EUROCONTROL Trends in Air Traffic | Volume 4

More to the Point: Business Aviation in Europe in 2007

EUROCONTROL

Acknowledgements

This is the second volume of *Trends in Air Traffic* that we have devoted to business aviation. The idea for the first volume, in 2006, came from Lex Hendriks, Deputy Director of ATM Strategies at EUROCONTROL who continues to work to ensure that the air traffic management system is ready for the arrival of the very light jets.

Trends in Air Traffic 1 was warmly welcomed by the business aviation sector when it was launched at EBACE in Geneva in May 2006 by Bo Redeborn, Director of ATM Strategies. It was not our original intention to publish updates, because there are many other subjects that we need to explore through our data archives. But for the last 18 months we have been asked frequently and repeatedly when the updated version would be available. Meanwhile business aviation has gone from strength to strength.

So I am happy to acknowledge the enthusiasm of the readers as the driving force behind this refreshed report. In fact, we have responded in two ways: an update of the document which reports on statistics to the end of 2007, rather than adding new analysis; and an on-line statistics portal that will continue to provide monthly updates from now on. For more on this see section 19.

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More to the Point: Business Aviation in Europe in 2007

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Foreword

EUROCONTROL, through its Statistics and Forecast Service (STATFOR), provides a range of air traffic forecasts for Europe. These forecasts allow civil aviation authorities, air navigation service providers, airspace users, airports and others in the industry to have a view of the future air traffic situation and thereby enable them to better focus and scale the development of their respective businesses in the short-, medium- or long-term.

In developing these traffic growth forecasts, an in-depth study is made into the state of the industry and of current trends, using EUROCONTROL's unique historical database of flight movements in Europe. Recognising that these background studies could themselves be of use to the Industry, we began to make them available: first with twice-yearly reports on the low-cost carriers and then by launching the *Trends in Air Traffic* series in 2006 with an examination of business aviation.

That first study of business aviation was triggered by the observation that the sector was growing and changing rapidly, but that only limited statistics were available so that the sector's contributions to mobility, to economic growth in Europe and to the challenges of air traffic management were only poorly understood. The last two years have seen even stronger growth, and the entry into service of the very light jets. So it is time for an update of the study.

Conrad Cleasby
Head of Data, Information and Analysis Division
EUROCONTROL

Summary

This continues to be a time of change for business aviation in Europe. New business models have been gaining ground in the USA for some years. Although the legal, social and geographical conditions are different, these new business models are being increasingly adapted for use in Europe. The result is that the business aviation segment is growing faster than the overall air traffic market. However, this growth is not uniform, so we need to ask where the growth will be and how much?

The first deliveries of a new breed of aircraft, the very light jets (VLJ), began in 2007 in Europe. In early 2008, we are already seeing several hundred flights per month by the VLJs. It is clear that their low price and operating costs open up new possibilities, but the size of this new market under European conditions remains an open question.

In 2007, 7.8% of all IFR flights in Europe were business aviation. Since 2001, this segment has grown more than twice as quickly as the rest of air traffic. Flights by business jets are growing particularly strongly, by more than 12% in both 2006 and 2007, as new business models enable growth that is driven by the needs of the global economy, by increasing profits and prosperity, and by a growing acceptance of the economic benefits. Regulation and lack of infrastructure, however, mean that the traffic volumes seen in the US are unlikely to be seen in Europe in the near future.

The network of airport pairs linked by business aviation has more than 100,000 links. That is three times as many links as the scheduled flight network and it highlights how business aviation is the ultimate in point-to-point air travel. This generates time savings which make it a commercial proposition, not a luxury. But it also spreads the already small volumes of traffic amongst a large number of small airports: only a third of business aviation departures are from airports with more than 100 IFR departures/day, although this proportion has increased since 2005. Providing appropriate infrastructure at other small airports then becomes the challenge.

In the air, the business network carries much less traffic than the scheduled network and, in some parts of the industry, for 40% of the time the aircraft are flying empty on positioning flights. But the network occupies much the same airspace as the rest of the traffic (see Figure 1) so competes for the same, limited resources. As a result, in 2007, although a smaller proportion of business flights were delayed than scheduled ones, the business flights that were delayed suffer worse en route delay.

Summary

Business aviation is not about taking passengers from the front cabin of a scheduled flight and flying them in their own aircraft. Business aviation fills a gap in scheduled services: two-thirds of business flights in 2007 were between cities not served by daily scheduled flights.

Scheduled aviation in Europe has around 700 operators; it's difficult to get precise numbers for business aviation, but the number of operators is at least 700. Since business aviation is ten times smaller, this means that there are many business operators with only one or two aircraft. These individuals, or small firms, have very limited resources to keep up with changes in equipment requirements or other regulations.

Business aviation has its share of long-haul, but only about 10% of business flights are over 2000km. Most business flights are shorter than the average scheduled flight, with half under 500km: for business aviation the taxi is a better metaphor than the ocean liner.

The European fleet of business aircraft has grown strongly in the last two years to around 3,000 airframes. In particular, deliveries at the high end of previous forecasts, coupled with transfers onto the European registers have resulted in nearly 70% more European-registered business jets than 2 years ago. By looking at a range of published forecasts, we estimate that the fleet will grow to around 4,600 by 2017. If air taxi operations do, as expected, grow strongly on the back of very light jets, then 2,200 additional flights/day over 10 years is possible which would be a contribution of around 0.8 percentage points/year to total growth in traffic of 3.7%-4.7%/year.

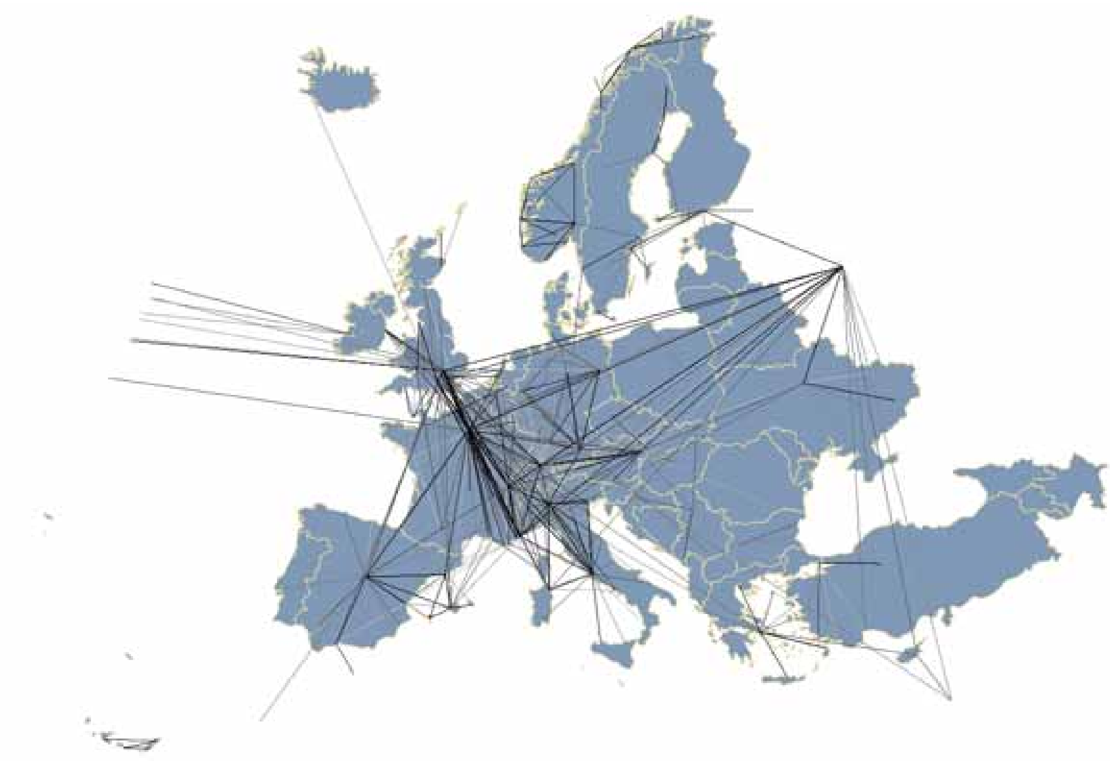


Figure 1. The 500 busiest business aviation routes in Europe (2007) carried 28% of all business flights.

Such growth presents a number of challenges to air traffic management, in particular:

- Although there is relatively little business aviation traffic, it generates more and bigger unanticipated peaks of demand at airports than does scheduled traffic at airports of similar size. This therefore consumes a disproportionate amount of flow-management resources. At the same time, procedures for giving business aviation access to capacity-constrained airports could be standardised and improved, from both the business aviation and the air traffic management perspectives.

- Business aviation tends to use different flight levels, but getting the different types of traffic to their preferred levels creates additional traffic complexity for controllers, particularly given the concentration of business aviation in an already busy airspace.

- The June and September peaks in total traffic are likely to get stronger, because business aviation is also busiest in these months, and still growing.

Contents

1.	Why look at business aviation trends?	11
2.	Some definitions	12
3.	So what is the business model?	13
4.	Growing	14
5.	New aircraft, new challenges?	16
6.	Business aviation is spread thinly	18
7.	The main European states	20
8.	An uneven network	22
9.	A tailor-made solution – filling a gap	26
10.	Far from routine	28
11.	Seasonal patterns	30
12.	Dominated by small firms	32
13.	Choosing the right level	34
14.	Avoiding delays?	36
15.	Taxi or cruise ship?	38
16.	Looking ahead	40
17.	Improving safety	43
18.	Aircraft type trends	44
19.	Summary and further information	47
A.	Annex: Business aviation aircraft types	49
B.	Annex: The top 25 airports for business aviation	53
C.	Annex: Summary of business aviation per State	56
D.	Annex: Summary of traffic per aircraft type	58
E.	Annex: Monthly traffic patterns in the busiest States	60
F.	Annex: Daily traffic patterns in the busiest States	62
G.	Annex: Hourly traffic patterns in the busiest States	64
H.	Annex: The largest European business fleets	66
I.	Annex: The busiest country-pair flows	67

1. Why look at business aviation trends?

This is a time of change for business aviation in Europe. New business models for business aviation have been gaining ground in the USA for some years. Although the legal, social and geographical conditions are different, these new business models are being increasingly adapted for use in Europe. The result is that the business aviation traffic segment is growing faster than the overall air traffic market. However, the growth is not uniform, so we need to ask where and what the growth is.

Taxiing to the runway today is a new breed of aircraft. Here we will call them the 'very light jets' and set aside arguments about categories and sub-categories. The first ones came into service in 2007, many in business aviation roles; in the USA they are already a means to try further new business models. But how many will there be in Europe? When? And where will they fly?

The biggest market segment in air traffic – the scheduled carriers – is well known and well documented. There is no argument that business aviation is different from scheduled, but until the publication of the first volume of *Trends in Air Traffic*[1], few knew quite how different it was. Two years on from that report we are in a better position to assess the growth of the segment, and its interaction with scheduled aviation.

This report addresses these questions. It updates to 2007 the figures previously provided and, where appropriate, comments on the changes since 2005.

This report will be of interest to anyone involved in business aviation. However, we must declare that our perspective is an air traffic management (ATM) one. That means we are more concerned with need for safe capacity than the need for passengers. What does business aviation need from air traffic management now and in the future, and how does that affect the service ATM provides to other airspace users?

We have used two main seams of data: EUROCONTROL's rich archives of data on flights; and a study in 2005 that we commissioned which explored the industry and interviewed a broad sample of those involved in business aviation in order to obtain a broad overview of how business aviation works.

This report brings these two strands together. It provides statistics which summarise business aviation now, considers the future outlook and discusses the implications of both for air traffic management.

[1] *Getting to the Point: Business Aviation in Europe*, EUROCONTROL *Trends in Air Traffic*, Volume 1, May 2006.

2. Some definitions

There is no single best definition of 'business aviation'. For this report, as in the original report, the simplest approach has been selected: business aviation is defined via a list of aircraft types. These aircraft types are listed and discussed in Annex A. They include jet-, turboprop- and piston-engined aircraft.

In some examples the report makes comparisons with scheduled traffic, and 'scheduled' traffic is taken to consist of all flights filing an 'S' (meaning 'scheduled') in their flight plans; in other sections the comparison is with all 'other' traffic, which is everything which is not business aviation, and so includes military, scheduled, charter (using any type of aircraft not on the business aviation list) and non-business general aviation.

All the flights considered here are operating under 'instrument flight rules' ('IFR'), which basically implies that they are under the control of an air traffic controller for some or all of the flight. Statistics on flights under the alternative 'visual flight rules' (VFR) are difficult to obtain. However, in interviews several business aviation operators commented that in Europe, VFR is not a viable alternative, for example because of the difficulties of providing their customers with a reliable service in poor weather or at night. We believe the restriction to IFR is not a significant limitation for our analysis.

3. So what is the business model?

Business aviation is operated under a number of different business models. The International Business Aviation Council (IBAC) classifies business aviation operators in three categories[2]:

- **Commercial:** Aircraft flown for business purposes by an operator having a commercial operating certificate. Typically these are on-demand charters ("air taxis"), fractional operators, but for the new very light jets "per seat, on demand" services are just beginning in the USA.

- **Corporate:** Non-commercial operations with professional crews employed to fly the aircraft (e.g. corporate fleets).

- **Owner Operated:** Aircraft flown for business purposes by the owner of the aircraft.

This report covers all three types of operation. Inevitably, the definition based on aircraft-type also picks up some operations that are not strictly for business. For example, aircraft types that are suitable for business use are also sometimes used for training, so there is some overlap with training flights in our statistics. Similarly, military and state flights by these types of aircraft have not been excluded. Some of the 'business aviation' types may also be used for hospital flights, and they will be included in the statistics. Figure 2 illustrates the potential overlaps in the definition.

It is worth also considering the types of aviation that are not considered 'business aviation' for the purposes of this report, even though they are clearly focused on the business traveller. Business class travel on scheduled flights is excluded. In particular, this exclusion includes the new breed of business class-only flights:

- Business class-only flights operated for the large scheduled carriers are excluded.

- A further recent development, scheduled carriers that have started solely to serve the business market are excluded.

These are excluded simply because they fall outside the aircraft-type definition.

Rotary-wing aircraft are not included in this report in 'business aviation', even though the business model or customer base for helicopter services is often similar. Helicopters flown IFR are in the data, and are classified as 'other'.

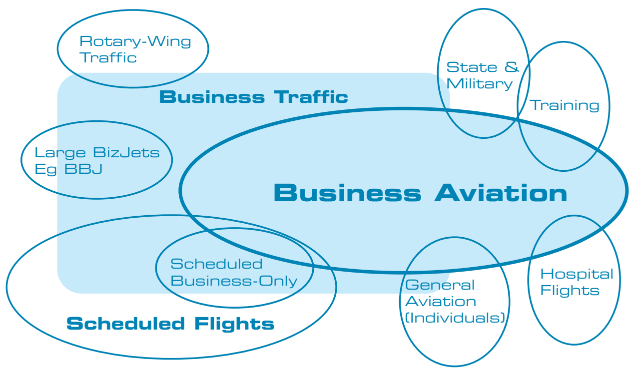


Figure 2. 'Business aviation' as defined here overlaps with other types of flight.

[2] Business Aviation Safety Brief, Summary of Global Accident Statistics, 1998-2002, Issue 2, March 2004.

4. Growing

In 2007, 7.8% of all IFR flights in Europe were business aviation. Since 2001, this segment has grown more than twice as quickly as the rest of air traffic. Flights by business jets are growing particularly strongly, by more than 12% in both 2006 and 2007, as new business models enable growth that is driven by the needs of the global economy, by increasing profits and prosperity, and by a growing acceptance of the economic benefits. Regulation and lack of infrastructure, however, mean that the traffic volumes seen in the US are unlikely to be seen in Europe in the near future.

In 2007 there were 764,000 business flights in Europe, which was 7.8% of all IFR flights in the EUROCONTROL Statistical Reference Area (ESRA)[3]. This segment of the traffic is growing at more than twice the rate of other traffic: 49% more flights in 2007 than in 2001, compared to a 19% increase for the rest of air traffic.

In 2007 business aviation grew by 9.8%, after registering 11.3% growth in flights in the FIFA World Cup year of 2006. This was not evenly distributed amongst the engine types (jet, turboprop, piston). In spite of the fuel price jump at the end of 2004, the number of flights by business jets grew by 8.6% in 2005, turboprops had a modest 2.1% increase, and piston aircraft flew 2% fewer flights. Since then, turboprop traffic has grown more strongly in 2006 and 2007, but piston-engined business aviation has remained fairly static at around 50,000 flights per year.

There are many underlying reasons for this growth, for example: globalisation means more business travel; since 9/11, there is a general perception of greater delays at airports, mostly because of security constraints; growing prosperity brings this sort of travel within the reach of more companies and individuals; changing European social perspectives which recognise the value of business aviation rather than seeing it as a luxury; and a stronger euro making dollar-priced aircraft cheaper.

Couple these reasons with the main enablers - new business models and new aircraft types making business aviation increasingly accessible - and the recipe is for continuing growth.

There are however inhibitors to growth. In particular for business aviation: lack of airfield infrastructure is a challenge; and regulation in Europe is different from the US, for example there is a requirement for two pilots on commercial services. In general, as with other air traffic segments, there are questions about the prospect of increasing environmental regulation and on the future oil price, but if anything business aviation seems likely to be less sensitive to these than the lower-cost end of air travel.

[3] The ESRA (2002) consists of the airspace of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Finland, France, FYROM, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Malta, Moldova, the Netherlands, Norway, Portugal (including Azores), Romania, Slovakia, Slovenia, Spain (including Canary Islands), Sweden, Switzerland, Turkey, and the United Kingdom.

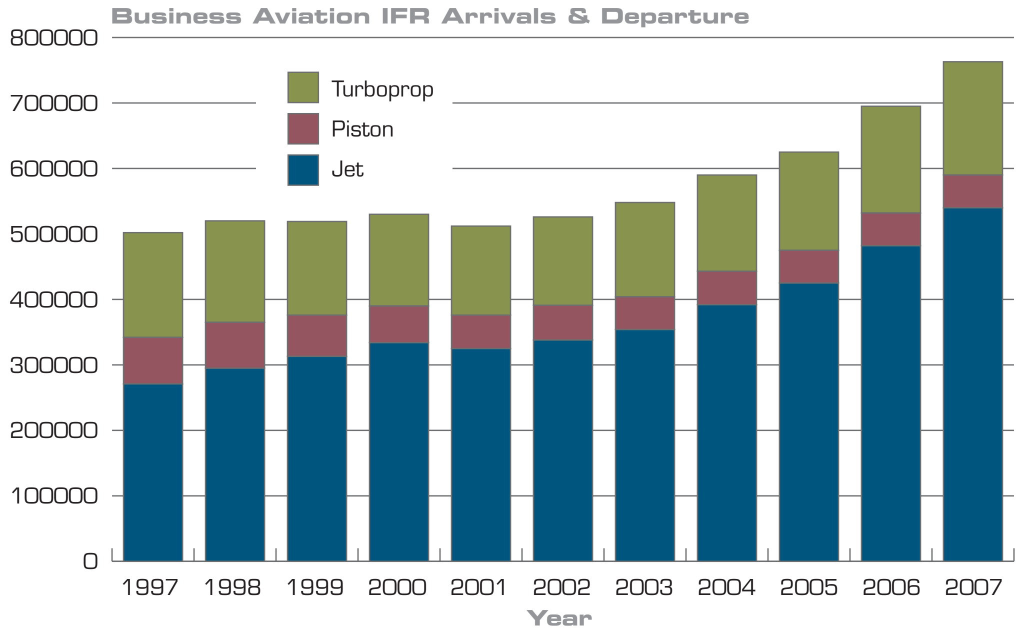


Figure 3. Business aviation traffic in Europe has grown strongly since 2001

Movements at Airports in ESRA	Business								Other	
	All		Jet		Piston		Turboprop			
	Movements ('000s)	Growth (%)	Movements ('000s)	Growth (%)	Movements ('000s)	Growth (%)	Movements ('000s)	Growth (%)	Movements ('000s)	Growth (%)
1997	502	.	271	.	71	.	160	.	6,456	.
1998	520	3.6%	295	8.8%	70	-1.2%	155	-3.1%	6,874	6.5%
1999	520	-0.1%	313	6.4%	63	-10.7%	143	-7.5%	7,358	7.0%
2000	530	2.0%	334	6.5%	56	-10.9%	140	-2.1%	7,691	4.5%
2001	512	-3.5%	325	-2.7%	51	-8.6%	136	-3.2%	7,618	-1.0%
2002	525	2.5%	338	4.0%	53	3.0%	135	-1.1%	7,500	-1.5%
2003	548	4.4%	354	5.0%	50	-5.4%	144	6.8%	7,740	3.2%
2004	589	7.6%	392	10.5%	51	2.1%	147	2.1%	8,085	4.5%
2005	625	6.0%	425	8.6%	50	-2.2%	150	2.1%	8,421	4.2%
2006	696	11.3%	482	13.4%	50	0.5%	163	8.9%	8,695	3.2%
2007	764	9.8%	540	12.1%	50	-0.1%	173	6.1%	9,052	4.1%

Figure 4. Since 2001, the number of business flights has been growing faster than other traffic, with jets leading the way

5. New aircraft, new challenges?

The first deliveries of very light jets began in 2007 in Europe. It is clear that their low price and operating costs open up new possibilities, but the size of this new market under European conditions remains an open question.

