Aviation external costs - reports and evidence

Transport 2000

The options in the Regional Air Studies are based forecasts of a significant growth in air travel. **An increase from 181 million passengers per annum (mppa) is 501 in 2030 is forecast.**

The forecasts are based on an econometric model which uses:

- an assumed rate of growth of the economy
- the propensity to spend additional income on air travel
- the price of air travel
- elasticity of demand

(SERAS, the South East Regional Air Study, gives most detail on external costs and is therefore the one we have used in this submission.)

SERAS says *"It is Government policy that aviation should meet its external costs, including environmental costs - that is, the costs to society of aviation noise, and other adverse impacts on, for example, climate change, local air quality, landscape, biodiversity and heritage."* (5.5) It is remarkable, then, that the Regional Air Studies are based on the assumption that the industry will continue to **not** meet its costs by 2030! While there are significant difficulties, such as international agreements, which make rapid changes difficult, it is hardly conceivable that the government could not have made progress 28 years later. One is led to the conclusion that either the government statement is in fact untrue or that it has an ulterior motive in 'hyping up' the growth in the Regional Air Studies.

External costs are included in a couple of 'sensitivity tests' which are reported in the Regional Air Studies. However, these tests are very limited, they assume very low external costs and there is little notice taken of them. Given that the Government says its policy is that air transport should pay its external costs, external costs should have been included in the main forecasts so their effect was reflected in the main options presented in the consultation. It is the alternative assumption - that external costs are not charged - that should have been relegated to a sensitivity test i.e. the other way round to what is presented in the consultation. The obvious conclusion is that the government has written the consultation this way round in order to demonstrate more strongly a 'need' for airport expansion.

Price elasticity
An important component of spending is the price of air travel - the assumptions are made on 'elasticity of demand'. The elasticity of demand shows the effect of price on demand as the price is altered. For air travel it is about -1 i.e. that is a 1% increase in price leads to a 1% reduction in demand. (This is a fairly high elasticity and is typical of goods that are luxury or 'discretionary'. Basic or 'essential' goods have a low elasticity.)

Valuation of external costs
The Government consultation 'The Future of Aviation' had a small ancillary document called 'Valuing the costs of aviation'. This paper gave estimates for just two types of external costs - noise and greenhouse gas emissions. The cost of air pollution, i.e. NO_xious gases and particles as opposed to greenhouse gases, were omitted on the grounds that estimates were uncertain. Our view is that uncertainties in the estimating process are no justification for leaving them out. Afterall, ultimately all external costs will be paid for by someone, somewhere, at some point in time, so the best estimates for the cost of these externalities currently available should be used, with caveats and ranges as appropriate.

In addition, we have some concerns about the way that the external costs of noise and greenhouse gases have been measured by the DfT.

Noise costs
SERAS says *"Monetary values for the effects of noise were estimated by assessing the impact of increased air traffic noise on house prices in the region of the airport option. The tentative finding of past research, that a 1 decibel change in noise level results in an approximate 0.5 to 1 per cent change in house prices, was used to estimate the order of magnitude of the noise value of different options. Values at Heathrow ranged between 36 and 40 pence per passenger; at all other airports, values never exceeded 5 pence per passenger."* (App B p150)

This method of calculating the cost of noise - by estimating an effect per dB of noise on house prices - was described in a study by Professor David Pearce and Brian Pearce ('Setting Environmental Taxes for Aircraft: A Case Study of the UK. 2000'). Their results have been used in the Regional Air Studies. However, there would seem to be some major shortcomings in the method. Their study only refers to noise within the 57 Leq contour and thus ignores all people who are affected by noise but are not exposed to 57dB. The 57 cut-off was based on a study over 20 years ago which took 57dB as representing low levels of "high annoyance". However, recent studies indicate the onset of annoyance at around 50dB and the WHO considers that people should not be exposed to levels over 55dB on health grounds. There are also other problems, in particular that aircraft noise is assumed to be superimposed on quite high levels of existing background noise. This would suggest that the true costs are more than double the ones produced by Pearce and Pearce and used by the DfT. As noted above, the noise cost is based on a study that uses empirical evidence on the reduction of house prices due to noise. In principle this takes account of the total cost imposed on residents. But it does not take account of non-residents; thus it would be inappropriate for an area valued by visitors for its peace, such as the Lake District or an Area of Outstanding Natural Beauty. This appears to further under-estimate the true cost of noise.

