ABC Impacts – Users' committee meeting – 6 May 2008

Workshop on aviation and offset programmes

Minutes

Attendances

ABC Impact research team	– Sandrine Meyer (CEESE-ULB) – Julien Matheys (ETEC-VUB) – Pinelopi Gkara, Laurence Turcksin, Pr. Cathy Macharis (MOSI-VUB) – Andrew Ferrone, Philippe Marbaix, Ben Matthews, Pr. Jean-Pascal van Ypersele (ASTR-UCL) Excused : Dr. Walter Hecq (CEESE-ULB), Pr. Joeri Van Mierlo (ETEC-VUB)
Workshop guests	– André Clodong (European Business Aviation Association) – André Heughebaert (Université libre de Bruxelles) – Sam Van den plas (WWF Belgium) – Tanguy du Monceau, Antoine Geerinckx (CO2logic) – Dimitri Mertens (Climact)
Users' committee members	– Bram Claeys (Bond Beter Leefmilieu) – Georges Jamart (The Belgian Scientific Policy) – Geoffray Robert (FPS, Mobility and Transport, DG Aviation) – Liesbeth Clerick (AMINAL ; Afdeling Milieu en Natuurbeleid ; Cel Lucht) – Elisabeth Peeters, Maes Maarten (The Brussels Airport Company)

Agenda of the meeting

1. Welcome …….... (09.30)
2. - Calendar of the European Parliament second reading (aviation / EU-ETS)
   - ABC Impacts main conclusions as regard aviation climate impacts and offset programmes (Julien Matheys, ETEC-VUB) ……... (09.40)
3. Comparison of offset programmes (André Heughebaert, ULB) …… (09.50)
4. EBAA's proposal to offset business aviation CO_2 emissions (André Clodong, EBAA) ……. (10.10)
5. Carbon offsetting and climate protection – WWF position (Sam Van den plas, WWF Belgium) ……..…….. (10.30)

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6. European governmental guidelines for voluntary CO_2 offsetting best practice (Tanguy du Monceau, CO2logic) ……..... (11.05)
7. Aviation climate impacts : the global and regional points of view (Andrew Ferrone, ASTR-UCL) ……. (11.20)
7. Discussion and questions …… (11.40)
8. End …… (12.40)

Remark: all the words appearing in blue in the text are explained in more detail in the ABC Impacts glossary (http://dev.ulb.ac.be/ceese/ABC_Impacts/open_section_in_brief.php#glossary).

1. Welcome

Seeing that the topic on offset programmes and the aviation sector is more and more discussed, the ABC Impacts research team decided to organize a workshop on this issue coinciding with the fourth users' committee of the project.

2.1 Calendar of the European Parliament second reading (aviation / EU-ETS)

Julien Matheys' presentation: see ABC Impacts website → Open Section → References / Project publications (http://dev.ulb.ac.be/ceese/ABC_Impacts/open_section_references.php#project)

The European Commission proposal (20 December 2006) to include the aviation sector in the EU-ETS has been analysed and amended jointly by the European Parliament and the European Council of the Environment Ministers throughout 2007.

The Parliament's common position was adopted on 13th November 2007, while the official Council's common position was published on 18th April 2008 and transferred to the Parliament on 24th April 2008.

The process of the second reading may therefore begin and the first important meeting on this issue is planed on the 19th May 2008 with the Parliament's WP on the Environment - aviation and EU-ETS. The second reading is expected to close at the end of June 2008.

If no common position is reached between the European Parliament and Council by then, a process of conciliation would be put in place.

2.2 ABC Impacts main conclusions as regard aviation climate impacts and offset programmes

Julien Matheys' presentation: see ABC Impacts website → Open Section → References / Project publications (http://dev.ulb.ac.be/ceese/ABC_Impacts/open_section_references.php#project)

The first phase of the ABC Impacts project has been achieved and the related final report and glossary are now available:

- on the website of the project (http://www.climate.be/abci → Open Section → References / Project publications)
- and soon on the Belspo's website (http://www.belspo.be/belspo/fedra/proj.asp?l=fr&COD=SD/CP/01A)

A short overview of the main conclusions of the first phase shows that the current rate of emission reduction, estimated at 0,5% to 2% per year, is far below the forecasted growth rate of the aviation sector (6,4% per year on average).

