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A Preliminary Estimate of NERL's Asset Beta

Prepared for the CAA

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1. Introduction

This paper provides a first estimate of the asset beta that the CAA ought to use in its calculations of NATS (En Route) plc's (NERL's) CP3 cost of capital. It is intended to inform the CAA's initial view on allowed returns and to highlight the judgments that the CAA will be required to make before reaching its final determination in the summer of 2010.

The report is structured into five main parts:

- section 2 outlines our approach to calculating asset betas;
- section 3 examines the betas of companies that have similar characteristics to NERL;
- section 4 tries to position NERL within the spectrum that emerges from this comparator analysis;
- section 5 compares the estimates obtained in section 4 with the assumptions that the CAA made in its CP2 review; and
- section 6 concludes.

2. Methodology

Equity betas

When assessing the returns that shareholders demand from a firm most regulators place considerable weight on the insights provided by the capital asset pricing model (CAPM), a theory which relates the cost of equity (K_e) to the risk-free rate (R_f), the expected return on the market portfolio (R_m) and a firm's equity beta (β_e):

$$K_e = R_f + \beta_e \, . \, (R_m - R_f)$$

The beta in this equation is a measure of the riskiness of the firm in question relative to the market portfolio. Firms that exhibit a beta of more than 1 can be considered more risky than the average firm in the portfolio and need to contribute a higher-than-average return; firms with a beta of less than 1 are less risky and warrant lower returns; and firms with a beta of exactly 1 are seen by investors as being of equal risk to the market portfolio and must generate a return in line with R_m.

Empirical estimates of beta can be obtained by measuring the correlation between movements in that company's share price and movements in the value of the stock market as a whole. Different practitioners tend to measure this correlation in slightly different ways – for example, some people prefer to calculate betas using daily share price data while others will use monthly data – and there is as yet no definitively 'right' formula to use in such calculations. Our approach follows the methodology used by the Competition Commission in its recent airport reviews in that we measure betas:

- over a period of 2 years;

[1] This paper was commissioned by the CAA last year, and the bulk of the analysis conducted in December 2008.

- using daily data on the returns accruing to shareholders;
- with the FTSE All Share Index (or the equivalent index for firms that are listed abroad) as a proxy for the market portfolio; and
- taking account of data only up until 12 September 2008 (i.e. excluding data from a period in which stock markets around the world were in an unprecedented state of crisis).[2]

We also follow the Competition Commission's lead by calculating a firm's beta as the slope in the regression of the excess return on that firm's equity compared to the returns on a 10-year nominal gilt versus the excess return on the market portfolio.

Asset betas

A significant proportion of the analysis in sections 3 and 4 of this paper focuses on obtaining equity beta estimates for comparator companies. When comparing the betas of different firms, one has to be careful to take account of the different gearing levels that firms choose since, all other things being equal, a firm with higher gearing will exhibit a higher equity beta. Unless one controls for this effect, there is a danger of confusing the risk that comes from high leverage with the underlying business risk that a firm faces by virtue of the nature of the activities it is carrying out.

This is where the concept of an asset beta proves useful. An asset beta is a hypothetical measure of the beta that a firm would have if it had no debts and were financed entirely by equity. By comparing different firms' asset betas it becomes possible to isolate shareholders' perceptions of underlying systematic risk and carry out an assessment of the relative riskiness of different businesses.

The asset beta is calculated using the following formula:

$$\beta_a = (1 – g) . \beta_e + g . \beta_d$$

where β_a is a firm's asset beta, g is gearing and β_d is the firm's debt beta.

A firm's gearing is something that is easily calculated using reported debt figures and the firm's market capitalisation, but a firm's debt beta is not something that is directly observable. We have been asked by the CAA to assume in our work that β_d is a constant of 0.1 (the value that the CC used in its recent airport inquiries). Although this is a simplification, there will be an opportunity for the CAA to revisit this assumption at a later stage of its cost of capital analysis when it has considered the debt beta in greater detail.

This provides a complete description of our methodology for estimating asset betas. The only other point we must make is that beta estimates are exactly that: estimates. Every estimate that we make comes with a standard error and the figures that follow must be regarded as mid-points within wider confidence intervals.

3. Comparator Analysis

Using the methodology that we have just described we can calculate asset betas for any company that has a stock market listing. Unfortunately NERL's shares are held privately and we do not have share price data with which to calculate a beta directly. The next best alternative that

[2] At a later stage of the review the CAA may wish to relax this constraint and examine what it can learn more recent share price movements. At the time of writing we do not have enough data to make a considered judgment. Our analysis should therefore be read as giving a preliminary estimate of NERL's beta which will need to be kept under review over the next 12 months.

we have is to collect beta estimates for companies that look to be in some sense similar to NERL and to make a judgment about the value of NERL's beta on the basis of this comparator evidence.

