ECONOMIC IMPACT OF BUSINESS AVIATION IN EUROPE

Booz | Allen | Hamilton

DLR

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Metric	Explanation
Avoided hotel cost	*Quantifies reduced costs to employers by completing travel in one day when using Business Aviation.*
Delays (time)	*Quantifies avoided loss of employee time (working or not working time) due to delays in travel. Data considers fixed-wing aircraft only.*
Employment	*Quantifies the total number of jobs supported by the economic activity in the value chains of the business aviation sector and by the spending of the employees in this value chain.*
Full-time employees equivalent	*Quantifies avoided loss of workforce due to travel.*
Gross Value Added (GVA)	*Quantifies the monetary worth of the production generated by firms in the business aviation sector and its suppliers.*
Labor compensation	*Provides all wages and salaries (incl. compensation of the self-employed) linked to the sector's economic activity.*
Output	*Quantifies the sector's output (sales plus inventory increase and self-made assets).*
Productivity (time)	*Quantifies avoided loss of employee working time due to travel*
Total time saved	*Provides baseline metric for time recovered by Business Aviation. Data considers fixed-wing aircraft only.*
Value of employee time	*Quantifies avoided monetary value of employee time lost due to travel. Data considers fixed-wing aircraft only.*

›› EXECUTIVE SUMMARY

Booz Allen Hamilton, in collaboration with Deutsches Zentrum für Luft-und Raumfahrt (DLR), analyzed the Business Aviation industry to identify and quantify impacts of the sector on the European economy. Using a combination of desktop research, expert interviews, and the analysis of large industry data sets, the study[1] presents findings along three dimensions, as highlighted below.

Business Aviation seamlessly connects distant and remote regions, spurring investment and the growth of business in these regions. Business Aviation therefore becomes a prime enabler for regional economic development. There are many benefits of Business Aviation, from economic benefits of well-connected global companies to air ambulances saving lives in remote areas. Major benefits of Business Aviation are discussed throughout the report.

The study quantifies **economic benefits** using an Input-Output approach applied to direct, indirect and induced effects of the Business Aviation sector on four indicators: Employment, Output, Gross Value Added (GVA) and Labor compensation. Findings include:

- The study identifies **371,000 jobs** that are either directly or indirectly dependent on the European Business Aviation sector;
- The analysis also indicates that **€ 98 bn** in output, € 27 bn in GVA, and € 21 bn spent in wages and salaries stem from the industry;
- The effect of Business Aviation over the European Gross Domestic Product (GDP) was about **0.2%**;
- Germany, France and the UK are the main players in the sector producing **63% of the total GVA** of the industry.

Throughout this report, case studies highlight the unique benefits that Business Aviation provides its users. These include greater security, being able to open and operate plants in remote areas, being able to have a corporate structure that is based on organizational efficiency. and being able to conduct proprietary discussions in private.

Business efficiencies produced by Business Aviation encompass three stakeholder categories: Employers, Employees and Customers/Clients. Business Aviation reduces distances and allows companies to optimize facilities and staff in locations where demand and talent are. Using a data science analysis approach which compared European Business Aviation flights against fastest commercial travel alternatives, key metrics relating to the efficiencies of Business

1 *Analysis in the study is conducted on 2014 data sets.*

Aviation were quantified. It should be noted that all commercial transportation options were considered for each comparison, including air transportation, automobile transportation, train transportation, and so on. Findings from this analysis include:

- The average time saved using a Business Aviation flight rather than the fastest commercial counterpart is 127 minutes per trip;
- The value of the total time saved by Business Aviation is on the order of 2,600 full-time equivalents annually;
- Although certain long-haul flights might be faster with commercial jets, about 20% of Business Aviation flights are more than 5 hours faster than their best commercial alternative;
- In an analysis of one broker's operating costs, the average cost per passenger on a Business Aviation flight leg is € 1,793. This cost may be considered comparable even with economy class full-fare commercial aviation tickets;
- The time savings of 127 minutes/flight translate into about 2 months of saved time per company in one year;
- For multi-trip Business Aviation itineraries (where Business Aviation users visit more than one destination in a given day), Business Aviation saved European businesses on the order of € 15 million in avoided overnight hotel nights;
- The productive work time produced by each employee flying with Business Aviation per single trip is 155 minutes higher than the productive work time generated flying on a commercial flight; and
- Business Aviation saves on the order of 1,825 days annually from reduced delays as compared to commercial aviation.

Business Aviation significantly improves **connectivity** over Europe. Supporting evidence includes:

- Study results show that Business Aviation in Europe serves 25,280 city pairs not connected by nonstop commercial flights (about 31% of airport pairs analyzed);
- Of the 800,000 Business Aviation city pairs analyzed, about 27% did not have nonstop commercial aviation service between them; and
- Time savings enabled by better connectivity were greater in Eastern Europe and in general in the continent's periphery.

Finally, Business Aviation yields **societal benefits** to the European community:

- Business Aviation allows for air ambulances and medical evacuations to be provided to remote regions; and
- Because Business Aviation aircraft require fewer connections and are subject to fewer delays, they have several emissions advantages over commercial aircraft.

PREFACE

This Economic Impacts of Business Aviation in Europe study analyzes benefits related to:

- Economic Growth
- Business Efficiencies
- Improved Connectivity

Measures of **economic growth** can be estimated in terms of industry-related employment impacts, income changes, Gross Value Added (GVA) and taxes paid in relation to the economic activity that is driven by the European Business Aviation sector. This study examines these impacts using a standard Input/Output approach that provides direct, indirect and induced effects. To reflect the interdependencies between European countries, the study team developed a comprehensive model that not only includes the Input/Output data for the 28 European Union (EU) member states and European Free Trade Association (EFTA) countries, but also considers trade flows to attribute indirect and induced effects accurately.

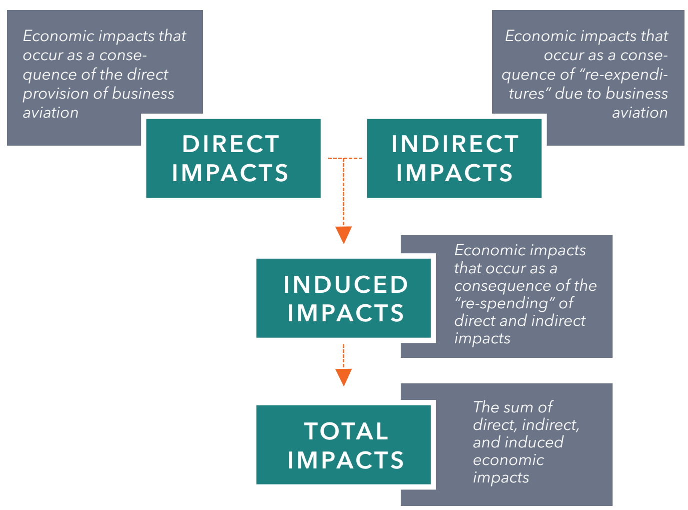

Figure 1: Economic impact studies measure the sum of the direct, indirect, and induced economic impacts to determine the contribution of an activity to the economy as a whole

The fact that **Business Aviation makes European companies more efficient** is widely acknowledged. This study is the first of its kind that estimates the actual time savings that Business Aviation created in 2014 by using a complex data science approach that compares over 800,000 Business Aviation flights against the best available commercial option (which includes commercial aviation, as well as rail, bus transport, and so on. The study team estimates the total time savings for 2014 by combining two data sets: actual flight data for all Business Aviation flights against total trip times collected from the Application Program Interface (API) of Rome2Rio.com, a trip planning tool which provides suggested itineraries between any two points on the globe. In addition, an average Value of Time (VOT) was used to monetize societal impacts for the three main user groups of Business Aviation (Top-Level Executives, Mid-Level Management and Technicians).

Business Aviation **improves a region's connectivity**, which has a significant impact on remote or less connected regions as well as on companies that can harvest the benefits of division of labor by more efficiently optimizing their supply chains via offshoring or outsourcing into these otherwise unconnected regions. This study analyzes this effect by calculating the share of Business Aviation airports that are actually served by commercial airlines and where commercial aviation is connecting these regions to the international Air Transport network.

Business Aviation is used by many major industries. NEXA indicates [7] that of the top 20 Forbes' Global 2000 companies, 85% of pharmaceutical companies, 100% of oil and gas companies, and 100% of aerospace and defense companies are reliant on Business Aviation.

While this report focuses largely on the economic benefits and business efficiencies afforded by Business Aviation, social benefits of Business Aviation should not be discounted. In particular, Business Aviation provides air ambulance and medical evacuation services in remote regions with limited medical facilities.

Literature Review

Previous studies overwhelmingly point to Business Aviation as being positive for a variety of stakeholders, including companies that operate aircraft for their employees and customers, employees of industries supporting Business Aviation and governments drawing tax revenue. Most previous studies focused on capturing economic impacts of Business Aviation and presented positive financial metrics of companies using Business Aviation as evidence of its value. "Softer" benefits, such as the value of employee time, the ability for key employees to reach new markets, and the privacy afforded in Business Aviation were often presented qualitatively, as such facets of Business Aviation are more difficult to quantify. The table below outlines some of the general benefits of Business Aviation that were identified and discussed in a range of literature that was reviewed as part of our analysis.

High-Level Summary of Business Aviation Benefits

Economic and Societal Benefits	
	Direct, indirect and induced effects from economic activity of the sector ***create jobs, income and economic activity***
	Potential cost savings compared to business or first class flights *on commercial scheduled services, particularly when several executives are travelling*
	Potential cost savings on overnight accommodations *as users may return home at any time instead of being forced to stay overnight in their destinations*
	The ability to ***make more effective use of travelling time in a more private and comfortable environment****; for example holding meetings, reading confidential documents and offering hospitality to clients. For leisure travelers, increased comfort provides for increased relaxation and allows users to be more productive when returning to work*
	Perceived safety advantages in terms of **greater security for staff and high-value goods***; for example from terrorism or concerns over lower air safety standards in some countries*
Business Efficiencies	
	Reduced access time to and from Business Aviation airports *as compared to large commercial ones (such as Paris, London, or Moscow) as Business Aviation airports tend to be closer to city centers*
	The ability to ***cover multiple business destinations much more quickly*** *with aircraft available to fly whenever the user is ready to depart, as opposed to waiting for commercial departures and limiting the ability to travel to multiple destinations in one day*
	Faster travel from origin to destination *given the flexibility and convenience of instantly accessible point-to-point air links that avoid the need for connections*
	Increased schedule flexibility *for users given that Business Aviation aircraft depart when users are ready. Users can wrap up meetings and complete site visits, ensuring all work is completed before departing. With commercial aviation, the airline schedule forces travelers to depart even though work may not yet be completed*
	Major time savings to business users from ***avoiding congested major commercial passenger airports*** *and taking off from small, less busy Business Aviation airports*
	Time savings from Business Aviation flights being **less susceptible to strikes and other disruptions** *affecting commercial airlines*
Improved Connectivity	
	The ability to travel directly to ***areas not well served by commercial airlines****, that is, providing connectivity for business travelers to the global aviation network*
	The ability to provide ***emergency medical and air ambulance service****s to communities and regions where hospitals and treatment centers are not available*
	Provision of access to the international air network of ***remote and rural regions, where commercial air traffic is not viable***

Previous studies have shown clear positive benefits for companies that operate aircraft for business purposes. All literature reviewed suggested that Business Aviation led to positive effects for multiple stakeholders: be they economic benefits for companies and countries or time and comfort benefits for employees and leisure travelers. Highlighted here, Appendix A presents greater details of studies reviewed.

- Andersen conducted a 2001 study [1,2] of Business Aviation using S&P 500 index companies as a representative sample. This report was updated with 2010 data by NEXA Advisors [3]. **Andersen and NEXA found that Business Aviation operators outperformed their non-operating peers in cumulative returns by 146% and 116%, respectively, during the study periods.** NEXA completed another study [6] that updated its findings with data from 2007 through 2012 (years of recession in the United States) and found that **companies operating aircraft for business aviation were less affected by the recession than non-operator companies**. Andersen also stated the air ambulance and medical evacuation benefits of Business Aviation. Given the use of S&P 500 data, the study focuses on Business Aviation in the United States.
- The NEXA work was extended in additional studies to assess the impact of Business Aviation to smaller companies [4] in the United States and to large, global companies [7]. Globally, NEXA found 88% of the "top 50" companies, as published by Forbes, were Business Aviation users, supporting the findings from its studies in the United States. Finally, NEXA published a similar study [5] that discussed **the significance of the taxpayer value generated by Business Aviation.**
- Many studies also captured the overall value of Business Aviation to the economy. Oxford Economics [8] found that typical users value Business Aviation flights 8 to 15 times higher than they do commercial flights. Oxford also found that Business Aviation flying was responsible for 9% of revenues from business trips while making up only 7% of the volume of business flights. Oxford pointed out that Business Aviation flights have far fewer passengers than commercial flights do, such that the revenue shares would have been even larger for Business Aviation on a per-passenger basis.
- A PriceWaterhouseCoopers study [10] reported that European Business Aviation contributed **approximately €19.7 bn in annual gross value to the European economy in 2007** and was responsible **for over 164,000 jobs**. Similar studies have been conducted in the United States by MergeGlobal [14] (for general aviation, of which Business Aviation is a subset) and in Canada by InterVISTAS [13]. **MergeGlobal reported economic benefits of $150.3 bn in 2005 to the United States while InterVISTAS reported benefits $5.4 bn annually to Canada in a 2014 study.**

Report's Purpose and Organization

The review of the existing literature about the benefits of Business Aviation in Europe (and North America) suggests a gap, which this study is attempting to close: There have been no relevant studies for the past five years in Europe, which means that many of the results stated above are likely outdated. Also, while some of the key benefits of Business Aviation have been discussed qualitatively, most studies have refrained from quantifying these. This report therefore addresses both gaps in the current literature and provides an updated and more comprehensive evaluation of the economic benefits related to Business Aviation in Europe.

This report is structured as follows:

Chapter 1 reports on the economic impact of the Business Aviation sector on the European economy;

Chapter 2 describes the benefits of increased business efficiency on multiple stakeholders and quantifies the value of time savings and increased productivity;

Chapter 3 highlights connectivity insights resulting from the time savings analysis and examines the effects of Business Aviation on connectivity at the country level;

Appendix A provides detailed information about the sources reviewed for this study;

Appendix B details the economic impact assessment methodology and results; and

Appendix C presents the details of the time savings calculations.

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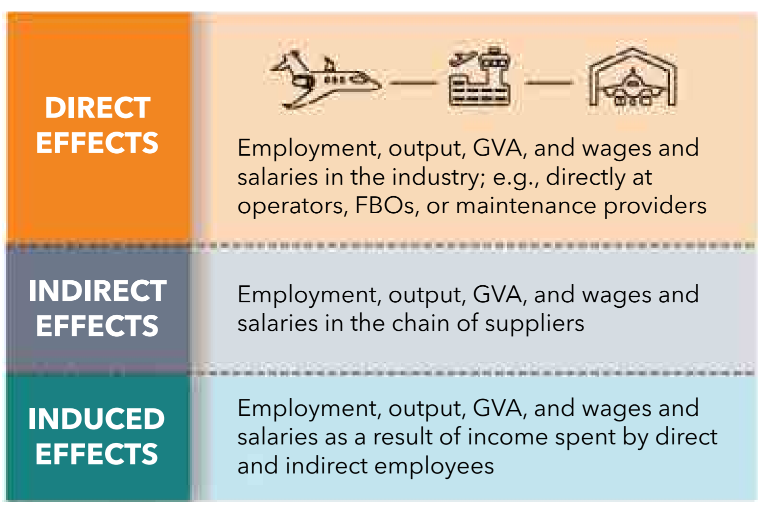
›› CHAPTER 1: BUSINESS AVIATION ENABLES ECONOMIC GROWTH

This study's economic impact analysis identifies:

- ***371,000 jobs being directly or indirectly dependent on Business Aviation activities in Europe;***
- ***€ 98 bn of goods and services produced , € 27 bn in Gross Value Added (GVA) and € 21 bn spent in wages and salaries;***
- ***The effect of Business Aviation over the European Gross Domestic Product (GDP) was about 0.2% in 2014 (comparable to the size of the economy of Latvia); and***
- ***Germany, France and the UK are the main players in the sector, producing 63% of the total GVA of the industry.***

As shown in Figure 2, this study examines the direct, indirect and induced effects of the Business Aviation sector on the European economy (EU28 and Monaco, San Marino, Norway, Switzerland, Channel Islands, Liechtenstein)[2] through four indicators of economic activity:



- **Employment:** Number of persons engaged (i.e., the total number of jobs, including self-employed), supported by the economic activity in the value chains of the Business Aviation sector and by the spending of the employees in those value chains;
- **Output:** The sector's output at basic prices, i.e., sales of self-produced goods and

2 *Data for Gibraltar and the Isle of Man has been attributed to the UK and hence is not disclosed separately*

services not including taxes, plus inventory increase and self-made assets;

- **GVA:** The monetary worth of the production and services generated by firms in the Business Aviation sector and its suppliers, measured as the sector's output at basic prices minus intermediate consumption (input) at purchaser prices; and
- **Labor compensation** (wages and salaries): All wages and salaries linked to the sector's economic activity, defined as the sum of the following: compensation of employees (wages and salaries including employers' social contribution) and compensation of self-employed individuals (per hour equivalent to the compensation of employees).[3]

The study considers two main activities in the sector: manufacturing – the manufacturing of business aircraft and related components, and operations – the operation, handling and maintenance, repair and overhaul of business aircraft. Within the operations sub-group, the study considers 5,489 European-registered fixed-wing aircraft and helicopters of air-taxi, corporate/executive and medical/ambulance operators as being part of Business Aviation.

Business Aviation Creates Jobs at Farnborough Airport

Farnborough airport was the UK's first airfield and used to be a successful center of aviation research. It was owned and operated by the British Ministry of Defence until 1991 when its research activity on site began to decline.

The government chose TAG Aviation to develop the decaying airport into a thriving business aviation center to boost the economic situation of the area. Approximately 220 million pounds were invested into the development of Farnborough airport. TAG Aviation has generated employment in its various departments: charter services, aircraft management, maintenance services, FBO handling and training. TAG Aviation employs 200 employees in Farnborough airport alone to provide services for its 23,000 yearly operations. The airport activities also stimulate the local economy by contributing to contractors, hotels and security services among other sectors. It currently accommodates almost 8,000 jobs. With indirect/induced effects, the total employment supported by this complex locally is estimated at almost 9,600 jobs and 12,000 in the region. This forms one of the largest employment centers in the North Hampshire/Surrey area.***

Direct Effects

Direct Effects of the Business Aviation sector are defined as the sector's own contribution to European employment, output, GVA and wages and salaries. Estimating the sector's direct impact is challenging. The industry consists of many smaller stakeholders, such as aircraft operators, fixed-base operators (FBOs) or maintenance firms, who have limited reporting re-

3 *For simplicity, this report will only use the terms "wages and salaries" and "compensation of employees."*

***** *Farnborough Airport (2009): Farnborough Master Plan, http://www.tagfarnborough.com/wp-content/uploads/2012/07/TAG-FarnboroughMP.pdf*

****** *See http://www.tagfarnborough.com/history/and for the master plan: http://www.tagfarnborough.com/wpcontent/uploads/2012/07/TAGFarnboroughMP.pdf* quirements. Additionally, larger stakeholders, such as aircraft manufacturers, usually produce a wide range of products, not exclusively business aircraft and related components, thereby making it difficult to assess the share that should be attributed to Business Aviation.

As a consequence, direct employment values for FBOs, Maintenance, Repair and Overhauls (MROs) and manufacturers were compiled from a variety of sources, such as company websites or financial databases, supplemented by assumptions and estimates. For the aircraft operators, in contrast, employment figures were estimated by multiplying the current aircraft and helicopter fleet size as reported by Ascend with empirically identified employees-by-aircraft estimates. In all cases, then, estimates for the sector's output, GVA and wages and salaries, were derived from these employment figures by applying values for sector-specific interrelations from Input-Output-tables. With this approach, it is assumed that the average firm in the Business Aviation segment has the same economic structure (e.g., in terms of output, wages, productivity etc.,) as the average firm in the overall air transport sector. This procedure is necessary and reasonable since more detailed macroeconomic data for the Business Aviation segments are not available.

Table 1 shows the **results** for direct effects:

Table 1: Direct economic effects of the European Business Aviation sector

Indicator	Aircraft Operators	FBO/ Handling	MRO	Operations Total	Aircraft Manufac-turers	Total
Employees	35,362	1,778	10,197	47,337	40,601	87,938
Output (€)	12.8 bn	0.2 bn	3.4 bn	16.4 bn	15.3 bn	31.7 bn
GVA (€)	3.2 bn	0.1 bn	0.7 bn	4.0 bn	3.0 bn	7.0 bn
Labor (€)	2.3 bn	0.05 bn	0.6 bn	3.0 bn	2.2 bn	5.2 bn
			Grand Total:	**23.4 bn**	**20.5 bn**	**43.9 bn**

Source: Direct employment estimates and sectoral data from the World Input Output Database.

FBO/Handling figures are comparably low as only "pure" FBO and business aircraft handling firms are considered here while employees in FBO departments of business aircraft operators or MRO firms are included in the operators and MRO totals, respectively.

54% of all staff work in the operation of business aircraft (i.e., either with aircraft operators or with MRO or FBO firms), while 46% deal with Business Aviation-related tasks at the aircraft and component manufacturer level.

Indirect Effects

Indirect Effects are defined as impacts on employment, output, GVA and wages and salaries that result from the purchase of goods and services by Business Aviation sector companies from other European firms further "upstream" in the value chain. Examples include aircraft manufacturers being supplied with metal, plastic and components, or aircraft operators purchasing fuel or paying commissions to brokers. These indirect effects are estimated by using a macro-economic modeling framework of Input-Output-tables[4] that contains the economic interrelations among all economic sectors.

Strictly speaking, such activities could be regarded as indirect effects of business air transport operations as they are intermediate consumer of the aircraft operator. However, Business Aviation-related activities of MRO service providers, FBOs and other dedicated handling firms and business aircraft manufacturers were reported as direct effects. Therefore, totals had to be adjusted for double-counting.

Business Aviation Creates Jobs at Biggin Hill Airport

Biggin Hill is a business aviation airport in the London Borough of Bromley, approximately 15 miles southeast of London. 1,000 people, of which 100 work for the airport operator, are employed on the airfield. The airport serves over 160 destinations around the world and likes to emphasize its high degree of connectivity by promoting the humanitarian side of Business Aviation. Biggin Hill operates one to two medical repatriation flights per day. Most of the passengers are critical patients and Biggin Hill is proud to help this life-saving tool thrive and provide patients with access to state-of-the-art medical treatment in the London area.

Biggin Hill strategic plan includes creating 2,300 jobs by 2030 thanks to the construction of new hangars, office buildings and hotels. Additionally, the creation of an aviation training college will also produce new jobs for the local population as well as attract students, further stimulating the local economy.

http://www.bigginhillairport.com/2014/10/biggin-hill-airport-announce-plans-to-create-jobs-

Table 2 shows the **results** for indirect effects:

4 *Timmer, M. P., Dietzenbacher, E., Los, B., Stehrer, R. and de Vries, G. J. (2015), "An Illustrated User Guide to the World Input-Output Database: the Case of Global Automotive Production", Review of International Economics., 23: 575–605.*

Table 2: Indirect economic effects of the European Business Aviation sector

Indicator	Aircraft Operators	FBO/ Handling	MRO	Operations Total	Aircraft Manufac-turers	Total
Employees	78,252	1,471	21,399	101,121	113,511	213,451
Output (€)	11.3 bn	0.2 bn	6.1 bn	17.6 bn	34.2 bn	51.8 bn
GVA (€)	4.3 bn	0.1 bn	1.8 bn	6.2 bn	10.2 bn	16.4 bn
Labor (€)	3.0 bn	0.03 bn	1.5 bn	4.5 bn	8.7 bn	13.2 bn
			Grand Total	**28.3 bn**	**53.1 bn**	**81.4 bn**

Source: Estimations based on data from the World Input Output Database.
(Totals have been adjusted to avoid double-counting)

Induced Effects

Table 3 shows the **results** for induced economic effects. The induced impact of both the sector's direct and indirect economic activities is the contribution to the economy resulting from spending by the employees from the sector's value chain, which yields further economic activity and jobs. The Input-Output-model is used to estimate these effects.

