Consultation Document

Draft guidelines on monitoring, reporting and verification (MRV) of greenhouse gas emissions for the aviation sector under the European Union Emissions Trading Scheme (EU-ETS)

1 Introduction: New MRV requirements for the aviation sector under the EU-ETS

On 20 December 2006 the European Commission adopted a proposal for a Directive[1] to amend Directive 2003/87/EC[2] (the Emissions Trading Directive) so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community (the "Aviation Directive"). The Commission's proposal is subject to the codecision procedure. The Council sent its common position to the European Parliament, which approved the proposed Directive with amendments at its second reading through legislative resolution of 8th of July 2008[3]. It is expected that the Council will shortly adopt the proposal as approved by the European Parliament. Therefore the adopted text will soon become a Directive and enter into force. The main features of the text approved by the Parliament are summarised in Appendix I.

Monitoring, reporting and verification of emissions are fundamental to any functioning emissions trading or project-based emissions reduction scheme. Accounting for reductions helps ensure the integrity of the system, and underpins the value of allowances. Like other participants in the EU-ETS, aircraft operators will have to monitor their emissions of carbon dioxide and report them to the competent authority of its administering Member State by 31 March each year. The reports must be verified to make sure that they are accurate. The adopted text for the Aviation ETS Directive includes the basic principles for monitoring, reporting and

[1] COM (2006) 818 - Proposal for a Directive of the European Parliament and of the Council amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community

[2] Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading with in the Community and amending Council Directive 96/61/EC

[3] 2006/0304 (COD) - European Parliament legislative resolution of 8 July 2008 on the Council common position for adopting a directive of the European Parliament and of the Council amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community

verifying emissions for the aviation sector. These principles have been adopted and therefore are not open to consultation. They are summarised in Table 1:

Table 1 Monitoring, reporting and verification of emissions in the amendment of Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community.

Topic and legal reference	Description
Responsibility for GHG emissions **(Article 3)**	Aircraft operators, defined as the person who operates an aircraft at the time it performs an aviation activity listed in Annex I or, where that person is not known or is not identified by the owner of the aircraft, the owner of the aircraft
Compliance periods **(Article 3c)**	1. Period from 1 January 2012 to 31 December 2012 2. Periods of eight years beginning on 1 January 2013 (as amended in the ETS review[4])
Monitoring periods **(Article 14, paragraph 3)**	Member States shall ensure that each operator or aircraft operator reports the emissions during each calendar year from the installation or from 1 January 2010, the aircraft, which it operates to the competent authority after the end of that year in accordance with the guidelines.
Compliance **(Article 12)**	Administering Member States shall ensure that, by 30 April each year, each aircraft operator surrenders a number of allowances equal to the total emissions during the preceding calendar year from aviation activities listed in Annex I for which it is the aircraft operator, as verified in accordance with Article 15.
Submission of tonne-kilometre data **(Article 3e)**	For each period referred to in Article 3c, each aircraft operator may apply for an allocation of allowances that are to be allocated free of charge. An application may be made by submitting to the competent authority in the administering Member State verified tonne-kilometre data for the aviation activities listed in Annex I performed by that aircraft operator for the monitoring year. For the purposes of this Article, the monitoring year shall be the calendar year ending 24 months before the start of each compliance period or 2010 for the period from 1 January 2012 to 31 December 2012. Applications shall be made at least 21 months before the start of each compliance period or for the period from 1 January 2012 to 31 December 2012, by 31 March 2011.
Submission of monitoring plans **(Article 3g)**	The administering Member State shall ensure that each aircraft operator submits to the competent authority in that State a monitoring plan setting out measures to monitor and report emissions and tonne-kilometre data for the purpose of an application under Article 3e and that such plans are approved by the competent authority in accordance with the guidelines adopted pursuant to Article 14.
Approach for monitoring of carbon dioxide emissions **(Annex IV- PART B)**	Emissions shall be monitored by calculation using the formula: *Fuel consumption x emission factor*
Estimation of fuel consumption for monitoring carbon	- Fuel consumption shall include fuel consumed by the auxiliary power unit (APU) - Actual fuel consumption for each flight shall be used wherever possible and shall be calculated using the formula:

[4] COM (2008) 16. Proposal for a European Parliament and Council Directive amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading system of the Community

dioxide emissions **(Annex IV- PART B)**	*Amount of fuel contained in aircraft tanks once fuel uplift is complete – amount of fuel contained in aircraft tanks once fuel uplift for subsequent flight is complete + fuel uplift for that subsequent flight* - A separate calculation shall be made for each flight and for each fuel - If actual fuel consumption data are not available, a standardised tiered method shall be used to estimate fuel consumption data based on best available information
Emission factors for monitoring carbon dioxide emissions **(Annex IV- PART B)**	- Default IPCC emission factors, taken from the 2006 IPCC Inventory Guidelines or subsequent updates of these Guidelines, shall be used unless activity-specific emission factors identified by independent accredited laboratories using accepted analytical methods are more accurate - The emission factor for biomass shall be zero
Contents of report of annual emissions **(Annex IV- PART B)**	A. Data identifying the aircraft operator (name, administering Member State, address, aircraft registration numbers and types of aircraft, number and issuing authority of the air operator certificate and operating licence under which the aviation activities were performed, contact details, name of aircraft owner) B. For each type of fuel for which emissions are calculated: - Fuel consumption - Emission factor - Total aggregated emissions from all flights - Aggregated emissions from all flights departing and arriving to a single Member State; rest of the flights; and flights which departed from each Member State and arrived in each Member State from a third country - Uncertainty
Approach for monitoring tonne-kilometre data **(Annex IV- PART B)**	The amount of aviation activity shall be calculated in tonne-kilometres using the following formula: *Tonne kilometres = distance x payload*
Estimation of distance for monitoring of tonne-kilometre data **(Annex IV- PART B)**	Distance: Great circle distance between the aerodrome of departure and the aerodrome of arrival plus an additional fixed factor of 95 km
Calculation of payload for monitoring of tonne-kilometre data **(Annex IV- PART B)**	Payload: Total mass of freight, mail and passengers carried. The Directive only suggests methods for calculating the mass of passengers carried as: • Number of passengers: number of persons on-board excluding crew members times • Actual or standard mass for passengers and checked baggage contained in its mass and balance documentation or a default value of 100 kg for each passenger and his checked baggage
Contents of report on tonne-kilometre data **(Annex IV- PART B)**	A. Data identifying the aircraft operator (name, administering Member State, address, aircraft registration numbers and types of aircraft, number and issuing authority of the air operator certificate and operating licence under which the aviation activities were performed, contact details, name of aircraft owner) B. Tonne-kilometre data: - Number of flights by aerodrome pair - Number of passenger-kilometres by aerodrome pair - Chosen method for calculation of mass for passengers and checked baggage - Total number of tonne-kilometres for all flights performed during the year to which

	the report relates falling within the aviation activities listed in Annex I for which it is the aircraft operator
Verification **(Article 15 and Annex V- PART B)**	Member States shall ensure that the reports submitted by operators and aircraft operators pursuant to Article 14 (3) are verified in accordance with the criteria set out in Annex V and any detailed provisions adopted by the Commission in accordance with this Article, and that the competent authority is informed thereof. The Commission may adopt detailed provisions for the verification of reports submitted by aircraft operators, including the verification procedures to be used by verifiers. The verifier shall in particular ascertain that: a) All flights falling within an aviation activity listed in Annex I have been taken into account. In this task the verifier shall be assisted by timetable data and other data on the aircraft operator's traffic including data from Eurocontrol requested by that operator b) There is overall consistency between aggregated fuel consumption data and data on fuel purchased or otherwise supplied to the aircraft performing the aviation activity.