This is an approach that has been deployed in an increasing number of periodic reviews during recent years as the number of regulated companies with a stock market listing has declined. These periodic reviews provide us with an alternative source of comparative data in the form of other UK regulators' estimates of the betas of regulated companies without stock market listings. Although recognising that there is a danger that we propagate previous errors by using these estimates, we believe that this danger is more than offset by the value that we can take from comparators that we would not otherwise have access to.

Our comparator set therefore comprises two types of data:

- calculated betas for comparator firms with a stock market listing; and
- the beta estimates that regulators have made in recent periodic reviews.

In the first of these groups we have collected beta estimates for international airports, UK-based airlines and the few remaining regulated companies with a stock market listing – National Grid, Northumbrian Water, Pennon Group, Severn Trent and United Utilities. The second group comprises the most recent assessments by the Competition Commission, Ofcom and ORR of the cost of capital for the UK's regulated airports, telecoms and railway infrastructure. Ideally we would have wanted to include other air traffic control businesses in one or both of these categories, but our investigations suggest that there are as yet no listed ANSPs and that NERL is the only such business to have been subjected to a formal periodic review in recent years.

The data is presented in tables 3.1 and 3.2.

Table 3.1: Calculated asset betas

	2-year asset beta
Copenhagen airport	0.17
Frankfurt airport	0.46
Florence airport	0.16
Macquarie airports	0.55
Vienna airport	0.63
Zurich airport	1.00
BA	0.74
easyjet	0.92
Ryanair	0.81
National Grid	0.35
Northumbrian Water	0.36
Pennon Group	0.37
Severn Trent	0.41
United Utilities	0.44

Source: Thomson Datastream and First Economics' calculations.

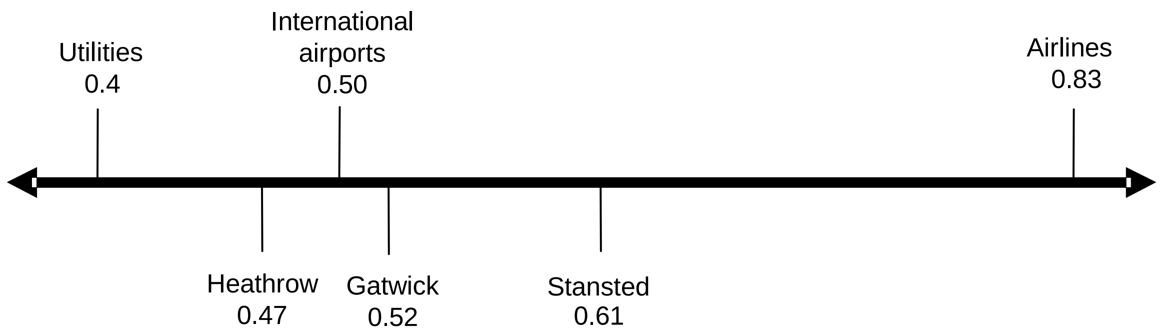
Table 3.2: Beta estimates used in recent periodic reviews

	Regulator's estimate of asset beta
Electricity DNOs	0.48
Network Rail	0.46
BT (regulated businesses)	0.56
Gatwick	0.52
Heathrow	0.47
Stansted	0.61

References: ORR (2008), Periodic Review 2008: draft determinations; Ofcom (2008), A new pricing framework for Openreach – second consultation; CC (2007), BAA Ltd: a report on the economic regulation of the London airport companies (Heathrow Airport Ltd and Gatwick Airport Ltd); CC (2008), Stansted Airport Ltd: Q5 price control review.

Figure 3.3 simplifies the picture that emerges from this analysis by grouping together similar types of company and highlighting the simple average of the betas within each comparator type.

Figure 3.3: Summary of comparator analysis



The chart suggests that utility companies have the lowest asset betas and airlines the highest betas, with other companies in the aviation sector slotting in somewhere between the two. This is a picture that bears a good number of similarities to the one that emerged in the work carried out during NERL's CP2 review and during the CC's airport inquiries, giving us confidence that it accurately characterises investors' perceptions of the riskiness of the different types of firm.

4. NERL's Beta

4.1 Assessment of comparators

The spectrum in figure 3.3 is a broad one, comprising a range of 0.4 to above 0.8. To help identify where NERL fits into this range it is useful to highlight four main determinants of the (systematic) risk that NERL's shareholders bear after buying an equity stake in NERL's business.