Table 3: Induced economic effects of the European business aviation sector

Indicator	Aircraft Operators	FBO/ Handling	MRO	Operations Total	Aircraft Manufac-turers	Total
Employees	26,828	859	7,456	35,142	35,054	69,972
Output (€)	3.4 bn	0.1 bn	1.8 bn	5.3 bn	9.4 bn	14.7 bn
GVA (€)	1.3 bn	0.05 bn	0.4 bn	1.7 bn	1.9 bn	3.6 bn
Labor (€)	1.0 bn	0.01 bn	0.3 bn	1.3 bn	1.5 bn	2.8 bn
			Grand Total	**8.3 bn**	**12.8 bn**	**21.1 bn**

Source: Estimations based on data from the World Input Output Database.
(Totals have been adjusted to avoid double-counting)

Results

Considering direct, indirect and induced effects, totals are shown in Figure 3. **The sector's GVA equals a contribution of the sector to the European (EU28/EFTA) GDP of approximately 0.2%.**

2014	Employment	Output (1000 €)	GVA (1000 €)	Salaries (1000 €)
Direct Effects	87,938	31,736,130	7,012,507	5,222,463
Indirect Effects	213,451	51,769,034	16,422,113	13,243,072
Induced Effects	69,972	14,670,706	3,584,228	2,830,837
Total Effects	*371,362*	*98,175,870*	*27,018,849*	*21,296,372*

Figure 3: Total economic impact of the Business Aviation sector in Europe[5]

The majority of the economic impacts of the Business Aviation sector are generated in the key markets in Western Europe. Germany, France and the UK alone represent 63% of the total industry GVA in Europe, with a further 17% being represented by Italy, Switzerland and Spain. These countries not only face a high share of business aircraft movements in Europe, but are also home to large MRO firms and important manufacturers of business aircraft and/or components (Figure 4).

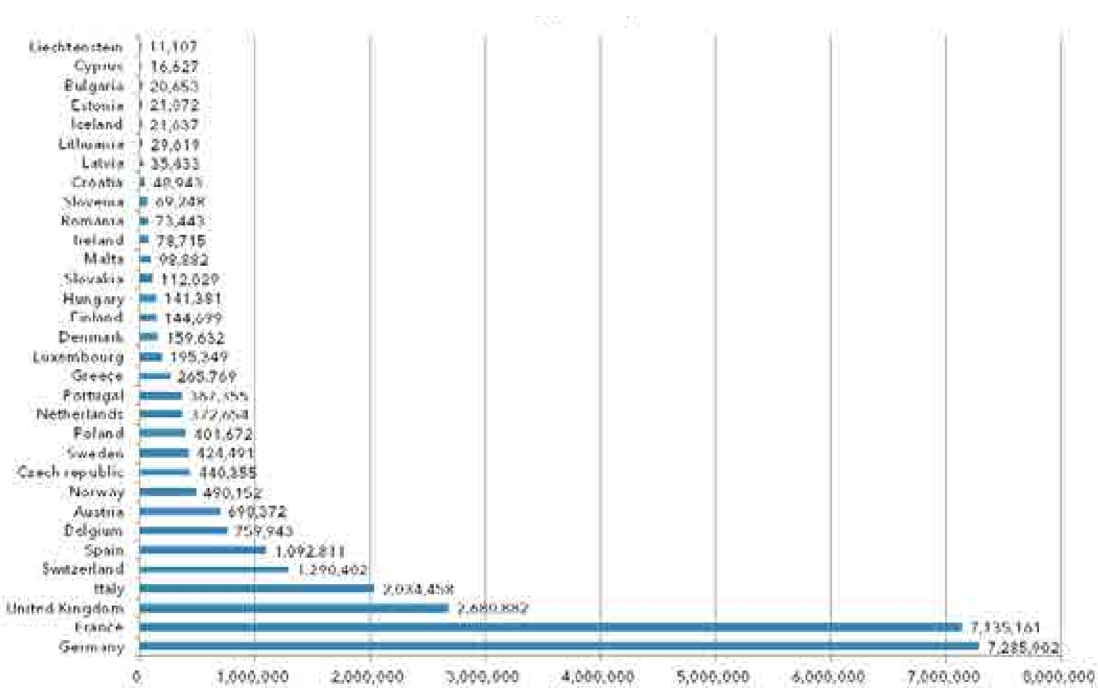


Figure 4: Germany, France and the UK represent 63% of the total industry GVA[6]

5 *Estimations based on data from the World Input Output Database. Totals have been adjusted for double-counting.*

6 *Estimations for Figures 3 and 4 are based on data from the World Input Output Database.*

Additionally, **approximately 25% of the employment and GVA in the sector's value chain is direct, while about 75% can be attributed to indirect and induced activities** (Figure 5).

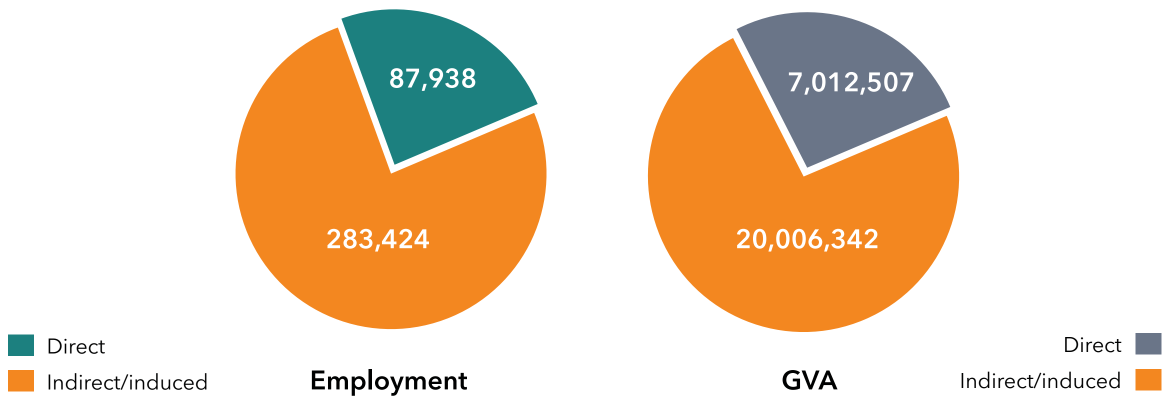


Figure 5: Share of direct and indirect/induced employment and GVA (in € 1,000) across the Business Aviation value chain. About 75% of the employment and GVA come from indirect and induced activities

Chapters 2 and 3 provide more detailed results of business efficiencies and connectivities (i.e., on the country levels) and describe in greater detail the methodologies applied to quantify these effects.

CHAPTER 2: BUSINESS AVIATION ENABLES BUSINESS EFFICIENCIES

This study's economic impact analysis identifies:

- ***The average time that can be saved using a Business Aviation flight rather than the fastest commercial counterpart is 127 minutes per trip;***
- ***About 20% of Business Aviation flights are more than 5 hours faster than their closest commercial alternative (though most trips save time, with the average of 127 minutes per trip);***
- ***With time savings of 127 minutes/trip, an average company saves about 1,380 man-hours annually, about 0.75 of a full-time equivalent;***
- ***The productive work time produced by each employee flying with Business Aviation per single trip is 155 minutes higher than the productive work generated flying on a commercial flight; and***
- ***Approximately 16,000 multi-trip Business Aviation itineraries with three or more flights per day were performed. This saved on the order of 75,000 overnight hotel stays and € 15M in hotel costs.***
- ***Business Aviation may, in some cases, be less costly than commercial travel, given an average cost per passenger of € 1,793 for a Business Aviation flight leg.***

BUSINESS AVIATION EFFICIENCIES

EMPLOYER BENEFITS	EMPLOYEE BENEFITS	CLIENT & CUSTOMER BENEFITS
• *Increased employee productivity in transit* • *Increased reach in expanding markets* • *Increased client inter-action and satisfaction* • *Reduced hotel and airfare costs*	• *Faster travel allowing employees to return home sooner* • *Perception of in-creased safety and security* • *Increased comfort and reduced stress when traveling*	• *Faster access to business partners and support* • *Seamless connec-tion of partners and vendors through increased transport reliability*

As discussed in the Literature Review in the Preface, a cornerstone benefit of Business

Aviation is enabling efficiency in transportation. Business Aviation reduces both travel times and travel burdens, allowing Business Aviation users to complete their travel objectives more quickly, securely, and smoothly. Business Aviation may also reduce cost as compared to commercial aviation, especially in cases where many executives are traveling on first class or business class tickets. For business and employee travel, Business Aviation leads to increased business efficiency, which leads to the flow of millions of Euros annually into the European economy.

While teleconferencing technology continues to improve, previous studies, such as the ones by Andersen [2,3] and Oxford Economics [8], have reported that face-to-face meetings are integral to the success of business deals. For example, Oxford Economics [8] conducted surveys of executives and reported that two thirds of respondents stated that face-to-face contact was integral in deal-making.

Business Aviation generates business efficiencies that impact three key stakeholder groups: Employers, Employees, and Customers/Clients.

- **Employers:** Using Business Aviation, employees spend less time traveling and are able to reach new markets, may visit multiple sites in a short timeframe, and may work to complete more business deals, all serving to drive the European economy;
- **Employees:** Business Aviation reduces travel times and burdens and allows employees to travel in more comfort and return home to their families sooner; and
- **Customers/Clients:** Business Aviation allows support to arrive more quickly so customers are able to get their problems resolved much faster, allowing European businesses to operate at high efficiency.

In short, increased employee productivity, elevated employee happiness and increased customer satisfaction all arise from increased business efficiency and lead to increased economic value.

Impacts on each of these stakeholders are briefly described.

Employer Benefits

Business Aviation allows for increased productivity in transit and increased productivity from reduced transit times.

- With Business Aviation's shorter travel times, employees are more productive as they can work additional hours instead of spending time in long transits to commercial airports or in long layovers between commercial airports; and

- Project teams are able to work in the security of the aircraft and discuss sensitive topics without fear of being overheard and on-board facilities are better suited to meetings and collaborative work than public commercial airport areas.

Business Aviation provides expanded reach to and increased connectedness with current and potential customers.

- Commercial aviation travel times and published flight schedules limit the number of customers employees can reach in one day (if long travel times are required to get to a site) or on any given day (if no commercial flights are available on that day);
- Business Aviation enables companies to stay connected with their plants located in remote regions, which enables them to organize their businesses in the most efficient ways and to leverage cost saving potentials and competitive advantages from various regions across Europe; and
- Previous studies, such as that by Andersen [2], have demonstrated that reduced travel times make it economical for executives to travel to new markets, bringing additional business to Europe and allowing Europe to compete in the global economy.

Business Aviation increases client interaction and drives client satisfaction.

- Additional face-to-face meetings that executives are able to have as a result of Business Aviation are considered as being tremendously important to driving business. In other words, according to Business Aviation users, teleconferencing technology is not sufficient to replace face to face meetings;
- Employees are able to visit multiple sites in a short timeframe, allowing a company's project team to meet a customer every day of the week, driving customer satisfaction up and increasing returns to the company; and
- Employees can meet many clients in different cities through one-day multi-city trips. Such travel is impossible with commercial aviation and forces employees to stay in hotels overnight while traveling instead of returning home.

Business Aviation enables businesses to reduce costs.

- Employers may reduce hotel costs and associated per diem expense through one-day multi-city trips; and
- Employers may avoid purchasing expensive business and first class tickets for traveling executives.

In short, employers benefit from Business Aviation through increased productivity, increased reach in expanding markets, increased client interaction, and potentially reduced costs. These benefits increased business efficiency of Business Aviation over commercial aviation.

Employee Benefits

Business Aviation reduces travel times and allows employees to return home sooner.

- Direct point-to-point flying allows employees to return home earlier, especially if they are able to complete the week's travel schedule in fewer days by visiting more destinations in a single day; and
- Employees more reliably return home at times planned for and expected due to reduced likelihood of travel delays from airport and airspace congestion.

Business Aviation increases perception of security for employees.

- Employees avoid public areas of commercial airports, potentially allowing employees to feel more secure; and
- A smaller number of passengers are transported with a Business Aviation flight than a commercial one, allowing greater care and attention afforded to the safety and the security of the crew [12]

Business Aviation provides employees with increased comfort and reduced stress.

- Employees travel in comfortable conditions, often surpassing commercial alternatives;
- Employees fly point-to-point with no connections and are likely to be using less congested airports with quick check-in and security times. Along with reduced delays, employees have a less stressful traveling experience; and
- The increased comfort and reduced stress drive employee happiness and leads to a higher quality of life than a "road warrior" employee frequently flying commercial.

For employees, Business Aviation promises the ability to return home earlier and more reliably, increases the perception of safety and security, and allows employees to travel in comfort, empowering the excellent work-life balance that distinguishes Europe in the global workplace.

Customer and Client Benefits

Business Aviation allows for increased agility in responding to client's needs.

- Third-party contractors, vendors and support staff are much more responsive to any issues arising at an office, plant, or work site;
- With no risk of flights being sold out and a much reduced chance of delays due to strikes or other disruptions, a customer can reliably get help immediately when needed. Dedicated maintenance personnel can be dispatched to any site at any time and vendors can respond quickly to product difficulties; and
- Customers may be reassured that their issues are heard as partner executives can quickly respond to emerging problems or explore new directions for work, building the client/vendor relationship.

Business Aviation allows for the seamless connection of partners and vendors through a transportation schedule that revolves around the business.

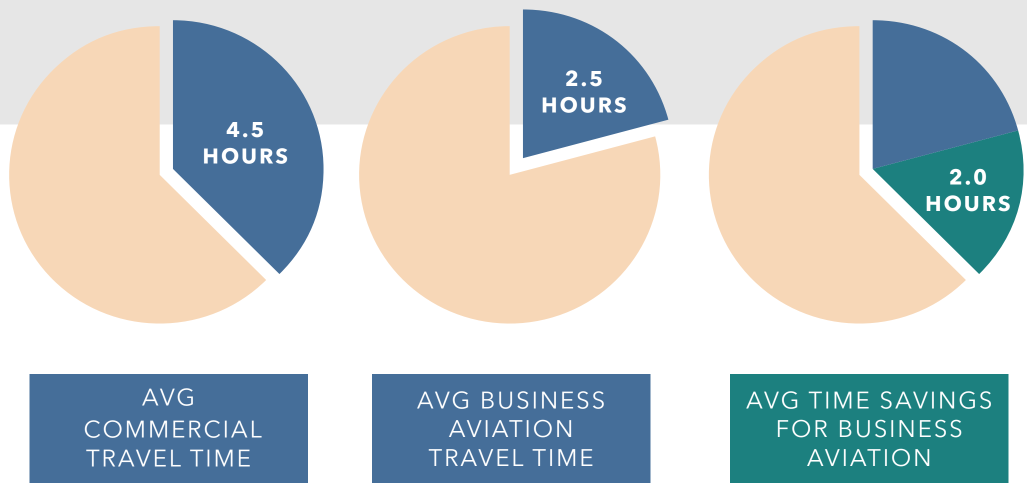
- Without the constraints of commercial aircraft schedules and the increased reliability of transportation options, Business Aviation users can stay on site as long as necessary to work through problems or generate ideas; and
- Business Aviation allows customers and clients to be connected to the global economy, wherever they may be located in Europe or abroad.

For customers and clients, Business Aviation provides business agility and seamless partnerships on a global level, providing a major advantage over other means of travel.

Efficiency Metrics

KEY FINDING

Business Aviation leads to large time savings for its users, saving an average of 127 minutes per flight over commercial aviation



Business Aviation itineraries were analyzed in order to quantify key metrics representing much of the value of Business Aviation. These metrics are described in the beginning of this report. Summarized here, results are presented in greater detail in the Detailed Discussion and Methodology Section.

Business Aviation in Europe saves an average of 127 minutes over commercial travel, or just over 2 hours. 800,000 fixed-wing Business Aviation flights in Europe in 2014 are compared against the fastest commercial alternatives, averaging the time savings per flight. Figure 6 summarizes the total trip time for Business Aviation.

BUSINESS EFFICIENCY METRICS

Total time saved allows users of Business Aviation to be as efficient as 2,600 FTE

In 20% of trips, Business Aviation saves **more than 5 hours** over commercial travel

Business Aviation saved **€ 1.20bn** of employee time in 2014

From reduced delays, Business Aviation users **save about 1,825** days annually

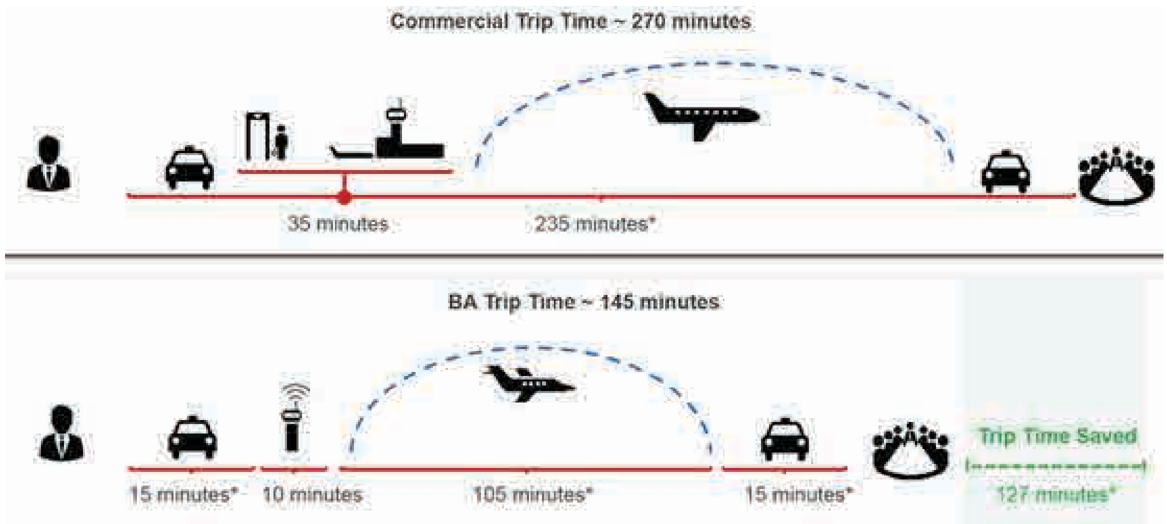


Figure 6: Average travel times for Business and Commercial Aviation, highlighting longer commercial travel time and 127 minute time savings for Business Aviation

Figure 7 shows that the aggregated time savings over 800,000 fixed-wing flights is 539 years. The calculation uses proprietary data from a major Business Aviation broker which specifies an average of 4.7 passengers per Business Aviation flight as well as EBAA data indicating that 41% of all Business Aviation flights in 2014 were empty leg flights, which cannot be considered in this analysis. [13]

Figure 7: Aggregated time savings for users of Business Aviation

While the average time savings of Business Aviation over commercial aviation is approximately 2 hours, it is important to consider the distribution of the time savings in order to form a clearer picture of the value of Business Aviation. The time savings histogram is shown in Figure 8 and highlights the large fraction of trips in which time savings far exceed 2 hours.

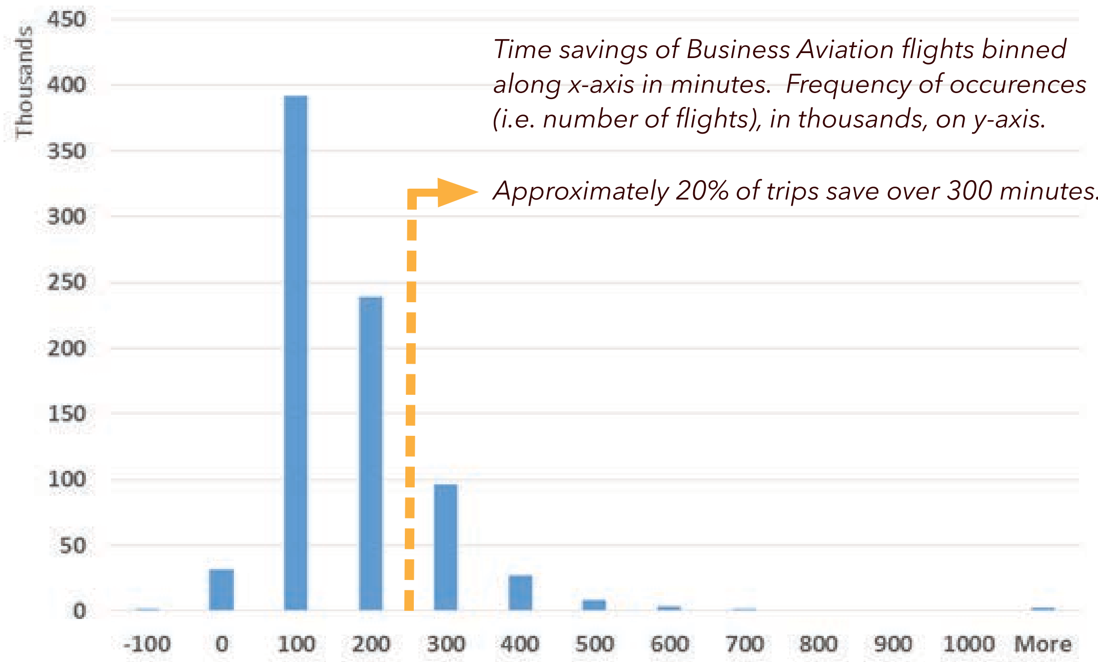


Figure 8: Time savings histogram for Business Aviation. While many flights save between 100 and 200 minutes over commercial trips, approximately 20% of trips save over 300 minutes (5 hours)

Additional efficiency findings include:

- Using a weighted average of employee levels who would use Business Aviation (executives, middle managers, and technicians) and their associated average salaries, the value of the total time saved was found to be € 1.20 bn annually;
- The time savings of Business Aviation can be broken out by company. With an average of 654 passengers transported by Business Aviation per company, each company saves on the order of 57 days per year using Business Aviation. This is a baseline order of magnitude estimate; time savings are likely to be larger in reality;
- Harris [14] has shown that employees consider time on a Business Aviation aircraft to be more productive than time on a commercial aircraft or even time in the office. Taking into account this increased productivity, Business Aviation users generate an additional 5.7 million hours of additional work output over commercial transport users annually; and
- Given Business Aviation tends to use less congested airports and airspace, Business Aviation flights are less likely to be delayed. Using Eurocontrol delay statistics, the total Business Aviation time savings resulting from reduced delays were found to be on the order of 1,825 days annually. This time is in addition to time savings obtained from

Business Aviation's faster travel over commercial alternatives.

Detailed Discussion and Methodology

Methodology

Figure 6 illustrates the data science approach for estimating overall time savings, showing an average time savings of 127 minutes of Business Aviation over commercial aviation. Figure 7 shows the total aggregated time savings of 539 years for all European Business Aviation users in 2014.

In short, the data science analysis estimates the time savings associated with Business Aviation as compared to commercial aviation. This time savings estimate is then used to quantify the value of time saved by Business Aviation which contributes to the total economic benefit of Business Aviation over commercial aviation. In this context, the analysis focuses on the time savings of a single flight only - an estimate of time savings for multiple city itineraries is provided later in the chapter. Appendix C describes the complete methodology for estimating time savings of Business Aviation.

Business Aviation Offers Increased Levels of Security

When examining destinations around the world, aviation safety does not always follow the same standards as in the European Union. For instance, flying into certain geographies with commercial aviation will require using airliners and aircraft that would not be allowed into European airspace. When business opportunities are located in regions that can only be accessed by certain local flights, business travelers would be required to put themselves at a higher risk than necessary. Business Aviation can provide a viable alternative here, as aircraft airworthiness and pilot training follow the highest standards when chartered in the EU.

Similarly, security can be of concern when traveling with public transportation into regions where the geopolitical risk is high. Alternatively, health risks should be considered when traveling in regions where outbreaks of rare and dangerous diseases are present.

Business Aviation offers the greatest security and safety possible and ensures that employees reach their destinations in the most reliable and secure way possible.

