



Bridgetts Farm Offices,
Bridgetts Lane, Martyr Worthy,
Winchester, SO21 3AR

Tel: 01962 779185
www.cprehampshire.org.uk

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DEVELOPING A SUSTAINABLE FRAMEWORK FOR UK AVIATION: SCOPING DOCUMENT

CPRE HAMPSHIRE RESPONSE

OCTOBER 2011

“It is unlikely that this response would have seen the light of day but for a gross error in supporting documentation for a Planning Application in 2009 to expand Business Aviation at Farnborough Airport, Hampshire, from 28,000 to 50,000 movements per annum.

The error was in quoting total airport and aircraft equivalent CO₂ emissions at ground level of some 2 million tonnes as an outcome of approval.

CPRE Hampshire identified this as more than double what could be expected in practice, but was astonished to find that although this figure had been in the public domain for more than three months, such a huge potential impact had passed unrecognised by the Local Planning Authority, the aviation authorities, the applicant’s consultants and the applicant; as if such profligacy of green-house gas emissions was of little or no consequence.

In the fall-out from this mistake, CPRE re-examined related statistics, which brought other information into the public domain, so that we now know that the average number of passengers per business departure from Farnborough – the UK’s premier Business Aviation airport – is just 2.53, or half the number put forward by the CAA in 2009, and that for a typical European return flight, each passenger is responsible for more equivalent CO₂ emissions than the UK average per person per annum.

This response will seek to explain these figures and extrapolate them into the national context, whereby annual BA emissions will be shown to match those of the UK’s fifth largest airport when considering the implications for UK aviation as a whole.”

HUGH SHEPPARD

OCTOBER 2011

Hugh Sheppard has been a member of CPRE for 15 years. He is Vice-chairman of CPRE Hampshire and Chairman of the North East Hampshire District Group. The Aviation Environment Federation, AirportWatch and the Campaign for Better Transport are among other organisations that have published or made use of his work. He attends meetings of the Farnborough Airport Consultative Committee and works closely with the CPRE Surrey Aviation Group on cross-county issues.

1. INTRODUCTION

- 1.1 CPRE Hampshire is a County Branch of the Campaign to Protect Rural England and an independent charity in its own right.
- 1.2 This response was prepared by Hugh Sheppard, Chairman of the North East Hampshire District Group, having originally researched the climate change implications of Business Aviation (BA) in the context of the 2009 Planning Application to Rushmoor Borough Council (refused) and the subsequent Appeal and 2010 Planning Inquiry into the expansion of Air Traffic Movements (ATMs) at Farnborough Airport. (Original RBC Ref. No. 09/00313/REVPP, 8th June 2009).
- 1.3 Determination in favour of TAG Aviation as the applicant was by a joint decision of the Secretaries of State for Communities & Local Government and Aviation, Coinciding with Inquiry into the Heathrow 3rd Runway, this was almost certainly the last airport application for which an Inspector was able to recommend approval on the grounds that the 2003 Air Transport White Paper (ATWP) embodied over-riding considerations when taking airport and aircraft emissions into account.
- 1.4 The Secretary of State for Aviation confirms this in the Foreword to the Scoping Document: *“The previous government’s 2003 White Paper, ‘The Future of Air Transport’, is fundamentally out of date, because it fails to give sufficient weight to the challenge of climate change.”*
- 1.5 This is the background to a response which sets out the reasons why the impact of aviation emissions associated with Business Aviation (BA), as the dominant sector within the General Aviation (GA) category, is unsustainable.
- 1.6 Full responsibility for the content of this response rests with the author.

