Annex 3 – Stansted's own airport charge elasticity – a summary of the evidence and research

Introduction

1.1 This annex calculates estimates of Stansted airport's (Stansted) own airport charge elasticity of demand (CED) for passengers.[1] This is the degree to which airport demand varies with changes in airport charges (aeronautical revenue per passenger).[2]

1.2 The calculation of CED assists the CAA with:

- the definition of the antitrust market(s) within which Stansted Airport Limited (STAL) operates; and
- whether STAL would be able to raise prices profitably, given the propensity of passengers to switch airports (or decide not to travel) in response to a price increase.

1.3 In undertaking this work, the CAA first considers general estimates of aviation elasticities and airport specific elasticities of demand. The CAA then considers a number of methodologies that have been used to calculate Stansted's CED including:

- methodologies based on the Department for Transport's (DfT's) aviation forecasting model including: 1) analysis carried out by Frontier Economics on behalf of easyJet; and 2) analysis carried out by the CAA;
- a methodology developed [✂] STAL in the context of forecasting future demand at the airport. This relies on [✂] passenger allocation model and time series regression to derive both short-run and long-run elasticities;
- a methodology developed by Frontier Economics using easyJet booking data; and
- the results of the CAA's stated intentions passenger survey.

1.4 For each of the approaches outlined above, the methodology used, its merits and limitations and its relevance to the estimation of Stansted's CED is described. The CAA then derives estimates of Stansted's CED. A summary of the range of elasticity estimates is provided in Table 5.

[1] The ability of airlines to switch airports is considered in section 4 with regard to market definition and section 5 with regard to the assessment of competitive constraints facing Stansted.

[2] The relevant price elasticity varies depending on what the relevant initial price is considered to be (ideally the competitive price level). However, for the purpose of this annex the CAA focuses on the extent to which passengers respond to a price increase rather than on what is the competitive price level at Stansted (which is discussed elsewhere in this report). Sometimes the modelling will use explicit or implicit assumptions on price, which the CAA is not able to change. However, this annex outlines any assumption that the CAA has made with regards initial airport charges for the calculation of CEDs.

Context: market-level elasticities of demand

1.5 The existing literature and research on aviation price elasticity of demand (that is, the amount demand falls in response to a 1 per cent increase in airfares) suggests that, under certain assumptions[3], there is a relationship between the airport charges elasticity of demand and aviation price elasticity of demand. If airlines pass onto passengers all of the airport charge increase, then the Airport charge elasticity of demand = Airport charge / Fare * Fare elasticity of demand.

1.6 For instance, in its latest aviation forecasts[4], DfT published its set of national-level air fare elasticity assumptions by market segments.[5] Some market segments are thought to be more price elastic than others: Western Europe UK and foreign leisure segments are more price elastic (around 0.7[6]) than business segments (around 0.2). DfT also carried out a literature review of demand elasticities and found, where elasticities were equivalent, "price elasticities broadly comparable to those presented" in their latest aviation forecasts.[7]

1.7 Another relatively recent and comprehensive study of aviation elasticities (with a focus on price elasticities) is the 2007 InterVISTAS report prepared for IATA.[8] Drawing upon an extensive literature review, as well as new econometric analysis, this report proposes a fare elasticity calculator for worldwide use in policy analysis. The calculator has a "base" elasticity for "Route/Market (1.4), National (0.8) and Pan-national (0.6) aggregation levels that can then be adjusted to account for differences between geographic markets and types of service. The IATA report stresses that the higher the level of aggregation, the lower the relevant price elasticity will be. In particular, fare elasticities facing a particular carrier can be expected to be high because, if a carrier increases its fare unilaterally, it is likely to lose passengers to other carriers operating the same route. However, a Pan-national price change (such as an oil-price increase) can be expected to have a smaller effect on demand because passengers have more limited possibilities of substitution.

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[3] The main assumptions are that the response of passengers to a fare increase equal to the airport charge increase will be equivalent to the reduction in airline supply should the airline choose not to pass on the charge increase in its prices and that the airport under consideration is the only relevant airport service provider in that market.

[4] See table A4 of http://assets.dft.gov.uk/publications/uk-aviation-forecasts-2011/uk-aviation-forecasts.pdf (accessed January 2013)

[5] The market segments are combinations of UK/Foreign residents, Business/Leisure purpose and Western Europe / rest of OECD / New industrialised countries / Less Developed countries destination group, as well as separate Domestic business and leisure segments and a separate International interlining segment.