- The fortunes of the UK aviation market – the first key feature of NERL's risk profile is its exposure to the ups and downs in the UK aviation market, especially changes in demand for air travel. Generally speaking, NERL's shares will offer higher returns when the UK aviation market is doing well and give lower returns when it is doing badly.

- Cost drivers – NERL's profitability also depends on its input costs. As a labour intensive organisation, NERL is exposed first and foremost to swings in UK wage inflation. Beyond this, most of the other cost risks it faces (e.g. the cost of introducing new IT systems) tend to be non-systematic in nature.

- Regulation – the two previous risk factors cannot be looked at in isolation from the important role that regulation plays in determining the way in which changes in volumes or costs translate into changes in profit. Through its design of the price control and associated incentive mechanisms the CAA has a significant degree of control over the degree to which shareholders are exposed to risk – a situation that distinguishes NERL from unregulated companies operating in the aviation sector and elsewhere.
- NERL's cost structure – a final consideration is the sensitivity of profit to out-/under-performance against the CAA's price control assumptions. NERL is unusual among regulated companies in having a relatively thin profit margin, which means that even quite small amounts of out-/under-performance can have a sizeable impact on profits (a feature of the business that in the past has sometimes been labelled – perhaps erroneously – as 'high operational gearing').

In our opinion, these four factors combined largely define NERL's risk profile. In order to understand how much risk shareholders are exposed to one first has to look at the potential volatility in volumes and costs, take the range of outcomes that one can envisage through the CAA's regulatory rules and then examine the impact on NERL's profits. It is not possible to evaluate riskiness without taking the full chain of events into account – in particular, we would caution anyone from making judgments about NERL's risk profile on the basis of perceptions of pure volume and cost risk alone.

4.2 Comparator selection

4.2.1 Initial filter

The features that we have just described permit us to filter out two of the comparator types that we highlighted in section 3 as follows:

- international airports – airports in foreign countries arguably have least in common with NERL. They operate in markets that exhibit different maturity and different demand risk from that of the UK, they buy from different labour markets and they are not exposed to the UK system of regulation. In addition, there are issues relating to thin trading and the composition of the market portfolio which appear to have a distorting influence on beta estimates. This makes it very difficult to know how to read the betas in table 3.1. The likelihood is that the spread in the data is being driven by country-specific factors rather than by anything that is relevant to our assessment of NERL's beta.
- airlines – the UK airlines are better comparators in that they are exposed to similar demand and (wage) cost risk, but unlike NERL airlines are not subject to regulation. We think this makes airlines more risky than NERL for the following reasons: first, airlines' revenues move one-for-one with volumes whereas NERL has an element of fixed income irrespective of traffic levels; and second, NERL's price control is reset every five years, each time resetting allowed returns to give shareholders a normal level of return. In our view, these features make NERL less risky in the minds of investors compared to airlines which compete for customers without any form of regulatory protection.

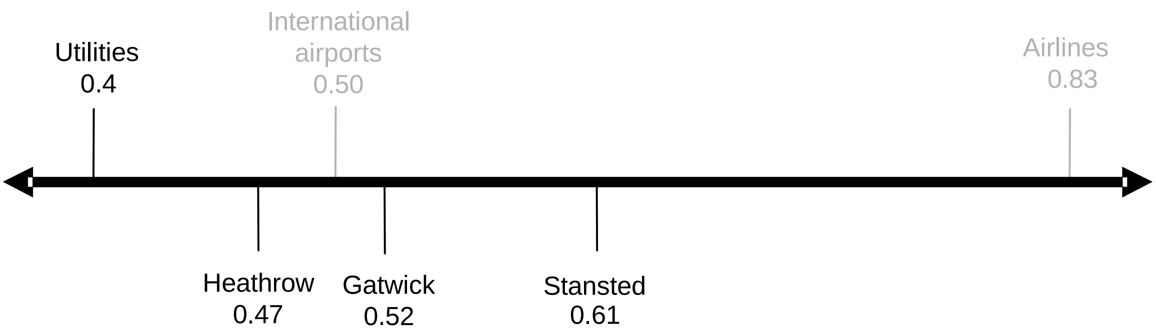
This leads us to conclude that we should focus our attention on the highlighted area in figure 4.1 and pay less attention to the extreme right-hand side of the chart. The comparators here are:

- the betas for other regulated companies – i.e. natural monopolies subject to permanent regulation and five-year price caps;

- the betas for BAA and its regulated airports (or strictly speaking, the CC estimates of these betas from the recent airport price control reviews) – i.e. businesses that have exposure to UK aviation and labour markets, a CAA-designed regulatory framework, and price cap formulas which deliberately exposes shareholders to demand risk.

