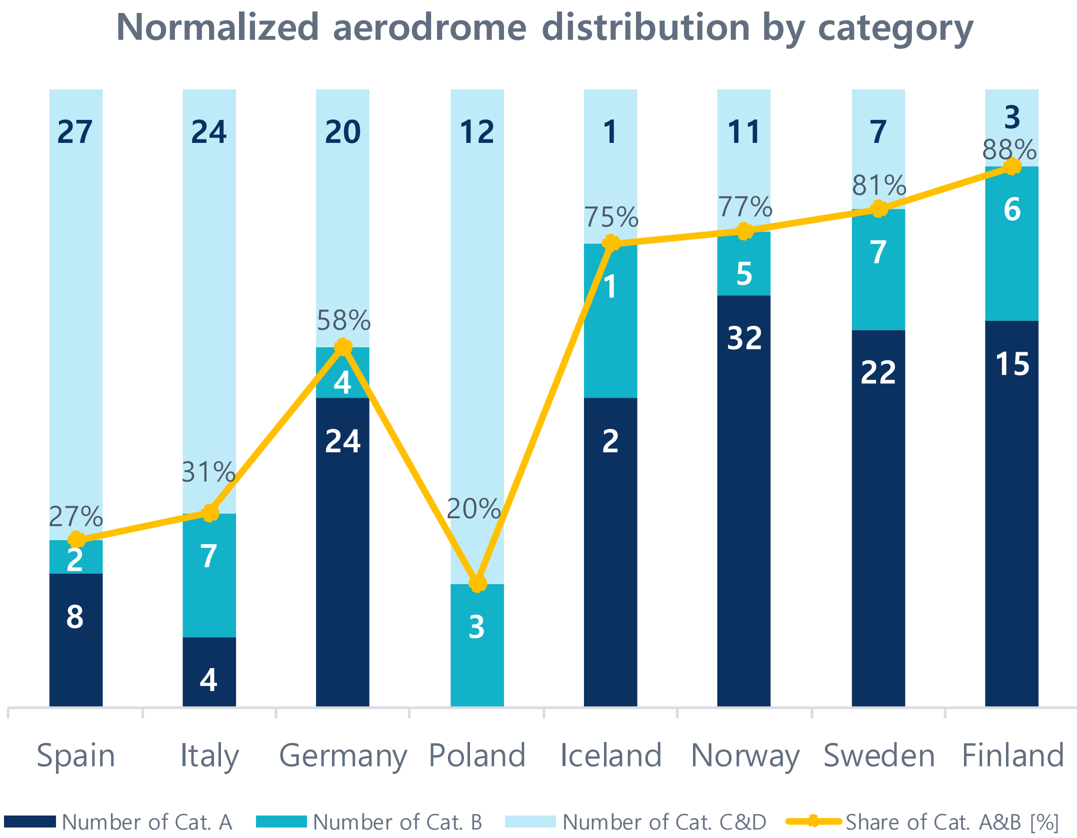


Figure 51. Distribution of aerodromes according to the defined categorization (normalised in order to display proportion).

Source: ALG elaboration based on aerodrome passenger throughput from EASA Standardisation and Eurostat 2018 data.

The breakdown of the aerodromes according to their categorization for all the assessed MS can be reviewed in Table 41~~Table 41~~.

As a general picture for each MS, the income and cost results are presented.

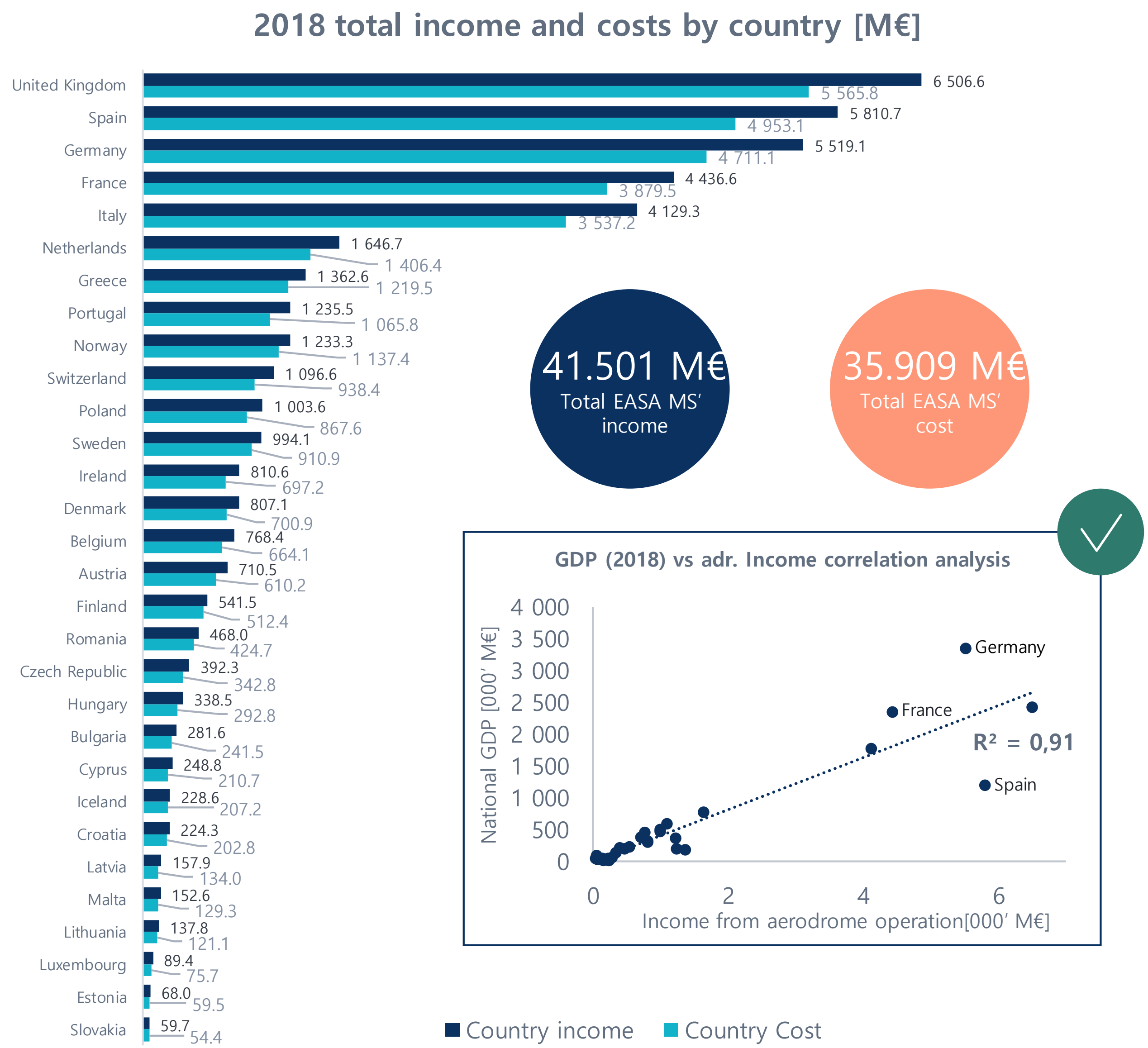


Figure 52. Estimated aerodrome income and cost results per EASA Member States, in M€, in 2018.

Additionally, a correlation analysis between the MS' GDP vs the income from aerodrome operation is also displayed. Source: ALG elaboration based on the reviewed sources on financial figures per passenger, EASA data for passengers transported and Eurostat for passengers transported and GDP (2018).

The income share for each aerodrome category is presented below. As it can be seen, as the size of an aerodrome increases, so does the share of non-aeronautical income. Only for Cat. D aerodromes it has been able to split income also as a result of ground handling concessions. Other income refers to Terminal navigation charges (if applicable), facility management, special guest services, and other operating income, as explained by ACI in its report.

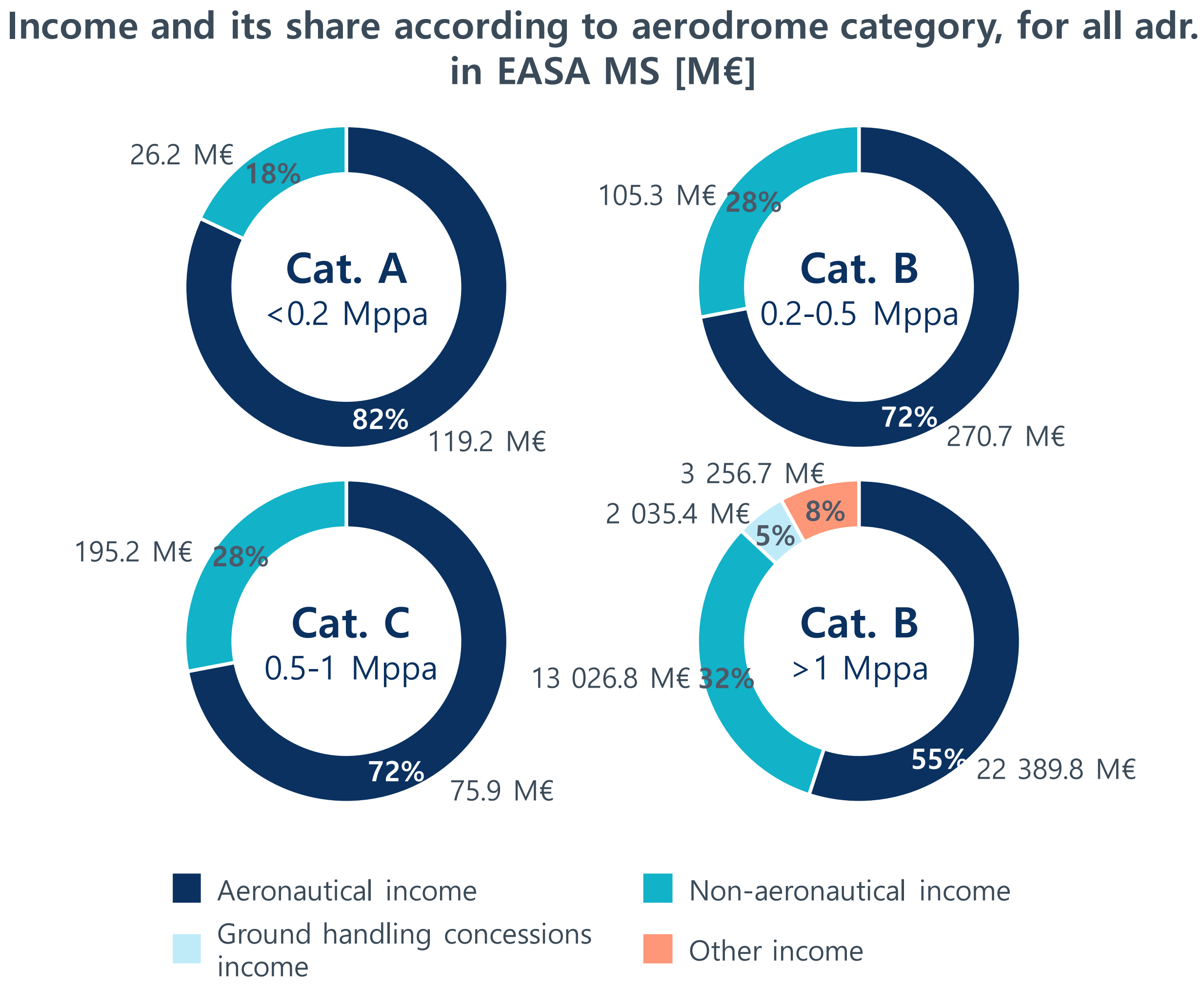


Figure 53. Income share of the different aerodrome categories and their values, in M€, for all aerodromes in all EASA MS.

Source: ALG elaboration based on (ACI Europe, 2017) for Cat. D aerodromes and (German Airport Performance, 2012) for Cat. A, B and C.

In a similar fashion, the costs shares according to the categorization presented in Section 1.2.1.3 is presented.

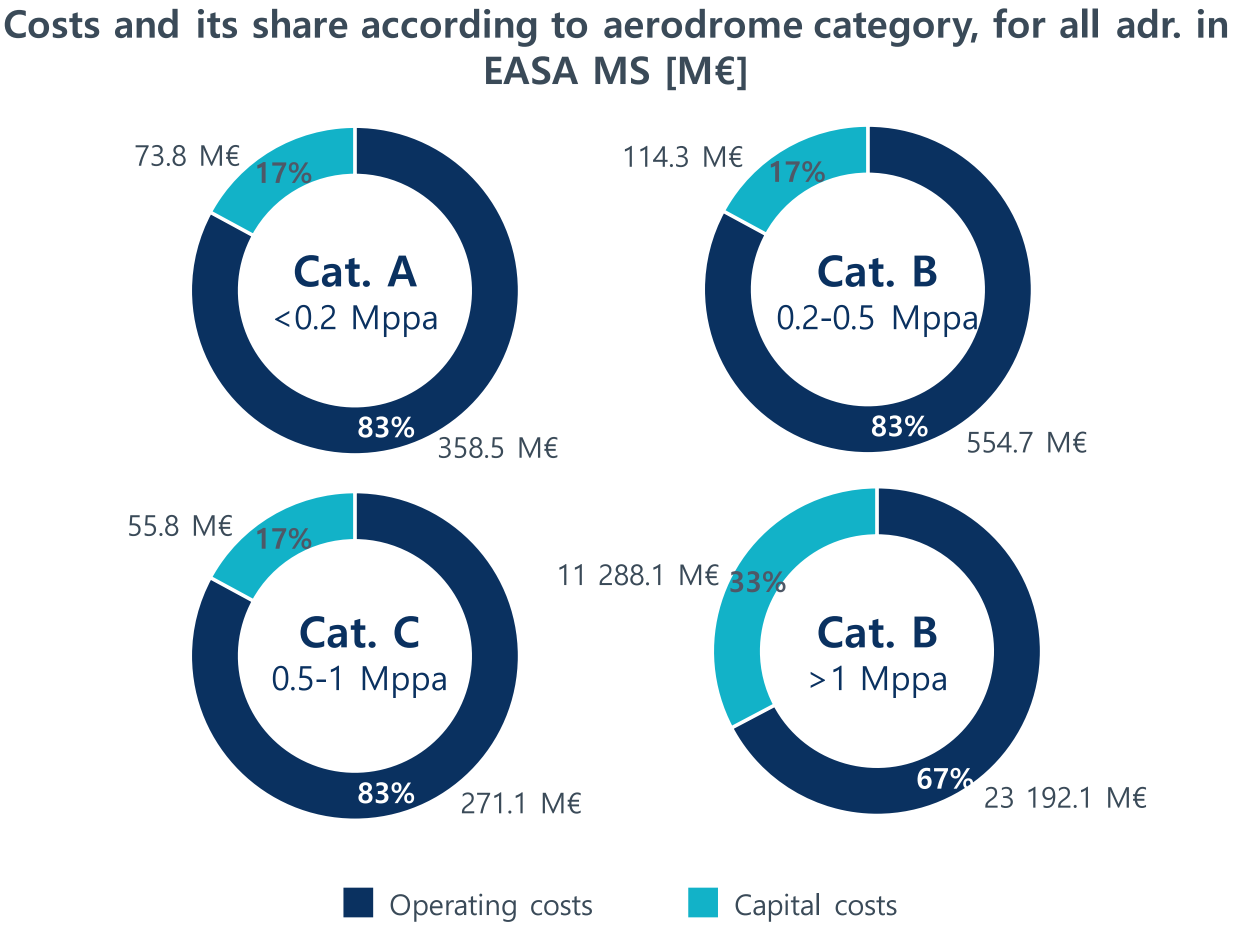


Figure 54. Cost share of the different aerodrome categories and their values, in M€, for all aerodromes in all EASA MS.

Source: ALG elaboration based on (ACI Europe, 2017) for Cat. D aerodromes and (Airports Council International, 2017) for Cat. A, B and C.

As a final step of this analysis, the impact on the financial figures of the exempted aerodromes is reviewed. In Section 1.2.1.3 the conditions that an aerodrome must meet in order to be exempted are presented. One key limit is the annual passenger throughput, set at no more than 10 000 ppa. Thus, these aerodromes fall into Cat. A.1. As the annual ppa figures are missing for 38 aerodromes means that of all the 117 exempted aerodromes the passenger figures are known for only 88 of them.

The income, costs, margin and subsidies of these aerodromes are compared with the already calculated value for Cat. A.1 category.

	Exempted aerodromes	Total Cat. A.1 aerodromes	Exempted to Cat. A.1 aerodromes ratio
Income [M€]	3.10	57.12	5,4%
Costs [M€]	10.27	189.26	
Margin [M€]	-7.17	-132.13	
Subsidies [M€]	5.41	99.80	

Table 31. Impact analysis of the exempted aerodromes over the total financial figures of Cat. A.1 aerodromes.

ALG elaboration based on the reviewed sources on financial figures per passenger, EASA data for passengers transported and Eurostat for passengers transported and GDP (2018).

5. Conclusions and limitations

The study provides estimates for the financial size of a number of stakeholders in the aviation domain, as a first attempt to assess their share of the total financial size of aviation across EASA member states. For most domains analysed, a double approach to the assessment from a financial perspective (i.e. the top-down approach) and from the operational one (i.e. the bottom-up perspective) has allowed to provide results which are rather robust, as also validated with several stakeholders' representatives.

However due to the great variability in both the operational environments and financial conditions of all the companies and organisations active in these domains, the model built for the study suffers of some limitations, which are highlighted in a specific section at the end of each section presenting the domain modelling in chapter 3 and resumed for convenience in the following of this chapter.

A general limitations that applies to all domains is that the analysis focuses on a time interval between 3 and 4 years (according to the specific domain), before the impact of Covid-19 pandemic, which will undoubtedly impact to a lesser o greater extent all the domains under review. Whilst the model developed in the study remains fully valid to support an ex-post of Covid-19 emergency measures, many economic and operational parameters will need to be modified in light of the new situation which are still unknown.

While in general AOC(H), ATOs(H) and aerodromes will experience a drop in commercial demand due to the operational restrictions raised almost in every EASA MS, for the maintenance domain this situation will increase or open up new income streams such as servicing the grounded airliners and preparing them for storage. On the other with the halt of operations, line and base maintenance checks will no longer be required. This will massively affect the financial situation of AMO companies, especially those dedicated to airline maintenance. Reports on the impact on the MRO market due to the Covid-19 crisis[27], forecast a severe impact on the industry. Depending on how long it takes the industry to recover, the demand for MRO services could contract between 20% and 40 %.

5.1. Helicopter domain

5.1.1. Helicopter operators

The assessment through the dual approach of bootm-up and top-down models yelds to conclude that the helicopter operations domain represent an 8.5 billion Euro market typically providing a 6% profit margin.

Whilst the top-down model focuses prevalently on commercial operators both private use and public operators are factored in the analysis through the bottom-up approach. The results in terms of income figures therefore are considered particularly robust and representative of the different nature of operations, only excluding military ones. However the costs of public operators have been calculated by modelling their equivalent income as if they were for-profit and subtracting the profit margin. However this assumption does not cater for the higher use the fleet that private operators typically have, adapting the use of their fleet to the markets demand. Also, employee costs are not usually the same in both contexts.

[27] Impact of Covid-19 on commercial MRO: Link

Therefore, it could be argued that a different approach could be set in place to estimate the financial size of these public operators.

The margin figure for the bottom-up approach is obtained from a handful of interviews and approximated to a single value (i.e. 6%). This value can highly varies according to the operator and the type of operations. A specific study would be needed to be run only to cover this aspect.

The deep-dive analysis of reviewed countries extended to other regions could also provide additional insights into different economies and be allowing explicit calculation of the income per helicopter indicator to all EASA MS.

5.1.2. ATO(H)

The financial size of helicopter training services is around 250 M€ per year, with a typical profit margin of 2%. However this estimation does not include recurrent training as well as other types of specific training as pointed out in section 3.1.2.1, due to the limited availability of related operational and financial information. . Even though the considered courses in this analysis make up the most important financial size of this domain, including those aforementioned would give a more complete view of the market.

Also a more diverse and populated dataset of ATO(H) financial information would provide more accurate results in the top-down approach. It provided particularly difficult to identify ATO(H) that are dedicated to external pilot formation or identifying the business share of helicopter training for a training organisation, since usually ATOs provide both airplane and helicopter pilot formation and often the same company provides training together with several other services such as helicopter operation and maintenance.

Finally the Attrition plus Retirement Rate (ARR) is very difficult to calculate accurately, since it presents a high variability and it is difficult to calculate based on helicopter pilot retiring statistics, which are scarce. A 10 % is assumed based on several interviews and statistics, however this would deserve further analysis, which would be particularly important in view of the current downward trend in the population of helicopter pilots in EASA MS for all license types in 2019, being CPL(H), the most affected. Many industry representatives raised this concern and are generally warning of a foreseeable pilot shortage in the coming future.

5.2. Maintenance domain

5.2.1. AMO

The AMO sector represents an industry of around 16 B€ turnover per year, with a typical profit margin of 6%.

Although the inputs collected through desk research, interviews and survey provided several reference cost figures for maintenance by aircraft category and in different MS, the analysis could be further extended to other companies to improve the accuracy of the bottom-up approach model.

On the other side using an average income per aircraft for AMOs for all MS in the top-down approach may cause some under/over estimation of the financial size at individual MS level. Refining the granularity of this variable would more accurately model the income for the AMO domain. Similarly by factoring in the fleet categorization in the top-down approach when weighting importance of each MS size for the AMO domain, as in the bottom-up approach, would possibly a more precise assessments.