In its aviation proposal [COM(2006) 818] the European Commission anticipated that the basic principles for monitoring, reporting and verifying emissions set out in the proposal would be elaborated by guidelines.

Principles for monitoring and reporting emissions are already established within the existing EU ETS legislation. Article 14 of the EU ETS Directive 2003/87/EC sets out the need to adopt guidelines for monitoring and reporting of emissions based on the principles set out in Annex IV. Directive 2003/87/CE requested that Member States ensure that emissions are monitored and reported in accordance with these guidelines. This requirement is fulfilled by the Commission Decision 2007/589/EC of 18 July 2007 [5] (MRG 2007 Decision) that provides monitoring and reporting guidelines for stationary installations. These guidelines are provided in Annexes I to XII of the MRG 2007 Decision. Annexes I (general guidance) and II (guidelines for combustion emissions) are the two with relevance to aviation. The remaining Annexes are largely aimed at process emissions from the activities of specific sectors other than aviation.

The development of MRV guidelines for the aviation sector raises particular issues as mobile sources have not previously been covered by the EU emissions trading scheme. Furthermore, the requirement to record activity data (tonne-kilometre data in the aviation sector) has not been considered by the existing MRV guidelines.

In developing the draft aviation MRV guidelines, the MRV principles as set out in the MRG 2007 Decision have been applied to key elements of the aviation sector. These principles include: completeness, consistency, transparency, trueness, cost-effectiveness, faithfulness, and improvement of performance in monitoring and reporting emissions.

[5] Commission Decision 2007/589/EC of 18 July 2007 establishing guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/CE.

The proposed changes to the EU ETS Directive[6] announced following the review of the EU ETS are also being taken into account in the development of the aviation MRV guidelines. The proposal covers a range of issues, but those relevant to MRV for aviation are:

- A proposed regulation on monitoring and reporting to add more legal weight to the MR Decision
- A proposed regulation on verification to provide a more solid legal basis for verification and accreditation
- Further improvements to monitoring, reporting and verification through amendments to Annexes IV and V of the Directive.

2 Status of work and objectives of consultation

For the implementation of the Aviation ETS Directive, the European Commission has started to develop guidelines for the monitoring, reporting and verification (MRV) of emissions from the aviation sector pursuant to Article 14 of the EU ETS Directive. These guidelines aim at further elaborating the MRV principles set up in the forthcoming Aviation ETS Directive.

At this stage, the MRV guidelines being developed for the aviation sector are taking the form of proposed amendments to Annex I of the existing MRG 2007 Decision and the creation of a new activity-specific Annex (provisionally number XV).

This consultation is part of the process of developing the guidelines (hereinafter called "aviation MRG"); the aim is to seek inputs from interested parties such as Member State experts, aircraft operators and associated service providers.

A series of different draft documents have been generated by consultants Entec Ltd that can be referenced as part of this consultation exercise:

1. A draft report outlining issues related to the MRV requirements for tonne-kilometre data. The report will be used to develop the detailed provisions relating to the allocation of free allowances. In addition to this report, Entec has also prepared:
   - A draft monitoring plan template for tonne kilometre data
   - A draft reporting template for tonne kilometre data
2. A draft report outlining issues related to the MRV requirements for reporting annual emissions. The report will be used to develop detailed provisions for the monitoring, reporting and verification of actual emissions on an annual basis once the scheme is underway. Entec has also prepared:
   - A draft monitoring plan template for annual emissions

[6] COM (2008) 16. Proposal for a European Parliament and Council Directive amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading system of the Community

- A draft reporting template for annual emissions data

When reviewing the draft reports as part of this consultation process it is important to recognise that the process of developing the guidance is ongoing. The results of this consultation will be taken into account in the further development of the guidance.

Following this consultation, the Commission will prepare the draft legislation on the MRV requirements for tonne-kilometre data and annual emissions reporting.