Moreover, radical technical changes at the aircraft level are to be expected only in the long term (e.g. hydrogen aircraft). The focus will therefore have to be put on short to medium term solutions, such as the implementation of synthetic fuels or agrofuels (each of them having specific strengths and weaknesses) and other innovative concepts (e.g. adapted rear turboprop mounting, adapted empennage and air frame, improved aerodynamics, etc.).

Other potential emission reductions are related to changes in the sector management (e.g. improved Air Transportation Management, Single European Sky[1], Reduced Vertical Separation Minimum which is already largely implemented, Continuous Descent Approach, etc.). Those options could reduce the

[1] http://www.eurocontrol.be/ses/public/standard_page/sk_ses.html

aviation climate impact by 10% with these two major advantages: there is no need for new technologies to be implemented onboard and no delay will appear between the adoption of the measure and the expected reductions (cf. no need of aircraft fleet renewal).

As regards the Belgian aviation market, different specificities are to be highlighted and analysed separately from the general European tendency. The Belgian territory, for example, is situated in the middle of the FLAP area (area between the main European airports of Frankfurt, London, Amsterdam and Paris). Therefore, the number of overflights is already considerable above Belgium and could even increase due to the sector growth and to the potential route adaptations (according to Eurocontrol, the adoption of shorter routes could increase overflights above the Belgian territory by 10%).

Concerning the climate impacts of aviation, two important acknowledgements are to be taken into account. Firstly, the interaction of aircraft emissions with ozone and aviation induced cirrus clouds influence the regional climate. Therefore, operational measures to reduce these impacts (or their triggers) should be considered, despite remaining uncertainties. Secondly, there are important tradeoffs between the different climate impacts. For example, reduction of CO_2 emissions often induces an increase in NO_x emissions (which implies an increase in ozone formation) and more fuel efficient engines produce contrails at higher temperature (i.e lower altitudes).

Taking both last paragraphs into account, it may be concluded that the global climate change caused by the Belgian aviation sector is relatively small, but the regional climate impacts due to contrails, cirrus formation and change in the ozone concentration could have a large influence on the country (increased cloudiness and precipitations) because of the concentration of flights over Belgium (mostly overflights from outside Belgium). Therefore, the focus for Belgian policy makers could be to reduce the impacts from transit aviation via support to the implementation of operational measures targeting non-CO_2 gases, and support to a European shift to other transport modes.

3. Comparison of offset programmes

André Heughebaert's presentation: see ABC Impacts website → Open Section → References / Project publications (http://dev.ulb.ac.be/ceese/ABC_Impacts/open_section_references.php#project)

Up to now, aviation greenhouse gas (GHG) emissions are not covered by the Kyoto Protocol. Even if the current share of the aviation sector is relatively small in the total anthropogenic GHG emissions, the sector growth is very rapid and consequent due to increasing tourism activities, to the fact that human beings travel further and further, and to recent boom of the low cost offer.

OCDE countries are responsible for 60% of the aviation emissions and the figures show that the European air traffic emissions have increased by 86,5% in 14 years (1990-2004) and that aviation GHG emissions will double by 2025.

A comparison shows that the GHG emissions of one return flight London-New York are equivalent to the total annual GHG emissions due to housing for an average Walloon household, and the GHG emissions of one return flight Paris-Madrid are equivalent to the total annual GHG emissions of the Walloon tertiary and waste sectors per inhabitant.

Different policy measures have already been suggested to mitigate the climate impacts of the aviation sector. Some are easier and more rapid to implement than other ones, some are less efficient or acceptable than other ones, but in general offset programmes are relatively the most easy and rapid to implement even if their efficiency is quite low and their acceptance variable.