To add to the already robust growth of the business jet market, 2007 saw new aircraft types come into service in Europe: the very light jets (VLJs).

Technology now allows the manufacture of less expensive, lighter jets with lower cost of operation. The first VLJ aircraft - Cessna Mustang and Eclipse 500 – have started flying in European airspace, albeit with some delay compared to expectations two years ago.

The Embraer Phenom 100 should enter service at the end of 2008. Section 16 examines the question of future growth.

The VLJ manufacturers are relying on their ability to bring new users into the business jet market, due to the performance characteristics and affordability of the new product. The companies believe that the low acquisition and operating costs will persuade owners of piston and turboprop aircraft to trade up to the jet market. Since there are nearly ten times as many people in Europe with wealth of \$5-30M compared to those with more than \$30M, it is clear that halving the costs of jet ownership far more than doubles the potential for private ownership.

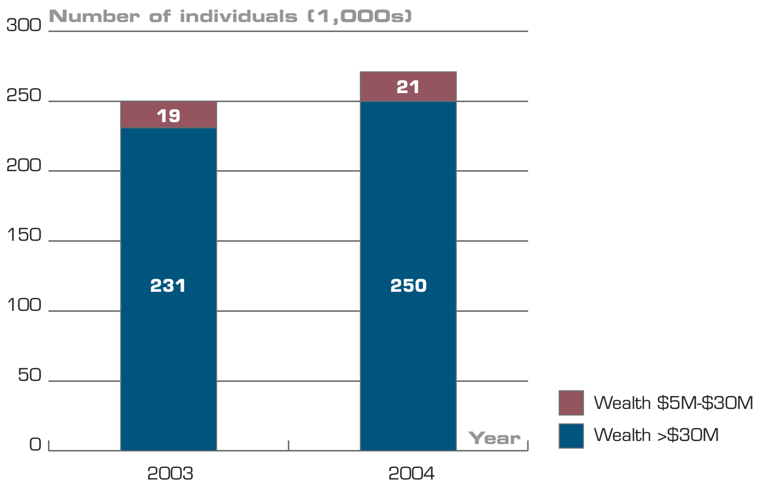


Figure 5. The number of high wealth individuals in Europe increases very quickly as the threshold for 'high wealth' decreases.[4]

[4] World Wealth Report 2005, Capgemini and Merrill Lynch.

The Embraer Phenom 100 is one of the aircraft looking for a share of the very-light jet market

Another point in favour of the VLJ is its ability to land on shorter airstrips, thereby accessing more airfields that are potentially less congested and closer to final destinations. Later sections will show how this is already true for existing business aircraft types.

A key cost factor for VLJs is that of single pilot operation. Unlike the USA, most European countries currently require two pilots for all commercial flights. If there are no changes to legislation on this issue, the economic arguments for VLJs may not be as convincing in Europe, particularly for air taxi operations. Moreover, given the VLJ's short range there will be less spill-over from US growth than for the current mix of business jets, some of which often cross the Atlantic.

Until recently, supersonic jets seemed relevant only to the long-term forecast. Two companies (Aerion and SAI) are planning jets that are expected to launch around 2014 (now slightly later than expected in 2006), but though supersonic aircraft could be a market success in the long term, in the next ten years they are expected to have only a small market niche and not to make a great impact on the general business aviation market activity due to high prices (~$80M). Aerion's forecast suggests a demand for 250-300 aircraft worldwide over ten years.

6. Business aviation is spread thinly

Business aviation is the real point-to-point form of air travel. This generates time savings which make it a commercial proposition, not a luxury, but it also spreads the already small volumes of such air traffic amongst a large number of small airports: only a third of business aviation departures are from airports with more than 100 IFR departures/day, although this proportion has increased since 2005. The challenge is to provide the infrastructure that is needed at other small airports.

There has been much discussion of the relative merits of point-to-point and hub-and-spoke operations for scheduled aviation, but it is business aviation that provides the ultimate in point-to-point service. In many cases, the main reason for taking business aviation rather than a scheduled service is that it takes the customer from the nearest airport to their starting point to the nearest airport to their destination. This saves time in ground transfers and in aircraft changes. An hour in a turbo-prop might cost €2000, a jet €3000-€6000, but if you are a large multinational company needing frequent transfers of staff between offices in cities that are not linked by scheduled services, if you need rapid access to a once-a-year event, or if you have factories to visit where labour costs are low and transport infrastructure less developed, then the business case can be made.

In addition to the specific requirements from passengers to fly to the nearest airport, in any case there can be difficulty in accessing the largest airports. Many of the bigger airports in Europe are geared to scheduled traffic:

- Their business models are built on throughput of passengers so, with runway capacity scarce, aircraft carrying large numbers of passengers are more attractive.

- In addition, lighter aircraft are more sensitive to the turbulent wake vortices generated by other aircraft; a lighter aircraft cannot land so close behind a heavy aircraft as a second heavy aircraft can. Therefore a small business jet takes more of the scarce landing time than a much larger jet carrying more passengers, which makes small aircraft operations doubly unattractive to some airports.

- The slot allocation and flow management processes work best for aircraft operators with a regular pattern of flights planned months ahead.

For a fractional operator or air taxi firm working to ten hours notice, in effect this makes smaller airports the only option. It also means that their customers do not always get what they want: connecting with a long-haul flight at a major airport, for example.

It therefore comes as no surprise to see that, in 2007, only a third of business departures were from airports with 100 or more departures per day (see Figure 6 left-hand side) although this is up from 30% in 2005. For all IFR flights 60% of departures are from airports with 100 or more departures per day (see Figure 6 right-hand side).

As a result, the busiest 100 business aviation airports have only 60% of the business traffic whereas the top 100 airports for all traffic together have 75% of all movements (see Figure 7).

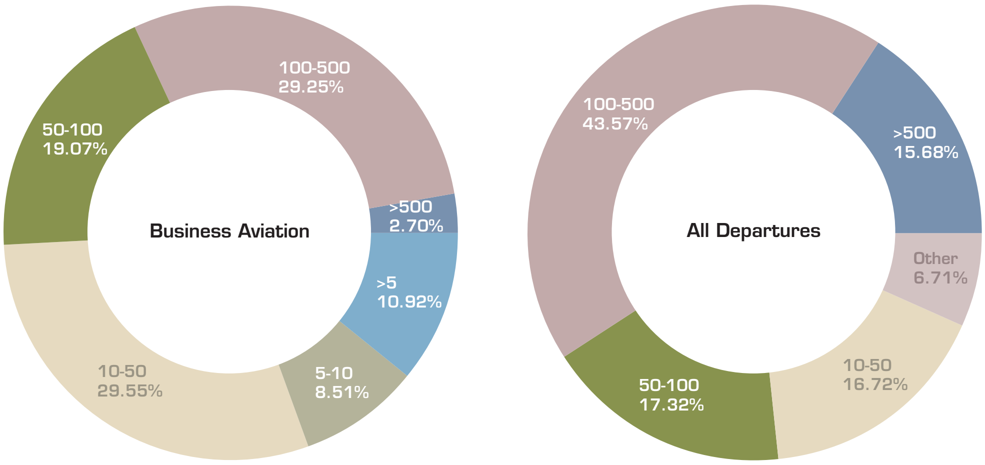


Figure 6. Business aviation is a small market spread thinly: half of traffic is from airports with fewer than 50 departures/day. (2007)

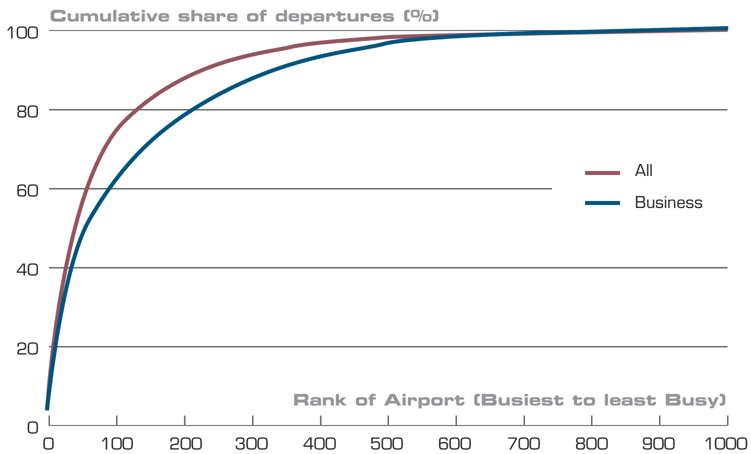


Figure 7. Business aviation is a small market spread thinly: the top 100 airports have only 60% of the traffic. The top 100 airports overall have 75% of the traffic.

Statistics for business aviation at airports in 2007 are given in Annex B.

This distribution of traffic suggests that, if they do not need access to a major hub, business aviation customers are getting the provision they need: a true point-to-point service. But providing the ground infrastructure is a challenge. Of course, there are large airports that are geared to business aviation and have business models that suit: Geneva for example. There are also airports that specialise in business aviation, such as Le Bourget, Farnborough or Torrejon. Elsewhere, the traffic does not justify the investment; only 11% of the 1100 airfields in Europe[6] able to accept business aviation have fixed-base operators providing specialist ground handling, servicing and other support for business aviation.

This is not a question of VIP lounges, because the business traveller does not want to spend time in lounges, although crews may need rest areas. Instead the need is for ground transport, fuel, maintenance, catering and, because Europe still has so many borders and half of business flights cross those borders, customs facilities.

[5] It is calculated as the sum of the squared market shares in percent: so an industry with three companies with 40%, 30% and 30% market shares would have an index of $40^2+30^2+30^2=3400$.
[6] 116 of 1178 civilian airports with paved runways over 600m. Sources: ALG analysis of Handbook of Business Aviation in Europe 05-06 and Aircraft Charter World Appendix.

7. The main European states

Business aviation is concentrated in six European States, with Switzerland in particular having twice the share of business aviation compared to its share of the rest of the air traffic market.

Business aviation is concentrated in six States in Europe, each with more than 5% (100 business movements per day) of business movements at airports and between them accounting for 67% of all business movements in 2007. Five of these States have a 5% or larger share of total departures, and they are joined by Switzerland, which has only 2.7% of other movements. Between them, France and the United Kingdom account for 30% of all business movements, compared to 26% for other traffic. (Figure 8, Figure 9 and with more detail in Annex C).

In 2005 it was France and Germany which were the biggest business markets. At the time they had a slightly larger combined share, 33%. So the business market is becoming more dispersed as it grows.

From an air traffic management point of view, overflights are also important. Figure 10 shows the total number of business movements in each airspace, divided into local traffic (departing from or landing at an airport there) and overflights. Here there are ten zones with more than 100 movements per day (Belgium and Luxembourg airspace is combined into one zone), and the ordering is slightly different because Germany and Austria have a significant proportion of business aviation overflights.

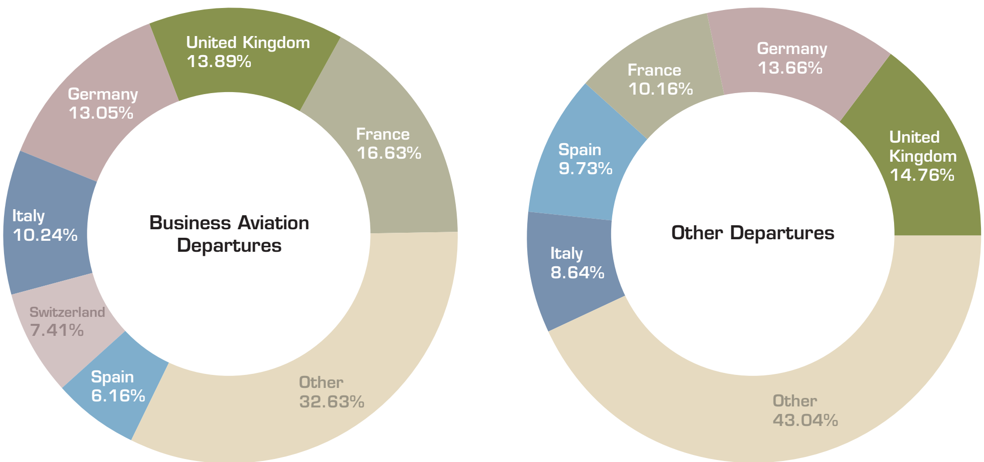


Figure 8. Business departures are concentrated in six States. (2007 total figures).

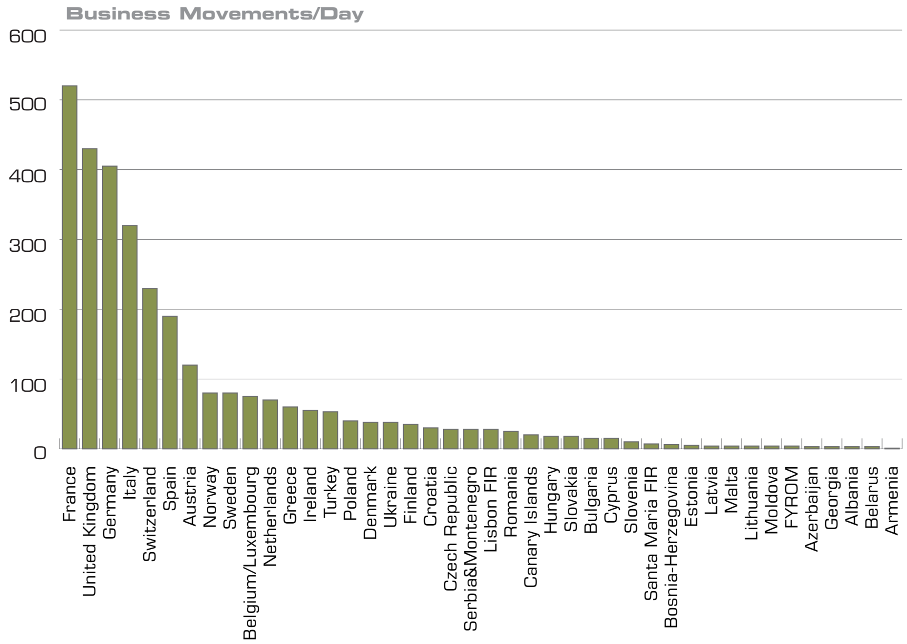


Figure 9. Excluding overflights, seven states had more than 100 business movements per day in 2007.

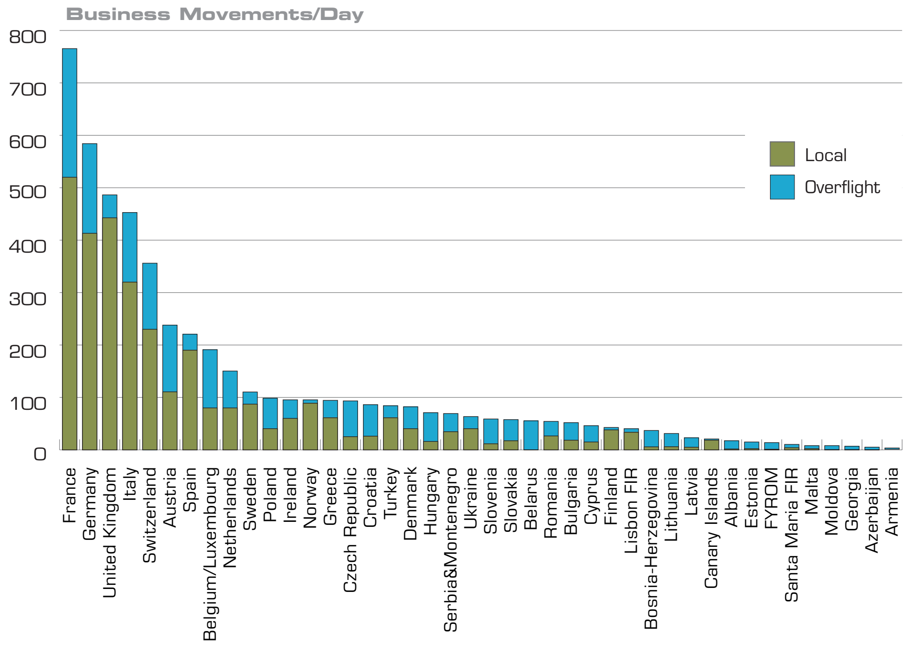


Figure 10. When overflights are added in, there were ten States with more than 100 business movements per day in 2007.

8. An uneven network

The network of airport pairs linked by business aviation has more than 100,000 links, three times as many links as the scheduled network. It carries much less traffic and, for some parts of the industry, the aircraft fly empty 40% of the time on positioning flights.

Air traffic is often described as using a network, with airports as the nodes and the routes between them as the links. Scheduled traffic uses some links more often than others, from a minimum of once a week in the Summer up to 60 times per day every day for busy links such as Madrid to Barcelona. Figure 11 shows this regularity: there were nearly 30,000 airport pairs in the scheduled network in 2007. Some 3000 airport-pairs are connected by scheduled flights one or two times per week, and around 1000 are connected seven times per week.

Business aviation also follows a network, but it is a very strange network. The business aviation network has three times as many links as the scheduled services, over 100,000 in 2007. However, as Figure 11 shows, most of the airport pairs (note the logarithmic scale) served by business aviation are flown less than once per week.

For scheduled traffic, the number of flights from airport A to airport B matches the number of flights back again. Figure 12 (right-hand side) shows that nearly all of the traffic has a similar number of flights from A to B as B to A. The rare exceptions are the occasional circular route, technical stops, and flights filed as 'scheduled' which were not.

For business aviation, perhaps surprisingly, there is also a significant portion of the traffic between airport pairs which see the same number of flights in both directions (and this portion has increased since 2005). These might be frequent links used by company shuttle services for example, or cases of non-business aviation use of an aircraft type from our business aircraft list. But the majority of business aviation flights are on airport pairs served seven to nine times in one direction for every ten in the other. One of the causes of this could be air taxi or fractional positioning flights. A rate of four positioning flights in every ten flights would not be unusual, and worse than one to one can happen (e.g. in the least efficient case, a flight from A to pick up passengers in B to take them to C, to return to the home base at A). On the extreme left of Figure 12 the largest number of airport pairs and still a significant portion of the business aviation traffic – are the routes flown mostly in one direction.

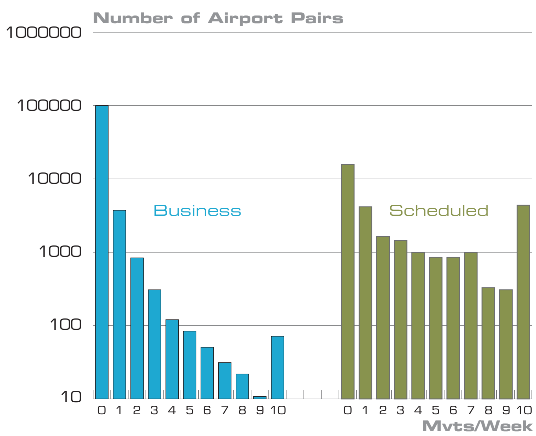
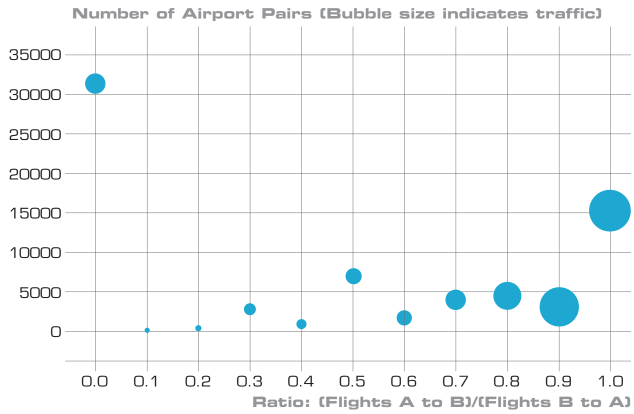


Figure 11. Business aviation rarely flies the same route twice. Nearly all business airport pairs are flown less than once a week. For scheduled traffic there are as many airport pairs flown ten times/week as once/week.