Given the lack of existing precedents for MRV in mobile sources, guidance included in the draft reports has been based extensively on existing MRV requirements for stationary installations. As the drafting of these documents has progressed, the applicability of guidance for stationary installations to aviation has been reviewed on the basis of input from various stakeholders.

3 Administrative processes

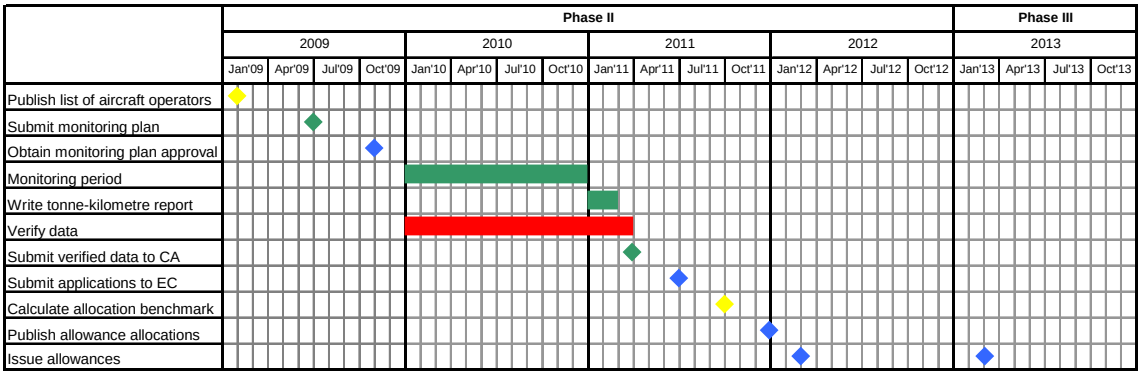
3.1 Tonne-kilometre data

Aircraft operators may apply for allowances that are to be allocated free of charge. It is an optional process, but without an application an operator will not receive any free allowances. Applications should be made by submitting to the competent authority in the administering Member State verified tonne-kilometre data for aviation activities performed during the monitoring year. This data must be monitored and reported in accordance with the corresponding monitoring plans, and then verified by accredited third-party verifiers.

There are a series of steps to the administrative process that makes up this application for free allowances. These steps are represented in Figure 1 With the exception of the first two steps related to the timing of the submission and approval of monitoring plans, all the dates of the processes in Figure 1 are set out in the proposed aviation legislation.

Submitting tonne-kilometre data as an application for an allocation of free emissions allowances is a one off process for the first two trading phases. Allocations for both Phase II (2012) and Phase III (2013 onwards) of the EU ETS will be based on 2010 aviation data.

Figure 1 Timeline of administrative processes for tonne-kilometre data



Key

European Commission		Aircraft operators		Competent Authority / Member States		Verifiers	

The eleven steps shown in Figure 1 are:

i) **Publish list of aircraft operators**. As required by the proposed Aviation ETS Directive the Commission shall publish before 1st February 2009 a list of aircraft operators specifying the administering Member State for each aircraft operator.

ii) **Submit monitoring plan**. Aircraft operators will be required to submit a monitoring plan for approval to the competent authority that sets out measures the operator will adopt to monitor and report tonne-kilometre data. There are no deadlines legally required for this submission. To ensure smooth operation of the system Entec proposes in its technical reports that the monitoring plan is submitted to the competent authority at the latest six months prior to the start of the 2010 benchmarking year.

iii) **Obtain monitoring plan approval**. There is no deadline legally required for when the competent authority will have to approve the monitoring plan. To ensure smooth operation of the system Entec proposes in its technical report that the competent authority will have to approve the monitoring plan three months prior to the start of the monitoring period. While not stated in the proposed Aviation ETS Directive, competent authorities will need to provide evidence of this approval to operators. This will comprise an important element of the verification process.

