Appeal by: Bristol Airport Limited

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Summary proof of evidence of
Patrick Folley MA, BA(Hons)
Air traffic forecasting

Reference: NSC/W1/3

Jacobs

Bristol Airport Public Inquiry

Proof of Evidence - Air Traffic Forecasts Assessment

Summary

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1. Introduction

1.1 My name is Patrick Folley, Operations Director and Strategic Consulting Aviation Lead at Jacobs, a multi-disciplinary consultancy. I have over 23 years' experience working in aviation for both government and private sector clients, with a particular focus on traffic demand forecasting and market development, business and strategic planning.

1.2 The evidence which I have prepared and provide in this Summary Proof of Evidence is true and I confirm that the opinions expressed are my true and professional opinions.

2. Scope of Evidence

2.1 My statement covers the assessment of the air traffic forecast provided by the appellant in support to its proposal for an increase in operating capacity to 12 million passengers per annum.[1]

2.2 The main issues that my statement highlights are:

a) Uncertainty around the assumptions underpinning the air traffic forecast and therefore its implications for the assessment of the environmental and economic effects of the proposed scheme. For instance, I question the assumptions regarding the recovery of business travel after the pandemic.

b) A lack of sensitivity testing for the busy day timetable and fleet mix, which have implications on the noise, air quality and carbon impacts of the proposed scheme.

c) The fact that the busy day timetable and fleet mix forecast were produced prior to the announcement of Jet2.com intending to commence operations from Bristol Airport.

2.3 The consequences of the issues I have identified upon the assessment of the impacts of the proposed development on noise, air quality, greenhouse gas emissions and the economy are not assessed in my

[1] The appellant has described its air traffic forecasting methodology and results in document ref. CD2.21 (Passenger Traffic Forecasts for Bristol Airport to Inform the Proposed Development to 12 mppa (30 November 2020))

Proof of Evidence but they are considered in the evidence of the other witnesses called on behalf of the Council.

3. Forecasting and Uncertainty

3.1 Forecasting the growth in the demand for air travel from a particular airport is inherently uncertain given the broad range of factors that determine the desire to travel, be they economic (e.g. general economic activity, oil prices, ticket prices), social (e.g. the destinations available) or environmental (e.g. the desire not to fly for personal carbon footprint reasons).

3.2 For example, Appendix A provides a comparison of the traffic forecasts of various UK airports in their plans to the actual traffic levels observed after those plans were implemented. For these cases, the actual traffic figures ranged from +51% above forecast to -50% below forecast, with the closest being 26% below forecast.

3.3 In accordance with best practice, the appellant has produced alternative scenarios for its annual passenger forecast: slow, core and fast growth. I agree that this process of examining the implications of alternative growth assumptions is appropriate given the inherent uncertainties of traffic forecasts.

3.4 However, the appellant has only provided a forecast fleet mix and night movements for the core scenario case. Fleet mix and night movements forecasts are key inputs into air quality, carbon and noise assessments. Depending on the point in time under consideration, the nature of fleet mix in operation will give rise to different effects upon the environment.

3.5 As an illustrative example, the table below shows what could be the possible fleet mixes of easyJet and Ryanair in 2028, 2030 and 2032 (that is two years earlier or later than 2030). These are currently the two largest operators at Bristol Airport.[2] As the table shows, the fleet mix at Bristol Airport could be different if 12 mppa were reached earlier or later than 2030, and as a consequence the environmental impacts of the proposed development could also be different. This reveals the extent to which

[2] This table compares the percentage of older generation aircraft in these airlines fleets to the percentage of cleaner and quieter next generation aircraft, such as the Boeing 737 MAX-8 and Airbus A320-neo (easyJet and Ryanair have large orders confirmed of these next generation aircraft).

uncertainty may affect the appraisal of the environmental and economic benefits of the proposed development.

Table 1: Estimate percentage of aircraft by type (as percentage of the airline's fleet)[3]

	easyJet		Ryanair	
Year	Older aircraft	Next-gen aircraft	Older aircraft	Next-gen aircraft
2028	18%	82%	16%	84%
2030	11%	89%	7%	93%
2032	4%	96%	7%	93%

4. Annual Passenger Forecasts

4.1 The appellant's annual passenger forecasts have been produced combining two methods:

a) A Bottom Up forecast (up to 2023) that considers airline behaviour and any short-term impacts that would not be picked up through economics alone; and

b) A Top Down forecast (from 2023) that uses mid- to long-term econometrics to model the underlying passenger demand at an airport or region.

