

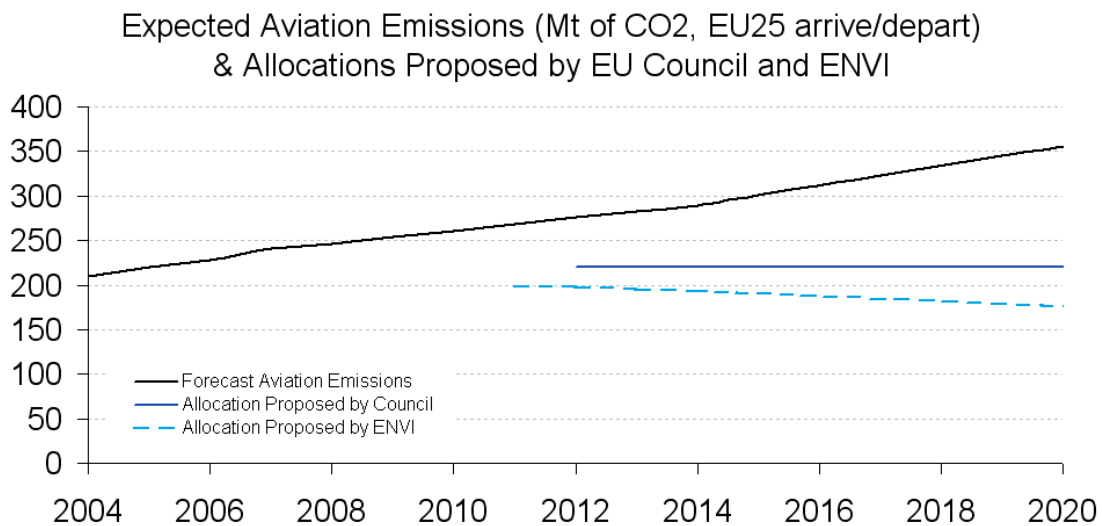
OVER A BARREL - EMISSIONS TRADING SCHEMES
AVIATION AND THE ENVIRONMENT – July 2008 Issue

Emissions Trading Schemes are all the rage; Australia, Japan, New Zealand, even US states are setting them up. Meanwhile the price of fuel is rocketing, raising the priority of fuel efficiency, possibly more than the trading schemes could. This article will attempt to gauge impacts of the European ETS on aviation by looking at effects of the current fuel spike.

First we should revisit the basics of the scheme. Aviation carbon credits (aviation EUA's) will not be Kyoto credits, but partly fungible equivalents. Partly fungible because other industries will be allowed to trade in them but not surrender them for their own emissions. Airlines will be allocated aviation EUA's based on the number of tonne kilometres of passengers or freight flown (RTK's) over the average completed in 2004-6. This implies a measure of carbon efficiency which the European Commission seeks to promote, ie RTKs per tonne of fossil carbon emitted. Indeed the European Parliament's environment committee (ENVI) would like to set aviation a target of improving RTK/CO2 by 3.5% per year.

The total allocation will be set centrally, thus avoiding over allocation encountered in Phase 1 of the ETS. By the time the allocation is made in 2012 it will be seven years of growth short. The European Council and European Parliament are agreed that the scheme should apply to flights either arriving or departing the EU, not simply intra EU. This means non EU airlines will be affected, most notably US airlines. Political disagreements with the US may lead back to the European Commission's proposals for starting with an intra EU scheme.

Ascend has modelled emissions for all flights arriving/departing the EU. We arrive at the below forecast, overlaid with the proposed allocations.



Source: Ascend

There are clearly differences between the Council and ENVI's proposed allocations, and hence the impact. Following due process, the Commission's proposal was first published in December 2006 and has recently been under discussion between the Council and the Parliament. The Parliament had its first reading in November 2007, subsequently the Council laid out its common position in April. Most recently, on May 28th, ENVI responded with suggested amendments to the Council's position, these remain far more radical than the industry hoped. By July 10th the Parliament is expected to review ENVI's recommendations at

its second reading of the proposal, by which time France will hold the Council presidency. On past form the Parliament is likely be supportive of ENVI's radical approach. If Parliament cannot agree with the Council, then this could go to a conciliation committee and drag on for some time, although France will probably want it wrapped up by the end of their Presidency in December. The current Parliamentary legislature closes in March '09 with EU elections in June '09.