The basic principle of an offset programme for aviation is to invest a certain amount of money in projects that will reduce GHG emissions in some parts of the world in order to compensate for the GHG emissions emitted by a specific flight.

One of the main findings when comparing offset programmes is the huge dispersion of the results obtained by the different programme calculators to estimate the emissions and the variety of prices per tonne of compensated CO_2. Another interesting fact is that the cost of voluntary offset represents only 5 to 10% of the ticket price.

The kind of project in which the offset money is invested differs quite largely from one programme to another (e.g. renewable energy projects such as solar installations, wind farms, small hydro-electric power plants ; energy efficiency projects such as improved heating and/or cooking systems, replacement of light bulbs ; carbon sink projects such as reforestation or forest protection), but most of the projects are located in developing countries.

The comparative study carried out focused on 16 different voluntary offset programmes and analysed accordingly to 9 specific criteria (6 criteria were taken from a scientific article from the Wuppertal Institut and three other ones were added afterwards). The final comparative results were put on a qualitative scale ranging from “Bad” to “Good” with two other intermediary steps (“Questionable” and “Unquestionable”).

The conclusion of the study was that, on the long term, aviation GHG emissions undermine climate change reduction policy and that offset programmes may be used as an easy and rapid tool to raise public awareness (on the occasion of big events, conferences, etc.), to finance renewable energy in poor/developing countries or to transfer clean technology form the North to the South. However, the voluntary offset market is still very small today (more or less 13Mt CO_{2eq} in 2006 according to Hamilton, 2007), and most of the programmes are questionable due to excessive management cost, doubtful GHG reductions, double counting, lack of transparency, etc., even if some projects give better guaranties such as a robust and transparent structure, an independent control over projects, a certification (e.g. CERs), the fulfilment of a quality standard (e.g. Gold Standard) or scientific source of emission calculation.

In 2007, a complementary study has been published on the website of Inter Environnement Wallonie (http://www.iewonline.be/spip.php?article1400) in order to take into account the three new Belgian offset programmes (CompenCO2, CO2Logic, Climact) in the comparison.

It seems indeed that the current context is quite favourable to the development of such programmes in Belgium because:

- 64% of people are ready to pay more if it reduces their environmental impact according to the Climate Change Study (December 2005)
- the Belgian public sector is ready to offset all flights (cf. the ‘Avant-projet du Plan Fédéral DD 2009-2012).

However, the path towards a mature voluntary offset market is still long and will necessitate a stricter legislation, the setting up of a carbon neutral label and/or the development of a code of best practice in order to increase consumer awareness, understanding and confidence in voluntary offset. Abroad, different initiatives have already been carried out in this way, such as the Best practice code (DEFRA, UK), the Compensation Portal (ADEME, France), the Comparison of Carbon Offset Standards (WWF, March 2008), etc.

Nevertheless, the final conclusion of the study is that the priority must be: “Let’s change our minds and habits to reduce our daily CO_2 emissions and compensate only for the unavoidable emissions”.

Questions

1. Which weighting method has been chosen to aggregate results from the comparison?
   During the first trial, all criteria were given the same weight and during a second trial, a score of 5 was given to the criteria of standard and transparency and a score of 3 to the other criteria. Ranging of the different offset programmes was more or less the same with both weighting methods. For a new update of the study, it could be interesting to use a multicriteria analysis with tools such as Prométhée or Gallilée.

4. EBAA's proposal to offset business aviation CO_2 emissions

André Clodong's presentation: see ABC Impacts website → Open Section → References / Project publications (http://dev.ulb.ac.be/ceese/ABC_Impacts/open_section_references.php#project)

The context of EBAA's proposal begins in 2003 with the EU Directive establishing scheme for greenhouse gas emission allowance trading (EU-ETS). This directive covers carbon dioxide only and applies to energy activities, production and processing of ferrous metals, mineral industry, pulp and paper. The aviation sector is not included.