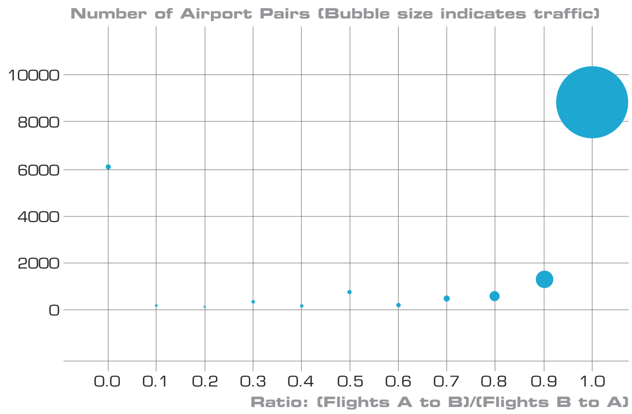


Figure 12. Business aviation is less there-and-back than is scheduled. Nearly all scheduled traffic has the same number of trips from A to B as from B to A (right-hand graph, large bubble). Business aviation commonly has only 0.7-0.9 return trips, and has more than 30,000 airport pairs flown in only one direction in 2007.

Network management tools that match flights more efficiently to passenger demand are still in their infancy. The future growth of demand for business aviation will make network management easier, but what 'critical mass' of flights is required for this is not clear. Yield management tools could also increase the scope for filling up the positioning or return flights, by finding a price that attracts demand for seats that would otherwise be empty. However, that too requires a large-enough market.

Geographically, the network is different from the scheduled network. Figure 13 makes clear that the scheduled network is organised around the capital cities or main population centres, where the large carriers have their bases. Darker lines indicate busier routes. The 500 routes shown had some 8,500 movements/day in 2007: 39% of all scheduled traffic.

Figure 14 shows the top 500 business aviation routes. In total they represent 590 movements/day in 2007, only 28% of all business traffic. So while the darker lines had more than one movement/day, the lighter ones will not have been used every day. Figure 15 shows how this network concentrates traffic along a London-Rome axis, taking in Paris, Geneva, Cannes and Milan on the way and with more than 50 business movements per day in some areas stretching as far East as Vienna. There are also a number of specialised markets: Moscow, the Norwegian Fjords and some island services being obvious examples. Annex I gives details of the main country-to-country flows.

8. An uneven network

This illustrates how business aviation is not about providing a multi-functional network that meets all needs, or about ferrying people from the wet North-West to the sunny South. Instead it links specific major business centres, often at short range. As business aviation traffic grows, this could create its own problems: adding a large proportion of its traffic to an area that is already the busiest airspace in Europe.

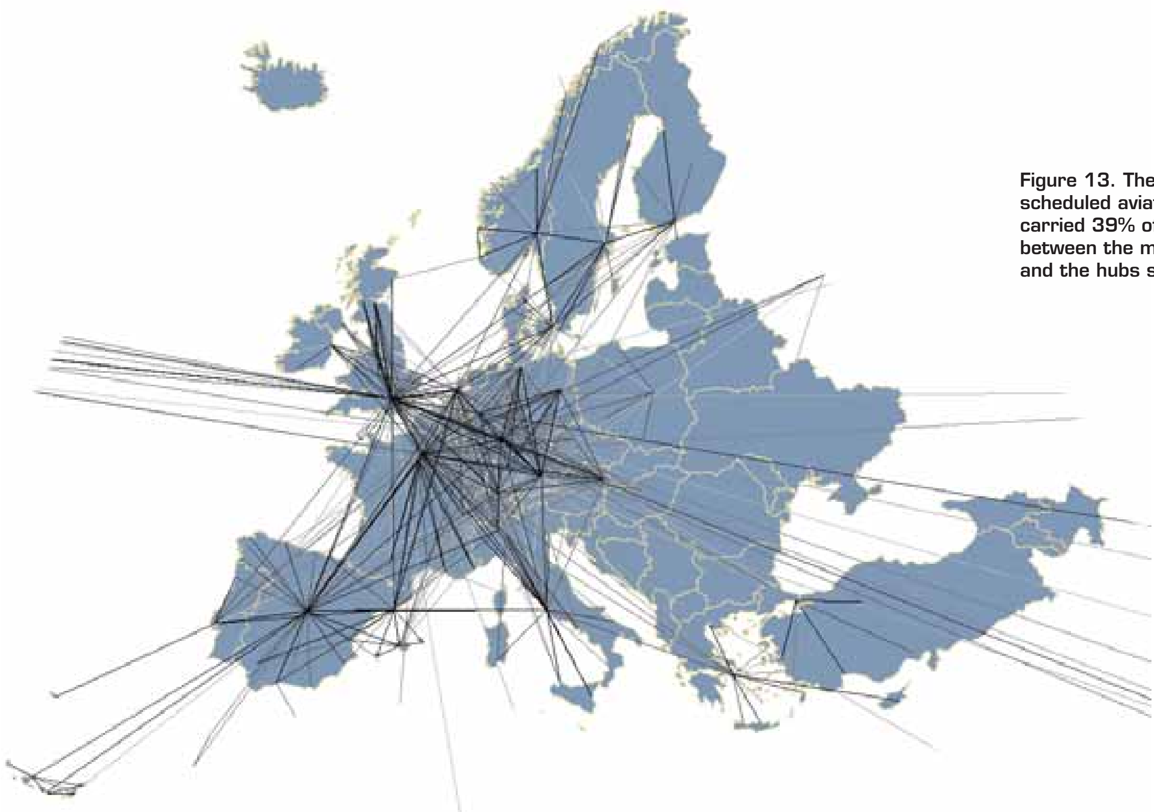


Figure 13. The top 500 bi-directional scheduled aviation routes (2007) carried 39% of scheduled flights between the main population centres and the hubs show up very clearly.

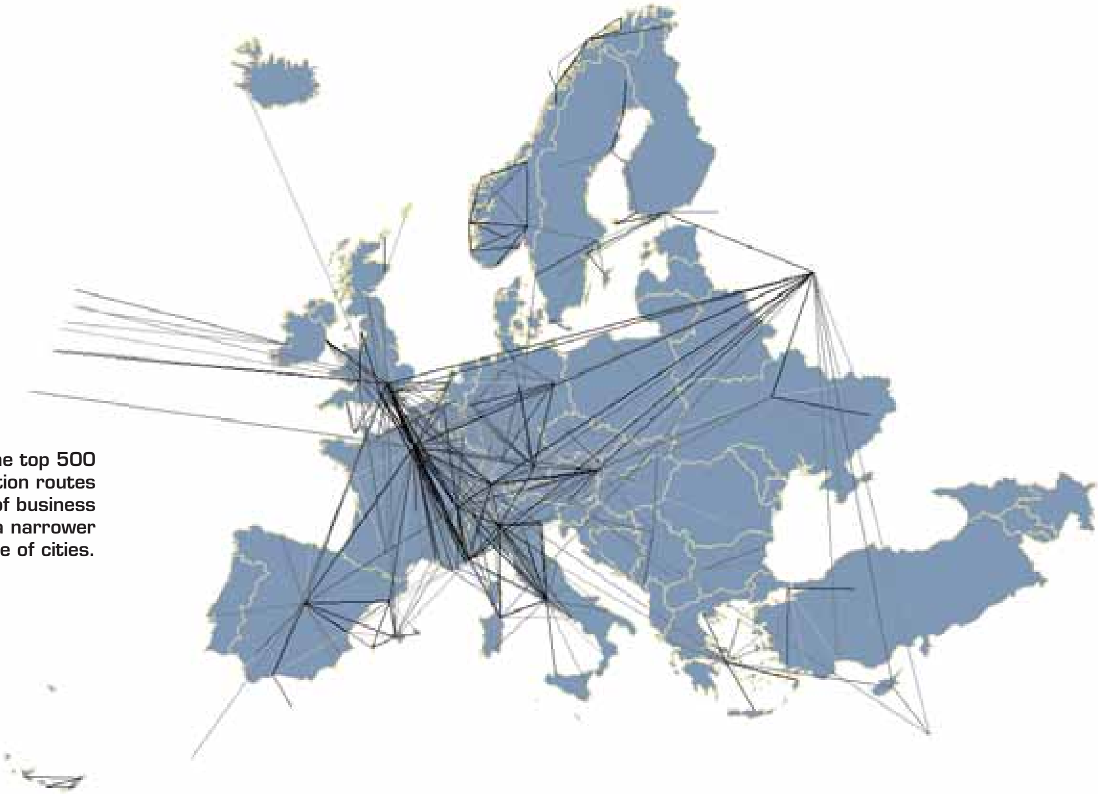


Figure 14. By contrast, the top 500 bi-directional business aviation routes (2007) carried just 28% of business aviation between a narrower range of cities.

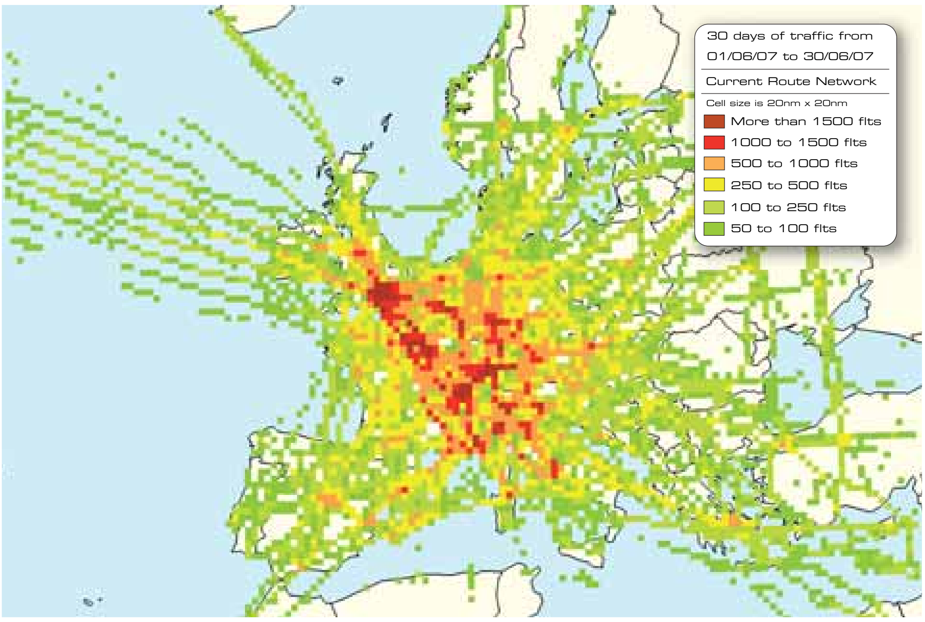


Figure 15. The densest business traffic is in a region roughly extending from London to Rome.

9. A tailor-made solution – filling a gap

Business aviation is not about taking passengers from the front cabin of a scheduled flight and flying them in their own aircraft. Business aviation fills a gap in scheduled services: two thirds of business flights were between cities not served by daily scheduled flights.

Business aviation flies when it is needed and cuts out check-in times, but it has another advantage which is less well documented: flying where it is needed.

In 2007, over 100,000 different airport pairs were flown by business aviation. Of these airport pairs, only 5% had a scheduled alternative: at least one scheduled flight per working day. (Here, a flight from airport A to B is separate from a flight from B to A, so one per working day gives a there-and-back-in-a-day option to travellers). Figure 16 shows these data and emphasises just how little overlap there is between airport-pairs served by scheduled and business aviation.

Of course, as we have already discussed, specific customer demand and difficulties of airport access mean that business aviation often flies to different airports than scheduled: Madrid/Torrejon rather than Barajas; Paris/Le Bourget rather than Charles de Gaulle; London/Luton, Farnborough and several others instead of Heathrow or Gatwick. Only three of the busiest ten airports overall have more than 3% business aviation (see Figure 44 in appendix B).

Even if we switch to looking at city pairs, the pattern remains. In Figure 17, major airports at cities such as London and Paris have been grouped together. The overall number of pairs of cities is of course smaller. In this figure, the size of the bubble indicates the number of business flights. It is clear that a significant portion of business aviation is between a few cities well-served by scheduled airlines (four or more times/day in each direction). However, two thirds of the flights and the large majority of the routes are between cities that have an infrequent scheduled service, i.e. less than daily. So, both in terms of airport-pairs and city-pairs, business aviation fills a gap in the schedules.

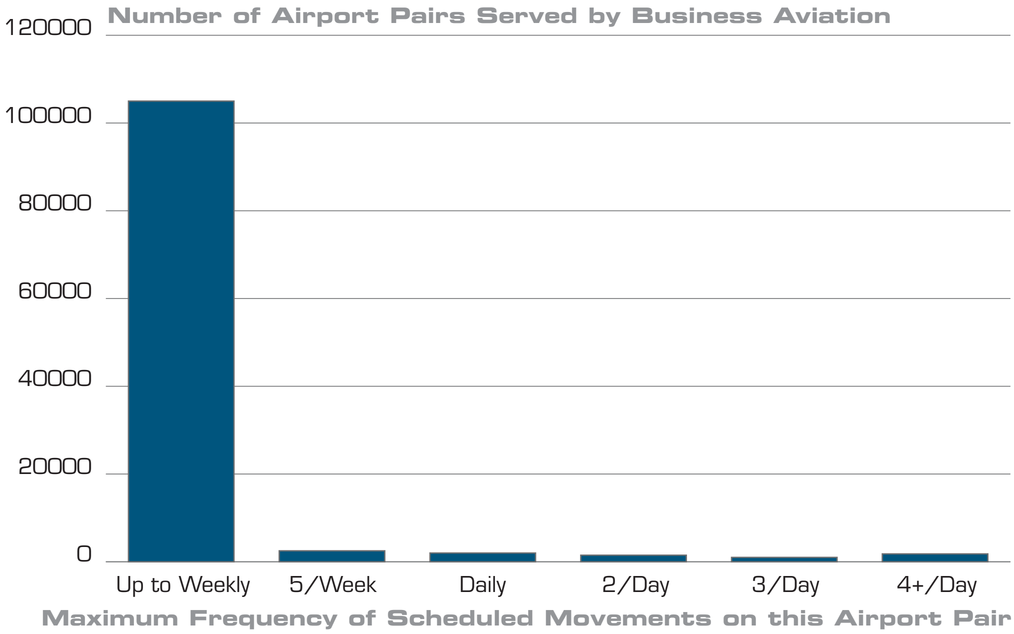


Figure 16. Business aviation typically flies airport pairs that are not covered by scheduled services.

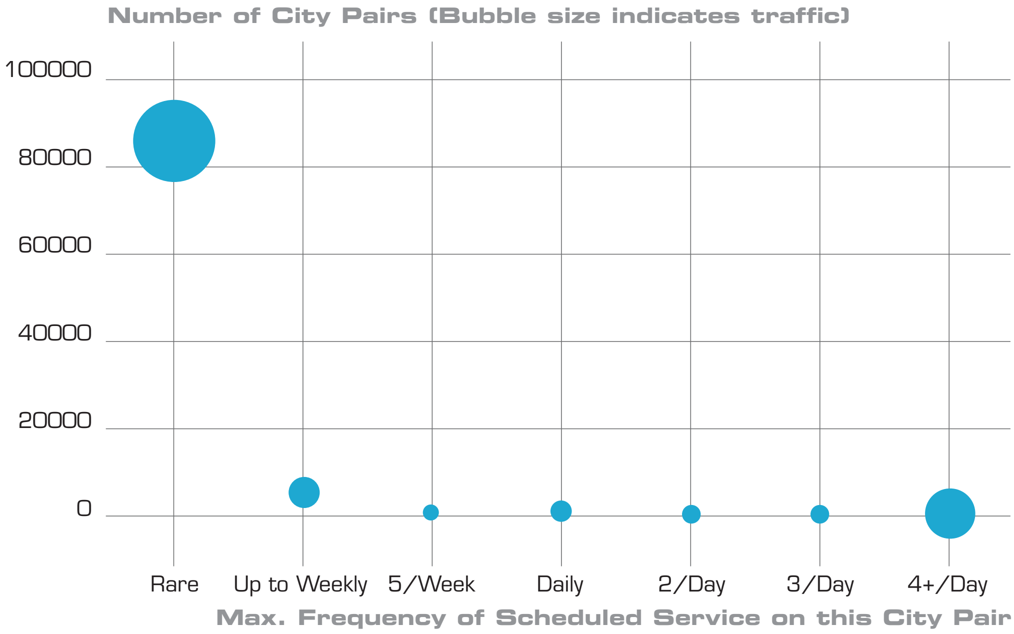


Figure 17. Two thirds of business flights in 2007 were between city pairs not served daily by scheduled services.

10. Far from routine

Although there is relatively little business aviation traffic, at airports it generates more and bigger peaks at short notice compared to scheduled traffic. This therefore consumes a disproportionate amount of flow-management resources.

We've seen already that the large majority of airport pairs are flown by business aviation less than once a week (Figure 11). This follows naturally from the service-on-demand principle which typifies business aviation. However, this high level of service does not lead to a uniformly thin and light loading on the total air traffic network.

One of the factors that helps to manage the flow of air traffic is its regularity. Scheduled services and to a lesser extent (tourist) charter traffic are regular, following a rather uniform, predictable pattern. This regularity of the bulk of flights is a great assistance, whether for resource planning a few months in advance as part of network planning, pre-tactical planning on the day before, tactical flow management on the day, or air traffic control once airborne.

A particular interest for EUROCONTROL is flow and capacity management, which the Agency is responsible for coordinating across Europe, through its Central Flow Management Unit (CFMU). Flow management aims, in real time, to match demand to the available capacity: it is safer, more cost-effective and better for the environment if an aircraft waits on the ground before departing rather than be held en route or prior to arrival in the air, or to overload particular sectors of airspace.

Figure 18 illustrates the peaks in business aviation demand. The diagram focuses on airports of the size typically used by business aviation, with up to 100 business or scheduled departures per day. The figure contrasts the average daily traffic in 2007 with the busiest day. For scheduled traffic there is some variation – a 20% difference between weekday and weekend day is not unusual, for example – and in most cases with the scheduled traffic there is little more than this. Where there are bigger differences, perhaps because of tourist changeover days, these are scheduled well in advance and are manageable.

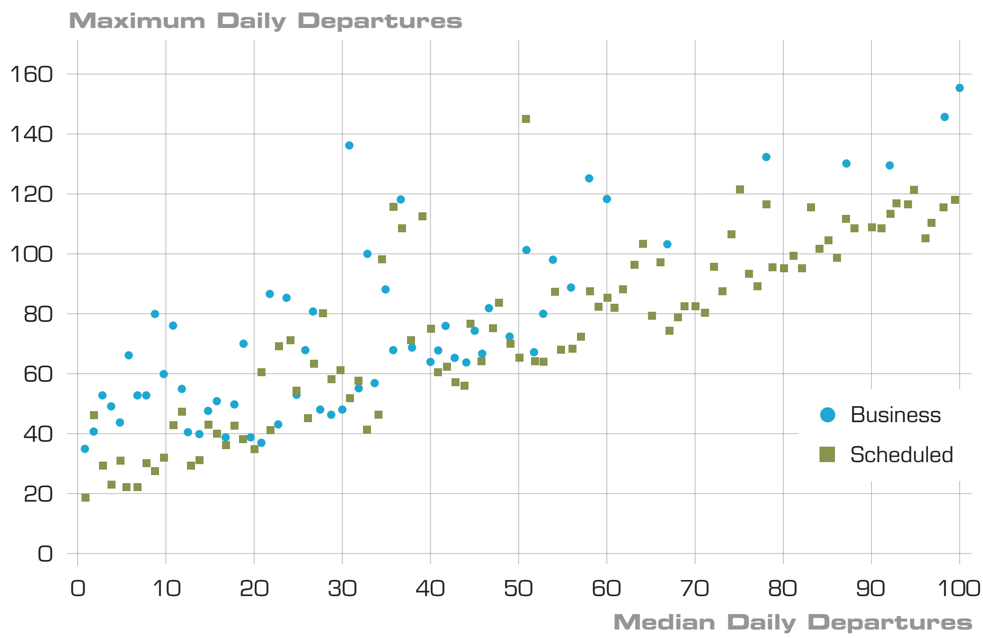


Figure 18. Business aviation generates more, bigger peaks at quieter airports: the maximum daily departures are often several times as big as the average. (Illustrated are airports with up to 100 business or scheduled departures/day in 2007).