Finally, regarding maintenance on smaller GA airplanes, stakeholders warned about a decline of pilot-owners demanding their services. As a result, one of them expressed that the market was increasingly steering towards business or utility airplanes. In his view, the increasing maintenance costs associated were pushing pilot-owners of GA airplanes to reduce their annual flight hours, reach out to shared property schemes or giving up this activity altogether. This would require to re-assess the parameters of the model in the near future to ensure that results are kept realistic.

5.2.2. CAMO

The financial size of CAMO services is around 600 M€ turnover per year, with a typical margin of 12%. The analysis for this domain has been cost-centred considered that it is a labour-intensive sector. The interviews with CAMO stakeholders (many are tagged in other domains such as helicopter operators but also were CAMO approved) confirmed this approach by revealing that usually CAMO is a business branch of many operators or AMO.

The model reflects therefore that a big share of the costs is directed to salary expenses, the rest allocated to cover general expenses that other business may have, namely indirect costs such as office space rent, IT software licenses, energy costs, etc. However differentiating the CAMO structure used in the model according to the type of company and aircraft services would increase the representativeness and accuracy of the model. Three CAMO sizes could be proposed: small, the most usual, medium and large. The latter would properly cover the operational reality of airline CAMO departments.

The used ratio of managed aircraft per CAMO engineer have been averaged and for several aircraft categories and extrapolated by similarity due to the lack of data and kept constant for all MSs. This may be improved in the future to better reflect the real productivity of CAMO engineers around different MSs.

The salary figures for CAMO workforce have been extrapolated based on MS' minimum wage and the correlation is high, however a country by country review of the salaries of CAMO engineers would improve the model's accuracy.

5.2.3. MTO

The maintenance training sector has financial size of around 170 M€ per year, with a margin of 7%. However the model used to assess the financial size of this domain is limited by the fact that it does not distinguish between internal training provided to AMO employees and to external ones. Furthermore there is in reality a coexistence of private companies, public institutions (public secondary or vocational schools) and companies providing internal training (most of them being airlines) that further complicates the modelling assumptions, being these very different from the financial perspective.

Retirement rate is calculated based on the UK CAA data. Despite being a suitable state to base the approach on given it is the one with more licenses, an analogous study could be performed on other countries with different maintenance and MTO industry characteristics.

Maintenance course pricing is given as a representative average for EASA MS. In order to improve the model, a further study could apply the same methodology for each MS. The same applies for type rating formation price, with further granularity on aircraft category, aircraft vs engine, etc.

5.3. Aerodrome domain

Aerodromes represent a widely variable sector in terms of financial size and characteristics. While the large aerodromes are a profitable business worth around 40 B€ per year at EASA MS level, the regional aerodromes all together represent around 800 M€ in financial size and often require public subsidies to be sustainable. Aerodromes also in fact experience the effect of economies of scale in their operations and economic model, since there is a significant shift between the variable and fixed cost distribution as the airport size grows. Larger operators are more capable of supporting their expenses on a variable base, whereas smaller/regional aerodromes do so in the fixed one.

Although the assessment suffers from some limitations (notably the use of average economic figures per pax for all airports in the same category), it reveals some important insights especially for small regional aerodromes in need of public subsidies.

The subsidy evaluation has revealed a clear correlation between the population density of a country and the public fund injection, proportional to the country's financial results. The Aerodrome distribution per category at country level also directly affect the overall profitability of this domain. In fact the most subsidized countries have predominantly Cat. A and B aerodromes in their network, (see Section 3.3.1 for aerodrome categorisation).

Special attention is deserved by the implementation analysis and foreseeable result of the EC Guidelines on State aid to airports and airlines, which have provided a cornerstone for the model developed in this study. As briefed in the regulatory text, this set of rules aim, among other things, to streamline the state aid allocation to regional aerodromes and guide those in need of aid to grow their business in order to be sustainable within the 2014-2024 period.

The results of this study hand in hand with published literature and industry reports provide evidence at least to cast a doubt on the ability of the addressed aerodromes to meet self-sustainability. Not only the thresholds in terms of annual passengers sit at or above the 0,5 Mppa value, but several authors indicate that this threshold has steadily moved up with time (German Airport Performance, 2012). Therefore it would be worth to further detail the analysis on this sector, , especially in view of the drop in demand due to the Covid-19 crisis.

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7. Annexes

7.1. Annex I: Working figures, tables and data

In this annex appear the different information sources and elaborated material around which the result section is composed, for each studied domain.

7.1.1. Helicopter domain

7.1.1.1 Helicopter operators

7.1.1.1.1 Bottom-up approach

The following figure presents the helicopter fleet for all MS sorted by country and operation (helicopters in active service, i.e., not in storage). Military operational categories are not included in the fleet categorisation.

Country	Business - Air Taxi/Air Charter	Business - Private Company Use	Company Demonstrator	Crop Dusting / Agricultural Spraying / Seeding	Experimental / R&D / Prototype / Mfr-Design Bureau	Fire Fighting (Utility Role)	Heavy-Lift Ops / Under Slung Loads / Logging	Medevac / Air Ambulance / EMS / Airborne Hospital	News Media / Camera Equipped	Off-Shore - Wind Farm / Other Support	Off-Shore / Oil & Gas Support	Passenger	Police Air Support / Law Enforcement / Border Patrol	Private Use	Search & Rescue / Coast Guard	Sightseeing / Tourist	Skydiving / Parachuting	Surveying / Mapping & Power/Pipeline Inspection	Trainer / Training School Aircraft	Utility (Civil Multi-Role)	VIP / Head of State / Government operated	Water-Bomber / Chemical Spray	Weather / Atmospheric / Geo & Environmental	Fleet per country
Austria	36	16		1			2	51	1				16	15					3	39				180
Belgium	27	68						7		1	26	1	7	12	3				17	7				176
Bulgaria	3	8		2			1	3					2		1					7	2			29
Croatia		3											9	1										13
Cyprus	1	7									1		5							3	2			19
Czech Republic	34	31		1				4				1	14	15					52	30	3			185
Denmark	8	33							2	4	2			16					2	9				76
Estonia	1	6											3						2	3				15
Finland	3	13						5					9	14	5				6	25				80
France	115	198	2	8	19	4	1	75	1		29	13	64	117	56	2		13	47	121				885
Germany	103	107			4			137	20	7	14	1	110	64	8	1		2	51	108			1	738
Greece	13	20		1		3		2	2			1	5	24	30	1			1	11	5	2		121
Hungary	10	5		7				13					15	4			2		3	38				97
Iceland	6	3												1	3	1				2				16
Ireland	6	29						1			1		2	21	6			1	4	2				73
Italy	63	95	5	3	14	37		84			8		246	97	31			4	71	177	2	4		941
Latvia	4	6						1				1	4	1						7				24
Liechtenstein	1	1												1										3
Lithuania	1	3											5	2	4				2	1				18
Luxembourg	2	9						7			1			3						1				23
Malta	2	5						1							6					2				16
Netherlands	11	7						11			12	2	10	4					12	7				76
Norway	77	20					2	27			42	1	2	13	11				12	35				242
Poland	5	128		4		3		27	1			1	18	9	1				3	19	6			225
Portugal	9	2				5		8			5			1		1			9	32				72
Romania	7	3		4				10			1		3	3	1				7	20	5			64
Slovakia	7	12					1	13					3	2					8	17				63
Slovenia	2	5											7	2						4				20
Spain	41	28		1		94		63			2		84	12	31				31	104				491
Sweden	31	23		4			1	22	1				8	15	11				14	82				212
Switzerland	125	41			1		5	35	3			1	1	18					45	33				308
United Kingdom	155	327	2	1	1		1	57	10	2	70	7	26	152	33	1		12	106	55	2			1.020
Total general	**909**	**1.262**	**9**	**37**	**39**	**146**	**14**	**664**	**41**	**14**	**214**	**30**	**678**	**639**	**241**	**7**	**2**	**32**	**508**	**1.001**	**27**	**6**	**1**	**6.521**

Table 32. Fleet division according to its operational category in all EASA MS.

Source: ALG elaboration based on Cirium (2017 data) database.

Additionally, the income by country and operational category is presented in the following table.

Country	Business - Air Taxi/Air Charter		Business - Private Company Use	Company Demonstrator	Crop Dusting / Agricultural Spraying / Seeding	Experimental / R&D / Prototype / Mfr-Design Bureau	Fire Fighting (Utility Role)	Heavy-Lift Ops / Under Slung Loads / Logging	Medevac / Air Ambulance / EMS / Airborne Hospital	News Media / Camera Equipped	Off-Shore - Wind Farm / Other Support	Off-Shore / Oil & Gas Support	Passenger	Police Air Support / Law Enforcement / Border Patrol	Private Use	Search & Rescue / Coast Guard	Sightseeing / Tourist	Skydiving / Parachuting	Surveying / Mapping & Power/Pipeline Inspection	Trainer / Training School Aircraft	Utility (Civil Multi-Role)	VIP / Head of State / Government operated	Water-Bomber / Chemical Spray	Weather / Atmospheric / Geo & Environmental	Fleet per country
Austria	43.8	14.6	0.0	0.3	0.0	0.0	7.2	90.7	0.7	0.0	0.0	0.0	19.4	0.9	0.0	0.0	0.0	0.0	1.0	39.6	0.0	0.0	0.0	218.3	217.3
Belgium	32.9	62.1	0.0	0.0	0.0	0.0	0.0	12.4	0.0	3.0	260.0	1.2	8.5	0.7	7.3	0.0	0.0	0.0	5.8	7.1	0.0	0.0	0.0	401.1	395.3
Bulgaria	3.7	7.3	0.0	0.6	0.0	0.0	3.6	5.3	0.0	0.0	0.0	0.0	2.4	0.0	2.4	0.0	0.0	0.0	0.0	7.1	3.0	0.0	0.0	35.4	35.4
Croatia	0.0	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.9	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.7	13.7
Cyprus	1.2	6.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	6.1	0.0	0.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0	29.8	29.8
Czech Republic	41.4	28.3	0.0	0.3	0.0	0.0	0.0	7.1	0.0	0.0	0.0	1.2	17.0	0.9	0.0	0.0	0.0	0.0	17.7	30.5	4.5	0.0	0.0	148.9	131.2
Denmark	9.7	30.1	0.0	0.0	0.0	0.0	0.0	0.0	1.4	12.0	20.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.7	9.1	0.0	0.0	0.0	84.1	83.4
Estonia	1.2	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	0.0	0.0	0.0	0.0	0.0	0.7	3.0	0.0	0.0	0.0	14.1	13.4
Finland	3.7	11.9	0.0	0.0	0.0	0.0	0.0	8.9	0.0	0.0	0.0	0.0	10.9	0.8	12.1	0.0	0.0	0.0	2.0	25.4	0.0	0.0	0.0	75.8	73.7
France	140.1	180.9	2.0	2.2	13.9	4.6	3.6	133.4	0.7	0.0	290.0	15.8	77.8	7.1	136.0	1.2	0.0	5.3	16.0	122.8	0.0	0.0	0.0	1 153.4	1 137.4
Germany	125.5	97.7	0.0	0.0	2.9	0.0	0.0	243.6	14.2	21.0	140.0	1.2	133.7	3.9	19.4	0.6	0.0	0.8	17.3	109.6	0.0	0.0	0.6	932.1	914.8
Greece	15.8	18.3	0.0	0.3	0.0	3.5	0.0	3.6	1.4	0.0	0.0	1.2	6.1	1.4	72.9	0.6	0.0	0.0	0.3	11.2	7.5	4.1	0.0	148.2	147.8
Hungary	12.2	4.6	0.0	2.0	0.0	0.0	0.0	23.1	0.0	0.0	0.0	0.0	18.2	0.2	0.0	0.0	3.2	0.0	1.0	38.6	0.0	0.0	0.0	103.1	102.1
Iceland	7.3	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	7.3	0.6	0.0	0.0	0.0	2.0	0.0	0.0	0.0	20.0	20.0
Ireland	7.3	26.5	0.0	0.0	0.0	0.0	0.0	1.8	0.0	0.0	10.0	0.0	2.4	1.3	14.6	0.0	0.0	0.4	1.4	2.0	0.0	0.0	0.0	67.6	66.3
Italy	76.7	86.8	5.0	0.8	10.2	42.6	0.0	149.4	0.0	0.0	80.0	0.0	298.9	5.9	75.3	0.0	0.0	1.6	24.1	179.7	3.0	8.2	0.0	1 048.2	1 024.1
Latvia	4.9	5.5	0.0	0.0	0.0	0.0	0.0	1.8	0.0	0.0	0.0	1.2	4.9	0.1	0.0	0.0	0.0	0.0	0.0	7.1	0.0	0.0	0.0	25.4	25.4
Liechtenstein	1.2	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	2.2
Lithuania	1.2	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.1	0.1	9.7	0.0	0.0	0.0	0.7	1.0	0.0	0.0	0.0	21.6	20.9
Luxembourg	2.4	8.2	0.0	0.0	0.0	0.0	0.0	12.4	0.0	0.0	10.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	34.3	34.3
Malta	2.4	4.6	0.0	0.0	0.0	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	14.6	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	25.4	25.4
Netherlands	13.4	6.4	0.0	0.0	0.0	0.0	0.0	19.6	0.0	0.0	120.0	2.4	12.2	0.2	0.0	0.0	0.0	0.0	4.1	7.1	0.0	0.0	0.0	185.4	181.3
Norway	93.8	18.3	0.0	0.0	0.0	0.0	7.2	48.0	0.0	0.0	420.0	1.2	2.4	0.8	26.7	0.0	0.0	0.0	4.1	35.5	0.0	0.0	0.0	658.0	653.9
Poland	6.1	116.9	0.0	1.1	0.0	3.5	0.0	48.0	0.7	0.0	0.0	1.2	21.9	0.5	2.4	0.0	0.0	0.0	1.0	19.3	9.1	0.0	0.0	231.7	230.7
Portugal	11.0	1.8	0.0	0.0	0.0	5.8	0.0	14.2	0.0	0.0	50.0	0.0	0.0	0.1	0.0	0.6	0.0	0.0	3.1	32.5	0.0	0.0	0.0	119.0	115.9
Romania	8.5	2.7	0.0	1.1	0.0	0.0	0.0	17.8	0.0	0.0	10.0	0.0	3.6	0.2	2.4	0.0	0.0	0.0	2.4	20.3	7.5	0.0	0.0	76.7	74.3
Slovakia	8.5	11.0	0.0	0.0	0.0	0.0	3.6	23.1	0.0	0.0	0.0	0.0	3.6	0.1	0.0	0.0	0.0	0.0	2.7	17.3	0.0	0.0	0.0	69.9	67.2
Slovenia	2.4	4.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.5	0.1	0.0	0.0	0.0	0.0	0.0	4.1	0.0	0.0	0.0	19.7	19.7
Spain	49.9	25.6	0.0	0.3	0.0	108.2	0.0	112.0	0.0	0.0	20.0	0.0	102.1	0.7	75.3	0.0	0.0	0.0	10.5	105.6	0.0	0.0	0.0	610.2	599.7
Sweden	37.8	21.0	0.0	1.1	0.0	0.0	3.6	39.1	0.7	0.0	0.0	0.0	9.7	0.9	26.7	0.0	0.0	0.0	4.8	83.2	0.0	0.0	0.0	228.7	223.9
Switzerland	152.3	37.5	0.0	0.0	0.7	0.0	18.0	62.2	2.1	0.0	0.0	1.2	1.2	1.1	0.0	0.0	0.0	0.0	15.3	33.5	0.0	0.0	0.0	325.1	309.8
United Kingdom	188.8	298.7	2.0	0.3	0.7	0.0	3.6	101.4	7.1	6.0	700.0	8.5	31.6	9.2	80.2	0.6	0.0	4.9	36.0	55.8	3.0	0.0	0.0	1 538.4	1 502.4
Total general	1 107.2	1 152.8	9.0	10.4	28.5	168.1	50.4	1 180.7	29.1	42.0	2 140.0	36.5	823.8	38.6	585.4	4.3	3.2	13.0	172.7	1 016.0	40.8	12.2	0.6	8 665.4	8 492.7

Table 33. 2018 income, in M€, for all EASA MS, according to the operational categorisation.

Source: ALG elaboration based on Cirium data and the economic figures mentioned in the model explanation section.

7.1.1.2 Helicopter ATO

7.1.1.2.1 Bottom-up approach

The income from initial license and IR and TR training for the reviewed years is detailed in Table 34~~Table 34~~ and Table 35~~Table 35~~.

Country	2016 income from license training ['000 €]			2017 income from license training ['000 €]			2018 income from license training ['000 €]		
	PPL(H)	CPL(H)	ATPL(H)	PPL(H)	CPL(H)	ATPL(H)	PPL(H)	CPL(H)	ATPL(H)
Austria	1 028	4 670	268	701	4 347	209	557	1 456	178
Belgium	1 084	1 027	495	739	956	387	588	320	328
Bulgaria	10	204	268	7	190	209	6	64	178
Croatia	0	138	96	0	128	75	0	43	64
Cyprus	0	0	46	0	0	36	0	0	30
Czech Republic	1 199	1 354	283	818	1 260	221	651	422	188
Denmark	648	1 945	2 479	442	1 811	1 935	351	606	1 643
Estonia	47	212	188	32	197	147	26	66	125
Finland	289	1 593	663	197	1 483	517	157	497	439
France	5 472	16 169	4 182	3 731	15 051	3 265	2 967	5 041	2 772
Germany	5 338	14 339	12 459	3 640	13 347	9 727	2 895	4 470	8 259
Greece	410	1 737	850	279	1 617	664	222	542	564
Hungary	243	726	0	165	675	0	132	226	0
Iceland	0	243	193	0	226	151	0	76	128
Ireland	595	1 228	3 378	406	1 143	2 637	323	383	2 239
Italy	3 723	11 646	8 873	2 539	10 841	6 928	2 019	3 631	5 882
Latvia	33	119	117	22	111	91	18	37	78
Lithuania	127	301	86	87	280	67	69	94	57
Luxembourg	67	0	0	45	0	0	36	0	0
Malta	4	0	0	3	0	0	2	0	0
Netherlands	813	3 149	3 006	555	2 931	2 347	441	982	1 992
Norway	589	7 468	8 306	402	6 951	6 485	319	2 328	5 506
Poland	564	2 171	288	385	2 020	225	306	677	191
Portugal	24	1 791	1 771	17	1 667	1 383	13	558	1 174
Romania	154	1 020	171	105	949	134	84	318	113
Slovakia	148	470	98	101	437	76	80	146	65
Slovenia	193	814	856	132	757	668	105	254	568
Spain	320	7 395	3 487	218	6 883	2 723	174	2 305	2 312
Sweden	736	4 409	2 177	502	4 104	1 700	399	1 375	1 443
Switzerland	2 904	8 286	2 627	1 980	7 713	2 051	1 575	2 583	1 742
United Kingdom	8 563	13 295	16 400	5 838	12 376	12 804	4 644	4 145	10 871
Total	**35 326**	**107 916**	**74 110**	**24 086**	**100 454**	**57 861**	**19 158**	**33 643**	**49 126**

Table 34. Income from PPL(H), CPL(H) and ATPL(H) for the 2016-18 period, in all EASA MS (Liechtenstein excluded).

Values in thousands of €. Source: ALG elaboration based on issued licenses, license pricing from survey and interviewee input and the described sources in the model explanation section.

Country	2016 income from IR and TR training['000 €]		2017 income from IR and TR training['000 €]		2018 income from IR and TR training['000 €]	
	IR	TR	IR	TR	IR	TR
Austria	596	328	666	326	716	203
Belgium	263	117	298	118	319	92
Bulgaria	71	18	80	16	86	12
Croatia	33	10	37	9	40	6
Cyprus	11	2	13	1	13	1
Czech Republic	231	123	261	126	279	95
Denmark	867	241	985	228	1.053	170
Estonia	65	20	74	19	79	13
Finland	339	129	382	124	410	82
France	2.821	1.268	3.177	1.253	3.405	844
Germany	4.726	1.366	5.359	1.277	5.734	862
Greece	353	128	399	124	427	85
Hungary	70	44	78	44	84	28
Iceland	77	23	87	21	93	14
Ireland	1.088	249	1.240	230	1.324	185
Italy	3.417	1.112	3.874	1.069	4.144	765
Latvia	38	11	43	11	46	8
Lithuania	177	52	202	49	215	37
Liechtenstein	51	23	58	23	62	16
Luxembourg	40	24	45	24	48	15
Malta	0	0	0	0	0	0
Netherlands	1.141	342	1.295	325	1.385	234
Norway	3.058	840	3.472	784	3.713	553
Poland	272	136	305	135	327	87
Portugal	573	158	651	147	696	102
Romania	129	60	144	59	155	37
Slovakia	70	33	78	32	84	21
Slovenia	288	83	327	78	350	57
Spain	1.571	550	1.774	524	1.901	336
Sweden	1.043	376	1.179	362	1.263	241
Switzerland	1.716	739	1.935	728	2.073	494
United Kingdom	5.668	1.689	6.446	1.628	6.886	1.261
Total	**30.861**	**10.291**	**34.965**	**9.895**	**37.408**	**6.956**

Table 35. IR and TR income for the 2016-18 period in all EASA MS, in thousands of €.

Source: ALG elaboration based on issued licenses, license pricing from survey and interviewee input and the described sources in the model explanation section.