[6] The elasticities presented in this annex are given in their absolute form. It should be noted that they are negative price elasticities of demand, which means that a price increase would lead to a fall in demand.

[7] DfT, Aviation Elasticities Literature Review, 2010, summarised in http://assets.dft.gov.uk/publications/uk-aviation-forecasts-2011/uk-aviation-forecasts.pdf (accessed January 2013)

[8] This report is available at: http://www.iata.org/whatwedo/Documents/economics/Intervistas_Elasticity_Study_2007.pdf (accessed January 2013)

1.8 Based on the two reviews mentioned above, if it is assumed that: 1) Stansted air services face a fare elasticity of demand between the route/market level and the national level; 2) Stansted airlines pass onto passengers 100 per cent of the airport charges; and 3) Stansted airport charges are in the region of 10 per cent[9] of airline fares at Stansted; then Stansted's CED would be below 0.15.

1.9 However, the CAA considers that using market level elasticities to estimate Stansted's CED (i.e. at airport level) would understate the true figure for Stansted as this would assume no substitution from Stansted to the wider market.

1.10 In coming to this view, the CAA has reviewed the research submitted to or carried out by the CAA to infer a more reasonable airport elasticity of demand for Stansted. Importantly, this research differs from other estimates as it allows for, and in some case estimates, some degree of airport substitution in a multi-airport city.

Analysis using DfT's aviation forecasting model

1.11 A number of approaches to estimating the elasticity of demand are based on DfT's aviation forecasting model, National Air Passenger Allocation Model (NAPALM). In the Initial Views, the CAA stated that, while the NAPALM model is primarily designed to estimate long-run passenger demand forecasts, using the model to estimate short-run elasticities was a useful contribution to assessing passenger impacts at Stansted.[10]

Frontier Economics' 2011 estimates

1.12 In section 5.2 of its report, Frontier Economics estimates how much of the demand at Stansted and Gatwick would switch to other UK airports as a result of a cost equivalent to 10 per cent of airport charges being added to the cost of accessing those airports. It does this by using the underlying allocation model of DfT's forecasting methodology.

1.13 According to Frontier Economics, a 10 per cent increase in airport charges (66 pence at Stansted) would lead to a reduction of 0.69 million passengers at Stansted in 2010.

1.14 The CAA calculates that this implies an Airport CED in the region of 0.3 to 0.4 for Stansted, given the initial price used by Frontier Economics of £6.60 and the initial passenger number[11] of 18.3 million.

[9] 10 per cent is a rough estimate achieved by dividing an approximate airport charge of £6 by an approximate average one-way fare (based on International Passenger Survey data) of £60. In section 5, the CAA examined airline financial data and computed the share of airport-related charges of airlines' costs bases. The results will be different, given the inevitable differences in coverage (e.g. non-aeronautical costs, air navigation, etc.). Even with airport costs up to 25 per cent of the airfare, the CED would be less than 0.5.

[10] See paragraph 3.58 of CAA's Initial Views document, available at: http://www.caa.co.uk/docs/5/StanstedMarketPowerAssessment.pdf (accessed January 2013)

[11] See Table 8 of Frontier Economics' report. http://www.caa.co.uk/docs/5/rpt-easyJet%20Competition%20Assessment%20Final%20Report_Abridged.pdf (accessed January 2013)

1.15 Table 1 shows where Stansted's passengers would switch to under the two scenarios considered by the report.

Table 1: Impact of a 10 per cent change in airport charges on passenger numbers (million passengers in 2010)

	Stansted Price Increase	
	Base Case	No capacity available at Heathrow and London City
Gatwick	0.30m	0.36m
Stansted	-0.69m	-0.61m
Luton	0.11m	0.13m
Heathrow	0.02m	0.00m
London City	0.15m	0.00m
Out of London	0.10m	0.13m

Source: Frontier Economics

1.16 In the Initial Views, the CAA stated that the modelled responsiveness of passengers appeared high, considering that a 10 per cent rise in the airport operator's revenues would only constitute a fraction of a passenger's total travel costs.[12] Nevertheless, the CAA pointed out a number of concerns with the modelling, which might suggest that the responsiveness is at the lower end of the spectrum:

- The analysis uses the passenger allocation methodology of DfT's forecasting model and not the overall model, thus a price increase at an airport only generates passenger switching to other alternatives, rather than passengers choosing not to fly.
- It is a one-year static analysis taking the existing route network at UK airports as given. It therefore does not take into account capacity constraints except for the option of not allowing any switching to Heathrow and London City.
- It treats passenger demand using low cost, charter and full service airlines as separate categories, which limits the substitution possibilities.[13]

CAA analysis

1.17 To take into account some of the drawbacks highlighted above, the CAA asked DfT to run its aviation forecasting model in a number of scenarios to simulate the effect of an airport charge increase at Stansted. DfT provided the CAA with the outputs of the Central Case of its latest forecasts (August 2011[14]), as well as the results of runs that tried to mimic an airport charge increase at Stansted that was passed onto the customer in its entirety. Given the setup of the model, DfT advised that the best way to model a Stansted price increase was to increase the surface access cost of using Stansted. In

[12] See paragraph 3.60 of the CAA's Initial Views, available at: http://www.caa.co.uk/docs/5/StanstedMarketPowerAssessment.pdf (accessed January 2013)
[13] A full list of the concerns is given in paragraph 3.59 of the Initial Views (February 2012)
[14] DfT's forecasts are available at: http://assets.dft.gov.uk/publications/uk-aviation-forecasts-2011/uk-aviation-forecasts.pdf (accessed January 2013).

fact, this approach is consistent with the approach adopted by Frontier Economics in a 2011 report and by HM Revenue & Customs (HMRC) in a 2012 report.[15]

1.18 Table 2 shows that, over the five years between 2014 and 2018, Stansted would lose 10 per cent of its passengers if it is £1 more expensive to use Stansted from 2014 onwards. The majority of those passengers travel from Luton or Gatwick instead of Stansted. Over a period of just one year, the amount of switching would be smaller: if it was £1 more expensive to use Stansted from 2014, Stansted would lose 7.4 per cent (1.4m) of its passengers in 2014. The difference between these two scenarios is outlined in Table 2 (below).

Table 2: Forecast passengers (m)

Period	2014				2014 to 2018			
Scenario	Base Case	Stansted Increases £1	Absolute Change	% Change	Base Case	Stansted Increases £1	Absolute Change	% Change
Heathrow	73	73	0.1	0.1%	375	376	0.8	0.2%
Gatwick	33	34	0.8	2.5%	170	173	3.6	2.1%
Stansted	19	18	-1.4	-7.4%	100	90	-9.9	-10.0%
Luton	9	10	0.3	2.8%	49	54	4.4	8.9%
London City	3	3	0.0	0.8%	21	21	0.2	0.9%
Southend	0	0	0.0	0.1%	1	1	0.0	-0.1%
Other Airport	93	93	0.1	0.1%	495	495	0.2	0.0%
Total	231	231	-0.1	0.0%	1,212	1,211	-0.7	-0.1%

Source: CAA analysis of outputs of the DfT's Aviation Forecasting Model

1.19 Using the results of Table 2 and depending on the initial price assumption (in 2008 prices since the £1 increase is on that basis), the implied price elasticities of demand can be determined. Table 3 below shows that the implied Stansted fare elasticity of demand is likely to be between 4.5 and 6 and the CED between 0.37 and 0.60 (assuming that the assumptions taken and the DfT model are accurate).

Table 3: Implied own price elasticities of demand

Initial price assumption	2014	2014-2018
Fare - £60	4.5	6.0
Airport Charge - £6	0.45	0.60
Airport Charge - £5	0.37	0.50

Source: CAA analysis of outputs of the DfT's Aviation Forecasting Model
Note: For the purpose of this analysis, two separate assumptions are made for the initial airport charge: £5 and £6.

1.20 The results of other model runs (£2 increase vs base and £2 increase vs £1 increase) gave similar results. However, when the price increase was assumed to take place in 2008 instead of 2014, the implied elasticities were substantially higher. DfT suggested that this was because the model allows

[15] The report aimed to understand the impacts of potential price changes resulting from the devolution of Air Passenger Duty to Scotland and Wales, as well as hypothetical APD increases at Heathrow and Gatwick. The report states that "the model is designed to capture the key inter-relationships between demand at different airports" but also acknowledges that "as with all models, it is a simplification of reality and can never capture the full complexity of the aviation sector." This report is available at: http://www.hmrc.gov.uk/research/report188.pdf (accessed January 2013).

each airport, over time, to specialise in some routes rather keeping the same route served by multiple airports, reducing the potential for airport substitution. This effect arises because the model assumes passengers value frequency of service higher than route availability at neighbouring airports. This variation in results emphasises the uncertainty around any elasticity estimates derived from using this model.