The business aviation pattern is much more varied, with many cases where the busiest day carries twice or even higher multiples of the average traffic. Again, some of this variation is due to week-weekend variation, but there are also particular airports where the business aviation demand occurs at very specific periods: trade and business conferences, such the World Economic Forum or film festivals; sporting events, such as Formula 1 Grand Prix; or political summits. Particular examples of these are seen in Annex B (Figure 43): Samedan is the airport used during the World Economic Forum and Speyer airport is used for the German Grand Prix.

Even where they can be anticipated, these peaks can demand specific air traffic flow and capacity management measures to ensure safe, orderly and expeditious flow not only at the airport, but also in the surrounding airspace.

11. Seasonal patterns

Business aviation follows different seasonal patterns from the rest of the air traffic. There is typically a strong drop in demand in August. During the week Wednesday-Friday have most demand, rather than the usual Monday & Friday peaks; and Saturday has only half the demand of the mid-week peak. Departures are on average more uniformly distributed during the day, but start later and end earlier.

Seasonality can be looked at in three ways: month-to-month variation; variation by day of the week; and variation by hour of the day. Data for the busiest States are presented in Annexes E to G. The questions to ask are: does business aviation have different seasonal patterns from the rest of aviation, and does this make it easier or less easy to share scarce capacity in the air and on the ground?

The monthly traffic patterns of business aviation mostly show a pronounced dip in demand in August (Figure 19, left). Even in Switzerland (Figure 19, right) this is true, although Switzerland has an additional ski-season peak in February-March. This Summer dip frees up capacity for holiday traffic and in that sense is quite complementary. But June and September are increasingly the busiest months of the year, and as business aviation - with its June and September peaks - grows, this trend will be reinforced.

During the week, there is most demand for business aviation from Wednesday to Friday (Figure 20, left) and only half that peak demand on a Saturday. So this also to some extent complements the Monday and Friday peaks exhibited by the rest of air traffic – but weekend capacity is not needed. Individual States have variable weekly patterns, especially holiday destinations such as Spain (Figure 20, right), so generalising across all States about the complementarities of weekly demand is difficult.

The same variation means that there are few generalisations to be made about hourly seasonality (Figure 21). For the busiest States shown in Annex G, there is typically a fairly uniform demand during the day, with a slight lunchtime dip, but the demand begins later and ends earlier than for the rest of air traffic. For this other traffic, hubbing creates peaks in the departure flows that are not in evidence for business aviation.

The figure shows the average departures in each hour for business aviation and for all other movements. In the case of business aviation, the average itself can be misleading because there is so much variation from day to day. So for each hour of the day the busiest hour of the year is also shown: these datapoints are thus made up of hours not from one day but from many during the year. In the case of Switzerland (Figure 21, right), the busiest hour (14:00-15:00) had 29 business departures, more than the average at this hour for all other traffic.

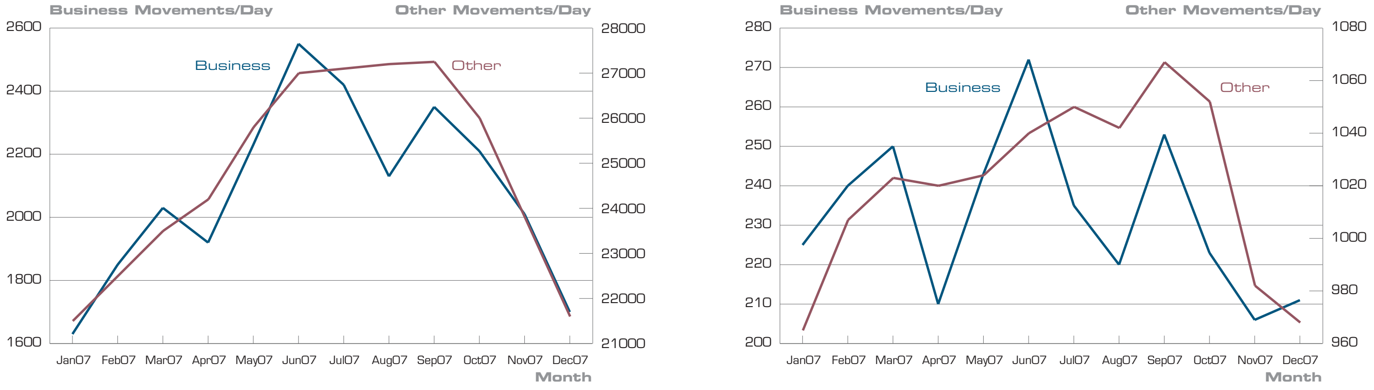


Figure 19. Business aviation has a June and September peak, and an August dip. (2007 Monthly traffic patterns in Europe (left) and Switzerland (right), excluding overflights).

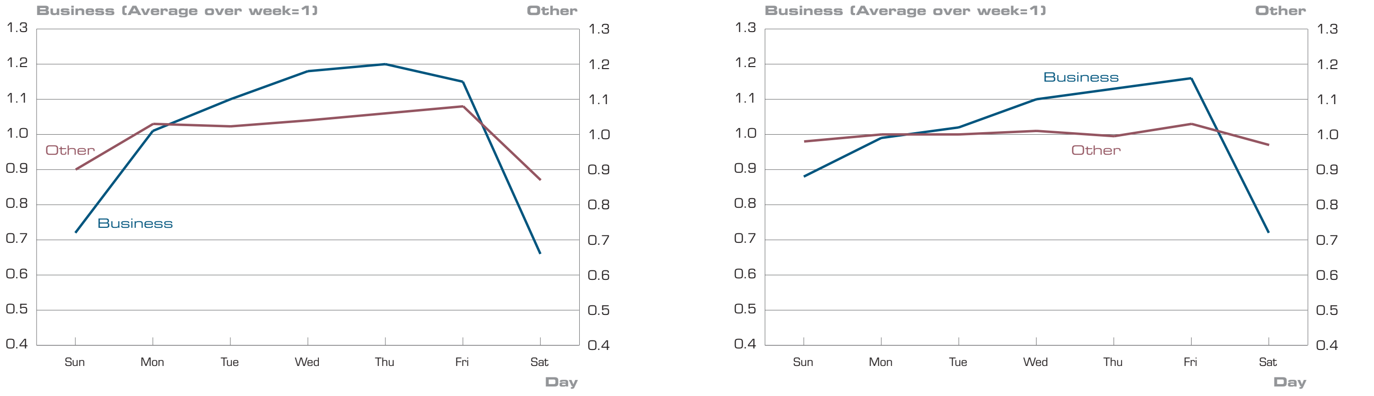


Figure 20. Business aviation has a mid-week, not Monday & Friday, peak, and a big dip on Saturdays. (2007 daily traffic patterns in Europe (left) and Spain (right) excluding overflights).

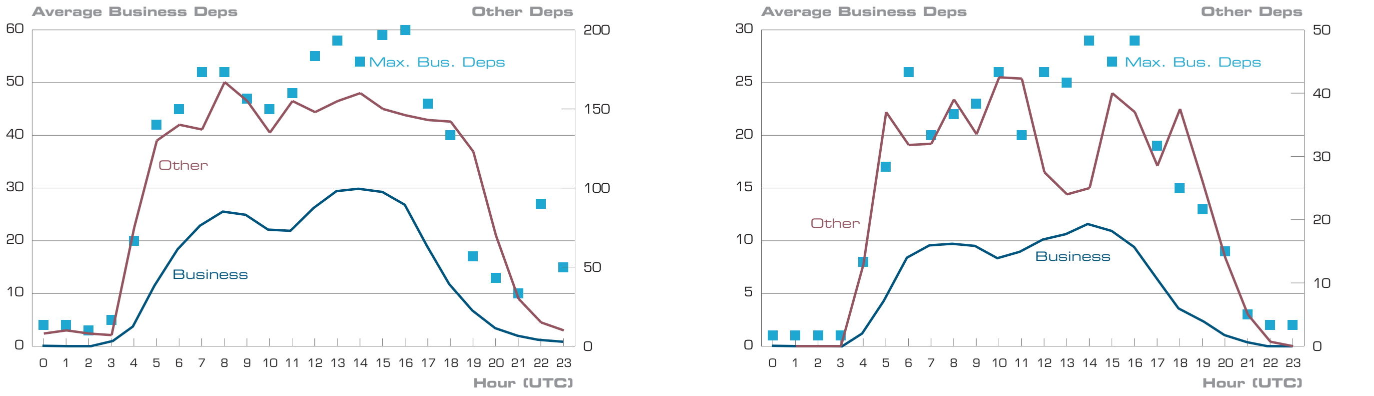


Figure 21. On average, business aviation is fairly uniformly distributed in a shorter working day than other traffic. (2007 hourly pattern of departures in France (left) and Switzerland (right)).

12. Dominated by small firms

Scheduled aviation in Europe has around 700 operators; it's difficult to get precise numbers for business aviation, but the number of operators is at least 700. Since business aviation is ten times smaller, this means that there are many business operators with only one or two aircraft. These individuals, or small firms, have very limited resources to keep up with changes in equipment requirements or other regulations.

The business aviation market in Europe is divided amongst a large number of operators. The precise number is difficult to identify from our statistics, but it's at least 700 operators. Just four of these operators have 1% of market, i.e. they fly more than 1% of the business flights. Figure 22 shows how few large operators there are. The small operators can add up to significant traffic: for example the 0% column of Figure 22 includes a grouping of small German-registered operators who together account for 7% of flights. Similarly the USA grouping accounts for over 3% of flights (and with identified US operators accounts for over 6% of flights).

Another perspective on the same issue is aircraft ownership. Our analysis shows that 80% of business aviation operators registered in Europe have fewer than five aircraft in their fleet. Indeed, as Figure 23 shows, most often they have just one aircraft. The owners of the largest European fleets are listed in Annex H. Note that Figure 23 does not include other business aircraft which fly into Europe but are based elsewhere – Russia, USA, the Gulf Region being prime examples – or are registered elsewhere, even though their flights will be counted in Figure 22.

The scheduled market in Europe has roughly 700 operators, but is more concentrated, with 25 scheduled operators having 1% of the scheduled market.

With the same number of operators in a market which is ten times smaller, this means that there are a large number of individuals and very small firms who make up the bulk of the business aviation industry. As a result, they bring local knowledge and detailed understanding of the passengers' needs, but no economies of scale and no spare resources.

In the future, the number of large fleets is likely to increase, as some operators have large orders of VLJs. However, there is also likely to remain a large number of operators with very few aircraft.

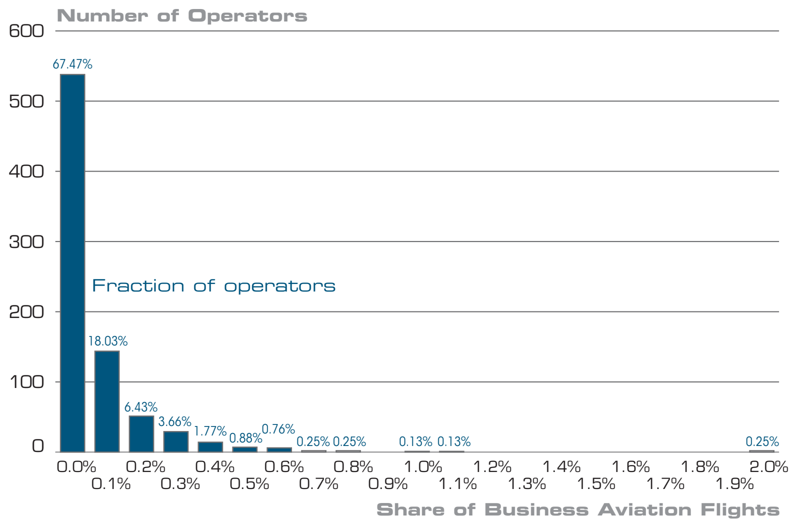


Figure 22. There are few business aviation operators with more than 1% of the market (number of flights).

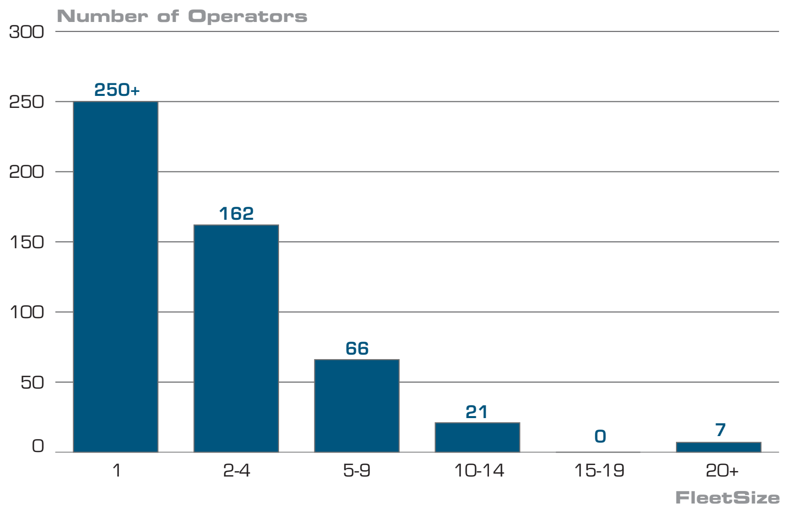


Figure 23. Indeed, 80% of European operators have fewer than five aircraft. Source: PRISME-Fleet, for business aircraft registered to operators EU27+ (CH,TU, NO).

13. Choosing the right level

Business aviation prefers to fly in several narrow ranges of altitude. Although this is sometimes intended to avoid flight levels that are busy with other traffic, and hence avoid delays, in fact this increases the competition and interaction with other users. Typically, it's only for flights of 1000km or more that business jets get above the main flows of other traffic.

Every IFR flight files a requested flight level (RFL) in its flight plan. Each flight level is 1000 feet high, so flight level 35 is at approximately 35,000 feet up. For clarity of communication, a zero is added, so flight level 35 is written FL350. The RFL is chosen by the operator based on the performance of the aircraft, the most efficient level, the distance travelled, the weather, traffic and other factors such as anticipated congestion. The RFL is often, but not always the level at which the aircraft cruises.

Figure 24 shows the RFLs filed by business aviation in 2007. It tells a number of stories:

- 29% of business aviation has a RFL of 350 or above: operators say they like to stay above the bulk of the traffic and manufacturers say that operators are always asking for better performance at high levels. This is just 1% more than observed in 2005, but FL380 is now clearly the level the most frequently-requested by business aviation, with the grouping at FL270-280 declining in importance since 2005. However, the rest of the air traffic has a strong cluster around 350: about 34% of other flights ask for FL330-370. Seven years ago, there was little other traffic above FL350, but the main flow of scheduled traffic is flying higher as new aircraft come into service. This is producing an overlap between business and other traffic. Furthermore, high-flying business flights still need to pass through the busy levels to get up to their RFL which generates complexity for air traffic controllers, although they tend to do this only for flights of 1000km or more (Figure 25).

- There is a second traffic cluster at FL280 and below, although of lower importance than in 2005. Many business aviation trips are short, so it is effective to stay low, below traffic and hence reduce the potential for any en route delays. It also avoids Reduced Vertical Separation Minimum (RVSM) airspace[7], which is at FL290 and above. To enter RVSM airspace airframes require specific equipment and approval. It is noticeable that few turboprops ask for higher than FL290 – the main exceptions are the B350 (e.g. Beech Super King 350) in the low 300s and the P180 (Piaggi 180) in the upper 300s. The Eclipse VLJ is reported as having an optimum level of around FL310 and the Phenom 100 FL350-370.

- At lower altitudes, differences in business aircraft type are evident, with a significant number of piston aircraft below FL190.

[7] http://www.ecacnav.com/RVSM, where vertical separation is 1000 rather than the usual 2000 feet.

As business and other traffic grows this clustering of demand will increase the scope for competition in two ways: business and other aircraft will want the same levels, and where the two traffic segments are looking for different levels, the need for other air traffic to pass through layers of business aviation to get to their desired level, and vice versa.

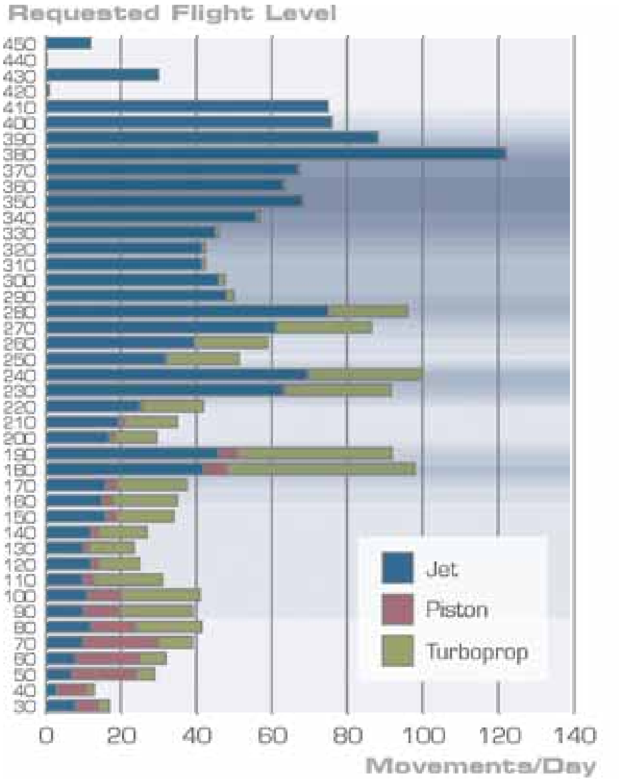


Figure 24. Requested Flight Levels of business aircraft (2007). (Shading shows density of non-business traffic).

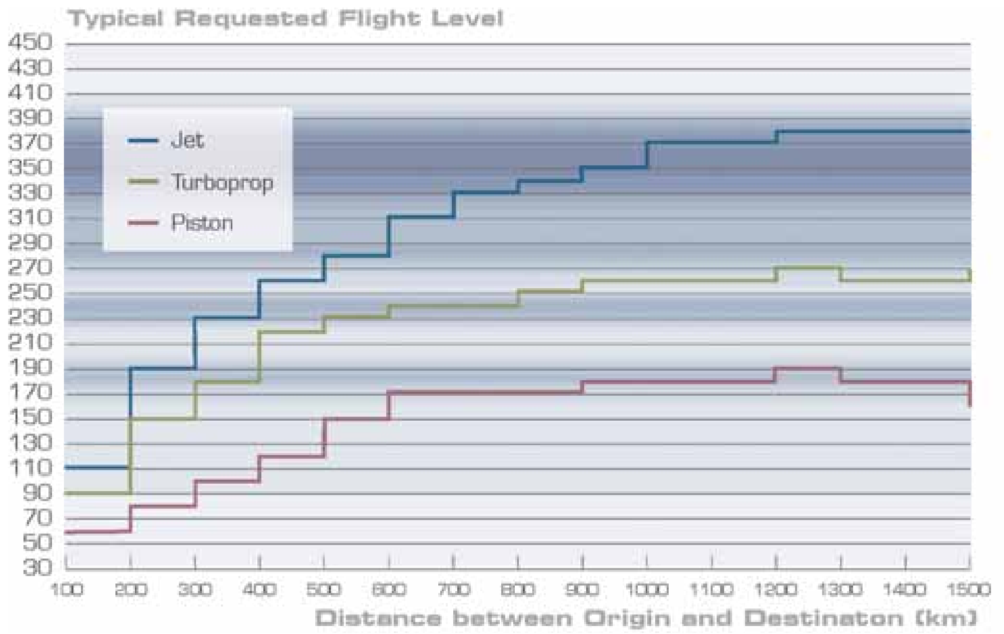


Figure 25. Only at the longest ranges do business jets get above the main flow of traffic (2007). (Shading shows density of non-business traffic).