7.1.2. Maintenance domain

7.1.2.1 AMO

7.1.2.1.1 Bottom-up approach

The fleet in EASA MS is central to several domain's modelling. The composition of airplane and helicopter fleet for all EASA MS is shown in the following figure.

Country	GA SE Piston	Business Jets	Business Pistons	Business Turboprops	GA ME Piston	Narrowbody Jets	Regional Jets	Regional Turboprops	Utility Pistons	Utility Turboprops	Widebody Jets	Piston Hlicopter	Monoturbine Hleicopter	Light Biturbine Helicopter	Med/Heavy Biturbine Helicopters	Fleet by country
Austria	422	216	17	30	39	214	20	17	0	13	12	43	50	83	4	1.180
Belgium	327	57	13	45	23	95	11	0	1	1	25	79	46	39	12	774
Bulgaria	130	13	3	11	9	39	2	0	0	9	0	13	6	4	6	245
Croatia	81	7	1	5	6	6	4	6	5	13	0	4	3	6	0	147
Cyprus	49	10	0	3	5	2	3	0	2	1	0	3	5	11	0	94
Czech Republic	889	65	26	42	27	21	2	8	1	21	1	116	33	32	4	1.288
Denmark	452	69	9	22	33	20	14	21	5	4	17	46	17	12	1	742
Estonia	38	11	4	4	2	1	9	14	0	3	0	10	2	3	0	101
Finland	391	14	6	19	14	39	12	15	0	1	22	36	28	11	5	613
France	5.325	163	51	160	134	184	71	53	5	135	145	294	329	254	8	7.311
Germany	6.471	483	199	281	253	387	56	39	18	22	193	202	176	335	25	9.140
Greece	266	21	10	12	13	64	3	32	12	7	0	41	31	35	14	561
Hungary	258	14	6	2	17	108	0	7	4	11	0	40	21	34	2	524
Iceland	148	0	6	4	5	33	0	14	2	0	9	3	9	1	3	237
Ireland	402	35	3	8	8	549	8	37	5	4	19	28	21	17	7	1.151
Italy	666	89	18	64	105	97	36	10	2	44	43	223	289	419	10	2.115
Latvia	123	2	1	0	3	25	0	15	0	3	0	7	5	5	7	196
Liechtenstein	7	2	0	2	0	0	0	1	0	0	0	0	2	1	0	15
Lithuania	112	9	0	1	7	11	0	2	0	5	0	5	5	7	1	165
Luxembourg	70	90	2	44	2	7	1	12	1	4	24	5	6	12	0	280
Malta	17	178	0	10	5	29	2	4	0	3	4	3	5	8	0	268
Netherlands	377	34	15	33	23	108	52	10	1	2	74	23	17	35	1	805
Norway	528	14	17	28	11	52	3	45	0	0	22	44	104	42	52	962
Poland	835	38	12	28	40	63	34	31	2	46	14	87	59	72	7	1.368
Portugal	414	123	9	2	19	63	13	18	3	4	28	16	35	20	1	768
Romania	72	9	2	5	9	37	2	8	4	4	0	24	12	27	1	216
Slovakia	300	13	0	4	12	1	2	0	0	11	2	24	11	20	8	408
Slovenia	202	18	3	3	3	3	14	4	10	8	2	5	9	6	0	290
Spain	1.459	84	38	33	129	253	45	85	4	126	79	79	139	247	26	2.826
Sweden	784	44	21	49	32	101	38	60	4	2	20	55	112	44	1	1.367
Switzerland	732	148	26	88	51	103	14	17	0	33	35	74	164	67	3	1.555
United Kingdom	8.238	359	99	175	215	539	73	119	26	37	227	360	270	309	81	11.127
Total general	30.584	2.432	617	1.217	1.254	3.254	544	704	117	577	1.017	1.992	2.021	2.218	290	48.838

Table 36. Fleet distribution by country and sorted by aircraft categorisation.

Source: ALG elaboration based on Cirium and GAMA 2019 databook.

In addition to fleet figures by country, Table 37~~Table 37~~ represents the annual maintenance cost according to this aircraft categorization in all EASA MS.

Country	Annual maintenance cost ['000 €]														
	General Aviation – Single Engine	Business Jets	Business Pistons	Business Turboprops	General Aviation - Multi Engine	Narrowbody Jets	Regional Jets	Regional Turboprops	Utility Pistons	Utility Turboprops	Widebody Jets	Piston helicopter	Monoturbine helicopter	Light biturbine helicopter	Med/Heavy biturbine helicopter
Austria	1.7	138.9	31.9	83.8	3.6	2 776	1 506	1 127	18.1	105.5	5 284	49.7	51.6	167	167
Belgium	1.5	126.1	29.0	76.1	3.3	2 522	1 368	1 024	16.4	95.8	4 800	45.2	46.9	152	152
Bulgaria	0.7	54.8	12.6	33.1	1.4	1 095	594	444	7.1	41.6	2 084	19.6	20.4	66	66
Croatia	0.8	68.9	15.8	41.6	1.8	1 377	747	559	9.0	52.3	2 622	24.7	25.6	83	83
Cyprus	1.1	94.7	21.8	57.2	2.5	1 893	1 027	768	12.3	71.9	3 604	33.9	35.2	114	114
Czech Republic	1.2	98.9	22.8	59.7	2.6	1 978	1 073	803	12.9	75.2	3 765	35.4	36.8	119	119
Denmark	1.7	137.8	31.7	83.2	3.6	2 755	1 495	1 118	17.9	104.7	5 244	49.3	51.2	166	166
Estonia	1.1	88.7	20.4	53.5	2.3	1 773	962	720	11.5	67.4	3 375	31.8	33.0	107	107
Finland	1.5	120.8	27.8	72.9	3.1	2 416	1 311	981	15.7	91.8	4 599	43.3	44.9	145	145
France	1.4	113.4	26.1	68.5	2.9	2 267	1 230	920	14.7	86.2	4 316	40.6	42.2	137	137
Germany	1.6	134.6	31.0	81.3	3.5	2 691	1 460	1 093	17.5	102.3	5 123	48.2	50.1	162	162
Greece	0.9	74.2	17.1	44.8	1.9	1 483	805	602	9.6	56.4	2 824	26.6	27.6	89	89
Hungary	0.9	76.7	17.6	46.3	2.0	1 533	832	622	10.0	58.2	2 918	27.5	28.5	92	92
Iceland	1.8	145.6	33.5	87.9	3.8	2 910	1 579	1 181	18.9	110.6	5 540	52.1	54.1	175	175
Ireland	2.5	204.2	47.0	123.3	5.3	4 083	2 215	1 657	26.6	155.2	7 772	73.1	75.9	246	246
Italy	1.3	104.2	24.0	62.9	2.7	2 084	1 131	846	13.6	79.2	3 967	37.3	38.8	125	125
Latvia	0.9	76.7	17.6	46.3	2.0	1 533	832	622	10.0	58.2	2 918	27.5	28.5	92	92
Lithuania	1.1	88.0	20.2	53.1	2.3	1 759	954	714	11.4	66.8	3 348	31.5	32.7	106	106
Luxembourg	3.4	277.4	63.8	167.4	7.2	5 545	3 009	2 251	36.1	210.7	10 555	99.3	103.1	334	334
Malta	1.3	106.7	24.5	64.4	2.8	2 133	1 158	866	13.9	81.1	4 061	38.2	39.7	128	128
Netherlands	1.7	141.0	32.4	85.1	3.7	2 818	1 529	1 144	18.3	107.1	5 365	50.5	52.4	170	170
Norway	2.0	164.3	37.8	99.2	4.3	3 284	1 782	1 333	21.4	124.8	6 253	58.8	61.1	198	198
Poland	0.9	77.4	17.8	46.7	2.0	1 547	839	628	10.1	58.8	2 945	27.7	28.8	93	93
Portugal	1.0	82.7	19.0	49.9	2.1	1 653	897	671	10.7	62.8	3 146	29.6	30.7	100	100
Romania	0.9	70.3	16.2	42.4	1.8	1 406	763	571	9.1	53.4	2 676	25.2	26.1	85	85
Slovakia	1.0	84.8	19.5	51.2	2.2	1 695	920	688	11.0	64.4	3 227	30.4	31.5	102	102
Slovenia	1.2	95.4	21.9	57.6	2.5	1 907	1 035	774	12.4	72.5	3 630	34.2	35.5	115	115
Spain	1.2	100.0	23.0	60.4	2.6	1 999	1 085	812	13.0	76.0	3 805	35.8	37.2	120	120
Sweden	1.6	132.2	30.4	79.8	3.4	2 642	1 434	1 072	17.2	100.4	5 029	47.3	49.1	159	159
Switzerland	2.1	171.0	39.3	103.2	4.4	3 419	1 855	1 388	22.2	129.9	6 508	61.2	63.6	206	206
United Kingdom	1.4	113.8	26.2	68.7	3.0	2 274	1 234	923	14.8	86.4	4 330	40.7	42.3	137	137

Table 37. Annual maintenance costs, in thousands of €, used in the AMO bottom-up approach model.

Please note the outlying values for Liechtenstein due to its high GDP PPS value. The impact on the overall calculation is negligible due to its few aircraft fleet (15 in total). Source: ALG elaboration based on interviewee and survey input as well as industry reports.

7.1.2.2 CAMO

7.1.2.2.1 Bottom-up approach

An extrapolation analysis has been carried out in order to extrapolate a base CAMO engineer salary to the rest of MS relying on the minimum wage, missing in some MS.

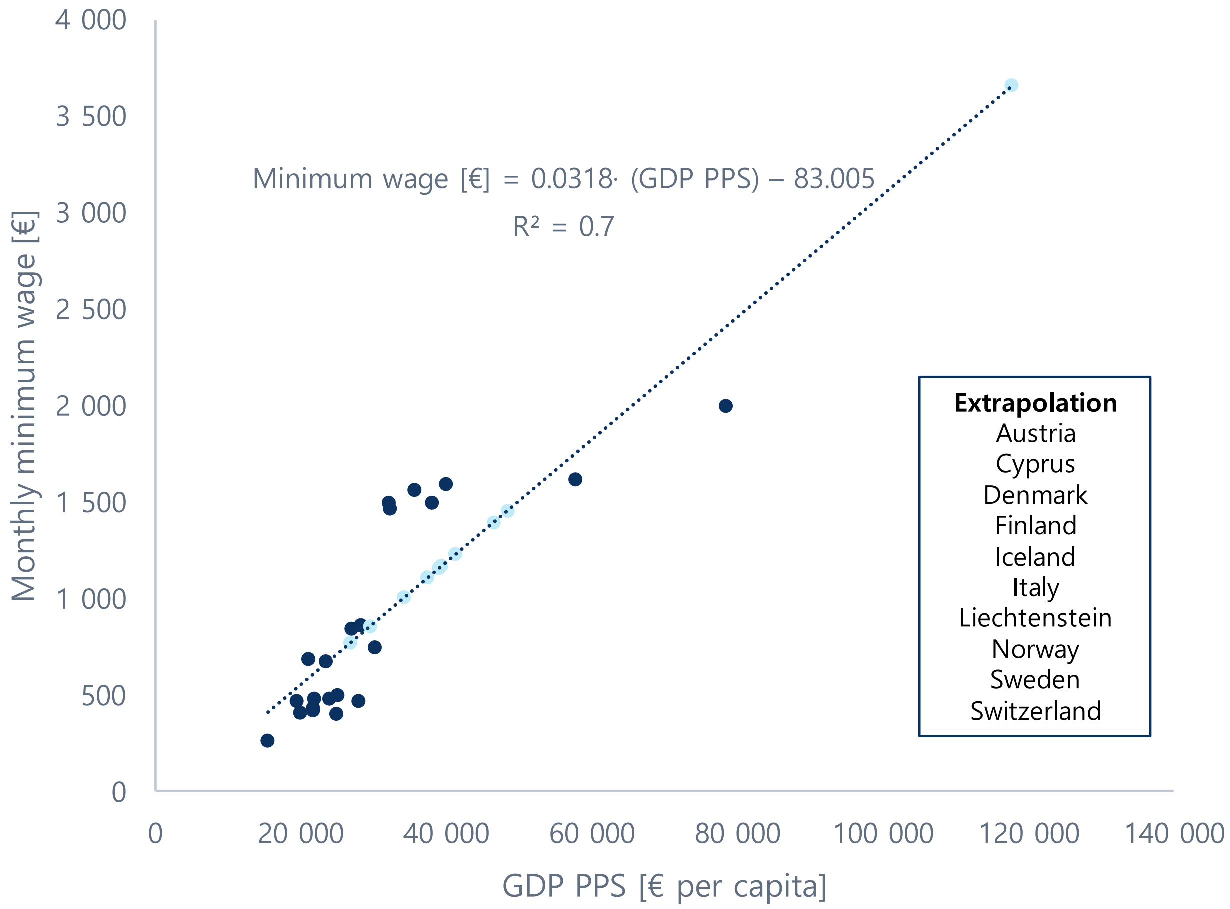

Figure 55. Minimum wage dataset and extrapolation to those countries (10) where no data is available in Eurostat's site.

Source: ALG analysis based on Eurostat minimum wage (2018) data.

The results may be seen in below.

Country	CAMO base engineer annual salary ['000 €]
Austria	68.4
Belgium	91.6
Bulgaria	15.3
Croatia	27.3
Cyprus	45.1
Czech Republic	27.5
Denmark	67.9
Estonia	29.3
Finland	58.9
France	87.9
Germany	87.9
Greece	40.1
Hungary	24.5
Iceland	72.0
Ireland	94.7
Italy	50.2
Latvia	25.2
Lithuania	23.5
Luxembourg	117.2
Malta	43.8
Netherlands	93.5
Norway	81.9
Poland	28.2
Portugal	39.7
Romania	23.9
Slovakia	28.2
Slovenia	49.4
Spain	50.4
Sweden	64.9
Switzerland	85.4
United Kingdom	86.1
Average	**60.8**

Table 38. Base CAMO engineer annual salary, in €, for al EASA MS.

The salary includes a 35% social contribution attributable to the employer. Source: ALG elaboration based on Eurostat 2018 minimum wage statistics and interviewee input.

7.1.2.3 MTO

7.1.2.3.1 Bottom-up approach

7.1.2.3.1.1 Equivalent License Attrition and retirement rate calculation

Firstly, a typical career duration of 42 years has been calculated. This is based on the typical age profile of the Part 66 engineer license holders[28]. Here, the dataset separates between EASA licenses and non-EASA licenses compliant with the British Civil Airworthiness Requirements (BCAR) licenses. Due to the scope of the study, the former have been reviewed. A summary of this dataset can be found in **Error! Reference source not found.** below.

Age	Number of licenses by age	BCAR license only by age	Part-66 license only by age	Both licenses held by age
20	1	0	1	0
21	2	0	2	0
22	7	0	7	0
23	27	0	27	0
24	54	0	54	0
25	78	0	78	0
26	141	0	141	0
27	172	0	172	0
28	227	0	227	0
....	....	....	....	....
62	281	1	259	21
63	279	1	256	22
64	252	2	240	10
65	198	0	184	14
66	173	0	161	12
67	115	3	105	7
68	97	2	88	7
69	88	1	73	14
70	71	2	61	8
Total	**13 382**	**36**	**12 969**	**377**

Table 39. Number of Part-66 exclusive, BCAR exclusive and combined licenses by age, on 2017. Source: UK CAA statistics on maintenance license holders by age.

The grand total per category of the table above, clearly show that vast majority of maintenance personnel holds only a Part-66 license (97%), with minimal overlap with the joint Part-66/BCAR licenses and the marginal BCAR only case, amounting these two last cases to the remaining 3%.

The career span (in years) is needed to calculate the retirement rate later on. Figure 56~~Figure 56~~ represents the number of Part-66 holders by age. In order to establish a typical career span, a representative starting

[28] Available at: https://www.caa.co.uk/Data-and-analysis/Approved-persons-and-organisations/Datasets/Engineer-licence-holders---age-profile/

and ending age must be set. A proxy value of 100 license holders at a given age is set, which crosses the data curve at the ages of 25 and 67 years old. These values are chosen based on the following assumptions: Starting to work as a licensed maintenance engineer requires several-year working experience and in most cases, several hundred hour-long courses (2.400 for a complete B1 course, averaging two years in duration). Thus, 25 years has been deemed as a reasonable approximation. On the other end, 67 years old is in line with the legal retirement age for EU countries[29]. As a result, the career span is set at 42 years.

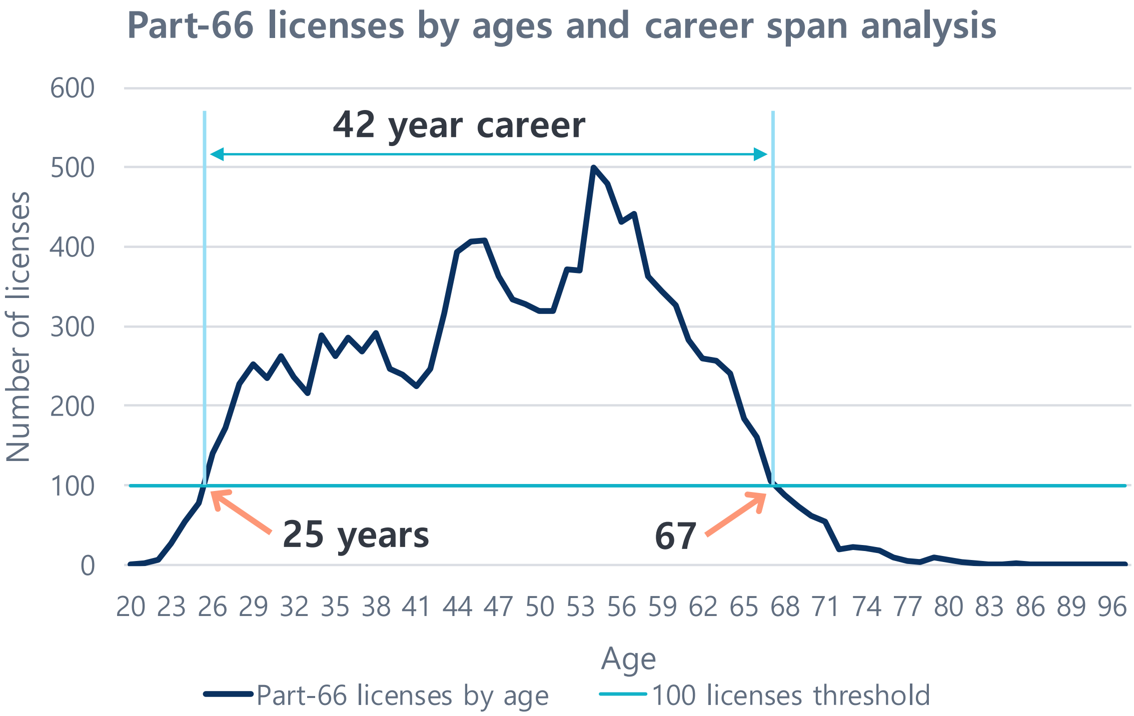

Figure 56. Evaluation of the number of Part-66 licenses by age, together with the calculation of the career span in years by means of a 100 license threshold.

Source: ALG elaboration based on UK CAA statistics on maintenance license holders by age.

It can be approximated then that if the census has remained stable in the previous years, and license issuing has kept a constant pace, the retirement ratio could be set at 1/42 or 2.38%. To be noted that on average a retiring engineer holds 3 licences, thus requiring 3 new licences to be issues to keep the total census constant. An additional 1% can be added to cater for natural attrition (relocation, promotion to managerial roles, leaving the industry, etc.), totalling 8%. Given that this rate is based on licenses and not on technician/engineers, it is names as Equivalent License Attrition and Retirement rate.

Next, using the mentioned methodology, the number of newly issued licenses is obtained for the years under analysis (2016 to 2018).

[29] Retirement age for different countries, including the EU, reported by the Finnish Centre for Pensions: https://www.etk.fi/en/the-pension-system/international-comparison/retirement-ages/

License	License census	YoY variation [%]	Retirement rate and attrition rate [%]	Licenses issued
2016	63 886	-0.89	8,00	4 582
2017	64 517	0.99	8,00	5 742
2018	64 525	0.01	8,00	5 169

Table 40. License issued according to retirement rate and YoY variation (2016 YoY % is calculated from 2015 values not present in this table).

Source: ALG elaboration based on EASA data.

The license distribution per country has been provided by EASA's Impact Assessment team, while the share of licenses according to each license category has been obtained through interviews. For this study, the following categories have been selected: A, B1, B2, B3 and C. As stated in Section 1.2.1.2, C licenses are acquired by experience and do not require theoretical formation as in the other categories. Thus, the corresponding financial size is not computed.

