

Draft for Discussion

Reforming aviation charges

Keith Buchan, 4th April 2008

1 Introduction and context

It has been clear for some time that the tax and charging position for aviation is poorly related to any identifiable Government objective. Aviation does not meet its environmental costs, even those that have been identified. Its tax position is privileged in that its users pay no VAT while the airlines claim it back. Nor does it pay any fuel duty. Money spent in the UK economy on aviation is thus a tax loss to the Government.

There is a further important complication in that emissions at high altitudes have an exaggerated impact on climate change – this is known as “radiative forcing”. A common assumption has been to multiply the impact of emissions by 2 to 2.5 times, although studies have produced multipliers between 1.9 and 4ⁱ. Thus emissions from aviation should be adjusted upwards to take this into account.

Because of its international nature, aviation is subject to treaty agreements, the most well known of which is the 1944 Chicago Convention. This is often used to argue that individual nations cannot apply taxes to fuel used for international flightsⁱⁱ. Although in fact the Convention only prohibits taxing fuel on board, a large number of bilateral treaties have extended this to prohibiting any tax on aviation fuel. Even if it were possible, airlines may well start to plan their routes so that they could avoid the tax by flying to countries which did not apply fuel duty.

There is one compensatory charge levied in the UK, the Air Passenger Duty (APD)ⁱⁱⁱ. This is considered to be outside the Chicago Convention because it is levied on people buying a ticket to leave the UK and thus not directly a charge on fuel. However, it is precisely for this reason that it is poorly related to environmental damage or climate change. For example, passengers on noisy inefficient aircraft pay the same as those on the most modern and efficient models. It is sometimes said that this compensates for the lack of VAT and fuel duty, although VAT alone would certainly raise more than APD.

In fact, APD is slightly related to distance travelled and thus climate change impact. This is because it has two rates, the first is for the EU nations plus some of their dependencies, and specified countries such as Norway, Iceland and Turkey. This is currently £20 per person. The second is the International rate, which covers everywhere else, and is currently £80. There is also a capacity related rate in that the lowest priced seats (which take up less room) are charged at half the standard rate APD (£10 and £40 respectively). The great majority (around 90%) of tickets are charged at this lower rate.

A common criticism of this approach, also made by some of the airlines, is that it fails to reflect the inefficient use of aircraft. Where there are empty seats there is no charge. It also gives no incentive to reduce fuel consumption. The obvious

method of charging would be to tax fuel, since fuel use is directly proportional to CO2 emissions, but this is generally held to contravene the Chicago Convention. The UK Government is consulting^{iv} on how to improve APD to respond to these concerns, as well as the general issue of aviation and its external costs. A key intention is to move to charging aircraft rather than passengers. The new approach would be implemented in November 2009.

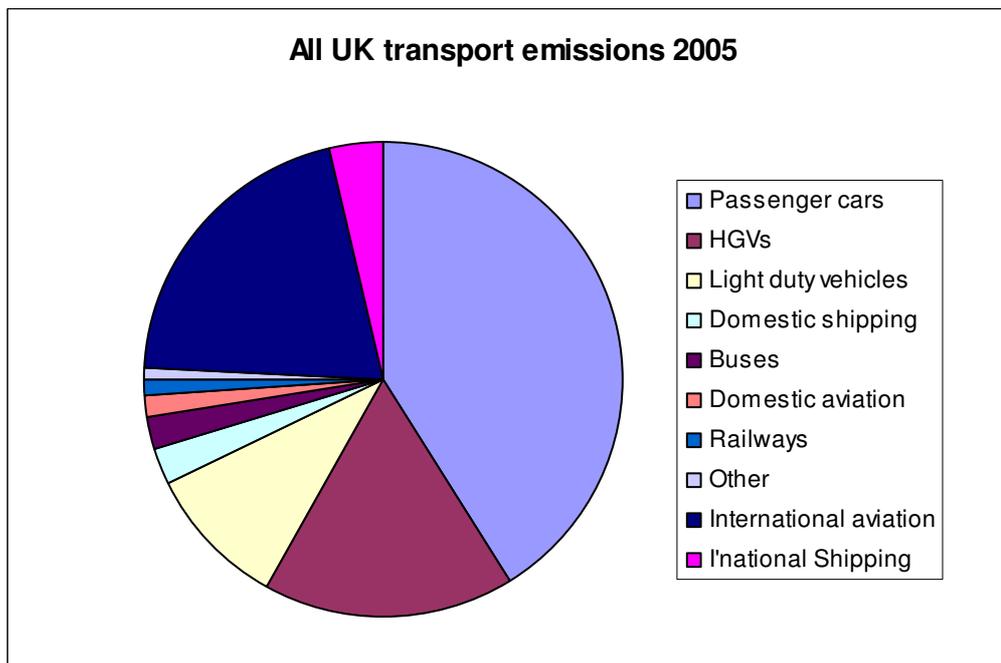
In due course the illogical position created by the 1944 Convention may well be addressed, but it will be a long drawn out and highly politicised process. The Kyoto protocol recognised this and does not include international aviation.

