exhaustless

Sir Howard Davies, Chair
Airports Commission
Sanctuary Buildings
20 Great Smith Street
London
SW1P 3BT
United Kingdom
demandforecasting@airports.gsi.gov.uk

Dear Sir Howard,

We are submitting this letter in response to the 'Aviation Demand Forecasting Discussion Paper' dated Feb 2013.

Answers to questions below are numbered in the order they appear in the discussion paper sections labeled 6.4 and 6.5.

Best regards,

[redacted]
Chief Executive Officer
Exhaustless Inc.
[redacted]

Discussion paper section 6.4 Questions and Response:

1. To what extent do you consider that the DfT forecasts support or challenge the argument that additional capacity is needed?

   The DfT forecasts support the argument that additional hub capacity is needed at Heathrow (LHR). These forecasts show LHR is already using 100% of its runway capacity.

   Historical and forecasted demand figures focus on average volumes of passengers and not the queues that accrue from such high utilization and everyday variability from events; like an unexpected security delay, flight equipment warning, missing passenger, stuck door, ground crew staffing issue, or migrating birds. Even less analysis has been given to the capacity needed to ensure a graceful recovery from storms rather than cancel flights.

   Many airlines advertise 80% of flights as “on time”, but define “on time” as less than 15 minutes late. The *average* delay at Heathrow is 12 minutes according to their statistics. Redefining “on time” may help meet corporate goals, but comes at the expense of a stressful experience for travelers, especially when the remaining 20% of flights are chronically unpredictable. (See Appendix A for more information.)

   Instead of unsatisfying refund schemes for late passengers, the UK should commit achieving a minimum level of service. As far as passengers are concerned, departure occurs at “wheels up” and arrival when “disembarking.” The UK should strive to goals such as “wheels up” or “disembarking”:
   1) Early or on schedule for 70% of the flights,
   2) Less than 5 minutes late for 90% of the flights, and
   3) Less than 10 minutes late for 95% of the flights.

   As a DfT forecast example, HS2 allows an increasing number of trains to run concurrently in a loop, to increase capacity, when demand peaks at various times of the day and year. At other times, additional cars increase the number of passengers served on each of the trains in the loop. This feature could be foregone to save money but would reduce the level of service during peak use. So having empty seats on a train is not a waste of money if peak demand justifies the added expense needed to meet low wait-times required to meet the expectations of travelers. Idle trains and empty seats are just forms of “reserve capacity”, as are unused gates, terminals, and runways.

2. What impact do you consider capacity constraints will have on the frequency and number of destinations served by the UK?

   Limited resources produce a self-selecting process whereby routes serve the highest-bidders. The decision process of adding more destinations versus more frequent flights to destinations already served is similar to any other marketing decision, but constrained capacity may force reduced frequency AND reduced number of destinations to prevent losing existing profitable customers to poor quality of service. The trend to reduce flight and passenger volumes to increase price and profit has a limit, but for long-haul flights, the price is quite high before private jets and charter flights compete – at least for flights originating in the UK.

   The hub effect plays an important economic role in profitability of airlines and airports. Constrained capacity will lead to faster cycles of reduced convenience and higher fares for general passengers, to provide higher convenience and higher fares for targeted high-profit passengers. The more constrained the capacity, the faster the process. Those airlines that don't adjust to this new market condition will become much less profitable and open to takeover.

   In summary, limited capacity requires airlines to forego volume and pursue margin. Larger aircraft may offset some of the capacity constraint, but the decision by airlines will still be to offer the few additional seats to either 1) high-paying passengers who demand punctual service, or 2) those less willing to pay for fares and slow everyone down by pushing utilization to high. The era of "low price airfares" as outlined by the DfT was supported by many economic factors. New York and Los Angeles experience similar airport capacity constraints and highlight the challenge in spreading demand among neighboring airports.

3. How effectively do the DfT forecasts capture the effect on UK aviation demand of trends in international aviation?

   The forecasts ignore important lessons from game theory. If the UK restricts aviation, will neighboring countries also forego economic expansion or take the business while waiting for innovation to overcome any carbon or noise reduction goals? If the UK restricts CO2 emissions from aviation, will the emissions follow the market to Amsterdam or Paris or possibly Dubai?