Time savings are computed for every Business Aviation flight in 2014. Each airport is resolved to the nearest major city such that every Business Aviation itinerary is mapped to a journey between two cities. The fastest commercial alternative may be any means of travel. For farther journeys, this is usually a surface sector from the origin city to an origin airport, any number of flights to a destination airport, and a surface sector to the final destination. The surface sector may be a train, taxi, ferry or any other mode of transportation. Additionally, especially on shorter distance journeys, the best commercial alternative may be entirely a train or car ride with no flying suggested. Commercial time also includes time for check-in (arriving at airport or train station in advance of departure). This best commercial alternative is compared against 800,000 WingX-provided Business Aviation flight itineraries. Travel time from origin city to Business Aviation origin airport and from Business Aviation destination airport to destination city is added, as well as a smaller minimum check-in time. An estimate of the time savings is produced for every Business Aviation flight in the data set.

Time Savings Results

Of the over 800,000 fixed-wing trips analyzed, the **average commercial trip time is 272 minutes**. This trip time represents an average of the best (shortest) commercial alternatives if not for the Business Aviation alternative. In effect, this is an average travel time for a European business trip. Of trips that included flying, the average flight time was found to be 163 minutes, with an average surface transit time of 94 minutes, such that the flying portion of a trip is almost twice as long as the surface portion. Note "flight time" includes connecting at airports and captures the time from take-off in the first (origin) airport of a trip to landing at the trip destination airport.

The Business Aviation average trip time is 145 minutes. An important finding of the analysis is that the average travel time from a city to a Business Aviation airport is only 15 minutes. This is a 30 minute total surface travel time, only a third of the 94 minute commercial alternative surface travel time. Therefore, even for routes in which good commercial service is available, the short travel time to Business Aviation airports results in substantial time savings and drives business efficiency.

With an average Business Aviation trip time of 145 minutes and an average commercial trip time of 272 minutes, **the average time savings is 127 minutes for Business Aviation over the shortest commercial alternative**, or just over two hours.

This time savings estimate represents the absolute minimum time a business traveler could expect to save – business travelers will often be unable to select the shortest flight because that flight may not be with a preferred corporate airline, may be outside of business hours, or may require travel through a country for which the traveler does not hold a valid visa.

Time Savings Distribution

The time savings of most flights are between 100 and 200 minutes (with an average of 127 minutes). Some flights are faster by commercial aviation: these are long-haul journeys where wide-body commercial jets simply fly faster than business aircraft do. However, the distribution has a long tail, and many Business Aviation itineraries are substantially faster than commercial alternatives. **Just under 20% of Business Aviation itineraries are at least 5 hours faster than the fastest commercial alternative**, representing a major boost to productivity.

Time Savings by Company

Harris reports in 2009 [14] that 327 passengers per company were flown by Business Aviation over a six-month period. Harris data are based on US surveys. The Harris data may be extended to an annual basis such that the average company transported 654 passengers by Business Aviation. **Given that each trip saves the user an average of 127 minutes, each company saves on the order of 1,380 hours, or about 57 days, by using Business Aviation for its employees. Assuming an employee works 1,840 hours per year[7] , this average company saves about 75% of a full time equivalent by using Business Aviation.**

It should be noted that while the Harris data are based on US surveys and may be used to generate an order of magnitude estimate of time savings by company in Europe, users of Business Aviation tend to be smaller companies in Europe than in the US, such that many users will not have 327 employees in the company. With smaller companies, a higher proportion of employees benefit from Business Aviation, while at larger firms, economies of scale improve cost effectiveness and amplify productivity gains. Thus, the estimates provided here of time savings by company should be considered conservative and, in reality, time and cost savings are likely higher, especially for smaller European companies, especially given the overall time savings of 2,600 FTEs in Europe and the smaller estimate of time savings per company here.

Value of Time Saved

The time savings analysis may be extended to provide a baseline estimate of the value of time saved by Business Aviation over commercial aviation. **The average time savings of Business Aviation is 127 minutes per flight, which, when multiplied over the approximately 800,000 Business Aviation flights taking out 41% of empty legs, is 41,897 days**. Given the **average of 4.7 passengers per flight**, the **total time saved by Business Aviation in Europe is 196,914 days, or just over 4.7 million hours**. Assuming 1,840 annual hours worked per employee, **Business Aviation allows its users to be as efficient as 2,600 full-time equivalents**.

According to Harris [14], Business Aviation users are primarily top executives (22%), middle managers (50%) and technicians (20%). Harris data are based on US surveys but there is no reason results would differ significantly in Europe. For simplicity in the calculations here, it may be assumed that the 8% of other users fall into the same pay band as technicians, such that the assumed mix for Business Aviation users is 22% top executives, 50% middle

7 *Assumes employees have six weeks' vacation resulting in a 46 week work-year at 40 hours worked per week. This is a conservative estimate of annual working hours for the European Union. See OECD statistics at http://stats.oecd.org/index.aspx?DataSetCode=ANHRS. Many countries, such as Germany, France, and the United Kingdom, have employees working less than 1,840 hours.*

managers, and 28% technicians.

To estimate the total value of time saved by Business Aviation, average salaries are considered for the three groups. According to Statista, executives average € 745 per hour [15]. Over 40 hours per week and 52 weeks per year, this translates to a € 1.55 million annual salary. Statista also reports that middle managers, who, for the purposes of the analysis, may be defined as MBA holders 3 years after graduation, earn an average of € 140,000 per year [16].

It may be assumed technicians earn an average salary based on a completed diploma or single degree program. Considering European salaries in [17], an annual salary of € 25,000 may be used for technicians.
Furthermore, the value of an employee's time in terms of productivity is not simply equal to his or her salary. PRC Aviation found that in a 1995 study, an employee's value of time was equal to 5.7 times his or her salary for a senior executive and 3.8 times his or her salary for a middle manager or professional employee [18].

Given the above data, the total value of time saved by Business Aviation in Europe may be computed according to the table below[8]. **Thus, the average annual value of time saved by Business Aviation in Europe is approximately € 1.20 bn**.

Table 4. Total value of time saved by Business Aviation in Europe

Category	Salary (€)	Amount over 539 years (€)	Fraction of Users	Value of Time Multiplier	Total Value of Time Saved
Executive	1,550,000	0.84 bn	22%	5.7	1.05 bn
Middle Manager	140,000	0.08 bn	50%	3.8	0.14 bn
Technician	25,000	0.01 bn	28%	3.8	0.01 bn
				Grand Total	1.20 bn

Business Aviation Productivity Advantages

Business Aviation users are 20% more productive in flight than in the office, and so they generate 105 minutes × 1.2 = 126 minutes of productive work time per flight.

Increased productivity is a major benefit of Business Aviation over commercial aviation. Business Aviation allows users to work in privacy and comfort on board business aircraft and reduces unproductive time spent waiting at or transiting through commercial airports.

8 *Note that the weighted hourly average for the Value of Time across the three user groups can be computed as 0.22*(€ 745*5.7)+0.5*(€ 76.01*3.8)+0.28*(€ 13.59*3.8) and equates to €1,093.25 where € 745 is the hourly salary for the executives, € 76.01 the one for mid-level managers and € 13.59 the one for technical staff, when assuming 1,840 hours per year worked.*

Harris reports in 2009 [14] that Business Aviation users are 20% more productive on board than when in the office and are 40% less productive on commercial flights than when in the office. Harris data are based on US surveys though there is no reason results would differ significantly in Europe.

To quantify the increased productivity afforded to users of Business Aviation, average flight times of Business Aviation against commercial aviation may be considered. European Business Aviation users average approximately 105 minutes in flight. It may be assumed that both business and commercial users work immediately after take-off, continue throughout the whole flight, and stop just before landing, such that entire flight times may be considered as time spent working. It may be similarly assumed that surface travel times to and from airports are not productive time, such that it is only the actual flight time that contributes to productive time.

If Business Aviation users are 20% more productive in flight than in the office, they generate 105 minutes × 1.2 = 126 minutes of productive work time per flight leg. Further, as Business Aviation users save an average of 127 minutes over commercial aviation, they may spend an additional 127 minutes of productive time in the office. **In total, Business Aviation users generate 253 minutes of productive time by taking a business flight.**

The average commercial flight time is 163 minutes, of which 163 minutes × 0.6 = 98 minutes may be considered productive time, given the 40% productivity penalty reported by Harris. Recall Rome2Rio reports total flight times, such that commercial flight times include layover times. Layover time is unlikely to be spent working, such that the 98 minute estimate of commercial travel productive time is generous and the productivity advantage of Business Aviation over commercial aviation is likely to be larger than estimated here.

It may be assumed that commercial aviation users are not productive when traveling to or from airports or when transiting between them, such that the total productive time of a commercial trip is 98 minutes. Thus, **for every trip, Business Aviation generates, on average, a 253 – 98 = 155 minute productivity advantage over commercial aviation**. In other words, Business Aviation users have 155 more minutes of work time when traveling by Business Aviation. For the 800,000 trips in the WingX data set minus the empty leg flights the total productivity advantage is approximately 1,200,000 hours. With 4.7 passengers per flight, Business Aviation generates approximately 5.7 million

According to Eurocontrol:

- *13.4% of Business Aviation flights were delayed in 2005*
- *The average delay for Business Aviation flights was 12.8 minutes*
- *19.0% of commercial aviation flights were delayed in 2005*
- *The average delay for commercial aviation was 10.4 minutes*

additional productive hours over commercial aviation. With a full-time employee working 1,840 hours per year, the extra productivity output from Business Aviation is approximately 3,100 full-time equivalents. These additional productive hours flow into Europe's economy and are a tremendous benefit of Business Aviation to Europe.

Delay Statistics

Business Aviation is less susceptible to travel delays as compared to commercial aviation, a key component of its enabling of business efficiency. The amount of time saved as a result of avoided delays is estimated here. As delay statistics for Business Aviation are not complete, the analysis endeavors to complete an order of magnitude analysis here.

Eurocontrol studied Business Aviation delays in 2013 using 2005 data [19]. Eurocontrol considered only Air Traffic Flow and Capacity Management (ATFCM) delays, that is, delays that arise out of air traffic constraints at airports, given the availability of only this data for Business Aviation flights. Eurocontrol notes that ATFCM delays make up only 10-20% of the total delays, which may include weather, baggage delivery delays, security delays, and so on. However, ATFCM delays would impact commercial aviation much more so than Business Aviation as commercial aviation uses the most congested airports. Therefore, it is still valuable to estimate the time savings of Business Aviation resulting only from reduced ATFCM delays.

According to Eurocontrol Central Office of Delay Analysis 2014 Report:

- *37.4% flights were delayed by an average of 26 minutes in 2014*
- *The average reactionary delay in 2014 was 4.32 minutes while the average airline delay was 3.04 minutes*
- *Business Aviation users save 7.35 minutes per delayed departure over commercial aviation*
- *With an assumed 37.4% of the 800,000 departures delayed, Business Aviation saves a total of 1,308,537 minutes, or 1,908 days (with the 41% empty leg flights not considered as they do not largely impact users of Business Aviation)*
- *Given the average of 4.7 passengers on board and 41% empty-leg flights, the total time saved by Business Aviation users is approximately 11.5 years*

Eurocontrol reports that 13.4% of Business Aviation flights were delayed in 2005, as compared to 19.0% of commercial aviation delays. The average delay for Business Aviation flights was 12.8 minutes, as compared to 10.4 minutes for commercial aviation. Eurocontrol explains that Business Aviation flights are less frequently delayed as these flights avoid congested airports; however, if a flight is delayed, the average delay is larger for Business Aviation. This is because Business Aviation primarily uses the highest flight levels in the airspace. Commercial traffic has begun to encroach upon these flight levels, such that when there is congestion at these flight levels, it primarily affects Business Aviation traffic. With these statistics, the time savings over the annual 800,000 Business Aviation flights may be computed.

Given 13.4% of flights are delayed by 12.8 minutes, the **total time lost to delays for Business Aviation is 1,383,852 minutes, or 961 days**. For commercial aviation, given 19.0% of flights are delayed by 10.4 minutes, **the total time lost is 1,594,270 minutes, or 1,107 days.** Note it is assumed that a delay impacts a commercial itinerary overall and not necessarily individual flight segments on that itinerary. Thus, Business Aviation flights save 146 days, or just under 5 months, over commercial aviation as a result of reduced delays. Given the average of 4.7 passengers on board and considering the 41% of empty leg flights, **the total time saved by Business Aviation users is 405 days**. As discussed, this estimate includes only the time saved by ATFCM delays at airports and accounts for only 10-20% of total delays.

As an alternative analysis, consider Eurocontrol's Central Office for Delay Analysis 2014 report on aviation delays in Europe [20]. In 2014, 37.4% of flights were delayed by an average of 26 minutes; these values are considerably larger than the 2005 data above. It can be reasonably inferred that commercial aviation delays will continue to increase as European airports and airspace get increasingly congested with the continued growth of air traffic. While Eurocontrol's report does not call out the differences between Business Aviation and commercial aviation delays, it lists reasons for delays and the associated averages. Delay types include airline delays, ATFCM delays, weather delays, airport delays, reactionary delays, and so on. Note reactionary delays are flights delayed from late arriving aircraft or crew, or from airlines holding aircraft for connecting passengers. As an order of magnitude estimate, it may be assumed that Business Aviation users are not affected by airline delays or reactionary delays, but are affected by other delays, such as government delays, weather delays, and airport delays.

Business Aviation Enables Offshoring to Eastern Europe

Since the fall of the Iron Curtain, Eastern European markets have become attractive regions for offshoring production facilities from for instance Western European firms. This is especially relevant due to comparably low-cost labor and cheap land, which enables firms to achieve lower production cost and makes them more competitive on International markets. One good example that demonstrates these benefits is Romania, where in 2007, CNN reported already 90% of some 1,000 Information Technology (IT) companies in the country were foreign-owned. However, with the exception of its capital Bucharest, Romania has not been able to get connected to the International air traffic network in a way that ensures that foreign companies that decide to open facilities here are able to easily travel to their facilities, frequently meet with their employees and ensure that standards are met.

The business processes of these firms therefore heavily rely on the availability of Business Aviation and Business Aviation ensures that Foreign Direct Investments can be made in remote areas of the world.

Eurocontrol reports that the average reactionary delay in 2014 was 4.32 minutes, while the average airline delay was 3.04 minutes. If Business Aviation is not affected by these delays, Business Aviation users save 7.35 minutes per delayed departure over commercial aviation. With an assumed 37.4% of the 800,000 Business Aviation departures delayed, and not considering the 41% of flights that are empty, **users save a total of 1,308,537 minutes, or 908 days**. Given **the average of 4.7 passengers on board and 41% of empty leg flights, the total time saved by Business Aviation users is 4,267 days or approximately 11.5 years**. This analysis is optimistic given that Business Aviation users will still occasionally be affected by airline and reactionary delays.

These two methods produce total delay time savings of Business Aviation of just over 1 year and 11.5 years, respectively. As an order of magnitude estimate, it may be stated that the **Business Aviation time savings that arise as a result of decreased delays are on the order of 5 years, or 1,825 days annually, splitting the estimates**.

Multi-Trip Itineraries

When traveling three or more legs on a single day, Business Aviation offers unique advantages over commercial airliners. An analysis of Eurocontrol-provided tail numbers for 151 aircraft that flew through 2014 was performed in order to identify multi-trip itineraries that were flown with these aircraft. On these missions, Business Aviation offered an average time saving of 6 hours and 33 minutes over commercial aviation. The 151 business aircraft completed 792 multi-trip itineraries in total. Proprietary broker data indicate that there are 3,080 active business aircraft in Europe. Assuming that these 151 aircraft were drawn randomly out of this 'population,' it can be estimated that 2014 saw 16,156 multi-trip itineraries. It may be assumed that replicating these itineraries with commercial travel would require at least one hotel night. Therefore with an average of 4.7 passengers on each flight, the total number of hotel nights required with commercial travel is 75,933. Finally, given an average assumed overnight hotel cost of € 200, European businesses saved at least €15,186,600 in hotel costs by using Business Aviation.

It should be noted that multi-trip data were limited to these 151 aircraft. With an estimate of 16,156 multi-trip itineraries, 2% of European Business Aviation trips make up multi-city itineraries.

Potential Cost Savings of Business Aviation

The use of Business Aviation may lead to cost savings over commercial fares. An analysis of business aircraft block hour operating costs and average passenger numbers allows for an order of magnitude estimate of Business Aviation costs per passenger and provides a baseline comparison to commercial fares.

An analysis of proprietary data for a large private Business Aviation broker provides monthly block hour operating costs of various types of Business Aviation aircraft, as well as the associated average passenger counts by type. As the WingX data set analyzed in this study reports operating aircraft type, using this in combination with the broker data, an operating cost estimate for every flight can be computed[9]. Given the average number of passengers per flight leg, an average cost per passenger can be obtained. For example, the broker reports the January 2014 operating cost per block hour of a super light jet is € 3,239 per hour and the January 2014 average passenger count for a super light jet to be 3.8 passengers. A 53 minute flight leg from Barcelona El Prat to Madrid Barajas may therefore be estimated to have an operating cost of € 2,861, or a € 753 cost per passenger. These rates are comparable to another broker's rates, igojet. igojet has published a white paper citing average total operating costs per block hour for a fully-owned mid-size jet to be $4,900 / hour [21].

Averaging over all 800,000 fixed-wing Business Aviation flights in the WingX data set **yields an average cost per passenger per flight leg of € 1,793**.

It is important to note that this cost is an order of magnitude estimate based on proprietary data from one broker (who naturally would like to advertise its low fares and may be including discounted empty legs that would drive down costs). This analysis is not sufficient for drawing a complete comparison between commercial aviation and Business Aviation costs and is meant only to illustrate that the usage of Business Aviation may be a cost-conscious service for many companies and employees.

This one-way average cost per flight leg per passenger is not out of line with full-fare commercial ticket prices, even for economy class, when considering business travelers are likely to purchase their tickets close to the date of departure. The cost effectiveness of this average price per passenger becomes even more obvious when compared against the savings discussed in previous sections:

- For every trip and passenger, Business Aviation generates, on average, 155 minute productivity advantage over commercial aviation by shorter trip times and higher productivity en-route. Using an average Value of Time of € 1,093, this benefit alone equates to gains of **€ 2,788 per passenger**.
- As Business Aviation flights are, on average, 2.64 minutes less delayed than commercial flights, this time saving is equivalent to **€ 48 per passenger**.
- 2% of all Business Aviation passengers experience the benefit if saving hotel room costs as they are on multi-trip itineraries that return on the same day to the origin. Compared

9 *It should be noted that the average cost per passenger will vary widely across the different segments in European Business Aviation. Utilizing for instance fully-owned aircraft will lead to significantly different cost than fractional ownerships or charter* to Commercial Aviation and assuming a conservative € 200/room, t**his benefit leads to savings of € 4 per passenger over commercial aviation**.

As such, Business Aviation leads to efficiency gains to European companies of € 2,840 per passenger relative to using Commercial Aviation. Comparing these gains against the average one-way cost per passenger of € 1,793 demonstrates the business case for choosing Business Aviation over Commercial Aviation and showcases why Business Aviation is an affordable service when purchased in a responsible fashion. The use of Business Aviation should therefore not be considered a luxury good, but a prudent purchase and an accepted cost of doing business.

Note on Environmental Costs of Business Aviation

It is important to note that, while Business Aviation aircraft carry fewer passengers than commercial aviation aircraft do, Business Aviation has several ways in terms of reducing its environmental impacts. Firstly, most Business Aviation travel is point-to-point, without fuel-consuming takeoffs and landings at connecting airports, leading to a relative reduction of emissions. As Business Aviation often avoids large, commercial airports, aircraft are not subject to the holding patterns and indirect air traffic control routings which can lead to increased fuel burn. Finally, Business Aviation aircraft tend to be less subject to tarmac and taxi delays, avoiding burning excess fuel on the ground.

CHAPTER 3: BUSINESS AVIATION ENABLES CONNECTIVITY

Business Aviation improves connectivity over Europe. Key findings from the analysis include:

- ***25,280 airport pairs served by Business Aviation were never connected by nonstop commercial flights, approximately 31% of all airport pairs analyzed;***
- ***Of the 800,000 fixed-wing Business Aviation itineraries examined, approximately 27% do not have nonstop service between them;***
- ***Time savings enabled by better connectivity are larger in Eastern Europe and in the continent's periphery; and***
- ***2.5% of all Business Aviation flights in Europe are operated for fast transportation of critically ill or transplant organs***

Summary of Results

Business Aviation improves connectivity over Europe by connecting cities that are underserved by commercial aviation to the global aviation network. As part of the analysis of Business Aviation efficiencies, Business Aviation itineraries and time savings by region were examined to explore the connectivity benefits provided by Business Aviation. The results are summarized here and described in further detail throughout this section.

- Analysis shows that 25,280 European city pairs are not connected by nonstop commercial flights;
- Of the 800,000 Business Aviation trips, 27% do not have any nonstop commercial service on any day of the week;
- Time savings of Business Aviation are much larger in Eastern Europe and in the continent's periphery in general: Central and Western Europe time savings are smaller; and

Business Aviation Enables Decentralized Corporate Structures

Some companies implement a corporate structure that is decentralized, where a holding has several strong brands that are located in different regions across a country, a continent or the globe. For instance, among others, a major automobile manufacturer operates brand headquarters in varying locations, requiring coordination of senior management and a respective number of business trips. Business Aviation enables corporations to reduce the efforts and time consumed traveling between several locations and thus enables them to implement the corporate structure that enables the most appropriate and efficient business processes.

- When looking at the results for specific countries, it can be noted that the largest time savings can be found in remoter and/or more rural regions of the country or within the congested areas, such as London, where the entire door-to-door trip times are massively increased by congested roads and long drive times to commercial airports outside of the city.

It should be noted that while the connectivity Business Aviation provides is fundamentally important to the European economy, this connectivity also provides significant societal benefits, such as allowing air ambulances and medical evacuations in remote regions of Europe. This enables important services to the society by ensuring that critically ill or injured patients or organs can be transported quickly and safely between medical centers, even to and from the most remote locations. Flexibility and speed are key here, which makes the option that aircraft are available 24/7 and can be dispatched within 1 to 1.5 hour notice invaluable. Business Aviation operators can mobilize specialist medical teams as required, which can include experts in the fields of cardiology, pediatrics, neo-natal and intensive care. Aircraft are typically equipped with the most advanced medical technology and can be adapted to suit the needs of a patient. This includes carrying infant incubators or intensive care equipment.

Based on EBAA data, almost 20,000 ambulance flights are being operated in Europe every year, which is about 2.5% of all Business Aviation flights. The European airports with the highest number of ambulance departures are Zurich, London Oxford, Le Bourget and Biggin Hill.