However, the European Commission issued a proposal to include the aviation sector in the EU ETS in December 2006. The proposal covers all operations within the EU and flights into and out of the EU. The proposed scheme would enter into force in 2012 but requires a huge data collection (mainly tonne-kilometre data) by 2010, the reference year, for the monitoring plan.

Allowances would be allocated for free to aviation operators on the basis of real figures related to payload and distances flown during the reference year (2010), but it seems that such figures are not meaningful for business operators (cf. few hours of activities per week for a business aircraft, few passengers on board, no regular schedule, etc.). In this framework, business operators would be allocated very few allowances for free. Moreover, monitoring, reporting and verification (MRV) processes are tailored to scheduled airline activities, which is problematic and a heavy burden for business operators.

Therefore, EBAA's proposal tries to avoid those problems on the basis of a European Parliament proposal, made in November 2007 by Peter Liese, which could exempt "flights performed by aircraft with a certified maximum take-off weight of less than 20.000 kg, under the condition that operators of these aircraft participate in an offset scheme which operates according to strict criteria and which has to be open to external control (comparable to Gold Standard)."

In this context, EBAA's alternative means of compliance would offer a common platform to meet EU-ETS legislative requirements based on emissions data from EUROCONTROL Environmental Cockpit (with operator's consent). The proposal would play the role of a pool purchase of carbon credits that would also handle monitoring and reporting processes for operators. The confidentiality of data used would be assured through legal undertakings. All CO_2 emissions would be offset (according to Eurocontrol, the entire European business fleet generates 2 million tons of CO_2 / year)

EBAA's proposal aims at saving time and money to business operators while respecting EU monitoring and reporting principles: completeness, consistency, transparency, trueness and cost effectiveness. Up to now, voluntary offset schemes for commercial airlines are not working well (small take-up) but for business aviation, there are a few large companies that will volunteer for political reasons.

In order to be able to implement its proposal, EBAA will launch in May 2008 a beta test of emissions data capture from EUROCONTROL in cooperation with two operators. Then, it will set up a non profit international association to manage the scheme on behalf of operators and research best value to be used for carbon credits.

Questions

1. Is the growth expected in the business aviation as important as for scheduled flights?
   In fact, business aviation is growing faster than scheduled flights, with the exception of low cost airlines. However, the sub-sector will continue to represent about one percent of overall aviation emissions as the focus is on new engine technologies, on the introduction of lighter/smaller aircraft, on the increased access to straighter flight routes and small airports and on the use of satellite tracking to reduce related CO_2 emissions.

2. Would the non-CO_2 GHGs also be included in the EBAA's proposal?
   No. The proposal will start with a multiplicator of 1 but EBAA is not happy with science beyond a higher multiplicator yet.

3. Which proportion of the business aviation service price would attain the offsetting of all CO_2 emissions?
   It would be less than 5% of the total price of the service. The hiring of a business plane costs more or less 4.000-5.000 € per hour. Offset cost will therefore be marginal.

5. Carbon offsetting and climate protection – WWF position

Sam Van den plas' presentation: see ABC Impacts website → Open Section → References / Project publications (http://dev.ulb.ac.be/ceese/ABC_Impacts/open_section_references.php#project)

The official origin of CO_2 offsetting in climate policy lays in Article 12 of the Kyoto Protocol. The basic principle consists in reducing CO_2 emissions elsewhere than in its own enterprise or country through "clean" projects in developing countries. This is a way to involve developing countries in the climate change mitigation while financing their (sustainable) development and to reduce abatement costs compared to domestic actions.

One of the most well-known offset programmes is the CDM, which consists in 4 main steps. Firstly, the project developer draws up the project design document (PDD) containing the reference scenario of the emissions, the evidence that the project fulfils the principle of additionality and that sustainable development criteria are taken into account, as well as the comments of the parties to the project. Secondly, the project is validated by an auditor registered by the Executive Council of the CDM. Thirdly, after the validation and the authorization of the host country, the project is registered by the Executive Council of the CDM. In the end, a second auditor carries out the monitoring and the control of the real emission reductions obtained and the Executive Council of the CDM issues the amount of emission certificates corresponding to the real emission reductions.