1.21 The CAA therefore considers that using DfT's model to estimate the extent of passenger substitutability across airports for the CAA's purpose is informative (as the model attempts to reflect actual passenger behaviour based on survey data) but that this model has a number of limitations. In particular:

- The model treats passengers travelling on full service scheduled, charter and low cost carriers separately, and so limits passenger substitution between routes and business models. As a result, given the very high proportion of low cost traffic at Stansted, the demand that is displaced from Stansted cannot go directly to Heathrow, as there are no low cost services there. Under the model, low cost passenger demand can only switch to low cost services at Luton and Gatwick. The CAA considers that this artificial separation may weaken the extent of substitution reported by the model, depending on whether there are enough alternative services at Luton and Gatwick.
- The model does not predict much growth at Southend in response to a price increase in Stansted. The CAA considers that this is because there is no significant traffic at Southend in the base year and the airport never reaches critical mass in terms of passengers to become established. The recent entry of easyJet at Southend suggests that the potential competitive constraint posed by Southend on Stansted may be downplayed by these forecasts, although there is considerable uncertainty about the future growth of Southend. The materiality of the potential constraints posed by Southend was discussed in Section 5.
- Although the model allows routes to be dropped and started at different airports, it does not explicitly model airline behaviour. The model works with the underlying assumption that (route) supply will follow (passenger) demand. The CAA therefore considers that the model captures better the dynamics of passenger-led switching (which is an important determinant of route economic viability) more accurately than capturing airline-led switching, which, if passengers follow route/frequency supply, is an important switching dynamic.

[✂] analysis

1.22 [✂] used two modelling approaches to gauge the sensitivity of traffic growth at Stansted to real and relative changes in airport charges: econometric analysis and a passenger allocation model.

1.23 The time-series regression analysis is based on an error correction model (ECM) that allows estimation of both short- and long-run elasticities at the same time. The model suggests a long-run airport charges elasticity of around 0.26 at Stansted and that traffic would have been around 4 million passengers per annum (mppa) higher in 2011 if charges had not been raised in 2007.

1.24 [✂] used its in-house passenger allocation model to 'reverse engineer' Stansted's traffic by running the forecasting model backwards from its 2010 base year to 2006. The results suggest Stansted would have attracted around 4.5 mppa less in 2006 compared to the actual passenger throughput with the charges change in place (and assuming the full modelled effect[16]). The analysis also suggests that a reduction in long-run fares of £2.86 per passenger (shadow cost) would be required to mirror its actual performance in 2006.

1.25 The report states that the effects of an increase or decrease of charges using both methods are not symmetrical: a 20 per cent charge reduction has a bigger impact on traffic (1.5-1.9 mppa higher by 2025) than an equivalent increase in charge (1.2-1.5 mppa lower by 2025). On the whole, whilst both methods appear to yield similar results, the allocation model suggests a greater ultimate effect (i.e. a higher elasticity is implied) whereas the elasticity approach suggests that the demand impact of a change in charges increases over time before flattening out.

1.26 It was not possible with the information provided and in the time available for the CAA to assess fully the validity of the methods employed. However, from what the CAA has seen, a high level of uncertainty needs to be attached to the estimated elasticities suggested in the analysis.

1.27 STAL stated[17] the [✂] sensitivity analysis did not represent its views on the issue. In particular, STAL considered that the results were likely to be an under-estimate of the CED because:

- "the time period over which the elasticity had been calculated was not likely to provide a reasonable estimate of current elasticity of demand;"
- "there is insufficient variability in charges and growth rates over the period to be able to establish a clear and robust estimate of the elasticity of demand;"
- "until the discounts were phased out in March 2007, charges were materially lower than they are currently, and substantially below the competitive price level;"
- "because prices were below the competitive price level for much of the period that has been analysed, the analysis will not provide a true and reliable guide to the sensitivity of demand to changes in charges from the competitive price level in a forward-looking sense;"

[16] The actual impact may take some years to be felt.
[17] Source: STAL [✂]

- "more extreme reactions to changes in airport charges were likely given the market structure and the characteristics of airlines at Stansted."