Here are the main points of contention between ENVI and the Council, who are close to the Commission's position.

Issue	Council Common Position	Parliament's ENVI Seeks
Start date	2012	2011
Phase 2 Allocation (2008-2012)	100% of 2004-6 avg per yr	90% of 2004-6 avg per yr
Phase 3 Allocation (2013-2020)	100% of 2004-6 avg per yr	As above but decreasing by 1.5% per yr
% of Allocation to be Auctioned	10% in 2012. 20% in 2013. Possible increase year on year	25% in 2012 then increase to max of other sectors: maximum of 60% in 2012 up to 100% in 2020.
Usage of CERs and ERUs	Up to 15% of total	% should be average of all industries. To be published annually
EUA Multiplier	None, but NOx proposals pending in 2008	A multiplier to be applied to each tonne of aviation CO2
CERs/ERU Divider	N/A	Each CER/ERU bought by aviation to be worth half face value, ie 500kg, not 1000kg of CO2. This could be negated by other NOx legislation
Efficiency Indicator	N/A	RTK/CO2 to be published. Target of 3.5% improvement p.a. Benefits for achievers.
Airport Subsidies	N/A	Should not encourage emissions
Aircraft Included	All over 5.7tonnes	All over 20tonnes (c.40 seats). Below 20tonnes to participate in voluntary schemes

Possibly the most contentious amendment within the industry is the multiplier. ENVI would like a multiplier to be applied to aviation's CO2 emissions, to represent the effect of NOx, cirrus clouds etc. ENVI quotes the IPCC as saying the green house effect of aviation is between 2 and 4 times the CO2 alone. Since the aviation market will be severely short, to say it will also need to buy x times the credits (aviation EUA's) is often considered insult to injury within the industry.

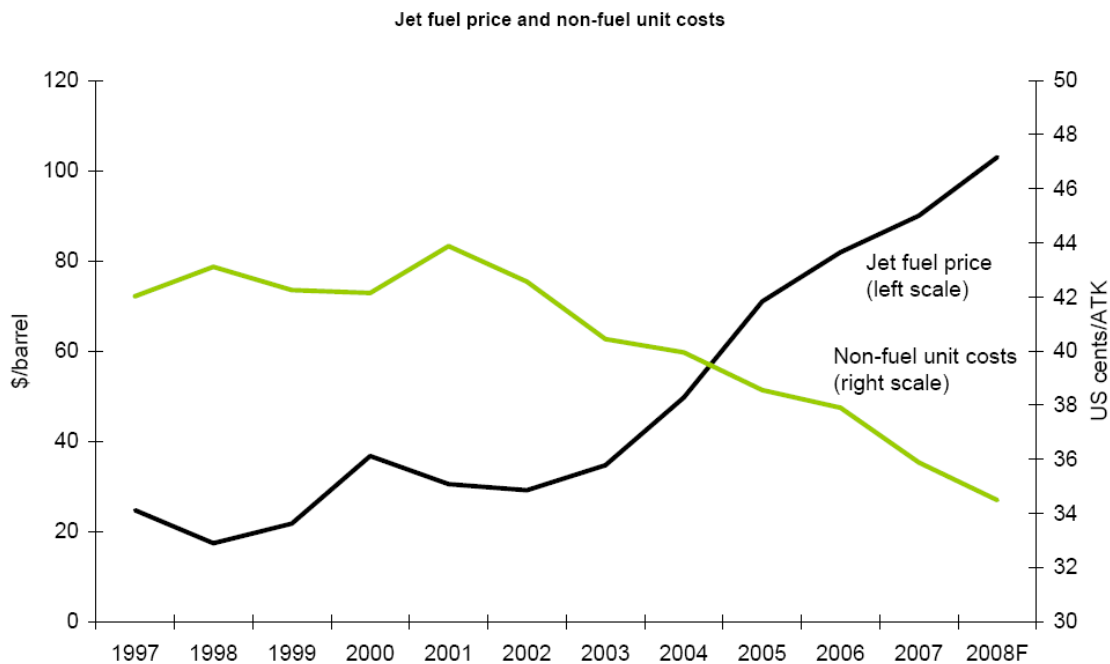
ENVI and the Parliament have long been more stringent in their demands than the Commission or Council. In fact the Director General of the International Air Carrier Association (IACA) said: "IACA is appalled at the extremism of the ENVI Committee in adopting such a radical ETS design". IATA has also been generally unsupportive of regional/national trading schemes, Bisignani recently said "Governments remain fixated on punitive economic measures such as the EU Emissions Trading Scheme. These are reckless decisions when the oil price could re-shape the industry. Governments must drive progress by taking politics out of air traffic management, acting globally on emissions trading and supporting positive economic measures to drive innovation".