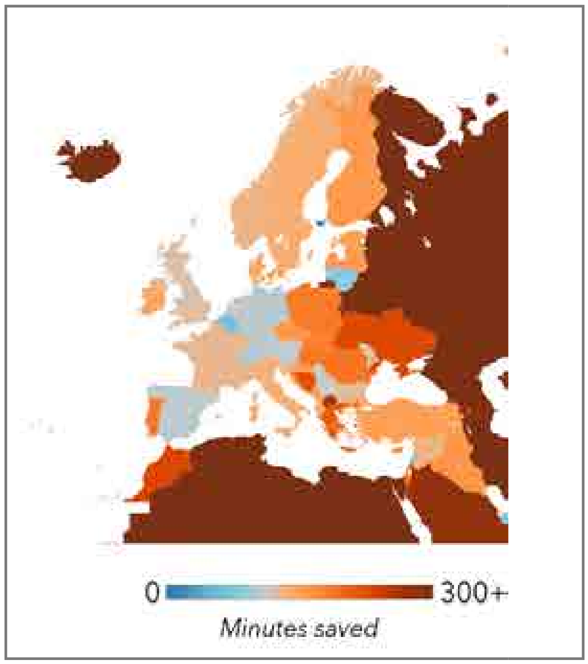


Figure 9: Average Business Aviation time savings for Europe. Larger time savings are seen in Eastern Europe and on the continent's periphery in general

Discussion

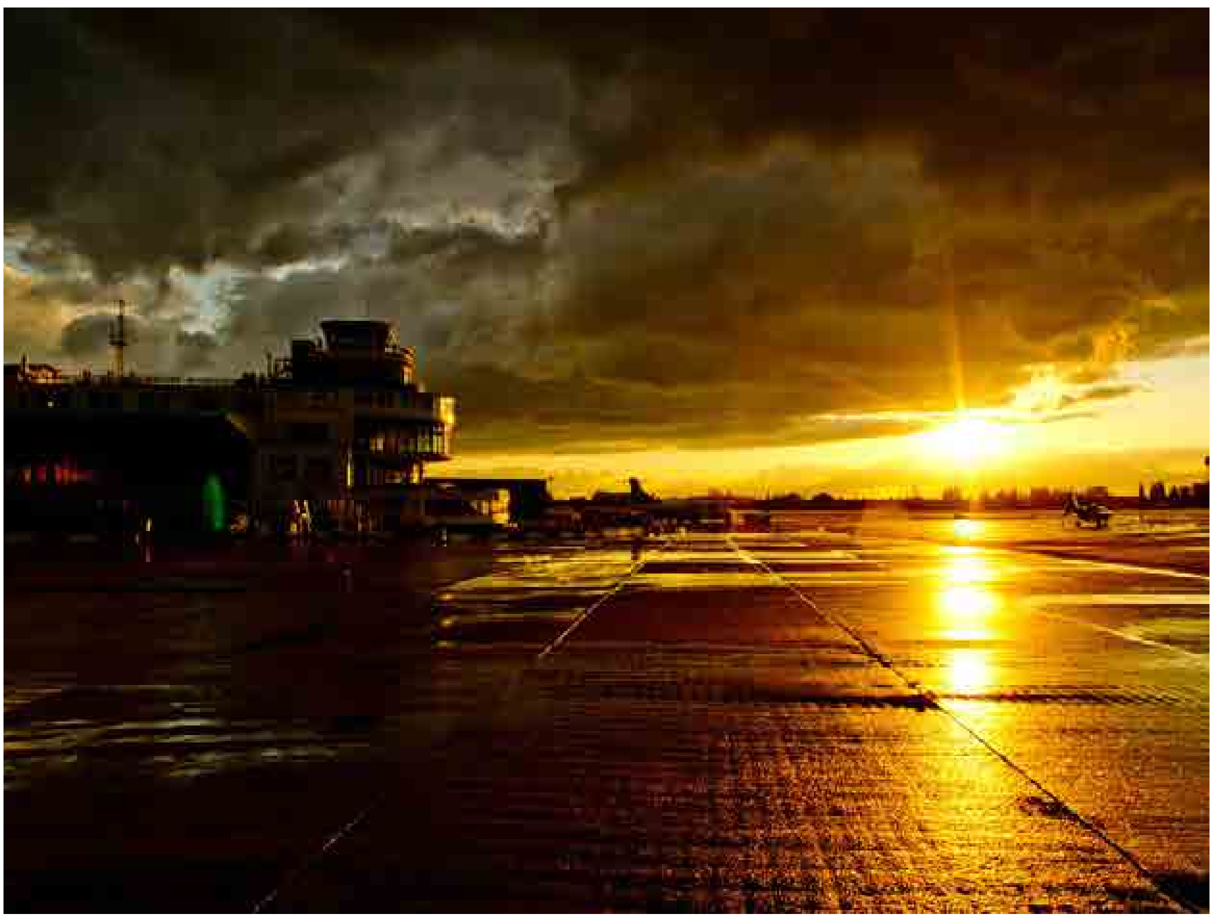
25,280 European city pairs that make up part of the Business Aviation network are never connected (any day of the week) by nonstop commercial service. The value of Business Aviation to these communities is clear – Business Aviation keeps these cities connected to the European and global economies. These airport pairs represent 31% of all pairs analyzed: a sizeable airport of the European aviation landscape.

Further, of the over 800,000 Business Aviation itineraries (markets) analyzed, 27% did not have nonstop commercial service on any day of the week. These markets benefit most from Business Aviation and allow employees traveling in these markets to be much more efficient and agile in their business travel.

General European Connectivity

This section highlights connectivity insights resulting from the time savings analysis the team performed. This discussion of connectivity completes the picture of the value and benefits of Business Aviation in Europe.

Figure 9 shows the average time savings by European country. Time savings are much larger in Eastern Europe and in the continent's periphery in general, illustrating the more limited connectivity of these regions to the global aviation network. Conversely, time savings are much lower in Central and Western Europe, especially Germany and France, as these are much larger global aviation hubs and are well connected.



CHAPTER 4: COUNTRY CASE STUDIES

This section summarizes the results gathered throughout the report for some key countries in Europe and highlights the economic impacts for these countries and the connectivity of their regions.

The following section focuses on the Czech Republic, France, Germany, Italy, Sweden, Switzerland, and the UK.

Czech Republic

Economic Impacts:

With a 2.7% share of European Business Aviation-related employment, the Czech Republic is responsible for 1.6% of the industry's GVA and €2,279,161 bn (2.3%) of its output. The country's 2,724 Business Aviation employees collect € 68,485 in (direct) wages and salaries. This workforce is distributed as follows: 751 work in Aircraft Operations, 33 at FBOs, and 1,600 in Aircraft Manufacturing. Manufacturing of business aircraft and components, in particular at Honeywell, is the primary driver of the Czech Republic's Business Aviator sector. The MRO business in Eastern Europe in general and in the Czech Republic in particular is growing - 1,124 employees are currently working at MRO firms. The total employment in the Czech Republic (Direct, Indirect and Induced) is 9,951, which is the 8th highest among all EU & EFTA countries. The country's fleet consists of 63 fixed wing aircraft and 53 helicopters.

Table 5: Summary of Economic Impacts for the Czech Republic

	Helicopter	Fixed Wing	Total
Fleet Size	53	63	116

	# of Employees	Output (1,000 €)	GVA (1,000 €)	Wages (1,000 €)
Direct Impact	2,724	545,122	115,002	68,485
Indirect Impact	5,953	1,484,512	292,443	245,201
Induced Impact	1,273	249,527	32,910	24,186
Total Impact	**9,951**	**2,279,161**	**440,355**	**337,872**

Time Savings:

The average time savings from Business Aviation over commercial flights for the Czech Republic is shown in Figure 12. Large time-savings pockets are seen throughout the country – Prague is the major commercial airport and travel to many cities outside of Prague would require connections through Prague or significant overland travel to these cities. The three main Business Aviation airports of the country (Prague in the North-West, Brno in the South-East and Ostrava in the East) are therefore the main areas where significant time savings canbe experienced.

Main Airports and Players:

Prague – Ruzyně Airport is not only the main commercial airport of the country, it also accounts for almost 10 times the number of average daily departures from the Czech Republic as the next two most active airports Brno – Tuřany (1 daily Business Aviation departure) and Leoš Janáček Ostrava (2 daily departures) lag behind.

France

Economic Impacts:

Along with Germany and the UK, France is a main player in the European Business Aviation sector. Collectively, the three countries produce 63% of the total GVA in the industry. France accounts for more than a quarter (26.4%) of the Business Aviation GVA and € 23,700,434 bn (24.1%) of its total output. France has a fleet of 364 helicopters (the second-biggest fleet in Europe) and 211 fixed-wing aircraft. 1,286 employees work in the MRO segment, 153 at FBOs – together with 3,457 employees who work for Business Aviation operators in France, the total workforce that is directly employed in the French Business Aviation sector is 23,739. Business-Aviation employees collected € 1,444,070 in wages and salaries, the large majority (82%) of which came from manufacturing of business aircraft and components. The European aircraft and components manufacturing locations are to a large extent concentrated in France that has 18,843 employees (or 46% of all in Europe) in this segment.

Table 6: Summary of Economic Impacts for France

	Helicopter	Fixed Wing	Total
Fleet Size	331	597	928

	# of Employees	Output (1,000 €)	GVA (1,000 €)	Wages (1,000 €)
Direct Impact	17,196	7,796,109	1,715,244	1,175,522
Indirect Impact	57,677	13,604,751	4,664,416	3,888,861
Induced Impact	17,653	3,910,476	906,242	705,102
Total Impact	**92,526**	**25,311,336**	**7,135,161**	**5,769,485**

Time Savings:

The average time savings for the French region are shown in Figure 13. When traveling into France, Business Aviation travelers will almost always experience significant time savings, no matter where they are going in the country. Time savings around Paris are particularly prominent. The major commercial airport, Charles de Gaulle, is located further away (about 45 minutes) from the city center of Paris than for instance Le Bourget Airport (about 30 minutes), such that travel times to the airport can be lengthy. Further, Charles de Gaulle is a complex and congested airport, such that travel times are extended significantly. Business Aviation benefits from avoiding these lengthy surface travel times and airport delays, are reflected in the time savings seen in the heat map.

Main Airports and Players:

With 65 daily departures, Le Bourget Airport is by far the busiest Business Aviation airport in the country, followed by Nice (40 departures), Cannes Mandelieu (14 departures) and Bale Mulouse (10 departures). The significant share of France in the Manufacturer segment is driven by the representation of several large firms like Airbus Group, Bombardier, Daher, Dassault, Safran and Thales.

Germany

Economic Impacts:

Along with France and the UK, Germany is a key player in the European Business Aviation sector. With a 24.9% share of European Business Aviation-related employment, Germany is responsible for 27.0% of the industry's GVA and € 25,311,336 bn (25.8%) of its output. The country's 17,196 Business Aviation employees collected € 1,175,522 in (direct) wages and salaries. Aircraft operations and manufacturing of business aircraft and components are the primary drivers of Germany's Business Aviator sector wages and salaries. 6,251 employees work in Operations, 312 at FBOs and 8,296 in the manufacturing of Business Aviation aircraft or components.

20% percent of the estimated European employment with fixed-wing operators is in Germany. In terms of executive ground handling and the fixed-base operator segment in Europe, Germany has the highest share (17.3%). The country has a helicopter fleet size of 331, and 597 fixed-wing aircraft.

Table 7: Summary of Economic Impacts for Germany

	Helicopter	Fixed Wing	Total
Fleet Size	331	597	928

	# of Employees	Output (1,000 €)	GVA (1,000 €)	Wages (1,000 €)
Direct Impact	17,196	7,796,109	1,715,244	1,175,522
Indirect Impact	57,677	13,604,751	4,664,416	3,888,861
Induced Impact	17,653	3,910,476	906,242	705,102
Total Impact	**92,526**	**25,311,336**	**7,285,902**	**5,779,485**

Time Savings:

The average time savings for Germany are shown in Figure 14, and like France, Business Aviation is generally valuable across a multitude of regions in Germany, since significant time savings are common, regardless of where you travel to in the country. Time savings are present throughout German cities, due to a combination of busy commercial airports and remoteness of certain regions. Large time savings are seen on the country's periphery, such as the North Sea and Baltic Sea coasts. In particular, the island Norderney, one of the main tourist destinations along the German North Sea coastline, benefits tremendously from Business Aviation, as its only airport does not have commercial traffic. Business Aviation and General Aviation connect this island to the rest of the country and contribute to the significant economic impact that the 500,000 yearly visitors bring to the island every year.

Main Airports and Players:

While Stuttgart and Munich have the largest numbers of average daily Business Aviation movements in Germany (17 and 18 daily departures), the rest of the departures are relatively evenly spread throughout a range of other airports in the country.

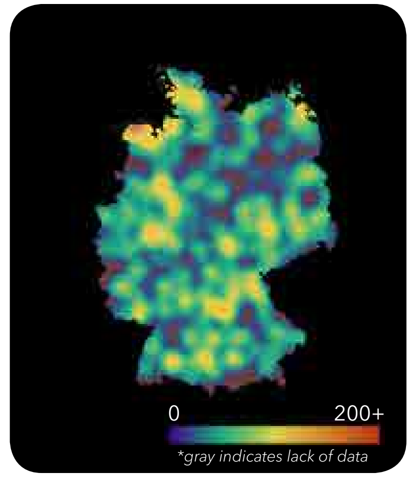


Figure 14: Heat map of Germany Average Time Savings by Business Flight and Region (in minutes). Significant time savings can be found at the North Sea Coast line and in more remote regions in the interior.

Since Germany has the biggest fixed-wing fleet in Europe, it is also leading employment numbers in terms of operators, MROs and FBOs. 89 Business Aviation operators are active in Germany and major companies, such as ThyssenKrupp, BMW or Deutsche Telekom, operate their own fleets.

The fact that Germany is the second biggest country in terms of employment in the manufacturing of Business Aviation aircraft and components, is due to the presence of companies such as Airbus Helicopters, MTU or Rolls Royce.

Italy

Economic Impacts:

Italy accounts for 7.5% of the Business Aviation GVA and € 8,190,430 bn (8.3%) of its total output. The 5,512 Business-Aviation employees collected € 280,452 in wages and salaries, this being split between aircraft operations (where 2,074 workers are employed) and manufacturing of business aircraft and components (2,729 employees). 87 employees work for FBOs and 622 for MROs. Finally, Italy plays a secondary role in Business Aviation-related employment for manufacturers in Europe (2,729 employees, or 7% of the European workforce in this segment).

The country's fleet consists of 230 helicopters and 119 fixed-wing aircraft.

Table 8: Summary of Economic Impacts for Italy

	Helicopter	Fixed Wing	Total
Fleet Size	230	119	349

	# of Employees	Output (1,000 €)	GVA (1,000 €)	Wages (1,000 €)
Direct Impact	5,512	1,814,848	298,794	280,452
Indirect Impact	18,473	4,919,362	1,434,559	1,234,947
Induced Impact	6,319	1,456,220	301,105	263,004
Total Impact	**30,304**	**8,190,430**	**2,034,458**	**1,778,403**

Time Savings:

The average time savings for Italy are shown in Figure 15. Larger time savings are seen along the coasts in more remote regions. Large time savings are also seen in the north of the country in the Italian Alps.

Main Airports and Players:

The main Business Aviation airport in Italy is Milano-Linate, with 27 average daily departures followed by Roma-Ciampino Airport with 22 daily departures and Olbia with 10.
Business Aviation Manufacturers, such as Piaggio or Agusta are key to the position the country has in producing aircraft and aircraft components, which amounts to 7% of this segment in Europe.

Sweden

Economic Impacts:

With a little over 1% share of European Business Aviation-related employment, Sweden is responsible for 1.6% of the industry's GVA (equal to that of the Czech Republic) and € 1,410,223 bn (1.4%) of its output. 924 Business-Aviation employees collected € 64,875 in (direct) wages and salaries. Aircraft operations is the primary driver of Sweden's Business Aviator sector, making up for 747 jobs. FBOs and MROs (9 and 168 employees respectively) are also relevant to operate a fleet of 66 helicopters and 54 fixed-wing aircraft.

The overall employment depending on Business Aviation (including indirect and induced effects) amounts to 4,181 people.

Table 9: Summary of Economic Impacts for Sweden

	Helicopter	Fixed Wing	Total
Fleet Size	66	54	120

	# of Employees	Output (1,000 €)	GVA (1,000 €)	Wages (1,000 €)
Direct Impact	924	470,599	101,918	64,865
Indirect Impact	2,676	780,091	280,858	223,670
Induced Impact	580	159,534	41,714	29,879
Total Impact	**4,181**	**1,410,224**	**424,491**	**318,414**

Time Savings:

The average time savings for Sweden is shown in Figure 16. While for many regions in the North no data exist, time savings can be seen throughout the country, showcasing the effectiveness of Business Aviation in connecting Sweden to the global aviation network. Where data exist, larger time savings can be seen in the more remote North.

Main Airports and Players:

Main Business Aviation airports in the country include Stockholm Arlanda Airport (the largest airport in Sweden and the third largest airport in the Nordic countries) as well as Stockholm Bromma.

Switzerland

Economic Impacts:

Although Switzerland accounts for only 8.2 million people (about 1.5% of Europe's population), it is a major player in European Business Aviation. It accounts for 4.8% of the Business Aviation GVA and € 3,746,706 bn (3.8%) of its total output. Its 6,442 Business-Aviation employees collected € 320,107 in (direct) wages and salaries, this being split between aircraft operations and maintenance, repair, and overhaul activities. 2,867 staff are employed in aircraft operations, 116 at FBOs, 1,650 at MROs and 1,800 at Swiss Manufacturers. The direct employment in the Business Aviation industry is the 4th highest in Europe and the total employment effects, including indirect and induced effects, amount to 17,301 jobs, the 5th highest value in Europe.

Switzerland operates a fleet of 194 helicopters and 246 fixed-wing aircraft.

Table 10: Summary of Economic Impacts for Switzerland

	Helicopter	Fixed Wing	Total
Fleet Size	194	246	440

	# of Employees	Output (1000 €)	GVA (1000 €)	Wages (1000 €)
Direct Impact	6,442	1,585,924	445,728	320,107
Indirect Impact	7,670	1,601,179	668,073	469,770
Induced Impact	3,189	559,603	176,601	120,664
Total Impact	**17,301**	**3,746,706**	**1,290,402**	**910,541**

Time Savings:

When discussing time savings in Switzerland, the reasons for the prominent role of Business Aviation in the country become obvious: As shown in Figure 17, large time savings are seen throughout the interior of the country. These are regions in the Alps that require train travel to Zurich, Basel, or Geneva when traveling on commercial aircraft. Business Aviation may utilize smaller airfields in the Alps, reflected in the larger time savings in these regions. In particular, Sion Airport in Valais (gateway to important ski resorts, such as Zermatt, Verbier, Crans-Montana, Saas-Fee) and Samedan Airport in Grisons (gateway to the St. Moritz ski area) both provide significant travel time savings, especially for winter tourism, which contributes to the significant role this sector plays for the local economies (25-30% of regional GDP).

Main Airports and Players:

Geneve Contrin is the largest Business Aviation airport in the country with 46 departures per day. Zurich is the largest international airport in Switzerland and second-largest Business Aviation Airport, serving 29 average daily departures. The third most important airport is Basel with 10 average departures.

The aircraft manufacturer Pilatus is a key provider of secure jobs in the country and a major player in the Business Aviation industry around the world.

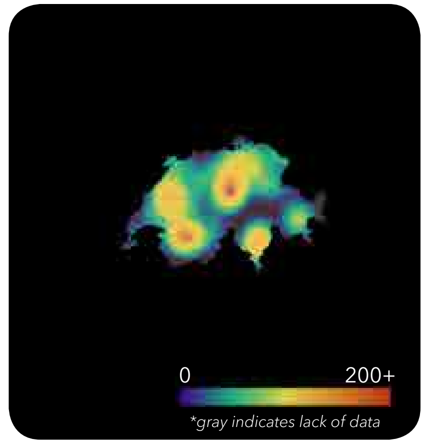


Figure 17: Heat map of Switzerland Average Time Savings by Business Flight and Region (in minutes). Cantons like Valais and Grisons experience high time savings.

United Kingdom

Economic Impacts:

Along with France and Germany, the UK plays a dominant role in the European Business Aviation sector. The UK accounts for 9.9% of the Business Aviation GVA and € 8,074,831 bn (8.2%) of its total output. Its 13,827 Business-Aviation employees collected € 1,005,642 in (direct) wages and salaries, much (61%) of which came from aircraft operations, where 5,952 people are employed. 221 work for FBOs, 1,431 for MROs and 6,223 for Aircraft Manufacturers, where the UK provides 15% of the European workforce. Given the country's geography and the dominance of the Oil & Gas sector, the country has the biggest helicopter fleet in Europe (480 or 19% of European fleet) and it has the second-biggest fixed-wing fleet with 460 aircraft.

Table 11: Summary of Economic Impacts for the United Kingdom

	Helicopter	Fixed Wing	Total
Fleet Size	480	460	940

	# of Employees	Output (1,000 €)	GVA (1,000 €)	Wages (1,000 €)
Direct Impact	13,827	2,938,809	1,109,395	1,005,642
Indirect Impact	14,081	3,884,507	1,256,207	967,424
Induced Impact	7,178	1,251,515	315,279	264,690
Total Impacts	**35,087**	**8,074,831**	**2,680,882**	**2,237,756**

Time Savings:

Figure 18 shows an average time savings heat map for the United Kingdom. The time savings around London are expected, but it is interesting to note the larger savings North and South of the city center, away from the major airports. Additionally, large savings are observed in Wales and in South West England, regions far from the major airports, highlighting the limited connectivity these regions have to the global aviation network.

Main Airports and Players:

London-Luton is the most important Business Aviation Airport in the UK, accounting for 35 average daily departures. Farnborough with 28 daily departures comes second and Biggin Hill with 15 departures third.

16% percent of European employees involved in manufacturing of business aircraft and components are in the UK. Major companies in this field include Rolls Royce and Bombardier.

›› CONCLUSION

The benefits of the Business Aviation sector in Europe are manifold and can broadly be grouped into economic benefits, increases in business efficiency and an increased connectivity. This study discusses and quantifies many of these benefits, many of which had not been quantified previously.

The assessment of the economic impacts of Business Aviation on the industry in Europe demonstrated that over 370,000 jobs in Europe are either directly or indirectly dependent on the Business Aviation sector. These jobs represent compensations of over € 21 bn and create an industry output of almost € 100 bn and GVA of € 27 bn. These impacts are distributed across the entire European continent and benefit large as well as smaller countries alike.

For the first time, this study was able to quantify and monetize the economic impacts from Business Aviation-related time savings. This analysis was based on a novel data science approach that mined over 800,000 flights and compared each individual flight against the next available and shortest commercial connection. The results indicate that in 2014, more than 60 million minutes of flight time or 115 years were saved, which, using an average occupation rate of 4.7 passengers per flight, equates to over 285 million saved minutes and over 539 person-years of highly qualified and paid staff. Almost 20% of all Business Aviation flights are at least 5 hours faster than the fastest commercial alternative, which highlights the significant benefits that Business Aviation has to offer to European companies.

- *370,000 jobs in Europe are either directly or indirectly dependent on the Business Aviation sector*
- *More than 60 million minutes of flight time or ~ 115 years were saved*
- *20% of all Business Aviation flights are at least 5 hours faster than the fastest commercial alternative*

Business Aviation can provide unmatched connectivity via direct flights to remote and rural regions that do not have a significant share of commercial traffic. Analysis showed that Europe's periphery significantly benefits from Business Aviation. Also, within countries, remote regions tend to show the highest time savings from Business Aviation.

Anecdotal evidence was collected in the form of case studies that demonstrate the benefits the sector creates by providing safe and secure ways to travel. Firms benefit by being able to decentralize their operations and open plants in remote areas that offer secrecy needed to perform their businesses. With Business Aviation bringing jobs and infrastructure to remote areas, communities benefit from the increased economic investment and development. Air ambulance use in rural areas also tremendously benefits communities.

These case studies and the estimated numbers demonstrate the significant role the European Business Aviation sector provides to European corporations, the general economy and for the continent's residents. Promoting and enabling these Business Aviation services provides the basis for efficiency gains by corporations, spurs economic growth and connects remote regions.

›› APPENDIX A: SUMMARY OF RELATED STUDIES

More detailed information from reviewed sources is available in the tables in this section.

Business aviation in today's economy: A shareholder value perspective.
Andersen. Michael J Dyment and Rodney J. Bosco. 2001.

Description

In this study, Andersen conducted a review of the benefits of Business Aviation by completing a macroscopic analysis comparing companies that do use Business Aviation ("operators") against those who do not ("non-operators"). Andersen examined financial data of S&P 500 and S&P 600 companies and compared key financial metrics of operators against non-operators.