For this reason, this submission considers methods which would be better related to environmental impacts but do not depend on a tax on fuel for international flights, or a mile by mile charge related to fuel consumption.

Need for reform

At present aviation is a major source of national greenhouse gas emissions, defined as flights taking off from the UK. It is growing very rapidly both here and across the world. The current UK position is shown in the chart below. By 2020 aviation is likely to be the single largest source of transport related emissions.

Figure 1



Source: DEFRA data

Ways forward

While there is widespread agreement that reform is needed, the simple approach of taxing fuel, even for some international flights, would require at the least an EU level agreement. Meanwhile it is intended to put aviation within the scope of the EU emissions trading scheme (ETS). This is a market in permits to emit amounts of greenhouse gas which are given to companies or organisations. At the

moment it focuses on power generation and energy intensive producers. A fixed number of permits are issued for a specific trading period and companies who emit less than their permit can sell the surplus to other companies who have not reduced their emissions. There are major issues over how generous the permit issuing has been. The availability of spare permits led to an unrealistically low price for a tonne of CO₂ at the end of the last trading period in 2007 (less than one euro).

It remains to be seen whether the practical difficulties of mixing the very different sectors of aviation and power generation in one trading scheme can be resolved. In any case, it is not clear that the scheme will produce any stable and meaningful price for carbon in the medium term due to the ongoing special pleading for extra permits. The current price (March 2008) is around 21 euros^v, about the same as early in the previous period.

In the mean time, the current APD is to be reformed. To avoid legal problems and to keep the approach simple, the Government has suggested using maximum take off weight (MTOW), or landing and take off (LTO) emissions, either carbon or nitrogen oxides, as a basis for charging. This could be combined with a modest adjustment for distance. The consultation suggests an EU zone, plus two international zones, up to 3,000 miles from the UK with one price, which would be increased for all flights over that distance.

The Government has also stated that it wishes to increase the charge which replaces APD (as yet unspecified) by 10% in the second year.

One further issue is that of flights not currently subject to APD. These include freight, transfer and transit passengers. The latter are people who may leave their aircraft, but not the airport, while it refuels. They tend to be quite small in number, less than 1%. Transfer passengers, who fly to an airport on a short flight to get on a longer distance one, can be a far higher proportion. DfT estimates for Heathrow suggest 25%^{vi}. There is significant disagreement over whether these passengers simply congest the airport and pollute its locality and should be minimised, or whether they contribute to the economy by ensuring a wide range of destinations are available from “hub” airports.

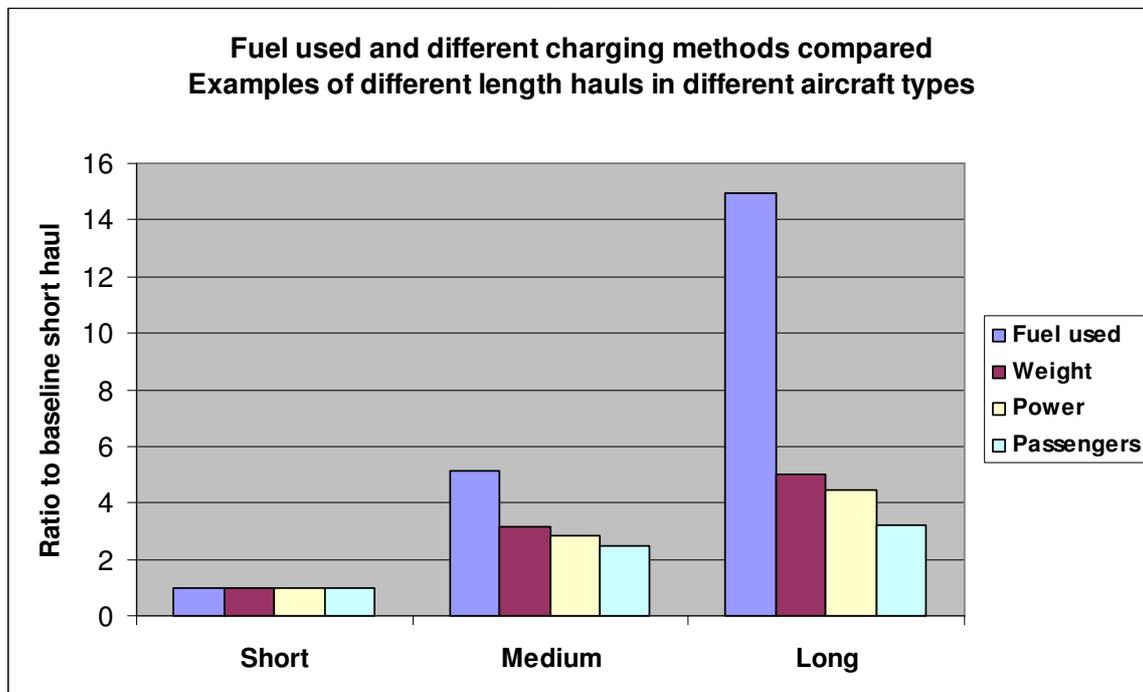
The rest of this paper consider different approaches to resolving the twin problems of the generally low level of charging for an important emissions source and its weak correlation with the amount actually produced.