We look in more detail at these comparators in the next two sections

Figure 4.1: Filtered comparator selection



4.2.2 Comparisons between NERL and regulated utilities

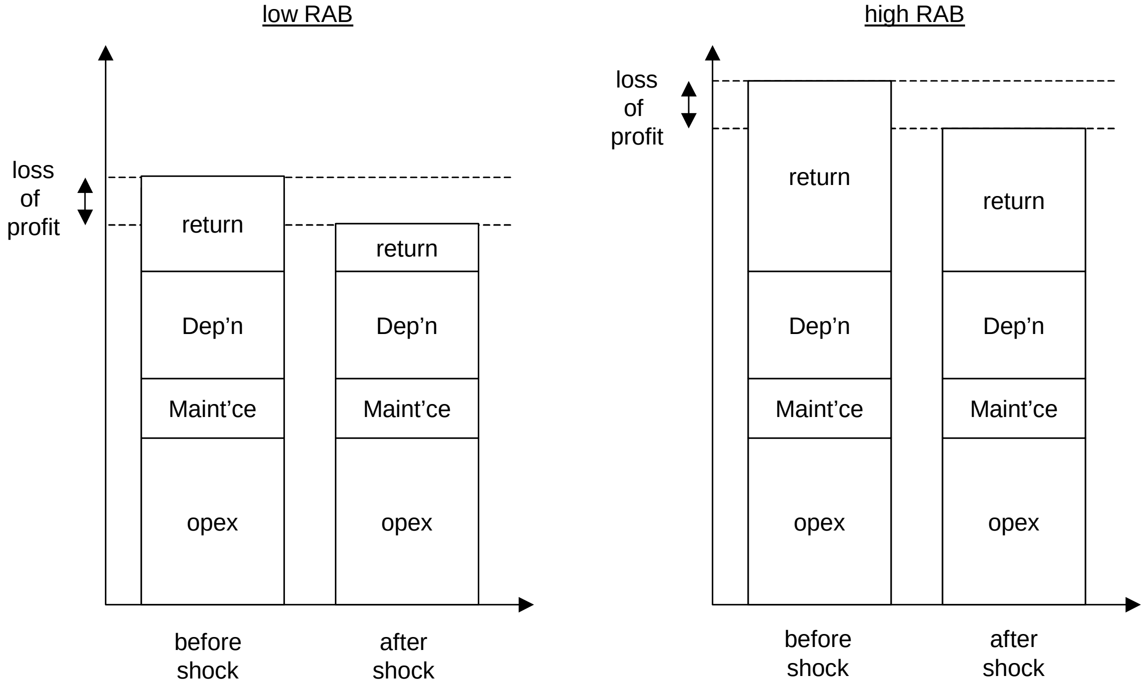
Despite the similarities in market power and regulation, NERL and the UK's regulated utilities are not identical. They differ, most notably, in relation to their exposure to volume risk, the precise design of their price controls and their levels of 'operational gearing'. To get a sense of the impact these differences have on shareholders we need to analyse in greater detail the way that external shocks impact upon the profits that each business earns. This requires answers to three questions:

- how much volume risk is there in each of the regulated sectors;
- to what extent do price control arrangements expose or shield companies from that volume risk; and
- how sensitive are out-turn profits to any shocks that occur?

The rationale for asking the first two questions is fairly straightforward, but the third merits a slightly more detailed explanation. In figure 4.2 we show the composition of allowed revenues[3] for two companies with identical ongoing opex and capex. They differ only in having different sized RABs, with the company on the left-hand side having a relatively small RAB relative to ongoing costs and the company on the right-hand side having a relatively high RAB. The diagram shows what happens to these companies' returns when they are exposed to the same percentage loss of revenue (as shown by the gap between the dotted lines). Although the absolute loss of profit is roughly the same in both companies, the percentage loss is far greater for the company on the right-hand side than it is for the company on the left-hand side.

[3] The CAA calculates a company's allowed revenues as the sum of its opex, depreciation and allowed return.

Figure 4.2: Composition/allocation of revenues before and after a revenue shock



This is a graphical illustration of the remarks that we made in section 4.1 about 'operational gearing'. Holding all other things equal, shareholders in a regulated company with a small RAB/profit relative to ongoing costs are likely to suffer proportionately more when downside shocks occur (and gain more following upside events) in comparison to shareholders in firms whose RABs/profits are large relative to ongoing costs. This volatility in profits makes companies with high 'operational gearing' more risky in the eyes of shareholders, causing them to demand higher upfront returns.