14. Avoiding delays?

Business aviation's twin strategies for avoiding delays – using smaller airports, and avoiding congested flight levels – succeeded in giving fewer than average delayed flights in 2007, but average minutes of delay per business flight was still the same as the global average. Of the two strategies, the airport strategy was more successful, as the majority of delays for business aviation are en route.

Earlier sections have described how difficulties in access mean that business aviation avoids the main airports, but how the customer requirement for access with minimum delays influences this too. The previous section showed business aviation choosing less congested flight levels. The question is does business aviation achieve fewer delays by these means?

Operationally, some business flights are more time-sensitive than others: "ferry-in" flights, when an aircraft might arrive 90 minutes early to pick up passengers, are less time-sensitive than flights actually carrying passengers.

Two sorts of delay are often quoted. The Central Office for Delay Analysis (CODA) (www.eurocontrol.int/coda) is the authoritative source of data on both, collating data from the CFMU and from airlines.

- Air traffic flow and capacity management (ATFCM) delays, which are applied to prevent overloads of air traffic control at airports or en route. Data on these are available for all IFR flights.
- The total delay from all sources. This includes ATFCM delay, plus delays due to operational problems of airlines or at airports, such as late baggage, security delays etc. Data on these delays are available for a large sample of scheduled flights from CODA. ATFCM delay may be only 10-20% of the total.

Data on total delay for business aviation is far from complete, so the data here have been limited to ATFCM delays.

Type	Fraction of Movements Delayed	ATFCM Delay/Movement (minutes)	ATFCM Delay/Delayed Movement (minutes)
Business	15.9%	2.3	14.5
Other	14.9%	2.0	13.2
Scheduled	21.0%	2.3	10.9
Total	**19.9%**	**2.3**	**11.3**

Figure 26. Business aviation is successful in avoiding ATFCM delays (2007 data).

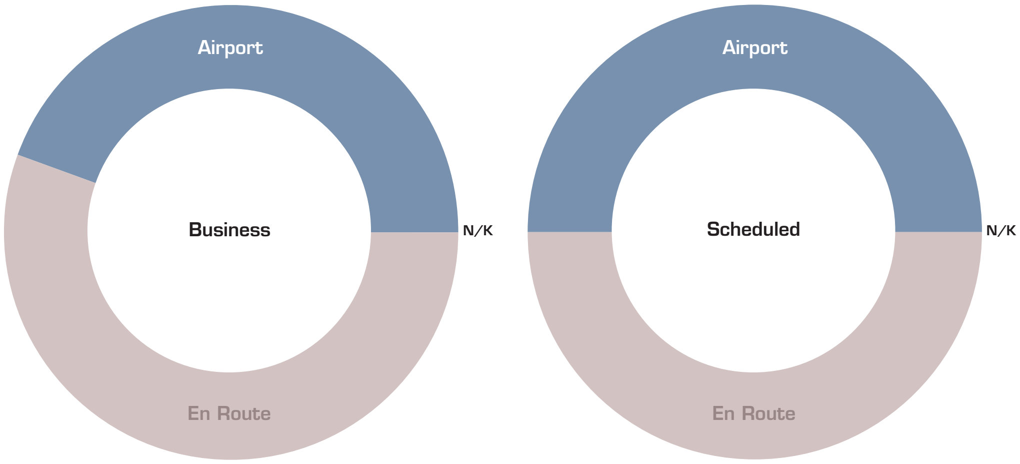


Figure 27. Business aviation (left) experiences more en route than airport ATFCM delays. (2007 data).

Figure 26 shows statistics on ATFCM delay in 2007. Fewer business aviation flights (15.9%) were delayed than the average (19.9%) and business aviation clearly did better than scheduled traffic (21% delayed). But the average minutes of ATFCM delay per movement was the same, at 2.3 minutes, whereas in 2005 the average delay per business movement (1.7) was lower than per scheduled movement (2.0). The delays even out because those business flights that were delayed on average had worse delays than average (14.5 minutes), so the delays for business flights were concentrated in a few instances.

Of the two strategies – avoiding congested airports and avoiding congested flight levels – it is the former which is more successful. Figure 27 shows that in 2007 scheduled traffic had a roughly even split between ATFCM delays because of airport capacity and due to capacity issues in en route airspace. Business aviation, on the other hand, had proportionately more en route delays. As section 13 reported, this is in part because the highest flight levels, which were previously used predominantly by business aviation, are increasingly being used by scheduled traffic.

15. Taxi or cruise ship?

Business aviation has its share of long-haul journeys, but only about 10% of business flights are over 2000km. Most business flights are shorter than scheduled flights, with half under 500km: for business aviation the taxi is a better metaphor than the ocean liner.

The majority of business aviation does not fit the image of the intercontinental, jet-set traveller. There are certainly long- and medium-haul routes as the map in Figure 14 showed, but for the bulk of business aviation, the air taxi is a more accurate metaphor than the ocean liner. Only 28% of scheduled flights in Europe are under 450km (Figure 28), but for business aviation 45% are under 450km and the most common range is 250-350km (Figure 29).

This requirement for shorter distances is reflected in the large proportion of turboprop and piston aircraft in the business aviation fleet. Since 2005, the typical distance flown by turboprop or piston on a business flight is unchanged, but the distance for jets is significantly higher (median 650km in 2007 versus 600km in 2005). In spite of this increase, as Figure 30 shows, business jets still fly shorter distances than scheduled traffic (average 716km), where scheduled traffic includes both jets and turboprops.

Some of the short distances are determined by the aircraft rather than the passenger. For example, depending on the load and the aircraft type, it might be necessary to stop off to re-fuel on a trip between Marrakech and London. Many of the stops shown at Shannon on Figure 14 will be re-fuelling stops too.

Just as business aviation links airports that scheduled aviation does not (section 9), it also serves distances over which scheduled traffic, with its fixed timetables and extended check-in times, can not practicably serve.

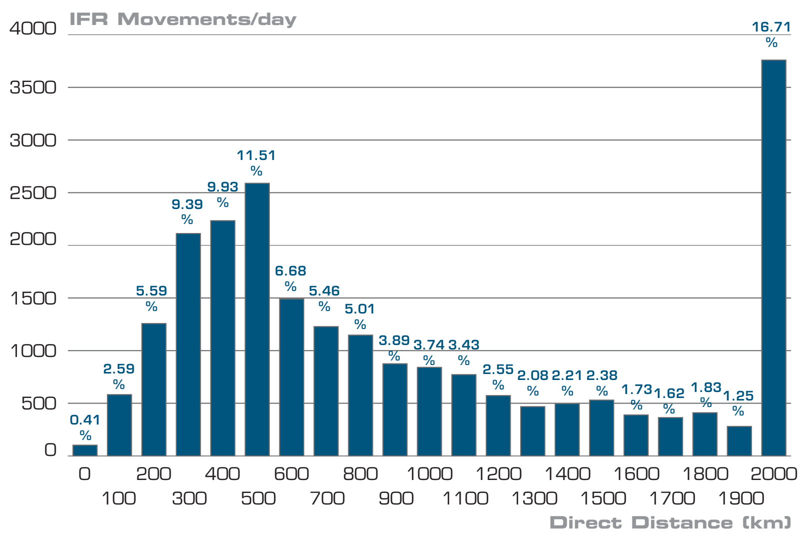


Figure 28. Scheduled services in Europe fly a broad range of distances.

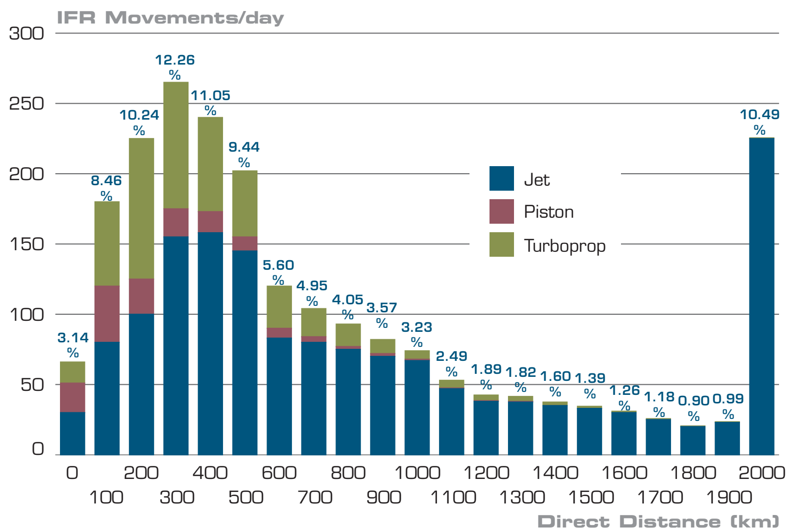


Figure 29. Half of business aviation flights are less than 500km.

		Airport Pairs (Thousands)	Median Distance (km)	Mean Distance (km)
Business	Jet	86	649.2	1124.5
	Piston	15	184.7	270.7
	Turboprop	39	325.3	418.1
Other		112	996.8	1524.0
Scheduled		33	716.4	1460.5

Figure 30. Summary of traffic by distance and type.

16. Looking ahead

The European fleet of business aircraft has grown strongly in the last two years to around 3,000 airframes. In particular, deliveries at the high end of previous forecasts, coupled with transfers onto the European registers have resulted in nearly 70% more European-registered business jets than 2 years ago. By looking at a range of published forecasts, we estimate that the fleet will grow to around 4,600 by 2017. If air taxi operations do, as expected, grow strongly on the back of very light jets, then 2,200 additional flights/day over 10 years is possible which would be a contribution of around 0.8 percentage points/year to total growth in traffic of 3.7%-4.7%/year.

We have already reported on how growth in business traffic accelerated from 2005 to 2007. In 2005, we also estimated that the business jet fleet could grow from 1100 to around 2000 aircraft in 2015, with a high forecast of 2600, based on a number of forecasts published by manufacturers and others[8].

In fact, the European jet fleet has grown by 70% in two years, boosted by not only more than 400 new airframe deliveries but also some 300 transfers to the European registry from other registers. The deliveries are at the high end of the 2005 estimates, but the transfers were not included in those estimates. Whilst some of the re-registrations are of aircraft which were in any case operating in Europe, this does not account for all. This means that the number of aircraft operating in Europe has grown faster than flights, so the average utilisation rates for jets have declined from around 1.1 flights/day in 2005, to 0.8 in 2007[9].

Forecasts for business aviation disagree as to the extent of the growth. Worldwide forecasts for total deliveries of new jets range from Walsh Aviation's projection of 680 jets per year, to Honeywell's 1,400 per year, although the scope and time horizon of these forecasts varies. Europe has received a relatively high proportion of new aircraft in the last years, so we use a European share of 16-20% for the 10-year period. With 10-year replacement rates expected at 25-33%, this means that Europe could see a total jet fleet of between 2,700 and 4,000 aircraft by 2017 with 3,500 as a mid-way baseline.

	Worldwide Forecasted Deliveries	Forecast Period	Yearly Deliveries	Total Value billions US$	Replacement Rate for Period	Europe % of New Deliveries
Honeywell	14,000	2007 – 2017	1,400	233	25%	22% [11]
Embraer	13,150	2008 – 2017	1,315	201		18.4%[12]
Pratt & Whitney	12,200	2004 – 2013	1,220			
Rolls-Royce	22,500	2006 – 2025	1,125	346	33%	
Forecast International	10,900	2004 – 2013	1,090	135		
Teal Group	7,417	2005 – 2014	742	107	26%	12%
Walsh International	6,770	2006 – 2015	677			

Figure 31. Forecasted Business Jet Aircraft Deliveries[10]. Source: Published forecasts.

[8] For this section only, a wider definition of business aircraft is used, to aid comparison with external forecasts.
[9] This is an estimate comparing registered aircraft with operating aircraft, so will tend to be on the high side.
[10] Honeywell at NBAA, 2007; Teal Group, "Business Jet Market Overview," by Richard Aboulafia (In World Aircraft Sales Magazine, June and July 2005); Forecast International Press Releases, 7 October 2003, 21 October 2004; Walsh Aviation, "Business Jet Aircraft Market Outlook and Forecast," at SpeedNews 19th Annual Aviation Industry Suppliers Conference, March 2005; Rolls-Royce, "Business Jet Review and Forecast," presented at NBAA 2006, Orlando, November 2006.
[11] Next 5 years.
[12] For Europe, Africa and Middle East.

Factors that were cited as contributing to the forecasted figures are:

- Order intakes: The high number of fixed orders reported by manufacturers. More than 400 jets were ordered worldwide in the first half of 2007, an increase of 11%[13].

- Growth trend: The accelerated rate of orders particularly from outside the USA.

- New products: All forecasts take into account new products, but these expectations differ for very light jets. Collectively the VLJ manufacturers predict annual production of 1,000 jets. Some industry analysts view this as optimistic, as the number exceeds current total annual jet sales for all types of business jets. Rolls Royce estimates 7,500 deliveries will be VLJs. Honeywell expects a demand for 8,000-9,000 VLJs (including the smallest personal jets) over the next ten years. Embraer expects 3,500-4,400 VLJs worldwide for air taxi services (2008-2017). There is a great deal of interest in VLJs from other aviation sectors, such as logistics, training or other aerial work. This interest is included in the airframe manufacturers' sales expectations, upon which the engine manufacturers base their forecasts.

- Fractional Ownership: Fractional fleets are growing in Europe and expected to continue to do so. Ownership at the levels seen in North America is unlikely to occur, however, due to legislative and tax differences between these regions. Instead, greater importance is given to card programmes, where clients buy flight hours instead of actual shares in an aircraft. At present, fractionals account for 10-15% of the global business jet production and this percentage is expected by some forecasters to increase to between 20-30%[14] over the next ten years, while others expect it to remain in the 10-15% range[15], which may be more appropriate for Europe.

- Economic growth: World economic growth is expected to continue to follow current positive trends, in the medium- to long-term.

- Emerging international markets: Since 2003 new business jets delivered outside of the U.S. have increased from 23% of the total to approximately 45%[16]. In the long term, economic growth expectations for countries like China, Russia and India will account for much of the growth. Growth in Russia in particular will affect Europe as their fleets travel to and from other European destinations.

These forecast figures include VLJs. EUROCONTROL has been working with air traffic control organisations, manufacturers, operators and others on the integration of VLJ operations into the European air traffic flow[17] As part of that activity, we have estimated around 100 new VLJ airframes per year in Europe over the next few years. This is consistent with the central-to-high forecast for business jets as a whole.

[13] Honeywell Business Aviation Outlook 2007.
[14] Teal Group Forecast; Honeywell Business Aviation Outlook 2005.
[15] Embraer.
[16] Rolls Royce 2006 Forecast.
[17] For example see "European Skies Prepare to Welcome the Very Light Jets", ECAC News, No. 37, pp26-29.

16. Looking ahead

	Jet				Total European Business Fleet 2017		
Scenario	Worldwide yearly deliveries	Europe as % of new deliveries	European deliveries over ten years	Yearly Replacement Rate	Jet	Turboprop	Piston
High Growth	1,400	20%	2,800	25%	4,000	850	400
Central Forecast	1,200	18%	2,160	28%	3,500	800	350
Low Growth	700	16%	1,120	33%	2,650	750	300

Figure 32. Forecast scenarios for Europe 2008-2017. Source: Published forecasts and EUROCONTROL analysis.

Many business aviation users may consider migrating to VLJs over the long term, but long waiting lists preclude immediate deliveries. Some of these customers will seek a turboprop solution in the shorter term. Any slow-down in turboprop deliveries as the availability of VLJs increases may be balanced by their increasing attractiveness at very high fuel prices. So, a market for turboprops will still remain after the cost efficient jets arrive, most notably for use at high altitudes and in rural areas that have airfields with short runways[18]. In addition, turboprop performance over short distances is similar to that of a jet aircraft; as controls in congested airport areas prohibit the realisation of full jet speeds, and short distances discourage climbing to high flight levels. As the market for air taxi expands in Europe, boosted by the VLJs, there could be room for expansion downwards into lower-cost (turboprop-based) air taxi. In total, we predict a modest 15% increase in European turboprop fleet size over the ten years, from a base of 700 aircraft in 2007, to 800 turboprop aircraft in 2018[19].

With a slight decrease in piston aircraft, we expect to see the total business fleet registered in Europe (jets, turboprops and piston) to increase to about 4,600 aircraft, up from the 3,000 in service at the end of 2007.

At current rates of flying, this means a further 1300 flights/day over 10 years, mostly by jets. In the high growth case, which is quite achievable on manufacturers' expectations of VLJ deliveries, there would be 1600 more flights/day by 2017. If, as expected, a significant portion of this growth is in air taxi, flown more frequently, then 2,200 additional flights per day over 10 years is more probable. This would be consistent with the high-growth scenario from the recent medium-term forecast[20].

H25B is the third busiest business aircraft type. (Here Hawker 850XP).

[18] "The VLJs Will no Doubt Be Popular, but Don't Count Turboprop Singles Out Yet," Aviation International News, 29 June 2005.
[19] PRISME-Fleet.
[20] EUROCONTROL Medium-Term Forecast, Flight Movements 2008-2014 Volume 1, February 2008.

17. Improving safety

The years 2005 and 2006 were relatively good ones for business aviation safety. With poor data on numbers of passengers, it is difficult to make a precise comparison between business aviation and other modes of transport. However, the fatal accident rates are higher than those for scheduled flights, and fatality rates lie closer to those of rail than of motorway travel.

According to the data in a five year study of business aviation safety, a total of 509 accidents are estimated worldwide from 2002-2006[21]. The study examined business turbine powered aeroplanes, and found that 72% of the accidents were related to turboprop aircraft, while 28% took place with jets. Contrary to the observation made two years ago (on data to 2002), there seems only limited evidence of a downward trend in accident rate in recent years, although 2005 and 2006 had low fatality rates.

Figure 33. Global business aviation accident rates per 100,000 hours flown. Source: IBAC.

As we have seen, even within Europe, scheduled and business aviation fly different distances to and from different airports, so a perfectly-matched comparison of the safety records of the two is not possible. For guidance, a comparison has been made using statistics per departure, in order to reduce the differences in typical operating distances between the two segments. The results are shown in Figure 34 and indicate that globally, business aviation operations by jet could improve their record further, if scheduled jet operations are used as a benchmark.

Since business aviation is typically short-range, with half of flights under 500km (see section 15), it is illuminating to compare accident rates with that of motorway and rail travel, which at that distance could be viable alternatives. In Europe, rates are variable, but on average motorway travel suffers 7.5 fatalities per billion passenger kilometres travelled[22] and the rate for rail travellers is around 0.9 fatalities per billion passenger kilometres. Using the mean business jet flight length of 1100km[23], the 0.18 fatal accident rate for business aviation jet departures worldwide (Figure 34) approximates to 1.6 fatality per billion passenger kilometres travelled. Without knowing how much European safety rates differ from the world averages, this appears to suggest the business jet is safer than taking the car, and of the same order as travelling by train. Even with higher world fatal accident rates and shorter distances (say 420km, from Figure 30) travelled, turboprops have a fatality rate of perhaps 19 per billion passenger kilometre, about twice the rate of motorway travel.

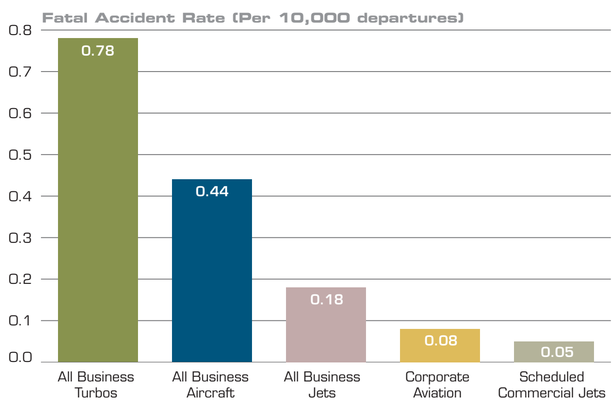


Figure 34. Global Fatal Accident Rates per 100,000 Departures[24]. Source: IBAC.

