



ANNEX C

Heathrow Air Traffic Forecasts

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Role of air passenger and air transport movement forecasts

1. The projections of air quality and noise around Heathrow used for the analysis reported in this consultation depend in part on forecasts of passenger and ATM throughputs at Heathrow.
2. Passenger throughput forecasts are inputs to the forecasts of surface transport demand to and from Heathrow which affect the air quality tests, and to the forecasts of ATM throughput at Heathrow which affect both the noise and air quality tests.

Forecasting approach

3. DfT and BAA each produce Heathrow passenger and ATM forecasts. BAA employs a forecasting methodology which has both differences from, and similarities to, DfT's. The two methods produce broadly similar results. For example, both forecast continued growth in passenger and ATM demand and build in the latest industry information on the likely future mix of aircraft operating at Heathrow.
4. The complexity of the air quality and noise modelling precluded running every scenario on both BAA and DfT forecasts. The BAA forecasting system is designed both to inform strategic decision making within BAA, and to provide detailed forecast outputs for facility development and

operational purposes. BAA's outputs can therefore include data such as daily schedules of departures and arrivals by aircraft type at Heathrow. DfT's forecasting system is designed primarily for the purpose of informing strategic aviation policy, and while it can provide some departure and arrival information at Heathrow, its outputs are less detailed than BAA's. As the noise and air quality modelling relies on detailed data, BAA's forecasts were the preferred source of the required inputs. However, DfT's forecasts were used throughout the modelling process as benchmarks to quality assure BAA's forecasts at the most detailed level possible. The impacts on the air quality and noise modelling conclusions of any significant differences between the forecasts were determined through sensitivity analysis.

5. **Table C1** summarises the BAA forecasts. An explanation of BAA's forecasting method, and a comparison with DfT's, is set out below.

BAA's forecasting methodology

6. BAA's current long term forecasting methodology involves the following steps:
 - i. forecast unconstrained passenger demand for London airports⁶⁵;

Table C1: BAA Heathrow passenger and ATM forecasts

Scenario	Year	Air Transport Movements (000s pa)	Passengers (million pa)
Outturn	2000	460	64
	2006	471	67
Maximum Use of existing runways	2015	480	85
	2030	480	95
Mixed Mode 2015–2019 at 540,000 ATMs, then Third Runway at 605,000 ATMs rising to 702,00 ATMs in 2030	2015	540	90
Third Runway 2020 at 605,000 ATMs rising to 702,000 ATMs in 2030	2030	702	122

- ii. assess the capacity constraints at each London airport;
 - iii. allocate the passenger demand to BAA's London airports within the capacity constraints;
 - iv. forecast connecting passenger volumes; and
 - v. forecast freight traffic.
- i. Unconstrained demand*
 - 7. BAA's method begins by generating passenger demand forecasts for London area airports as a whole. These are unconstrained in that they take no account of future additional airport or airspace capacity constraints.

8. BAA's view on the key drivers of passenger demand is informed by an econometric modelling framework. This uses equations to estimate drivers of passenger demand. BAA finds that the key driving factors of air passenger demand include UK GDP, consumer expenditure, international trade, and air fares. The sensitivity of passenger demand to these factors varies by market segment (e.g. business and leisure). Combining its projections of these factors with its view of their influence on passenger demand delivers BAA's unconstrained forecasts of London area passenger demand by market segment.

ii. Capacity

9. BAA then assesses the availability of passenger capacity at each airport during the forecasting period. This depends on the development scenario, e.g. whether in a particular year existing runways, operating modes, and supporting infrastructure will continue or be altered. Under each scenario, the annual passenger capacity of each airport's runway(s) depends on the maximum number of passenger ATMs per year, and the average number of passengers per ATM. The latter is a function of the mix of geographical markets served from the airport, the mix of aircraft types used to serve each market, and the load factor (proportion of seats filled). BAA's forecasts of aircraft fleet mix start with the existing mix in the

base year, adds in announced future purchases, and then predicts how additional demand will be met by existing and new aircraft types, at five year intervals.

iii. Demand allocation

10. BAA's next step is to forecast how demand is likely to be distributed between airports. It uses the CAA's origin and destination surveys to identify the factors that affect the attractiveness of an airport to passengers. It concludes that the major determining factors are accessibility and airline service frequency, and that sensitivity varies between passenger segments.
11. The share of passengers from each geographical area allocated to each airport is determined by applying BAA's view of the attractiveness of each airport to passengers travelling to or from each area. This is combined with its unconstrained London area forecasts to generate an initial level of demand at each airport in future years.
12. BAA then compares demand with passenger capacity to see whether the allocated demand can be accommodated. If there is excess demand, BAA determines its reallocation to other airports, taking into account their view of each passenger segment's propensity to switch, and the likelihood of such 'spillover' to be attracted by each alternative airport. This 'spillover'

is based on judgements on the relative attractiveness of each airport which depends in particular on the availability of capacity and the breadth and depth of air services from each airport. Not all of this spillover is assumed to remain within BAA's London airports, or the five London airports as a whole; some demand may switch to non-London airports, or be lost. BAA repeats this process until airports are either at or below their estimated capacity. Once this high level forecasting has been undertaken, BAA generates a wide range of forecast data outputs in support of each scenario. These include data required for NATS, air quality modelling, air noise modelling, and facilities and layout planning.