Methodology

- Andersen gathered economic data from 1992 – 1999
- In order to isolate the effect of business aviation, Andersen attempted to control for industry, company size, company performance, and other metrics. This was done by classifying companies by industry, examining percentage changes and ratios, and averaging over all companies within an industry
- Andersen examined a range of financial performance metrics for three peer groups: (1) S&P 500 operators vs. non-operators, (2) companies that became operators during the study period, and (3) S&P 600 operators vs. non-operators. Benefits were quantified for each group
- Industries not operating business jets or operating too few were excluded from the analysis
- To supplement quantitative financial benefit findings, Andersen interviewed CFOs to capture some qualitative benefits

Findings

- Andersen reported its results by peer group. For operators vs. non-operators, Andersen examined 335 companies from 24 industries within the S&P 500:
    + Operators earned 146% more in cumulative returns than non-operators did over the study period
    + Sales and earnings were nearly double for operators vs. non-operators
    + EBIT growth was more than double for operators vs. non-operators
    + Asset efficiency (defines as the ratio of sales to assets) declined by 5% for operators but for 15% for non-operators

- For new operators vs. non-operators, Andersen compared financial performance in the 4 years before a company became a business aviation operator with the 4 years following:
  + On average, operators outperformed non-operators (with 348% total returns to 252% total returns)
  + New operators returned 343% to shareholders vs. 177% before they became operators
  + Sales for new operators were similar before and after, but new operators increased their net income by three times as much as before they were operators
- Andersen reports that most business jet operators are not within the S&P 500 and expanded its analysis to S&P 600 operators vs. non-operators
  + However, non-operators had larger sales. Andersen believes the unique nature of S&P 500 companies explains this discrepancy
- Andersen concluded that Business Aviation can make a substantial difference in how a company performs its mission, in many cases generating significant gains in the drivers of shareholder value

Business aviation in today's economy: A guide to the analysis of business aircraft use, benefits and effects on shareholder value. Andersen. J Michael Stepp, Jr. and David M. Behrmann. 2001

Description

In this study, Andersen introduced an analytical framework for linking the use of Business Aviation to value drivers: "Utilization yields Benefits that yield Shareholder Value" (UBV)

Methodology

- Andersen determined which Business Aviation benefits are quantifiable vs. qualitative
- Andersen discussed how to obtain costs for operating aircraft and explored the effect costs have
- Andersen analyzed quantifiable benefits and examined non-quantifiable benefits, noting that they often concerned employee or customer satisfaction
- Andersen interviewed CFOs to understand benefits of Business Aviation, noting that executives do not typically quantify a reason to use business aviation
- In order to obtain a value for employee time savings, Andersen outlined an approach of estimating the difference between commercial flying and Business Aviation and then taking into account the time cost of an employee to the company

Findings

- Andersen reported that 75% of S&P 500 companies own business aircraft and that some companies have very sophisticated flight operation practices, including safety, training, maintenance, and equipment
- From its interviews, Andersen reported that Business Aviation can stimulate 5 value drivers: revenue growth, profit growth, asset efficiency, employee satisfaction, and customer satisfaction
- As a key finding, Andersen reported that the largest benefit of Business Aviation was the face-to-face contact communication of executives

Business Aviation: An Enterprise Value Perspective (The S&P 500 from 2003-2010), Part I. NEXA Advisors, LLC. 2009.

Description

This study provided an update to Andersen's 2001 study on the benefits of Business Aviation and compared Business Aviation users against non-users. The study used Andersen's UBV (Utilization that yields Benefits that yields Value) framework.

Methodology

- NEXA's study used Andersen's UBV framework to link the use of business aircraft to drivers of company value in the United States. This work updated the previous study period ending 1999
- NEXA examined S&P 500 data and analyzed company revenue growth, profit growth, and asset efficiency for 2003 – 2007, tying business aircraft use to these value drivers
- NEXA supplemented its analysis of S&P 500 with in-depth interviews of CFOs, who tend to be most skeptical of Business Aviation use

Findings

- As with Andersen's 2001 study, NEXA found that Business Aviation users outperformed non-users in key financial metrics in the period between 2003 and 2007:
    + Average revenue growth on a market cap-weighted basis was 116% higher for users than for non-users
    + Average weighted annual earnings growth was 434% higher for users
- NEXA also reported on non-financial qualitative aspects of Business Aviation:
    + Among several best-of lists, such as Business Week's "50 Most Innovative Companies" and Fortune's "100 Best Places to Work," 95% and 86% of the S&P 500 companies on the list were users, respectively
    + NEXA reports that CFO opinions are also very positive towards Business Aviation, in line with NEXA's quantitative findings

Business Aviation: An Enterprise Value Perspective (S&P Smallcap 600 Companies from 2005-2010) – Small and Medium Enterprises, Part II. NEXA Advisors, LLC. 2010.

Description

This study aimed to learn whether the use of business aircraft was beneficial to small and medium-sized enterprises (SME) as determined by shareholder and enterprise value. The analysis revealed that the use of business aircraft provided an important competitive benefit, and the companies who utilize business aircraft outperform those that do not.

Methodology

- NEXA's study utilized a methodology pioneered in similar study in 1993 and the UBV framework developed by Andersen in 2001 – attempting to quantify benefits that lead to shareholder value. Company growth was measured with a compound annual growth rate (CAGR)
- NEXA defined small and medium-sized enterprises (SMEs) as "Small Cap" publicly-traded and private companies and used the S&P SmallCap 600 as a proxy for US SMEs
- Examined peer groups of companies by their use/nonuse of business aircraft
- NEXA supplemented its analysis of the S&P 600 with in-depth interviews and company surveys

Findings

- NEXA reported three primary findings:
  - + Business Aviation users demonstrated better financial performance than non-users
  - + The impact of the recession was reduced for Business Aviation users; 69% of SMEs using business aircraft showed greater top line growth in 2008 and 2009
  - + Business Aviation allowed for greater access to customers and markets which led to improved customer retention and new revenue sources

Government Use of Aircraft: A Taxpayer Value Perspective (Business Aviation User Studies), Part III. NEXA Advisors, LLC. 2012.

Description

This study traced the relationship between government use of aircraft and taxpayer value. It built upon the Utilization, Benefit, Value methodology to create the "Utilization yields Benefits which drive Taxpayer Value" (UBTV) approach. The analysis demonstrates the government use of aircraft at the federal, state, and local levels provides significant financial and non-financial value to taxpayers.

Methodology

- NEXA's study extended the UBV framework to link the use of business aircraft to drivers of taxpayer value in the United States, tying benefits to enablers, value levers, and the key taxpayer value drivers. This work updated the previous study period ending 1999
- NEXA used JETNET data spanning 2007 – 2011 to obtain data on the aircraft operated by government agencies
- NEXA supplemented its analysis of JETNET with in-depth interviews and surveys of government officials

Findings

- More than 2000 aircraft are in use in government operations and provide taxpayer value by providing cost-effective transportation of civil servants
- NEXA found that business jets provide taxpayer value by providing public safety and security, providing more effective government, protecting public health and welfare, facilitating economic growth, improving tax dollar efficiency, promoting good government relations, and improving compliance
- In summary, NEXA concluded that there is a visible, positive correlation between government use of aircraft and taxpayer value – 38 governors have issued proclamations in support of Business Aviation

Business Aviation: Maintaining Shareholder Value through Turbulent Times (The S&P 500 During the Great Recession 2007 - 2012), Part IV. NEXA Advisors, LLC. 2012.

Description

This study uses UBV methodology to determine the potential impact of companies' use of business aircraft during difficult economic conditions. It offers financial and non-financial evidence to prove that business aircraft use is a powerful asset that can significantly enhance a company's resiliency during economic downturns.

Methodology

- NEXA's study continued its 2009 analysis of the value of Business Aviation of S&P 500 firms: this study covered the time period 2007 – 2012, a recession period in the United States
- As in previous studies, NEXA organized the S&P 500 into users and non-users of business aircraft and examined financial data and its links to shareholder and enterprise value
- NEXA used JETNET data spanning 2007 – 2011 to obtain data on the aircraft operated by companies

Findings

- As in previous studies, NEXA discovered that companies that used Business Aviation outperformed their competitors in both financial and non-financial metrics. For example, companies who used Business Aviation grew at more than three times the pace of companies who did not
- In particular, companies using Business Aviation mitigated revenue losses and recovered from the recession more quickly that non-users did
- NEXA found that a significant number of companies dropped from the S&P 500 from 2007 – 2011 were non-users of Business Aviation

Business Aviation: And the World's Top Performing Companies, Part V.
NEXA Advisors, LLC. 2013.

Description

This report extends NEXA's business aviation value studies to the rest of the world: it demonstrates that the beneficial effects on shareholder value that business aircraft use has in the United States is reflected similarly on the global stage. Using UBV methodology and a "Best of the Best" analysis, it shows that companies around the world correlate business aircraft usage with high business performance.

Methodology

- NEXA's study extended its analysis US Business Aviation to the global stage
- NEXA used JETNET data and journalistic and independent sources to assess the impact of Business Aviation in different countries
- NEXA supplemented its data with interviews with executives of leading global companies

Findings

- In line with its studies in the United States, NEXA confirmed that global users of Business Aviation stood out from their peers
- For example, among "Global 2000" and "Global 500" companies - compilations of leading companies produced by Forbes – 88% of the top 50 were Business Aviation users.

  For some industries, the user rates were even higher: 100% of oil and gas and 100% of aerospace and defense sectors were Business Aviation users

The Role of Business Aviation in the European Economy. Oxford Economics. October 2012

Description

In this report, Oxford assessed the impact of Business Aviation on the European economy. Oxford examined the relationship between Business Aviation and commercial aviation. In particular, Oxford noted that Business Aviation is a "thinly connected" operation (low volume with a large number of destinations), while commercial aviation is "thickly connected" (high volume centered around major hubs). Oxford then evaluated the impacts of Business Aviation on local economies, focusing on expertise, skill, and investment.

Methodology

- Oxford conducted interviews with key stakeholders within Business Aviation and conducted a review of Business Aviation literature
- Oxford analyzed a Business Aviation data set of 110 routes and 3400 flights and conducted a statistical analysis to estimate the value that Business Aviation users place on time savings

Findings

- Oxford's analysis found that 96% of city pairs served by Business Aviation has no daily scheduled direct commercial service. The remaining routes represent more than one third of total Business Aviation traffic. As expected, Business Aviation allows much more flexibility over scheduled commercial service
- Oxford found that a typical Business Aviation user values Business Aviation between 8 and 15 times higher than scheduled commercial flying
- Finally, Oxford found that Business Aviation accounts for approximately 9% of revenues from business-related trips as compared to its 7% share of flights (noting that Business Aviation flights carry few passengers)

The Real World of Business Aviation: A Survey of Companies Using General Aviation Aircraft. Harris Interactive, Inc. David Krane, Kalyan Orkis. 2009.

Description

This report aimed to better understand who flies on business aircraft, passengers' use of time and productivity levels while aboard, fleet characteristics, destinations, reasons for using business aircraft, and the frequency with which it is used. Harris Interactive interviewed both pilots and passengers of business aircraft to provide insight into the realities of the Business Aviation industry.

Methodology

- Phase 1 (June 1-16, 2009): interviews conducted online with 305 Chief Pilots, Pilots, Flight Department Managers, and Directors of Flight Operations or Aviation from U.S. companies, universities, and government agencies
- Number of aircraft per company and size of aircraft were weighted to align figures with actual proportions in business aircraft population (proportions from JETNET)
- Phase 2 (June 12-October 6, 2009): pilots distributed paper survey and URL link to survey online to 15 passengers on upcoming flights. Data were not weighted. 289 respondents

Findings

- This study updated a similar 1997 study; 2009 findings remained consistent with 1997 findings
- 59% of companies that operate business aircraft have fewer than 500 employees. 7 in 10 have fewer than 1000 employees
- 50% of passengers are managers; 20% technical, sales, or service staff; 22% top management
- Passenger count per company who flew on business aircraft averaged 327
- 36% of passengers' time aboard is spent in meetings and 30% is spent on individual work tasks. Passengers estimated they were 20% more productive on business aircraft than in the office, and 40% less productive on commercial flights
- 75% of companies operate one single aircraft
- 33% of business aircraft flights go to secondary airports and 47% to airports with infrequent or no scheduled airline service. 19% of flights are into commercial airports

The economic impact of business aviation in Europe. PriceWaterhouseCoopers. 2008

Description

PWC assessed the economic impact of Business Aviation in Europe in 2007 by conducting interviews with over 40 representatives of the industry and examining a wide array of Business Aviation data. PWC was able to provide quantified estimates of the value of Business Aviation in Europe.

Methodology

- Between May and November 2008, PWC conducted interviews with companies accounting for 45% of the economic activity of the Business Aviation sector in Europe
- PWC used data from several industry databases: JetNet, Eurocontrol, ProdCom, as well as reports from 70 companies in the aviation space
- To assess the economic impact of business aviation, PWC tabulated the monetary worth of the production generated by Business Aviation, the total wages and salaries linked to Business Aviation, and the total number of jobs that are supported by Business Aviation

Findings

- Business Aviation in Europe contributed approximately € 19.7 bn in annual gross value added (GVA) to the economy in 2007 – approximately 0.2% of total GDP of the European Union, Norway, and Switzerland
- Business Aviation accounted for over 164 000 jobs in Europe and generated wages and salaries of approximately € 5.7 bn
- France, Germany, and the United Kingdom were more impacted by Business Aviation with a total impact of € 12.6 bn

Business aviation in Germany: An empirical and model-based analysis.
Peter Berster, Marc C. Gelhausen, Diter Wilken. 2011

Description

Berster et al. examined Business Aviation in Germany and investigated the possibility of secondary "satellite" airports accepting more Business Aviation traffic to relieve highly constrained primary international airports, such as Frankfurt, Munich, and Dusseldorf. They examined empirical data and constructed a discrete choice model to evaluate what attributes are important in encouraging business aviation users to select satellite airports.

Methodology

- Berster et al. examined German Statistisches Bundesamt data from 1995 – 2007 and constructed a discrete choice model to examine what choices are at play when Business Aviation users select airports
- The study involved a consideration of travel time to airports using commercial routing software and regional statistics. Users were assumed to use cars as public transportation is less likely to be used by high-value executives who are likely to use Business Aviation services

Findings

- As major airports become more constrained and slot controlled, Business Aviation landing rights are reduced and become more unpredictable
- The study found a relationship between runway length and small airport market share for Business Aviation: airport short runways are not equipped to attract business jets and runways of intermediate length can only accept some types of business aircraft
- Distance to the satellite airport was a strong factor in determining the utility of the airport for Business Aviation users: If the satellite airport is 21 minutes further away than the main airport, its market share falls to approximately 10%
- Berster et al. concluded the study by remarking that focusing on Business Aviation may be an effective business model for smaller airports that have surplus capacity or may easily have runway lengths extended

Unintended trajectories: liberalization and the geographies of private business flight. Lucy Budd and Brian Graham. Journal of Transport Geography, vol. 17, 2009.

Description

In this study, Budd and Graham explored the relationship between air transportation liberalization and the growth of private Business Aviation. The authors argue that liberalization has created innovative market opportunities for private Business Aviation and illustrate how the sector's operating models are facilitating new forms of aerial mobility

Methodology

- Budd and Graham report on findings from the literature relating to a variety of factors in Business Aviation, including
  + advantages of private aviation over scheduled services
  + "timeshares in the sky" – a discussion of fractional ownership of business jets
  + impacts of new innovations and technologies, especially Very Light Jets
  + spatialities of Business Aviation in Europe

Findings

- Budd and Graham explain that the liberalization and growth of Business Aviation has created increasing fragmentation within aviation and has not been successful in increasing competition in the global airline industry as legislators would have hoped: instead, increasing numbers of affluent travelers are simply bypassing congested routes and cities through the use of business Aviation
- Instead, as "hassle" continues to grow in commercial aviation, new operators are seeking to reclaim some of the glamour of air transportation and an increasing number of operators have been introduced as new lifestyle solution for the super-rich: Business Aviation is also becoming private jet leisure aviation

Economic Impact of Business Aviation in Canada. InterVISTAS. 2014.

Description

This study examined the economic contribution of Business Aviation in Canada, including quantitative financial and qualitative quality of life benefits for users. InterVISTAS determined the total economic impact by summing the direct, indirect, and induced impacts of Business Aviation.

Methodology

- InterVISTAS used JETNET to obtain data on the number of business aircraft operated in Canada
- For the direct impact of Business Aviation, InterVISTAS conducted surveys and interviews to quantify the person years of employment each Business Aviation aircraft was responsible for
- InterVISTAS estimated induced employment impact as well as economic output and GDP by using national employment impact multipliers from Statistics Canada

Findings

- There are approximately 1900 business aviation aircraft in Canada out of approximately 36 000 total aircraft
- InterVISTAS uncovered direct annual economic impacts of $800 million in wages, $ 1.3 bn in GDP, and $ 3.1 billion in economic output
- In total, Business Aviation contributed $ 5.4 bn worth of annual economic impact in Canada and had annual tax impacts of $ 470 million to the federal government, $170 million to provincial/territorial governments, and $ 13 million to municipal governments

General Aviation's Contribution to the U.S. Economy, MergeGlobal, Inc., W. Bruce Allen, David L. Blond, Aaron J Gellman. 2006.

Description

This study, commissioned by the General Aviation Manufacturers Association (GAMA), examined the economic contribution of general aviation in the United States. General aviation includes Business Aviation, and so this study may be used to provide an additional perspective into the value of Business Aviation. MergeGlobal used a variety of data sources and conducted an input output study to quantify the value of general aviation.

Methodology

- MergeGlobal utilized an input-output model and tracked direct and indirect economic impacts of general aviation and then used a proprietary pre-multiplier to take into account the value of different products within an aircraft
- MergeGlobal used a variety of data sources in the study: the number and value of aircraft sales from GAM, the number of active aircraft from the FAA, and variable and maintenance costs from Conklin & deDecker
- The value of time savings was not included in MergeGlobal's study

Findings

- General aviation contributed a total of $ 150.3 bn in output and $ 53.2 bn in wages to the US economy in 2005
- California, Texas, and New York had the highest total economic contributions of general aviation, while Kansas, Georgia, and Washington DC had the largest contribution by capita

I. Direct Economic Contribution of the European Business Aviation Sector

As the Business Aviation industry is comprised of virtually thousands of relatively small stakeholders along the value chain (such as aircraft operators, Fixed-Base Operators (FBOs), Maintenance, Repair and Overhaul (MRO) firms, manufacturers), most of them with only limited reporting requirements, no single source of data reveals aggregate economic figures for "our" four indicators of economic activity, i.e., employment, output, wages and salaries, or gross value added (GVA). What is more, the different groups of stakeholders along the value chain differ with regard to their production and output. Hence, different methodological paths have been taken in order to estimate the corresponding direct effects in these subsectors.

1. Direct employment of the sector

Aircraft Operators

A "fleet-based approach" is applied to estimate the direct effects of the business aircraft operators based in Europe (Figure B-1).

Sources: Results of analysis based on JP Airline Fleets 2010, Ascend 2010, Eurostat, and WIOD databases.

Figure B-1: Approach to estimate the direct impact of business aircraft operators

Starting point are employment figures reported in the 2010 edition of the (meanwhile discontinued) fleet yearbook "JP Airlines Fleets" which have been used to estimate the average workforce-per-aircraft indicators for fixed-wing aircraft and helicopters operated in the Business Aviation sector (Table B-1).

Table B-1: Workforce-per-aircraft estimates for fixed-wing and rotorcraft Business Aviation operators (2010)

(1)	(2)	(3)	(4)	(5)	(6)
Aircraft Category	EU28+EFTA Business Aircraft Fleet Size (Ascend, 2010)	EU28+EFTA Business Aircraft Fleet Size (Ascend, 2010) of operators with published employment figure in JP Airline Fleets 2010	EU28+EFTA Share of aircraft represented by operators with published employment figure in JP Airline Fleets 2010	EU28+EFTA Employment totals in JP Airline Fleets 2010	Employees per aircraft estimate (5)/(3)
Fixed-wing	3,080	1,418	46.0%	10,878	7.67
Rotorcraft	2,624	1,449	55.2%	7,322	5.05

Source: Results of analysis based on JP Airline Fleets 2009/2010 and Ascend 2010 data.

Assuming these indicators remain stable, they may be applied to the current (as of 31 December 2014) fleet of European-based business aircraft (fixed-wing aircraft and helicopters) as reported by the Ascend database, to gather estimations for the 2014 workforce of the sector.

Helicopter Operators

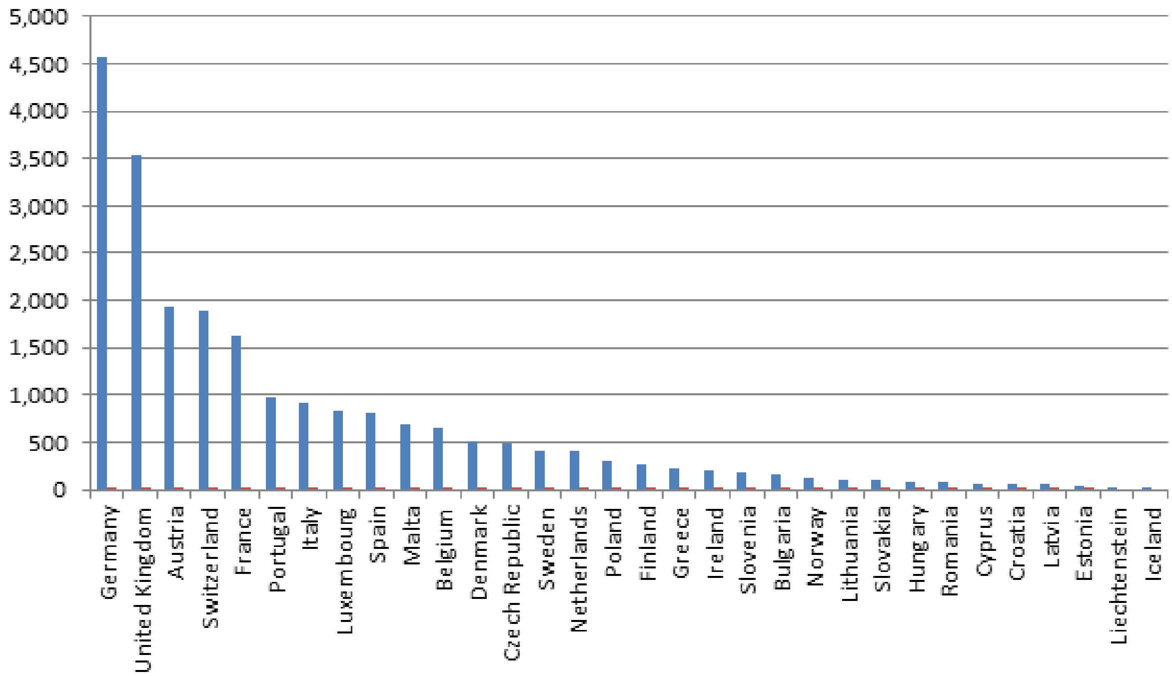
As of 31 December 2014, 2,572 helicopters with 1,334 European operators in the Business Aviation sector (Ascend-categories "Business - Private Company Use"; "Business/Corporate/Executive," "Passenger," "Medevac/Air Ambulance/EMS/Airborne Hospital") were in use. This leads to a total estimate of 12,989 (= 2,572 * 5.05) employees with helicopter operators. Table B-2 and Figure B-2 show their distribution across Europe.

Table B-2: Employment estimates for helicopter operators in Europe (31/12/2014)

Country	Region	Fleet Size	Employee Estimates	Share	Remark
Austria	EU28	72	364	3%	
Belgium	EU28	112	566	4%	
Bulgaria	EU28	15	76	1%	
Croatia	EU28	4	20	0%	
Cyprus	EU28	7	35	0%	

Country	Region	Fleet Size	Employee Estimates	Share	Remark
Czech Republic	EU28	53	268	2%	
Denmark	EU28	49	247	2%	
Estonia	EU28	7	35	0%	
Finland	EU28	18	91	1%	
France	EU28	364	1,838	14%	incl. Monaco
Germany	EU28	331	1,672	13%	
Greece	EU28	40	202	2%	
Hungary	EU28	25	126	1%	
Iceland	EFTA	6	30	0%	
Ireland	EU28	25	126	1%	
Italy	EU28	230	1,162	9%	incl. San Marino
Latvia	EU28	9	45	0%	
Liechtenstein	EFTA	3	15	0%	
Lithuania	EU28	5	25	0%	
Luxembourg	EU28	14	71	1%	
Malta	EU28	2	10	0%	
Netherlands	EU28	26	131	1%	
Norway	EFTA	123	621	5%	
Poland	EU28	121	611	5%	
Portugal	EU28	11	56	0%	
Romania	EU28	21	106	1%	
Slovakia	EU28	24	121	1%	
Slovenia	EU28	5	25	0%	
Spain	EU28	110	556	4%	
Sweden	EU28	66	333	3%	
Switzerland	EFTA	194	980	8%	
United King-dom	EU28	480	2,424	19%	(Incl. Isle of Man and Gibraltar)
Total EU28	EU28	2,246	11,342	87%	
Total EFTA	EFTA	326	1,646	13%	
EU28+EFTA	ALL	2,572	12,989	100%	

Source: Results of analysis based on Ascend 2014 and JP Airline Fleets 2009/2010 data.



Source: Results of analysis based on Ascend 2014 and JP Airline Fleets 2009/2010 data.