2 Could a non-distance related charge work?

While it may seem obvious that a per passenger flat rate charge cannot reflect distance, this is not entirely true. The reason is that different aircraft types have to be used for different lengths of flight. The huge amounts of fuel that have to be carried for long distance flights mean that these aircraft tend to be much heavier, with more powerful engines as well as more passengers. Fuel represents a far higher proportion of their take off weight, up to a third, about twice as much as a small aircraft. However, these smaller aircraft, which use less fuel per passenger, cannot fly very long distances.

Thus APD does slightly reflect distance travelled but this is highly dependent on aircraft type. For the purposes of this paper, two other widely available factors were considered, maximum take off weight and engine power (measured as thrust). The detailed workings are available on request, but the results are summarised in the chart below.

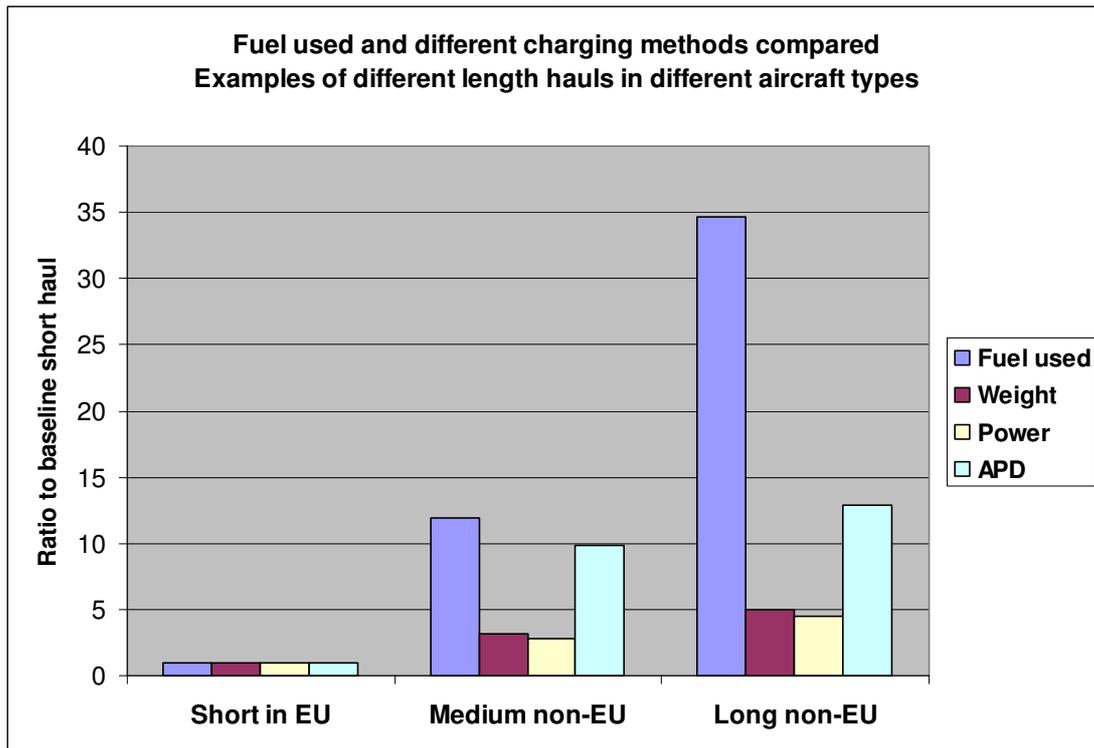
Figure 2



Source: EEA corinair data^{vii}, Airbus and Boeing aircraft published specifications^{viii}
The haul lengths chosen were 1,550 miles short, 3,400 miles medium, 6,750 long
Aircraft are assumed to be full and using a standard 2 class configuration
All flights are **outside** the European zone

The conclusion is that using passengers as a basis for charging (as APD does) is poorly related to increases in fuel used, especially for longer flights. Weight is best, followed by power, but neither solve the problem. The two zone approach used by APD does help significantly to raise duty on longer distances compared to some shorter flights, but this is more related to EU membership and EU agreements than distance. This is shown in the next chart.

Figure 3



Source: EEA corinair data^{ix}, Airbus and Boeing aircraft published specifications
The haul lengths chosen were 575 miles short, 3,400 miles medium, 6,750 long
Aircraft are assumed to be full and using a standard 2 class configuration

The use of an extended EU plus zone also leads to anomalies such flights to Turkey and the Canary Islands (around 1800 miles) having lower APD than those to closer North African destination (Tangier is just over 1100 miles). Much closer EU destinations have the same APD (Milan is about 600 miles).

