MEMO/06/506

Brussels, 20 December 2006

Questions & Answers on aviation & climate change

How do aircraft affect the climate?

Aircraft typically operate at cruising altitudes of 8 to 13 km, where they release several types of gases and particles which alter the composition of the atmosphere and contribute to climate change.

Carbon dioxide (CO_2) is the most important greenhouse gas because of the large quantities released and its long residence time in the atmosphere. Increasing concentrations have a well-known, direct effect which warms the Earth's surface.

Nitrogen oxides (NOx) have two indirect effects on the climate. Nitrogen oxides produce ozone under the influence of sunlight, but they also reduce the atmospheric concentration of methane. Both ozone and methane are strong greenhouse gases. They have opposite effects but the net result is that the ozone dominates the methane effect, thus warming the Earth.

Water vapour released by aircraft has a direct greenhouse gas effect, but as it is quickly removed by precipitation the effect is small. However, water vapour emitted at high altitude often triggers the formation of **condensation trails**, which tend to warm the earth's surface. Moreover, such "contrails" may develop into **cirrus clouds** (clouds of ice crystals). These are also suspected of having a significant warming effect, but this is still uncertain.

Sulphate and soot particles have a smaller direct effect compared with other aircraft emissions. Soot absorbs heat and has a warming effect; sulphate particles reflect radiation and have a small cooling effect. In addition, they can influence the formation and properties of clouds.

How big is EU aviation's contribution to climate change?

Direct emissions from aviation account for about 3% of the EU's total greenhouse gas (GHG) emissions. The large majority of these emissions comes from international flights, ie flights between two Member States or between a Member State and a non-EU country. This figure does not include indirect warming effects, such as those from NOx emissions, contrails and cirrus cloud effects. The overall impact is therefore higher. The Intergovernmental Panel on Climate Change (IPCC) has estimated that aviation's total impact is about 2 to 4 times higher than the effect of its past CO_2 emissions alone. Recent EU research results indicate that this ratio may be somewhat smaller (around 2 times). None of these estimates take into account the uncertain but potentially very significant effects of cirrus clouds.

EU emissions from international aviation are increasing fast – by 87% since 1990 – as air travel becomes cheaper without its environmental costs being addressed. For example, someone flying from London to New York and back generates roughly the same level of emissions as the average person in the EU does by heating their home for a whole year. Emissions from all flights departing from EU airports exceed total verified emissions from activities covered by the EU Emissions Trading Scheme (EU ETS) in 19 of the 25 Member States. Emissions from aviation are also higher than from certain entire sectors covered by the EU ETS, for example refineries and steel production.

The rapid growth in aviation emissions contrasts with the success of many other sectors of the economy in reducing emissions. Without action, the growth in emissions from flights from EU airports will by 2012 cancel out more than a quarter of the 8% emission reduction the EU-15 must achieve to reach its Kyoto Protocol target. By 2020, aviation emissions are forecast to more than double from present levels.

Why is the Commission proposing to bring aviation into the EU Emissions Trading Scheme?

To date, policies to address climate change have not required any substantial contribution from the aviation sector. Emissions from domestic flights are covered by the Kyoto Protocol's emission reduction or limitation targets for developed countries, but international aviation – which makes up the vast majority of flights - is not. Instead, the Kyoto Protocol places an obligation on its parties to pursue the limitation or reduction of emissions from international aviation through the International Civil Aviation Organization (ICAO), the global body responsible for aviation matters. Another way in which international aviation does not help the fight against climate change is that jet fuel for international flights has historically been exempted from taxation. Bilateral air agreements between EU Member States and third countries are being changed to allow this possibility, but this will take time to implement.

Given this situation, the Commission has carried out extensive analysis of how best to address the growing climate change impact of aviation emissions.

After undertaking a wide-ranging consultation of stakeholders and the public and analysing several types of market-based solutions, the Commission concluded in its September 2005 Communication[1] that bringing aviation into the EU ETS would be the most cost-efficient and environmentally effective option approach for controlling aviation emissions. This is in line with ICAO's endorsement of emissions trading. The Council of Ministers and the European Parliament subsequently also endorsed this approach. The Commission has therefore followed up by proposing legislation to include aviation emissions in the EU ETS.

Compared with alternatives such as a fuel tax or charge, bringing aviation into the EU ETS provides the same environmental benefit at a lower cost to society - or a higher environmental benefit for the same cost. In other words the impact on ticket prices, airline companies and the overall economy will be smaller for a given environmental improvement.