7.1.3. Aerodrome domain

The breakdown of the reviewed aerodromes in each MS is presented in Table 41~~Table 41~~Table 41~~Table 41~~

Country	Number of Cat. A.1	Number of Cat. A.2	Number of Cat. B.1	Number of Cat. B.2	Number of Cat. B.3	Number of Cat. C	Number of Cat. D	Total by country
Austria	1	0	1	0	1	0	4	**7**
Belgium	1	1	1	0	1	0	2	**6**
Bulgaria	2	0	0	0	0	0	3	**5**
Croatia	3	1	0	0	0	2	3	**9**
Cyprus	0	0	0	0	0	0	2	**2**
Czech Republic	1	1	0	0	1	1	1	**5**
Denmark	3	1	1	0	1	0	3	**9**
Estonia	3	0	0	0	0	0	1	**4**
Finland	13	2	3	2	1	1	2	**24**
France	62	5	7	5	3	4	20	**106**
Germany	22	2	2	1	1	1	19	**48**
Greece	8	3	5	1	3	2	10	**32**
Hungary	2	0	0	1	0	0	1	**4**
Iceland	1	1	0	1	0	0	1	**4**
Ireland	4	0	0	1	0	1	3	**9**
Italy	4	0	2	2	3	2	22	**35**
Latvia	1	0	0	0	0	0	1	**2**
Liechtenstein	0	0	0	0	0	0	0	**0**
Lithuania	0	0	0	1	0	0	2	**3**
Luxembourg	0	0	0	0	0	0	1	**1**
Malta	0	0	0	0	0	0	1	**1**
Netherlands	2	0	2	0	0	0	2	**6**
Norway	21	11	2	2	1	2	9	**48**
Poland	0	0	1	0	2	2	7	**12**
Portugal	6	2	1	0	0	0	5	**14**
Romania	6	2	1	0	2	1	4	**16**
Slovakia	3	0	0	0	0	1	1	**5**
Slovenia	1	0	0	0	0	0	1	**2**
Spain	4	4	1	1	0	1	26	**37**
Sweden	17	5	4	0	3	1	6	**36**
Switzerland	2	2	0	0	0	0	2	**6**
United Kingdom	10	5	1	0	1	5	21	**43**
Total	**203**	**48**	**35**	**18**	**24**	**27**	**186**	**541**

below.

Table 41. Aerodrome classification for all EASA MS in 2018.

Passenger data for 38 aerodromes could not be retrieved. Source: ALG elaboration based on EASA Standardisation and Eurostat data.

The following figures similarly present the income, costs, margin and subsidy for each aerodrome category and country.

Country	Income [M€]							
	Cat. A.1	Cat. A.2	Cat. B.1	Cat. B.2	Cat. B.3	Cat. C	Cat. D	Total by country
Austria	0.1	0.0	3.3	0.0	6.9	0.0	700.2	**710.5**
Belgium	0.1	2.2	4.1	0.0	5.9	0.0	756.1	**768.4**
Bulgaria	1.2	0.0	0.0	0.0	0.0	0.0	280.4	**281.6**
Croatia	0.9	1.9	0.0	0.0	0.0	19.3	202.2	**224.3**
Cyprus	0.0	0.0	0.0	0.0	0.0	0.0	248.8	**248.8**
Czech Republic	0.6	2.0	0.0	0.0	5.8	7.5	376.4	**392.3**
Denmark	2.1	1.8	3.7	0.0	7.0	0.0	792.5	**807.1**
Estonia	0.8	0.0	0.0	0.0	0.0	0.0	67.2	**68.0**
Finland	6.3	3.2	10.9	10.3	5.8	9.4	495.6	**541.5**
France	8.5	8.1	25.4	25.4	19.7	39.9	4 309.6	**4 436.6**
Germany	2.7	3.1	7.7	5.6	7.0	10.7	5 482.4	**5 519.1**
Greece	3.5	5.3	17.3	5.8	19.1	18.5	1 293.3	**1 362.6**
Hungary	0.4	0.0	0.0	5.6	0.0	0.0	332.5	**338.5**
Iceland	1.3	2.7	0.0	5.6	0.0	0.0	219.0	**228.6**
Ireland	0.7	0.0	0.0	5.3	0.0	11.2	793.5	**810.6**
Italy	1.4	0.0	7.1	9.7	19.8	20.7	4 070.4	**4 129.3**
Latvia	0.1	0.0	0.0	0.0	0.0	0.0	157.9	**157.9**
Liechtenstein	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Lithuania	0.0	0.0	0.0	4.7	0.0	0.0	133.1	**137.8**
Luxembourg	0.0	0.0	0.0	0.0	0.0	0.0	89.4	**89.4**
Malta	0.0	0.0	0.0	0.0	0.0	0.0	152.6	**152.6**
Netherlands	0.0	0.0	7.7	0.0	0.0	0.0	1 639.0	**1 646.7**
Norway	10.1	19.4	7.4	10.4	6.4	20.2	1 159.5	**1 233.3**
Poland	0.0	0.0	3.2	0.0	12.6	19.7	968.2	**1 003.6**
Portugal	2.7	4.1	3.1	0.0	0.0	0.0	1 225.5	**1 235.5**
Romania	2.2	4.0	3.8	0.0	13.0	10.3	434.7	**468.0**
Slovakia	0.4	0.0	0.0	0.0	0.0	7.9	51.4	**59.7**
Slovenia	0.0	0.0	0.0	0.0	0.0	0.0	40.6	**40.6**
Spain	0.7	7.1	4.3	5.0	0.0	14.2	5 779.5	**5 810.7**
Sweden	7.1	8.7	15.7	0.0	18.7	7.5	936.5	**994.1**
Switzerland	1.3	3.4	0.0	0.0	0.0	0.0	1 091.9	**1 096.6**
United Kingdom	2.0	11.5	3.6	0.0	6.6	54.1	6 428.8	**6 506.6**
Total	**57.1**	**88.2**	**128.3**	**93.4**	**154.4**	**271.1**	**40 708.8**	**41 501.2**

Table 42. Breakdown of 2018 income, in M€, for all aerodromes in EASA MS.

Sources: EASA and Eursoatat for passenger data and all economic sources mentioned in the modelling section.

Country	Costs [M€]							
	Cat. A.1	Cat. A.2	Cat. B.1	Cat. B.2	Cat. B.3	Cat. C	Cat. D	Total by country
Austria	0.3	0.0	7.9	0.0	9.0	0.0	593.1	**610.2**
Belgium	0.3	6.1	9.7	0.0	7.7	0.0	640.4	**664.1**
Bulgaria	4.0	0.0	0.0	0.0	0.0	0.0	237.5	**241.5**
Croatia	3.1	5.2	0.0	0.0	0.0	23.3	171.3	**202.8**
Cyprus	0.0	0.0	0.0	0.0	0.0	0.0	210.7	**210.7**
Czech Republic	2.0	5.4	0.0	0.0	7.6	9.0	318.8	**342.8**
Denmark	6.8	4.9	8.7	0.0	9.2	0.0	671.3	**700.9**
Estonia	2.6	0.0	0.0	0.0	0.0	0.0	56.9	**59.5**
Finland	20.8	8.8	25.7	18.3	7.6	11.4	419.7	**512.4**
France	28.1	22.4	59.8	45.2	25.6	48.2	3 650.2	**3 879.5**
Germany	9.0	8.5	18.1	9.9	9.1	12.8	4 643.5	**4 711.1**
Greece	11.5	14.5	40.7	10.3	24.8	22.3	1 095.4	**1 219.5**
Hungary	1.2	0.0	0.0	9.9	0.0	0.0	281.7	**292.8**
Iceland	4.4	7.3	0.0	10.0	0.0	0.0	185.5	**207.2**
Ireland	2.2	0.0	0.0	9.4	0.0	13.5	672.1	**697.2**
Italy	4.7	0.0	16.8	17.3	25.8	25.0	3 447.6	**3 537.2**
Latvia	0.3	0.0	0.0	0.0	0.0	0.0	133.7	**134.0**
Liechtenstein	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Lithuania	0.0	0.0	0.0	8.3	0.0	0.0	112.7	**121.1**
Luxembourg	0.0	0.0	0.0	0.0	0.0	0.0	75.7	**75.7**
Malta	0.0	0.0	0.0	0.0	0.0	0.0	129.3	**129.3**
Netherlands	0.1	0.0	18.1	0.0	0.0	0.0	1 388.2	**1 406.4**
Norway	33.3	53.5	17.4	18.4	8.3	24.4	982.1	**1 137.4**
Poland	0.0	0.0	7.5	0.0	16.3	23.8	820.0	**867.6**
Portugal	9.0	11.3	7.4	0.0	0.0	0.0	1 038.0	**1 065.8**
Romania	7.2	11.0	9.0	0.0	16.9	12.5	368.2	**424.7**
Slovakia	1.4	0.0	0.0	0.0	0.0	9.5	43.5	**54.4**
Slovenia	0.0	0.0	0.0	0.0	0.0	0.0	34.4	**34.4**
Spain	2.3	19.6	10.1	8.8	0.0	17.1	4 895.2	**4 953.1**
Sweden	23.4	23.9	37.1	0.0	24.3	9.0	793.2	**910.9**
Switzerland	4.3	9.2	0.0	0.0	0.0	0.0	924.9	**938.4**
United Kingdom	6.8	31.6	8.4	0.0	8.6	65.2	5 445.2	**5 565.8**
Total	**189.3**	**243.1**	**302.2**	**165.9**	**201.0**	**326.9**	**34 480.3**	**35 908.7**

Table 43. Breakdown of 2018 costs, in M€, for all aerodromes in EASA MS.

Sources: EASA and Eursoatat for passenger data and all economic sources mentioned in the modelling section.

Country	Margin [M€]							
	Cat. A.1	Cat. A.2	Cat. B.1	Cat. B.2	Cat. B.3	Cat. C	Cat. D	Total by country
Austria	-0.2	0.0	-4.5	0.0	-2.1	0.0	107.1	100.3
Belgium	-0.2	-3.9	-5.6	0.0	-1.8	0.0	115.7	104.3
Bulgaria	-2.8	0.0	0.0	0.0	0.0	0.0	42.9	40.1
Croatia	-2.2	-3.3	0.0	0.0	0.0	-4.0	30.9	21.5
Cyprus	0.0	0.0	0.0	0.0	0.0	0.0	38.1	38.1
Czech Republic	-1.4	-3.4	0.0	0.0	-1.8	-1.5	57.6	49.5
Denmark	-4.8	-3.1	-5.0	0.0	-2.1	0.0	121.3	106.2
Estonia	-1.8	0.0	0.0	0.0	0.0	0.0	10.3	8.5
Finland	-14.5	-5.6	-14.8	-8.0	-1.8	-1.9	75.8	29.1
France	-19.6	-14.2	-34.4	-19.8	-5.9	-8.2	659.4	557.2
Germany	-6.3	-5.4	-10.4	-4.3	-2.1	-2.2	838.8	808.0
Greece	-8.0	-9.2	-23.4	-4.5	-5.8	-3.8	197.9	143.1
Hungary	-0.9	0.0	0.0	-4.3	0.0	0.0	50.9	45.7
Iceland	-3.1	-4.7	0.0	-4.4	0.0	0.0	33.5	21.4
Ireland	-1.6	0.0	0.0	-4.1	0.0	-2.3	121.4	113.4
Italy	-3.3	0.0	-9.7	-7.5	-6.0	-4.3	622.8	592.0
Latvia	-0.2	0.0	0.0	0.0	0.0	0.0	24.2	24.0
Liechtenstein	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lithuania	0.0	0.0	0.0	-3.6	0.0	0.0	20.4	16.7
Luxembourg	0.0	0.0	0.0	0.0	0.0	0.0	13.7	13.7
Malta	0.0	0.0	0.0	0.0	0.0	0.0	23.3	23.3
Netherlands	0.0	0.0	-10.4	0.0	0.0	0.0	250.8	240.3
Norway	-23.3	-34.1	-10.0	-8.0	-1.9	-4.2	177.4	95.9
Poland	0.0	0.0	-4.3	0.0	-3.8	-4.1	148.1	136.0
Portugal	-6.3	-7.2	-4.3	0.0	0.0	0.0	187.5	169.7
Romania	-5.0	-7.0	-5.2	0.0	-3.9	-2.1	66.5	43.3
Slovakia	-1.0	0.0	0.0	0.0	0.0	-1.6	7.9	5.3
Slovenia	0.0	0.0	0.0	0.0	0.0	0.0	6.2	6.2
Spain	-1.6	-12.5	-5.8	-3.9	0.0	-2.9	884.3	857.6
Sweden	-16.3	-15.3	-21.3	0.0	-5.6	-1.5	143.3	83.2
Switzerland	-3.0	-5.9	0.0	0.0	0.0	0.0	167.1	158.2
United Kingdom	-4.7	-20.1	-4.8	0.0	-2.0	-11.1	983.6	940.8
Total	**-132.1**	**-154.9**	**-173.9**	**-72.5**	**-46.6**	**-55.9**	**6 228.5**	**5 592.6**

Table 44. Breakdown of 2018 margin, in M€, for all aerodromes in EASA MS.

Sources: EASA and Eursoatat for passenger data and all economic sources mentioned in the modelling section.

Country	Subsidies [M€]							
	Cat. A.1	Cat. A.2	Cat. B.1	Cat. B.2	Cat. B.3	Cat. C	Cat. D	Total by country
Austria	0.2	0.0	2.5	0.0	0.4	0.0	0.0	3.2
Belgium	0.2	2.8	3.1	0.0	0.4	0.0	0.0	6.5
Bulgaria	2.1	0.0	0.0	0.0	0.0	0.0	0.0	2.1
Croatia	1.6	2.4	0.0	0.0	0.0	0.0	0.0	4.0
Cyprus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Czech Republic	1.1	2.5	0.0	0.0	0.4	0.0	0.0	3.9
Denmark	3.6	2.3	2.8	0.0	0.4	0.0	0.0	9.2
Estonia	1.4	0.0	0.0	0.0	0.0	0.0	0.0	1.4
Finland	11.0	4.1	8.3	3.9	0.4	0.0	0.0	27.7
France	14.8	10.4	19.4	9.6	1.3	0.0	0.0	55.5
Germany	4.7	4.0	5.9	2.1	0.4	0.0	0.0	17.1
Greece	6.1	6.8	13.2	2.2	1.2	0.0	0.0	29.4
Hungary	0.6	0.0	0.0	2.1	0.0	0.0	0.0	2.7
Iceland	2.3	3.4	0.0	2.1	0.0	0.0	0.0	7.9
Ireland	1.2	0.0	0.0	2.0	0.0	0.0	0.0	3.2
Italy	2.5	0.0	5.4	3.7	1.3	0.0	0.0	12.9
Latvia	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Liechtenstein	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lithuania	0.0	0.0	0.0	1.8	0.0	0.0	0.0	1.8
Luxembourg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Malta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Netherlands	0.0	0.0	5.9	0.0	0.0	0.0	0.0	5.9
Norway	17.6	24.9	5.6	3.9	0.4	0.0	0.0	52.5
Poland	0.0	0.0	2.4	0.0	0.8	0.0	0.0	3.2
Portugal	4.8	5.3	2.4	0.0	0.0	0.0	0.0	12.4
Romania	3.8	5.1	2.9	0.0	0.8	0.0	0.0	12.6
Slovakia	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.7
Slovenia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spain	1.2	9.1	3.3	1.9	0.0	0.0	0.0	15.5
Sweden	12.3	11.2	12.0	0.0	1.2	0.0	0.0	36.7
Switzerland	2.3	4.3	0.0	0.0	0.0	0.0	0.0	6.6
United Kingdom	3.6	14.7	2.7	0.0	0.4	0.0	0.0	21.4
Total	**99.8**	**113.3**	**97.8**	**35.3**	**9.8**	**0.0**	**0.0**	**356.1**

Table 45. Breakdown of 2018 subsidies, in M€, for all aerodromes in EASA MS.

Sources: EASA and Eursoatat for passenger data and all economic sources mentioned in the modelling section

7.2. Annex II: Data references

The different values used in the model, e.g., maintenance costs, licensing structure and prices, ratios… are referenced in this annex. For each value, the sources and how the final amount is obtained are explained.

7.2.1. Helicopter domain

7.2.1.1 Helicopter operators

Approach	Concept	Value	Source
Bottom-up	Business - Air Taxi/Air Charter annual flight hours	600	Average-proxy value
Bottom-up	Business - Private Company Use annual flight hours	450	From EHA input after meeting (provided by EHA)
Bottom-up	Company Demonstrator annual flight hours	200	Average-proxy value
Bottom-up	Crop Dusting / Agricultural Spraying / Seeding annual flight hours	350	Average-proxy value
Bottom-up	Experimental / R&D / Prototype / Mfr-Design Bureau annual flight hours	200	Average-proxy value
Bottom-up	Fire Fighting (Utility Role) annual flight hours	350	Interviewee #2
Bottom-up	Heavy-Lift Ops / Under Slung Loads / Logging annual flight hours	600	Interviewee # 5
Bottom-up	Medevac / Air Ambulance / EMS / Airborne Hospital annual flight hours	600	From EHA input after meeting (provided by EHA)
Bottom-up	News Media / Camera Equipped annual flight hours	350	Interviewee #5

Approach	Concept	Value	Source
Bottom-up	Off-Shore - Wind Farm / Other Support annual flight hours	600	From Bristow Group 2017 Annual report
Bottom-up	Off-Shore / Oil & Gas Support annual flight hours	1250	From EHA input after meeting (provided by EHA)
Bottom-up	Passenger annual flight hours	600	Average-proxy value
Bottom-up	Police Air Support / Law Enforcement / Border Patrol annual flight hours	410	Average from 2018 contract for Customs helicopter operation awarded to Babcock in Spain (480 fh) and 2016 Revues de Dépenses-Gendarmerie nationale in France (18.737fh/56 helicopters=335 fh per helicopter)
Bottom-up	Private Use annual flight hours	80	Average-proxy value
Bottom-up	Search & Rescue / Coast Guard annual flight hours	500	Interviewee #2. Average from 12 hour and 24 hour operational bases. Approx. 100 annual fh operational plus a lot of training. Confirmed by British SAR data (operated by Bristow) of 200 fh for each of the 22 helicopters.
Bottom-up	Sightseeing / Tourist annual flight hours	300	Average-proxy value
Bottom-up	Skydiving / Parachuting annual flight hours	200	Average-proxy value
Bottom-up	Surveying / Mapping & Power/Pipeline Inspection annual flight hours	200	Same as in Heavy-Lift Ops / Under Slung Loads / Logging

Approach	Concept	Value	Source
Bottom-up	Trainer / Training School Aircraft annual flight hours	425	From interviewee #8. Total of 5.100 fh for a 12 helicopter fleet.
Bottom-up	Utility (Civil Multi-Role) annual flight hours	500	Average-proxy value considering firefighting, law enforcement, etc
Bottom-up	VIP / Head of State / Government operated annual flight hours	200	Average-proxy value
Bottom-up	Water-Bomber / Chemical Spray annual flight hours	350	Same as Firefighting
Bottom-up	Weather / Atmospheric / Geo & Environmental annual flight hours	200	Average-proxy value
Bottom-up	Eurocopter AS350 and Airbus H125 in Business - Air Taxi/Air Charter, income per flight hour [€]	2.030	Average from interviewee #4 and #5 1.500 €/fh response and 3.110 €/fh value from Aeca & Helicopteros 2017 helicopter firefighting report for a 5,5 month 25 fh per month campaign
Bottom-up	Eurocopter AS350 in Business - Private Company Use, income per flight hour [€]	2.030	Average from interviewee #4 and #5 1.500 €/fh response and 3.110 €/fh value from Aeca & Helicopteros 2017 helicopter firefighting report for a 5,5 month 25 fh per month campaign
Bottom-up	Augusta Westland AW139 in Company Demonstrator, income per flight hour [€]	5.000	Interviewee #4
Bottom-up	Hughes 269 & Robinson R22 and R44 in Crop Dusting / Agricultural	800	Average-proxy value

Approach	Concept	Value	Source
	Spraying / Seeding, income per flight hour [€]		
Bottom-up	Eurocopter AS365N in Experimental / R&D / Prototype / Mfr-Design Bureau, income per flight hour [€]	3.660	IAOPA and GAMA survey for aircraft operating costs provides values of 3.500 and 4.000 € from two Italian companies. Plus, interviewee #2 expressed that is equivalent operationally to the Bell 412. Thus, the same value for this helicopter on Fire Fighting (utility role) is taken. Averaging all the responses yields
Bottom-up	Augusta Bell AB412 and Bell 412 in Fire Fighting (Utility Role), income per flight hour [€]	3.385	Average from interviewee #2 and #4= 2.500 and 3.500 plus the 4.155 from Aeca & Helicopteros 2017 helicopter firefighting report for a 5 month 200 fh campaign
Bottom-up	Eurocopter AS332 in Heavy-Lift Ops / Under Slung Loads / Logging, income per flight hour [€]	6.000	Interviewee #2
Bottom-up	Eurocopter EC135 and Airbus H135 in Medevac / Air Ambulance / EMS / Airborne Hospital, income per flight hour [€]	3.050	Average rom TAF Helicopters public contract to provide HEMS service to the Catalan government with 4 EC135 and 3.500 value for a similar helicopter EC145
Bottom-up	Eurocopter AS350 in News Media / Camera Equipped, income per flight hour [€]	2.030	Average from interviewee #4 and #5 1.500 €/fh response and 3.110 €/fh value from Aeca & Helicopteros 2017 helicopter firefighting