iv) **Monitoring period**. Aircraft operators will have to monitor tonne-kilometre data in accordance with the monitoring plan.

v) **Prepare tonne-kilometre report**. Aircraft operators will have to report tonne-kilometre data in accordance with the required reporting format.

vi) **Verify data**. Accredited third-party verifiers must verify the aircraft operator's tonne-kilometre data against the approved monitoring plan.

vii) **Submit verified data to the competent authority**. The tonne-kilometre data report along with the verification report shall be submitted by 31st March 2011, as stated in the Aviation ETS Directive.

viii) **Submit applications to the EC**. Member States shall submit applications (verified tonne-kilometre data reports) to the Commission by 30th June 2011.

ix) **Calculate allocation benchmark**. The Commission shall calculate the allowances to be freely allocated, auctioned and set aside in the special reserve, and the benchmark used to allocate allowances by 30th September 2011.

x) **Publish allocation of allowances**. Member States shall calculate and publish the allocation of allowances to each aircraft operator whose application it submitted to the Commission by 31st December 2011.

xi) **Issue allowances**. The competent authority of the administering Member State shall issue the allocated allowances to each aircraft operator by 28th February 2012 and 28th February for each following year.

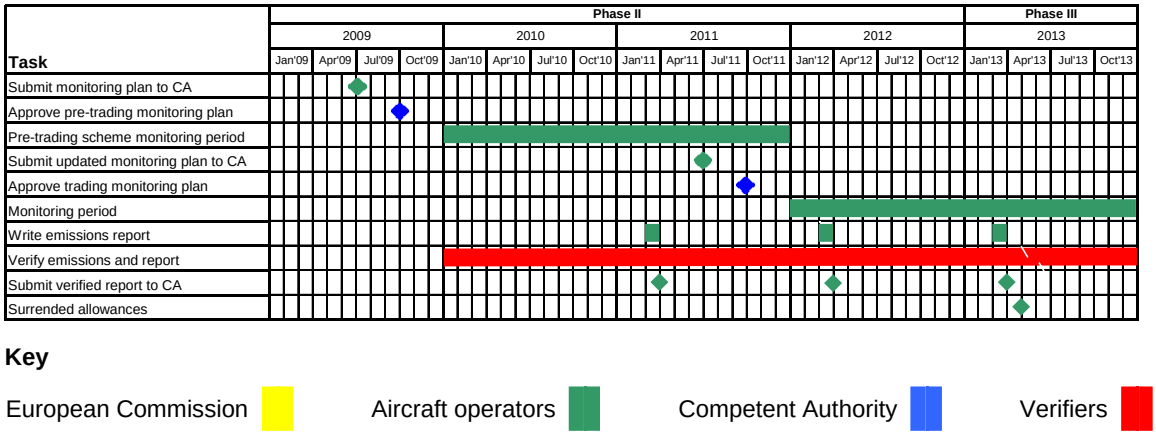
Steps ii) and iii) above do not have dates specified by the current legislation, and as such it is desirable to provide guidance so as to ensure the suitable timing of monitoring plan submission. Given the global nature of the aviation industry and based on experience from the first two allocation phases, a common approach throughout all Member States should be used in order to avoid competitive distortions. Because verifiers need a monitoring plan to verify reporting against, it makes sense to propose and get approved a monitoring plan before monitoring takes place, in order to identify potential problems or sources of errors.