[21] IBAC Business Aviation Safety Brief, Issue 2, 3 and 6, December 2007.
[22] Traffic Safety Basic Facts 2004: Motorways, SWOV Institute for Road Safety Research, http://europa.eu.int/comm/transport/care/studies/doc/safetynet/ SN-SWOV-1-3-BFS-Motorways_022005.pdf
[23] This also assumes that the average occupants per flight is the same as the average fatalities per fatal accident, which may not be true for small numbers of accidents.
[24] Business Aviation Safety Brief, IBAC, Issue 6, December 2007.

18. Aircraft type trends

Seven jet aircraft types each have 4% or more of business flights. The business turboprop market is more concentrated; the BE20 (e.g. Beechcraft King Air B200) flies more than 8% of all the business flights in Europe put together. Just one piston type remains in the top 25, with around 2% of business flights each in 2005.

Figure 35 shows the 20 business aircraft types that fly the most in Europe (for the top 25 see Figure 47 in Annex D). In particular for the jets, these figures will include a significant number of aircraft registered outside Europe but which fly occasionally or routinely here.

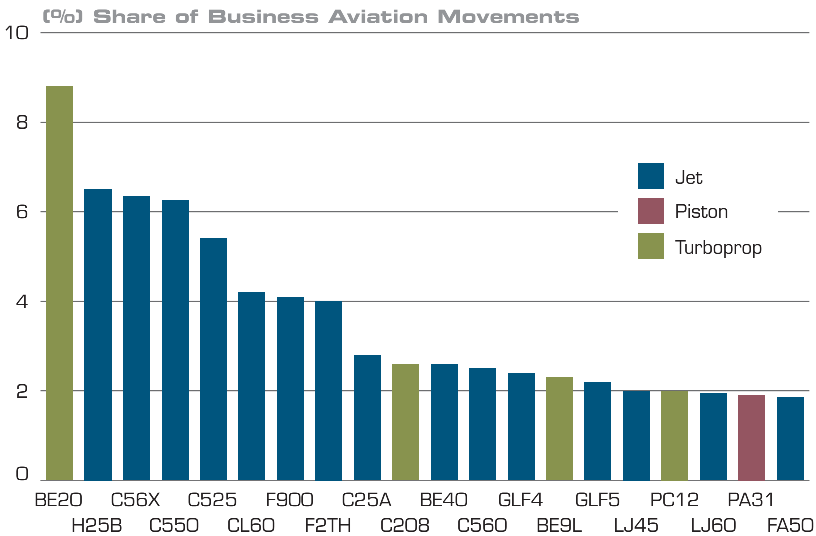


Figure 35. There are now seven business jet types with 4% or more of the business market (2007 data).

Just three turboprop types (BE20, C208 and BE9L) together fly most of the turboprop flights and similarly two piston aircraft types (PA31 and BE58) command a majority in the piston category. Within these five, there have been some changes in ranking since 2005, but none are growing particularly quickly. Fastest growing is the Pilatus PC12, currently the fourth-ranking turboprop, with 30% more flights in 2007 than 2006. But all the other turboprops still have a long way to go to challenge the BE20 (e.g. Beech Super King Air) which has 39% of the turboprop departures.

The business jet market is less concentrated and changing more rapidly: even the busiest two jet types H25B (e.g. Raytheon Hawker 800) and Citation Excel (C56X) flew 20% more departures in 2007 than in 2006. Fastest growing out of the top 25 is the C25A (Citation CJ2) with 40% more departures in 2007 (it was also the fastest growing in the top 25 in 2005).

Figure 36. C550 is the third busiest business jet in Europe (here Citation Bravo)

Figure 37. BE20 is still the business aircraft type with the most departures in Europe (here King Air B200).

Figure 38. Cessna CJ2 remains the fastest growing jet in the top 25 (here CJ2+).

18. Aircraft type trends

In terms of the number of flights per day, business aviation lacks the same predictability that comes with scheduled airline services, but based on these statistics and discussions with operators it is possible to estimate some typical usage rates. Hours flown per aircraft vary by the type of operator, with individuals usually not flying over 250 hours a year. Charter operators represent the other extreme, with aircraft registering up to 1,200 hours a year (see Figure 39). In contrast, an airline will fly a long-range aircraft upwards of 5,000 hours per year, although overall commercial aircraft use averages around 2,000 hours per year.

Aircraft Operator	Hours Flown Annually
Owner	150-250
Corporate	200-600
Charter/Taxi	600-1200

Figure 39. Estimated Hours Flown by Business Aviation Operators.
Source: Interviews with manufacturers and operators.

Business aircraft usage in Europe averages 0.60 flights per day. When broken down between charter fleets and corporate users, the numbers are quite different, with charter fleet aircraft estimated at 0.67 flights per day (just under five per week), and corporate aircraft at 0.3 flights per day (two flights per week).

Aircraft Operator	Hours Flown Annually	Flights per Week
Corporate	0.3	2.0
Charter/Taxi	0.67	4.7

Figure 40. Estimated Flights per Business Aviation Aircraft by Operator Type.
Source: Operator interviews and EUROCONTROL flight statistics.

19. Summary and Further Information

Since 2005, the growth of business aviation has accelerated. The driving forces are: growing corporate and personal spending power; globalisation that means companies are increasingly spread across many locations and countries; new technology that makes business aviation increasingly efficient and affordable; new business models that suit new customers; and travellers who are less willing to accept the perceived or actual hassles of travelling by scheduled services.

Further work is in hand, of which three aspects are highlighted here:

- These studies of business aviation have already led to refinements to the EUROCONTROL forecasts;
- The environmental impact of this segment of the air traffic continues to be examined;
- And the EUROCONTROL Agency is working with industry to assess how very light jets can best be integrated into the air traffic management system.

The continuing growth of business aviation, geographically and in terms of the mix of aircraft types, needs to be monitored. In support of this we have refined the monthly statistics that STATFOR has published for many years: we now provide regular monthly updates to the main business aviation statistics (such as Figures 42, 45 and 46) through a new statistics portal. For access to this portal, please use the contact details on the back cover of the report.

A. Annex: Business aviation aircraft types

There is no single best definition of 'business aviation'. An economic study might define it using the purpose of the trip, but then business flights can only be identified by asking the traveller. This is both costly and sensitive to interpretation. Another approach would be to use a list of aircraft operators, such as members of the European Business Aviation Association, but this list changes from year to year, and especially for business aviation, may miss the large number of very small operators who do not join the association.

EUROCONTROL has a rich archive of flight data. The definition chosen was selected to allow these data to be exploited most efficiently. A number of methods of definition were considered: combining aircraft types, where they flew and who the aircraft operators were. But the simplest – **business aviation defined as a list of aircraft types** – captured the essence of this segment of air traffic, and its simplicity means it is clear what the statistics presented relate to.

Of course, there were discussions about what should be included and what should not. A typical problem was with respect to the same aircraft types used by some operators for training and by others for business. We reviewed the fleets in Europe to make the selection which is given here.

The approach means that the largest business jets, such as the Boeing Business Jet or even B747 conversions are excluded, because in our data they have the same type-code as their counterparts used for scheduled services, but these large aircraft probably make up less than 10% of the business fleet.

Other cases include the Piper34, which are owned mostly by business operators, but are used more by training operators, and so in the end these types were also excluded from the list.

For this study 'business aviation' was all flights by aircraft with the ICAO codes listed in Figure 41 (ICAO Doc8643/35). It is likely that some of the models listed for a particular ICAO code are not flying in Europe, or are included for historical completeness. Furthermore, codes change with time, so the historical data in section 4 are based on this list, plus additional codes where necessary because of code changes. The only change since 2005 is the addition of the C510 (Citation Mustang). The Phenom 100 will be added once its ICAO code is published.

The other definitions used are: 'scheduled' traffic, which consists of all flights filing an 'S', the ICAO code for 'scheduled', in their flight plans; and 'other' traffic, which is everything which is not business aviation, and so includes military, charter, scheduled, and general aviation.

All the flights here are 'IFR' flights, that is flown under 'instrument flight rules', which roughly means under the control of an air traffic controller.

A. Annex: Business aviation aircraft types

	ICAO ID	Manufacturers and Models	Wake Turbulence Category	Engines	Typical Seats
Jet	ASTR	IAI: GULFSTREAM 100 (C-38); 1125 ASTRA	M	2	8
	BE40	BEECH: 400 BEECHJET (T-400)	M	2	8
		RAYTHEON: 400 BEECHJET	M	2	8
	C25A	CESSNA: 525A CITATION CJ2	L	2	7
	C25B	CESSNA: 525B CITATION CJ3	L	2	.
	C500	CESSNA: CITATION 1; 500 CITATION	L	2	6
	C501	CESSNA: 501 CITATION 1SP	L	2	6
	C510	CESSNA: CITATION Mustang	L	2	6
	C525	CESSNA: CITATION CJ1; 525 CITATIONJET	L	2	7
	C550	CESSNA: S550; 552 CITATION 2/S2/BRAVO; 550	L	2	11
	C551	CESSNA: 551 CITATION 2SP	L	2	11
	C560	CESSNA: 560 CITATION 5/5 ULTRA/5 ULTRA ENCORE	M	2	8
	C56X	CESSNA: 560XL CITATION EXCEL	M	2	10
	C650	CESSNA: 650 CITATION 3/6/7	M	2	10
	C680	CESSNA: 680 CITATION SOVEREIGN	M	2	14
	C750	CESSNA: 750 CITATION 10	M	2	8
	CL30	BOMBARDIER: BD-100 CHALLENGER 300	M	2	8
	CL60	CANADAIR: CL-600 CHALLENGER 600/601/604 (CC-144, CE-144)	M	2	19
	EA50	ECLIPSE: ECLIPSE 500	L	2	5
	F2TH	DASSAULT: FALCON 2000	M	2	19
	F900	DASSAULT: MYSTèRE 900; FALCON 900	M	3	19
		DASSAULT-BREGUET: FALCON 900	M	3	19
	FA10	DASSAULT: MYSTèRE 10; FALCON 10	M	2	7
		DASSAULT-BREGUET: MYSTèRE 10/100; FALCON 10/100	M	2	7
	FA20	DASSAULT: MYSTèRE 20; FALCON 20	M	2	14
		DASSAULT-BREGUET: MYSTèRE 20/200; FALCON 20/200	M	2	14
	FA50	DASSAULT: MYSTèRE 50; FALCON 50	M	3	16
		DASSAULT-BREGUET: FALCON 50	M	3	16
	GALX	IAI: GULFSTREAM 200; 1126 GALAXY	M	2	19
	GL5T	BOMBARDIER: BD-700 GLOBAL 5000	M	2	.
	GLEX	BOMBARDIER: BD-700 GLOBAL EXPRESS	M	2	13
	GLF2	GRUMMAN: G-1159B GULFSTREAM 2/2B/2SP; G-1159	M	2	19
		GULFSTREAM AMERICAN or GRUMMAN AMERICAN: G-1159B/TT GULFSTREAM 2/2B/2SP/2TT; G-1159	M	2	19
	GLF3	GULFSTREAM AEROSPACE: G-1159A GULFSTREAM 3/SRA-1 (C-20A/B/C/D/E)	M	2	19
		GULFSTREAM AMERICAN: G-1159A GULFSTREAM 3/SMA-3	M	2	19
	GLF4	GULFSTREAM AEROSPACE: G-1159C GULFSTREAM 4/4SP/SRA-4; G300, G350, G400, G450	M	2	19
	GLF5	GULFSTREAM AEROSPACE: G-1159D GULFSTREAM 5 (C-37); G500, G550	M	2	19
	H25A	DE HAVILLAND: DH-125	M	2	7
		HAWKER SIDDELEY: HS-125-1/2/3/400/600; DOMINIE	M	2	7
	H25B	BRITISH AEROSPACE: BAE-125-700/800 (C-29)	M	2	8
		HAWKER SIDDELEY: HS-125-700	M	2	8
		RAYTHEON: HAWKER 800 (U-125)	M	2	8
	H25C	BRITISH AEROSPACE: BAE-125-1000	M	2	9
		RAYTHEON: HAWKER 1000	M	2	9
	HF20	MBB or HFB: HFB-320 HANSA	M	2	.
	HRZN	RAYTHEON: 4000 HAWKER HORIZON	M	2	12
	JCOM	AERO COMMANDER: 1121 JET COMMANDER	M	2	.
		IAI: 1121 COMMODORE JET	M	2	.
	L29A	LOCKHEED: L-1329 JETSTAR 6/8	M	4	.
	L29B	LOCKHEED: L-1329 JETSTAR 2/731	M	4	.
	LJ23	LEAR JET: 23	L	2	6
	LJ24	LEAR JET or GATES LEARJET: 24	L	2	6
	LJ25	LEAR JET or GATES LEARJET: 25	L	2	8
	LJ28	GATES LEARJET: 29; 28	L	2	10

Figure 41. ICAO aircraft types used to define 'business aviation'.

	ICAO ID	Manufacturers and Models	Wake Turbulence Category	Engines	Typical Seats
Jet	LJ31	LEARJET or GATES LEARJET: 31	M	2	9
	LJ35	GATES LEARJET: 36; 35	M	2	10
		LEARJET: 35	M	2	10
	LJ40	LEARJET: 40	M	2	.
	LJ45	LEARJET: 45	M	2	9
	LJ55	LEARJET or GATES LEARJET: 55	M	2	10
	LJ60	LEARJET: 60	M	2	6
	MU30	MITSUBISHI: MU-300 DIAMOND	M	2	8
	PRM1	RAYTHEON: 390 PREMIER 1	L	2	7
	S601	AEROSPATIALE: SN-601 CORVETTE	L	2	8
	SBR1	NORTH AMERICAN: TP86; NT-39 SABRELINER; NA-265 SABRELINER 40/50/60	M	2	7
		NORTH AMERICAN ROCKWELL: SABRE 40/60; NA-265 SABRELINER 40/60	M	2	7
		ROCKWELL: NA-265 SABRE 40/60/65	M	2	7
	SBR2	NORTH AMERICAN ROCKWELL: NA-265 SABRE 75	M	2	7
		ROCKWELL: NA-265 SABRE 75/80	M	2	7
	SJ30	SWEARINGEN or SINO SWEARINGEN: SJ-30	L	2	6
	WW23	IAI: 1123 WESTWIND	M	2	.
Piston	BE55	BEECH: 55 Baron	L	2	5
		COLEMILL: President 600; Foxstar Baron 55	L	2	5
	BE56	BEECH: Turbo Baron; 56 Turbo Baron	L	2	.
	BE58	BEECH: 58 Baron	L	2	5
		COLEMILL: Foxstar Baron 58	L	2	5
		RAYTHEON: Baron; 58 Baron	L	2	5
	C340	CESSNA or AVIONES COLOMBIA: 340	L	2	6
		RILEY: Super 340; Rocket 340	L	2	6
	C411	CESSNA: 411	L	2	8
	C414	AVIONES COLOMBIA: 414	L	2	9
		CESSNA: CHANCELLOR; 414	L	2	9
		RILEY: ROCKET POWER 414	L	2	9
	C421	CESSNA: GOLDEN EAGLE; EXECUTIVE COMMUTER; 421	L	2	9
	PA31	AICSA: PA-31-350 Navajo Chieftain; PA-31-350 Chieftain; PA-31-325 Navajo CR; PA-31-310 Navajo; Navajo Chieftain; Navajo CR; Navajo; Chieftain	L	2	9
		CHINCUL: Pressurized Navajo; PA-A-31P-425 Pressurized Navajo; PA-A-31-350 Navajo Chieftain; PA-A-31-350 Chieftain; PA-A-31-325 Navajo CR; PA-A-31-310 Navajo; Navajo Chieftain; Navajo CR; Navajo; Chieftain	L	2	9
		COLEMILL: Panther Navajo; Panther 3; Panther 2	L	2	9
		NEIVA or EMBRAER: Navajo; EMB-820 Navajo	L	2	9
		PIPER: T-1020; Pressurized Navajo; PA-31P-425 Pressurized Navajo; PA-31P-350 Mojave; PA-31-350 T-1020; PA-31-350 Navajo Chieftain; PA-31-350 Chieftain; PA-31-325 Navajo CR; PA-31-310 Navajo; PA-31-300 Navajo; Navajo Chieftain; Navajo CR; Navajo; Mojave; Chieftain	L	2	9
	PA44	AICSA: Seminole; PA-44 Seminole	L	2	3
		PIPER: Turbo Seminole; Seminole; PA-44 Turbo Seminole; PA-44 Seminole	L	2	3
	PA46	PIPER: PA-46-310P/350P MALIBU; MALIBU MIRAGE	L	1	.
Turboprop	BE10	BEECH: 100 King Air	L	2	10
	BE20	BEECH: Commuter; 200 Super King Air; 1300 Commuter	L	2	14
		RAYTHEON: 200 Super King Air	L	2	14
	BE30	RAYTHEON or BEECH: 300 Super King Air	L	2	15
	BE9L	BEECH: King Air (90, A90 to E90); 90 King Air; 90 (E90) King Air; 90 (D90) King Air; 90 (C90) King Air; 90 (B90) King Air; 90 (A90) King Air	L	2	9
		RAYTHEON: King Air; 90 King Air	L	2	9
		SWEARINGEN or JETCRAFTERS: Taurus 90	L	2	9
	BE9T	BEECH: King Air (F90); 90 (F90) King Air	L	2	9
	C208	CESSNA: Super Cargomaster; Grand Caravan; Cargomaster; Caravan 1; 208 Super Cargomaster; 208 Grand Caravan; 208 Cargomaster; 208 Caravan 1	L	1	14
	C425	CESSNA: CONQUEST 1; 425 CORSAIR	L	2	8

Figure 41. ICAO aircraft types used to define 'business aviation'. (cont'd)

A. Annex: Business aviation aircraft types

	ICAO ID	Manufacturers and Models	Wake Turbulence Category	Engines	Typical Seats
Turboprop	C425	CESSNA: CONQUEST 1; 425 CORSAIR	L	2	8
	C441	CESSNA: CONQUEST 2; 441 CONQUEST	L	2	10
	P180	PIAGGIO: P-180 Avanti	L	2	7
	PAY2	AICSA: PA-31T-620/T2-620 CHEYENNE 2	L	2	7
		CHINCUL: PA-A-31T-620 CHEYENNE 2	L	2	7
		PIPER: PA-31T-620/T2-620 CHEYENNE; CHEYENNE 2	L	2	7
		SCHAFER: COMANCHERO 620	L	2	7
	PAY3	PIPER or AICSA: PA-42-720 CHEYENNE 3	L	2	10
	PAY4	PIPER: PA-42-1000 Cheyenne 400; Cheyenne 400	L	2	10
	PC12	PILATUS: PC-12	L	1	8
	TBM7	TBM or SOCATA: TBM-700	L	1	.

Figure 41. ICAO aircraft types used to define 'business aviation'. (cont'd)

B. Annex: The top 25 airports for business aviation

This annex gives three views of business aviation at airports:

- Figure 42 shows the airports with the highest average number of business departures per day;
- Figure 43 shows the airports with the highest proportion of business departures per day;
- Figure 44 shows the busiest airports overall, and the proportion of business aviation that they had in 2007.

Paris/Le Bourget is the busiest business aviation airport in Europe (Figure 42). Even though it is not growing as quickly as lower-ranking airports, it is well ahead of the others with an average of 80 departures per day. Of the top 25 airports, it was Le Bourget which had the busiest day in 2007: 202 departures on 21 October, 2.5 times its typical day, following the Rugby World Cup finals.