IATA and ICAO want an international agreement, but the EU has committed itself to cutting fossil carbon emissions to 20% less than 1990 levels by 2020. That's a tough target and ENVI wants aviation to play its part, although will not apply that specific target to aviation. No doubt

aviation's growth and public prominence make it an attractive target, despite it contributing only 3% of international emissions, although more like 7% of UK emissions.

IACA and other European aviation bodies simply want a system which will not be unduly punishing, especially in the light of recent fuel price hikes. We should remember that despite 'fuel surcharges' airlines have incredible difficulty in passing on costs to customers. As fuel prices have risen airlines have made huge cost cuts, mostly in staff costs, thus passing on only a fraction of the fuel price rise. However, when demand has been high they have still been able to make a small profit, 2007 saw average margins of 3.4% (source:IATA).

The relationship between fuel costs and other airline costs over the past few years is best shown in the below chart. The mirror between increasing fuel price and pressure on other costs, mostly staff, is striking.



Source: IATA

Scaling the impact

When the Commission first made its proposals crude was just \$60 per barrel, the price imposed by the markets just two years later is greater than the ETS would probably add in the 8 years from 2012. One could ask why we need an ETS when crude is \$135 per barrel? To assess Bisignani's comments on 'reckless' ETS proposals in the light of recent fuel prices, we need to scale the ETS's impact versus that of fuel.

The ETS acts like a fuel price increase, exactly as intended. The current price per tonne of CO2 is €27.5, jet fuel is around US\$4 per USG. At current prices a CO2 credit (EUA) would add an extra 40cents per USG of jet fuel, adding 10% to the already high fuel price. However, much of that would be allocated for free. In the first year the Council suggests 73% of the forecasted demand would be allocated free, the rest being allocated via auction or bought on the market. ENVI seeks around 53% to be allocated free in the first year.

In March IATA forecast that fuel would represent around 32% of an airline's costs, although \$135 crude has airlines fearing it will be more like 40%. Let's assume 32% for now. It would appear to follow that raising fuel by 2.75% or 4.8% in the first trading year would raise total airline costs by 0.9% or 1.5% respectively. To put that in context, IATA figures show the average airline operating profit to be 0.75% since 2000. Furthermore, it is entirely possible that the amount allocated for free will reduce to zero over the eight years to 2020. We have also ignored the Parliament's potential EUA 'multiplier', the CER/ERU 'divider', the cost of trading and how fuel prices may change by 2012.

If airlines had to pay twice for each credit they bought on the market, the 'multiplier', that's effectively a 9% fuel price increase in the first year of trading. That sounds small compared to recent price rises in fuel, but if crude were to rise 9% from \$135/bl to \$147/bl that would have an important effect, pushing many airlines over the edge. Clearly aviation needs time to adjust to the latest fuel prices before it can swallow another increase.