After some years of functioning, the first assessment of CDM projects highlights the difficulty to prove the additionality of CDM projects, the lack of attention paid to sustainable development criteria, as well as a lack in documentation or comments from parties in the project design document. Moreover, some governance problems have arisen because of the conflicting interests between the project developers and the auditors and because of the lack of coherence in the decisions of the Executive Council of the CDM.

Offset programmes can be roughly divided into regulated and voluntary markets. In the first ones, buyers come from Annex I countries of the Kyoto Protocol and are companies included in the EU-ETS. They use offset programmes to comply with a mandatory emission reduction and to obey the law. In the second ones, buyers can be companies motivated by the social responsibility of the companies or citizens (mainly to compensate for air travels) aware of the climate change issues and aiming at acting on their own as well as at easing their conscience. Since several years, different standards have appeared on voluntary markets, mainly based on the CDM model, but voluntary markets still represent only a small fraction of the total carbon offset market today.

Slide 9 lists the most important standards existing on the voluntary offset markets.

These standards have been compared to each other on the basis of different criteria: eligibility (does the project contribute to the transition towards a low carbon economy?), the methodology (do the calculated emission reductions reflect real emission reductions?), the additionality (would the project have been financed in the absence of the CDM revenues?), the contribution to local sustainable development (employment, education, access to energy, environmental protection, etc.), the consultation of the parties, the validation and control (are the verification and the control carried out by an organization which is independent of the auditors and the project developers?).

The results of the comparison are illustrated on slides 11 and 13.

For an offset programme, it seems that the link between the standard adopted and the price per tonne of CO_2 or $CO_{2\,eq}$. to be offset is direct: a low-quality standard induces a low CO_2 price and conversely.

Since 2007, governmental action is growing in the voluntary markets and several countries have edited guidelines and "good practices" concerning voluntary offset programmes.

Nonetheless, the best way to use voluntary offset is first to avoid CO_2 emissions, then to reduce emissions and, in the end, to offset emissions that can not be avoided or reduced. Contrarily to the first two steps, offsetting does not reduce or limit CO_2 emissions. At best, it is a tool that ends in a nil draw.

There are some good examples of offsetting initiatives from financial institutions such as Fortis or Rabobank, having chosen good quality offset standards for their programmes, but there are also many bad examples that use faulty calculators (EasyJet, KLM, Lufthansa) ignoring non-CO_2 climate impacts of the aviation sector or that use voluntary offset as a way to delay emission legislation and/or minimize the real environmental impacts of the aviation sector.

Comparing offset programmes of airlines with Belgian offset programmes, it appears that the variation in the emission estimations is huge and that the price per tonne of CO_2 offset is far lower for airline programmes.

In order to choose a good offset programme, different criteria have to be taken into account such as the type of projects (sustainable development taken into account?), the way emissions have been calculated (for a flight, a multiplier should be applied for non-CO_2 climate impacts), the transparency (which standard has been applied?), the part of the investment dedicated to administrative costs, the price per tonne of CO_2 / CO_{2eq}. offset (the minimum recommended price is 20€/t).

6. European governmental guidelines for voluntary CO_2 offsetting best practice

Tanguy du Monceau's presentation: see ABC Impacts website → Open Section → References / Project publications (http://dev.ulb.ac.be/ceese/ABC_Impacts/open_section_references.php#project)

The best methodology to use carbon offset programmes is to first carry out a carbon footprint, then identify the emission reduction potentials and define reduction objectives, and in the end use registered and validated projects to offset the remaining emissions.