2. AVIATION POLICY

- 2.1 CPRE Hampshire supports the responses of CPRE National Office to the Scoping Document, to HM Treasury’s Reform of Air Passenger Duty and to the CAA’s Future UK Airspace Strategy consultation of February 2011. The County branch has also read and endorses replies to the current consultation by:
 - The CPRE Surrey Aviation Group;
 - The Gatwick Area Conservation Campaign (GACC), and particularly GACC Evidence Paper 6: Climate Change Choices;
 - AirportWatch: both in terms of the Scoping Document and more specifically the report to AirportWatch by Peter Lockley, Ubina Environment Group, of July 2011 ‘Aviation and Climate Change Policy in the UK’.
- 2.2 In commending these papers, that of the Ubina Environment Group would seem to be exceptionally authoritative such that elements may, in time, be recognised as a definitive commentary on aviation emissions.

3. CLIMATE CHANGE

3.1 Having endorsed Peter Lockley's report, this response concentrates on climate change in the context of Business Aviation and its relevance to national and international aviation policies due to:

- The extraordinarily high ratio of emissions per flight and per person in the UK BA sector, and
- Misunderstandings perpetuated by the British Business & General Aviation Association (BBGA), the CAA, HM Treasury and others over total emission figures for the UK BA sector.

3.2 Through the BBGA, the BA industry has convinced itself that it makes a minimal contribution to UK aviation emissions as a whole. ('..... we account for only 1% of aviation emissions' [see: <http://www.bbga.aero/bbga-environmental.php>]).

3.3 **This response will show that far from BA emissions accounting for only 1% or 'around 1.5% of total UK aviation CO₂ emissions' (HM Treasury 'Reform of Air Passenger Duty Consultation' 2011 p.33), the proportion may well be double. If so, this challenges HMT's statement on the same page that: '*The net impact of emissions has not been quantified but is expected to be small or negligible, relative to total UK emissions from the industry.*'**

As a result, the DfT may wish to revisit HMT's estimate of the BA contribution to greenhouse gas emissions and take appropriate steps to scale them back in the national interest. (My emphasis and underline).

4. RESPONSES TO QUESTIONS

4.1 These responses concentrate on those questions with a direct relevance to the climate change impacts associated with BA.

The aviation sector

Q 5.1 How does the aviation sector as a whole benefit the UK? Please consider the whole range of aviation activities including, for example, air freight, General Aviation and aerospace.

A. This response will show that, as an aspect of General Aviation, Business Aviation is responsible for disproportionately high and unsustainable climate change impacts, such that CPRE Hampshire believes these operations should be discouraged. There is no convincing evidence that the commercial benefit to the UK would be lost by capping BA operations, particularly as most international business activity is already conducted on the basis of scheduled services.

- Q5.5** How, and within what constraints, can aviation growth occur as technological developments and improved operating procedures reduce CO₂, pollutant emissions and noise impacts?
- A.** For the BA sector, the UK uses more jet aircraft than EU norms or for similar traffic in the US. The wider use of propeller-driven aircraft would result in an increase of journey times, but the same quantity of fuel would power many more aircraft of a similar size. This would permit a considerable expansion of BA movements without adding to climate change implications.

Climate change impacts

- Q5.30** What do you consider to be the most significant impacts of aviation, including non-CO₂ emissions, on climate change? How can these impacts best be addressed?
- A.** If non-CO₂ impacts are to be equitably addressed, it is essential that the DfT and international agencies address Radiative Forcing as a significant factor in any assessment of how greenhouse gases affect the upper atmosphere. The DfT applies an RFI (radiation forcing index) of 1.9 elsewhere to derive an approximate figure for equivalent CO₂ emissions at ground level.
- Q5.31** What role should aviation play relative to other sectors of the economy in reducing greenhouse gas emissions in the medium and long term?
- A.** CPRE Hampshire disagrees with current government and international policies to permit leeway for the expansion of aviation emissions at the expense of the emission-related activities of other sectors.
- Q5.32** How effective do you believe the EU ETS will be in addressing the climate impacts of aviation? Should the UK consider unilateral measures in addition to the EU ETS? If so, what?
- A.** The validity of the EU ETS is compromised by international disagreement and unwarranted exclusions, such as of Very Light Jets, and dependence on financial constraints which, in the BA sector, may well be ineffective. The UK's unilateral measures should include a statutory cap on the total fuel allocation for BA. This would encourage the development and use of much more fuel-efficient aircraft, such as is referred to in Answer 5.5 above.