Approach	Concept	Value	Source
			report for a 5,5 month 25 fh per month campaign
Bottom-up	Augusta Westland AW139 in Off-Shore - Wind Farm / Other Support, income per flight hour [€]	5.000	Interviewee #4
Bottom-up	Sikorsky S92 in Off-Shore / Oil & Gas Support, income per flight hour [€]	8.000	Interviewee #4
Bottom-up	Eurocopter AS350 in Passenger, income per flight hour [€]	2.030	Average from interviewee #4 and #5 1.500 €/fh response and 3.110 €/fh value from Aeca & Helicopteros 2017 helicopter firefighting report for a 5,5 month 25 fh per month campaign
Bottom-up	Eurocopter EC135 in Police Air Support / Law Enforcement / Border Patrol, income per flight hour [€]	3.050	Average rom TAF Helicopters public contract to provide HEMS service to the Catalan government with 4 EC135 and 3.500 value for a similar helicopter EC145
Bottom-up	Robinson R44 I&II in Private Use, income per flight hour [€]	800	Average-proxy value
Bottom-up	Augusta Westland AW139 in Search & Rescue / Coast Guard, income per flight hour [€]	5.000	Interviewee #4
Bottom-up	Eurocopter AS350 in Sightseeing / Tourist, income per flight hour [€]	2.030	Average from interviewee #4 and #5 1.500 €/fh response and 3.110 €/fh value from Aeca & Helicopteros 2017 helicopter firefighting

Approach	Concept	Value	Source
			report for a 5,5 month 25 fh per month campaign
Bottom-up	Mil Mi-8/17 in Skydiving / Parachuting, income per flight hour [€]	8.000	Lack of data being a rare and Russian built model. Values from Sikorsky S96 taken being similar aircraft.
Bottom-up	Eurocopter AS350 in Surveying / Mapping & Power/Pipeline Inspection, income per flight hour [€]	2.030	Average from interviewee #4 and #5 1.500 €/fh response and 3.110 €/fh value from Aeca & Helicopteros 2017 helicopter firefighting report for a 5,5 month 25 fh per month campaign
Bottom-up	Robinson R44 I&II in Trainer / Training School Aircraft, income per flight hour [€]	800	Average-proxy value
Bottom-up	Eurocopter AS350 in Utility (Civil Multi-Role), income per flight hour [€]	2.030	Average from interviewee #4 and #5 1.500 €/fh response and 3.110 €/fh value from Aeca & Helicopteros 2017 helicopter firefighting report for a 5,5 month 25 fh per month campaign
Bottom-up	Mil Mi-8/17 in VIP / Head of State / Government operated, income per flight hour [€]	8.000	Lack of data being a rare and Russian built model. Values from Sikorsky S96 taken being similar aircraft.
Bottom-up	Sikorsky S64 in Water-Bomber / Chemical Spray, income per flight hour [€]	6.000	Due to lack of data, same value as Eurocopter AS332 being both heavy lift helicopters
Bottom-up	Eurocopter EC135 in Weather / Atmospheric /	3.050	Average rom TAF Helicopters public contract to provide

Approach	Concept	Value	Source
	Geo & Environmental, income per flight hour [€]		HEMS service to the Catalan government with 4 EC135 and 3.500 value for a similar helicopter EC145
Bottom-up	Industrial margin	6%	Interviewee IDs: 02, 04 and 05 supporting data from a public tender in La Rioja (Spain)

7.2.1.2 ATO(H)

Approach	Concept	Value	Source
Bottom-up	Licenses, IR and TR course pricing	Multiple	Survey (15 inputs), interview (17 inputs) and web research (49 inputs)
Bottom-up	Retirement and Attrition Rate	10%	Interviewee ID: 08
Bottom-up	IR course enrolment rate for PPL(H) students	0%	Convergence and validation from EAMTC
Bottom-up	IR course enrolment rate for CPL(H) students	0%	Convergence and validation from EAMTC
Bottom-up	IR course enrolment rate for ATPL(H) students	0%	Convergence and validation from EAMTC
Bottom-up	IR course enrolment rate for PPL(H) pilots	0%	Convergence and validation from EAMTC
Bottom-up	IR course enrolment rate for CPL(H) pilots	50%	Convergence and validation from EAMTC
Bottom-up	IR course enrolment rate for ATPL(H) pilots	50%	Convergence and validation from EAMTC
Bottom-up	TR course enrolment rate for PPL(H) students	1%	Convergence and validation from EAMTC
Bottom-up	TR course enrolment rate for CPL(H) students	5%	Convergence and validation from EAMTC
Bottom-up	TR course enrolment rate for ATPL(H) students	20%	Convergence and validation from EAMTC
Bottom-up	TR course enrolment rate for PPL(H) pilots	3%	Convergence and validation from EAMTC
Bottom-up	TR course enrolment rate for CPL(H) pilots	4%	Convergence and validation from EAMTC

Approach	Concept	Value	Source
Bottom-up	TR course enrolment rate for ATPL(H) pilots	4%	Convergence and validation from EAMTC
Top-down	Correction factor for for-profit ATO(H)	0,67	Individual company study from approved ATO listings from Norway, Spain, the UK and Romania

7.2.2. Maintenance domain

7.2.2.1 AMO

Approach	Concept	Value	Source
Bottom-up	GA SE Pistons annual flight hours	80	GAMA.IAOPA European GA Survey 2019 (link)
Bottom-up	Business Jets annual flight hours	376	Cirium (2017) data
Bottom-up	Business Pistons annual flight hours	410	GAMA.IAOPA European GA Survey 2019 (link)
Bottom-up	Business Turboprops annual flight hours	319	Cirium (2017) data
Bottom-up	GA ME Pistons annual flight hours	80	GAMA.IAOPA European GA Survey 2019 (link)
Bottom-up	Narrowbody Jets annual flight hours	2.868	Cirium (2017) data
Bottom-up	Regional Jets annual flight hours	2.074	Cirium (2017) data
Bottom-up	Regional Turboprops annual flight hours	1.552	Cirium (2017) data
Bottom-up	Utility Pistons annual flight hours	610	Cirium (2017) data
Bottom-up	Utility Turboprops annual flight hours	401	Cirium (2017) data
Bottom-up	Widebody Jets annual flight hours	4.364	Cirium (2017) data
Bottom-up	Piston helicopter annual flight hours	400	Average value from all the annual flight hours per helicopter operation category, in the Helicopter Operators model
Bottom-up	Monoturbine helicopter annual flight hours	400	Average value from all the annual flight hours

Approach	Concept	Value	Source
			per helicopter operation category, in the Helicopter Operators model
Bottom-up	Light biturbine helicopter annual flight hours	400	Average value from all the annual flight hours per helicopter operation category, in the Helicopter Operators model
Bottom-up	Med/Heavy biturbine helicopter annual flight hours	400	Average value from all the annual flight hours per helicopter operation category, in the Helicopter Operators model
Bottom-up	GA SE piston annual maintenance cost [€]	1.210	Interviewee ID: 07
Bottom-up	Business Jets annual maintenance cost [€]	100.000	Interviewee ID: 03
Bottom-up	Business Pistons annual maintenance cost [€]	23.000	Proxied based on similar category similarity
Bottom-up	Business Turboprops maintenance cost per flight hour [€]	189	European Aircraft Sales estimated operating costs for the Pilatus PC-12 NG, exchanged at 2018 ER and adjusted from Danish prices via GDP PPS (link)
Bottom-up	GA ME piston annual maintenance cost [€]	2.600	Interviewee ID: 07
Bottom-up	Narrowbody Jets maintenance cost per flight hour[€]	697	Survey ID: 13 for line maintenance cost and Aircraft operating costs, Peter Belobaba (2014)

Approach	Concept	Value	Source
			(link), adjusted for inflation and $ to € ER from mid-year 2014
Bottom-up	Regional Jets maintenance cost per flight hour [€]	523	Proxied based on similar category similarity (based on Regional Turboprops
Bottom-up	Regional Turboprops maintenance cost per flight hour [€]	523	Aircraft Scheduled Airframe Maintenance and Downtime Integrated Cost Model, Remzi Saltoglu. Adjusted for inflation and $ to € ER from mid-year 2008
Bottom-up	Utility Pistons annual maintenance cost [€]	13.000	Proxied based on similar category similarity
Bottom-up	Utility Turboprops maintenance cost per flight hour [€]	189	European Aircraft Sales estimated operating costs for the Pilatus PC-12 NG, exchanged at 2018 ER and adjusted from Danish prices via GDP PPS (link)
Bottom-up	Widebody Jets maintenance cost per flight hour [€]	872	Survey ID: 13 for line maintenance cost and Aircraft operating costs, Peter Belobaba (2014) (link), adjusted for inflation and $ to € ER from mid-year 2014
Bottom-up	Piston helicopter annual maintenance cost [€]	35.800	Interviewee ID: 04

Approach	Concept	Value	Source
Bottom-up	Monoturbine helicopter annual maintenance cost [€]	37.180	Interviewee ID: 04
Bottom-up	Light biturbine helicopter annual maintenance cost [€]	120.380	Interviewee ID: 04
Bottom-up	Med/Heavy biturbine helicopter annual maintenance cost [€]	120.380	Interviewee ID: 04

7.2.2.2 CAMO

Approach	Concept	Value	Source
Bottom-up	CAMO engineer base salary in Spain	37.500 € + 35% social contributions	Interviewee ID: 04
Bottom-up	Overhead percentage based on direct costs to calculate indirect costs	15%	Interviewee IDs: 02, 04 and 05 supporting data from a public tender (Gobierno de la Rioja, 2018)
Bottom-up	CAMO manager to base engineer salary ratio	2	Interviewee ID: 04
Bottom-up	Number of GA SE Piston airplanes managed per CAMO engineer ratio	20	Interviewee ID: 16
Bottom-up	Number of Business Jets aircraft managed per CAMO engineer ratio	8	Proxied
Bottom-up	Number of Business Piston airplanes managed per CAMO engineer ratio	20	Interviewee ID: 16
Bottom-up	Number of Business Turboprop airplanes managed per CAMO engineer ratio	8	Proxied
Bottom-up	Number of GA ME piston airplanes managed per CAMO engineer ratio	20	Interviewee ID: 16
Bottom-up	Number of Narrowbody jets managed per CAMO engineer ratio	1.6	Interviewee ID: 14

Approach	Concept	Value	Source
Bottom-up	Number of Regional jets managed per CAMO engineer ratio	1.6	Interviewee ID: 14
Bottom-up	Number of Regional Turboprops managed per CAMO engineer ratio	1.6	Proxied
Bottom-up	Number of Utility Piston airplanes managed per CAMO engineer ratio	20	Interviewee ID: 16
Bottom-up	Number of Utility Turboprop airplanes managed per CAMO engineer ratio	8	Proxied
Bottom-up	Number of Widebody jets managed per CAMO engineer ratio	1.6	Interviewee ID: 14
Bottom-up	Number of Piston helicopters managed per CAMO engineer ratio	8	Interviewee ID: 04 and 07
Bottom-up	Number of Monoturbine helicopters managed per CAMO engineer ratio	8	Interviewee ID: 04 and 07
Bottom-up	Number of Light Biturbine helicopters managed per CAMO engineer ratio	8	Interviewee ID: 04 and 07
Bottom-up	Number of Med/heavy Biturbine helicopters managed per CAMO engineer ratio	8	Interviewee ID: 04 and 07

7.2.2.3 MTO

Approach	Concept	Value	Source
Bottom-up	Equivalent License Attrition and Retirement rate	8%	Based on UK CAA data on aircraft licenses by age and Interviewee ID: 17 (EAMTC) input
Bottom-up	Number of licenses held by a retiring engineer	3	Interviewee ID: 17(EAMTC)
Bottom-up	A license type share over the total census	13%	Proposed and validated with Interviewee ID: 13, 14, 15 and 17 (EAMTC)
Bottom-up	B1 license type share over the total census	50%	Proposed and validated with Interviewee ID: 13, 14, 15 and 17 (EAMTC)
Bottom-up	B2 license type share over the total census	20%	Proposed and validated with Interviewee ID: 13, 14, 15 and 17 (EAMTC)
Bottom-up	B3 license type share over the total census	2%	Proposed and validated with Interviewee ID: 13, 14, 15 and 17 (EAMTC)
Bottom-up	C license type share over the total census	15%	Proposed and validated with Interviewee ID: 13, 14, 15 and 17 (EAMTC)
Bottom-up	A license course price (EASA MS representative average value) [€]	9 000	Proposed and validated with Interviewee ID: 13, 14, 15 and 17 (EAMTC)
Bottom-up	B1 license course price (EASA MS representative average value) [€]	25 000	Proposed and validated with Interviewee ID: 13, 14, 15 and 17 (EAMTC)
Bottom-up	B2 license course price (EASA MS representative average value) [€]	25 000	Proposed and validated with Interviewee ID: 13, 14, 15 and 17 (EAMTC)

Approach	Concept	Value	Source
Bottom-up	B1 type rating course price (EASA MS representative average value) [€]	8 875	Weighted average based on fleet from the price by aircraft category provided by Interviewee ID: 17 (EAMTC)
Bottom-up	B2 type rating course price (EASA MS representative average value) [€]	10 400	Weighted average based on fleet from the price by aircraft category provided by Interviewee ID: 17 (EAMTC)

7.2.3. Aerodrome domain

Concept	Value	Source
Subsidy per passenger regression	Multiple	Regression on the state aid awarded to French regional aerodromes, from the Transport and Environment report on this subject (link)
Passengers transported at each of the reviewed aerodromes	Multiple	From EASA and Eurostat (2018) data (link)
Aerodromes falling in the scope of the study	-	List of aerodromes in the scope of EASA Basic Regulation (link)
Cat. A aerodromes income per passenger [€/pax]	13,40	From Comparative study (benchmarking) on the efficiency of Avinor´s airport operations, by GAP. Page 26. For aerodromes under 0.2 Mppa per year, average income per pax of the aerodromes falling in the first and third quartile. Adjusted for inflation and using NOK to EUR ER of mid-year 2010 (link)
Cat. B aerodrome income per passenger [€/pax]	13,40	The European Commission's consultation on the 2014 Aviation State Aid Guidelines. An economic analysis of airports' profitability, by Oxera. Averaged value of the aero and non-aero income of this report's surveyed aerodromes. Adjusted for inflation
Cat. C aerodrome income per passenger [€/pax]	13,40	The European Commission's consultation on the 2014 Aviation State Aid Guidelines. An economic analysis of airports' profitability, by Oxera. Averaged value of the aero and non-aero income of this report's surveyed aerodromes. Adjusted for inflation

Concept	Value	Source
Cat. B aerodrome income per passenger [€/pax]	22,42	From ACI Europe Airport Economics 2017 report. Adjusted for inflation
Cat. A aerodromes share of income from aeronautical income	82%	From Comparative study (benchmarking) on the efficiency of Avinor´s airport operations, by GAP. Page 102. Average value for aerodromes in the 0-0,2 Mppa range (link)
Cat. A aerodromes share of income from non-aeronautical income	18%	From Comparative study (benchmarking) on the efficiency of Avinor´s airport operations, by GAP. Page 102. Average value for aerodromes in the 0-0,2 Mppa range (link)
Cat. B aerodromes share of income from aeronautical income	72%	From Comparative study (benchmarking) on the efficiency of Avinor´s airport operations, by GAP. Page 102. Average value for aerodromes in the 0,2-0,5 Mppa range (link)
Cat. B aerodromes share of income from non-aeronautical income	28%	From Comparative study (benchmarking) on the efficiency of Avinor´s airport operations, by GAP. Page 102. Average value for aerodromes in the 0,2-0,5 Mppa range (link)
Cat. C aerodromes share of income from aeronautical income	72%	From Comparative study (benchmarking) on the efficiency of Avinor´s airport operations, by GAP. Page 102. Average value for aerodromes in the 0,5-1 Mppa range (link)
Cat. C aerodromes share of income from non-aeronautical income	28%	From Comparative study (benchmarking) on the efficiency of Avinor´s airport operations, by GAP. Page 102. Average

Concept	Value	Source
		value for aerodromes in the 0,5-1Mppa range (link)
Cat. D aerodromes share of income from aeronautical income	28%	From ACI Europe Airport Economics 2017 report
Cat. D aerodromes share of income from non-aeronautical income	28%	From ACI Europe Airport Economics 2017 report
Cat. D aerodromes share of income from Ground Handling income	28%	From ACI Europe Airport Economics 2017 report
Cat. D aerodromes share of income from Other income	28%	From ACI Europe Airport Economics 2017 report
Cat. A cost share among operating and capital costs	83% - 17%	From Airport Economics 2017 report
Cat. B cost share among operating and capital costs	83% - 17%	From Airport Economics 2017 report
Cat. C cost share among operating and capital costs	83% - 17%	From Airport Economics 2017 report
Cat. D cost share among operating and capital costs	67% - 33%	From ACI Europe Airport Economics 2017 report

7.3. Annex III: Aerodrome list

The following table provides the list of aerodromes falling within EASA BR (2019 data).

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
Austria	Wien	No	D	27 196 609	Ireland	Weston	Exempted	A	977
Austria	Wien	No	D	27 196 609	Ireland	Weston	EYes	A	977
Austria	Linz	No	B	475 124	Italy	Alghero Fertilia	No	D	1 374 147
Austria	Salzburg	No	D	1 861 010	Italy	Ancona Falconara	No	B	448 746
Austria	Innsbruck	No	D	1 125 223	Italy	Bari Palese Macchie	No	D	5 084 025
Austria	Klagenfurt	No	B	229 755	Italy	Bergamo Orio al Serio	No	D	12 937 182
Austria	Graz	No	D	1 042 519	Italy	Bologna Borgo Panigale	No	D	8 581 898
Austria	Bad Vöslau	EYes	A	7 320	Italy	Bolzano	No	NA	NA
Belgium	Antwerpen / Deurne	No	B	281 956	Italy	Brescia Montichiari	No	A	3 436
Belgium	Brussel/ Brussel-Nationaal	No	D	25 702 502	Italy	Brindisi Papola Casale	No	D	2 508 403
Belgium	Charleroi / Brussels South	No	D	8 016 800	Italy	Cagliari Elmas	No	D	4 412 938
Belgium	Kortrijk / Wevelgem	EYes	A	6 512	Italy	Catania Fontanarossa	No	D	9 943 668
Belgium	Liège / Liège	No	A	164 043	Italy	Comiso	No	B	431 061
Belgium	Oostende-Brugge / Oostende	No	B	408 329	Italy	Cuneo	No	A	27 160
Bulgaria	Burgas Airport	No	D	3 266 565	Italy	Firenze Peretola	No	D	2 706 527
Bulgaria	Gorna Oryahovitsa Airport	EYes	A	388	Italy	Genova Sestri	No	D	1 462 991
Bulgaria	Plovdiv Airport	No	A	90 136	Italy	Lamezia Terme	No	D	2 795 657
Bulgaria	Sofia Airport	No	D	6 942 484	Italy	Lampedusa	No	B	267 617
Bulgaria	Varna Airport	No	D	2 296 047	Italy	Milano Linate	No	D	9 215 912

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
Croatia	Zagreb Internationa l Airport	No	D	3 330 684	Italy	Milano Malpensa	No	D	24 426 946
Croatia	Dubrovnik Airport	No	D	2 553 269	Italy	Napoli Capodichino	No	D	9 939 714
Croatia	Split Airport	No	D	3 134 212	Italy	Olbia Costa Smeralda	No	D	3 012 268
Croatia	Pula Airport	No	C	717 430	Italy	Palermo Punta Raisi	No	D	6 698 355
Croatia	Zadar Airport	No	C	610 949	Italy	Pantelleria	Not yet No	A	34 572
Croatia	Rijeka Airport	No	A	139 480	Italy	Parma	No	A	41 811
Croatia	Osijek Airport	No	A	41 976	Italy	Perugia	No	B	222 359
Croatia	Brač Airport	No	A	21 596	Italy	Pescara	No	C	657 053
Croatia	Mali Lošinj Airport	EYes	A	6 042	Italy	Pisa San Giusto	Not yet No	D	5 457 429
Cyprus	Larnaca Internationa l Airport	No	D	8 225 179	Italy	Reggio Calabria	No	B	360 618
Cyprus	Pafos Internationa l Airport	No	D	2 870 709	Italy	Rimini	No	B	308 034
Czech Republic	Vaclav Havel Airport Prague	No	D	16 787 436	Italy	Roma Ciampino	No	D	5 812 451
Czech Republic	Brno Airport	No	C	513 224	Italy	Roma Fiumicino	No	D	43 086 201
Czech Republic	Leos Janacek Airport Ostrava	No	B	401 819	Italy	Taranto Grottaglie	No	NA	NA
Czech Republic	Internationa l Airport Karlovy Vary	No	A	45 007	Italy	Torino Caselle	No	D	4 115 861
Czech Republic	Pardubice Airport	No	A	146 455	Italy	Trapani Birgi	Not yet No	B	485 105
Denmark	Billund Airport	No	D	3 496 417	Italy	Treviso Sant'Angelo	No	D	3 304 285
Denmark	Bornholm Airport	No	B	254 584	Italy	Trieste Ronchi dei Legionari	No	C	769 767
Denmark	Esbjerg	No	A	76 214	Italy	Venezia Tessera	No	D	11 179 488