Figure B-3: Distribution of employment with fixed-wing operators over Europe

About 20% of the estimated employment with fixed-wing operators in the region considered as Europe is based in Germany (4,579 people), followed by the UK (16%), Austria (9%), Switzerland (8%), France (7%), and Portugal, Italy Luxembourg, Spain (4% each).

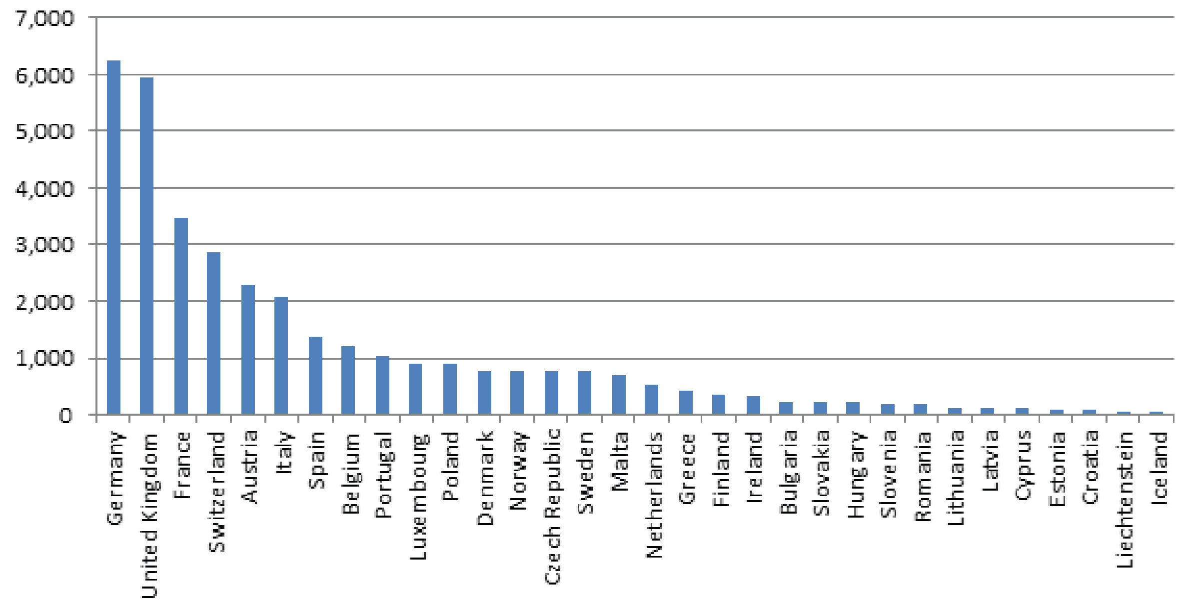
Adding helicopter and fixed-wing operators yields a total 35,362 jobs with business aircraft operators in Europe operating a fleet of 5,489 aircraft. The EU28/EFTA shares are 90%/10% respectively. The highest employment can be observed for Germany (18%), followed by the UK (17%) and France (10%) (Table B-4 and Figure B-4).

Table B-3: Employment estimates for fixed-wing operators in Europe

Country	Region	Fleet Size	Employee Estimates	Share	Remark
Austria	EU28	252	1,933	9%	
Belgium	EU28	85	652	3%	
Bulgaria	EU28	21	161	1%	
Croatia	EU28	8	61	0%	
Cyprus	EU28	9	69	0%	
Czech Republic	EU28	63	483	2%	

Country	Region	Fleet Size	Employee Estimates	Share	Remark
Denmark	EU28	67	514	2%	
Estonia	EU28	7	54	0%	
Finland	EU28	34	261	1%	
France	EU28	211	1,618	7%	Incl. Monaco
Germany	EU28	597	4,579	20%	
Greece	EU28	29	222	1%	
Hungary	EU28	12	92	0%	
Iceland	EFTA	1	8	0%	
Ireland	EU28	26	199	1%	
Italy	EU28	119	913	4%	Incl. San Marino
Latvia	EU28	8	61	0%	
Liechtenstein	EFTA	3	23	0%	
Lithuania	EU28	14	107	0%	
Luxembourg	EU28	110	844	4%	
Malta	EU28	91	698	3%	
Netherlands	EU28	53	407	2%	
Norway	EFTA	17	130	1%	
Poland	EU28	39	299	1%	
Portugal	EU28	127	974	4%	
Romania	EU28	12	92	0%	
Slovakia	EU28	13	100	0%	
Slovenia	EU28	23	176	1%	
Spain	EU28	106	813	4%	
Sweden	EU28	54	414	2%	
Switzerland	EFTA	246	1,887	8%	
United Kingdom	EU28	460	3,528	16%	Incl. Isle of Man and Gibraltar
Total EU28	EU28	2,650	20,326	91%	
Total EFTA	EFTA	268	2,048	9%	
EU28+EFTA	ALL	2,917	22,373	100%	

Source: Results of analysis based on Ascend 2014 and JP Airline Fleets 2009/2010 data.



Source: Results of analysis based on Ascend 2014 and JP Airline Fleets 2009/2010 data.

Figure B-4: Distribution of employment with business aircraft operators (fixed-wing and helicopters) over Europe

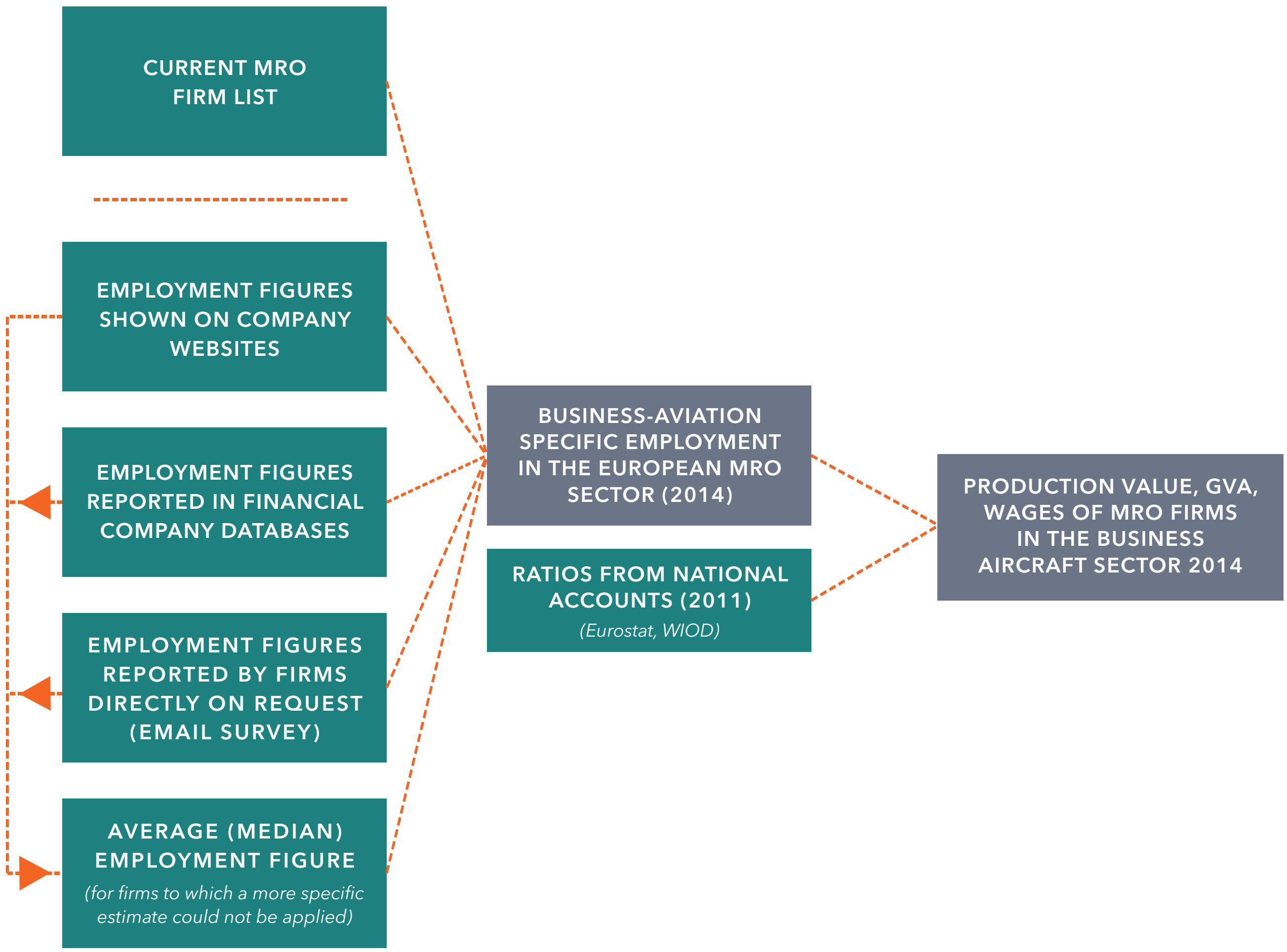
2. Maintenance, Repair and Overhaul of Business Aircraft (MRO)

Although MRO is an important segment of the Business Aviation industry in Europe, hardly any employment data is publicly available. In addition, many aircraft operators provide MRO services, both to themselves and to third parties, but do not report employment figures by area of activity, making the share of MRO employees difficult to assess.

The number of employees with European MRO firms specialized in Business Aviation (Figure B-5) may be estimated as follows:

- Identification of MRO service providers by country using the database available on the 'Handbook of Business Aviation' website (http://www.handbook.aero/hb_maintenance.html). The analysis only considered firms that, according to their websites, provide MRO services for typical Business Aviation aircraft and helicopters. Firms focusing on light aircraft or on large passenger jets have not, or only partly, been taken into account.
- Estimation of each firm's employment figure using the following sources (in descending priority):
  + 1st priority: official employment figure presented on the firm's website or provided by the firm upon request by e-mail (the Annex shows a sample query)

+ 2nd priority: employment figure available from financial company databases such as Hoovers, Bloomberg, or from sources such as LinkedIn. If employment figures were provided in the form of a range (e.g., 10-20 employees), the analysis has taken into account the lower end value (conservative approach)
+ 3rd priority: median of all firm-specific estimates



Source: Results of analysis.

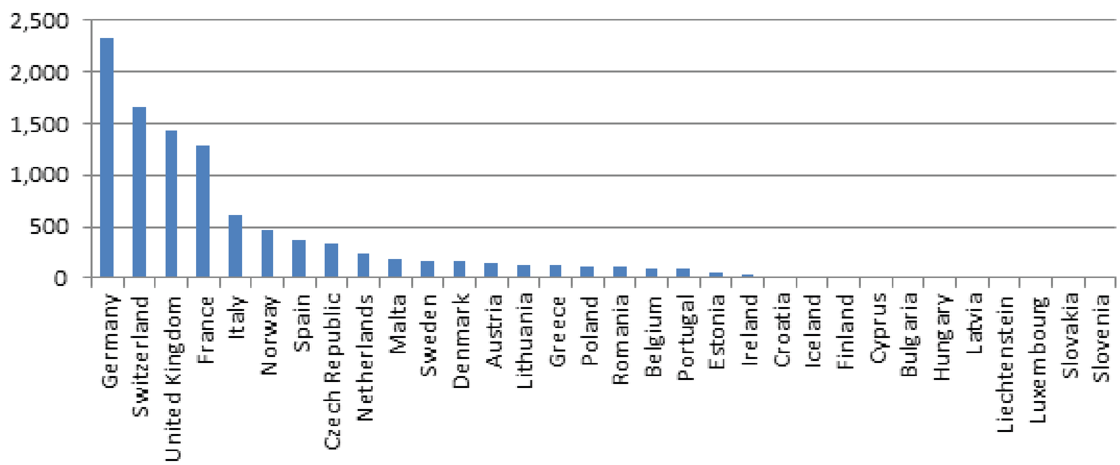
Figure B-5: Approach to estimate the direct impact of MRO companies in the business aircraft sector

To avoid double-counting, the analysis did not consider business aircraft operators with integrated MRO facilities. Total employment for such companies is assumed to be included in the employment estimation on the aircraft operator level. Also, strictly speaking, some of the data compiled from the above-mentioned sources is from 2015 and not from 2014. However, 2015 data was regarded as also valid for 2014. The resulting figures are shown in Table B-5 and Figure B-6.

Table B-5: Business aviation-specific employment estimates for MRO firms in Europe

Country	Region	MRO	Share
Austria	EU28	152	1%
Belgium	EU28	96	1%
Bulgaria	EU28	0	0%
Croatia	EU28	13	0%
Cyprus	EU28	3	0%
Czech Republic	EU28	340	3%
Denmark	EU28	167	2%
Estonia	EU28	51	1%
Finland	EU28	9	0%
France	EU28	1,286	13%
Germany	EU28	2,337	23%
Greece	EU28	120	1%
Hungary	EU28	0	0%
Iceland	EFTA	11	0%
Ireland	EU28	40	0%
Italy	EU28	622	6%
Latvia	EU28	0	0%
Liechtenstein	EFTA	0	0%
Lithuania	EU28	122	1%
Luxembourg	EU28	0	0%
Malta	EU28	188	2%
Netherlands	EU28	234	2%
Norway	EFTA	465	5%
Poland	EU28	116	1%
Portugal	EU28	90	1%
Romania	EU28	105	1%
Slovakia	EU28	0	0%
Slovenia	EU28	0	0%
Spain	EU28	372	4%
Sweden	EU28	168	2%

Country	Region	MRO	Share
Switzerland	EFTA	1,659	16%
United Kingdom	EU28	1,431	14%
Total EU28	EU28	8,062	79%
Total EFTA	EFTA	2,135	21%
Total EU28+EFTA	ALL	10,197	100%



Source: Results of analysis based on various data sources.

Figure B-6: Distribution of business-aviation-specific employment with MRO firms over Europe

3. Fixed-Base Operators (FBO)

Ground handling is another important service within the business aviation community.

- At small airports and airfields, the general aviation segment is usually dominated by private flights, hobby flights, flight schools etc., with usually only small shares of movements (and hence only a small share of the workforce) that could be attributed to Business Aviation. As part of our conservative approach and due to missing data, this workforce is not included in the analysis
- At larger airports and at dedicated Business Aviation airports , in contrast, Business Aviation flights are usually handled by FBOs, or other types of specialized ground handling firms. Based on industry sources, most of the independent FBOs and dedicated ground handlers in Europe were identified. Their workforce was estimated using data from company websites, direct company contacts, and financial databases. For those

FBOs for which no employment figures could be retrieved, an average employment number per firm and airport of 6.89 employees was used, which was calculated from available data. Airport operator employees have only been considered in cases in which the airport company runs an executive ground handling division as a separate entity.

In cases in which the FBO operation is part of an MRO firm or aircraft operator, the firm's total workforce has been attributed to either the aircraft operation or MRO section unless full workforce splits have been provided. This approach is depicted in Figure B-7.

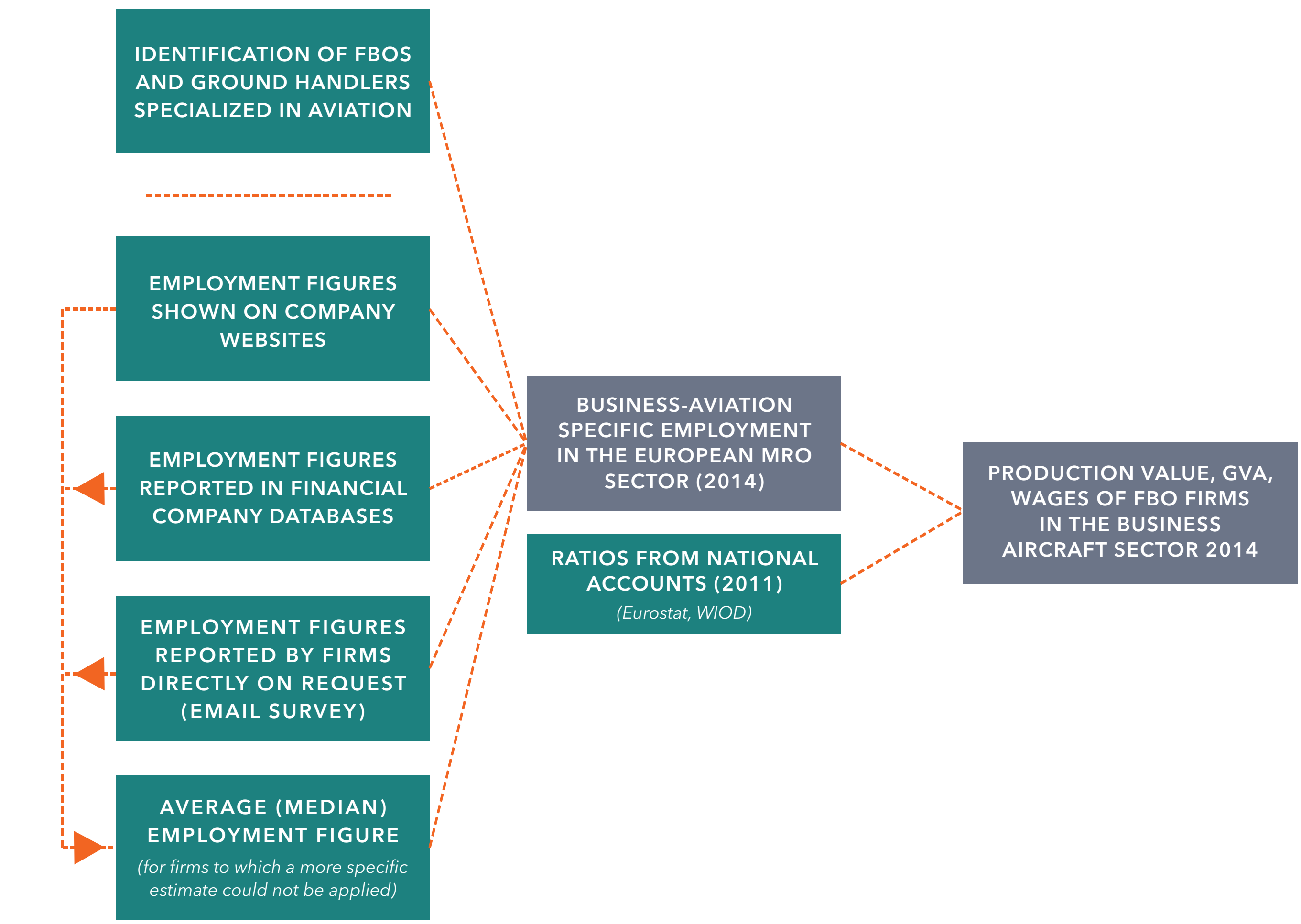


Figure B-7: Approach to estimate the direct impact of FBO companies on the business aircraft sector

It was estimated that 1,800 employees were present in the executive ground handling and FBO segment in Europe. The countries with the highest shares are Germany (312), UK (221), Spain (216), France (153), Greece (152) and Switzerland (116) as can be seen in Table B-6 and Figure B-8.

Table B-6: Employment estimates for FBO in Europe

Country	Region	FBO	Share FBO
Austria	EU28	14	1%
Belgium	EU28	14	1%
Bulgaria	EU28	22	1%
Croatia	EU28	21	1%
Cyprus	EU28	34	2%
Czech Republic	EU28	33	2%
Denmark	EU28	6	0%
Estonia	EU28	10	1%
Finland	EU28	28	2%
France	EU28	153	9%
Germany	EU28	312	18%
Greece	EU28	152	9%
Hungary	EU28	12	1%
Iceland	EFTA	0	0%
Ireland	EU28	45	3%
Italy	EU28	87	5%
Latvia	EU28	3	0%
Liechtenstein	EFTA	0	0%
Lithuania	EU28	12	1%
Luxembourg	EU28	0	0%
Malta	EU28	7	0%
Netherlands	EU28	14	1%
Norway	EFTA	18	1%
Poland	EU28	36	2%
Portugal	EU28	68	4%
Romania	EU28	89	5%
Slovakia	EU28	18	1%
Slovenia	EU28	9	1%
Spain	EU28	216	12%
Sweden	EU28	9	1%

Country	Region	FBO	Share FBO
Switzerland	EFTA	116	7%
United Kingdom	EU28	221	12%
Total EU28	EU28	1,644	92%
Total EFTA	EFTA	134	8%
Total EU28+EFTA+Other	ALL	1,778	100%

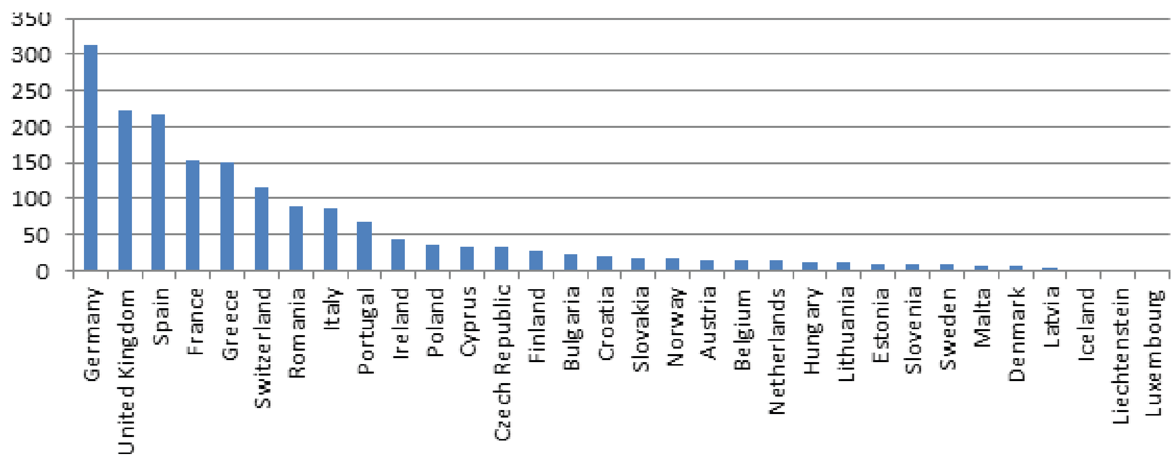


Figure B-8: Distribution of employment with FBO firms over Europe

4. Aircraft Manufacturers

Europe is not only a region with a high number of flights in the Business Aviation sector, but it is also an important place of business for the business aircraft manufacturing industry.

In this section, estimates of the European workforce of manufacturers of business aircraft are reported. Using a conservative approach, the analysis only considers those firms that produce and sell aircraft and engines, as well as the leading manufacturers of other components (such as Honeywell, Thales or Safran), while other manufacturers of components could not be considered as direct effects. A good portion of the latter's workforce is however considered to be part of the indirect effects of the aircraft manufacturers. For methodologic reasons, the share of the workforce of smaller manufacturers of components that concerns parts for aircraft manufacturers outside Europe could not be estimated, making results conservative in nature.

Workforce estimates for the aircraft manufacturers were compiled from various sources, mainly company (annual) reports, feedback/information from direct contacts, and internal assumptions. Figure B-9 shows the methodology, while Table B-7 and Figure B-10 contain the results on the country level.