Question 1	**Should there be common dates, set by the Commission, across all MS for the submission of tonne-kilometre monitoring plans to Competent Authorities, and for the approval of tonne-kilometre monitoring plans, or should the deadlines be left open for each Competent Authority to set to reflect their own circumstances?**
Question 2	**If common dates should be set by the Commission for the submission of tonne-kilometre monitoring plans to Competent Authorities, and for the approval of tonne-kilometre monitoring plans, do you agree with the timing proposed in this document?**

3.2 Annual emissions

As with stationary installations, aircraft operators will be required to annually report emissions from all flights that are included in the Scheme (see Annex I of the proposed Aviation ETS Directive). The legislation also sets the requirement "*that each aircraft operator submits to the competent authority in that [Member] State a monitoring plan setting out measures to monitor and report emissions (…)*". As such, and similarly to the monitoring and reporting of tonne-kilometre data, there are a series of steps in the administrative process that makes up the annual monitoring and reporting of emissions. These steps are represented below in Figure 2 for the pre 2012 monitoring and the 2012 trading year. For the subsequent 8 year periods steps 1, 2 and 3 will be omitted, unless significant changes of the aircraft operations such as additional aircraft or aerodrome pairs occur in which operators would need to submit an updated monitoring plan and only step 3 would be omitted.

Figure 2 Timeline of administrative processes for annual emissions reporting



The steps shown in Figure 2 are:

i) **Submit monitoring plan to the competent authority**. Aircraft operators will be required to submit their monitoring plans to the competent authority of their administering Member State. The legislation sets no specific deadlines for the submission of annual emissions monitoring plans to the competent authority. Entec suggests that they are submitted at the latest six months prior to the start of the first monitoring year, therefore before the 30th of June of 2009.

ii) **Obtain monitoring plan approval**. Although there are not specific deadlines in the legislation, the initial technical reports by Entec suggest that a period of at least 6 months could allow Competent Authorities to approve monitoring plans by at least 3 months prior to the start of the monitoring period. While not stated in the Aviation ETS Directive, competent authorities will need to provide evidence of this approval to operators. This will comprise an important element of the verification process.

iii) **Pre-trading scheme monitoring period**. The legislation requires that operators will monitor and report emissions from 2010. The aircraft operator will collect emissions data for the pre-trading scheme monitoring years of 2010 and 2011 according to the methodology approved by the competent authority in the monitoring plan.

iv) **Submit updated annual emissions monitoring plan to the competent authority**. The operator will update its monitoring plan submitted for the pre-trading scheme monitoring period to reflect changes in its contents (number and details of aircrafts, operated flight routes, fuels used) as well as to improve its methodology according to lessons learnt in the pre-trading period. The updated annual emissions monitoring plan will also need to incorporate an uncertainty assessment for their measurement system, which could be voluntary for the first submission of their monitoring plan. If no changes to the monitoring plan submitted for the pre-trading period are deemed necessary, it will be communicated to the Competent Authority. Entec suggests that an updated monitoring plan is submitted to the competent authority at least six months before the start of the trading period.

v) **Obtain monitoring plan approval**. Competent Authorities will approve the updated versions of the annual emissions monitoring plans prior to the start of the trading-scheme monitoring period in 2012. If the initial monitoring plan submitted for the pre-trading scheme period does not need updating, the Competent Authority will confirm approval of the initial version. Entec suggests that approval takes place at least three months prior to the start of the monitoring period.

vi) **Trading-scheme monitoring periods**. The aircraft operator will collect emissions data for each monitoring year (2012 onwards) according to the methodology approved by the competent authority in the monitoring plan.

vii) **Prepare annual emissions report**. Aircraft operators must report emissions after each monitoring year in accordance with the required reporting format.

viii) **Verification**. Aircraft operators must use accredited third party verifiers to verify their emissions against the approved monitoring plan.

ix) **Submission of verified report**. Aircraft operators must submit their verified annual emissions report along with the verification report to the competent authority by 31st March following each monitoring year.

x) **Surrender allowances**. Aircraft operators shall surrender sufficient allowances in accordance with its verified annual emissions report by 30th April 2013 for the 2012 monitoring period.

Similarly to the monitoring and reporting of tonne-kilometre data, steps i) and ii) above do not have dates specified by the current legislation, and as such it is desirable to provide guidance so as to ensure a suitable timing to the monitoring plan submission. Given the global nature of the aviation industry, a harmonised approach would avoid competitive distortions. Because verifiers need a monitoring plan to verify reporting against, it makes sense to propose and get approved a monitoring plan before monitoring takes place, in order to identify potential problems or sources of errors.