Q.533

Q.534

Q.535 Informed responses are not available with respect to these questions.

Q.536 Which technologies (e.g. for aircraft and air traffic management) have the most potential to help reduce aviation's CO₂ emissions (noting potential trade-offs with local environmental impacts)?

A. Key technologies that are available now would warrant the acceptance of longer journey times associated with more efficient means of propulsion, as per previous answers. Video-conferencing & high-speed rail are discussed by others.

Q.537 What more could be done to encourage the aviation industry to adopt new technology to reduce its climate change impacts?

A. Lead by example: government use of inefficient aviation services should be cut back, while Air Passenger Duty – per aircraft - should be applied rigorously across the civil and business aviation sectors.

Q.538 What more can the UK aviation industry do to reduce the climate change impact of its ground operations and surface access to and from the airport (which can also help reduce local environmental impacts)?

A. These aspects of emissions represent a very small element in the total panoply of climate change impacts caused by the industry. They represent an aspect of planning for the future of aviation that could be determined by Local Planning Authorities, unlike airport capacity and aircraft emissions for which a central aviation planning authority is needed.

Q.539 What scope is there to influence people and industry to make choices aimed at reducing aviation's climate change impacts, e.g. modal shift, alternatives to travel, better information for passengers, fuller planes, airspace management (which can also help reduce local environmental impacts)?

A. Those with wider expertise will no doubt provide some comprehensive answers.

Any other comments

Q.549 If you have comments on any strategic issues not covered in this scoping document, which you consider to be relevant to the development of the aviation policy framework, please include them in your response.

A. **It is a weakness of the scoping document that it does not seek to directly address climate change issues in the context of Business Aviation.**

On the one hand, BA is an industry that lays down benchmarks for corporate and individual success; success in rising to the top as a businessman, a sportsperson, a banker or a celebrity. On the other hand, this is an industry that symbolises excess; excess in terms of conspicuous consumption, an inordinate emphasis on the need to save time and a readiness to burn fossil-fuel at an unconscionable rate, irrespective of the wider interest.

There is a balance to be struck between such competing qualities and interests. In today's environmentally-conscious world there may be little or no room for the further expansion of aviation to satisfy this exclusive sector.

Subsequent evidence will cover the climate change impacts of Business Aviation. CPRE Hampshire believes that previous generalisations as to the proportion of emissions for which the sector is responsible have minimised their importance, while the number of business passengers carried under the banner of BA is fewer than many proponents for the industry acknowledge.

Moreover, if the high proportion of BA passengers who are said to be flying on leisure-bound activities were to be validated, the duty and tax shelter privileges of the sector, together with the climate change concerns identified in this response, warrant that a far brighter light is shone into this corner of the UK aviation industry than hitherto.

5. SUMMARY OF FINDINGS and CONCLUSIONS

- 5.1 The FINDINGS outlined below are derived from the WORKING PAPER which is appended after CONCLUSIONS.
- 5.2 Source data used for calculations is historic and not based on projections, except in noting the projected expansion of BA operations in the WORKING PAPER.
- 5.3 This is inevitably a broad-brush exercise as related data is not always available for precisely the same periods and some calculations depend on estimates and rounding-up or down. Nonetheless, such cross-referencing as has been feasible fully bears out the main conclusions.

5.4 FINDINGS

- Farnborough Airport is an exemplar of Business Aviation operations; average BA flights are responsible for 11.6 tonnes CO₂ per departure movement (no RFI applied – see Para 6.1.8). With 2.5 persons as the average passenger payload, this equates to some 4.65 tonnes CO₂ per passenger.

The return flight represents emissions of 9.1 tonnes per passenger, or up to 18 tonnes with an RFI of 1.9 applied to indicate the equivalent CO₂ at ground level.

N.B. UK average annual equivalent CO₂ emissions per person are ± 12 tonnes.