   Without focused effort to overcome noise, pollution, and emissions from airports, connecting flights might migrate to oil rich countries without land constraints. Whether the UK could prevent high-profit passengers from switching would require further analysis of the needs of those customers.

4. How could the DfT model be strengthened, for example to improve its handling of the international passenger transfer market?

   Without sorting routes by profit, the forecasts for international transfer passengers are not supported by an understanding of the market served. For example, Heathrow may serve 35% of the international transfer *passengers* but collect 80% of the *profits* - due to serving the most profitable routes.

   Our rough approximation is that the UK has lost 37% of the transfer passenger market opportunity since 2003 (Appendix A.) But if the remaining mix of routes produces more profit through higher ticket prices, then the "hub effect" is working well. Sorting routes by profit provides information to the commission about the marginal benefit of capacity for servicing more passengers or offering current passengers better service.

   Those transfers willing to pay higher prices to pass through the UK likely have other business and are more likely to spend money in the local economy. The UK would prefer to attract and not lose these higher-profit transfers to competing hubs by diluting service to increase passenger numbers. For example, employees of Bloomberg may fly through UK to offices in the Far East. Given the investments in office space in London by Bloomberg, those employees are more likely to spend additional time and money within the London area.

   [Commissions that intend to encourage route development at smaller airports should consider that profitability depends upon hub status, not the other way around. The concept of a "multi-hub" misses the key economic qualities that define a hub, such as the lower marginal cost of offering another flight, ground transport, land expense, and air space limits. A profitable single hub that operates as a monopoly broken into two "hub-lets" in the hopes of fostering market competition will more likely leave neither airport and associated airlines profitable. This may seem to benefit passengers, but actually degrades service for all and creates a need for taxes for infrastructure funding. This runs counter to creating financially self-sustaining airports, and should require other techniques to limit monopoly power.]

5. What approach should the Commission take to forecasting the UK's share of the international aviation market and how this may change in different scenarios?

   The commission should rely upon ticket sales for connecting flight as the metric for measuring its position within the international aviation market. Those travelers who intend to spend money in the UK while connecting or having business in the UK will pay higher prices for fewer connections.

Price sensitive transfers at neighboring hubs are less likely to have business in the UK or spend more if a connection were offered through the UK. Using profit as the market metric rather than passengers will provide the commission with forecasts that correctly assess whether more capacity would provide better service to attract more high profit customers or would instead attract less profitable price-sensitive routes.

6. How well do you consider that the DfT's aviation model replicates current patterns of demand? How could it be improved?

   The forecasted reduction of demand from substitutes like video conferencing should stay low as forecasted. This is supported by the large supply of unused fiber spanning oceans today that could provide much more capacity than demanded today.

Discussion paper 6.5 Questions and Response:

1. Do you agree with the source of the input data and assumptions underpinning the DfT model?

   No. The DfT model assumes that constrained hub capacity will bleed over into more regional airport demand, but will airlines supply those routes given the lack of hub capacity within the UK? Attempts to expand regional offerings in Los Angeles have not been profitable enough for lasting success. Profitable routes rely upon the fact that the bulk of travelers fly between hubs. Small airport to small airport routes require new airline entrants with "Southwest Airlines style" business models and political market restrictions that gave Dallas Love Field enough volume for Southwest to thrive on low-cost fairs.

   The DfT forecast assumes that low cost fares are less likely in the future, but that enough demand exists to justify new market entrants. These conflicting assumptions create a paradox that is difficult to balance especially given the volatile price of fuel and policies that may restrict connecting capacity at Heathrow.

   The assumption that "passengers will fly from regional airports to other hubs" implies that the routes are frequent enough to justify the investment in aircraft and staff. The profitability of airlines may be outside the scope of the DfT model, but plays an important role in how demand may be constrained in other ways than by future carbon taxes, increased jet fuel prices, and high-speed rail. Even if enough hub capacity exists in Amsterdam, Paris, and Frankfurt to increase demand at the regional UK airports, the supply of routes may not increase unless those routes are sufficiently profitable. The high-value services offered by business travelers should continue to outpace the rise in costs of fuel and tickets, but these high-value economic activities typically occur between large cities with easy access to hub airports, not regional airports.