4.2 I consider that this methodology is appropriate.

4.3 However, uncertainty remains in the assumptions underpinning these forecasts, such as the impact of Covid-19, the impact of Brexit, changes in oil prices, etc. The uncertainty for the airports industry in the UK, given the pandemic and Brexit alone, is greater that it has been for decades and in my view this needs to be recognised.

Covid-19 and Brexit impacts

4.4 For the long term, the appellant's forecasts have been based on economic projections with Covid-19 and Brexit uncertainty factored into them. The appellant has also indicated that (when choosing probabilities

[3] Jacobs' estimate based on data from CAPA on current fleet, typical retirement age and aircraft orders from these airlines.

in the Monte Carlo simulation) it assumed the balance of risk was towards the downside (at the time) given COVID-19 and Brexit. In the short term (and based on those projections) the appellant has reduced the frequency of flights on some routes or completely removed the routes. I agree that this is a reasonable approach.

4.5 However, for the bottom-up forecast used in the short term, the appellant has not considered a reduction or levelling off of route frequency to EU worker markets (e.g. Eastern Europe). In 2019, 76% of the flights scheduled at Bristol Airport were to EU countries. And 10% of these (7.4% of total) were to Eastern EU countries, which in recent decades have been an important source of labour for the UK. In my view, the end of freedom of movement between the UK and these EU worker markets may not have been appropriately reflected in the appellant's short term forecast.

4.6 The pandemic and Brexit are factors which weigh against any rapid growth at Bristol Airport in the short term. In my view this means that the fast growth scenario is less likely to materialise than the core scenario. Whilst there is the potential for growth to be slower over the longer term if the pandemic continues to impinge upon the ability to travel on holiday, it seems to me that this is less likely than a gradual recovery over the short/medium term given Bristol Airport's strong leisure traffic component. As a result, I believe that the core scenario is more likely to materialise than the slow scenario. On that basis I consider the use of the core scenario for the assessment of the environmental and economic impacts to be appropriate although the uncertainty, and the potential difference in the scale of impacts associated with this, needs to be recognised and understood.

Business passenger forecasts

4.7 The elasticities used by the appellant for forecasting business passenger growth are from the Department for Transport's (DfT) UK Aviation Forecasts 2017. In the appellant's core case the average annual growth rates for business passengers and leisure passengers assumed for the 2019-2030 period are as follows:

Table 2: Passenger growth by trip purpose in the appellant's forecast

Trip purpose	Average annual passenger growth (2019-2030)
Domestic Business	3.0%
Domestic Leisure	2.0%
International Business	2.8%
International Leisure	2.9%

4.8 As the table above indicates, international business travel would grow at almost the same rate as international leisure travel, and domestic business travel would grow quicker than domestic leisure travel.

4.9 Between 2000 and 2019 business passenger numbers grew by an average 4.2% per year at Bristol Airport, while leisure passenger numbers grew by an average 8.1% per year[4]. This showcases how even prior to the Covid-19 pandemic and Brexit, leisure travel was growing at almost double the pace than leisure travel at the Airport.

4.10 The pandemic has resulted in significant skilling up in the use of technology in order to conduct business (e.g. an increasing use in virtual meetings). This is likely to mean that business travel will not grow generally at the rates seen prior to the pandemic.

4.11 Therefore, I question whether the elasticities specified in the DfT's UK Aviation Forecasts 2017 remain appropriate to forecast business passengers at Bristol Aiport, especially given the potential impacts of the Covid-19 pandemic and Brexit on business travel.

4.12 This could mean that the economic benefits of the expansion may be lower than what the appellant has estimated both in the short and long term. The implications of this are considered by Mr Siraut in his evidence relating to the economy.

[4] https://www.caa.co.uk/Data-and-analysis/UK-aviation-market/Consumer-research/Departing-passenger-survey/Survey-reports/

4.13 I also note that the growth rates provided by the appellant are for the average of the 2019-2030 period, so it is not possible to differentiate the assumed recovery profile from Covid-19 and the growth afterwards.

Assumptions derived from airline interviews

4.14 The appellant's traffic forecasting report states: *"A core element of this work on the short term forecast has been to engage with the key airlines at BAL, namely easyJet, Ryanair and Tui. In order to provide the greatest value to the forecasting process, these meetings remain commercially confidential, but the intelligence gathered on airline intentions influenced the short-term forecasts and also provided validation on the long-term forecasts based on how the airlines view the market within the region. Furthermore, engagement with the airlines has allowed us to consider other relevant matters including expected changes in the fleet mix over time"*.