How will trading in aviation emissions work?

The EU Emissions Trading Scheme, which started on 1 January 2005, currently covers only energy-intensive industrial installations – more than 10,000 of them across Europe, which are collectively responsible for nearly half of total EU CO_2 emissions. In future, air operators will also be covered. Like industrial installations, airlines will receive tradeable allowances to emit a certain level of CO_2 per year from their flights. After each year operators must surrender a number of allowances equal to their actual emissions in that year. The total number of allowances available to airlines in the future will be capped at the average level of emissions in the years 2004-2006.

[1] COM(2005) 459 final. *Reducing the climate change impact of aviation*.

The existence of a market in which these allowances can be traded enables operators to manage their emissions cost-effectively. If their actual emissions are lower than their allowances, they can sell their surplus allowances on the market or else 'bank' them to cover future emissions. If they anticipate that their emissions will exceed their allowances, they can either take measures to reduce their emissions - for instance by investing in more efficient technologies or operational practices - or they can buy additional emission allowances on the market, whichever is cheaper. Thus, for example, airlines will be able to buy allowances from industrial installations that have reduced their emissions. In addition, to help meet their obligations under the EU ETS, operators can also buy emission credits from clean energy projects carried out in third countries under the Kyoto Protocol mechanisms.[2]

(For more information on the EU ETS – see MEMO/05/84).

When will aviation emissions be brought into the EU ETS?

Aviation will be brought into the EU ETS in two steps. From the start of 2011, emissions from all domestic and international flights between EU airports will be covered. One year later, at the start of 2012, the scope will be expanded to cover emissions from all international flights – from or to anywhere in the world – that arrive at or depart from an EU airport. The intention is for the EU ETS to serve as a model for other countries considering similar national or regional schemes, and to link these to the EU scheme over time. Therefore, the EU ETS can form the basis for wider, global action.

Which airlines and routes will be affected?

The scheme will cover any aircraft operator, whether EU- or foreign-based, operating international flights on routes to, from or between EU airports. All airlines will thus be treated equally. To reduce administrative costs, each operator will be administered by a single Member State regarding emissions from the total of its flights to, from and within the EU. Very light aircraft will not be covered. Military, police, customs and rescue flights, flights on state and government business, and training or testing flights will also be exempted.

Will ticket prices increase?

Including aviation in the EU emissions trading scheme will not directly affect or regulate air transport tickets. However, aircraft operators may have to invest in more efficient planes or buy emission allowances in the market in addition to those allocated to them. The associated costs per ticket are likely to be modest. Assuming airlines fully pass on these extra costs to customers, by 2020 the ticket price for a return flight within the EU could rise by between €1.8 and €9. Due to their higher environmental impact, long-haul trips could increase by somewhat more depending on the journey length – for example a return flight to New York might cost an additional €8 to €40 depending on the market price for CO_2 allowances. However, ticket price increases are in any case expected to be significantly lower than the extra costs airlines have passed on to consumers due to world oil price rises in recent years. Including aviation in the EU emissions trading scheme will also have a smaller impact on prices than if the same environmental improvement were to be achieved through other measures such as a fuel tax or an emissions charge.

[2] Clean Development Mechanism and Joint Implementation.

What other economic and social impacts will the measure have?

The impact assessment carried out by the Commission concludes that the overall effect on the European economy and competitiveness is likely to be very small both in terms of overall GDP growth and employment. The main impact is likely to be a small reduction in the rate at which demand grows. According to the different scenarios analysed, the reduced growth in demand would vary from 0.1 to 2.1%, assuming CO_2 allowance prices of €10-€30

Including aviation in the EU ETS is projected to have only a marginal effect on airlines' profitability since they would be able to pass on most or all of the extra cost to customers. Since all airlines will be treated equally, competition between them is not expected to be significantly affected. Carriers travelling shorter distances, using older aircraft or carrying fewer passengers or less cargo would be affected to a greater extent than more fuel-efficient carriers. Competition between airports and in the tourism sector is also not expected to be significantly affected since forecast demand growth remains high.

What will the effect be on emission allowance prices?

Projections indicate that including aviation in the EU ETS will have no significant impact on EU ETS prices.

It is anticipated that the additional demand for allowances generated by the sector will be largely met through an increase in the number of credits bought from emission-saving projects carried out under the Kyoto Protocol's flexible mechanisms.

What will the effect be on aviation emissions?