While splitting the EU into two zones would help, it is not clear that this would be possible within EU regulations. Established commercial zoning systems, such as Air Miles^x, split the current APD European zone into three. There are four other zones for the rest of the world.

It is clear that current charges do not reflect actual emissions and that a distance element is crucial, whether weight, capacity or power is used to calculate the charge.

The final problem is in relation to the encouragement of fuel efficient aircraft. The basis for any charge, whether weight, capacity or power, is hard to relate to this factor. However, it would be possible to apply a lower rate of duty if an aircraft manufacturer could show significantly lower than average (taken as 2008) flight emissions per tonne of take off weight. This need not be a very onerous process, and much data is already available. The reduction in rate of duty (above the level charged for general taxation) would be proportionate to the emissions reduction. This is the preferred option in this report.

3 A new basis for aviation charges

Creating a baseline: domestic flights

There is one type of flight where the UK has control over charging for use: those entirely within the UK. While some flights which cross the sea need separate consideration due to the lack of alternatives, the vast majority of UK flights compete with the traditional surface modes: coach, rail and private car. Rail and air times are particularly close. It seems entirely illogical that fuel duty, which is said to be an environmental charge (for example for road track cost calculations) should be paid by some competing modes, but not by the most environmentally damaging one. The charge would be doubled until further data is available on high altitude radiative forcing.

It should be noted that APD is here considered as a substitute for VAT, and thus makes a contribution to general taxation. It is not strictly an environmental charge. However, it is preferable to VAT because it is independent of ticket price and better related to environmental damage. The fuel duty should be additional and seen as creating a more level playing field with the other modes in relation to climate change. Operators would declare fuel used and pay the duty, this should avoid aircraft trying to fill up in nearby European airports for UK domestic flights.

Thus the preferred option for domestic overland flights is to keep a fixed charge equivalent to current APD, but reformed in two critical ways. The first is that it should be based on capacity or weight, rather than passengers carried. This should be the same as the international flight basis. This removes the anomaly of it being cheaper to fly an aircraft with a few passengers than a full one. The second is that all aircraft departures should be charged, including freight, transfer and transit passengers. The details of options for charging, with strengths and weaknesses, are summarised at the end of this report.

Flights to the EU and beyond

Moving on to international flights, it is clear that the current extended EU zone is illogical, but difficult to change. A two zone system is preferred, but this would probably be difficult to implement due to the overlap with EU regulations. Thus a flat rate capacity charge of 7p per kg MTOW is proposed, approximately equivalent to £35 per economy seat. This reflects the greater average distances than domestic flights and lack of fuel duty.

There are so many different fares on the same flight that it is hard to distinguish a “typical” percentage change. In addition, the airlines will have discretion as to their pricing and revenue management. Using the Civil Aviation Authority (CAA) averages, European fares would rise by about 19%.

For flights outside this EU based zone, the current flat rate of APD favours longer distance flights and penalises some flights to close EU neighbours, for example in parts of North Africa and Eastern Europe. A two zone system is too coarse to remove such problems.

For this reason, four zones and four charges are proposed as shown below. They have been expressed initially as economy seat capacity to allow for easy comparison with the current APD.

This tapers off in terms of impact at longer distances and should avoid distortions in the choice of refuelling stops. The rate could be reduced if an aircraft manufacturer can show significantly lower than average (taken as 2008) flight emissions per tonne of take off weight. The reduction in rate of duty would be proportionate to the emissions reduction.

Table 1
Non-EU zones for direct international flights

	Up to 2000m	2001 – 3000	3001 - 4000	Over 4000
Per economy seat capacity	£55	£70	£85	£100
Per kg of MTOW	10p	12p	14p	16p

Because of the differences between weight and passenger capacity, the above will not be precisely equivalent. However, the seat capacity figures have been produced to allow comparison with APD and allow impact on fares to be assessed.

It should be noted that these calculations are complicated by the way in which different aircraft are used for different length flights. For this reason the figures above have not been constructed using averages across all aircraft types. Instead, they have assumed smaller aircraft for shorter distances, larger for the hauls. This has been based on the limits inherent in the industry standard data which is also used for fuel consumption (Corinair). This is the same data set used by the UK Government in its consultation paper.

In this case, typical economy fares for flying to North Africa would go up by 10%, to New York by 15% and to the Far East by 10%. This would still mean that the total charges (including existing APD) would still be less than adding VAT to fares.

Implementation

Given the wide availability of alternatives, the new domestic system should be brought in as soon as possible, probably 2010.