To our mind, this is as important a determinant of a company's risk profile as the underlying amount of volume risk that a company bears. Table 4.3 describes the position in the different regulated industries.

Table 4.3: Characteristics of regulated companies

	Underlying volume risk in industry	Exposure to volume risk via price control	Operational gearing
Water	Low – income elasticity probably less than 0.5	Low to moderate – main driver of revenue entitlement is number of households, although companies have some exposure to volume of water consumed for customers with meters	Low to moderate – RAB-to-revenue ratio of 4.9
Electricity/gas transmission	Low to moderate – income elasticity probably between 0.5 and 1.0	Low – companies have revenue caps plus, in the case of electricity, adjustment mechanisms linked to the amount of new generation connected to the network	Low – RAB-to-revenue ratio of 5.8
Electricity distribution	Low to moderate – income elasticity probably between 0.5 and 1.0	Low to moderate – companies have 50% fixed revenue entitlement and 50% variable entitlement linked to customer numbers and units distributed	Low to moderate – RAB-to-revenue ratio of 4.4
Rail	Moderate to high – income elasticity probably between 1.0 and 1.25	Low – fixed and variable elements in price control deliberately structured to exactly match ratio of fixed-to-variable costs	Low – RAB-to-revenue ratio of 7.0
Telecoms	Moderate – income elasticity probably around 1.0	High – most businesses subject to a pure price cap	n/a
NERL	High – income elasticity probably between 1.5 and 2.0	Moderate – NERL has a 50% fixed revenue entitlement and a 50% variable entitlement linked to distance travelled	High – RAB-to-revenue ratio of 1.9

Source: First Economics' analysis.

The table shows that NERL appears riskier than all of the other regulated companies, with the possible exception of BT's monopoly activities. On the three criteria considered:

- NERL operates in the market with the greatest sensitivity to macroeconomic shocks;
- NERL has a price control which is deliberately designed to expose it to a certain amount of volume risk, whereas most of the other companies either have been deliberately shielded from volume variations or where the variable income entitlement is heavily weighted to a measure of customer numbers (which is unlikely to vary greatly from one year to the next); and
- NERL has the highest 'operational gearing' of all regulated companies.

Only regulated telecoms businesses, with their moderate income elasticity, pure price cap arrangements and relatively high 'operational gearing', could conceivably be regarded to exhibit a comparable risk profile to NERL.

Looking back at tables 3.1 and 3.2, the implication is that NERL's asset beta is likely to lie some way above the extreme left-hand side of figure 4.1. The qualitative analysis in table 4.2 does not tell us precisely where to position NERL, but it appears to us unlikely that NERL's asset beta is less than, say, 0.5.

4.2.3 Comparisons between NERL and regulated airports

The comparisons with regulated utilities focus our attention on a region of figure 4.1 inhabited by BAA and its regulated airports. While airports are not natural monopolies and do not therefore benefit to the same extent from the risk-reducing features of regulation (e.g. the certainty of a five-year price reset and a long-term financial framework), we identified earlier that there are marked similarities in the exposure to the UK aviation market and its attendant volume risk. To get a sense of just how much correlation there is likely to be in the businesses' exposure to systematic risk one can analyse in greater detail the way that external shocks impact on the profits that each business earns. We describe below the results of some very simple modelling that we have carried out to illustrate the effect of these factors.

The modelling shows the effects that shareholders feel when annual GDP growth declines unexpectedly by 1 percentage point. We have chosen this example because it is an illustration of a systematic risk that impacts in one way or another on all of the businesses we are considering and one that is especially relevant at the current time. We have looked separately at other examples of systematic risk – e.g. bigger declines in GDP, unexpected increases in GDP growth, oil price shocks, and changes in wage inflation – and found similar pictures to the one which we are about to describe. As such, we think that the example that follows is a good characterisation of the companies' riskiness.

The chain of events that we have considered is as follows:

- an unexpected reduction in GDP causes a reduction in volume growth;
- lower volumes in turn impact upon a business's revenues in accordance with the structure of the company's price control;
- lower revenues translate pound-for-pound into lower profits; and
- a reduction in profits means that shareholders suffer a reduction in their return on equity, the scale of which depends on the size of annual revenues in relation to the value of the RAB.

Table 4.4 contains a summary of the main factors that impact on this analysis (a more detailed write-up can be found in appendix 1 to this paper).