Air pollution costs
SERAS dismisses the economic cost of air pollution thus *"The analysis indicates that within the South East, only an additional runway at Heathrow could (without preventative measures) lead to a significant number of people being subject to changes in NO_2 of this magnitude, and this on conservative assumptions. These estimates of the costs of respiratory illnesses indicate that the total amount would be too low to be expressly represented in any environmental levy."* (App B, page 151,

SE) In other words, the economic cost of air pollution is too small to worry about. A closer look suggests a rather different picture.

SERAS only takes account of the effect of NO_2 (nitrogen dioxide) on hospital admissions which do not lead to death: *"Robust values of the effects of local air quality changes, primarily NO_2, on health are not available. But information supplied by DEFRA suggests that respiratory hospital admissions might increase by 0.5 per cent for each 10ug/m3 of NO_2. This implies an increased admission rate of approximately 5 per 100,000 people at an NHS cost of £1500 - 2700 per respiratory hospital admission. These values give a total cost of around £10,000 for every 100,000 people subject to an increase of 10ug/m^3 of NO_2 arising from respiratory illnesses (this does not include any deaths brought forward for which there is no evidence at present)."* There are a number of shortcomings within this approach.

The NHS costs are only part of the story. The total cost of illness and suffering is greater than the costs of treating it. While it is harder to put a cost on suffering compared with the financial cost of treatment, there are established methods of estimating such economic costs.

SERAS suggests that there will be no deaths from air pollution and therefore there will be no cost. This cannot be right. Air pollution is a major killer in the UK - a government committee estimated that it causes 12-24,000 deaths per annum. These were due only to short episodes of high pollution levels; the committee was not able to estimate deaths from long-term or chronic exposure. Since airports are a major polluter in the area, they will cause deaths from air pollution.

SERAS says there is no evidence for deaths from NO_2. This may be correct in respect of direct deaths. However, NO_x leads to production of other potentially lethal gases, especially ozone. So do 'non-methane volatile hydrocarbons'. Ozone is one of the most dangerous pollutants. The other dangerous pollutants are PM10 (small particulate matter) and SO_2 (sulphur dioxide). While they are not emitted in such large quantities around airports as NO_x, there can be enough to cause ill health and death. The economic cost of illness and deaths from these various pollutants has been ignored in the Regional Air Studies.

Interestingly, the cost of air pollution was estimated by Peace and Pearce (2000). The government has used the cost analysis from Pearce and Pearce for noise (Annex B, p150), but not for air pollution. We have not been able to carry out a full comparison, but Pearce et al's costs are almost certainly much higher than the NHS cost. **Examples in their paper suggest that the cost of air pollution may be about 20% of the cost of greenhouse gases and the same order as their estimate of the cost of noise.**

There are also effects of air pollution other than those on human health, including corrosion of buildings and structures, soiling of materials, interference with agriculture, damage to habitats and local extinction of species (see 4.8, etc of air pollution briefing). These will also have economic costs.

It seems clear, then, that the statement in SERAS - *"... the total amount would be too low to be expressly represented in any environmental levy"*- is very misleading. The

DfT may claim that the statement refers only to NHS costs, but there can be little doubt that the intent is to convince the reader there is no significant economic cost of air pollution. We believe there is no reason to assume the cost of air pollution is negligible.

Greenhouse gas costs

SERAS describes work done on external costs of greenhouse gases and sensitivity tests to take account of them. The explanation is very confusing because it is spread over various places in the document - 5.7, 5.8 , 5.10, 5.11/4, 16.21, App B p150, Annex E p159 last para.

An external cost for greenhouse gases is used for the sensitivity tests: *"Further information on the scientific understanding of aviation's contribution to global warming, together with some revised estimates of the damage costs of carbon emissions, is now available. Recent evidence indicates that aircraft have approximately three times the radiative forcing effect than would be expected from their CO_2 emissions alone. In addition, Defra has revised its guidance on the social cost of carbon with a central estimate of £70 per tonne of carbon, increasing by £1 per tonne of carbon per annum to reflect increasing damage costs over time."* (Annex B p159 para 5). It can be inferred from this that the cost of £70 (increasing by 1% per annum) per tonne of carbon has been multiplied by three to take account of the full 'radiative forcing' of the emissions and then applied in the sensitivity tests. The results support this interpretation.