2. Do you agree with the choice of outputs modeled?

   Not without an assessment of reserve capacity for randomness. What amount of resilience is needed to ensure adequate recovery from weather events rather than massive flight cancellations? Investments by Heathrow in snow moving and plowing equipment should help reduce connecting delays, but the storms themselves may lie in the shifting routes of arriving aircraft adding to the variance in inter-arrival times. This will produce delays and long queues without adequate reserve, or stand-by, capacity. The P-K (Pollaczek-Khinchin) queuing model and other similar relationships could provide the commission an estimate of achievable

level of service for a given level of demand and capacity. As a simple example, the following image shows the predicted time airplanes spend waiting for takeoff given a number of runways.

Possible Reduction in Takeoff Queue Times

PK Formula

	Old Capacity		New Capacity	
ci	1	Variability	0.99	interarrival
cp	1		0.99	process
Ri	34	per hour	35.7	arrival rate
Rp	35	per hour	70	process rate
rho	0.971	rho2	0.510	utilization
c	1	runways	2	
1/Rp	0.029		0.014	
(Ci^2+Cp^2)/2	1		0.9801	
exp	1		1.449489743	
sqrt(exp)	1		1.449489743	
rho^exp	0.971		0.377	
1-rho	0.029		0.490	
T	0.971	hours	0.011	time in queue
	58.286	min	0.646	
I	33.029	airplanes deep	0.520	planes in queue
		98.89%	Reduction	

3. Do you consider that the DfT modeling approach presents an accurate picture of current and future demand for air travel? If not, how could it be improved?

   The model likely accurately presents current demand at current supplies and prices, but not at the price possible for achieving higher customer satisfaction associated with reduced delays or higher resilience to storms.

   Estimation error or accuracy for future demand, supply, and prices is very difficult to quantify based upon shifting energy and climate policy. Government action can limit the capacity of aviation without adequately funding the research needed to overcome the issues that justified the policy.

   If the commission decides that trends toward large aircraft will continue, and that HS2 will allow regional travel without the need for aircraft, then why does DfT assume airlines will invest in regional jets while hub connections continue to decline for short-haul flights? An improved model would look at the relationship of route profit to decisions to offer new routes and expand additional flights in routes already served. Airlines would prefer to focus almost exclusively upon one airport until full vs. growing equally across all airports served.

4. Is the DfT model suitable to underpin an assessment of the UK's aviation connectivity and capacity needs?

   Not without a service level goal or "test case" defined as the desired level of recovery from unexpected events. These could be called a Category 1 event, Category 2 event and so on. Category 1 events could be defined as rejected takeoff, or runway down for 15 minutes. Category 2 events could include storms not at Heathrow but affecting arrivals. Category 5 could be ash from Iceland volcano expected over London.

5. What alternative or complementary approaches could be used to assess the impact of international competition?

   We looked at recently lost market share from the top competing airports computed as number of transfer passengers. While the UK has added 2 million transfer passengers from 2003, Paris, Frankfurt, and Amsterdam have added 14 million new transfer passengers to their hubs over the same time. This represents 37% percent of the current Heathrow transfer passenger market. That is, had Heathrow expanded in the past, it could have more transfer passengers today and perhaps as much as £4B more per year in economic activity. This projection assumes that transfer passengers lost to other hubs would spend at levels as identified by Heathrow's economic consultants[1] were they to switch to routes flying through the UK. This ignores the differences in price insensitive travelers with business in the UK and price sensitive families passing through to far regions. Assuming all connecting travelers spend equally simplifies the forecasts, but would likely project higher passenger volumes but with less benefit to the economy than hoped.

   Profit from each route can vary substantially, but approximating the market share by customer served and not by profit might wrongly support expanding airports to serve un-profitable customers. Computing market share by profit would focus efforts on better serving customers willing to pay more to transfer through the UK. Segmenting the market for transfer passengers along price sensitivity will provide the commission with a better understanding of whether added capacity could better serve existing customers but not necessarily increase passenger numbers.

   This effort would group transfer passengers at neighboring hubs into segments. One segment would most benefit the UK economy and others may just dilute service and expend resources.