Table 4.4: Determinants of risk

	Elasticity in volumes with respect to GDP growth	Exposure to volume risk via price control	Operational gearing (i.e. RAB[1] divided by revenue)
Heathrow	1.6	pure price cap	5.7
Gatwick	1.8	pure price cap	3.7
Stansted	1.9	pure price cap	4.1
NERL	1.75	50% fixed revenue entitlement, 50% volume-related revenue entitlement	1.9

Note: [1] in the case of Stansted, the RAB is the value calculated by the CC in its 2008 airport inquiry. We note that the CAA's December 2008 proposals represent a movement away from standard RAB based regulation at Stansted airport.

The table shows that:

- on elasticities alone, NERL is more risky than Heathrow but less risky than Stansted;
- NERL's price cap design shields it from some of the revenue risk that the airports are exposed to; and
- NERL's relatively small RAB will magnify the effect that any given reduction in revenues has on shareholders' return on equity.

Of the three factors we have identified, one makes NERL less risky than the airports (price cap design), one makes NERL more risky (operational gearing) and one puts NERL roughly in the middle of the pack (elasticity of volumes with respect to GDP growth). To get a sense of the scale of these effects, table 4.5 tracks the consequences of our 1 percentage point reduction in the rate of GDP growth on volumes, revenues and the return on the RAB

Table 4.5: Effect of a 1 percentage point reduction in GDP growth

	NERL	Heathrow	Gatwick	Stansted
Effect on volumes	minus 1.75%	minus 1.6%	minus 1.8%	minus 1.9%
Effect on revenues	minus 0.875%	minus 1.6%	minus 1.8%	minus 1.9%
Effect on return on the RAB	minus 0.5 percentage points	minus 0.3 percentage points	minus 0.5 percentage points	minus 0.5 percentage points

Table 4.5 shows how a 1 percentage point reduction in GDP growth reduces volumes, which, when taking into account the charging structure, reduces revenues and, which in turn, reduces the return on the RAB. Equity investors are ultimately concerned with the return on the RAB (as a proxy for their investment). The table shows that the return on Heathrow's RAB, as the airport with the lowest income elasticity and the lowest operational gearing, is by some distance the least affected by a reduction in GDP growth. Returns on the RAB at NERL, Gatwick and Stansted all seem to suffer by a similar amount. In NERL's case, the 50:50 price cap design and relatively high 'operational gearing' appear to be cancelling each other out, so that the impact of a negative GDP shock on the return on the RAB is broadly similar to the effects seen at Gatwick and Stansted.

Looking back at figure 4.1, this appears consistent with our earlier conclusion that NERL's asset beta is no lower 0.5 (since, the analysis in table 4.5 suggests NERL's beta lies above Heathrow's beta) and also implies that we can narrow the analysis further to a range of 0.5 to 0.6 (i.e. the area in the chart where the Gatwick and Stansted betas are located). We also think that there are reasons to place more weight on the bottom end of this range. In its 2008 Stansted price control recommendations the CC had two reasons for giving Stansted a higher asset beta than Gatwick:

- acceptance of evidence that Stansted had been hit harder by the recent downturn in the aviation market; and
- a sense that Stansted's exposure to competition made it a riskier airport than Gatwick.

We have dealt with the first of these factors directly in the analysis in table 4.5. However, the second helps to distinguish Stansted from Gatwick but is of no relevance to NERL, suggesting that the bottom end of the range might be potentially more relevant to NERL.

Stepping back momentarily from the detail that we have just been through, we think that this makes sense as a conclusion. NERL and Gatwick operate in what is essentially the same market and of all the airports in the UK Gatwick is probably one of the airports whose traffic mix most closely resembles the traffic mix for the whole of the UK. Having established in table 4.5 that differences in price cap design and differences in operational gearing essentially cancel each other out, and notwithstanding that NERL is a natural monopoly and Gatwick is not, it is not immediately obvious to us why NERL should be regarded as more risky than Gatwick (or vice versa) or why shareholders should demand different rates of return from the two businesses.

We therefore feel quite confident with a recommendation to the CAA that it should use a range of 0.5 to 0.6 as its starting point for the calculation of NERL's beta.

5. Explaining the Change in NERL's Beta Since the CP2 Review

We are, however, realistic about the limitations of the analysis that we have conducted in sections 3 and 4 and recognise that it is dependent on judgment. A regulator that sets price controls every five years generally tries to be watchful of the consistency in its determinations and aims to have good reasons for any change in approach between one control period and the next. This suggests to us that it is not sufficient for us to present a new estimate of NERL's beta in isolation; we also need to explain any change from the value that the CAA assumed in its CP2 determination.