Indicators From the Current Fuel Crisis

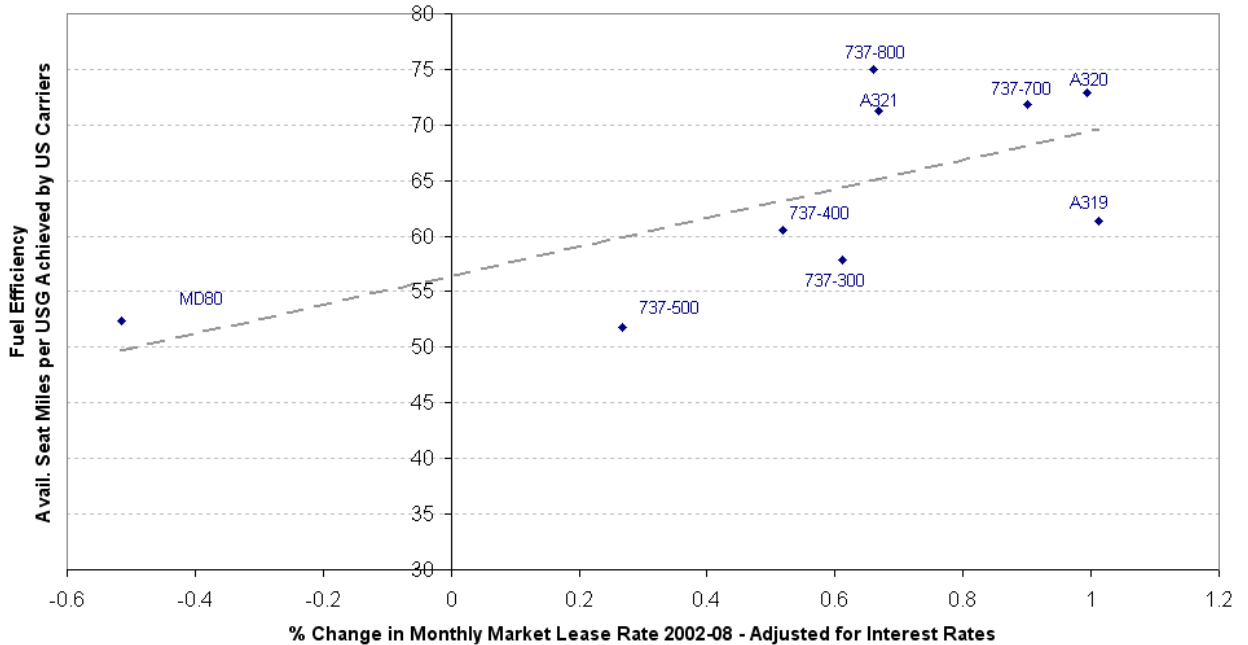
Besides consultancy and aviation data, Ascend is a well established aircraft appraiser. A starting point for analysing the ETS was the effect of fuel price rises, as a proxy for the ETS, on asset values. Bert van Leeuwen of DVB wrote on this subject in the spring edition of *Aviation and the Environment*. Mr van Leeuwen looked to noise legislation as the most obvious precedent for legislation affecting aircraft values and Ascend has made the same comparison. However, there are some important caveats. Noise legislation banned entire aircraft types from the largest markets, North America and Europe. The ETS would not ban an aircraft type, it acts much more subtly, punishing but not banning fuel inefficiency. As we shall see later in this article, fuel efficiency is much more than a function of aircraft type.

Ascend has heard it said that a rule of thumb is that 50 seat aircraft face economic problems at around \$50 per barrel of crude, 70 seat at \$70/barrel and so on. The truth of this anecdotal rule would depend on many parameters, mostly how efficient the aircraft are and how they are operated. Ascend notes that Aircraft values have held up very well over recent years but the values of 50 seat RJs are moving south at an alarming rate.