The environmental impact of the proposal will be significant because aviation emissions, which are currently growing rapidly, will be capped at their average level in 2004-2006. By 2020 it is estimated that a total of 183 million tonnes of CO_2 will be saved per year on the flights covered, a 46% reduction compared with business as usual. This is equivalent, for instance, to twice Austria's annual greenhouse gas emissions from all sources. Some of these reductions are likely to be made by airlines themselves. However, participation in the EU scheme will also give them other options: buying additional allowances on the market – i.e. paying other participants to reduce their emissions - or investing in emission-saving projects carried out under the Kyoto Protocol's flexible mechanisms. Providing aviation with these options does not reduce the environmental impact of the proposal since the climate impact of emission reductions is the same regardless of where they are made.

How can airlines reduce their emissions in practice?

Airlines can reduce their emissions in several ways, notably by investing in more efficient aircraft and engines and by optimising operations. Although the biggest improvements typically arise from accelerated fleet renewal, many aircraft in the current fleets also hold potential for improvements. For instance some aircraft can be retrofitted with technical devices at the tip of the wings ("winglets"), new surface treatments that reduce drag (air resistance) and even new engines. Airlines can also optimise their timetables, route network and flight frequencies to minimise the number of empty seats flown. ICAO has published a catalogue of "Operational Opportunities to Minimize Fuel Use and Reduce Emissions" which describes some of these opportunities. In the longer term, research into more efficient technologies and alternative fuels may provide additional opportunities.

Besides the proposed directive, what else is the Commission doing to help reduce aviation emissions?

The proposed directive is part of a strategy for addressing aviation emissions which the Commission set out in its 2005 Communication. This includes more research into 'greener' technologies and improvements in air traffic management:

- The 7th EU Research Framework Programme will strengthen research into the impacts of aircraft emissions on the climate and into ways to reduce them;
- Air Traffic Management offers potential for efficiency improvements (in terms of more direct flight routes, less queuing of aircraft etc.) that should be used. This is one of the aims of the SESAR programme, one of the measures for implementing the Single European Sky initiative.

Isn't the increase in oil prices over recent years a strong enough incentive for airlines to be more fuel-efficient?

Higher oil prices certainly provide a stronger incentive to reduce fuel consumption. However, the airline industry starts from a comparatively low fuel cost because aviation fuel is not taxed. Recent increases in fuel prices represent only a fraction of the minimum tax that would have applied if aircraft fuels were taxed like other motor fuels. Oil prices would have to increase much more before the cost of aircraft fuels reaches the level they would be at if they were not exempt from taxes.

How does emissions trading fit with the idea of a levy on airline tickets to fund development aid?

These are two completely different issues. The purpose of a "solidarity contribution" levied on airline tickets to help fund development aid, as discussed in the ECOFIN Council of Ministers (IP/05/1082**),** would be to generate revenues. The aim of emissions trading is to limit emissions, not to collect money.

Has the Commission consulted stakeholders and taken their comments into account?

Yes. As part of preparations for its Communication of September 2005, the Commission conducted a public consultation in early 2005 to which almost 200 organisations and 5,600 individual citizens responded. In drafting the Communication the Commission carefully considered the views and opinions expressed and published an overview of the results in a separate report (see IP/05/1024).

The Commission also carried out a study on the feasibility of including aviation in the EU Emissions Trading Scheme. A summary of the draft findings were discussed with stakeholders at a conference in June 2005. The final report, as well as the report on the stakeholder consultation, can be found at:
http://europa.eu.int/comm/environment/climat/aviation_en.htm

In their responses to the Communication, both the Council of Ministers and the European Parliament endorsed emissions trading to help control aviation emissions. To follow up on the Communication, the Commission set up an aviation working group under the European Climate Change Programme to advise it on how to integrate aviation into the EU ETS. The group comprised experts from Member States and representatives of key stakeholders including industry and consumer and environmental organisations. The final report from the working group was published in April 2006 and can also be found on the above web site.

Will aviation be treated differently from the sectors already covered by the EU ETS?

Aviation will be treated in the same way as other sectors covered by the EU ETS except where a more harmonised approach is required to ensure the EU meets its legal obligations to treat all airlines equally regardless of their country of origin. This is necessary, for example, in relation to the allocation of emissions allowances to airlines and their use of emission credits from emission-saving projects carried out under the Kyoto Protocol. This harmonisation contrasts with the scheme's devolved approach to industrial installations, under which Member States fix their own national emission caps – subject to Commission approval - and decide the allocation of allowances to individual installations.