For other flights, it is suggested that the changes to the structure of the charge is also implemented in 2010, but the increases phased in over 5 years. The reasons for this are to allow for:

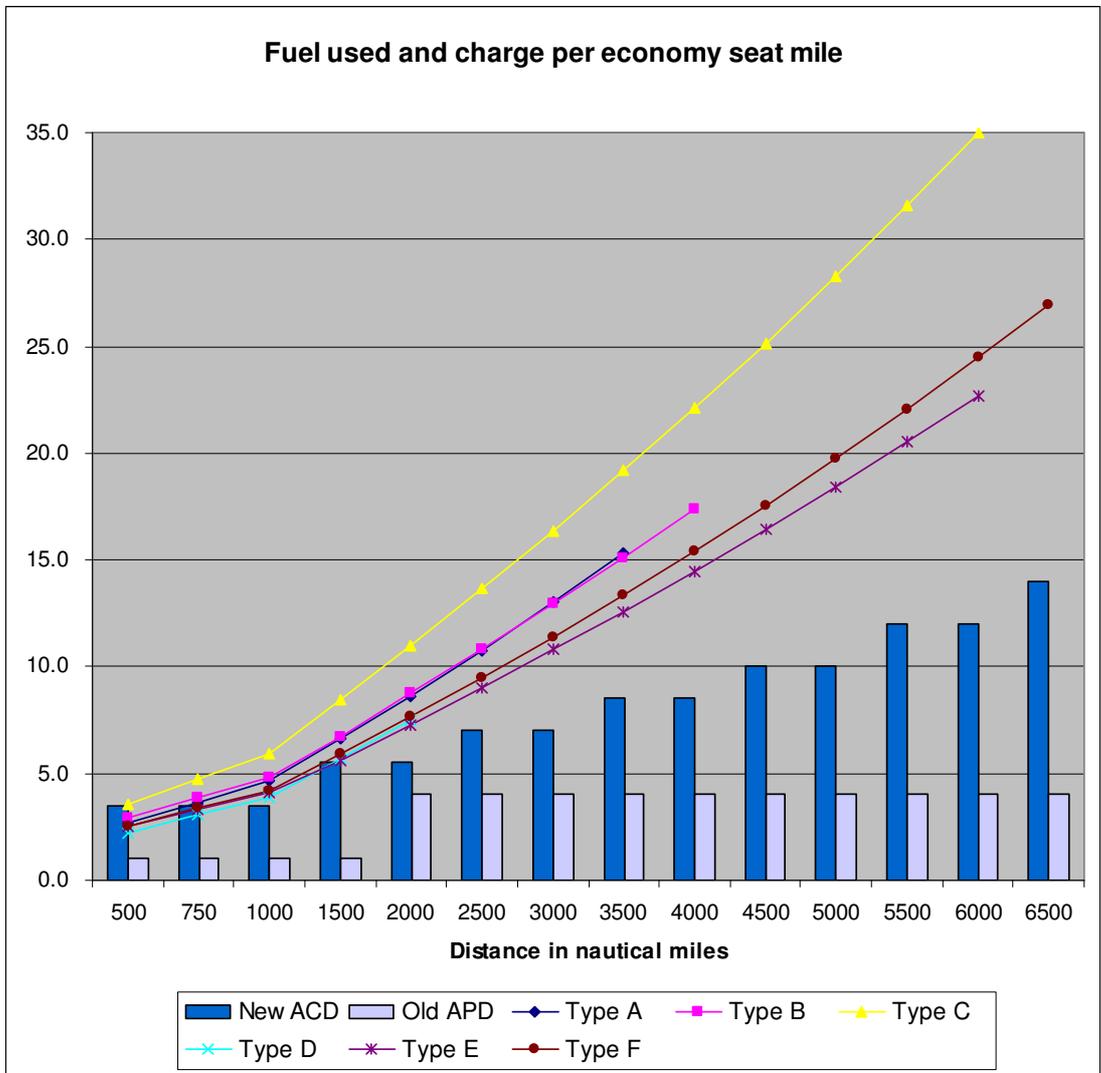
- people planning a special journey a long time in advance
- minimising any one off surge in demand just before the price rise
- time for adaptation by airlines and other transport operators
- clear price signals to the market to encourage energy efficient operation

What is the overall impact of the new approach?

The following two figures try to make the proposed changes as transparent as possible, given the wide range of fares, the different balance of economy and premium seating, and the use of different aircraft for different lengths of flight.

Using Corinair data for fuel consumption, it is possible to review how much fuel different aircraft types use over different distances. This includes landing and take off. Combining this data with the above charging system illustrates how the charges would relate to fuel used. As before, six of the most popular types of aircraft have been used, typifying short, medium and long haul. This is shown on the chart below. In order to compare the rate of change of the charge with the rate of increase of fuel used, current APD (based on full aircraft) and the new charge, which we have called Air Capacity Duty (ACD) are also shown.