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
Denmark	Midtjyllands Lufthavn A.m.b.a.	No	A	133 405	Italy	Verona Villafranca	No	D	3 466 440
Denmark	Kolding/Vamdrup	EYes	NA	NA	Italy	Albenga (Villanova di)	EYes	NA	NA
Denmark	Copenhagen, Kastrup	No	D	30 262 426	Italy	Aosta	EYes	NA	NA
Denmark	H.C Andersen	Not yet No	NA	NA	Italy	Foggia	EYes	NA	NA
Denmark	Copenhagen, Roskilde	No	A	5 981	Italy	Grosseto	EYes	NA	NA
Denmark	Sindal	EYes	NA	NA	Italy	Salerno Pontecagnano	EYes	NA	NA
Denmark	Stauning	EYes	D		Latvia	RIGA	No	D	7 039 419
Denmark	Sønderborg	No	A	72 002	Latvia	LIEPAJA	No	A	6 105
Denmark	Vojens/Skrydstrup	EYes	NA	NA	Lithuania	Vilnius International	No	D	4 924 916
Denmark	Aalborg A.M.B.A	No	D	1 583 749	Lithuania	Kaunas International	No	D	1 010 682
Denmark	Aarhus	No	B	483 952	Lithuania	Palanga International	No	B	322 411
Estonia	Lennart Meri Tallinn	No	D	2 995 830	Luxembourg	Luxembourg-Findel	No	D	3 988 224
Estonia	Tartu	No	A	30 292	Malta	Luqa International	No	D	6 805 643
Estonia	Kuressaare	No	A	19 231	Netherlands	Schiphol	No	D	71 169 454
Estonia	Kärdla	No	A	9 170	Netherlands	Rotterdam	No	D	1 923 386
Finland	Enontekiö	No	A	26 129	Netherlands	Groningen	No	B	249 583
Finland	Halli	No	A	15	Netherlands	Maastricht Aachen	No	B	279 254
Finland	Helsinki-Vantaa	No	D	20 994 030	Netherlands	Lelystad	EYes	A	677
Finland	Ivalo	No	B	273 048	Netherlands	Kempen	EYes	A	704
Finland	Joensuu	No	A	122 297	Netherlands	Teuge	EYes	NA	NA
Finland	Jyväskylä	No	A	88 285	Norway	Alta Lufthavn	No	B	395 000
Finland	Kajaani	No	A	91 546	Norway	Andøya Lufthavn, Andenes	No	A	61 510
Finland	Kemi-Tornio	No	A	71 953	Norway	Bardufoss Lufthavn	No	B	242 112
Finland	Kittilä	No	B	402 212	Norway	Bergen Lufthavn, Flesland	No	D	6 187 578
Finland	Kokkola-Pietarsaari	No	A	97 831	Norway	Berlevåg Lufthavn	No	A	14 043
Finland	Kuopio	No	B	246 854	Norway	Bodø Lufthavn	No	D	1 951 312

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
Finland	Kuusamo	No	A	117 063	Norway	Brønnøysund Lufthavn, Brønnøy	No	A	118 851
Finland	Maarianha mina	No	A	57 653	Norway	Båtsfjord Lufthavn	No	A	28 474
Finland	Oulu	No	D	1 105 797	Norway	Fagernes Lufthavn, Leirin	No	A	1 818
Finland	Pori	No	A	17 675	Norway	Florø Lufthamn	No	A	118 520
Finland	Rovaniemi	No	C	648 459	Norway	Førde Lufthamn, Bringeland	No	A	85 479
Finland	Savonlinna	No	A	10 744	Norway	Hammerfest Lufthavn	No	A	184 346
Finland	Tampere-Pirkkala	No	B	231 531	Norway	Harstad/Narvik Lufthavn, Evenes	No	C	773 378
Finland	Turku	No	B	392 228	Norway	Hasvik Lufthavn	No	A	22 604
Finland	Utti	No	A	7	Norway	Haugesund Lufthavn, Karmøy	No	C	620 059
Finland	Vaasa	No	B	317 826	Norway	Honningsvåg Lufthavn, Valan	No	A	25 385
Finland	Lappeenran ta	No	A	6 215	Norway	Kirkenes Lufthavn, Høybuktmoen	No	B	317 795
Finland	Mikkeli	No	A	46	Norway	Kristiansand Lufthavn, Kjevik	No	D	1 062 156
Finland	Seinäjoki	No	A	595	Norway	Kristiansund Lufthavn, Kvernberget	No	B	266 155
France	Agen-La Garenne	No	A	31 395	Norway	Lakselv Lufthavn, Banak	No	A	61 009
France	Ajaccio-Napoléon Bonaparte	No	D	1 673 154	Norway	Leknes Lufthavn	No	A	143 743
France	Albert-Bray	EYes	A	1 561	Norway	Mehamn Lufthavn	No	A	23 794
France	Albi-Le Séquestre	EYes	A	33	Norway	Mo I Rana Lufthavn, Røssvoll	No	A	113 208
France	Amiens-Glisy	EYes	A	19	Norway	Molde Lufthavn, Årø	No	B	438 565
France	Angers-Marcé	EYes	A	3 734	Norway	Mosjøen Lufthavn, Kjærstad	No	A	76 234
France	Angoulême-Brie-Champniers	EYes	A	267	Norway	Rygge Air Station	EYes	NA	NA
France	Annecy-Meythet	EYes	A	3 335	Norway	Namsos Lufthavn	No	A	37 260
France	Aurillac	No	A	32 962	Norway	Oslo Lufthavn, Gardermoen	No	D	28 406 796
France	Auxerre-Branches	EYes	A	1 315	Norway	Røros Lufthavn	No	A	24 473
France	Avignon-Caumont	No	A	8 844	Norway	Rørvik Lufthavn, Ryum	No	A	42 510

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
France	Bâle-Mulhouse	No	D	8 564 223	Norway	Røst Lufthavn	No	A	15 631
France	Bastia-Poretta	No	D	1 522 854	Norway	Sandane Lufthamn, Anda	No	A	44 900
France	Beauvais-Tillé	No	D	3 786 250	Norway	Sandefjord Lufthavn, Torp	No	D	2 063 313
France	Bergerac-Roumanière	No	B	285 584	Norway	Sandnessjøen Lufthavn, Stokka	No	A	84 900
France	Besançon-La Vèze	EYes	A	65	Norway	Sogndal Lufthamn, Haukåsen	No	A	110 681
France	Béziers-Vias	No	B	229 434	Norway	Stavanger Lufthavn, Sola	No	D	4 044 559
France	BIARRITZ-PAYS-BASQUE	No	D	1 183 568	Norway	Stokmarknes Lufthavn, Skagen	No	A	120 692
France	Blois-Le Breuil	EYes	NA	NA	Norway	Stord Lufthavn, Sørstokken	No	A	35 021
France	Bordeaux-Mérignac	No	D	6 785 056	Norway	Svalbard Lufthavn, Longyear	No	A	181 110
France	Bourges	EYes	A	96	Norway	Svolvær Lufthavn, Helle	No	A	107 144
France	Brest-Bretagne	No	D	1 102 539	Norway	Sørkjosen Lufthavn	No	A	22 256
France	Brive-Souillac	No	A	69 171	Norway	Tromsø Lufthavn, Langnes	No	D	2 410 316
France	Caen-Carpiquet	No	B	274 081	Norway	Trondheim Lufthavn, Værnes	No	D	4 446 857
France	Cahors-Lalbenque	EYes	A	3	Norway	Vadsø Lufthavn	No	A	127 540
France	Calais-Dunkerque	EYes	A	160	Norway	Vardø Lufthavn, Svartnes	No	A	30 107
France	Calvi-Sainte-Catherine	No	B	335 107	Norway	Værøy Helikopterhavn, Tabbisodden	No	A	8 793
France	Cannes-Mandelieu	EYes	A	7 226	Norway	Ørland lufthavn	No	A	4 074
France	Carcassonne-Salvaza	No	B	375 344	Norway	Ørsta/Volda Lufthamn, Hovden	No	A	122 189
France	Castres-Mazamet	No	A	44 924	Norway	Ålesund Lufthavn, Vigra	No	D	1 137 018
France	Cayenne-Félix Eboué	No	C	537 475	Poland	Bydgoszcz-Szwederowo	No	B	410 250
France	Chalon-Champforgeuil	EYes	A	163	Poland	Gdańsk Lech Walesa	No	D	4 968 941

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
France	Châlons-Vatry	No	A	60 790	Poland	Kraków-Balice	No	D	6 762 776
France	Chambéry-Aix Les Bains	No	B	204 938	Poland	Katowice-Pyrzowice	No	D	4 846 241
France	Châteauroux-Déols	EYes	A	7 966	Poland	Lublin	No	B	454 012
France	Cherbourg-Maupertus	EYes	A	2 548	Poland	Łódź-Lublinek	No	B	217 684
France	Cholet-Le Pontreau	EYes	A	48	Poland	Warszawa/Modlin	No	D	3 080 775
France	Clermont-Ferrand-Auvergne	No	B	430 851	Poland	Poznań-Ławica	No	D	2 465 270
France	Colmar-Houssen	EYes	A	2 632	Poland	Rzeszów-Jasionka	No	C	762 569
France	Deauville-Normandie	No	A	149 249	Poland	Szczecin-Goleniów	No	C	595 201
France	Dijon-Longvic	EYes	A	2 987	Poland	Warsaw Chopin	No	D	17 751 592
France	Dinard-Pleurtuit-Saint-Malo	No	A	108 062	Poland	Wrocław-Strachowice	No	D	3 300 584
France	Dole-Tavaux	No	A	107 264	Poland	Zielona Góra-Babimost	No	NA	NA
France	Epinal-Mirecourt	EYes	A	2 352	Poland	Radom-Sadków	EYes	NA	NA
France	Figari-Sud-Corse	No	C	744 769	Poland	Olsztyn-Mazury	No	NA	NA
France	Grenoble-Isère	No	B	355 292	Portugal	Aeroporto De Lisboa	No	D	29 113 780
France	Ile D'Yeu	EYes	A	779	Portugal	Aeroporto Francisco Sá Carneiro - Porto	No	D	12 037 371
France	La Mole	EYes	A	3 364	Portugal	Aeroporto De Faro	No	D	8 678 536
France	La Réunion-Roland Garros	No	D	2 475 520	Portugal	Aeroporto Da Madeira	No	D	3 057 124
France	La Rochelle-Île De Ré	No	B	239 814	Portugal	Aeroporto Do Porto Santo	No	A	172 778
France	La Roche-Sur-Yon-Les Ajoncs	EYes	A	288	Portugal	Aeroporto De Ponta Delgada – João Paulo Ii	No	D	1 766 560
France	Lannion	No	A	2 704	Portugal	Aeroporto De Santa Maria	No	A	88 125
France	Laval-Entrammes	EYes	A	342	Portugal	Aeroporto Da Horta	No	B	216 773

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
France	Le Castellet	EYes	A	782	Portugal	Aeroporto Das Flores	No	A	41 947
France	Le Havre-Octeville	EYes	A	5 525	Portugal	Aeródromo Da Ilha Do Pico	No	A	133 449
France	Le Mans-Arnage	EYes	A	7 107	Portugal	Aeródromo Da Ilha Graciosa	No	A	53 781
France	Le Puy-Loudes	EYes	A	6 453	Portugal	Vila Real	EYes	A	6 542
France	Le Touquet-Cote D'Opale	EYes	A	1 144	Portugal	Cascais	EYes	A	12 872
France	Lille-Lesquin	No	D	2 080 684	Portugal	Évora	EYes	A	214
France	Limoges-Bellegarde	No	B	301 482	Romania	Arad	No	A	11 309
France	Lyon-Bron	EYes	A	6 870	Romania	Bacău	No	B	447 465
France	Lyon-Saint-Exupéry	No	D	11 032 587	Romania	Baia Mare	No	A	44
France	Marie - Galante	EYes	A	21	Romania	Băneasa - Aurel Vlaicu	No	A	17 548
France	Marseille-Provence	No	D	9 389 154	Romania	Henri Coandă	No	D	13 823 708
France	Martinique-Aimé Césaire	No	D	1 964 331	Romania	Avram Iancu	No	D	2 790 419
France	Mayotte-Dzaoudzi-Pamandzi	No	B	384 350	Romania	Mihail Kogălniceanu - Constanţa	No	A	133 892
France	Merville-Calonne	EYes	A	18	Romania	Craiova	No	B	447 571
France	Metz-Nancy-Lorraine	No	B	276 070	Romania	Iaşi	No	D	1 251 358
France	Montbéliard-Courcelles	EYes	A	91	Romania	Oradea	No	A	162 798
France	Montluçon-Guéret	EYes	A	12	Romania	Satu Mare	No	A	60 838
France	Montpellier-Méditerranée	No	D	1 879 845	Romania	Sibiu	No	C	712 040
France	Morlaix-Ploujean	EYes	A	212	Romania	Stefan Cel Mare-Suceava	No	B	262 165
France	Moulins-Montbeugny	EYes	A	16	Romania	Transilvania-Târgu Mureş	No	A	68 233
France	Nancy-Essey	EYes	A	699	Romania	Traian Vuia	No	D	1 518 073

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
France	Nantes-Atlantique	No	D	6 190 913	Romania	Delta Dunării	No	A	4 232
France	Nevers-Fourchambault	EYes	A	313	Slovak Republic	Bratislava	No	D	2 292 644
France	Nice-Côte D'Azur	No	D	13 849 869	Slovak Republic	Piešťany	No	A	1 204
France	Nîmes-Garons	No	B	236 501	Slovak Republic	Poprad-Tatry	No	A	30 104
France	Orléans-Saint-Denis-De-L'Hôtel	EYes	A	1 380	Slovak Republic	Košice	No	C	541 058
France	Ouessant	EYes	A	3 141	Slovak Republic	Žilina	EYes	A	383
France	Paris-Charles De Gaulle	No	D	72 231 558	Slovenia	Letališče Jožeta Pučnika Ljubljana - Ljubljana Jože Pučnik	No	D	1 810 567
France	Paris-Le Bourget	No	A	121 671	Slovenia	Letališče Edvarda Rusjana Maribor - Maribor Edvard Rusjan	EYes	NA	NA
France	Paris-Orly	No	D	33 117 792	Slovenia	Letališče Portorož - Portorož	EYes	A	399
France	Pau-Pyrénées	No	C	609 906	Spain	Adolfo Suárez Madrid-Barajas	No	D	56 425 858
France	Périgueux-Bassillac	EYes	A	2 870	Spain	Barcelona-El Prat	No	D	49 595 574
France	Perpignan-Rivesaltes	No	B	464 275	Spain	Palma De Mallorca	No	D	29 057 276
France	Pointe À Pitre-Le Raizet	No	D	2 436 506	Spain	Malaga-Costa Del Sol	No	D	18 932 148
France	Poitiers-Biard	No	A	119 432	Spain	Gran Canaria	No	D	13 426 003
France	Pontoise-Cormeilles-En-Vexin	EYes	A	203	Spain	Alicante-Elche	No	D	13 927 608
France	Quimper-Pluguffan	No	A	78 993	Spain	Tenerife Sur	No	D	10 978 296
France	Reims-Prunay	EYes	NA	NA	Spain	Ibiza	No	D	8 087 557
France	Rennes-Saint-Jacques	No	C	856 792	Spain	Lanzarote	No	D	7 324 433
France	Roanne	EYes	A	316	Spain	Valencia	No	D	7 748 000
France	Rochefort-Charente-Maritime	EYes	A	40	Spain	Fuerteventura	No	D	6 094 486

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
France	Rodez-Aveyron	No	A	80 350	Spain	Bilbao	No	D	5 452 920
France	Rouen-Vallée De Seine	EYes	A	16 800	Spain	Sevilla	No	D	6 360 400
France	Saint-Brieuc-Armor	EYes	A	3 790	Spain	Tenerife Norte	No	D	5 390 863
France	Saint-Etienne-Loire	EYes	A	4 277	Spain	Girona	No	D	2 009 057
France	Saint-Nazaire-Montoir	No	A	17 410	Spain	Menorca	No	D	3 431 395
France	Saint-Pierre-Pierrefonds	No	A	98 194	Spain	Santiago	No	D	2 708 898
France	Strasbourg-Entzheim	No	D	1 270 054	Spain	Asturias	No	D	1 397 277
France	Tarbes-Lourdes Pyrénées	No	B	459 609	Spain	Santander	No	D	1 098 930
France	Toulouse-Blagnac	No	D	9 652 562	Spain	Reus	No	D	1 030 296
France	Troyes-Barberey	EYes	A	1 227	Spain	A Coruña	No	D	1 221 110
France	Valence-Chabeuil	EYes	A	453	Spain	Jerez De La Frontera	No	D	1 127 488
France	Valencienne s-Denain	EYes	A	1 370	Spain	La Palma	No	D	1 416 884
France	Vannes-Meucon	EYes	A	420	Spain	Almeria	No	C	976 700
France	Vichy-Charmeil	EYes	A	16	Spain	Vigo	No	D	1 135 361
Germany	Verkehrslan deplatz Augsburg	No	A	20 028	Spain	Fgl Granada-Jaen	No	D	1 123 032
Germany	Verkehrslan deplatz Bautzen	EYes	NA	NA	Spain	Castellon	No	A	144 221
Germany	Verkehrslan deplatz Bayreuth	EYes	A	105	Spain	Melilla	No	B	342 486
Germany	Verkehrsflu ghafen Berlin-Schönefeld	No	D	12 723 916	Spain	San Sebastian	No	B	293 709

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
Germany	Verkehrsflughafen Berlin-Tegel	No	D	22 001 675	Spain	Pamplona	No	A	122 523
Germany	Flughafen Braunschweig-Wolfsburg	No	A	100 798	Spain	El Hierro	No	A	123 525
Germany	Verkehrsflughafen Bremen	No	D	2 561 967	Spain	Lleida-Alguaire	No	A	26 224
Germany	Seeflughafen Cuxhaven/Nordholz	EYes	NA	NA	Spain	Burgos	No	A	5 953
Germany	Flugplatz Donaueschingen-Villingen	EYes	A	3 455	Spain	Logroño	No	A	20 008
Germany	Flughafen Dortmund	No	D	2 280 880	Spain	Vitoria	No	A	139 379
Germany	Verkehrsflughafen Dresden	No	D	1 759 285	Spain	Huesca-Pirineos	EYes	A	257
Germany	Flughafen Düsseldorf	No	D	24 276 909	Spain	Aeropuerto Internacional de la Región de Murcia	No	D	1 237 774
Germany	Verkehrslandeplatz Eggenfelden	EYes	A	114	Sweden	Arvidsjaur	No	A	57 760
Germany	Verkehrslandeplatz Emden	EYes	A	5 770	Sweden	Borlänge	No	A	29 544
Germany	Flughafen Erfurt-Weimar	No	B	261 926	Sweden	Eskilstuna	EYes	NA	NA
Germany	Flughafen Frankfurt-Hahn	No	D	2 172 426	Sweden	Gällivare	No	A	26 769
Germany	Verkehrsflughafen Frankfurt/Main	No	D	69 584 156	Sweden	GÖTEBORG/Landvetter	No	D	6 853 152
Germany	Flughafen Friedrichshafen	No	B	482 452	Sweden	Hagfors	No	A	3 212
Germany	Verkehrslandeplatz Giebelstadt	EYes	A	1 526	Sweden	Halmstad	No	A	133 809
Germany	Flughafen Hamburg	No	D	17 256 640	Sweden	Hemavan Tärnaby	No	A	13 624

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
Germany	Flughafen Hannover-Langenhagen	No	D	6 336 715	Sweden	Jönköping	No	A	144 235
Germany	Verkehrslandeplatz Haßfurt-Schweinfurt	EYes	A	2 105	Sweden	Kalmar	No	B	243 756
Germany	Flughafen Heringsdorf	No	A	105	Sweden	Karlstad	No	A	89 936
Germany	Flughafen Hof-Plauen	EYes	A	1 839	Sweden	Kiruna	No	B	278 711
Germany	Kassel	No	A	62 614	Sweden	Kramfors-Sollefteå	No	A	11 396
Germany	Flughafen Karlsruhe/ Baden-Baden	No	D	1 248 174	Sweden	Kristianstad	No	A	33 502
Germany	Verkehrslandeplatz Kiel-Holtenau	EYes	A	1 461	Sweden	LINKÖPING/SAAB	No	A	145 756
Germany	Flughafen Köln Bonn	No	D	12 962 247	Sweden	Ljungbyhed	EYes	NA	NA
Germany	Verkehrslandeplatz Lahr	EYes	A	860	Sweden	Lycksele	No	A	19 505
Germany	Leipzig-Altenburg	EYes	A	1 221	Sweden	Malmö	No	D	2 173 461
Germany	Verkehrsflughafen Leipzig/Halle	No	D	2 577 028	Sweden	MORA/Siljan	No	A	7 399
Germany	Verkehrsflughafen Lübeck-Blankensee	No	A	5 247	Sweden	NORRKÖPING/Kungsängen	No	A	104 206
Germany	Verkehrslandeplatz Magdeburg City	EYes	A	1 262	Sweden	Pajala	No	A	6 485
Germany	Verkehrsflughafen Magdeburg /Cochstedt	EYes	NA	NA	Sweden	Skellefteå	No	B	412 459
Germany	Verkehrslandeplatz Manching	No	A	81 206	Sweden	Skövde	EYes	NA	NA
Germany	City Mannheim	No	NA	NA	Sweden	STOCKHOLM/Arlanda	No	D	26 953 307