Question 3	**Should there be common dates, set by the Commission, across all MS for the submission of annual emissions monitoring plans to Competent Authorities, and for the approval of emission monitoring plans, or should the deadlines be left open for each Competent Authority to set to reflect their own circumstances?**
Question 4	**If common dates should be set by the Commission for the submission of annual emissions monitoring plans to Competent Authorities, and for the approval of emission monitoring plans, are those proposed in this document suitable?**

The proposed Aviation ETS Directive states in Article 14 (3.) that "*Member States shall ensure that each (…) aircraft operator reports the emissions during each calendar year from 1 January 2010 [from] the aircraft which it operates to the competent authority after the end of that year (…)*". This means that, because 2012 is the first year that aircraft operators are included in the ETS, the monitoring and reporting of emissions in years 2010 and 2011 can be considered as the 'pre-trading scheme monitoring period' (as per step iii). For these years monitoring, reporting and verification will take place, but without the subsequent surrendering of allowances. This process can serve as a 'dry-run' for the start of the Scheme in 2012.

Question 5	**How should it be ensured that maximum benefit is derived from experiences learned during the pre-trading scheme monitoring period?**
Question 6	**Do you think that the submission of an updated monitoring plan before the start of the first trading period in 2012 will contribute to improve the quality of monitoring and reporting in the emissions trading period? If yes, how and in what areas of the monitoring plan?**

4 Monitoring and reporting: Main Issues

4.1 General issues

4.1.1 Responsibility for emissions

The entity responsible for complying with the requirements of the Emissions Trading Scheme is the aircraft operator. This is defined as "*the person who operates an aircraft at the time it performs an aviation activity or where that person is not known or is not identified by the owner of the aircraft, the owner of the aircraft*". Determining who is responsible for the activities to be covered by the directive will be a question of defining the ownership of flight routes. This is a complex issue for the aviation sector given complex commercial arrangements between airlines such as wet and dry leasing and code sharing.

The verifier will need to trace ownership of flight routes using a specific designator. This will be necessary in sampling emissions data for individual flight routes as part of the verification process. As outlined in Entec's technical reports, the preferred designator to be used in reference to flight route operation is the ICAO designator.

Question 7	**In which circumstances would the ICAO designator not be considered as the appropriate way to define the aircraft operator?**

4.1.2 Monitoring plans

The current legislation after the European Parliament's second reading includes a separate aviation-specific provision on the Monitoring Plan. The new Article 3g requires Member States to ensure that each aircraft operator submits monitoring plans setting measures to monitor and report emissions and tonne-kilometre data in accordance with guidelines for monitoring and reporting adopted by the Commission pursuant to Art. 14 of the EU ETS Directive. These guidelines are therefore binding pursuant to the Art. 14.

As previously explained in section 3.1 the submission of tonne-kilometre data and monitoring plans for tonne-kilometre data is an optional process, but without submission of verified tonne-kilometre data, the operator will not receive any free allowances. However, submission of verified annual emissions reports in accordance with approved annual emissions monitoring plans is a mandatory process.

Unlike operators of stationary installations, aircraft operators will not be required to hold a separate GHG emission permit. However operators will be required to hold a monitoring plan for their annual emissions. This plan will set out the measures to monitor and report emissions and tonne-kilometre data.