Figure 4



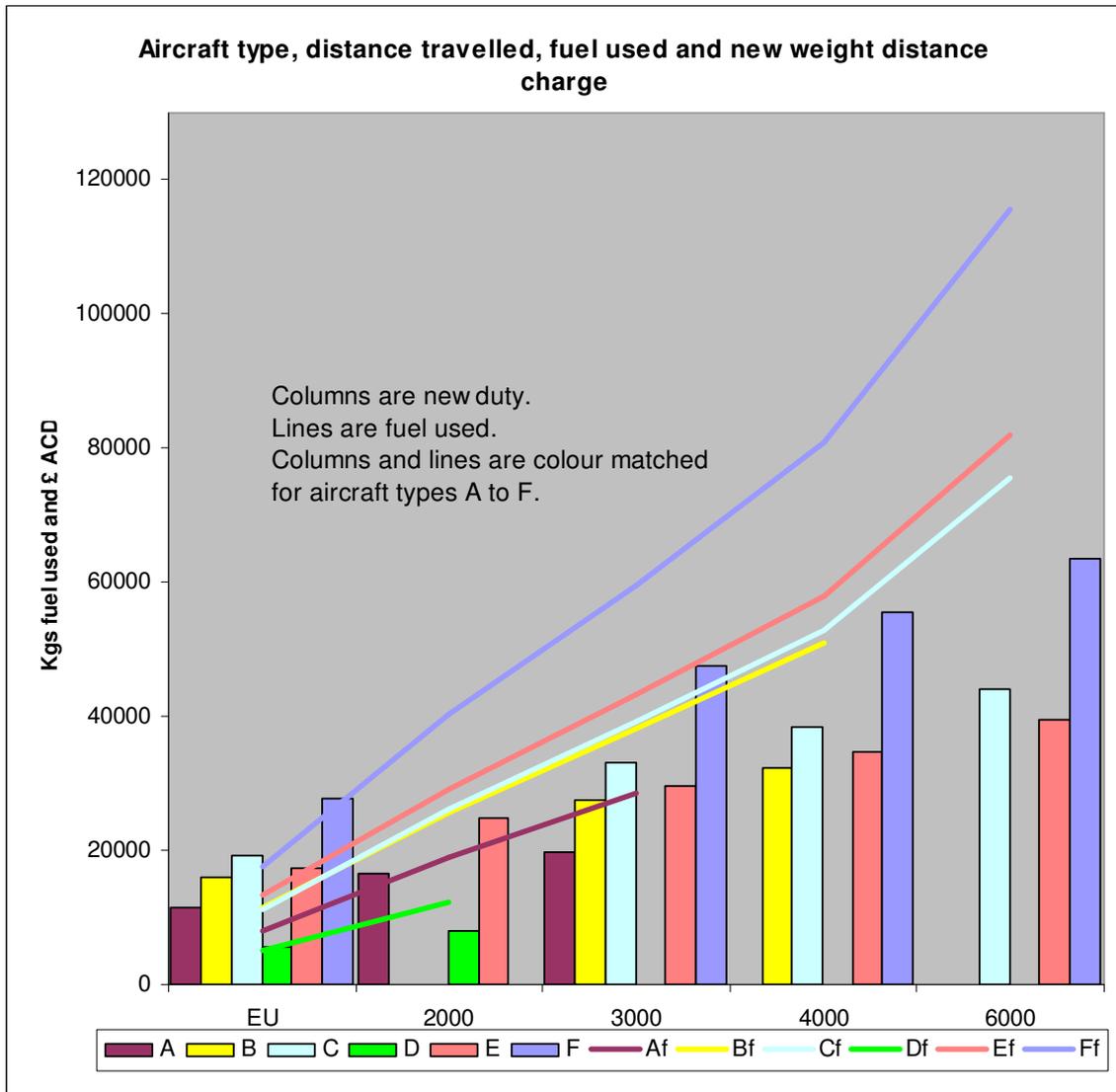
Note: Aircraft types A to F are representative Airbus and Boeing models for short medium and long hauls, sources as Figures 2 and 3.

The impact of the stepped approach created by the new ACD zones is immediately apparent. Even four zones do not precisely track the fuel used,

however they allow for a great improvement over a two zone approach. They avoid the distortion caused by the sudden change of the original APD at the EU zone boundary, and the way that APD provides no tracking at all of rapidly increasing fuel use.

In the second figure below, a more direct comparison is shown between actual aircraft types and a weight based charge. This pairs the fuel used by an aircraft with the actual level of charge based on its weight.

Figure 5



Note: Aircraft types A to F are the representative Airbus and Boeing models used for Figure 4, in this case paired so that A is the charge applied to aircraft type A and Af is the fuel used by the same aircraft using Corinair data. The columns show the most likely distance for which each aircraft is used, again using Corinair. All aircraft are shown for the shortest distance as a base comparison. EU is based on a 750m flight.

This proposal is not perfect in matching emissions (or local environmental damage) to charges but is a very significant improvement. It may prove an acceptable compromise in view of the problems of international and EU

agreements. These include the Chicago Convention, but also many one to one national treaties.