2007 Rank	2006 Rank	ICAO Code	Airport	2007 Business Deps/Day	2006 Business Deps/Day	Business Growth	% Business	Busiest Business Day
1	1	LFPG	PARIS LE BOURGET	80.2	74.2	8.1%	88%	202
2	2	LSGG	GENEVE COINTRIN	53.8	48.6	10.9%	23%	125
3	4	EGGW	LONDON/LUTON	42.4	37.3	13.8%	26%	72
4	3	LIML	MILANO LINATE	42.3	38.4	10.4%	23%	89
5	6	LFMN	NICE	37.4	31.2	19.7%	19%	136
6	5	LIRA	ROMA CIAMPINO	36.5	35.9	1.6%	38%	75
7	7	LSZH	ZURICH	33.7	29.9	12.8%	9.6%	86
8	8	EGLF	FARNBOROUGH CIV	32.1	25.8	24.8%	90%	82
9	9	LOWW	WIEN SCHWECHAT	26.2	23.3	12.8%	6.9%	56
10	10	LETO	MADRID TORREJON	25.7	22.8	12.7%	72%	55
11	11	EDDM	MUENCHEN 2	22.7	21.9	3.8%	3.9%	53
12	12	LFMD	CANNES MANDELIEU	20.3	18.1	12.3%	88%	65
13	15	EGLC	LONDON/CITY	18.3	17.3	5.7%	15%	35
14	23	EGKB	BIGGIN HILL	18.1	13.7	31.9%	89%	48
15	13	EDDS	STUTTGART	17.9	17.9	-0.2%	8.7%	41
16	14	EDDI	TEMPELHOF-BERLIN	17.3	17.3	-0.3%	50%	47
17	19	LGAV	ATHINAI E. VENIZELOS	17.2	14.6	18.2%	6.3%	70
18	16	LEBL	BARCELONA	17.0	16.4	3.8%	3.5%	39
19	17	LEPA	PALMA DE MALLORCA	16.1	15.7	2.7%	6.0%	40
20	18	EBBR	BRUSSELS NATIONAL	15.0	14.7	1.9%	4.3%	39
21	20	EDDK	KOELN-BONN	14.5	14.5	0.6%	7.1%	35
22	22	EHAM	SCHIPHOL AMSTERDAM	14.5	13.9	4.5%	2.4%	31
23	21	EDDL	DUESSELDORF	14.0	14.1	-0.8%	4.5%	34
24	24	LIEO	OLBIA COSTA SMERALDA	13.8	12.4	11.1%	32%	70
25	25	EIDW	DUBLIN	13.2	12.4	6.6%	4.7%	31

Figure 42. Airports with the most business departures (2007 compared to 2006).

B. Annex: The top 25 airports for business aviation

There are many small airfields where most of the traffic is business aviation. To concentrate on the larger ones, the statistics in Figure 43 are limited to airfields with at least ten business aviation departures on one day in 2007.

For this table, the ranking may be sensitive to the definition of 'business aviation'. Top of the list is a military airfield.
For these small airports, the busiest day is of more relevance to air traffic management, for example:

- Samedan is used during the World Economic Forum meeting in Davos – and the busiest day is eight times the average traffic;
- Speyer is used during the German Grand Prix, when it has more than four times the typical amount of traffic.

Section 10 discusses busiest day issues in more detail.

2007 Rank	2006 Rank	ICAO Code	Airport	2007 Business Deps/Day	Other Business Deps/Day	Proportion Business	Business Growth	Busiest Day
1	1	ETOU	WIESBADEN	4.3	0.1	97%	25%	14
2	2	EDRY	SPEYER	2.6	0.2	92%	(12%)	11
3	4	LSGS	SION	6.6	0.5	92%	43%	35
4	3	EGWU	NORTHOLT	10.4	1.0	91%	-3.0%	27
5	6	EGLF	FARNBOROUGH CIV	32.1	3.8	90%	25%	82
6	7	EGKB	BIGGIN HILL	18.1	2.2	89%	32%	48
7	5	LFMD	CANNES MANDELIEU	20.3	2.7	88%	12%	65
8	8	LFPB	PARIS LE BOURGET	80.2	11.4	88%	8.1%	202
9	9	LSZS	SAMEDAN	4.9	0.7	87%	28%	42
10	12	EDMO	OBERPFAFFENHOFEN	3.8	0.7	84%	5.6%	19
11	11	LFTZ	LA MOLE	3.6	0.8	83%	-1.3%	25
12	17	LFMQ	LE CASTELLET	1.1	0.4	76%	44%	14
13	10	LSZC	BUOCHS	1.8	0.6	76%	-1.7%	10
14	13	EDTY	SCHWAEB.HALL-HESSENT	5.0	1.7	75%	44%	14
15	15	LETO	MADRID TORREJON	25.7	10.0	72%	13%	55
16	18	LFLY	LYON BRON	7.8	3.7	68%	15%	22
17	20	EBKT	WEVELGEM/KORTRIJK	4.3	2.0	68%	36%	13
18	22	EGSC	CAMBRIDGE	3.2	1.5	68%	30%	12
19	19	LFPV	VILLACOUBLAY	6.2	3.2	66%	5.4%	17
20	23	LIRE	PRATICA DI MARE	4.6	2.4	66%	39%	14
21	16	EGBJ	GLOUCESTERSHIRE	2.2	1.5	60%	10%	14
22	14	ESTL	LJUNGBYHED	1.7	1.2	59%	(16%)	13
23	21	LFRM	LE MANS ARNAGE	1.5	1.0	59%	-0.2%	35
24	24	LFQG	NEVERS FOURCHAMBAULT	0.6	0.5	56%	(17%)	33
25	28	EGNR	HAWARDEN	3.6	2.8	56%	14%	11

Figure 43. Airports with the highest proportion of business departures.

Of the busiest ten airports in Europe only Vienna had more than 4% business aviation in 2007. Of the top five airports, all but Amsterdam/Schiphol had less business aviation in 2007 than in 2006, a trend that was also observed comparing 2005 to 2004.

Rank	ICAO Code	Airport	Total Deps/Day	Business Deps/Day	Proportion Business	Business Growth	Busiest Business Day
1	LFPG	PARIS CH DE GAULLE	757	0.9	0.1%	-10.2%	8
2	EDDF	FRANKFURT MAIN	674	11.0	1.6%	-7.2%	24
3	LEMD	MADRID BARAJAS	662	1.7	0.3%	-37.2%	9
4	EGLL	LONDON/HEATHROW	659	3.4	0.5%	-8.4%	11
5	EHAM	SCHIPHOL AMSTERDAM	615	14.5	2.4%	4.5%	31
6	EDDM	MUENCHEN 2	587	22.7	3.9%	3.8%	53
7	LEBL	BARCELONA	483	17.0	3.5%	3.8%	39
8	LIRF	ROME FIUMICINO	459	0.3	0.1%	29.0%	4
9	LOWW	WIEN SCHWECHAT	380	26.2	6.9%	12.8%	56
10	LIMC	MILANO MALPENSA	367	5.3	1.4%	17.5%	17
11	EGKK	LONDON/GATWICK	366	2.7	0.7%	-5.9%	11
12	EKCH	COPENHAGEN KASTRUP	353	3.5	1.0%	-12.2%	11
13	EBBR	BRUSSELS NATIONAL	352	15.0	4.3%	1.9%	39
14	LSZH	ZURICH	350	33.7	9.6%	12.8%	86
15	LTBA	ISTANBUL-ATATURK	337	11.0	3.3%	23.5%	33
16	LFPO	PARIS ORLY	325	0.6	0.2%	55.5%	8
17	ENGM	OSLO/GARDERMOEN	313	13.1	4.2%	7.4%	27
18	EDDL	DUESSELDORF	311	14.0	4.5%	-0.8%	34
19	EGCC	MANCHESTER	301	6.9	2.3%	24.7%	25
20	ESSA	STOCKHOLM-ARLANDA	299	3.4	1.1%	3.5%	14
21	EIDW	DUBLIN	283	13.2	4.7%	6.6%	31
22	EGSS	LONDON/STANSTED	283	8.7	3.1%	14.0%	24
23	LGAV	ATHINAI E. VENIZELOS	273	17.2	6.3%	18.2%	70
24	LEPA	PALMA DE MALLORCA	270	16.1	6.0%	2.7%	40
25	EFHK	HELSINKI-VANTAA	248	9.0	3.6%	19.1%	25

Figure 44. Business aviation at the busiest airports for all traffic (2007).

C. Annex: Summary of business aviation per state

Traffic Zone	2007 Business Movements/Day	2006 Business Movements/Day	Business Growth	Growth of Total Movements
Albania	17.4	12.7	36.7%	19.2%
Armenia	3.5	1.7	102.7%	16.3%
Austria	238.2	207.7	14.7%	8.2%
Azerbaijan	4.7	3.0	55.5%	5.0%
Belarus	48.8	39.2	24.6%	18.9%
Belgium/Luxembourg	191.3	178.7	7.0%	4.4%
Bosnia-Herzegovina	32.3	26.8	20.6%	19.7%
Bulgaria	44.6	35.5	25.4%	10.7%
Canary Islands	21.7	17.5	24.3%	1.9%
Croatia	80.8	64.8	24.9%	17.5%
Cyprus	39.4	32.8	20.0%	11.9%
Czech Republic	92.6	82.7	12.0%	5.8%
Denmark	77.6	70.5	10.0%	5.0%
Estonia	15.4	13.6	13.4%	-4.5%
FYROM	13.4	11.7	14.0%	4.1%
Finland	37.3	35.7	4.4%	-0.1%
France	772.0	691.3	11.7%	6.2%
Georgia	5.7	3.3	69.0%	17.7%
Germany	582.6	542.1	7.5%	4.8%
Greece	94.2	78.7	19.7%	10.0%
Hungary	65.5	54.2	20.9%	1.9%
Ireland	96.3	88.2	9.1%	6.1%
Italy	445.8	400.9	11.2%	8.6%
Latvia	22.9	20.3	13.1%	15.5%
Lisbon FIR	35.8	31.3	14.3%	6.6%
Lithuania	30.7	25.8	18.6%	15.5%
Malta	9.4	8.9	5.9%	8.4%
Moldova	8.3	5.5	49.9%	24.8%
Netherlands	151.6	142.6	6.3%	5.1%
Norway	94.5	87.9	7.5%	4.7%
Poland	99.3	82.9	19.7%	13.5%
Romania	47.0	38.2	23.1%	4.2%
Santa Maria FIR	12.0	11.0	9.8%	2.5%
Serbia&Montenegro	63.1	51.1	23.5%	16.6%
Slovakia	53.6	42.4	26.4%	-1.5%
Slovenia	54.6	47.0	16.1%	14.8%
Spain	224.7	202.2	11.1%	8.6%
Sweden	115.1	110.6	4.0%	2.9%
Switzerland	353.7	315.0	12.3%	6.1%
Turkey	78.9	66.9	18.0%	9.5%
Ukraine	61.6	48.1	28.1%	-2.2%
United Kingdom	480.9	420.8	14.3%	3.6%
Europe (Esra)	2106.9	1915.4	10.0%	5.2%

Figure 45. Total IFR Business aviation per State (2007 v 2006), including overflights.

In these statistics, because of the way the airspace is organised, Belgium and Luxembourg are treated as one unit, as are Serbia and Montenegro. For the same reason, the Canary Islands are treated separately from continental Spain, as are the Azores (Santa Maria FIR) from the rest of Portugal (Lisbon FIR).

Traffic Zone	2007 Business Movements/Day	2006 Business Movements/Day	Business Growth	Growth of Total Movements
Albania	1.9	1.5	26.6%	12.9%
Armenia	1.1	0.4	195.0%	25.8%
Austria	113.7	103.0	10.4%	7.5%
Azerbaijan	2.0	1.5	37.3%	3.9%
Belarus	1.7	1.2	40.2%	16.8%
Belgium/Luxembourg	81.1	77.7	4.3%	4.1%
Bosnia-Herzegovina	4.9	6.5	-24.9%	-12.7%
Bulgaria	13.2	9.9	32.6%	9.7%
Canary Islands	18.8	14.5	29.8%	0.8%
Croatia	29.7	24.2	22.7%	7.0%
Cyprus	12.5	10.6	18.2%	0.7%
Czech Republic	27.9	24.6	13.6%	6.5%
Denmark	36.8	34.4	7.2%	3.5%
Estonia	3.9	3.1	24.6%	-2.3%
FYROM	2.3	2.0	12.6%	1.6%
Finland	32.3	30.6	5.5%	-0.2%
France	518.2	472.9	9.6%	3.5%
Georgia	1.9	1.0	84.8%	18.7%
Germany	406.8	389.5	4.5%	4.0%
Greece	59.3	48.9	21.4%	7.3%
Hungary	15.1	12.6	20.1%	-0.6%
Ireland	57.1	52.3	9.2%	7.6%
Italy	319.1	292.1	9.3%	8.4%
Latvia	3.6	3.7	-2.9%	19.9%
Lisbon FIR	27.3	23.7	15.2%	7.6%
Lithuania	3.0	2.5	21.7%	10.2%
Malta	3.5	3.0	15.2%	9.7%
Moldova	2.5	1.6	53.4%	9.9%
Netherlands	77.1	74.0	4.2%	4.2%
Norway	87.8	82.3	6.7%	4.3%
Poland	37.9	33.3	13.7%	11.5%
Romania	22.8	18.4	24.1%	19.3%
Santa Maria FIR	6.1	5.2	17.1%	5.8%
Serbia&Montenegro	27.3	24.7	10.5%	7.0%
Slovakia	14.5	10.3	40.4%	4.8%
Slovenia	9.6	8.2	17.5%	17.0%
Spain	191.9	173.5	10.6%	9.2%
Sweden	85.7	84.8	1.1%	-0.1%
Switzerland	230.8	202.9	13.7%	6.5%
Turkey	54.8	47.0	16.6%	10.7%
Ukraine	36.0	28.3	27.2%	4.4%
United Kingdom	432.8	376.2	15.1%	2.9%
Europe (Esra)	2091.3	1902.9	9.9%	5.1%

Figure 46. Total IFR Business Aviation per State (2007 v 2006), excluding overflights.

D. Annex: Summary of traffic per aircraft type

In 2007, the top 25 business aviation aircraft types (Figure 47) accounted for 81% of all business aviation departures. For further discussion see section 18.

Rank	ICAO Aircraft Type	Engine Type	Num. Engines	2007 IFR Deps/Day	2006 IFR Deps/Day	Change
1	BE20	Turboprop	2	189.2	185.0	2.3%
2	H25B	Jet	2	138.4	114.2	21.1%
3	C56X	Jet	2	135.8	110.9	22.4%
4	C550	Jet	2	133.3	134.7	-1.0%
5	C525	Jet	2	115.3	104.4	10.5%
6	CL60	Jet	2	90.7	80.0	13.4%
7	F900	Jet	3	88.2	88.1	0.1%
8	F2TH	Jet	2	86.5	75.7	14.3%
9	C25A	Jet	2	59.9	42.8	40.1%
10	C208	Turboprop	1	55.0	54.1	1.6%
11	BE40	Jet	2	54.8	41.9	30.8%
12	C560	Jet	2	52.6	53.4	-1.5%
13	GLF4	Jet	2	51.9	46.4	11.9%
14	BE9L	Turboprop	2	49.6	53.0	-6.6%
15	GLF5	Jet	2	49.0	43.5	12.6%
16	LJ45	Jet	2	44.0	39.5	11.4%
17	PC12	Turboprop	1	43.7	33.6	30.2%
18	LJ60	Jet	2	42.1	41.3	1.9%
19	PA31	Piston	2	41.0	40.6	0.8%
20	FA50	Jet	3	40.5	42.2	-3.8%
21	TBM7	Turboprop	1	39.1	32.2	21.3%
22	BE58	Piston	2	37.3	37.1	0.6%
23	LJ35	Jet	2	36.8	36.7	0.4%
24	P180	Turboprop	2	34.5	29.4	17.4%
25	GLEX	Jet	2	30.4	24.7	23.0%

Figure 47. IFR departures by ICAO aircraft type (2007 compared to 2006).

Figure 48. C525 was the 5th busiest business aircraft type in 2007 (Here Citation CJ1 Interior).

E. Annex:
Monthly traffic patterns in the busiest states

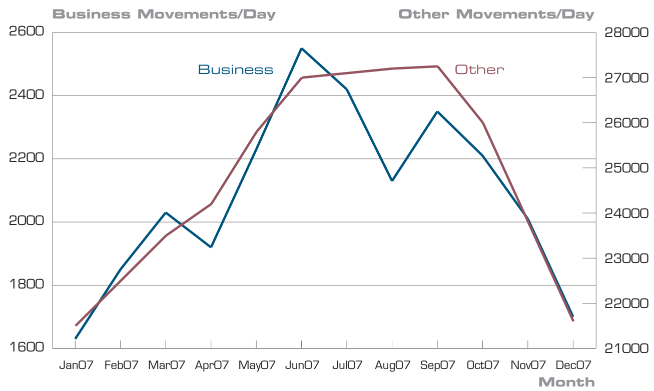


Figure 49. Monthly traffic patterns in Europe (ESRA), excluding overflights.

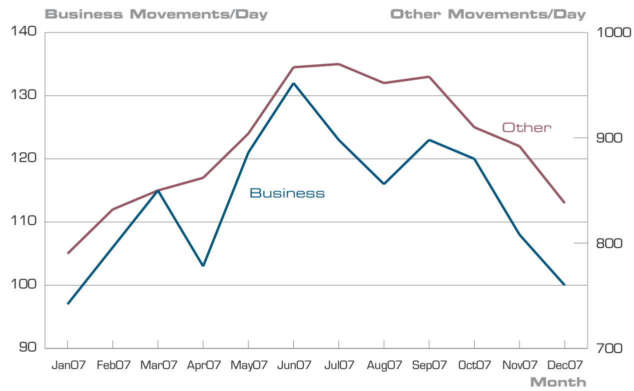


Figure 50. Monthly traffic patterns in Austria, excluding overflights.

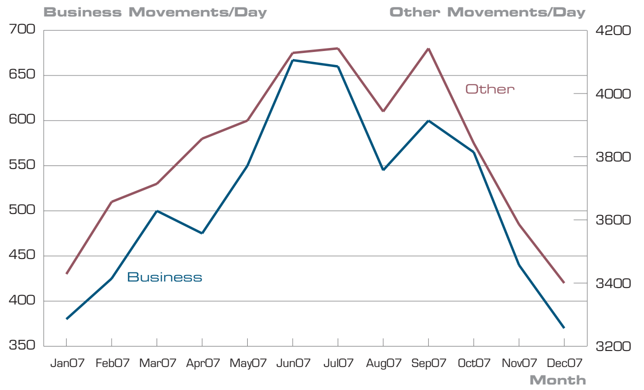


Figure 51. Monthly traffic patterns in France, excluding overflights.

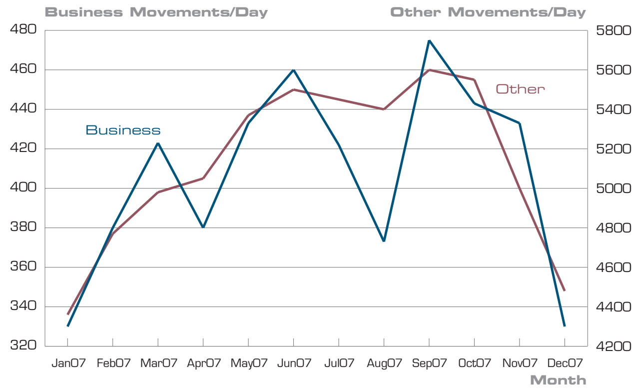


Figure 52. Monthly traffic patterns in Germany, excluding overflights.

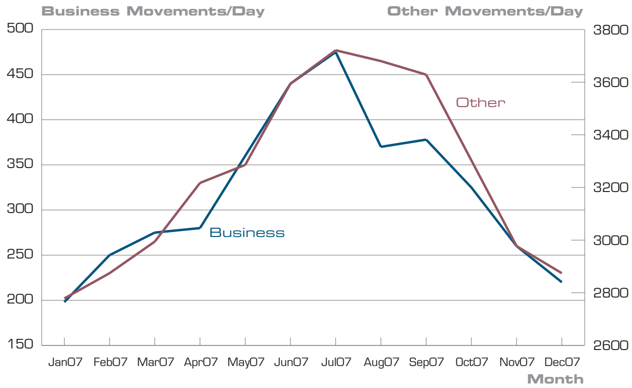


Figure 53. Monthly traffic patterns in Italy, excluding overflights.