- Extrapolating data on the basis of Farnborough movements as 14% of UK BA movements overall, the evidence suggests that of a UK total of 165,000 BA Air Traffic Movements pa. some 80,000 are departures.

At 2.5 passengers per departure, a UK total of some 200,000 BA outbound passengers pa. are involved. With departures as 48% of ATMs, a throughput of some 415,000 persons is suggested for all BA operations. (The total passenger count includes people counted twice as on return flights).

- **On the 14% basis, Farnborough's 128,000 tonnes CO₂ pa. of emissions (no RF) scales up to 0.91 Mt CO₂ pa. for UK BA overall.**

5.5 CONCLUSIONS

- **Annual emissions of 0.91 Mt CO₂ pa. bring BA's overall climate change impact above that of all national airports except Heathrow, Gatwick, Manchester and Stansted, and comparable with Birmingham.** (See: CAA UK Aviation Forecasts, Page 163: Table H.6. Total CO₂ in 2010).

Table H.6: CO₂ emissions at airport level 2005 2030 and 2050 detailed (central forecast)

	Total CO ₂ (mtCO ₂) in 2010	Share of 2010 Total CO ₂	Total CO ₂ (mtCO ₂) in 2030	Share of 2030 Total CO ₂	Total CO ₂ (mtCO ₂) in 2050	Share of 2050 Total CO ₂
Heathrow	18.9	56.4%	23.1	48.5%	14.9	30.4%
Birmingham	0.9	2.6%	4.3	9.1%	4.0	8.2%
Gatwick	3.8	11.4%	3.8	8.0%	3.7	7.6%
Manchester	2.3	7.0%	3.7	7.8%	5.9	12.0%
Stansted	1.3	3.8%	2.0	4.2%	1.8	3.6%
Luton	0.5	1.6%	1.0	2.1%	0.6	1.3%
Edinburgh	0.5	1.6%	1.0	2.0%	1.1	2.3%
Glasgow	0.5	1.6%	0.7	1.5%	1.1	2.3%
Bristol	0.4	1.1%	0.6	1.3%	0.8	1.7%
London City	0.2	0.6%	0.6	1.2%	0.6	1.2%
Leeds/Bradford	0.2	0.6%	0.5	1.1%	1.1	2.3%
Southampton	0.1	0.3%	0.4	0.9%	0.3	0.6%
Belfast International	0.2	0.7%	0.4	0.8%	0.5	1.1%
Newcastle	0.3	0.9%	0.3	0.7%	0.5	1.1%
Liverpool	0.3	0.8%	0.3	0.7%	1.2	2.4%
Nottingham East Midlands	0.3	0.9%	0.3	0.6%	3.3	6.8%
Aberdeen	0.2	0.5%	0.3	0.5%	0.2	0.5%
Bournemouth	0.1	0.3%	0.2	0.4%	0.6	1.3%
Humberside	0.0	0.1%	0.2	0.4%	1.1	2.2%
Prestwick	0.1	0.3%	0.2	0.4%	0.3	0.6%
Belfast City	0.1	0.3%	0.2	0.3%	0.2	0.5%
Exeter	0.1	0.2%	0.1	0.2%	1.1	2.3%
Cardiff	0.1	0.3%	0.1	0.2%	0.6	1.3%
Doncaster Sheffield	0.1	0.3%	0.1	0.1%	0.2	0.3%
Norwich	0.0	0.1%	0.1	0.1%	0.1	0.3%
Inverness	0.0	0.1%	0.1	0.1%	0.1	0.1%
Newquay	0.0	0.1%	0.0	0.1%	0.1	0.1%
Plymouth	0.0	0.0%	0.0	0.1%	0.1	0.3%
Durham Tees Valley	0.0	0.0%	0.0	0.0%	0.1	0.1%
Blackpool	0.0	0.0%	0.0	0.0%	0.0	0.0%
Coventry	0.0	0.0%	0.0	0.0%	0.1	0.2%
Ground (APU)	0.4	1.2%	0.6	1.2%	0.8	1.6%
Freight	1.1	3.2%	1.9	4.1%	1.1	2.2%
Residual	0.4	1.2%	0.6	1.2%	0.6	1.1%
Total	33.4		47.6		49.0	