[1] http://www.frontier-economics.com/_library/pdfs/Connecting%20for%20growth.pdf

6. What factors, if any, are missing from the DfT's modeling approach? How can these be more effectively analyzed?

   There is no provision for the randomness inherent in operating airports and how those events change the level of variation (stdev/mean) requiring reserve or "stand-by" capacity to maintain a level of service quality and punctuality. In other words, do we need 25% stand-by capacity to maintain expected arrival and departure times? This has a big impact on whether an airport needs 3 terminals or 4.

7. Is the DfT model granular enough to underpin the Commission's assessment of future demand?

   Increased spatial granularity of demand would only change the order in which airports would become capacity constrained, rather than how to provide flexibility to manage for uncertainty in population forecast.

   More time granularity may make forecasts feel more "precise" but will not improve the "accuracy". There are just too many political and global economic uncertainties to unconditionally commit to investments 15 or 20 years in the future.

8. Does the DfT approach to demand uncertainty capture a reasonable range of uncertainty? Could the approach be improved?

9. Would a probability-based approach to dealing with uncertainty help the Commission to test the robustness of the model's outputs?

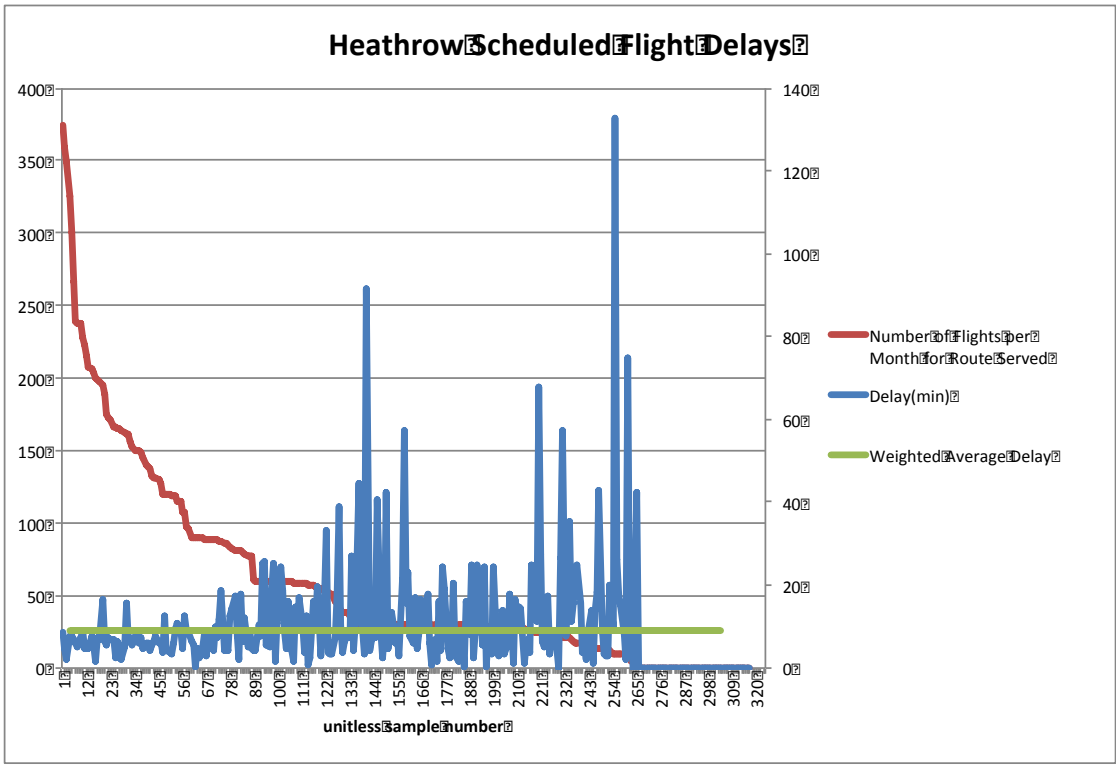
10. We have reviewed four alternative forecasts. Do you consider that there are others we should be looking at and why?

    Yes. There are two scenarios that could alter the demand for aviation in an unexpected way that the commission should consider.

    If the commission for competition forces routes to be served at regional airports, the difficult economics of operating airlines without the gains from hub effects could degrade service level to the point where airlines pull out of the UK. Worse still, the action would subsidize urban sprawl and require significantly more resources for roads and rail access. So to dampen monopoly prices at Heathrow, the government could cause much more costly and permanent inefficiencies surrounding London. In this case, demand for aviation could shift to other hubs like Schiphol or Charles de Gaulle which would greatly lower profits for those operating out of the UK, creating a feedback process of unintended events.