The work that the CAA undertook in the CP2 review was very similar to the analysis set out in sections 3 and 4 of this paper. Advised by PwC, the CAA:

- gathered together beta estimates for comparator companies in the aviation and regulated utility sectors;
- identified BAA as the comparator that most closely resembled NERL; and
- allowed a small uplift to the observed BAA beta on the grounds that NERL had higher operational gearing.

The point estimate for NERL's asset beta that emerged from this analysis was 0.6. This is a slightly higher figure than we came to at the end of our more up-to-date analysis. It is therefore important to ask: what changes have there been in the last four years that would have brought about a change in NERL's beta?

There are three factors that we can identify as being relevant to this question.

- The first is a reduction in NERL's operational gearing over the course of CP2. When comparing NERL's financial position in 2010 with 2006 it is apparent that the business's RAB has grown and its opex has fallen. All other things being equal, this means that more of its revenue requirement is driven by the recovery of a return of and on historical investment, which in turn means that its profits are somewhat less sensitive to cost and revenue shocks.
- A second consideration is evidence of a decline in BAA's asset beta between 2003 and 2006. In purely practical terms, this is relevant insofar as PwC used a 2004 BAA beta estimate in its advice to the CAA, whereas we are making use of a later, lower estimate produced by the CC (which used data that runs until the BAA's takeover in 2006). In effect, the data indicates that investors' perceptions of BAA's riskiness decreased during and after the period in which the CAA was conducting its CP2 review. To the extent that BAA is a comparator to NERL, it may be reasonable to expect this change in perception to be relevant to perceptions of NERL also.
- The third factor is slightly different in that it relates to a difference in PwC's methodology and our methodology. When PwC produced estimates of NERL's asset beta in 2004 it did not use a debt beta in moving from equity betas to asset betas. The equation on p.2 of this report shows that this caused PwC to understate all of its asset beta estimates, including NERL's, by a small amount. Because we use a debt beta of 0.1 throughout our analysis, our asset betas sit naturally a little higher.

We therefore have two factors that point to a lower asset beta estimate for NERL and one factor that by itself ought to bring us to a higher asset beta. It is not possible for us to say definitively how far these factors offset each other, but our instincts are that the developments which point towards a downward drift in NERL's beta – especially the decline in the BAA beta – ought to be more than sufficient to outweigh the change in methodology.

We are content on this basis to recommend to the CAA that it should make use of a lower asset beta estimate than it used in the CP2 review at this stage of the CP3 review.

6. Conclusions

The analysis in this paper is intended to constitute only a preliminary recommendation to the CAA prior to the detailed work that the CAA will be carrying out over the next 12 months. It is dependent, in particular, on what we know today about the CAA's price cap design, NERL's operational gearing and the CAA's financial framework, all of which could conceivably look quite different after the review thereby necessitating an update to this analysis.

At this stage our work shows that it might be appropriate for the CAA to factor an asset beta of 0.5 to 0.6 in its cost of capital calculations. We say this for three reasons:

- first, consistent with the work carried out during the CP2 review, we have found that NERL is a more risky business than the regulated utilities by virtue of its exposure to sizeable volume risk and its higher operational gearing. All other things being equal, this means that NERL's beta is likely to exhibit a premium to the betas of regulated utilities, which average around 0.4;
- second, having seen considerable effort go into the estimation of the betas for Heathrow, Gatwick and Stansted betas during the last two years, it makes sense that the CAA should try to position NERL's beta logically in relation to the results of this analysis. We have

shown that NERL’s risk profile sits somewhere close to that of Gatwick and Stansted, pointing us to an asset beta of around 0.5 to 0.6; and

- third, NERL’s operational gearing has fallen during the course of CP2, making returns less sensitive to out-/under performance and reducing shareholders’ exposure to risk. There is also evidence from BAA’s share price prior to its acquisition that investors were becoming more comfortable with the riskiness of regulated UK aviation businesses. If NERL were a listed company, one might expect to see this stability translate into a less volatile share price and a lower asset beta than the 0.6 used in the CP2 review.

We have acknowledged at a number of points in this report the extent to which this conclusion is based on subjective judgments. In the absence of actual share price data, there is no entirely objective way of estimating NERL’s beta or knowing for sure how investors’ perceive NERL’s riskiness in 2009. That said, we do believe that at the end of our analysis we have a convincing explanation for where NERL fits in relation to other companies and why a slightly lower beta is warranted in this review. If there are factors that we have overlooked in reaching these conclusions, there will be an opportunity for the CAA to take account of these considerations in the next phase of its periodic review.