Emissions cap: Whereas national caps for industrial emissions are fixed through national allocation plans drawn up before each new trading period under the EU ETS, the Commission's proposal would set the cap on aviation emission allowances for the next three trading periods, ie until the end of 2022. This is necessary to ensure equal treatment of airlines. It will also give operators certainty and clarity on which to base their investment decisions. For the trading periods up until 2022, aviation emissions will be capped at the average level for the years 2004-2006. However, should international aviation be brought into a global climate agreement after 2012, this cap could be reviewed.

Allowance allocation: The allocation of allowances to each airline will be decided at EU level on the basis of a common methodology. This will take the form of a harmonised efficiency benchmark. Each operator will be allocated allowances on the basis of its share of overall passenger and cargo traffic on the routes to be covered by the EU ETS.

Auctioning: The proportion of allowances to be auctioned to airlines will also be harmonised at EU level rather than left to Member States. For the 2008-2012 trading period Member States will be able to auction up to 10% of allowances to industrial companies if they wish to, and from 2013 there will be no limit on auctioning. For aviation, the Commission proposes that the percentage of allowances to be auctioned should be set at the average level used by those Member States that opt to auction allowances to industrial installations. After 2012, this approach would be reviewed in the light of the outcome of the general review of the EU ETS that is currently underway (see IP/06/1548).

Use of Kyoto Protocol emission credits: The harmonised approach taken is similar to that for auctioning. A common limit on the use of credits from projects carried out under the Kyoto Protocol's Joint Implementation and Clean Development Mechanisms will be set at EU level. This will be based on the average limits set in Member States' national allocation plans for emissions from industrial installations.

How will emissions be monitored? Will airlines have to report details of each flight?

Each airline will calculate its annual emissions on the basis of its fuel consumption multiplied by a standard emission factor. The proposed directive requires that wherever possible actual fuel consumption data for each flight should be used, but if this is not available a standardised method for estimating fuel consumption will be used. Like other participants in the EU ETS, aircraft operators will have to monitor their emissions each year and report them to the administering Member State by 31 March of the following year. The reports must be checked by professional verifiers to ensure they are accurate.

Aviation is an international business – why not conduct emissions trading at global level?

The International Civil Aviation Organization (ICAO) in 2001 endorsed open emissions trading for international aviation, ie the inclusion of aviation in emissions trading schemes that also cover other sectors, rather than dedicated trading schemes for aviation on its own. In terms of how to implement this, ICAO in 2004 decided against developing a new legal instrument (a "Kyoto Protocol for aviation") under its own auspices and instead endorsed aviation emissions trading through voluntary initiatives or the inclusion of international aviation emissions in states' existing trading schemes. The Commission's proposal is based on the latter approach and is therefore fully in line with ICAO policy. In addition, the EU continues to work with partners in ICAO to promote emissions trading and other actions to combat aviation's contribution to climate change. For instance, the EU is contributing to the non-binding guidance ICAO is drafting to assist countries that want to include aviation in their emission trading schemes This guidance is due to be finalised in 2007 and might encourage even more states to implement emissions trading.

How will the scheme be enforced for all airlines, including third country airlines? What penalties will apply if airlines don't comply?

The inclusion of aviation in the EU ETS is consistent with the 1944 Chicago Convention and bilateral air service agreements, which require aircraft to comply with the laws and regulations of the State to/from which they fly. Such laws and regulations could include laws requiring airlines to report their emissions and surrender allowances to cover those emissions, as the proposed directive does.

The scheme will be enforced in the same way as for other sectors in the EU ETS. This means that if an operator fails to surrender sufficient allowances to cover its emissions in a given year, a financial penalty would be imposed (100€ for every tonne of CO2 not covered by allowances) and the aircraft operator would no longer be able to sell allowances. As an ultimate sanction, the State responsible for administering the airline under the EU ETS could revoke or suspend its authorisation to operate.

What are the next steps?

The proposed directive now goes to the European Parliament and the Council of Ministers for discussion and adoption under the co-decision procedure, which typically takes 1-2 years. Meanwhile, the Commission and the EU Member States will continue to work with other countries through the UN Framework Convention on Climate Change and ICAO to pave the way for wider implementation of measures to reduce the climate change impact of aviation.

Where can I find further information?

Climate change:
http://europa.eu.int/comm/environment/climat/home_en.htm

Aviation and climate change:
http://europa.eu.int/comm/environment/climat/aviation_en.htm