It should be noted that this approach would effectively remove the need for a carbon charge and have a major benefit in terms of slowing down aviation growth and avoiding airport and surface access congestion costs. It would also reduce local environmental damage, in particular noise and air pollution.

What should be done with surplus revenue?

While the charges proposed would increase Government revenue, it is not proposed that any excess over current APD is used as general tax income. They are genuine environmental charges, and the tax objective is to minimise revenue and maximise greenhouse gas reductions. To improve public acceptability they should be recycled in the most direct manner possible.

There are several options which MTRU are exploring in the context of other environmental charges for transport and these will be set out in more detail later in 2008^{xi}. While deliberately omitting detailed specification, the options, which may be combined, include:

- additional non-business aviation revenue separated out from general taxation and returned to the general population, for example through tax credits or through other means
- making a per head cash payment for mitigation measures to those living, working or attending education close to airports
- funding a UK national travelcard with an annual credit
- additional business revenue separated out from general taxation and returned to businesses, for example using rate rebates, corporation tax reductions or lower national insurance contributions
- funding improved access to airports by sustainable modes

The national travelcard could be innovative and include paying for flights as well as rail, coach or bus journeys. This would probably make the first flight no more expensive than today but subsequent flights much more so. It would maximise individual choice. Revenue from business users could also be recycled more directly back to businesses.

Potential local and international problems from new charges

The first point to be made is the obvious one that flights which do not need to come to the UK, and particularly to Heathrow, are likely to be discouraged. It is hard to see how, given the large scale local environmental problems and that Heathrow is so congested, the reduction in aircraft using it as a refuelling or transfer point is anything other than an advantage. Any such passengers do not leave the airport and there is thus no tourist gain. Heathrow supports a wide range of destinations and it is extremely unlikely that this would be affected because of the very strong local demand. It is interesting to note that the development of direct flights from regional airports, rather than flying to Heathrow and transferring, would be encouraged. Alternative means of travelling to

Heathrow would also become more attractive, for example from cities such as Manchester and Bristol. Such modes could even be improved using allocated revenue from the charges proposed.

As regards what other EU countries will be doing, most are already concerned about aviation growth, sufficiently so to agree that it will be included in the trading scheme. Some already charge VAT on some flights. In a sense, this proposal provides a parallel and supportive approach to any inclusion in the scheme. For trading to be effective, high prices may have to be charged. The UK would already be on the reduction pathway required to meet its trading requirement.

This means that it is unlikely that the UK in general, or London in particular, would lose out relative to other areas. Expansion at Heathrow is widely opposed by London local authorities and by the Mayor. The approach set out in this report is also entirely in line with the Mayor's climate change policy, which identifies transport and aviation as an area for urgent action.

As regards wider patterns of change, international aviation agreements are very complex. One example is the anomaly which gives greater freedom to US airlines to operate in Europe than European airlines in the US (the gateway problem). Such factors make it difficult to predict exact operational changes. The US/EU balance may, if anything, be slightly helped by a distance related take off charge.

A further operational issue is whether there would be distortions in where aircraft refuel in order to reduce the charge. The system set out in this report has been designed with this risk in mind. Having more zones and a large final zone (all flights over 4000m) means lower price thresholds and thus less incentive to change stopover points. In addition, the cost penalty of having to land and take off (fuel, time and fees) means it is unlikely that the levels of charge proposed would have the effect of operators inserting an extra stop to reduce the charge. This can also be addressed by applying duty to the final destination. There may still be some attempt to do this but it is likely to be limited. For example, landing in Paris on the way to New Zealand and buying separate tickets would be complex, time consuming, and also move the CO₂ emissions from the UK to France. It would only be worthwhile if the French took no action on their emissions generally or to prevent the transfer to their national carbon account.

As regards efficiency improvements, the availability of a reduced rate will raise the importance of this factor in the airlines' purchasing decisions. This cannot be achieved without the knowledge that higher charges are being brought in. The phasing proposal will help in this regard. It is important to note that there is some discussion over whether the optimistic targets for annual improvements in aircraft efficiency, for example those contained in the recent Heathrow consultation document, will be met without direct financial encouragement.

4 Conclusions and Recommendations

Conclusions

Basic structure of charging

There are several different ways of defining what should be charged in relation to aviation. These are:

- maximum take off weight,
- engine power (thrust), and
- capacity (measured as maximum number of economy passengers).

Of these, take off weight appears the best basis for any charge and data is readily available. We have called this Air Capacity Duty (**ACD**).

However, to reflect emissions effectively, the charge will need to be varied according to distance travelled.

A UK zone, an EU zone, plus four international distance bands would strike a reasonable compromise between smoothing the transition between bands and simplicity. It should avoid the legal and regulatory pitfalls of more direct fuel taxation at the EU and nation to nation level and in relation to the Chicago Convention.