- **Birmingham Airport handles 9.1 million passengers pa. (See para 6.4.11) for the same proportion of national emissions as the 415,000 passenger throughput of UK Business Aviation (2.6%). In sum, each BA passenger is responsible for over 20 times the individual emissions per journey of his or her civil counterpart.**
- CPRE Hampshire accepts that aspects of source data may need to be qualified; eg. the re-calculation of emissions data as put to the Inquiry in Public into the appeal against expansion at Farnborough - refused by the Local Planning Authority and granted by Secretaries of State.
- Even if the outcomes as demonstrated were to be revised by 10, 20 or 25%, there can be no doubt that Business Aviation is unsustainable in terms of its contribution to the UK's aviation emissions and is failing to play a positive part in support of the UK's climate change policies.
- **The DfT is urged to review and revise government's assessment of the contribution of Business Aviation to the UK's national aviation emissions.**

WORKING PAPER

DEVELOPING A SUSTAINABLE FRAMEWORK FOR UK AVIATION: SCOPING DOCUMENT

CPRE HAMPSHIRE RESPONSE

OCTOBER 2011

6. METHODOLOGY

6.1 OVERVIEW

- 6.1.1 There is no ready means of establishing the climate change impact of Business Aviation (BA) other than by cross-referencing traffic data from Europe, the UK and individual airports, in this case Farnborough as an exemplar of BA.
- 6.1.2 The European Organisation for the Safety of Air Navigation (Eurocontrol) publishes data for the European Business Aviation Association (EBAA) as 'Business Aviation: Traffic Tracker Europe' which, in turn, is re-published on the British Business & General Aviation Association (BBGA) public website.



- 6.1.3 Traffic Tracker Europe covers BA flights on an EU airport, state and EU 27 (Europe-wide) basis. For most EU states a high proportion of flights are tabled as 'Internal'. These are identified separately from 'Arrivals' and 'Departures' ie. inbound and outbound flights between states. Where Eurocontrol shows total 'Flights' this can include overflights which are not normally assessed within UK airport Air Traffic Movements (ATMs).
- 6.1.4 Internal flights within the UK represent a smaller proportion of BA flights than European norms, so that comparisons with other states need to be assessed with caution. Departures from individual UK airports as a proportion of airport movements can be derived from available data as, in this context, 'Departures' represent all outbound flights.
- 6.1.5 Farnborough departures shown by Eurocontrol tables are 48% of total airport ATMs shown in TAG reports to the Farnborough Airport Consultative Committee (FACC). The implication is of 2% positioning flights etc. which may be ignored in extrapolating Farnborough data so as to assess UK-wide BA totals. In principle, national BA totals are derived on the reasonable assumption that they are broadly in proportion with Farnborough.

- 6.1.6 BA passengers across the EU had been assessed as 2.3 per flight in trade journals of 2008/9, but the key figure of 2.53 passengers per Farnborough departure was given in evidence on behalf of TAG to the Public Inquiry (Ref. APP/P1750/A/09/2118357/NWF. Also see para 1.2).

This is likely to be the source for HM Treasury's statement that '*Evidence from the industry generally suggests that the average "business jet" carries around 2 – 3 passengers*'. ('Reform of Air Passenger Duty Consultation' 2011).

(NB. Prior to CPRE initiating discussion of the payloads issue at an FACC Meeting in 2009 and bringing this to the Inquiry, the CAA Report of May 2009: 'UK Business Air Travel – Traffic Trends and Characteristics' had assumed that '*there are, on average, five business travellers per flight,...*')

In this response, calculations assume a business passenger payload of 2.5.