This cost has been assumed to be charged as a tax on fuel, set at 100% of the basic cost of the fuel. The effect on demand is estimated initially at 12%: *"The combined effect of these two revisions indicates that the demand for air travel could reduce by about 12 per cent."* (Annex B p150, para 5). The calculations were carried out by a computer modelling programme called 'SPASM' which we have not been able to study. However, the result is consistent with what would be expected if the elasticity of demand is -1 (see 5.1) and the cost of fuel represents 10-15% of the costs of airline operations.

Although a tax on fuel would reduce demand, the effect is not as great as one would expect on the basis of price elasticity alone. This is because a higher cost of fuel gives more incentives to the industry to use more fuel-efficient aircraft. This in turn means the impact of the tax on fuel is reduced: *"However, a higher price of aviation fuel is likely to have supply side effects through encouraging the use of more fuel-efficient aircraft and, in the longer term, acting as a spur to the development of more fuel-efficient technologies. The long term effect of a tax designed to reflect external costs will be smaller than the initial effects based on demand impacts alone."* (Annex B p150 paras 6,7). The net effect is estimated to be a reduction of demand by about 10% instead of 12%.

Although demand is only reduced by 10%, the CO_2 emissions will be reduced by more. The more fuel-efficient aircraft will produce less CO_2, so CO_2 emissions and global warming are reduced by more than the fall in demand. Defra has estimated an external cost of £70 per tonne for CO_2. But the European Environment Agency (EEA), an agency of the EU, has used a figure some four times as great. While the

EEA figure could be an over-estimate, it shows that the figures in SERAS could very significantly understate the importance of the issue and impacts of taking action.

Having derived an external cost for greenhouse gases and shown that application of a charge on fuel would make an appreciable impact on demand, SERAS then tries 'talk it out'. It claims that the underlying demand is in fact higher than originally forecast, and that this neatly balances out any reduction due to a fuel tax! *"The midpoint estimates of national demand for air travel drawn from 'Air Traffic Forecasts for the United Kingdom 2000' have been used in this document. These midpoint estimates were predicated on a 1 per cent per annum reduction in fares in real terms over the forecasting period. This is less than the historic trend over the last 20-30 years of minus 2 per cent per annum. Evidence since the forecasts were published suggests that costs have continued to fall by 2 per cent per annum. (5.9) Air Traffic Forecasts for the United Kingdom 2000 suggests, if the reduction of air fares in the long-term is 2 per cent per annum rather than 1 per cent, that demand would rise by 20 per cent, which, if achievable, would comfortably exceed the reduction in demand due to a CO_2 tax."* (5.10)

This is deeply suspicious. If the DfT/Government had really believed that the forecasts in the 'Air Traffic Forecasts for the United Kingdom 2000' were wrong, why did they not revise the forecasts as soon as they knew? And why did they not use adjusted forecasts for all the calculations and results and options presented in the Regional Air Studies?

The answer may be surmised in the history of the subject of external costs. NGOs and others have been pressurising the government for many years to address the issue of external costs of aviation. The government has continually tried to ignore the issue. 'The Future on Aviation', said very little about external costs, while eulogising the economic benefits of aviation. A major study was commissioned to provide the economic inputs into the Regional Air Studies and the forthcoming Aviation White Paper. That study, 'The Contribution of the Aviation Industry to the UK Economy', made no mention whatever of external costs, despite the fact that they are an essential aspect of a proper study into economic impacts. Finally, the government acceded to pressure and put a small report on external costs on its web site. It seems clear that the DfT/government, having been forced to recognise external costs as a consideration, is now desperate to show that even if they are included in the equation, they will have virtually no effect. This would be entirely consistent with the stance and tone of the whole consultation, which is to play up the benefits of massive growth in air travel and play down all the costs and disbenefits.