Appendix 1: Assumptions used in illustrative modelling

Elasticities

The first step in our simple model involves identifying how an unexpected reduction in the rate of GDP growth impacts upon volumes. Data on income elasticities can be found in a number of recent studies and we have placed most weight on:

- the CAA's 2005 report 'Demand for Outbound Leisure Air Travel and its Key Drivers'; and
- the DfT's 2007 report 'UK Air Passenger Demand and CO2 Forecasts'.

The two bodies of work suggest respectively that: the elasticity of outbound leisure passenger numbers with respect to growth in total consumer expenditure (termed income elasticity of demand) is between 1.5 and 1.8; and the elasticity of passenger numbers with respect to GDP growth is 1.5. We take this to be a close proxy for the relationship between the rate of change in GDP growth and the rate of change in the volume of flights and the distance travelled metric that appears in NERL's price control formula.

Neither of these studies gives income elasticities at specific airports. However, they do identify that elasticities are fairly consistent across different types of traffic. The general picture is that UK charter traffic tends to be less elastic than UK business, UK leisure and foreign demand, which in turn is less elastic than domestic travel.

Taking account of the different mix of traffic at each of the London airports, the relative elasticities by traffic type and the overall elasticity of UK demand with respect to UK GDP, we use the following income elasticities in our modelling:

- Heathrow = 1.6
- Gatwick = 1.8
- Stansted = 1.9
- NERL = 1.75

Price cap design

The impact of an unexpected change in volumes on revenues is dependent upon the design of the CAA's price controls.

The airports all have price caps which are expressed as a limit on the amount of revenue per passenger that an airport can collect each year. This means that a 1% reduction in volumes translates to a 1% reduction in aeronautical revenue.

NERL has a hybrid revenue/price cap. This is a formula which permits NERL to collect a fixed amount of income each year plus a further entitlement per flight handled. When setting NERL's the existing cap the CAA deliberately sized the two components so that 50% of the income that NERL was deemed to need came through the fixed element and 50% came through the volume-related element. In practice this means that a 1% reduction in volumes translates into a 0.5% reduction in revenues.

Treatment of other income

Our modelling is complicated somewhat by the presence of significant other income within the CAA's single till approach to setting price caps. Strictly speaking, each revenue stream will respond in a different way and with a different elasticity to GDP shocks, although in many cases there should be a close relationship to a passenger numbers. To keep things simple, we assume that 'other' income moves in line with aeronautical income (meaning, in effect, that we apply the elasticities above to all revenue).

'Operational gearing'

The way that a change in income translates into a change in profits depends on the scale of a business's RAB relative to ongoing expenditure. As we explained in section 4, a company with a RAB that is small relative to ongoing expenditure will find that a loss of revenue eats into profit quite quickly. A company with a bigger RAB, by contrast, will experience a smaller percentage reduction in its return when revenues fall by the same amount.

There isn't a universally accepted way of measuring whether a company has a 'big' or a 'small' RAB. One useful indicator is the ratio of the RAB to ongoing opex – a measure of the extent to which revenue is for the return of and on historical investment as compared to ongoing expenditure. On this basis the numbers are as follows:

- Heathrow, Q5 average = 12.5
- Gatwick, Q5 average = 6.4
- Stansted, Q5 average = 7.9
- NERL (UKATS), 2010 = 2.8

A second useful metric is the ratio of the RAB to annual revenues. In using this metric one has to watch for circularity; if the CAA has in the past awarded a firm a higher return because it has high operational gearing, that firm will by implication have higher revenue so offsetting the effect that we are trying to measure. To counter this, we have recalculated companies' revenues to give the same 6.5% pre-tax rate of return. The RAB to adjusted revenue ratios are as follows:

- Heathrow, Q5 average = 5.7
- Gatwick, Q5 average = 3.7
- Stansted, Q5 average = 4.1[4]
- NERL (UKATS), 2010 = 1.9

Both of the above calculations deliberately compare Q5 averages for Heathrow, Gatwick and Stansted with the figures for NERL in the last year of the current control. Ideally we would want to look at NERL's ratios over the next five-year period, so as to align any estimate that we make of CP3 beta with NERL's financial profile in the same period. As this information is not yet available, the best that we can do for the time being is to focus on the last year for which data is available.

[4] In the case of Stansted, the RAB is the value calculated by the CC in its 2008 airport inquiry. We note that the CAA's December 2008 proposals represent a movement away from standard RAB based regulation at Stansted airport.