- 6.1.7 By convention, aircraft emissions are calculated for individual airports on a departure basis ie. as for single flights, including internals. Arrivals contribute to the emissions set against the appropriate departure airport, again as single journeys. To assess the approximate aircraft emissions associated with a return trip, those for a given departure movement and thus associated with an airport's overall CO₂ contribution, should be doubled. (This does not deny the validity of the per departure method of calculation which avoids double-counting).
- 6.1.8 Radiative Forcing (RF) is an index or multiplier for the heightened effect of aircraft emissions on global warming. CO₂ measured in metric tonnes is used to assess climate-warming impacts, but water vapour, NO_x and other emissions from aircraft engines are believed to cause more harm to the upper atmosphere than at ground level. Different authorities take account of this by applying an RF index of between 4 and 1.9 to the more readily determined CO₂ emissions. An RF of 1.9 has been accepted by DfT in some circumstances, but this is only discussed in general terms in the context of the Scoping Document.
- 6.1.9 For a realistic assessment of the impact of BA aircraft emissions, this response calculates CO₂ impacts both without RF and with an RFI of 1.9.

6.2 FARNBOROUGH AND UK MOVEMENTS & DEPARTURES

- 6.2.1 The key Eurocontrol data for July 2011 shows all UK BA movements ('flights') averaged 452 per day. For the Year to Date (YTD) since January 2011, the figure is 402 per day ie. for the UK BA industry as a whole. (Data tabled for June 2009 was 433 per day with 357 pd. for the YTD).

To ensure no under-accounting, this has been rounded to assume 450 UK BA movements per day or say, 165,000 movements per annum (mpa).

TAG Farnborough Airport

Farnborough Aerodrome Consultative Committee
TAG Information Report
June 2011



1. Aircraft Movements

1.1 TAG's planning permission up to and including 2010 allowed for 28,000 movements a year, of which up to 1,500 could be between 50 and 80 tons maximum take-off weight (MTOW). Following the acceptance of the TAG appeal on the 11th February 2011, 31,000 movements are now permitted for 2011 of which 5,500 are permitted on weekends and bank holidays. The restriction on aircraft movements between 50 and 80 tons remains unchanged.

1.2 The table below displays movements since the last meeting; the blue section of the table relates to the reporting period of this FACC report:

Month	Reported aircraft	50-80T	Weekend
January	1606	20	442
February	1770	16	458
March	1920	28	328
April	1639	34	410
May	2333	40	659
FACC Period Total	7662	118	1855
2011 Total	9268	138	2297

6.2.2 Recent Farnborough data (TAG reports to the FACC) shows airport movements of 9,268 for January to May 2011, of which 138 were of 'heavy aircraft' (50 – 80 tonnes). For BA calculation purposes these are discounted as atypical since most have a full passenger load, eg. regular BAE workforce flights, although some could class as BA. The revised total of 9,130 'business jet' movements over 5 months represents an average of 1,826 BA movements per month, or 21,912 mpa for 2011 based on the YTD. (This correlates well with the known total for 2010 of 23,511 mpa. or 22,926 mpa for BA exc. heavy aircraft).

This has been rounded to assume circa 23,000 mpa for BA at Farnborough.

6.2.3 Paras 6.2.1 and 6.2.2 source evidence of total Farnborough movements as some 14% of all UK BA movements on average in recent years.

6.2.4 From Eurocontrol data for airports, average Farnborough departures are 33.2 pd. for July 2011 with an average of 28.3 pd. YTD. **Allowing for 30 departures per day as an average in recent years, this would equate to some 11,000 for the full year, or 48% of all Farnborough mpa.** (The 2% representing positioning flights etc. has been discounted as per Para 6.1.5).

On this basis, national Business Aviation departures would total circa 80,000 of the 165,000 UK BA annual movements. (see: Para 6.2.1).

Again, this figure correlates well with HM Treasury's recent APD Consultation (page 32) which quotes 'around 80,000 – 90,000 "business jet" flights...' with a potential liability to pay APD as a new charge in 2012 – 2013.