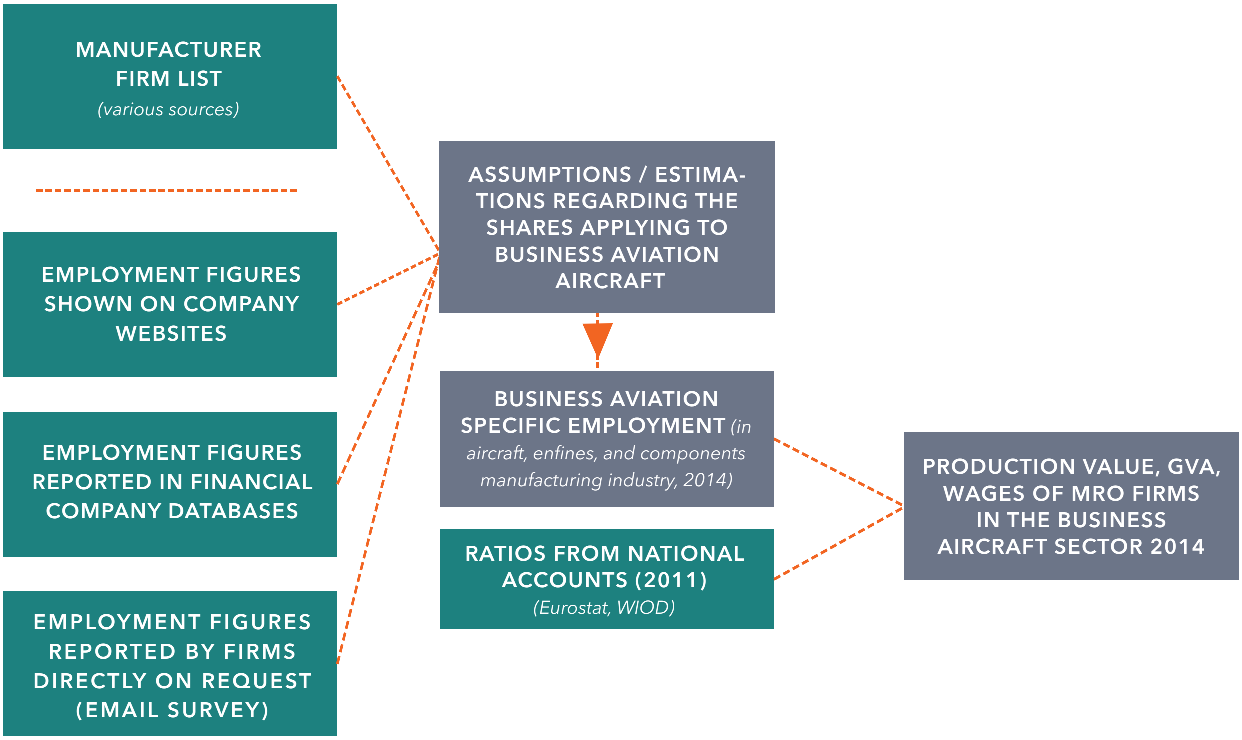


Figure B-9: Approach to estimate the direct impact of manufacturers in the business aircraft sector

40,600 employees were estimated to be in the manufacturing of business aircraft and components in Europe. The countries with the highest shares are France (46%), Germany (20%), and the UK (15%), where firms like Airbus Group, Bombardier, Daher, Dassault, MTU, Rolls-Royce, Safran and Thales are located. Other countries that play a (minor) role include Czech Republic (Honeywell), Italy (Agusta and Piaggio) and Portugal (Embraer).

Table B-7: Business aviation-related employment estimates for manufacturers in Europe

Country	Region	Manufacturer	Share
Austria	EU28	0	0%
Belgium	EU28	0	0%
Bulgaria	EU28	0	0%

Country	Region	Manufacturer	Share
Croatia	EU28	0	0%
Cyprus	EU28	0	0%
Czech Republic	EU28	1,600	4%
Denmark	EU28	0	0%
Estonia	EU28	0	0%
Finland	EU28	0	0%
France	EU28	18,843	46%
Germany	EU28	8,296	20%
Greece	EU28	0	0%
Hungary	EU28	0	0%
Iceland	EFTA	0	0%
Ireland	EU28	0	0%
Italy	EU28	2,729	7%
Latvia	EU28	0	0%
Liechtenstein	EFTA	0	0%
Lithuania	EU28	0	0%
Luxembourg	EU28	0	0%
Malta	EU28	0	0%
Netherlands	EU28	0	0%
Norway	EFTA	0	0%
Poland	EU28	705	2%
Portugal	EU28	401	1%
Romania	EU28	0	0%
Slovakia	EU28	0	0%
Slovenia	EU28	0	0%
Spain	EU28	4	0%
Sweden	EU28	0	0%
Switzerland	EFTA	1,800	4%
United Kingdom	EU28	6,223	15%
Total EU28	EU28	38,801	96%
Total EFTA	EFTA	1,800	4%
Total EU28+EFTA+Other	ALL	40,601	100%

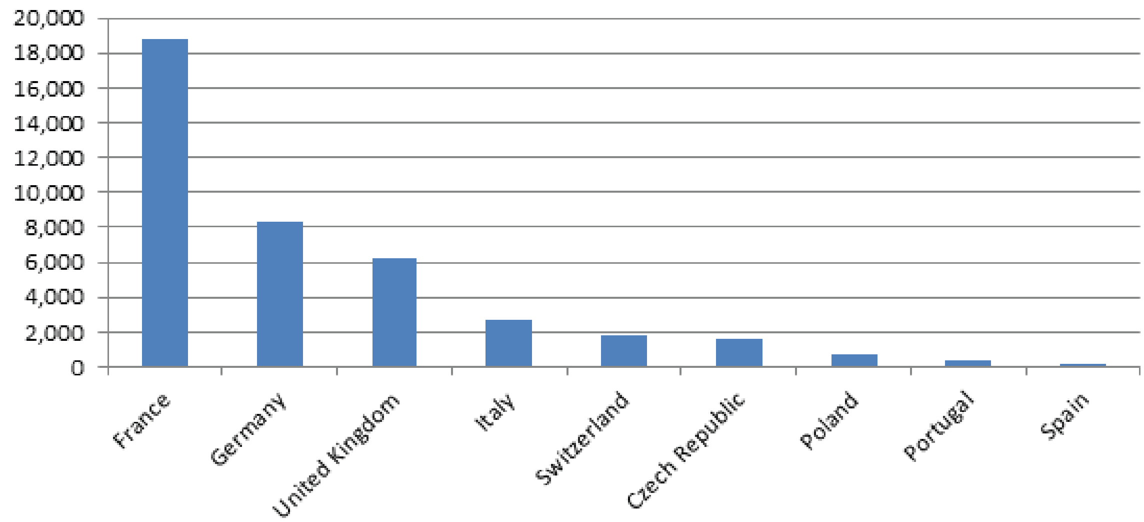


Figure B-10: Distribution of business-aviation employment with manufacturers over Europe

Direct Employment Summary

Table B-8, Figure B-11 and Figure B-12 summarizes our direct employment estimations for the Business Aviation sector in Europe in the year 2014. In total, 47,337 people (or 54%) were estimated to be employed in the operation of business aircraft (i.e., either with aircraft operators or with MRO or FBO firms), and 40,601 (46%) people to work on Business Aviation-related tasks for aircraft manufacturers.

Table B-8: Business aviation-related direct employment estimates in Europe

Country	Region	Aircraft operators	FBO	MRO	Sum (Operations)	Manufacture	Total Sum
Austria	EU28	2,296	14	152	2,462		2,462
Belgium	EU28	1,218	14	96	1,327		1,327
Bulgaria	EU28	237	22		259		259
Croatia	EU28	82	21	13	116		116
Cyprus	EU28	104	34	3	142		142
Czech Republic	EU28	751	33	340	1,124	1,600	2,724

Country	Region	Aircraft opera-tors	FBO	MRO	Sum (Opera-tions)	Manu-facture	Total Sum
Denmark	EU28	761	6	167	934		934
Estonia	EU28	89	10	51	150		150
Finland	EU28	352	28	9	388		388
France	EU28	3,457	153	1,286	4,896	18,843	23,739
Germany	EU28	6,251	312	2,337	8,900	8,296	17,196
Greece	EU28	424	152	120	696		696
Hungary	EU28	218	12		230		230
Iceland	EFTA	38		11	49		49
Ireland	EU28	326	45	40	410		410
Italy	EU28	2,074	87	622	2,783	2,729	5,512
Latvia	EU28	107	3		110		110
Liechten-stein	EFTA	38			38		38
Lithuania	EU28	133	12	122	267		267
Luxem-bourg	EU28	914			914		914
Malta	EFTA	708	7	188	903		903
Nether-lands	EU28	538	14	234	786		786
Norway	EFTA	752	18	465	1,234		1,234
Poland	EU28	910	36	116	1,062	705	1,767
Portugal	EU28	1,030	68	90	1,188	401	1,589
Romania	EU28	198	89	105	392		392
Slovakia	EU28	221	18		239		239
Slovenia	EU28	202	9		211		211
Spain	EFTA	1,369	216	372	1,956	4	1,960
Sweden	EU28	747	9	168	924		924
Switzerland	EFTA	2,867	116	1,659	4,642	1,800	6,442
United Kingdom	EU28	5,952	221	1,431	7,604	6,223	13,827
Total	EU-28+EFTA	35,362	,778	10,197	47,337	40,601	87,938

The aircraft and components manufacturing locations are to a large extent concentrated in a few, key countries, led by France, Germany, the UK and Italy, while activities and hence the resulting employment impact on the operations side are much more spread across Europe.

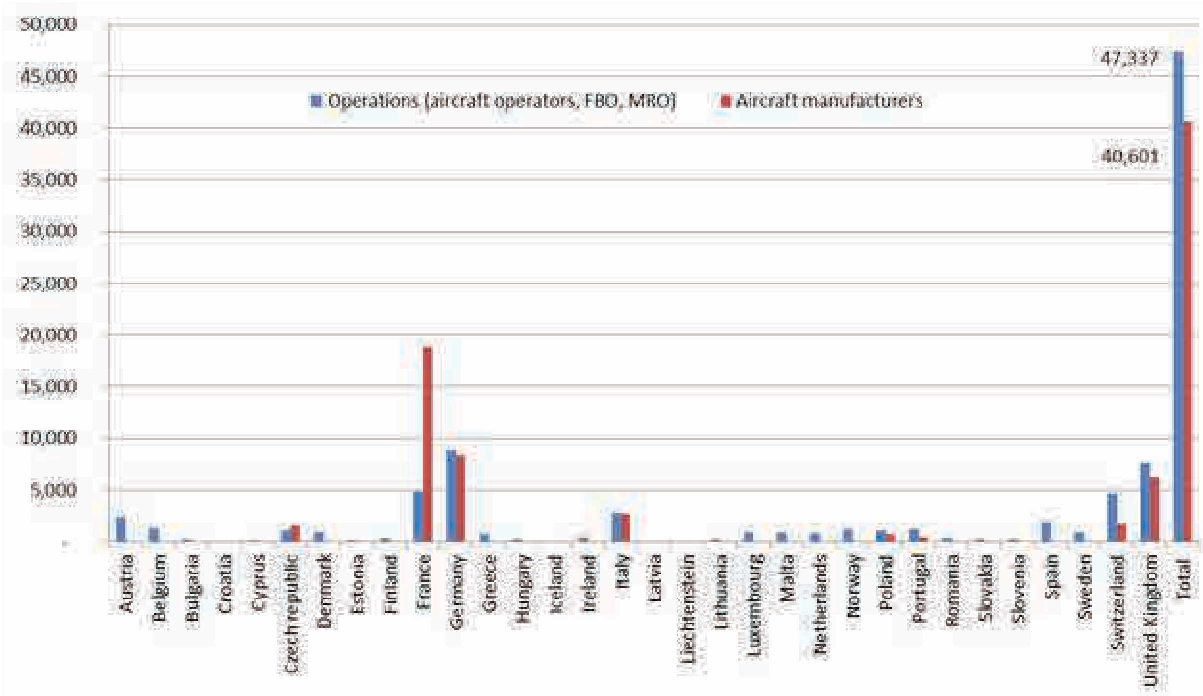


Figure B-11: Distribution of Business Aviation-related direct employment (operations/ manufacturing) over Europe

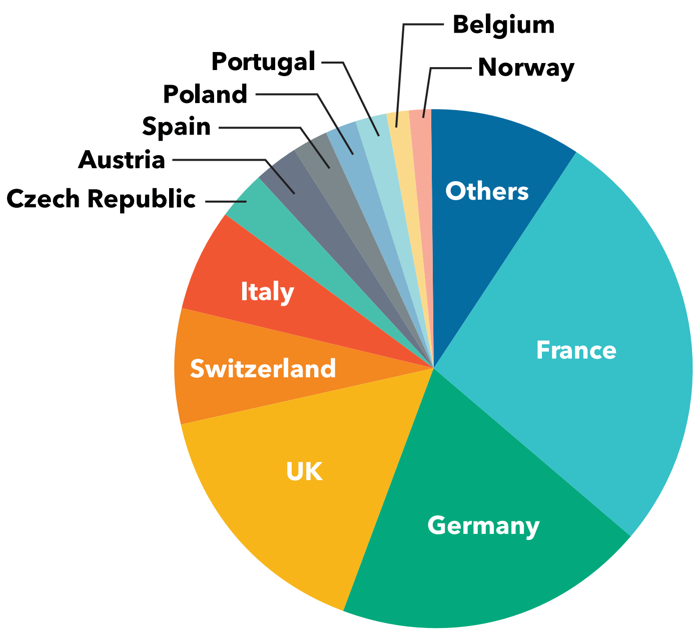


Figure B-12: Distribution of Business Aviation-related direct employment over Europe

Direct Output, GVA and Compensation of Employees

Estimated employment figures were used on the operator and manufacturer levels as a basis for the estimation of the sector's output, GVA and employee compensation. Ratios from the National Accounts provided by Eurostat/WIOD (World Input-Output (I-O) Database) for 2011 were used as more recent I-O data was not yet available at the time of writing. It may be assumed that the economic structure between the business air transport sector and its suppliers has not changed between 2011 and 2014.

As I-O tables were not available for Croatia, Iceland, Liechtenstein, Norway and Switzerland, it was assumed that the actual economic structure of similar/neighboring countries to be valid (e.g., Sweden for Norway).

This exercise resulted in the figures that are shown in Table B-9, with the country shares shown in Table B-10 and Figures B-13 through B-15.

Table B-9: Direct economic contribution of the European business aviation sector (operations and manufacture; EU28, Monaco, San Marino, Norway, Switzerland, Channel Islands, Liechtenstein)

Indicator	Unit	Aircraft Operators	FBO / Handling	MRO	Operations (total)	Aircraft Manufac-turers	Total
Employees	Number	35,362	1,778	10,197	47,337	40,601	87,938
Output at basic prices	1000 Euro	12,802,321	205,991	3,412,616	16,420,928	15,315,202	31,736,130
Value added at basic prices	1000 Euro	3,160,762	143,842	734,919	4,039,522	2,972,985	7,012,507
Labour Compensation	1000 Euro	2,355,478	45,864	585,216	2,986,559	2,235,905	5,222,463

Source: Direct employment estimates and sectoral data from the World Input Output Database

Table B-10: Direct output, GVA and wages of the business aviation sector by European country

Indicator	Output (1,000 €)			Gross Value Added (1,000 €)			Labor compensation (1,000 €)		
Country	**Operation**	**Manufac-ture**	**Total**	**Operation**	**Manufac-ture**	**Total**	**Operation**	**Manufac-ture**	**Total**
Austria	791,017	0	791,017	190,925	0	190,925	156,129	0	156,129
Belgium	1,090,721	0	1,090,721	141,029	0	141,029	101,183	0	101,183
Bulgaria	11,873	0	11,873	5,544	0	5,544	2,586	0	2,586
Croatia	40,702	0	40,702	20,238	0	20,238	9,969	0	9,969
Cyprus	21,404	0	21,404	10,992	0	10,992	5,865	0	5,865
Czech republic	192,746	352,375	545,122	47,730	67,273	115,002	37,748	30,737	68,485
Denmark	340,069	0	340,069	16,522	0	16,522	13,811	0	13,811
Estonia	24,601	0	24,601	9,912	0	9,912	4,129	0	4,129
Finland	159,917	0	159,917	41,411	0	41,411	25,481	0	25,481
France	1,254,097	9,479,188	10,733,285	388,861	1,557,063	1,945,924	263,890	1,180,180	1,444,070
Germany	4,293,783	3,502,325	7,796,109	902,357	812,887	1,715,244	615,463	560,059	1,175,522
Greece	358,262	0	358,262	149,408	0	149,408	28,979	0	28,979
Hungary	24,853	0	24,853	3,183	0	3,183	4,135	0	4,135
Iceland	24,923	0	24,923	5,684	0	5,684	3,567	0	3,567
Ireland	74,422	0	74,422	26,097	0	26,097	16,466	0	16,466
Italy	1,249,815	565,033	1,814,848	184,222	114,573	298,794	174,751	105,701	280,452
Latvia	40,297	0	40,297	11,482	0	11,482	4,079	0	4,079
Liechten-stein	12,179	0	12,179	2,925	0	2,925	2,433	0	2,433
Lithuania	32,517	0	32,517	10,308	0	10,308	3,655	0	3,655
Luxem-bourg	501,130	0	501,130	93,987	0	93,987	69,610	0	69,610
Malta	195,941	0	195,941	30,456	0	30,456	55,605	0	55,605
Nether-lands	229,514	0	229,514	28,017	0	28,017	49,876	0	49,876
Norway	620,615	0	620,615	142,244	0	142,244	88,948	0	88,948
Poland	61,295	90,627	151,923	13,457	13,964	27,421	11,870	6,379	18,249
Portugal	358,742	71,853	430,595	78,530	15,221	93,751	64,260	9,414	73,674
Romania	32,650	0	32,650	17,360	0	17,360	7,309	0	7,309
Slovakia	36,308	0	36,308	14,701	0	14,701	7,475	0	7,475
Slovenia	47,550	0	47,550	15,752	0	15,752	12,521	0	12,521
Spain	556,407	1,046	557,453	170,942	208	171,151	97,429	156	97,585
Sweden	470,599	0	470,599	101,918	0	101,918	64,865	0	64,865
Switzerland	1,457,444	128,480	1,585,924	356,012	89,716	445,728	291,500	28,606	320,107
United Kingdom	1,814,535	1,124,273	2,938,809	807,315	302,080	1,109,395	690,969	314,673	1,005,642
Total	16,420,928		31,736,130	4,039,522	2,972,985	7,012,507	2,986,559	2,235,905	5,222,463

Almost 75% (73.4%) of the sector's output is generated in the four "key countries" France, Germany, the UK and Italy alone, mirroring the strong position of these four countries both in business aircraft operations and aircraft manufacturing.

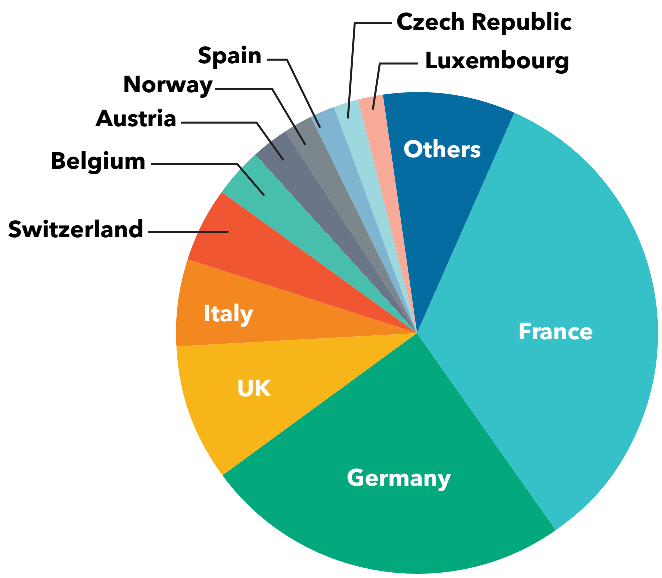


Figure B-13: Distribution of business-aviation related output over Europe

Considering GVA and wages and salaries, the situation looks similar, with France, Germany and the UK accounting for about 70% but Switzerland slightly ahead of Italy.

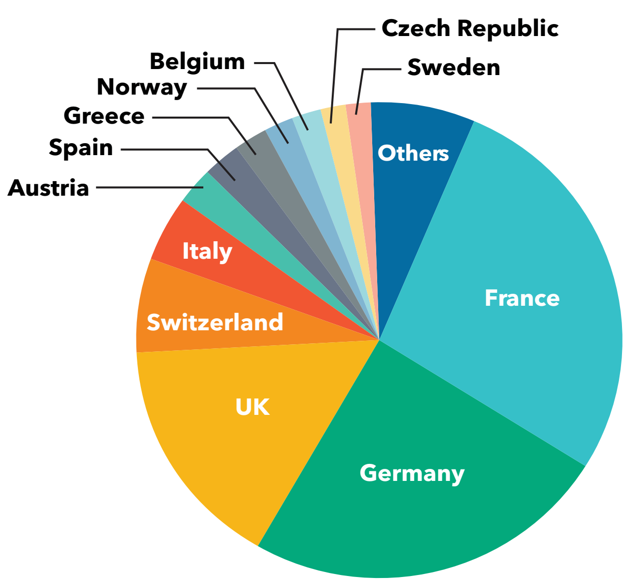


Figure B-14: Distribution of business-aviation related GVA over Europe

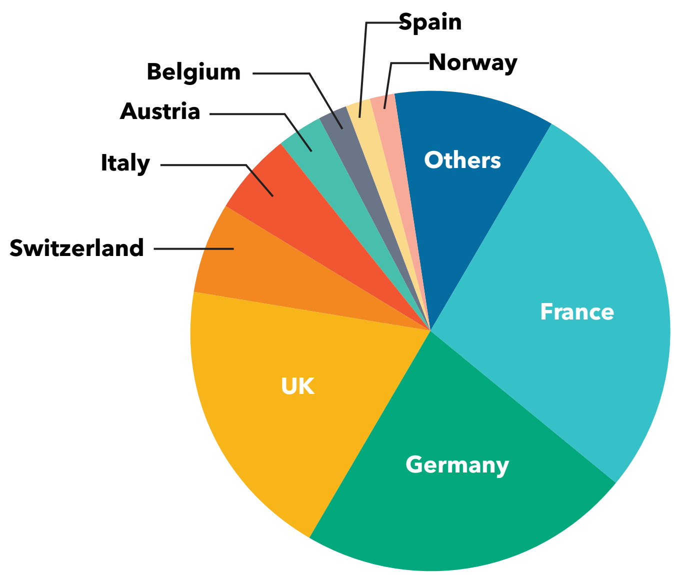


Figure B-15: Distribution of Business Aviation-related wages and salaries over Europe

II. Indirect and Induced Economic Contribution of the European Business Aviation Sector

Indirect effects are those impacts on employment, output, GVA and wages and salaries that originate from inputs delivered from external industries to the aviation sector. Examples include aircraft manufacturers being supplied with metal, plastic and components, or aircraft operators purchasing fuel or paying commissions to brokers. Thus, activities in the European Business Aviation market (operations and manufacture) in Europe do not only contribute to the European economy directly, but also indirectly, as services and goods are purchased from other sectors. The complete chain of inputs may be regarded as including the industries supplying inputs to the aviation sector themselves requiring inputs from sectors even further upstream.

Indirect effects may be estimated applying a macro-economic modelling approach called Input-Output model (IO model). In an IO model, a nation's economy and its interrelations are summarized in matrix form, allowing for a prediction of the effects that changes in activity in one sector have on the other sectors. The basis for IO estimations used in this study are Input-Output tables that are taken from the World I-O Database[10] containing the economic

10 *The World Input-Output Database (WIOD) was funded by the EU FP7 program. According to its website, "it provides time-series of world input-output tables for forty countries worldwide and a model for the rest-of-the-world, covering the period from 1995 to 2011." For more information please refer to Timmer, M. P., Dietzenbacher, E., Los, B., Stehrer, R. and de Vries, G. J. (2015), "An Illustrated User Guide to the World Input–Output Database: the Case of Global Automotive Production", Review of International Economics., 23: 575–605* interrelations between all economic sectors in Europe and selected other countries. The underlying approach goes back to the work of Wassily Leontief who developed the so-called Leontief inverse, which translates the IO model into multipliers for each unit of direct output. In applying these multipliers, the whole chain of inputs can be estimated for each country differentiated by country and industry.

Business Aviation is not directly included as a sector in the WIOD tables. Hence, the analysis refers to the sectors “Air Transport” (for business aircraft operators), “Other Supporting and Auxiliary Transport Activities” and “Activities of Travel Agencies” (for FBO and MRO) and “Manufacture of Transport Equipment” (for manufacturers) which are the subordinate industries listed in the WIOD database.

To give a broad picture of the economic impact of the Business Aviation sector, Business Aviation-related activities of MRO service providers, FBOs and other dedicated handling firms, and business aircraft manufacturers are reported as direct effects, although, strictly speaking, such activities could also be regarded as indirect effects of business air transport operations. This is because they are intermediate consumers of the aircraft operators. Hence, totals were adjusted to avoid double-counting.

In the WIOD database, Input-Output tables are available for all countries except Croatia, Iceland, Norway, Liechtenstein and Switzerland. To account for these exceptions, it was assumed that the economic structure in these countries is the same as in neighboring/similar countries, and hence applied the following: Slovenia for Croatia; Sweden for Iceland and Norway, Austria for Liechtenstein and Switzerland.