On the other extreme, the commission should look at an alternative where technology surprises us all and produces designs that do not rely upon carbon energy sources for the entire flight. While it's true that new energy sources have a particularly tough hurdle to jump, there is a non-zero chance that ingenuity will overcome these obstacles in the next three decades.

Appendix A: Utilization, Variation, and Delay Analysis



Source:
http://www.caa.co.uk/default.aspx?catid=80&pagetype=88&pageid=12&sglid=12

The weighted-standard-deviation for delay is 8.4 min and the weighted-average or mean is 8.9 min. Variance, computed as stdev/mean, is very close to 1. According to operations management and queue-theory, there is absolutely no margin for small fluctuations in everyday occurrences, let alone large unexpected events such as weather.

As reported by the CAA, a departure is considered “on-time” if takeoff occurs early or before 15 minutes late. It’s difficult to imagine a rail system operating with such high variance considered sufficiently punctual. Worse, since the raw data is not available, we do not know whether the flight delay includes the taxi time and runway queue time. Is a departure time the gate departure time plus 15 minutes, or actual “ wheels-off ” runway time plus 15 minutes? As far as passengers are concerned, they expect to have left the airport by scheduled departure time.

One consistent issue with performance metrics placed within discrete bins of arbitrary size, is that they allow companies who pay for poor performance to not live up to stated goals. When a slogan of “85% on time” really means 85% less

than 15 minutes late, how do consumers compare this to other service agreements? Obviously, the interaction between airline, airport, tower control, makes it very difficult for an airline to guarantee any level of service when airport capacity is constrained. This is the main point of this analysis, that Heathrow is operating so close to capacity that consumers think if they are not on time, that they must be part of the unlucky 15% that left later than scheduled. In reality, almost everyone is leaving later than scheduled.

Appendix B: Transfer Passenger Volumes

	Frankfurt		***Heathrow***		***Charles de Gaulle***		***Schiphol***
Year	Total Pax	Transfer	Total Pax	Transfer	Total Pax	Transfer	Transfer
2002	48,459,594		63,362,097		48,358,499		17,006,826
2003	48,359,320		63,495,367		48,220,436		16,341,954
2004	51,098,271		67,342,743		51,260,363		17,968,188
2005	52,219,412		67,913,153		53,798,308		18,664,350
2006	52,810,683		67,527,923		56,849,567		19,126,008
2007	54,167,817		68,066,028		59,922,177		19,730,560
2008	53,472,915		67,054,745		60,874,681		20,320,026
2009	50,937,897		66,036,957		57,906,866		18,854,306
2010	53,013,771		65,881,660		58,167,062		18,746,660
2011	56,443,657		69,433,230		60,970,551		20,189,362
		54%		34.60%		52%	Reported
Delta 2002-2011		4,311,394		2,100,612		6,558,267	3,182,536
Total 2011		30,479,575		24,023,898		31,704,687	20,189,362

2,100,612	*Transfers added at Heathrow 2002-2011
14,052,197	*Transfers added at Top 3 Competitors 2002-2011
37%	% Of European transfer market lost to Competition
£4,096,517,483	Pounds per year Lost due to insufficient capacity at LHR

* Transfer passengers counted only once, Assumes the percentage of total passengers, as transfer passengers, remained constant from 2002-2011

http://www.fraport.com/content/fraport/en/misc/binaer/press-center/facts-and-figures/jcr:content.file/zadafa 2012_e_lowres.pdf
http://www.heathrowairport.com/about-us/company-news-and-information/company-information/facts-and-figures
http://www.nytimes.com/2012/03/30/business/global/charles-de-gaulle-airport-in-paris-is-being-upgraded.html?pagewanted=al
http://www.schiphol.com/SchipholGroup/Company1/Statistics/TransportAndTrafficStatistics.htm
http://www.schiphol.com/web/file?uuid=c41ce587-3132-40a8-bd3a-0cffc7bb2805&owner=90f55b14-7360-4d08-bb68-e2bc1a7b47a5

http://www.frontier-economics.com/_library/pdfs/Connecting%20for%20growth.pdf