6.3 GREENHOUSE GAS EMISSIONS

6.3.1 Where this response disagrees with H M Treasury's APD consultation (page 33) is in relation to its statement that '*Evidence from industry suggests that "business jets" account for 1.5% of total aviation CO₂ emissions.*' And: '*The net impact on emissions has not been quantified but is expected to be small or negligible,.....*' (See Para 3.3).

- 6.3.2 Environmental Statement 6 of the Farnborough expansion application (09/00313/REVPP) originally set out a total of 469,314 tonnes CO₂ pa. for aircraft emissions in cruise as a consequence of approval, to which an RF index of 4 was applied before adding airport emissions of 19,749 tonnes CO₂ with no RF. This gave a grand total of over 2 million tonnes CO₂ equivalent should the proposal to expand to 50,000 mpa succeed. Using this (flawed) method, the total assessed for 2008 as the baseline year with 28,000 mpa permitted was tabled at over 1 million tonnes.
- 6.3.3 At the instigation of CPRE Hampshire and after wide publicity this was corrected by consultants RPS on behalf of the applicant. Revised figures put to the Inquiry set out a total of 241,153 tonnes CO₂ pa for aircraft in cruise, subject to consent, with no mention of RF.

http://aerograms.net/farnborough_airfield_builder.html

The CO₂ analysis for the Airport considered the baseline year (2008) and 2019 with and without consent scenarios. This identified an increase in CO₂ associated with the aircraft movements from the Airport of approximately 10% in the event that permission is refused and 70% if the Airport is granted permission for 50,000 aircraft movements per annum by 2019 (an increase of 78% on the permitted number of movements). The majority of the increase in emissions is associated with aircraft in flight; TAG only has direct control over a very small proportion of these projected CO₂ emissions increases. Were these aircraft not able to fly out of Farnborough it is likely that the majority would find alternative airports. Therefore, the net emissions would be the same, or in some cases greater, depending on the additional distances flown to reach these alternative airports and whether the aircraft were held in flight before obtaining a landing slot - an activity known as "stacking" which is common at many airports in the South East but very rare at Farnborough. Also, these calculations do not take account of carbon offsetting measures proposed through the EU-ETS scheme (described previously) or technological and other advancements in aircraft design, efficiency and emissions predicted over the coming decade.

TAG Aviation has determined in consultation with the original authors of the Environmental Statement that an error was made in the calculations, such that the coefficients were applied to individual engines rather than per aircraft. This means that the previous calculation for cruise emissions overestimated by a factor of more than two (since it was effectively, double-counting twin-engined aircraft and counting quads four times). The re-calculated figures for cruise emissions are:

Cruise emissions tonnes of carbon dioxide		
	Published in the application	New
Baseline year	265595	128412
With consent	495594	241153
Without consent	291106	140756

- 6.3.4 For this response, it is appropriate to take the revised figures for 2008, the baseline year (ie. before approval) in order to relate these total Farnborough emissions to the number of of departures. The total tabled at the Inquiry was 128,412 tonnes CO₂ pa. for aircraft (as above, with no RF) and 14,757 tonnes for the airport.
- 6.3.5 Some 585 of Farnborough’s baseline year movements were accounted for by ‘heavy aircraft’ or some 2.5% of the total. Assuming such aircraft emit double the emissions of regular BA aircraft, this represents ± 5% of calculated CO₂ pa. This is a sufficiently close figure to the 6% represented by ground-based airport emissions that the one may be set off against the other – and ignored.
- 6.3.6 Such an approximation is sufficient to validate the climate change impact of BA nationally as a proportion of total aviation emissions for the UK. Since detail calculations would be influenced by a wide range of practical and theoretical criteria over which experts would inevitably disagree, DfT analysts may find accord with this generalised presentation.