In a second step, data from Eurostat and Oxford Economics was used to deduce the interesting industries “Airports” and “Aircraft Industry” (not needed for Airport Transport).
In a third step, data calculated in step two was used to estimate the economic effects of the Business Aviation sector in Europe.

This three-step process resulted in the economic effects of Business Aviation in each country subdivided by industry and by country.

Induced effects are defined as the additional economic activity (employment, output, GVA, wages and salaries) generated by the consumption of income generated from direct and indirect activities of the Business Aviation sector in Europe. They can, therefore, be considered as the multipliers of income of persons directly and indirectly employed in the aviation sector.

To quantify the sector’s induced effects, the direct and indirect “compensation of employees” of the Business Aviation sector and its value chain were estimated using a Leontief model based on Input-Output tables. In this approach, the consumption of direct and indirect aviation employees is split into 35 different multipliers, one for each relevant group of consumer goods. The underlying model operates with a number of assumptions. First, consumption depends on total disposable income and assets, and not just on salaries and wages. It was hence assumed that the share of salaries for persons employed directly or indirectly in the aviation sector is the same as in other sectors. Furthermore, it was assumed that the average propensity to consume is the same for employees in the aviation sector as in other sectors.

Results

Table B-11 summarizes the sector's indirect impact for each of the four indicators. In 2014, about 213,000 people worked indirectly for the Business Aviation sector and generated a total output of € 51.8 bn and a GVA of € 16 bn. Total wages and salaries amounted to € 13 bn. The manufacturing of aircraft and components accounts for about 53% of indirect employment and for more than 60% of all indirect output, GVA and labor compensation, due to higher value added and wages in the aircraft manufacturing value chain.

Indicator	Unit	Aircraft Operators	FBO / Handling	MRO	Operations (total)	Aircraft Manufacturers	Total
Employees	Number	78,252	1,471	21,399	101,121	113,511	213,451
Output at basic prices	1000 Euro	11,365,100	218,766	6,115,292	17,698,490	34,369,405	51,769,034
Value added at basic prices	1000 Euro	4,365,826	93,569	1,787,566	6,246,874	10,250,681	16,422,113
Labour Compensation	1000 Euro	3,047,070	33,462	1,449,326	459,829	8,737,872	13,243,072

Source: Estimations based on data from the World Input Output Database.

** Totals have been adjusted for double-counting.*

In Table B-12, the sector's indirect effects for each of the four indicators on the country levels are presented.

Table B-12: Indirect effects of the European Business Aviation sector (operations and manufacture; EU28, Monaco, San Marino, Norway, Switzerland, Channel Islands, Liechtenstein)

Country	Region	Employment	Output	GVA	Labor Compensation
Austria	EU28	4,490	1,182,319	428,285	354,841
Belgium	EU28	5,192	1,625,832	560,962	475,980
Bulgaria	EU28	813	176,645	13,259	12,157
Croatia	EU28	326	107,982	25,834	20,364
Cyprus	EU28	83	9,980	3,512	2,080
Czech republic	EU28	5,953	1,484,512	292,443	245,201
Denmark	EU28	1,354	359,947	126,326	100,790
Estonia	EU28	345	51,896	9,678	7,135
Finland	EU28	926	277,106	87,259	68,753
France	EU28	55,530	9,582,339	3,977,500	2,952,539
Germany	EU28	57,677	13,604,751	4,664,416	3,888,861
Greece	EU28	1,906	155,333	69,626	51,329
Hungary	EU28	1,968	891,576	131,906	128,128
Iceland	EFTA	133	37,922	13,732	10,758
Ireland	EU28	535	150,677	45,843	41,636
Italy	EU28	18,473	4,919,362	1,434,559	1,234,947
Latvia	EU28	779	61,403	18,848	11,095
Liechtenstein	EFTA	72	19,261	6,933	5,780
Lithuania	EU28	556	67,557	15,636	9,048
Luxembourg	EU28	788	208,984	88,565	55,095
Malta	EFTA	1,146	95,323	41,489	24,216
Netherlands	EU28	3,182	1,230,258	314,803	297,576
Norway	EFTA	3,030	781,548	293,992	220,087
Poland	EU28	7,156	2,978,938	349,831	323,208
Portugal	EU28	4,770	735,639	214,262	148,350
Romania	EU28	1,913	764,075	49,412	47,230
Slovakia	EU28	1,260	567,765	89,691	84,097
Slovenia	EU28	717	244,272	47,627	44,717

Country	Region	Employment	Output	GVA	Labor Compensation
Spain	EFTA	7,948	3,130,054	800,745	716,209
Sweden	EU28	2,676	780,091	280,858	223,670
Switzerland	EFTA	7,670	1,601,179	668,073	469,770
United Kingdom	EU28	14,081	3,884,507	1,256,207	967,424
Total	EU28+EFTA	213,451	51,769,034	16,422,113	13,243,072

Source: Estimations based on data from the World Input Output Database.
** Totals have been adjusted for double-counting.*

Finally, Table B-13 presents the sector's induced effects. For 2014, the value chain of the European business air transport and aircraft industry was estimated to induce a total number of almost 70,000 employees in Europe, who earn € 3.6 bn in wages and generate an output and GVA of € 14.7 bn and 4.2 bn respectively.

Table B-13: Induced economic contribution of the European Business Aviation sector (operations and manufacture; EU28, Monaco, San Marino, Norway, Switzerland, Channel Islands, Liechtenstein)

Indicator	Unit	Aircraft Operators	FBO /Handling	MRO	Operations (total)	Aircraft Manufacturers	Total
Employees	Number	26,828	859	7,456	35,142	35,054	69,972
Output at basic prices	1000 Euro	3,407,946	118,530	1,790,914	5,317,347	9,408,099	14,670,706
Value added at basic prices	1000 Euro	1,395,782	51,757	377,299	1,724,828	1,873,247	3,584,228
Labour Compensation	1000 Euro	1,006,018	14,506	342,441	1,362,961	1,472,361	2,830,837

Source: Estimations based on data from the World Input Output Database.
** Totals have been adjusted for double-counting.*

Table B-14: Induced effects of the European Business Aviation sector (operations and manufacture; EU28, Monaco, San Marino, Norway, Switzerland, Channel Islands, Liechtenstein)

Country	Region	Employees	Output	GVA	Labor Compensation
Austria	EU28	1,345	325,936	79,162	62,683
Belgium	EU28	917	275,010	57,952	45,837
Bulgaria	EU28	233	34,538	1,850	1,392
Croatia	EU28	93	20,781	2,871	2,623
Cyprus	EU28	77	6,937	2,122	1,804
Czech republic	EU28	1,273	249,527	32,910	24,186
Denmark	EU28	289	67,422	16,783	13,849
Estonia	EU28	73	8,709	1,481	1,060
Finland	EU28	258	63,006	16,029	12,402
France	EU28	18,412	3,384,810	1,211,737	912,933
Germany	EU28	17,653	3,910,476	906,242	705,102
Greece	EU28	1,499	93,770	46,735	38,178
Hungary	EU28	367	128,037	6,291	5,745
Iceland	EFTA	30	8,414	2,221	1,582
Ireland	EU28	138	31,679	6,776	5,376
Italy	EU28	6,319	1,456,220	301,105	263,004
Latvia	EU28	227	16,509	5,103	2,859
Liechtenstein	EFTA	21	5,233	1,249	998
Lithuania	EU28	196	17,261	3,675	1,977
Luxembourg	EU28	156	50,703	12,797	8,753
Malta	EFTA	686	67,168	26,937	68,607
Netherlands	EU28	717	219,289	29,834	30,640
Norway	EFTA	727	193,055	53,916	37,789
Poland	EU28	1,705	551,839	24,420	18,836
Portugal	EU28	1,668	242,791	59,343	42,025
Romania	EU28	573	182,369	6,671	5,224
Slovakia	EU28	541	146,037	7,637	7,509
Slovenia	EU28	191	48,795	5,869	5,621

Country	Region	Employees	Output	GVA	Labor Compensation
Spain	EFTA	2,639	893,733	120,915	87,013
Sweden	EU28	580	159,534	41,714	29,879
Switzerland	EFTA	3,189	559,603	176,601	120,664
United Kingdom	EU28	7,178	1,251,515	315,279	264,690
Total	EU28+EFTA	69,972	14,670,706	3,584,228	2,830,837

Source: Estimations based on data from the World Input Output Database.
** Totals have been adjusted for double-counting.*

III. Total Economic Contribution of the European Business Aviation Sector

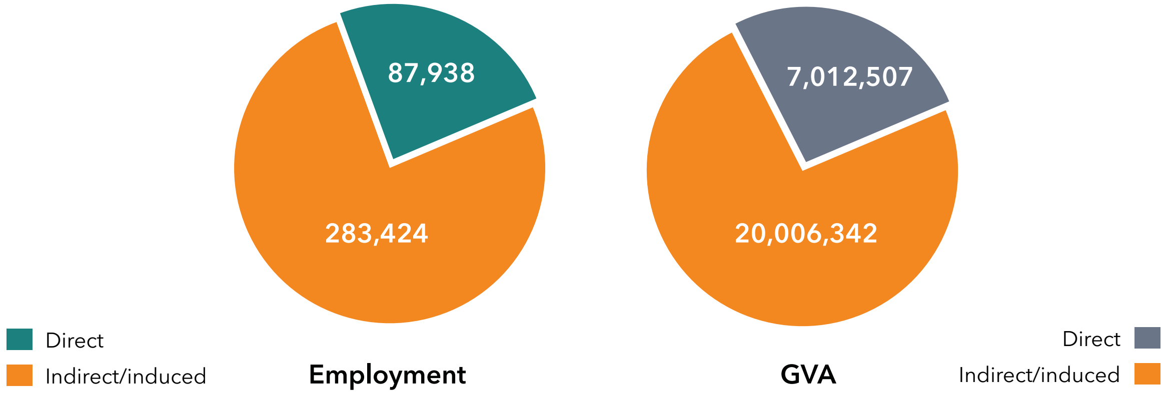
Considering both the direct, indirect and induced effects, the total impact is 371,000 employees, € 98 bn in output, € 27 bn in GVA and € 21 bn in gross wages and salaries (19). The sector's gross value added equals a contribution of the sector to the European (EU28/EFTA) GDP of about 0.2%.

Table B-15: Total economic contribution of the European Business Aviation sector (operations and manufacture; EU28, Monaco, San Marino, Norway, Switzerland, Channel Islands, Liechtenstein)

Indicator	Unit	Aircraft Operators	FBO /Handling	MRO	Operations (total)	Aircraft Manufacturers	Total
Employees	Number	140,442	4,107	39,052	183,600	189,166	371,362
Output at basic prices	1000 Euro	27,575,367	543,288	11,318,822	39,436,765	59,092,705	98,175,870
Value added at basic prices	1000 Euro	8,822,371	289,168	2,899,784	12,011,224	15,096,913	27,018,849
Labour Compensation	1000 Euro	6,408,566	93,832	2,376,983	8,879,349	12,446,139	21,296,372

Source: Estimations based on data from the World Input Output Database.
** Totals have been adjusted for double-counting.*

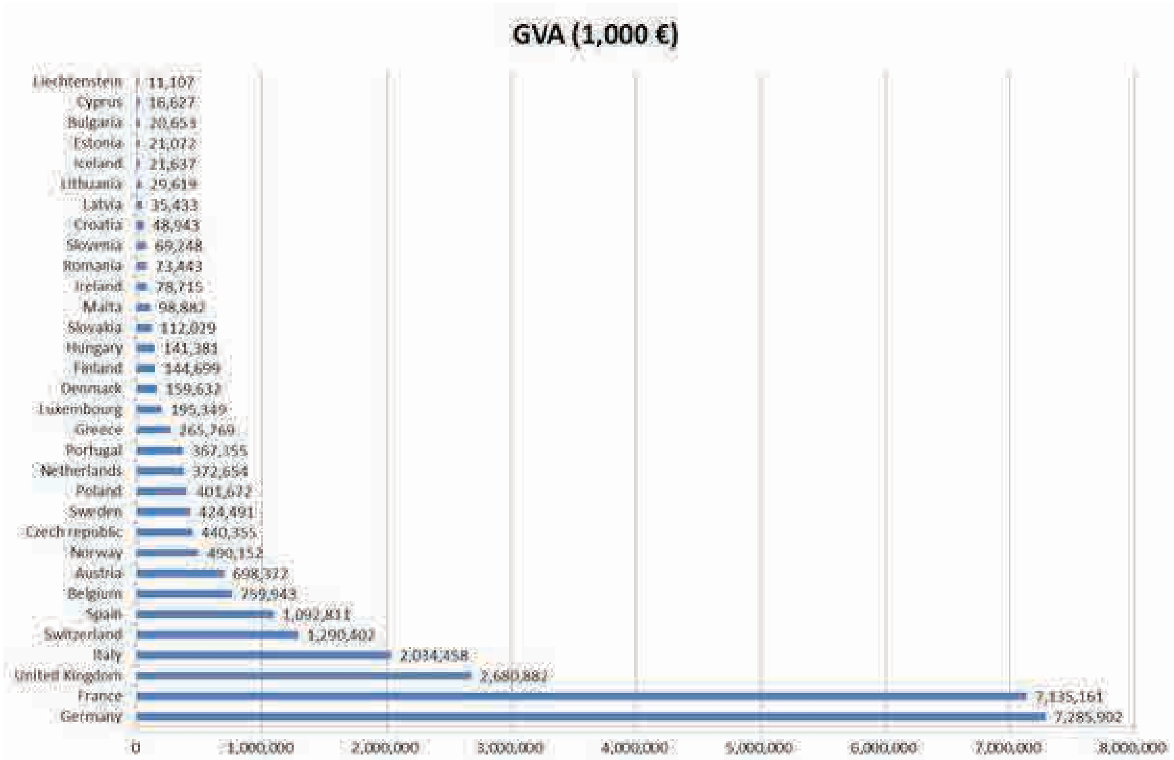
About 24% of the employment in the sector's value chain is direct employment, while about 76% of all jobs can be attributed to indirect and induced employment (Figure B-16). GVA-wise, the shares are similar.



Source: Estimations based on data from the World Input Output Database.

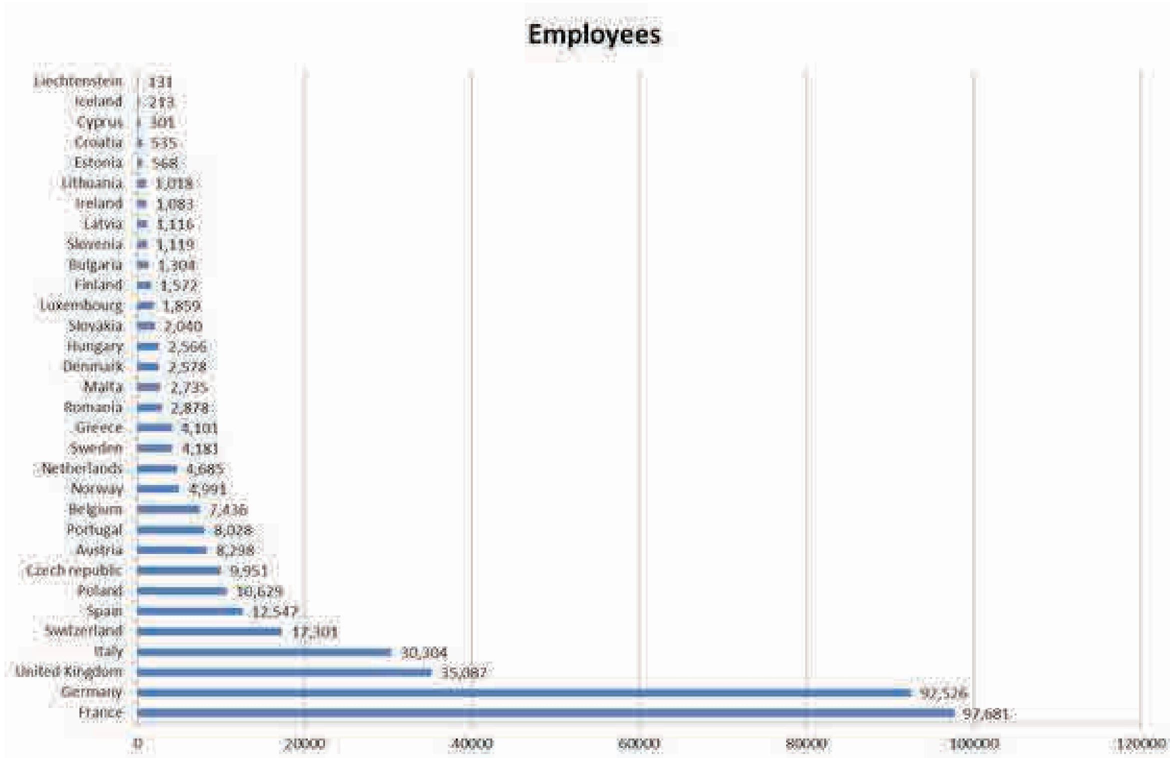
Figure B-16: Share of direct and indirect/induced employment and GVA (in 1,000 €) over the business aviation value chain

The majority of the economic impacts of the Business Aviation sector are generated in the key markets in Western Europe. Germany, France and the UK alone represent 63% of the total industry GVA in Europe, with a further 17% being represented by Italy, Switzerland and Spain. These countries do not only face a high share of business aircraft movements in Europe, but are also home to large MRO firms and important manufacturers of business aircraft and/or components (Figure B-17 and Figure B-18).



Source: Estimations based on data from the World Input Output Database.

Figure B-17: GVA by country



Source: Estimations based on data from the World Input Output Database.

Figure B-18: Employment by country

APPENDIX C: DETAILS OF TIME SAVINGS CALCULATIONS

In the existing studies, the time savings of Business Aviation are often discussed in general, qualitative terms. In the data science analysis used in this report, Booz Allen provides a quantified estimate of time savings for users of European Business Aviation by comparing a large data set of business flights to the best commercial travel alternatives users would have taken if not for Business Aviation. Cumulative and average time savings are computed and the total value of time saved is estimated.

WingX provided the primary Business Aviation flight data used in the study. The WingX data contains departure date, time, origin, destination, operating aircraft, and travel time for all 806,817 tracked business aviation flights for the 2014 calendar year[11]. A private broker provided representative costs per block hour of Business Aviation flights broken out by type of business jets and by 2014 calendar months. Eurocontrol provided an additional sample data set listing itinerary data as well as tail numbers for some Business Aviation aircraft. This data set was used for the multi-trip analysis.

Rome2Rio, a multimodal transportation search engine that supplies travel times for a given itinerary provides commercial travel alternatives. For example, in the case of a trip from London to Paris, Rome2Rio would provide several suggested routes and associated travel times, such as taking a taxi to Heathrow, flying to Charles de Gaulle, and taking the RER into the center of Paris; or riding the London Underground to a rail station and connecting to a Eurostar train directly to an inner arrondissement in Paris. These options are then compared against a Business Aviation flight for example a nonstop flight from London City to Paris Orly. Rome2Rio data includes flight schedules so that departure times and dates of business flights may be compared to commercial flights operating on the same day. The set of Rome2Rio-suggested itineraries provides the set of commercial alternatives for any given business flight.

To obtain the time savings of Business Aviation, every Business Aviation departure was compared to the "best" commercial alternative, with the time difference between the total Business Aviation travel time and total commercial alternative travel time reported as the time savings (or delays when applicable) of Business Aviation for that itinerary.

11 *Note that the 806,817 is a subset of a total of 887,487 flights with Business Aviation aircraft, which is derived by filtering out training flights, which are not the focus of this study.*

The total time of a Business Aviation itinerary is the surface travel time from the origin city to the Business Aviation airport, the time spent at the airport in advance of the flight, the flight time itself, and the surface travel time to the final destination in the destination city. WingX provides the flight time and the remaining times are computed to estimate the total time of the itinerary.

Every Business Aviation airport in the WingX data set is resolved to the nearest major city. Rome2Rio was used to compute surface travel time from the origin city center to the Business Aviation origin airport and from the Business Aviation destination airport to the destination city center. Additionally, 10 minutes of "minimum check-in time" was added to each trip, assuming that Business Aviation users spend at least 10 minutes waiting for their flights at the airport. This 10 minute time is much smaller than in commercial aviation.

For commercial alternatives, Rome2Rio provides complete travel times between cities and therefore includes surface travel time to and from airports. Note that for most city pairs, flying is the fastest commercial option: Rome2Rio will recommend a taxi or train to the origin airport and a taxi or train from the destination airport. However, in some cases, Rome2Rio will also return non-flying options – such as entirely train or bus trips – which may end up being the fastest commercial option. As with Business Aviation check-in times, a 35 minute "minimum check-in time" was added to commercial itineraries to accommodate early arrival at the airport in advance of a scheduled departure time. This value is based on an average of business-class check-in cutoffs for Austrian Airlines' stations and is used as a representative time for other airlines and airports.

The commercial alternative with the shortest overall travel time is selected as the best alternative for the business flight in order to generate a conservative estimate for time savings of Business Aviation. Note that a Business Aviation customer would generally be unlikely to select the fastest commercial alternative – for example, a passenger departing from the Middle East is unlikely to select a 5-hour nonstop flight departing at 4 AM when traveling to Western Europe, as it is the case with many commercial airline schedules. Time savings determined from a shortest overall travel time alternative analysis should be viewed as the absolute minimum time savings of Business Aviation as compared to commercial travel as travelers will frequently have to select longer itineraries based on time of departure or arrival.

Several key assumptions are present in the analysis. 2014 WingX data is compared against more recent flight schedules that existed at the time of the writing of this report. Historical flight schedules were not available for query. Slight differences in time savings would be observed if 2014 flight schedules differed radically from today's.

Rome2Rio does not provide day of operation for non-flight methods of transport. Therefore, it is assumed that all trains, busses, taxis, ferries, and so on, operate on a daily basis. Rome2Rio also does not provide schedules for surface transport and there is therefore an implicit assumption that a train is always waiting to depart to take a traveler to an airport.

Multi-Trip Itinerary

Time savings of Business Aviation against commercial travel was also examined for multi-trip itineraries. A multi-trip itinerary in Business Aviation was defined as an itinerary performed by a single aircraft that includes three or more consecutive flights/trips in a single day. A multi-trip itinerary for commercial aviation is the collection of three or more consecutive trips where each trip is performed by the fastest available commercial flight. It was assumed that there are always available commercial flights to perform the trips mentioned and therefore, delays between trips that could have been due to lack of availability of the next flight until many hours later are not accounted for. As with the single-trip analysis, the analysis therefore provides an absolute minimum time savings estimate for multi-itinerary trips.

A data set of 151 tail numbers was used to analyze the time savings of multi-itinerary trips. Eurocontrol arrival and departure data was used to note how long every flight spends on the ground between segments. The Rome2Rio API was used to find the fastest commercial alternative for each segment of the multi-itinerary trip, as in the case of the single itinerary trips. Time spent on the ground was added to obtain the total commercial trip time, with the difference between the commercial alternative and the business aircraft itinerary giving the time savings for that itinerary. The analysis results in an average time savings of 393 minutes i.e., 6 hours and 33 minutes.

Clearly, 6 hours and 33 minutes is the most optimistic estimate of time savings simply because it is unlikely that there will always be available flights on demand for business agents and also because there is no guarantee that even if a flight is available that it will be the fastest for that given day. Therefore it is safe to assume that the business agent in question would have to stay overnight at some mid-itinerary destination and complete the itinerary the next day. This overnight stay adds costs to the trip starting with at least the needed hotel costs. It is assumed that an average one night stay in a European hotel costs € 200.

The data set used to compute the 6 hours and 33 minutes time difference included the operations of 151 different business aircraft that completed 792 multi-trip itineraries in total. Given that there are 3,080 active business aircraft in Europe and that these 151 aircrafts were drawn randomly out of this ‘population,’ it can be inferred that 2014 saw 16,156 multi-trip itineraries. In addition, on average 4.7 people use business aircraft on each itinerary, so that the total number of overnight hotel stays (assuming these people stay in separate rooms) is 75,933 in 2014. Finally, given an average overnight hotel cost of € 200, if every business agent performs their business itinerary with Business Aviation rather than commercial, European businesses will save at least € 15,186,600 in hotel costs per year.

›› APPENDIX D: LIST OF REFERENCES

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