4.15 The appellant has only provided high-level anonymised outcomes from these interviews, indicating that due to stated confidentiality they cannot provide more detail. The information provided is general and does not specify what each airline stated in particular, nor does it show a commitment from the airlines to follow through with these statements. In addition, it is not clear when these interviews exactly took place in 2020 (the airlines' views may have changed since then, for instance due to the evolution of the pandemic and Brexit).

4.16 This means that there is an element of input into the forecasting exercise which cannot be scrutinised by the decision maker, the Council or the public.

4.17 The assumptions said to be drawn from these confidential interviews have an impact on airline growth and therefore the forecast fleet mix and business/leisure splits. In the absence of evidence to support them or the means of scrutinising them, they have to be treated with caution.

Route development approach

4.18 The appellant has also provided the rationale for routes being picked for its forecasts. The rationale described appears in line with standard industry practice. However, it does not indicate how these routes support the assumptions made with regards to the projected business travel growth.

4.19 When asked, the appellant has replied as follows (in its clarification responses dated 19 February 2021):

" While the 'bottom up' forecasts do consider market growth in terms of business and leisure travel, the extent of dislocation in the market in the short term is such that, in our view, it is only sensible to view the market in aggregate. As we have commented previously, it should be recognised that the short term is of limited relevance to the assessment of the application, as it is some time before relevant thresholds are reached in the forecasts."

"In relation to the longer term, the passenger volume forecasts are not undertaken on a route by route basis and hence it is not possible to provide such an assessment. As is stated in the Forecasting Report, the elasticities used within the growth modelling are adopted from the Department for Transport's UK Aviation Forecasts 2017. These were developed through a detailed and robust econometric modelling process. They provide a comprehensive, long term view of the relationships between market growth and income and air fare drivers. To the extent that there are differences between markets, these are a reflection of the underlying analysis undertaken by the Department."

4.20 Based on this response:

a) For the short term, I consider that the appellant has not demonstrated how this route development approach supports its projected growth business travel; and

b) Earlier in this proof of evidence, I have stated that I question whether the elasticities specified in the DfT's UK Aviation Forecasts 2017 remain appropriate to forecast business passengers at Bristol Aiport given the potential impacts of the Covid-19 pandemic and Brexit on business travel. Thus I

do not consider that the appellant's route development approach supports its projected growth in business travel in the long term either.

Logit model for airport choice

4.21 For the long term annual passenger forecast the appellant has used an econometric passenger allocation model (logit model) to determine how the underlying passenger demand base in the broad catchment area around Bristol Airport will split between it and a number of competing airports.

4.22 The logit model examines how passengers make choices between the different airports available based on factors including, for example, surface access time, flight time and fares .

4.23 The appellant has indicated that the values assigned to each variable differ by market segment. However, the appellant has not indicated what values have been assigned to each market segment, despite Jacobs requesting this repeatedly. Until that information is provided I have to reserve my position on whether the passenger allocation model is appropriate.

5. Busy Day Timetable

5.1 Busy day timetables provide outputs for surface access assessments and capacity planning. They also form the basis of annual fleet mixes and inform calculations related to the numbers of flights by time of the day, which are used for the assessment of air quality, carbon and noise impacts.

5.2 The appellant has explained the methodology used to produce its busy day timetable. After review, I consider that this methodology is appropriate at the point in time when it was adopted.

5.3 However, since the production of the appellant's forecast, Jet2.com, a British low-cost leisure airline, has announced plans to open a new base at Bristol Airport, effective 01 Apr 2021[5]. The carrier plans to offer

[5] At the time of writing this Proof of Evidence Jet2.com has not started operations at Bristol due to the UK government restrictions on international travel. Operations are currently expected to start at the beginning of July (based on flight tickets available).

routes to 33 destinations and up to 56 times weekly movements from the airport. With this, Jet2.com may become the third main carrier at Bristol Airport (with easyjet and Ryanair).

5.4 This announcement has the potential to alter the routes at Bristol Airport and therefore the busy day timetable. I examine the implications of this further below.

6. Night Movements

6.1 The number of night movements in the summer period are important to assess noise levels at night on the surroundings of the airport.

6.2 I have reviewed the appellant's methodology for producing the number of night movements and consider it appropriate at the point in time when it was adopted. However, as mentioned earlier in this document, the lack of sensitivity testing in this area is a concern: the appellant has provided a night movements forecast for the core scenario only and not for the slow and fast growth scenarios.

6.3 In addition, this forecast of night movements was produced prior to the Jet2.com announcement (which may affect the busy day timetable and, thus, the number of night movements).

6.4 I therefore believe that the calculation of the number of night movements by the appellant is not appropriate, as it does not reflect the Jet2.com operations and no sensitivity testing has been carried out.