iv. Connecting passenger volumes

13. BAA believes there are features relating to passenger traffic connecting flights at an airport which make it more volatile and less easy to forecast by conventional econometric means. It believes the key factors underlying this to be: the greater level of inter-airport competition (both with other hubs and with direct services); a greater sensitivity to individual airline strategies; the relative importance of airport facilities on passenger choice; and the extent to which airlines regard connecting traffic as 'core' to their market.

14. As a result, BAA's approach to forecasting connecting activity entails making judgements on the extent to which changes might occur in the level of competition, the level of airport capacity relative to demand, and the potential for passengers to fly direct rather than via a connection. BAA incorporates these judgements in its demand and allocation models by treating international/domestic and international/international connecting passengers as specific segments of the market.

v. Freight traffic

15. BAA's approach to forecasting air-flown cargo tonnage results from judgements on the level of freight which will be flown in the belly-holds of passenger aircraft and the freight flown in freighter aircraft. The latter is a product of the runway capacity which is likely to be available for freighter operations together with assumptions on the likely freighter types. The analysis is therefore driven more by available capacity than demand considerations.

DfT's forecasting methodology

16. DfT's forecasting methodology is similar to BAA's method, in that:
 - it uses econometric models with income and air fares as driving variables to produce an 'unconstrained' forecast of air passenger demand;

- passengers are split into UK and foreign, business and leisure and domestic and international journey purpose markets;
- unconstrained demand is allocated between airports, taking into account capacity constraints;
- passenger demand forecasts are converted into ATM demand forecasts; and
- fleet turnover and replacement assumptions are used to produce fleet mix projections at each airport.

17. However, the DfT model differs in that it:

- covers the whole of the UK;
- applies the structure and parameters of estimated econometric models explicitly to produce unconstrained demand forecasts;
- allocates passengers to airports using a statistical model of airport choice, calibrated to past data, which allocates passengers according to 'generalised cost', comprising:
 - the surface access journey by either road or public transport between the airport and the point of origin or destination;
 - the number, range and convenience of flights at each airport (including waiting time and penalties for interchanging);
 - the fares charged on specific routes at each airport; and
 - flying time;
- builds up the total allocation of passengers to airports at the route level using 48 international zone destinations and 32 UK airport destinations, whereas BAA allocates to 13 geographical sectors after the initial airport allocation;
- forecasts connecting passengers during the main passenger to airport allocation process comparing the costs of direct and indirect routings;
- forecasts ATM demand at each airport by applying observed past relationships between ATM size, ATM frequency, and passenger demand, plus expectations of future airline fleet replacement strategies;
- deals with excess demand by raising the cost of passengers accessing a capacity-constrained airport by adding an element to generalised cost (known as a 'shadow cost') and repeatedly re-running the calibrated airport choice model until demand at each airport is at or below capacity; and,

- forecasts fleet mix by extrapolating the current fleet of aircraft using UK airports by retiring older aircraft and replacing them with new stock, using assumptions about retirement ages and the replacement models of aircraft likely in each forecast year.
18. **Table C2** below shows the DfT ATM and passenger demand forecasts for each year and scenario reported in Table C1. It shows that while the forecasts differ in some respects,

they are broadly similar. They both forecast that continued growth in passenger and ATM demand would lead to the take up of most or all of the capacity available under the scenarios considered. BAA's forecasts of passenger demand tend to be higher than DfT's, except for the 2030 third runway scenario. In that scenario, the difference is mainly due to DfT forecasting a greater number of interlining passengers, so the

Table C2: DfT Heathrow Passenger and ATM Forecasts

Scenario	Year	Air Transport Movements (000s pa)	Passengers (million pa)
Outturn	2000	460	64
	2006	471	67
Maximum Use of existing runways	2015	480	80
	2030	480	85
Mixed Mode 2015–2019 at 540,000 ATMs, then Third Runway at 605,000 ATMs rising to 702,000 ATMs in 2030	2015	540	90
Third Runway 2020 at 605,000 ATMs rising to 702,000 ATMs in 2030	2030	702	135

Note: DfT's iterative forecasting model solves to a tolerance of around +/-3 per cent of ATM capacity. Where the capacity inherent in the solution exceeds forecast capacity, the forecast capacity has been reported.

forecasts of passengers requiring surface access are broadly similar.

19. A more detailed explanation of DfT's forecasting methodology and forecasts is given in *UK Air Passenger Demand and CO₂ Forecasts* – see Annex D.