Other external costs

There are other costs in addition to those of noise, air pollution and greenhouse gases. Some are environmental; others not, including:

- loss of wildlife, habitats and biodiversity
- impacts on watercourses and groundwater
- increased risk of flooding due to loss of natural surfaces
- loss of countryside
- loss of landscape
- harm to townscape and visual amenity

- loss of heritage, e.g. ancient churches, old buildings and monuments
- traffic congestion

With the exception of congestion, none of these are very amenable to calculation of external costs. If, however, one were able to assess costs, it seems likely that these would not be insignificant compared with the costs of noise, air pollution and greenhouse gases where estimates have been made.

Total external costs
As indicated above, there is a good deal of uncertainty in the individual external costs. It is therefore not possible to derive an absolutely reliable figure for the total external costs. It is however instructive to derive a rough estimate.

The external cost of greenhouse gases appears to be about 12%. (This is based on the estimated reduction of demand by 12% and the assumption of an elasticity of -1). According to the study of Pearce and Pearce, the cost of air pollution may be around a quarter of the cost of greenhouse gases. This would correspond to a 3% cost. The cost of noise quoted in the Regional Air Studies is 36 to 40 pence per passenger at Heathrow. Noting that their figures are under-estimated by a factor of over 2, the real cost would be about £1. As there will be noise nuisance caused at each end of the journey, the cost per trip is £2. The total of the costs - greenhouse gases, NO_xious gases and noise - is thus 18%. This is however only applicable to an airport with a large population nearby, such as Heathrow. At other airports the economic cost of noise and air pollution would be less.

Effect on demand
If an external cost of 20% were charged, the demand might be expected to would fall by some 20%, given an elasticity of -1. There would probably be some supply side effects offsetting this figure, as noted for greenhouse gas emissions. However, they would not be large, as it is not as easy to improve performance across a whole range of parameters as it is in one parameter, such as fuel consumption. A reduction of 10% in the initial fall of demand of 20% is assumed, giving an actual reduction of 18%.

The Contribution of the Aviation Industry to General Taxation
Transport 2000 also argues that, in addition to paying its external costs, the aviation industry should contribute a fair share to general taxation. It was for the reason of trying to rectify this situation, that that Air Passenger Duty was introduced by the then Chancellor, Kenneth Clarke. However, the aviation industry continues to receive significant benefits from the present taxation system, in the absence of an air transport tax exemption:

- Tax exemptions for air transport were worth £7.5 billion in 2000. They will be worth £16.6 billion in 2020 and £21 billion in 2030, if passenger numbers increase as forecast.

- In 2002 a single person earning £25,000 (national average) will pay £557 income tax to meet the costs of air transport's tax exemptions, even if he or she does not fly.

- Air passenger duty (APD) was introduced in 1993 on the grounds that airlines did not pay fuel duty on VAT and were under-taxed compared with other sectors of the economy, according to the Budget Statement of 30th November 1993 by Kenneth Clarke, then Chancellor of the Exchequer - see also statements by Sir John Cope, the Paymaster General, on 1st December 1993 and 31st January 1994 (Budget Statement debate). But the tax collected from the airlines in APD is only a fraction of the tax that would be collected if the airlines paid fuel duty and VAT. For example, as the table below shows, in 2000 the airlines paid £1 billion in APD but did not pay £8.5 billion in fuel duty and VAT, a net saving to airlines of £7.5 billion.

Table: Air Transport Tax Balance 2000

Tax paid	£bn	Tax exemptions	£bn
Air passenger duty	£1.0	Excise duty and VAT on aviation fuel	£5.8
		VAT on passenger tickets	£2.3
		Excise duty and VAT on consumer goods	£0.4
Total	**£1.0**	**Total**	**£8.5**

Notes: The figures in the table show that the net value of air transport tax exemptions in 2000 was £7.5 billion (after deducting £1billion air passenger duty). The exemptions for fuel and passenger tickets have been calculated from UK airline accounts. The exemptions for consumer goods have been calculated from information from BAA. The size of the tax exemptions relates directly to the number of passengers, so an increase in passengers from 180 million in 2000 to 400 million in 2020 and to 500 million in 2030 (as forecast by the DfT) would increase the net value of the tax exemptions from £7.5 billion in 2000 to £16.6 billion in 2020 and to £21 billion in 2030.

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