7. Fleet Mix

7.1 The fleet mix is the breakdown of air traffic movements at an airport by aircraft type. This is a key input into the air quality, carbon and noise assessments of that airport, as different aircraft types have different emissions and noise levels.

7.2 The appellant has estimated a future fleet mix at Bristol Airport for the core case forecast. That fleet mix shows the number of movements per aircraft type in 2030, the year when 12 million annual passengers are reached in that case.

7.3 As mentioned earlier in this document, the lack of sensitivity testing in this area is a concern: no fleet mix for the slow and fast growth scenarios has been produced and the environmental/economic impacts of these scenarios has not been identified.

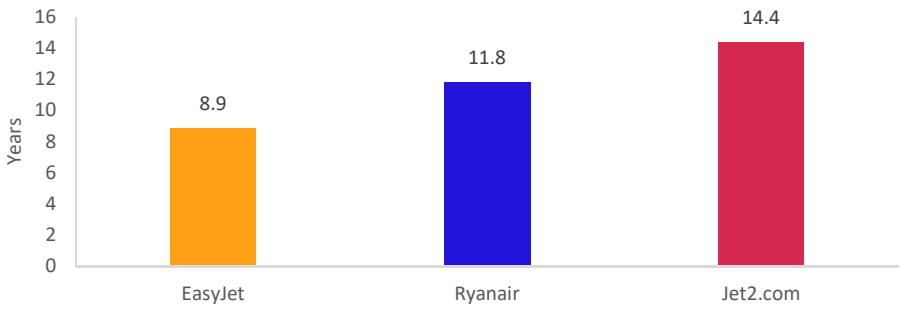
7.4 I have reviewed the appellant's methodology for producing a fleet mix and, in my view, this approach was appropriate when it was applied. However, since the production of the appellant's forecast, Jet2.com has announced plans to open a new base at Bristol Airport. Ryanair and easyJet operate at high frequencies from Bristol Airport and, given the Jet2 announcement, the three carriers are likely to dominate air traffic at the airport in future years.

7.5 Jet2.com has historically bought second hand or older generation aircraft, which are then operated for a long period. This is in contrast to easyJet and Ryanair, who tend to buy aircraft new and replace them at a higher frequency. This is reflected by:

a) a notable difference in average aircraft age (see figure below) between these airlines; and

b) the fact that easyJet and Ryanair have large orders of new generation aircraft (92 "A320neo" and 16 "A321neos" for easyJet and 135 "Boeing 737-Max8s" for Ryanair), whilst Jet2.com has no new aircraft on order at the time of writing this Proof of Evidence.

Figure 1: Average aircraft age in February 2021 (Source: CAPA)



7.6 I have produced an alternative 2030 fleet mix which takes into account Jet2.com's operation. In order to provide a direct comparison to the appellant's fleet mix, I have taken its same approach when developing the fleet mix to include Jet2.com.

7.7 My assessment has been based on aircraft orders and age, with the following outcomes:

a) easyJet and Ryanair will transition largely to A320neos and 737-Max8s respectively, with a small percentage of A321neos and 737 Max10s expected in the year 2030.

b) Jet2.com will continue to operate 737-800's in the year 2030.

7.8 As a result, my 2030 fleet mix sees an increase of c.11,400 movements (+479%) of the Boeing 737-800 aircraft and a reduction in annual movement of the Boeing 737 MAX 8 (-2,676 movements, that is -19%) and Airbus A320Neo family (-1,495 movements, that is -4%) when compared to the the appellant's forecast.

7.9 These are significant differences which are likely to have material implications in the noise, carbon and air quality impact assessments of the proposed development. The implications of this are considered by Mr Fiumicelli (noise) and Dr Broomfield (air quality) in their respective evidences on behalf of the Council.

Table 3: 2030 fleet mix comparison

Aircraft	Appellant's 2030 Fleet Mix	Jacobs 2030 Fleet Mix	Difference
Aircraft used by Jet2.com (and others)			
Boeing 737-800	2,380	13,781	*+11,401*
Next generation aircraft			
Airbus A320neo	20,200	24,538	*+4,338*
Airbus A321neo	15,720	9,887	*-5,833*
Boeing 737 MAX 10	2,050	2,097	*+47*
Boeing 737 MAX 8	14,360	11,684	*-2,676*
All other existing generation aircraft			
Airbus A320	6,540	2,828	*-3,712*
ATR 72	8,360	5,225	*-3,135*
Boeing 737-700	750	2,397	*+1,647*
Boeing 767-400	-	300	*+300*
Boeing 777	-	300	*+300*
Boeing 787-8	510	599	*+89*
Embraer 190	2,240	599	*-1,641*
Embraer 195-E2	2,240	-	*-2,240*
Embraer RJ145	-	1,115	*+1,115*
Total air movements	**75,350**	**75,350**	-

8. Conclusions

8.1 Air traffic forecasts are inherently uncertain. Uncertainty remains in the assumptions underpinning the appellant's air traffic forecasts, such as the impact of Covid-19 and the speed of the anticipated economic recovery, the impact of the UK leaving the European Union, changes in oil prices, etc.