We have also investigated lease rates. Notably how narrow body lease rates have varied as the price of fuel has risen over the six years from Q1 2002- Q1 2008, from USD25/bl to USD 100/bl. We based our analysis on aircraft built in 1997, since that year saw a good mix of fuel efficient and inefficient aircraft being delivered. We did the same for 1998 aircraft and saw similar results. Fuel efficiency was derived from how US airlines use the aircraft in real life, not from manufacturer numbers. Finally, we stripped out the effect of interest rates. GDP growth is the main driver of values and lease rates so we would expect a rise in lease rates for most types. But, would fuel efficient types see a larger percentage growth than less efficient types? The answer is yes, but the relationship is still a little untidy, R squared of 46%. Furthermore this relationship only became discernable by 2007, when crude had spent many months over \$60/barrel, three times the price of 2002.

The MD80 is the most inefficient in our analysis and the number in storage have been rising daily, driving down values. 737 classics built in 1997/8 also suffer from the 'last off the line' effect, as evidenced by the analysis below. Many investors suspect that recent fuel price rises, even prior to 2008, will see the values of inefficient types continue to fall compared with new technology of a similar build year. Their portfolio strategies will surely reflect this concern.

**Change in Market Lease Rates, 2002-08, vs Fuel Efficiency Achieved
1997 Year of Build Narrow Bodies**

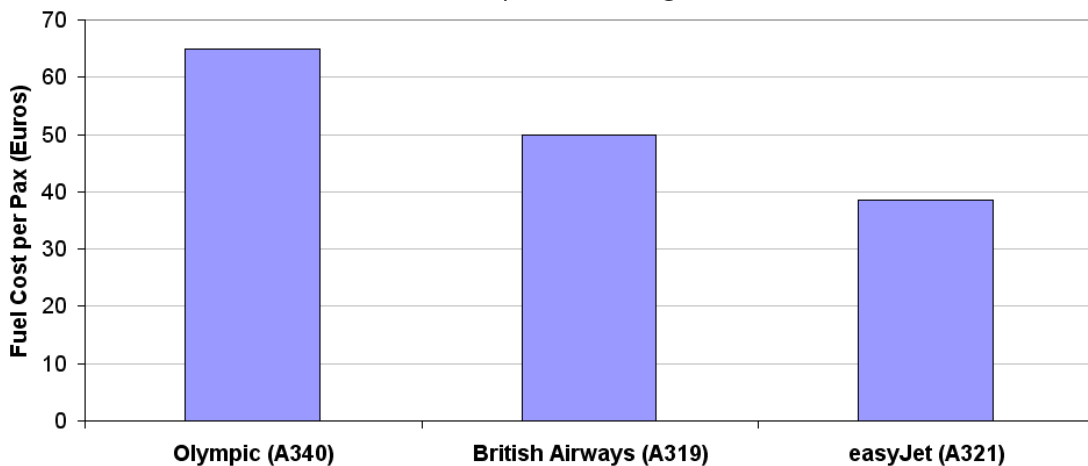


Source: Ascend

Before analysing fuel efficiency further, one of the more curious ETS considerations for lessors is that should an airline fail to pay for its emissions, the aircraft owner would be responsible, exactly as with Eurocontrol charges.

As discussed above, the aircraft's fuel efficiency is only one factor leading to the airlines RTK's/CO2. The most important factor is how the aircraft are operated. There are vast differences in operation within the EU. Below is a chart showing fuel cost per passenger for various operators on the London to Athens route. The biggest effect is not the type being flown, oddly the largest aircraft scores worst. More important is the number of passengers carried, which means seat configuration and proportion of seats filled (load factor).