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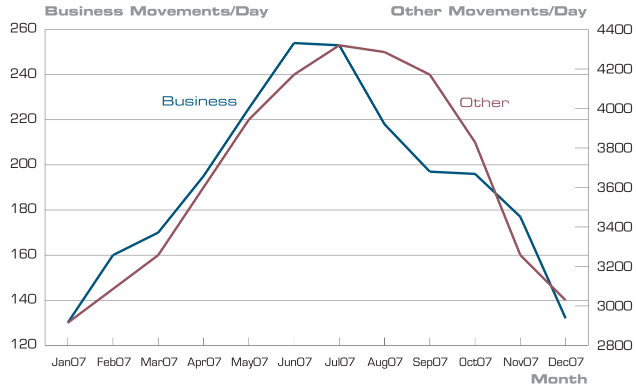

Figure 54. Monthly traffic patterns in Spain, excluding overflights.

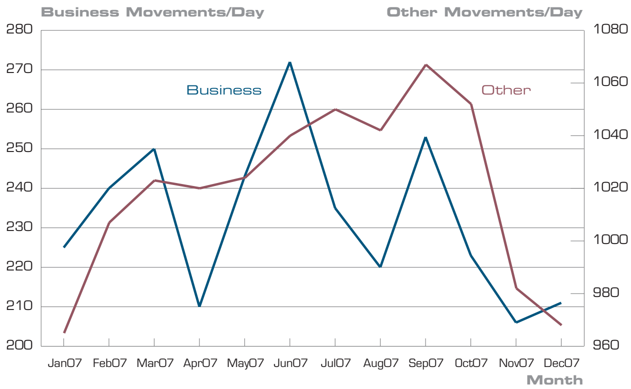

Figure 55. Monthly traffic patterns in Switzerland, excluding overflights.

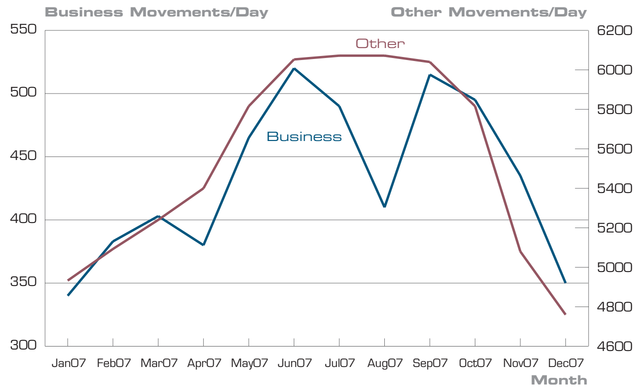

Figure 56. Monthly traffic patterns in UK, excluding overflights.

F. Annex:
Daily traffic patterns in the busiest states

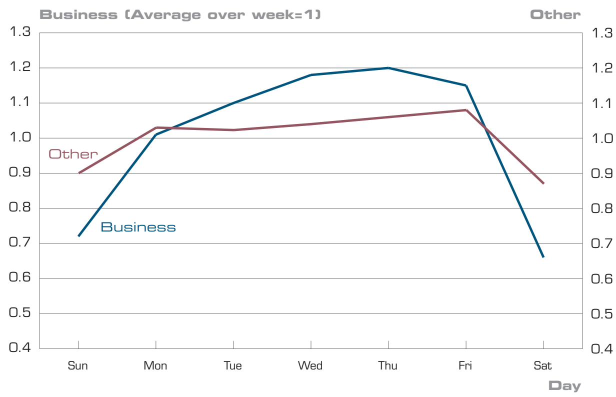

Figure 57. Daily traffic patterns in the Europe (ESRA), excluding overflights.

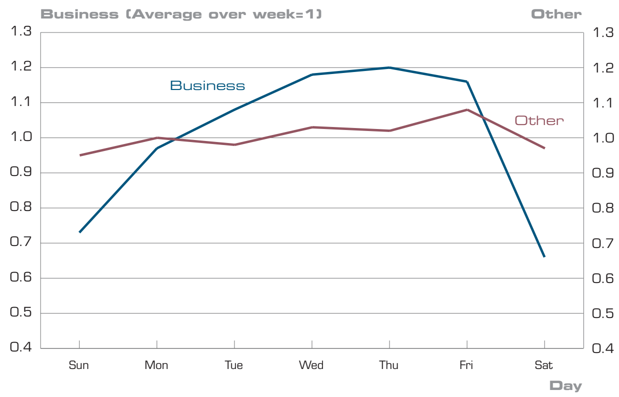

Figure 58. Daily traffic patterns in Austria, excluding overflights.

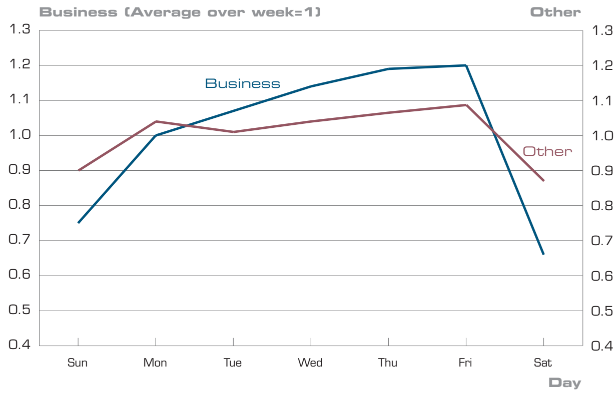

Figure 59. Daily traffic patterns in France, excluding overflights.

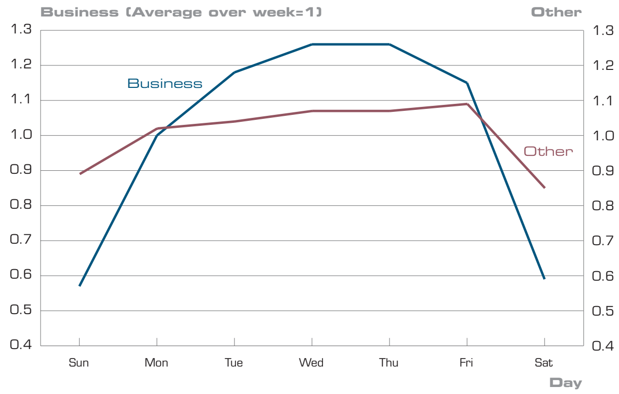

Figure 60. Daily traffic patterns in Germany, excluding overflights.

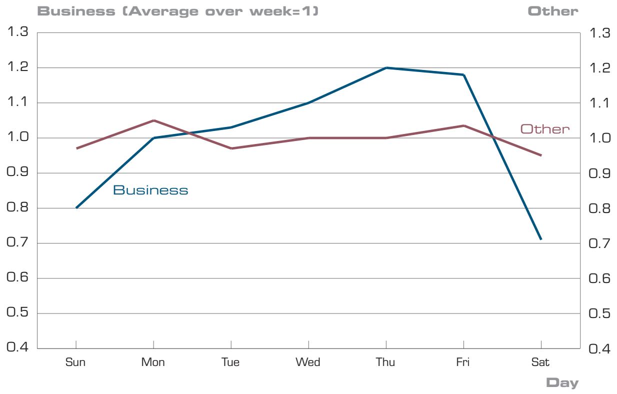

Figure 61. Daily traffic patterns in Italy, excluding overflights.

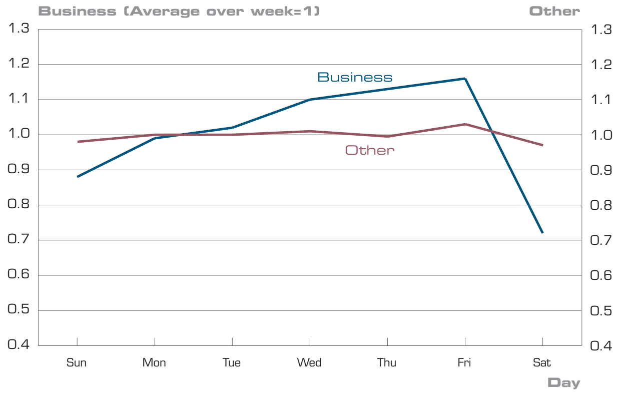

Figure 62. Daily traffic patterns in Spain, excluding overflights

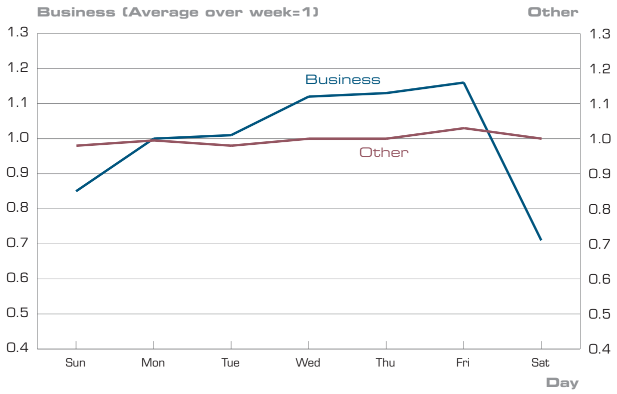

Figure 63. Daily traffic patterns in Switzerland, excluding overflights.

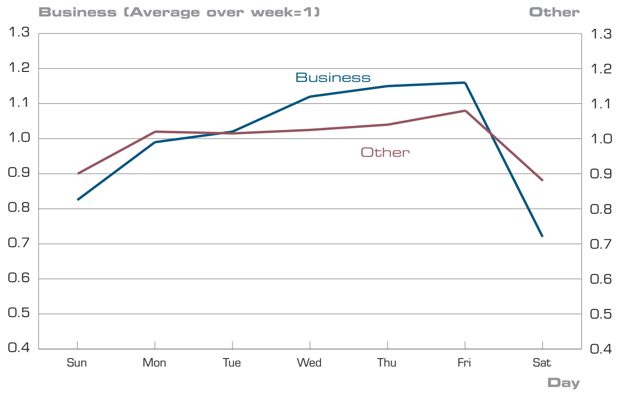

Figure 64. Daily traffic patterns in UK, excluding overflights.

G. Annex:
Hourly traffic patterns in the busiest states

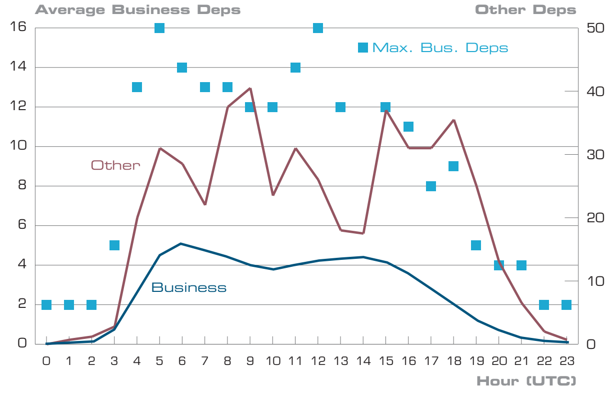

Figure 65. Hourly pattern of departures in Austria.

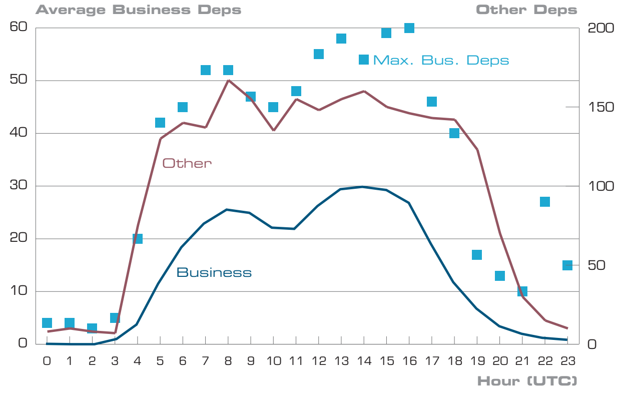

Figure 66. Hourly pattern of departures in France.

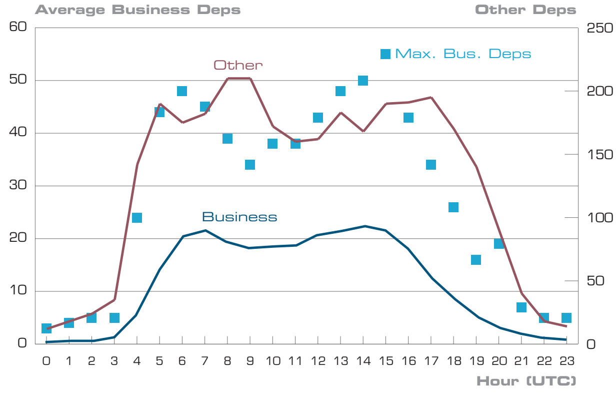

Figure 67. Hourly pattern of departures in Germany.

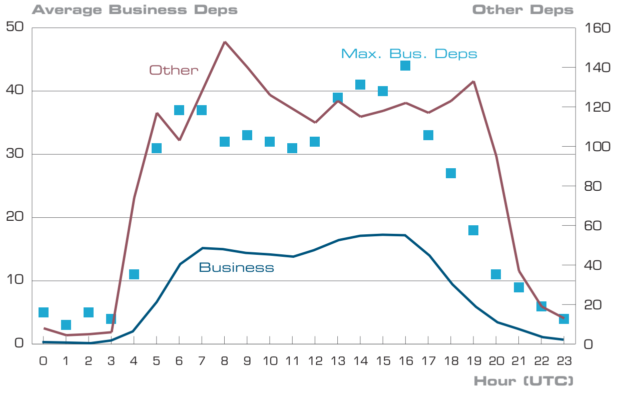

Figure 68. Hourly pattern of departures in Italy.

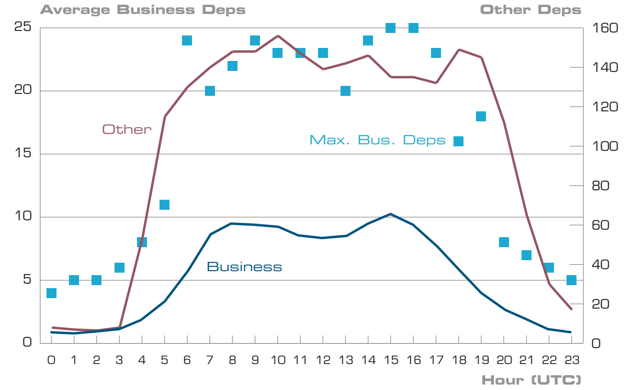

Figure 69. Hourly pattern of departures in Spain.

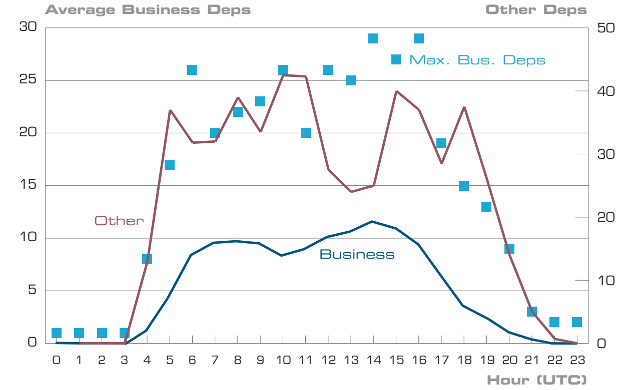

Figure 70. Hourly pattern of departures in Switzerland.

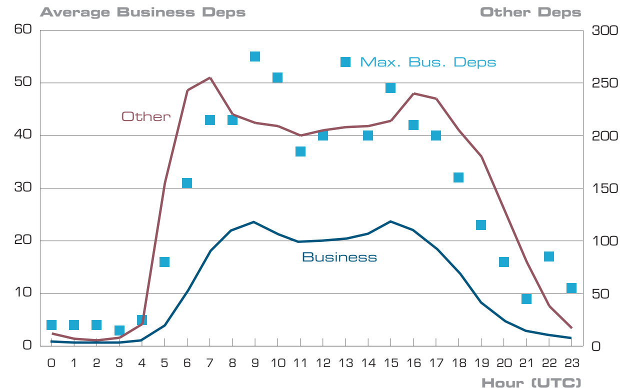

Figure 71. Hourly pattern of departures in the UK.

H. Annex: The largest European business fleets

The European operators with the largest fleets of business aircraft (i.e. those aircraft types listed in Annex A) are summarised in Figure 72.

Company	Country	Number of Aircraft	Primary Fleet Operations in Europe
NetJets	Portugal	144	Fractional shares, card programme operator
TAG Aviation	United Kingdom, Switzerland, Spain	48	Charter, fleet management
GlobalJet	Luxembourg/Austria	42	Corporate, charter, fleet management
Jetalliance Flugbetriebs	Austria	39	Charter, fleet management
Grupo Gestair	Spain	33	Charter, fleet management
Zimex Aviation	Switzerland	30	Charter
London Executive Aviation	United Kingdom	24	Charter, fleet management
Cirrus Aviation	Germany	14	Corporate, charter, fleet management
Daimler Chrysler Aviation	Germany	14	Corporate, charter, fleet management
19 Operators		10-13	All charter and fleet management
651 Operators		1-9	Various

Figure 72. Main European Business Fleets. Source: PRISME-Fleet

The Citation Mustang very light jet started operating in Europe in 2007.

I. Annex: Main country-pair flows of business aviation

This annex summarises the main flows of traffic, in terms of country pairs. In the case of jets, the busiest 30 country-pairs account for some 60% of total traffic.

Rank	Jet			Piston			Turboprop		
	Between	And	Mvts/Day	Between	And	Mvts/Day	Between	And	Mvts/Day
1	Italy	Italy	88.4	France	France	30.7	France	France	65.0
2	Germany	Germany	83.2	Germany	Germany	14.6	Norway	Norway	59.1
3	UK	UK	75.5	UK	UK	10.1	Germany	Germany	38.9
4	France	France	70.1	Sweden	Sweden	8.6	UK	UK	36.6
5	France	UK	63.1	Netherlands	Netherlands	8.0	Italy	Italy	25.4
6	Spain	Spain	44.2	Finland	Finland	5.6	Sweden	Sweden	21.4
7	France	Switzerland	42.7	France	UK	5.6	Spain	Spain	17.5
8	France	Italy	35.6	Spain	Spain	4.0	France	Switzerland	15.1
9	France	Germany	28.3	Denmark	Sweden	3.3	Greece	Greece	13.4
10	Switzerland	UK	27.7	France	Switzerland	3.1	Canary Islands	Canary Islands	11.3
11	Germany	UK	27.1	Croatia	Croatia	2.7	France	UK	9.8
12	Germany	Italy	24.4	Finland	Sweden	2.5	France	Germany	5.8
13	UK	North Atlantic	23.3	Austria	Germany	1.9	Turkey	Turkey	5.8
14	Germany	Switzerland	21.8	Denmark	Denmark	1.7	Germany	Switzerland	5.4
15	Italy	UK	21.2	Norway	Norway	1.6	France	Italy	5.2
16	Spain	UK	20.5	Germany	Switzerland	1.6	Switzerland	Switzerland	5.1
17	Italy	Switzerland	19.9	Ireland	UK	1.5	Finland	Finland	4.9
18	France	Spain	19.7	Italy	Italy	1.4	Italy	Switzerland	4.6
19	Austria	Germany	18.9	Switzerland	Switzerland	1.3	Germany	Italy	4.5
20	Ireland	UK	18.6	France	Germany	1.3	Poland	Poland	4.3
21	Turkey	Turkey	13.7	Germany	Netherlands	1.2	Belgium/ Luxembourg	France	4.2
22	Germany	Spain	12.6	Austria	Austria	1.0	France	Spain	4.1
23	Belgium/ Luxembourg	France	12.4	Greece	Greece	1.0	France	Netherlands	4.0
24	France	CIS Region	12.4	France	Spain	0.8	Germany	UK	3.9
25	Italy	Spain	12.0	Belgium/ Luxembourg	France	0.8	Ireland	UK	3.8
26	Switzerland	Switzerland	10.9	Czech Republic	Czech Republic	0.8	Austria	Germany	3.6
27	Sweden	Sweden	10.5	Germany	UK	0.7	Finland	Sweden	3.3
28	Netherlands	UK	10.4	Belgium/ Luxembourg	UK	0.7	Germany	Netherlands	2.9
29	Belgium/ Luxembourg	Germany	10.1	Netherlands	UK	0.7	Switzerland	UK	2.8
30	Austria	France	9.6	Germany	Poland	0.6	Norway	Sweden	2.4
Other	-	-	637.0	-	-	18.8	-	-	86.1
All	-	-	1525.8	-	-	138.0	-	-	480.0

Figure 73. Main flows, by engine type

Notes

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