Offset markets are divided into regulated and voluntary markets. In a regulated market, clients are companies subjected to a mandatory objective of CO_2 emission reductions ; while in a voluntary market, there are only voluntary companies or citizens. In a regulated market, offset programmes are initiated in official and regulated markets such as the EU-ETS, the CDM or the JI with their specific related emission reduction units (EUAs, CERs, ERUs) ; while in voluntary markets, projects give only the right to verified/voluntary emission reductions (VERs).

The offsetting analysis leads to different findings. First, there is a risk of double counting if emission credits are not tracked and cancelled properly. Secondly, different types of projects may be involved (e.g. forestry). Thirdly, the quality of the verification, the respect for the additionality criteria and sustainable development principles varies widely from one project to another. In the fourth place, accounting rules to estimate the carbon footprint are an essential element of the methodology applied to the offset programme. In the fifth place, it is important to note that there is a huge difference in the quality of the programme according to the project cycle stages: emission reduction certificates granted ex ante (before that real emission reductions have occurred, on the basis of calculation assumptions) have far less value than emission reduction certificates granted ex post (see slide 8 fro an illustration of the project cycle stages). Finally, it is important to communicate on the scope of the offset programme.

Slide 9 shows an example of the risk incurred with non-registered offset projects: the Agcert® case that goes bankrupt before having delivered any emission certificate. Another example is given with a recent programme claiming that it works with Kyoto certified emissions reduction projects but in fact, the emission reduction certificates will be granted ex ante (before the verification step) which goes against the basic principles of Kyoto flexible mechanisms.

Therefore, governments of different countries have taken initiative to design "good practice standards" for the voluntary market, as in UK with the DEFRA standard and in France with the ADEME standard.

Based on those experiences, CO2logic works on a standard proposal for Belgium.

Questions/remarks

1. Is the RFI factor mentioned in DEFRA and ADEME criteria covering all the gases - seems to be lower than IPCC?
   Yes. The chosen factor results from a consensus.
2. Offset projects are often launched for several years. With R&D progress in the field, could the RFI factor be adapted?
   Yes, this could be done for new projects but not for those already in the pipeline.
3. There is a risk with offset projects. Who pays if the programme goes bankrupt?
   It should be the company exposed to the risk, not the client.
4. Environmental NGO's are developing a common position on compensation that will also support VERs when credible. However, how would it be possible to make the relation between voluntary offset in the aviation sector and the inclusion of this sector in the EU-ETS?
   Up to now, voluntary offset in the aviation sector is very small. Seeing that the phenomenon is marginal, the inclusion in the EU-ETS should have a great influence on it. It is important to note that offset does not always put a brake on legislation: it can be a useful tool in the short term, before the real implementation of a stricter legislation.
5. Are the criteria "ex ante" / "ex post" of the emission certificates important to take into account in the comparison of offset programmes?
   Yes, it is an essential criterion!

7. Aviation climate impacts: the global and regional points of view

Andrew Ferrone's presentation: see ABC Impacts website → Open Section → References / Project publications (http://dev.ulb.ac.be/ceese/ABC_Impacts/open_section_references.php#project)

Offset programmes fall within the general scope of the need to reduce GHG emissions to stabilize climate change (see slides 3 and 4) and of the carbon cycle (see slide 5).

Anthropogenic activities such land use changes or fossil fuel combustion generate a surplus of GHG emissions that can not be completely offset by growing carbon sinks or ocean absorption (see slide 6). Therefore, the carbon concentration in the atmosphere increased by an average of 3,2 Gt carbon per year since the pre-industrial period. In this framework, carbon offset programmes aim at acting on three main carbon flows: sinks (e.g. reforestation) and anthropogenic activities (land use change and combustion).