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
Germany	Flughafen Memmingen	No	D	1 487 478	Sweden	STOCKHOLM/Bromma	No	D	2 507 594
Germany	RegioAirport Mengen	EYes	A	1 079	Sweden	STOCKHOLM/Skavsta	No	D	2 215 141
Germany	Flughafen Mönchengladbach	EYes	A	6 240	Sweden	STOCKHOLM/Västerås	No	A	120 471
Germany	Flughafen München "Franz Josef Strauß"	No	D	46 266 420	Sweden	Storuman	EYes	NA	NA
Germany	Flughafen Münster Osnabrück	No	D	1 013 179	Sweden	Sundsvall-Timrå	No	B	281 627
Germany	Verkehrsflughafen Neubrandenburg	EYes	NA	NA	Sweden	Sveg	No	A	6 455
Germany	Flughafen Niederrhein	No	D	1 669 475	Sweden	Torsby	No	A	3 529
Germany	Verkehrslandeplatz Niederstetten	EYes	NA	NA	Sweden	TROLLHÄTTAN/Vänersborg	No	A	39 732
Germany	Flughafen Nürnberg	No	D	4 469 405	Sweden	Umeå	No	D	1 060 783
Germany	Flughafen Paderborn/ Lippstadt	No	C	733 287	Sweden	Vilhelmina	No	A	14 938
Germany	Flughafen Rostock-Laage	No	B	268 177	Sweden	Visby	No	B	468 270
Germany	Flughafen Saarbrücken	No	B	383 760	Sweden	VÄXJÖ/Kronoberg	No	B	279 352
Germany	Verkehrslandeplatz Schönhagen	EYes	A	3 290	Sweden	Ängelholm	No	B	405 493
Germany	Siegerland Flughafen	EYes	A	760	Sweden	Örebro	No	A	91 058
Germany	Flughafen Stralsund-Barth	EYes	NA	NA	Sweden	Örnsköldsvik	No	A	71 535
Germany	Flugplatz Schwäbisch-Hall	EYes	A	837	Sweden	Åre Östersund	No	C	513 098
Germany	Flughafen Schwerin-Parchim	EYes	NA	NA	Switzerland	Zürich Flughafen	No	D	31 097 730

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
Germany	Verkehrslandeplatz Straubing-Wallmühle	EYes	A	1 311	Switzerland	Genève Aéroport	No	D	17 597 179
Germany	Flughafen Stuttgart	No	D	11 840 360	Switzerland	Flughafen Bern	No	A	136 863
Germany	Verkehrsflughafen Sylt	No	A	129 240	Switzerland	Aeroporto di Lugano	No	A	88 570
Germany	Verkehrslandeplatz Wilhelmshaven „JadeWeser Airport"	EYes	NA	NA	Switzerland	Flugplatz St.Gallen-Altenrhein	No	A	113 295
Greece	Araxos	Not yet No	A	182 434	Switzerland	Aéroport de Sion	EYes	A	8 782
Greece	Aktion	No	C	557 973	Switzerland	Aéroport Les Eplatures	EYes	NA	NA
Greece	Alexandroupolis Dimokritos	Not yet No	B	210 383	Switzerland	Flughafen Grenchen	EYes	NA	NA
Greece	N.Anchialos	Not yet No	A	46 286	United Kingdom	Aberdeen	No	D	3 056 041
Greece	Zakynthos Dionisios Solomos	No	D	1 693 168	United Kingdom	Belfast City	No	D	2 512 184
Greece	Iraklion N. Kazantzakis	Not yet No	D	7 999 758	United Kingdom	Belfast International	No	D	6 269 039
Greece	Thessaloniki Makedonia	No	D	6 412 306	United Kingdom	Benbecula	No	A	35 430
Greece	Ioannina King Pyrros	Not yet No	A	108 932	United Kingdom	Birmingham	No	D	12 460 088
Greece	Kavala Megas Alexandros	No	B	398 874	United Kingdom	Blackpool	EYes	A	19 321
Greece	Kalamata Captain Vasilis Konstantakopoulos	Not yet No	B	288 104	United Kingdom	Bournemouth	No	C	674 972
Greece	Karpathos	Not yet No	B	253 987	United Kingdom	Bristol	No	D	8 702 405
Greece	Kerkira I. Kapodistrias	No	D	3 210 469	United Kingdom	Cambridge	No	NA	NA
Greece	Kefallinia	No	C	714 266	United Kingdom	Cardiff	No	D	1 583 140
Greece	Kithira Alexandros	Not yet No	A	39 910	United Kingdom	Carlisle	EYes	A	5 092

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
	Aristotelous Onassis								
Greece	Kos Ippokratis	No	D	2 514 331	United Kingdom	Doncaster Sheffield	No	D	1 222 399
Greece	Limnos Ifaistos	Not yet No	A	100 707	United Kingdom	Dundee	No	A	21 185
Greece	Milos	Not yet No	A	67 863	United Kingdom	Durham Tees Valley	No	A	144 639
Greece	Mikonos	No	D	1 334 989	United Kingdom	East Midlands	No	D	4 873 905
Greece	Mitilini Odysseas Elytis	No	B	460 332	United Kingdom	Edinburgh	No	D	14 297 136
Greece	Paros	Not yet No	B	204 619	United Kingdom	Eglinton	No	A	185 843
Greece	Rodos Diagoras	No	D	5 300 196	United Kingdom	Exeter	No	C	931 348
Greece	Samos Aristarchos Of Samos	No	B	437 946	United Kingdom	Glasgow	No	D	9 660 532
Greece	Santorini	No	D	2 181 262	United Kingdom	Hawarden	No	NA	NA
Greece	Sitia	Not yet No	A	59 905	United Kingdom	Humberside	No	A	193 224
Greece	Skiathos Alexandros Papadiaman dis	No	B	413 425	United Kingdom	Inverness	No	C	895 811
Greece	Skiros	Not yet No	A	18 018	United Kingdom	Kirkwall	No	A	193 425
Greece	Syros Dimitrios Vikelas	Not yet No	A	17 441	United Kingdom	Leeds Bradford	No	D	4 040 092
Greece	Chania I.Daskalogia nnis	No	D	2 899 196	United Kingdom	Liverpool	No	D	5 051 678
Greece	Chios Omiros	Not yet No	B	231 340	United Kingdom	London City	No	D	4 820 292
Greece	Athens Eleftherios Venizelos	No	D	24 130 121	United Kingdom	London Gatwick	No	D	46 091 009
Greece	Kastoria Aristotelis	EYes	A	4 967	United Kingdom	London Heathrow	No	D	80 148 763
Greece	Kozani Filippos	EYes	A	5 043	United Kingdom	London Luton	No	D	16 772 716
Hungary	Budapest Liszt Ferenc	No	D	14 829 726	United Kingdom	London Stansted	No	D	27 997 001

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
	Internationa l								
Hungary	Debrecen Internationa l	No	B	382 695	United Kingdom	Manchester	No	D	28 330 954
Hungary	Héviz-Balaton	No	NA	NA	United Kingdom	Newcastle	No	D	5 335 952
Hungary	Győr-Pér	No	A	22 940	United Kingdom	Newquay	No	B	457 265
Hungary	Pécs-Pogány	EYes	A	4 595	United Kingdom	Norwich	No	C	536 578
Iceland	Keflavik	No	D	9 766 608	United Kingdom	Oxford	No	A	100
Iceland	Reykjavik	No	B	387 530	United Kingdom	Prestwick	No	C	682 472
Iceland	Akureyri	No	A	198 189	United Kingdom	Shoreham By Sea	EYes	A	165
Iceland	Egilsstaðir	No	A	98 989	United Kingdom	Southampton	No	D	1 991 098
Ireland	Dublin	No	D	31 319 419	United Kingdom	Southend	No	D	1 480 139
Ireland	Cork	No	D	2 387 806	United Kingdom	Stornoway	No	A	138 025
Ireland	Shannon	No	D	1 677 661	United Kingdom	Sumburgh	No	B	245 970
Ireland	Ireland West Knock	No	C	770 908	United Kingdom	Wick	No	A	16 794
Ireland	Kerry	No	B	365 339	United Kingdom	Campbeltown	No	A	8 592
Ireland	Donegal	No	A	46 514	United Kingdom	Islay	No	A	33 042
Ireland	Waterford	No	A	2 249	United Kingdom	Tiree	No	A	12 963
Austria	Linz	No	B	475 124	Italy	Alghero Fertilia	No	D	1 374 147
Austria	Salzburg	No	D	1 861 010	Italy	Ancona Falconara	No	B	448 746
Austria	Innsbruck	No	D	1 125 223	Italy	Bari Palese Macchie	No	D	5 084 025
Austria	Klagenfurt	No	B	229 755	Italy	Bergamo Orio al Serio	No	D	12 937 182
Austria	Graz	No	D	1 042 519	Italy	Bologna Borgo Panigale	No	D	8 581 898
Austria	Bad Vöslau	EYes	A	7 320	Italy	Bolzano	No	D	:

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
Belgium	Antwerpen / Deurne	No	B	281 956	Italy	Brescia Montichiari	No	A	3 436
Belgium	Brussel/ Brussel-Nationaal	No	D	25 702 502	Italy	Brindisi Papola Casale	No	D	2 508 403
Belgium	Charleroi / Brussels South	No	D	8 016 800	Italy	Cagliari Elmas	No	D	4 412 938
Belgium	Kortrijk / Wevelgem	EYes	A	6 512	Italy	Catania Fontanarossa	No	D	9 943 668
Belgium	Liège / Liège	No	A	164 043	Italy	Comiso	No	B	431 061
Belgium	Oostende-Brugge / Oostende	No	B	408 329	Italy	Cuneo	No	A	27 160
Bulgaria	Burgas Airport	No	D	3 266 565	Italy	Firenze Peretola	No	D	2 706 527
Bulgaria	Gorna Oryahovitsa Airport	EYes	A	388	Italy	Genova Sestri	No	D	1 462 991
Bulgaria	Plovdiv Airport	No	A	90 136	Italy	Lamezia Terme	No	D	2 795 657
Bulgaria	Sofia Airport	No	D	6 942 484	Italy	Lampedusa	No	B	267 617
Bulgaria	Varna Airport	No	D	2 296 047	Italy	Milano Linate	No	D	9 215 912
Croatia	Zagreb Internationa l Airport	No	D	3 330 684	Italy	Milano Malpensa	No	D	24 426 946
Croatia	Dubrovnik Airport	No	D	2 553 269	Italy	Napoli Capodichino	No	D	9 939 714
Croatia	Split Airport	No	D	3 134 212	Italy	Olbia Costa Smeralda	No	D	3 012 268
Croatia	Pula Airport	No	C	717 430	Italy	Palermo Punta Raisi	No	D	6 698 355
Croatia	Zadar Airport	No	C	610 949	Italy	Pantelleria	Not yet No	A	34 572
Croatia	Rijeka Airport	No	A	139 480	Italy	Parma	No	A	41 811
Croatia	Osijek Airport	No	A	41 976	Italy	Perugia	No	B	222 359
Croatia	Brač Airport	No	A	21 596	Italy	Pescara	No	C	657 053
Croatia	Mali Lošinj Airport	EYes	A	6 042	Italy	Pisa San Giusto	Not yet No	D	5 457 429

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
Cyprus	Larnaca International Airport	No	D	8 225 179	Italy	Reggio Calabria	No	B	360 618
Cyprus	Pafos International Airport	No	D	2 870 709	Italy	Rimini	No	B	308 034
Czech Republic	Vaclav Havel Airport Prague	No	D	16 787 436	Italy	Roma Ciampino	No	D	5 812 451
Czech Republic	Brno Airport	No	C	513 224	Italy	Roma Fiumicino	No	D	43 086 201
Czech Republic	Leos Janacek Airport Ostrava	No	B	401 819	Italy	Taranto Grottaglie	No	D	:
Czech Republic	International Airport Karlovy Vary	No	A	45 007	Italy	Torino Caselle	No	D	4 115 861
Czech Republic	Pardubice Airport	No	A	146 455	Italy	Trapani Birgi	Not yet No	B	485 105
Denmark	Billund Airport	No	D	3 496 417	Italy	Treviso Sant'Angelo	No	D	3 304 285
Denmark	Bornholm Airport	No	B	254 584	Italy	Trieste Ronchi dei Legionari	No	C	769 767
Denmark	Esbjerg	No	A	76 214	Italy	Venezia Tessera	No	D	11 179 488
Denmark	Midtjyllands Lufthavn A.m.b.a.	No	A	133 405	Italy	Verona Villafranca	No	D	3 466 440
Denmark	Kolding/Vamdrup	EYes	#N/A	#N/A	Italy	Albenga (Villanova di)	EYes	D	:
Denmark	Copenhagen, Kastrup	No	D	30 262 426	Italy	Aosta	EYes	D	:
Denmark	H.C Andersen	Not yet No	D	:	Italy	Foggia	EYes	D	:
Denmark	Copenhagen, Roskilde	No	A	5 981	Italy	Grosseto	EYes	D	:
Denmark	Sindal	EYes	#N/A	#N/A	Italy	Salerno Pontecagnano	EYes	#N/A	#N/A
Denmark	Stauning	EYes	D	:	Latvia	RIGA	No	D	7 039 419
Denmark	Sønderborg	No	A	72 002	Latvia	LIEPAJA	No	A	6 105
Denmark	Vojens/Skrydstrup	EYes	D	:	Lithuania	Vilnius International	No	D	4 924 916

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
Denmark	Aalborg A.M.B.A	No	D	1 583 749	Lithuania	Kaunas International	No	D	1 010 682
Denmark	Aarhus	No	B	483 952	Lithuania	Palanga International	No	B	322 411
Estonia	Lennart Meri Tallinn	No	D	2 995 830	Luxembourg	Luxembourg-Findel	No	D	3 988 224
Estonia	Tartu	No	A	30 292	Malta	Luqa International	No	D	6 805 643
Estonia	Kuressaare	No	A	19 231	Netherlands	Schiphol	No	D	71 169 454
Estonia	Kärdla	No	A	9 170	Netherlands	Rotterdam	No	D	1 923 386
Finland	Enontekiö	No	A	26 129	Netherlands	Groningen	No	B	249 583
Finland	Halli	No	A	15	Netherlands	Maastricht Aachen	No	B	279 254
Finland	Helsinki-Vantaa	No	D	20 994 030	Netherlands	Lelystad	EYes	A	677
Finland	Ivalo	No	B	273 048	Netherlands	Kempen	EYes	A	704
Finland	Joensuu	No	A	122 297	Netherlands	Teuge	EYes	#N/A	#N/A
Finland	Jyväskylä	No	A	88 285	Norway	Alta Lufthavn	No	B	395 000
Finland	Kajaani	No	A	91 546	Norway	Andøya Lufthavn, Andenes	No	A	61 510
Finland	Kemi-Tornio	No	A	71 953	Norway	Bardufoss Lufthavn	No	B	242 112
Finland	Kittilä	No	B	402 212	Norway	Bergen Lufthavn, Flesland	No	D	6 187 578
Finland	Kokkola-Pietarsaari	No	A	97 831	Norway	Berlevåg Lufthavn	No	A	14 043
Finland	Kuopio	No	B	246 854	Norway	Bodø Lufthavn	No	D	1 951 312
Finland	Kuusamo	No	A	117 063	Norway	Brønnøysund Lufthavn, Brønnøy	No	A	118 851
Finland	Maarianhamina	No	A	57 653	Norway	Båtsfjord Lufthavn	No	A	28 474
Finland	Oulu	No	D	1 105 797	Norway	Fagernes Lufthavn, Leirin	No	A	1 818
Finland	Pori	No	A	17 675	Norway	Florø Lufthamn	No	A	118 520
Finland	Rovaniemi	No	C	648 459	Norway	Førde Lufthamn, Bringeland	No	A	85 479
Finland	Savonlinna	No	A	10 744	Norway	Hammerfest Lufthavn	No	A	184 346
Finland	Tampere-Pirkkala	No	B	231 531	Norway	Harstad/Narvik Lufthavn, Evenes	No	C	773 378
Finland	Turku	No	B	392 228	Norway	Hasvik Lufthavn	No	A	22 604
Finland	Utti	No	A	7	Norway	Haugesund Lufthavn, Karmøy	No	C	620 059
Finland	Vaasa	No	B	317 826	Norway	Honningsvåg Lufthavn, Valan	No	A	25 385

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
Finland	Lappeenranta	No	A	6 215	Norway	Kirkenes Lufthavn, Høybuktmoen	No	B	317 795
Finland	Mikkeli	No	A	46	Norway	Kristiansand Lufthavn, Kjevik	No	D	1 062 156
Finland	Seinäjoki	No	A	595	Norway	Kristiansund Lufthavn, Kvernberget	No	B	266 155
France	Agen-La Garenne	No	A	31 395	Norway	Lakselv Lufthavn, Banak	No	A	61 009
France	Ajaccio-Napoléon Bonaparte	No	D	1 673 154	Norway	Leknes Lufthavn	No	A	143 743
France	Albert-Bray	EYes	A	1 561	Norway	Mehamn Lufthavn	No	A	23 794
France	Albi-Le Séquestre	EYes	A	33	Norway	Mo I Rana Lufthavn, Røssvoll	No	A	113 208
France	Amiens-Glisy	EYes	A	19	Norway	Molde Lufthavn, Årø	No	B	438 565
France	Angers-Marcé	EYes	A	3 734	Norway	Mosjøen Lufthavn, Kjærstad	No	A	76 234
France	Angoulême-Brie-Champniers	EYes	A	267	Norway	Rygge Air Station	EYes	D	:
France	Annecy-Meythet	EYes	A	3 335	Norway	Namsos Lufthavn	No	A	37 260
France	Aurillac	No	A	32 962	Norway	Oslo Lufthavn, Gardermoen	No	D	28 406 796
France	Auxerre-Branches	EYes	A	1 315	Norway	Røros Lufthavn	No	A	24 473
France	Avignon-Caumont	No	A	8 844	Norway	Rørvik Lufthavn, Ryum	No	A	42 510
France	Bâle-Mulhouse	No	D	8 564 223	Norway	Røst Lufthavn	No	A	15 631
France	Bastia-Poretta	No	D	1 522 854	Norway	Sandane Lufthamn, Anda	No	A	44 900
France	Beauvais-Tillé	No	D	3 786 250	Norway	Sandefjord Lufthavn, Torp	No	D	2 063 313
France	Bergerac-Roumanière	No	B	285 584	Norway	Sandnessjøen Lufthavn, Stokka	No	A	84 900
France	Besançon-La Vèze	EYes	A	65	Norway	Sogndal Lufthamn, Haukåsen	No	A	110 681
France	Béziers-Vias	No	B	229 434	Norway	Stavanger Lufthavn, Sola	No	D	4 044 559
France	BIARRITZ-PAYS-BASQUE	No	D	1 183 568	Norway	Stokmarknes Lufthavn, Skagen	No	A	120 692
France	Blois-Le Breuil	EYes	#N/A	#N/A	Norway	Stord Lufthavn, Sørstokken	No	A	35 021

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
France	Bordeaux-Mérignac	No	D	6 785 056	Norway	Svalbard Lufthavn, Longyear	No	A	181 110
France	Bourges	EYes	A	96	Norway	Svolvær Lufthavn, Helle	No	A	107 144
France	Brest-Bretagne	No	D	1 102 539	Norway	Sørkjosen Lufthavn	No	A	22 256
France	Brive-Souillac	No	A	69 171	Norway	Tromsø Lufthavn, Langnes	No	D	2 410 316
France	Caen-Carpiquet	No	B	274 081	Norway	Trondheim Lufthavn, Værnes	No	D	4 446 857
France	Cahors-Lalbenque	EYes	A	3	Norway	Vadsø Lufthavn	No	A	127 540
France	Calais-Dunkerque	EYes	A	160	Norway	Vardø Lufthavn, Svartnes	No	A	30 107
France	Calvi-Sainte-Catherine	No	B	335 107	Norway	Værøy Helikopterhavn, Tabbisodden	No	A	8 793
France	Cannes-Mandelieu	EYes	A	7 226	Norway	Ørland lufthavn	No	A	4 074
France	Carcassonne-Salvaza	No	B	375 344	Norway	Ørsta/Volda Lufthamn, Hovden	No	A	122 189
France	Castres-Mazamet	No	A	44 924	Norway	Ålesund Lufthavn, Vigra	No	D	1 137 018
France	Cayenne-Félix Eboué	No	C	537 475	Poland	Bydgoszcz-Szwederowo	No	B	410 250
France	Chalon-Champforgeuil	EYes	A	163	Poland	Gdańsk Lech Walesa	No	D	4 968 941
France	Châlons-Vatry	No	A	60 790	Poland	Kraków-Balice	No	D	6 762 776
France	Chambéry-Aix Les Bains	No	B	204 938	Poland	Katowice-Pyrzowice	No	D	4 846 241
France	Châteauroux-Déols	EYes	A	7 966	Poland	Lublin	No	B	454 012
France	Cherbourg-Maupertus	EYes	A	2 548	Poland	Łódź-Lublinek	No	B	217 684
France	Cholet-Le Pontreau	EYes	A	48	Poland	Warszawa/Modlin	No	D	3 080 775
France	Clermont-Ferrand-Auvergne	No	B	430 851	Poland	Poznań-Ławica	No	D	2 465 270
France	Colmar-Houssen	EYes	A	2 632	Poland	Rzeszów-Jasionka	No	C	762 569
France	Deauville-Normandie	No	A	149 249	Poland	Szczecin-Goleniów	No	C	595 201