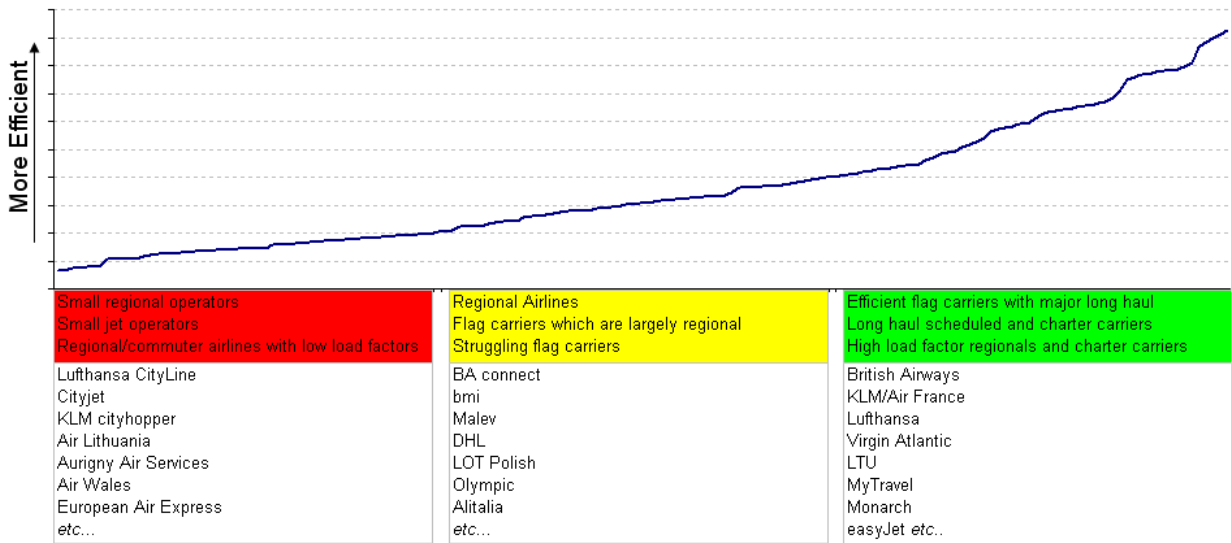
**London to Athens
Fuel Cost per Passenger**



Source: RDC

This leads us on to which operators are disproportionately exposed to fuel effects and thus the ETS. Ascend used the hours and cycles of each operator's aircraft to model their emissions. We then compared this with their published RTK's, resulting in the EU's proposed efficiency measure of RTK's per tonne of CO2.

Fuel efficiency of 160 EU Operators
Measured in 1,000's of RTK's per tonne CO2. Average for 2004-6 (ETS reference period)



Source: Ascend

Since the EU proposes to allocate EUA's on the basis of RTK/CO2 the right hand group of airlines will be most favoured. It is interesting to note the spread of efficiency and how the smaller players are over-represented in the bottom half of the league. We have yet to analyse Parliament's proposal that 20tonne (c.40 seat) aircraft and smaller should be outside the ETS, if they participate in a voluntary scheme. This would assist those players at the bottom of the efficiency curve.

At this point it is worth re-iterating that the EU can achieve major improvements via the air traffic management (ATM) system. This would reduce emissions from all operators and types. Various estimates put waste in European airspace due to indirect routing at 12% per year. ENVI has tabled an ETS amendment encouraging ATM improvements. Co-incidentally SESAR (Single European Sky Research ATM Research) moved to the development phase in Rome during May. This is a major move in the right direction to simplifying Europe's airspace, but much more needs to be done.

Alternatives to Fossil Fuels

Many articles are dedicated to the subject of fossil fuel alternatives, so we will only touch on it's relevance to values and fuel price.

Although emissions from biojet fuel are likely to be excluded from the ETS, airlines cannot easily manage capacity from one fuel source to another. CAAFI and USAF have made significant progress to 'drop in' alternatives although these are years from certification for civil use. 'Drop in' fuels are the only way forward and Ascend does not envisage a dual speed Europe in terms of aviation fuel. Alternative fuels which lead to major engine modifications

would be too complex for airport fuel infrastructure and airlines to accommodate separately to fossil fuels. A dual fuel threat to aircraft values is possible but unlikely.