Analysing climate impacts of the aviation sector[2] more in detail, it appears that the combustion of kerosene generates different air pollutants (NO_x + C_xH_y + CO_2 + H_2O + CO + C_{BC} + SO_x) with different climate impacts. CO_2 emissions for example have a direct global warming effect, while NO_x cause indirect climate effects through their interactions with the chemistry of the atmosphere (increase in the ozone concentration which generates a climate warming effect and decrease in the methane concentration which generates a climate cooling effect). Water vapour and soot have a small climate warming effect, while SO_x emissions have a small climate cooling effect. Moreover, under certain meteorological conditions, aircraft emissions generate condensation trails (contrails) which can evolve into persistent cirrus clouds if the air is supersaturated. This aircraft induced cloudiness (AIC) reflects the incoming solar light during the day which has a cooling effect but absorbs simultaneously outgoing long wave terrestrial radiation which has a warming effect. On average, AIC has a warming effect that is even stronger during the night than during the day.

The different direct and indirect climate impacts of aviation are illustrated on slide 9 on the basis of their respective radiative forcing according to the IPCC study (1999)[3] and a more recent European research project called TRADEOFF (2003).

[2] http://dev.ulb.ac.be/ceese/ABC_Impacts/glossary/sheet_climate_aviation.php
[3] http://www.grida.no/climate/ipcc/aviation/index.htm

Slide 10 shows that AIC has a more regional effect along the main air corridors and that Belgium is situated right in the middle of the main current and future routes.

Impact of AIC is thus particularly important for Belgium especially due to overflights (see slide 11). Tackling non-CO_2 climate impacts from the aviation sector should be a priority for Belgian authorities either within the EU-ETS either through some parallel process.

Another important point related to the issue of the climate impacts of the aviation sector is the time horizon considered. Non-CO_2 climate impacts from the aviation sector have in fact a shorter lifespan than the global warming effect of CO_2 and methane. The total radiative forcing index decreases in time to stabilize around 2.

In order to tackle non-CO_2 climate impacts from the aviation sector, it is important to note that the flight altitude may have a great influence on aircraft emissions (see slide 13), as well as on AIC by avoiding supersaturated areas.

As a conclusion, non-CO_2 climate impacts have a strong regional climate impacts and are therefore difficult to mitigate through offset programmes, which act on global scale.

8. Discussion and questions

1. If there is a minimum value for a non-CO_2 GHG multiplier in the aviation sector (e.g. 1.5-2 used in voluntary offset programmes), can we include that now in the scheme proposed by EBAA?
   That's a political question - we will live with whatever is legislated... but we don't have resources to come up with numbers ourselves... It is up to scientists and politicians to suggest such a multiplier.
2. Business aviation differs hugely from traditional flights as regards the altitude and other flight parameters, and has more flexibility to avoid supersaturated areas…
   With the EBAA data platform, it will be possible to gather data on altitude and distance for each flight.
3. There are different technical trade-offs between engine efficiency, NO_x emissions, contrails generation, etc.
   EBAA already works in co-operation with Eurocontrol in order to identify different measures to plan flights to minimize flight routes / timing according to several environmental criteria (e.g. SESAR programme).
4. In the RF factors used in the offset programmes, is there a distinction made between CO_2 and non-CO_2 climate impacts?
   No, in existing calculators, all impacts are lumped together.
5. The best is to reduce emissions at the source - can EBAA additionally consider to make the same business by using videoconference, trains etc.?
   Business aviation is not cheap. It is scrutinized and compared other options, so if our clients do use it, it is for a reason. A corporate aircraft flies on average 3 days per week – it is not used if the clients do not need it.
6. Offsetting is quite cheap now, while other alternatives (e.g. teleconferencing, high-speed trains etc.) require infrastructure development. Aren't those investments discouraged by cheap offsetting?
   There is only one answer: the only way to use offsetting properly is first to reduce what can be reduced, and then offset the rest...
7. Is the impact of AIC different between the day and the night?

   Yes. During the night, the cooling effect induced by the reflection of incoming solar radiations do not occur anymore contrarily to the warming effect due to the absorption of outgoing long wave terrestrial radiations. Therefore, the global climate impact of AIC during the night is a climate warming that is more important than during the day.

ANNEXES