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
France	Dijon-Longvic	EYes	A	2 987	Poland	Warsaw Chopin	No	D	17 751 592
France	Dinard-Pleurtuit-Saint-Malo	No	A	108 062	Poland	Wrocław-Strachowice	No	D	3 300 584
France	Dole-Tavaux	No	A	107 264	Poland	Zielona Góra-Babimost	No	#N/A	#N/A
France	Epinal-Mirecourt	EYes	A	2 352	Poland	Radom-Sadków	EYes	#N/A	#N/A
France	Figari-Sud-Corse	No	C	744 769	Poland	Olsztyn-Mazury	No	#N/A	#N/A
France	Grenoble-Isère	No	B	355 292	Portugal	Aeroporto De Lisboa	No	D	29 113 780
France	Ile D'Yeu	EYes	A	779	Portugal	Aeroporto Francisco Sá Carneiro - Porto	No	D	12 037 371
France	La Mole	EYes	A	3 364	Portugal	Aeroporto De Faro	No	D	8 678 536
France	La Réunion-Roland Garros	No	D	2 475 520	Portugal	Aeroporto Da Madeira	No	D	3 057 124
France	La Rochelle-Île De Ré	No	B	239 814	Portugal	Aeroporto Do Porto Santo	No	A	172 778
France	La Roche-Sur-Yon-Les Ajoncs	EYes	A	288	Portugal	Aeroporto De Ponta Delgada – João Paulo Ii	No	D	1 766 560
France	Lannion	No	A	2 704	Portugal	Aeroporto De Santa Maria	No	A	88 125
France	Laval-Entrammes	EYes	A	342	Portugal	Aeroporto Da Horta	No	B	216 773
France	Le Castellet	EYes	A	782	Portugal	Aeroporto Das Flores	No	A	41 947
France	Le Havre-Octeville	EYes	A	5 525	Portugal	Aeródromo Da Ilha Do Pico	No	A	133 449
France	Le Mans-Arnage	EYes	A	7 107	Portugal	Aeródromo Da Ilha Graciosa	No	A	53 781
France	Le Puy-Loudes	EYes	A	6 453	Portugal	Vila Real	EYes	A	6 542
France	Le Touquet-Cote D'Opale	EYes	A	1 144	Portugal	Cascais	EYes	A	12 872
France	Lille-Lesquin	No	D	2 080 684	Portugal	Évora	EYes	A	214
France	Limoges-Bellegarde	No	B	301 482	Romania	Arad	No	A	11 309
France	Lyon-Bron	EYes	A	6 870	Romania	Bacău	No	B	447 465
France	Lyon-Saint-Exupéry	No	D	11 032 587	Romania	Baia Mare	No	A	44

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
France	Marie - Galante	EYes	A	21	Romania	Băneasa - Aurel Vlaicu	No	A	17 548
France	Marseille-Provence	No	D	9 389 154	Romania	Henri Coandă	No	D	13 823 708
France	Martinique-Aimé Césaire	No	D	1 964 331	Romania	Avram Iancu	No	D	2 790 419
France	Mayotte-Dzaoudzi-Pamandzi	No	B	384 350	Romania	Mihail Kogălniceanu - Constanţa	No	A	133 892
France	Merville-Calonne	EYes	A	18	Romania	Craiova	No	B	447 571
France	Metz-Nancy-Lorraine	No	B	276 070	Romania	Iaşi	No	D	1 251 358
France	Montbéliard -Courcelles	EYes	A	91	Romania	Oradea	No	A	162 798
France	Montluçon-Guéret	EYes	A	12	Romania	Satu Mare	No	A	60 838
France	Montpellier-Méditerranée	No	D	1 879 845	Romania	Sibiu	No	C	712 040
France	Morlaix-Ploujean	EYes	A	212	Romania	Stefan Cel Mare-Suceava	No	B	262 165
France	Moulins-Montbeugny	EYes	A	16	Romania	Transilvania-Târgu Mureş	No	A	68 233
France	Nancy-Essey	EYes	A	699	Romania	Traian Vuia	No	D	1 518 073
France	Nantes-Atlantique	No	D	6 190 913	Romania	Delta Dunării	No	A	4 232
France	Nevers-Fourchambault	EYes	A	313	Slovak Republic	Bratislava	No	D	2 292 644
France	Nice-Côte D'Azur	No	D	13 849 869	Slovak Republic	Piešťany	No	A	1 204
France	Nîmes-Garons	No	B	236 501	Slovak Republic	Poprad-Tatry	No	A	30 104
France	Orléans-Saint-Denis-De-L'Hôtel	EYes	A	1 380	Slovak Republic	Košice	No	C	541 058
France	Ouessant	EYes	A	3 141	Slovak Republic	Žilina	EYes	A	383
France	Paris-Charles De Gaulle	No	D	72 231 558	Slovenia	Letališče Jožeta Pučnika Ljubljana - Ljubljana Jože Pučnik	No	D	1 810 567

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
France	Paris-Le Bourget	No	A	121 671	Slovenia	Letališče Edvarda Rusjana Maribor - Maribor Edvard Rusjan	EYes	#N/A	#N/A
France	Paris-Orly	No	D	33 117 792	Slovenia	Letališče Portorož - Portorož	EYes	A	399
France	Pau-Pyrénées	No	C	609 906	Spain	Adolfo Suárez Madrid-Barajas	No	D	56 425 858
France	Périgueux-Bassillac	EYes	A	2 870	Spain	Barcelona-El Prat	No	D	49 595 574
France	Perpignan-Rivesaltes	No	B	464 275	Spain	Palma De Mallorca	No	D	29 057 276
France	Pointe À Pitre-Le Raizet	No	D	2 436 506	Spain	Malaga-Costa Del Sol	No	D	18 932 148
France	Poitiers-Biard	No	A	119 432	Spain	Gran Canaria	No	D	13 426 003
France	Pontoise-Cormeilles-En-Vexin	EYes	A	203	Spain	Alicante-Elche	No	D	13 927 608
France	Quimper-Pluguffan	No	A	78 993	Spain	Tenerife Sur	No	D	10 978 296
France	Reims-Prunay	EYes	D	:	Spain	Ibiza	No	D	8 087 557
France	Rennes-Saint-Jacques	No	C	856 792	Spain	Lanzarote	No	D	7 324 433
France	Roanne	EYes	A	316	Spain	Valencia	No	D	7 748 000
France	Rochefort-Charente-Maritime	EYes	A	40	Spain	Fuerteventura	No	D	6 094 486
France	Rodez-Aveyron	No	A	80 350	Spain	Bilbao	No	D	5 452 920
France	Rouen-Vallée De Seine	EYes	A	16 800	Spain	Sevilla	No	D	6 360 400
France	Saint-Brieuc-Armor	EYes	A	3 790	Spain	Tenerife Norte	No	D	5 390 863
France	Saint-Etienne-Loire	EYes	A	4 277	Spain	Girona	No	D	2 009 057
France	Saint-Nazaire-Montoir	No	A	17 410	Spain	Menorca	No	D	3 431 395
France	Saint-Pierre-Pierrefonds	No	A	98 194	Spain	Santiago	No	D	2 708 898

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
France	Strasbourg-Entzheim	No	D	1 270 054	Spain	Asturias	No	D	1 397 277
France	Tarbes-Lourdes Pyrénées	No	B	459 609	Spain	Santander	No	D	1 098 930
France	Toulouse-Blagnac	No	D	9 652 562	Spain	Reus	No	D	1 030 296
France	Troyes-Barberey	EYes	A	1 227	Spain	A Coruña	No	D	1 221 110
France	Valence-Chabeuil	EYes	A	453	Spain	Jerez De La Frontera	No	D	1 127 488
France	Valenciennes-Denain	EYes	A	1 370	Spain	La Palma	No	D	1 416 884
France	Vannes-Meucon	EYes	A	420	Spain	Almeria	No	C	976 700
France	Vichy-Charmeil	EYes	A	16	Spain	Vigo	No	D	1 135 361
Germany	Verkehrslandeplatz Augsburg	No	A	20 028	Spain	Fgl Granada-Jaen	No	D	1 123 032
Germany	Verkehrslandeplatz Bautzen	EYes	#N/A	#N/A	Spain	Castellon	No	A	144 221
Germany	Verkehrslandeplatz Bayreuth	EYes	A	105	Spain	Melilla	No	B	342 486
Germany	Verkehrsflughafen Berlin-Schönefeld	No	D	12 723 916	Spain	San Sebastian	No	B	293 709
Germany	Verkehrsflughafen Berlin-Tegel	No	D	22 001 675	Spain	Pamplona	No	A	122 523
Germany	Flughafen Braunschweig-Wolfsburg	No	A	100 798	Spain	El Hierro	No	A	123 525
Germany	Verkehrsflughafen Bremen	No	D	2 561 967	Spain	Lleida-Alguaire	No	A	26 224
Germany	Seeflughafen Cuxhaven/Nordholz	EYes	#N/A	#N/A	Spain	Burgos	No	A	5 953
Germany	Flugplatz Donaueschingen-Villingen	EYes	A	3 455	Spain	Logroño	No	A	20 008

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
Germany	Flughafen Dortmund	No	D	2 280 880	Spain	Vitoria	No	A	139 379
Germany	Verkehrsflughafen Dresden	No	D	1 759 285	Spain	Huesca-Pirineos	EYes	A	257
Germany	Flughafen Düsseldorf	No	D	24 276 909	Spain	Aeropuerto Internacional de la Región de Murcia	No	D	1 237 774
Germany	Verkehrslandeplatz Eggenfelden	EYes	A	114	Sweden	Arvidsjaur	No	A	57 760
Germany	Verkehrslandeplatz Emden	EYes	A	5 770	Sweden	Borlänge	No	A	29 544
Germany	Flughafen Erfurt-Weimar	No	B	261 926	Sweden	Eskilstuna	EYes	#N/A	#N/A
Germany	Flughafen Frankfurt-Hahn	No	D	2 172 426	Sweden	Gällivare	No	A	26 769
Germany	Verkehrsflughafen Frankfurt/Main	No	D	69 584 156	Sweden	GÖTEBORG/Landvetter	No	D	6 853 152
Germany	Flughafen Friedrichshafen	No	B	482 452	Sweden	Hagfors	No	A	3 212
Germany	Verkehrslandeplatz Giebelstadt	EYes	A	1 526	Sweden	Halmstad	No	A	133 809
Germany	Flughafen Hamburg	No	D	17 256 640	Sweden	Hemavan Tärnaby	No	A	13 624
Germany	Flughafen Hannover-Langenhagen	No	D	6 336 715	Sweden	Jönköping	No	A	144 235
Germany	Verkehrslandeplatz Haßfurt-Schweinfurt	EYes	A	2 105	Sweden	Kalmar	No	B	243 756
Germany	Flughafen Heringsdorf	No	A	105	Sweden	Karlstad	No	A	89 936
Germany	Flughafen Hof-Plauen	EYes	A	1 839	Sweden	Kiruna	No	B	278 711
Germany	Kassel	No	A	62 614	Sweden	Kramfors-Sollefteå	No	A	11 396
Germany	Flughafen Karlsruhe/Baden-Baden	No	D	1 248 174	Sweden	Kristianstad	No	A	33 502

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
Germany	Verkehrslandeplatz Kiel-Holtenau	EYes	A	1 461	Sweden	LINKÖPING/SAAB	No	A	145 756
Germany	Flughafen Köln Bonn	No	D	12 962 247	Sweden	Ljungbyhed	EYes	#N/A	#N/A
Germany	Verkehrslandeplatz Lahr	EYes	A	860	Sweden	Lycksele	No	A	19 505
Germany	Leipzig-Altenburg	EYes	A	1 221	Sweden	Malmö	No	D	2 173 461
Germany	Verkehrsflughafen Leipzig/Halle	No	D	2 577 028	Sweden	MORA/Siljan	No	A	7 399
Germany	Verkehrsflughafen Lübeck-Blankensee	No	A	5 247	Sweden	NORRKÖPING/Kungsängen	No	A	104 206
Germany	Verkehrslandeplatz Magdeburg City	EYes	A	1 262	Sweden	Pajala	No	A	6 485
Germany	Verkehrsflughafen Magdeburg /Cochstedt	EYes	D	:	Sweden	Skellefteå	No	B	412 459
Germany	Verkehrslandeplatz Manching	No	A	81 206	Sweden	Skövde	EYes	#N/A	#N/A
Germany	City Mannheim	No	D	:	Sweden	STOCKHOLM/Arlanda	No	D	26 953 307
Germany	Flughafen Memmingen	No	D	1 487 478	Sweden	STOCKHOLM/Bromma	No	D	2 507 594
Germany	RegioAirport Mengen	EYes	A	1 079	Sweden	STOCKHOLM/Skavsta	No	D	2 215 141
Germany	Flughafen Mönchengladbach	EYes	A	6 240	Sweden	STOCKHOLM/Västerås	No	A	120 471
Germany	Flughafen München "Franz Josef Strauß"	No	D	46 266 420	Sweden	Storuman	EYes	#N/A	#N/A
Germany	Flughafen Münster Osnabrück	No	D	1 013 179	Sweden	Sundsvall-Timrå	No	B	281 627
Germany	Verkehrsflughafen Neubrandenburg	EYes	#N/A	#N/A	Sweden	Sveg	No	A	6 455

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
Germany	Flughafen Niederrhein	No	D	1 669 475	Sweden	Torsby	No	A	3 529
Germany	Verkehrslandeplatz Niederstetten	EYes	#N/A	#N/A	Sweden	TROLLHÄTTAN/Vänersborg	No	A	39 732
Germany	Flughafen Nürnberg	No	D	4 469 405	Sweden	Umeå	No	D	1 060 783
Germany	Flughafen Paderborn/ Lippstadt	No	C	733 287	Sweden	Vilhelmina	No	A	14 938
Germany	Flughafen Rostock-Laage	No	B	268 177	Sweden	Visby	No	B	468 270
Germany	Flughafen Saarbrücken	No	B	383 760	Sweden	VÄXJÖ/Kronoberg	No	B	279 352
Germany	Verkehrslandeplatz Schönhagen	EYes	A	3 290	Sweden	Ängelholm	No	B	405 493
Germany	Siegerland Flughafen	EYes	A	760	Sweden	Örebro	No	A	91 058
Germany	Flughafen Stralsund-Barth	EYes	D	:	Sweden	Örnsköldsvik	No	A	71 535
Germany	Flugplatz Schwäbisch-Hall	EYes	A	837	Sweden	Åre Östersund	No	C	513 098
Germany	Flughafen Schwerin-Parchim	EYes	#N/A	#N/A	Switzerland	Zürich Flughafen	No	D	31 097 730
Germany	Verkehrslandeplatz Straubing-Wallmühle	EYes	A	1 311	Switzerland	Genève Aéroport	No	D	17 597 179
Germany	Flughafen Stuttgart	No	D	11 840 360	Switzerland	Flughafen Bern	No	A	136 863
Germany	Verkehrsflughafen Sylt	No	A	129 240	Switzerland	Aeroporto di Lugano	No	A	88 570
Germany	Verkehrslandeplatz Wilhelmshaven „JadeWeser Airport"	EYes	#N/A	#N/A	Switzerland	Flugplatz St.Gallen-Altenrhein	No	A	113 295
Greece	Araxos	Not yet No	A	182 434	Switzerland	Aéroport de Sion	EYes	A	8 782
Greece	Aktion	No	C	557 973	Switzerland	Aéroport Les Eplatures	EYes	D	:
Greece	Alexandroupolis Dimokritos	Not yet No	B	210 383	Switzerland	Flughafen Grenchen	EYes	D	:

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
Greece	N.Anchialos	Not yet No	A	46 286	United Kingdom	Aberdeen	No	D	3 056 041
Greece	Zakynthos Dionisios Solomos	No	D	1 693 168	United Kingdom	Belfast City	No	D	2 512 184
Greece	Iraklion N. Kazantzakis	Not yet No	D	7 999 758	United Kingdom	Belfast International	No	D	6 269 039
Greece	Thessaloniki Makedonia	No	D	6 412 306	United Kingdom	Benbecula	No	A	35 430
Greece	Ioannina King Pyrros	Not yet No	A	108 932	United Kingdom	Birmingham	No	D	12 460 088
Greece	Kavala Megas Alexandros	No	B	398 874	United Kingdom	Blackpool	EYes	A	19 321
Greece	Kalamata Captain Vasilis Konstantako poulos	Not yet No	B	288 104	United Kingdom	Bournemouth	No	C	674 972
Greece	Karpathos	Not yet No	B	253 987	United Kingdom	Bristol	No	D	8 702 405
Greece	Kerkira I. Kapodistrias	No	D	3 210 469	United Kingdom	Cambridge	No	D	:
Greece	Kefallinia	No	C	714 266	United Kingdom	Cardiff	No	D	1 583 140
Greece	Kithira Alexandros Aristotelous Onassis	Not yet No	A	39 910	United Kingdom	Carlisle	EYes	A	5 092
Greece	Kos Ippokratis	No	D	2 514 331	United Kingdom	Doncaster Sheffield	No	D	1 222 399
Greece	Limnos Ifaistos	Not yet No	A	100 707	United Kingdom	Dundee	No	A	21 185
Greece	Milos	Not yet No	A	67 863	United Kingdom	Durham Tees Valley	No	A	144 639
Greece	Mikonos	No	D	1 334 989	United Kingdom	East Midlands	No	D	4 873 905
Greece	Mitilini Odysseas Elytis	No	B	460 332	United Kingdom	Edinburgh	No	D	14 297 136
Greece	Paros	Not yet No	B	204 619	United Kingdom	Eglinton	No	A	185 843
Greece	Rodos Diagoras	No	D	5 300 196	United Kingdom	Exeter	No	C	931 348

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
Greece	Samos Aristarchos Of Samos	No	B	437 946	United Kingdom	Glasgow	No	D	9 660 532
Greece	Santorini	No	D	2 181 262	United Kingdom	Hawarden	No	D	:
Greece	Sitia	Not yet No	A	59 905	United Kingdom	Humberside	No	A	193 224
Greece	Skiathos Alexandros Papadiamandis	No	B	413 425	United Kingdom	Inverness	No	C	895 811
Greece	Skiros	Not yet No	A	18 018	United Kingdom	Kirkwall	No	A	193 425
Greece	Syros Dimitrios Vikelas	Not yet No	A	17 441	United Kingdom	Leeds Bradford	No	D	4 040 092
Greece	Chania I.Daskalogiannis	No	D	2 899 196	United Kingdom	Liverpool	No	D	5 051 678
Greece	Chios Omiros	Not yet No	B	231 340	United Kingdom	London City	No	D	4 820 292
Greece	Athens Eleftherios Venizelos	No	D	24 130 121	United Kingdom	London Gatwick	No	D	46 091 009
Greece	Kastoria Aristotelis	EYes	A	4 967	United Kingdom	London Heathrow	No	D	80 148 763
Greece	Kozani Filippos	EYes	A	5 043	United Kingdom	London Luton	No	D	16 772 716
Hungary	Budapest Liszt Ferenc International	No	D	14 829 726	United Kingdom	London Stansted	No	D	27 997 001
Hungary	Debrecen International	No	B	382 695	United Kingdom	Manchester	No	D	28 330 954
Hungary	Héviz-Balaton	No	#N/A	#N/A	United Kingdom	Newcastle	No	D	5 335 952
Hungary	Győr-Pér	No	A	22 940	United Kingdom	Newquay	No	B	457 265
Hungary	Pécs-Pogány	EYes	A	4 595	United Kingdom	Norwich	No	C	536 578
Iceland	Keflavik	No	D	9 766 608	United Kingdom	Oxford	No	A	100
Iceland	Reykjavik	No	B	387 530	United Kingdom	Prestwick	No	C	682 472
Iceland	Akureyri	No	A	198 189	United Kingdom	Shoreham By Sea	Yes	A	165

Country	Name	Exemption status	Cat.	2018 pax	Country	Name	Exemption status	Cat.	2018 pax
Iceland	Egilsstaðir	No	A	98 989	United Kingdom	Southampton	No	D	1 991 098
Ireland	Dublin	No	D	31 319 419	United Kingdom	Southend	No	D	1 480 139
Ireland	Cork	No	D	2 387 806	United Kingdom	Stornoway	No	A	138 025
Ireland	Shannon	No	D	1 677 661	United Kingdom	Sumburgh	No	B	245 970
Ireland	Ireland West Knock	No	C	770 908	United Kingdom	Wick	No	A	16 794
Ireland	Kerry	No	B	365 339	United Kingdom	Campbeltown	No	A	8 592
Ireland	Donegal	No	A	46 514	United Kingdom	Islay	No	A	33 042
Ireland	Waterford	No	A	2 249	United Kingdom	Tiree	No	A	12 963

7.4. Annex IV: Minutes of the interviews held

Interviews are prepared in advance preparing an agenda for the meeting which is sent to the stakeholder days in advance. This document is subdivided as follows:

- Interview objectives.
- Documents referenced during the interview. This section is crucial in order to maximize the output of the interview. By doing this, the stakeholder is able to consult and review key documents related to his/her business operation.
- Operational review. The core business model of the interviewed companies is addressed by looking at their operational figures, i.e., how they create value. For instance, operators will be asked for annual flight hours, helicopter models used, income and cost per flight hour, etc.
- Financial review. The economic situation of the company is assessed looking into financial statement records, exploring the business areas and their share in the overall company income, etc.
- Model explanation. It is important for interviewees to know how the data is fed and used in the model. This helps them understand the approach, target the specific figures required and, if needed, propose changes to the model to improve its accuracy.

During the meeting, interviewees were encouraged to answer and address the points presented in the agenda. The survey is used also as a support to obtain specific values in the survey’s format. This eases the latter processing of data and avoids excess interpretation of the results to feed them into the model.

Additionally, interviewees usually go beyond the topics listed in the agenda, and can provide personal estimations of other sector’s operational and economic information.

After each interview, the conversation and notes taken have been followed by minutes of the meeting (MoM), basically following this structure:

- Meeting details: Date, place, participants, company, etc.
- Interview summary. Following an equivalent structure as that of the agenda.
- Next steps. Agreed actions to be carried out after the interview.

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