6.4 THE FINDINGS

- 6.4.1 Findings are straightforward, in that they rely on data reported as above both to derive BA emissions per departure and per person for the UK as a whole and to assess BA's proportion of annual national aviation emissions.
- 6.4.2 For Farnborough in recent years total BA departures are taken as 11,000 pa. as per para 6.2.4 above. At 2.5 passengers per departure, some 27,500 passengers would have been carried on these outbound flights. A similar number of inbound /returning BA passengers would bring the airport throughput (excl. 'heavy aircraft') to some 55,000 persons pa. - plus flight crews, stewards etc.
- 6.4.3 Aircraft emissions for a similar number of Farnborough departures in 2008 are taken as some 128,000 tonnes CO₂ pa. This implies some 11.6 tonnes CO₂ per aircraft departure, or some 4.65 tonnes CO₂ per typical passenger.
- 6.4.4 With no allowance for RF, it is reasonable to assess each passenger on a typical return BA trip as responsible for some 9.3 tonnes CO₂. Allowing for an RF index of 1.9, the outcome is that each such passenger's return trip contributes some 18 tonnes of greenhouse gas emissions.
- 6.4.5 Extrapolating Farnborough data on the basis that it represents 14% of national BA emissions, the outcome for a typical recent year is that national UK Business Aviation departures were responsible for a total of some 0.91 million tonnes CO₂ pa, ignoring RF. Taking RF of 1.9 into account, the annual total is a CO₂ equivalent of circa 1.73 million tonnes.
- 6.4.6 If return BA flights are also recognised as a responsibility of the UK as the country of origin, a total of 3.46 million tonnes CO₂ equivalent emissions pa. can be laid at the door of UK Business Aviation.
- 6.4.7 This figure equates to the average annual CO₂ emissions for nearly 300,000 UK residents (based on 12 tonnes per person pa.). However, the individual benefits are experienced by only 200,000 BA passengers on return flights, typically within Europe and averaging perhaps 1½ hours each way.
- 6.4.8 Taking annual UK aviation emissions overall, the latest DfT forecasts list the total as 34.7 MtCO₂ for 2009. On this basis, UK Business Aviation with emissions of 0.91 MtCO₂ (without RF) can fairly be said to represent some 2.6% of total UK aviation emissions.**
- 6.4.9 This 2.6% proportion remains constant provided like is compared with like, ie. for departures or return flights, with or without applying an RF index etc.
- 6.4.10 These annual emissions bring BA's overall climate change impact above that of all national airports for 2010 except Heathrow, Gatwick, Manchester and Gatwick, and comparable with Birmingham. (See: CAA UK Aviation Forecasts, Page 163: Table H.6).**

6.4.11 The passenger throughput of Birmingham is reported in Annex F: Detailed Validation Results, Page 141 of the CAA report. This shows the airport with 94,000 ATMs in 2009 and a throughput of 9.1 mppa (million passengers per annum). With 47,000 ATMs (50%) as departures, **some 4.05 million outbound passengers were responsible for Birmingham's 0.9 MtCO₂.**

Compare UK BA: 80,000 departures out of 165,000 ATMs (inc. positioning etc.) which, at 2.5 passengers per ATM, represent an industry throughput of some 412,500 persons or well under 0.45 mppa. Of this UK BA throughput, **some 200,000 outbound passengers were responsible for BA's 0.91 MtCO₂.**

6.4.12 **If total airport and BA passengers are related to total departure movements, each departing Birmingham aircraft is shown to average a payload of 96.8 passengers, compared with the 2.5 passengers for BA.**

6.4.13 **From the same data, Birmingham's outbound passengers are each responsible for 220 kg (0.22 tonnes) CO₂, while UK BA outbound passengers are each responsible for some 4.65 tonnes CO₂, ie. over 20 times the emissions per passenger.**

6.5 PROJECTIONS

6.5.1 Farnborough Airport has permission to expand from 28,000 to 50,000 annual movements. If taken up, this would be more than double the historic number of ATMs of recent years. It plans for this by 2020.

6.5.2 Should UK Business Aviation as a whole more than double its ATMs by 2020, this would imply a doubling of BA national emissions. Hence, in the face of all UK civil aviation emissions being held at or close to their current level, the proportion of UK BA emissions will potentially increase to more than 5% of the total for UK aviation.

END

Hugh Sheppard

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