Refiners such as UOP have proven they can crack a stable fuel, which can be 'dropped into' the existing fuel infrastructure, from almost any biomass feedstock. The question of feedstock is politically important. It is clear to everyone in the industry that any feedstock which displaces food is not sustainable, but can be used to prove the technology. Algae and Jatropha are in the vanguard of non-displacing feedstocks and are the favourites of Boeing and Airbus. However, they would need massive scaling up to supply even a fraction of aviation, which will take many years. Algae faces some serious scaling issues, notably contamination from lower yield species. Furthermore, certification of such new fuels for use in jet engines takes at least 5 years according to CAAFI. Engine test beds are expensive and few, if any, are currently dedicated to new fuels. Biofuel projects have to squeeze into the schedules of other engine projects. Airbus, who have partnered with UOP, believe algae fuels could provide 30% of all jet fuel by 2030, though this will be too late to have a material effect on Phase III the ETS which closes in 2020. The average retirement age of the European fleet is currently around 25yrs old, by 2030 almost the entire fleet will have been replaced.

UOP have been careful to mention that biofuel feedstocks can just as easily be processed into diesel or gasoline. If those markets pay better than aviation and the competing fossil product is \$135/barrel, why would they sell biofuel product either at a discount to fossil fuels or even to aviation at all?

Effect of Aviation on the ETS

So far we have focussed almost exclusively of the effect of the ETS on aviation. But what about the effect of aviation on the ETS? We have already identified that the aviation sector will be around 55Mt of CO₂ short in the first year of trading, 2012, which is the only year within ETS Phase 2. This assumes 95% of 2004-6 emissions is available for allocation, the Council suggests 100% and ENVI suggests only 90%. Over the Phase 3 ETS trading period (2013-2020) and using the same assumptions, Ascend estimates aviation will be short by c.860Mt.

At current prices the discussed shortfall in 2012 alone would equate to €1.8bn and that spend excludes any auctioned allocation. Of course, such a calculation is not so simple, the increased demand of adding aviation to the trading scheme will affect the price of carbon.

New Carbon Finance, a leading research firm on the carbon market, has modelled the effect of aviation on the EU ETS. According to New Carbon Finance the aviation sector will be in deficit by 66Mt in 2012, increasing to 89Mt by 2015 and 131Mt by 2020. These figures assume a 95% cap on 2004-06 emissions stable throughout the phase. New Carbon Finance sees this additional demand for allowances increasing EUA prices by €8/t in 2012, and increase of around 13%. The resultant carbon price in 2012 would be €47 in 2012 and €61 on average throughout Phase III.

The above figures are based on the full inclusion of aviation in the EU ETS, ie that it would have unfettered access to buy EUAs to meet its emissions target. However, the Parliament's new draft published on 27th May 2008 suggests limiting the ability of airlines to purchase allowances from the rest of the scheme. To be allowed to buy allowances, they would have to meet a number of criteria. These criteria would be firmed up by the Commission at a later date but the important would be the requirement for airlines to improve fleet efficiency by at least 3.5% a year. Furthermore airlines would need to compete with existing players in the EU ETS for the potential use of low cost carbon credits imported from developing countries under the Kyoto Protocol.

In effect these latest proposals would mean that the aviation sector could only buy allowances from the rest of the scheme *after* it had achieved its emissions reductions, which would

largely negate the purpose of including aviation in the EU ETS in the first place. New Carbon Finance therefore believes that these latest proposals are too extreme to go through in their current form and that the aviation sector will have largely unrestricted access to EU ETS allowances.

The lack of a single view on how to include aviation in the EU ETS from the various European institutions reflects the difficulties in dealing with a sector that on the one hand is seen as a saint of economic progress by some, but an environmental villain by others with rapidly growing CO₂ emissions and a range of local environmental impacts. The practical difficulties also reflect the cross-border nature of the aviation sector, making the use of national targets more problematic especially within the framework of international negotiations to address global warming. In spite of these difficulties however, it is clear that aviation will be forced to address its growing emissions, and the ability to buy allowances from other sectors will play a prominent part of the solution. By the time airlines will feel the full force of the legislation, carbon prices could be in excess of €40/t, nearly twice the current price. These impacts will be material. To the airline industry the additional costs will be seen as layering more pain on a sector already suffering from high fuel prices. To the advocates of tighter emission controls, they see this as the aviation sector paying a fairer price for the resources it consumes.

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