8.2 Due to the inherent uncertainty of traffic forecasts, it is best practice to produce alternative scenarios. In accordance with this, the appellant has produced alternative annual passenger forecasts for the proposed development, that is: slow, core and fast growth. I consider that sound.

8.3 Of these scenarios I considered that the core scenario is the most likely to occur.

8.4 However, the appellant has only provided its forecast fleet mix and night movements for its core case. Fleet mix and night movement forecasts are relevant for air quality, carbon and noise assessments. This means that the full range of impacts associated with the uncertainty in the forecasts has not been assessed.

8.5 I also question some of the assumptions used by the appellant which cast uncertainty on the results of its air traffic forecasts and, therefore, their implications on the environment and the economy:

a) The appellant has used airline interviews to inform its forecasts, which is sound. However, the appellant has only provided high-level anonymised outcomes from these interviews, indicating that due to stated confidentiality they cannot provide more detail. The information provided is general and does not specify what each airline stated in particular, nor does it show a commitment from the airlines to follow through with these statements.

b) The appellant's bottom-up forecasts haven't considered a reduction or levelling off of route frequency to EU worker markets, e.g. Eastern Europe. I thus question whether the end of freedom of movement between the UK and these EU worker markets is accurately reflected in the appellant's short term forecast.

c) The appellant's route development assumptions for forecasting in the short term appear in line with standard industry practice. However, they do not provide sufficient evidence to support the growth assumptions made with regards to business travel in its forecasts.

d) To forecast business passengers in the long term, the appellant has used elasticities from the DfT's UK Aviation Forecasts 2017. I question whether these elasticities remain appropriate after the Covid-19 pandemic (given the recent changes in business behaviour accelerated by the pandemic, such as a more established use virtual meetings) and Brexit. I also note that the growth rates provided by the appellant are for the average of the 2019-2030 period, so it is not possible to differentiate the assumed recovery profile from Covid-19 and the growth afterwards.

e) For the long term forecast the appellant has used an econometric passenger allocation model (logit model) to determine how the underlying passenger demand base in the broad catchment area around Bristol Airport will split between it and a number of competing airports. The logit model examines how passengers make choices between the different airports available based on factors including surface access time, flight time, the availability of the relevant destination, the 'quality' of service as represented by the level of service frequency offered, the availability of indirect options, airline type and fares on offer. The appellant has indicated that the values assigned to each variable differ by market segment. However, the appellant has not indicated, when queried, what values have been assigned to each market segment. As a result I am unable to confirm whether the passenger allocation model is appropriate since I have been denied the information I need to be able to do this.

8.6 Since the production of the appellant's forecast, Jet2.com, a British low-cost leisure airline, has announced plans to open a new base at Bristol Airport. The carrier plans to offer routes to 33 destinations and up to 56 times weekly movements from the airport. With this, Jet2.com may become the third main carrier at Bristol Airport (with easyjet and Ryanair). This announcement is likely to alter the busy day timetable, night movements and fleet mix at the airport.

8.7 Jet2.com has historically bought second hand and older generation aircraft which it operates for a long period. This is in contrast to easyJet and Ryanair, who tend to buy aircraft new and replace them at a

higher frequency. Currently Jet2.com has an older fleet than these other airlines and it doesn't have new planes on order, whilst easyJet and Ryanair have large orders confirmed of cleaner, next-generation aircraft (A320neo family and 737 MAX 8, respectively).

8.8 This means that the fleet mix in the future years is likely to look different with the introduction of Jet2.com, with a larger proportion of older, noisier and dirtier aircraft. Using an approach aligned as much as possible to the appellant's, I have produced an alternative 2030 fleet mix with Jet2.com in it. The result is an increase of c.11,400 annual movements (+479%) of the Boeing 737-800 aircraft and a reduction in annual movement of the more efficient Boeing 737 MAX 8 (-2,676 movements, that is -19%) and Airbus A320Neo family (-1,495 movements, that is -4%) when compared to the the appellant's forecast.

8.9 These are significant differences that can increase the noise, carbon and air quality impacts of the proposed development. These are further examined in the proofs of Evidence of the relevant consultants on behalf of the Council.