1.28 The CAA considers that the competitive level issue is an important one and is likely to be contributing to an underestimate of the CED. The potential for more "extreme" airline reactions is something that the CAA acknowledges throughout this annex and is considered elsewhere in the report.

Frontier Economics (2007[18]): passengers airport switching using easyJet booking data

1.29 In a report commissioned by easyJet, Frontier Economics used easyJet booking data for a sample of routes, where the routes were served by easyJet from more than one London airport, to construct an airport choice model for easyJet's passengers. Among other controls, the probability of passengers choosing an airport (from which easyJet operated) was modelled against the travel distance and the price of easyJet flights at each alternative airport.

1.30 The report stresses that the high travel-time elasticities that were found suggest that passengers are unlikely to switch airports if they have to travel much longer than the alternative. However, the report also finds equally high fare elasticities of demand, which suggests that passengers are quite willing to substitute airports if the airfares at an airport increase.

1.31 The annex of the report also contains airfare elasticities of demand for 12 routes served out of Stansted, Luton and Gatwick by easyJet. The table below summarises the fare elasticities found for each route.

Table 4: implied route own price elasticities of demand reported

[✂]

Source: CAA analysis of Annex 1 of Frontier Economics' 2007 report

1.32 [✂].[19]

1.33 The CAA considers that one of the main problems with the approach adopted in this report is that by only using easyJet booking data it restricts the alternatives for substitution available to passengers. The elasticities are also calculated on a route by route level, which does not allow for route substitution.

CAA stated intentions passenger survey

1.34 In November 2011, the CAA published a working paper on the results of a passenger survey conducted at the four largest London airports.[20] Short haul passengers were asked whether they would switch to another airport or not

[18] Frontier Economics, The De-designation of Stansted Airport, October 2007 http://www.frontier-economics.com/_library/publications/Frontier%20paper%20-%20de-designation%20of%20Stansted%20airport%20Oct%202007.pdf (accessed January 2013)
[19] This implied elasticity would increase if the CAA assumed that the airport charge represented a higher proportion of the ticket price.
[20] See Figure 12 of the Passengers' airport preferences, Results from the CAA Passenger Survey, available at: http://www.caa.co.uk/docs/5/Passenger%20survey%20results%20-%20FINAL.pdf, (accessed January 2012).

travel if the cost of using the airport went up by £5 (one-way). Of those, 17 per cent of passengers at Stansted, 20 per cent of passengers at Gatwick and 10 per cent of passengers at Heathrow responded that they would no longer use that airport. In the case of Stansted, assuming an airport charge in the region of £5-£6, that translates into an implied CED of around 0.2.

1.35 However, given the relatively small sample size and potential biases, the CAA considers that only an approximate CED can be derived.

Conclusion

1.36 Based on the above methods, Stansted charge elasticity of demand is likely to be subject to a degree of uncertainty, with some research suggesting that it can be above 0.5 whilst other research points to as low as 0.2. Table 5 summarises the results described above and provides a brief description of each piece of analysis.

Table 5: Summary Table

	Stansted Elasticity	Brief Description
Frontier 2011 (using NAPALM)	~ 0.3 to 0.4	Passenger-led switching of passengers no route dynamic effects
Full DfT forecasting runs (£1 increase in 2014)	~ 0.4 to 0.6	Passenger-led switching of passengers and routes
[✂]	[✂]	[✂]
[✂]	[✂]	[✂]
Stated intentions passenger surveys	~ 0.2	17% of Stansted passengers say they would switch airport if it was £5 more expensive to fly from Stansted

1.37 The CAA considers that all of the models used provide an imperfect representation of reality and each makes different assumptions that affect the results. In reality, many factors will affect the relevant/true Stansted CED. However, based on the CAA's analysis the CAA considers that a 0.2 to 0.6 range is wide but suitable for Stansted passenger-led CED.

1.38 The CAA notes that airlines' ability to switch services in the face of airport charge increases is considered elsewhere in the report. In addition, the CAA notes that much of the evidence presented above assumes a full pass-through but no supply-side response from the airlines, whereas in reality the CAA expects to see a degree of partial pass-through and some supply-side response from airlines. Relaxing the first assumption would mean a lower elasticity range whereas relaxing the second would mean a higher elasticity range.