Air travel is VAT zero rated and thus makes a low contribution to general taxation. Rather than imposing VAT, a form of tax which is more related to environmental impact is preferable.

It is possible to establish a base level of charge by adding fuel duty (doubled to account for radiative forcing) to a reformed Aviation Duty based on weight, irrespective of what the aircraft is carrying. This could only be applied for flights entirely within the UK at the present time because of international agreements.

This base level leads to proposals for levels of charge both to Europe and internationally which increase revenue substantially for some destinations, although some anomalies are removed or reduced.

This charge should be reduced if an aircraft manufacturer can show significantly lower than average (taken as 2008) flight emissions per tonne of take off weight. This need not be a very onerous process, and much data is already available. The reduction in rate of duty would be proportionate to the emissions reduction.

The EU emissions trading scheme (ETS)

The EU ETS will not be having much impact in the immediate future. There are likely to be practical implementation problems, and at present the mechanism itself is unproven in relation to actually reducing emissions beyond what would have been achieved by other policies and regulations.

However, there is no particular conflict between the EU ETS and the proposals set out here. ETS could simply be implemented as a later addition. If the new charge

removes the need to buy permits to pollute from power companies there will no extra charge from ETS. If the new charge under achieves, ETS may help to top it up. If it over achieves, the airlines can sell their excess permits. It should be remembered, however, that all results need to be measured against the 1990 emissions baseline.

Current APD

The current APD is simple but not comprehensive. To summarise:

Advantages of current APD scheme

- 1 Clear link to ticket price
- 2 While not distance related, reflects fixed carbon cost of take off, landing and ground based facilities
- 3 At least some relationship to distance through aircraft size and thus number of seats
- 4 Simple to calculate

Disadvantages

- 1 Reduced rate for economy seats very low and virtually the standard rate
- 2 Not directly related to emissions
- 3 Misses out movements such as transfer passengers and freight
- 4 Impact on passenger demand less for higher cost, longer distance flights
- 5 Disproportionately high cost on flights just outside the EU

Weight and zone replacement (ACD)

A UK zone, an EU zone, plus four international distance bands would strike a reasonable compromise between smoothing boundary transitions and simplicity. It would avoid the legal and regulatory pitfalls of more direct fuel taxation.

Advantages of modified ACD scheme

- 1 Greatly improved relationship with actual fuel used (related to size and distance plus fixed carbon cost of take off, landing and ground facilities)
- 2 Freight and transfer passengers included
- 3 Simple to calculate
- 4 Avoids conflict with EU regulation and international treaties

Disadvantages of modified ACD scheme

- 1 Not completely related to emissions
- 2 Needs extra procedure to reward the use of more efficient aircraft
- 3 Impact on demand still modest for higher cost, longer distance flights
- 4 Less obvious relationship to ticket price – cross subsidy possible

Recommendations

- 1 A per aircraft charge should replace current APD, based on maximum take off weight and distance bands.
- 2 A double fuel duty charge should be placed on GB domestic flights in addition to a weight distance charge.
- 3 The EU distance zone should be split into two bands but this may be difficult to negotiate. A single zone is therefore proposed.
- 4 Outside the EU a four zone system would strike a reasonable balance between complexity and boundary problems, such as those currently experienced.
- 5 Significant increases in the level of charge are proposed, although these do not fully reflect the emissions caused. To put this in perspective, the total charges (not just the increased revenue over existing APD) would still not exceed the application of VAT to international air fares. It would, however, be much better tuned to environmental damage.
- 6 The target should be that by 2020 the take should be at least what would be raised by VAT plus fuel tax (adjusted for radiative forcing).
- 7 Excess revenue from any aviation charge imposed for environmental reasons should be recycled. This could be to those who currently suffer airport pollution. Alternatively, income from leisure flights could be recycled to the general population and from business flights to businesses.

Specifically in relation to the HM Treasury consultation

- 8 Using the most recent Corinair data, and a smaller but representative sample of aircraft, the Government proposal for basing a charge on maximum take off weight is supported.
- 9 The approach of using distance bands is also supported but with important variations.
- 10 The three zone system is simple but would lead to distortions and does not address the issue of modal competition.
- 11 A UK zone, with additional fuel duty as above, an EU zone, plus four international distance bands would better achieve Government objectives.

References

- i* See Intergovernmental Panel on Climate Change (IPCC) 1999
- ii* 1944 Chicago Convention, Article 24
- iii* See HM Customs & Excise: ref BN HMRC23/06
- iv* Aviation Duty: a consultation, HM Treasury, January 2008
- v* See <http://www.pointcarbon.com>
- vi* Heathrow consultation document, Annex B, para 2.7
- vii* Corinair data published by European Environment Agency, 2007
- viii* See www.airbus.com and www.boeing.com
- ix* as v above
- x* See <http://www.airmiles.co.uk/travel/home.do?from=spendingtips>
- xi* See MTRU national project reported on: www.transportclimate.org