As described in Section 3.2 about the administrative processes for annual emissions, a Monitoring Plan must be delivered before the start of the first monitoring period 2010. Although no specific timeline is proposed in the legislation, Entec suggests that they are submitted at the latest six months prior to the start of the first monitoring year, therefore before the 30th of June of 2009. Competent Authorities will approve the submitted monitoring plans before the start of the first monitoring period. An updated monitoring plan, incorporating improvements to the

methodology for annual emissions monitoring, an uncertainty assessment for activity data and all changes to the underlying data (aircrafts, flight routes, type of fuels) will be required prior to the start of the first trading period, preferably 6 months before 2012. Additionally, and according to the MRG 2007 Decision, the operator will continuously need to notify to the competent authority *"all changes and proposed changes in their monitoring methodology or the underlying data without undue delay after the operator has become aware of it, unless otherwise specified in the monitoring plan*".

There is no specific provision on sanctions in the legislation for not submitting a Monitoring Plan for annual emissions. However, Article 16 requires Member States to adopt penalties applicable to infringements of the national provisions adopted pursuant to this Directive and shall take all measures necessary to ensure that such rules are implemented. The penalties provided for must be effective, proportionate and dissuasive.

Since Member States are required to ensure that monitoring plans are submitted, they also have to impose penalties as set out in Art. 16 for not submitting monitoring plans.

For the allocation of free allowances, submission of tonne-kilometre data in the monitoring plan is voluntary. There is no sanction for failure to submit – an operator will simply not be allocated free allowances.

4.1.3 Special reserve

Issues related to changes to operations in the aviation sector relate primarily to the increase in the number of flight routes and tonne kilometres flown. This has specific implications for the allocation of allowances from the "special reserve", in which 3% of the total quantity of allowances to be allocated shall be set aside for each phase of the scheme for new entrants and fast growing airlines.

Operators who wish to apply for the extra free allocation through the special reserve will need to either repeat the verified tonne km data collection exercise in 2014 (for fast growers), or complete a new verified tonne km data collection exercise in 2014 (for new entrants). They will then need to make an application including verified tonne-kilometre data to the competent authority of its administering Member State by 30 June 2015, for the second period starting in 2013. The expansion in activity must be shown over time (i.e. 2014 relative to 2010). Therefore 2 separate tone-kilometre data are required for fast growing operators, submitted separately by Member States to the Commission who shall decide on the final allocation of free allowances to aircraft operators applying to the final reserve.

In both cases, aircraft operators must demonstrate that growth in operations is not a result of continuation of an aviation activity previously performed by another aircraft operator. Revisions to existing plans in 2014, must therefore consider the addition of flights as part of the monitoring for tonne km data collection exercise.

Question 8	**What evidence should be required to ensure that applications to the special reserve refer to additional or new activity?**
Question 9	**Is listing flight routes in a monitoring plan for tonne kilometre data sufficient to gauge potential expansion of aircraft operators? How could it be demonstrated that this growth is not a continuation of an aviation activity previously performed by another aircraft operator?**

4.2 Monitoring and reporting tonne-kilometre data

The formula shown in Box 1 is the methodology used to calculate tonne-kilometre data for the purpose of applying for an allocation of allowances. The two components, distance and payload, are considered separately in sections 4.2.1 and 4.2.2 respectively.

Box 1 Calculation methodology for tonne-kilometre data

tonne kilometres = distance × payload

where:

"distance" means the great circle distance between the aerodrome of departure and the aerodrome of arrival plus an additional fixed factor of 95 km; and

"payload" means the total mass of freight, mail and passengers carried.

4.2.1 Calculation of distance

Issue

No guidance is currently provided on whether existing databases of great circle distances can be used or whether each operator is expected to calculate the Great Circle Distance. Great Circle Distance is technically defined as the shortest distance between any two points on the surface of a sphere measured along a path on the surface of the sphere. The Earth can be approximated by a sphere with a radius of 6372.795 km. However, the Earth is not a perfect sphere, and is more closely approximated by a spheroid with the radius of curvature of 6356.750 km at the poles and 6378.135 km at the equator[7].

There is no clear guidance in the legislation about how the Great Circle Distance should be calculated. Furthermore, the precise location assumed for an aerodrome can vary and there is no guidance on which data sources to use to establish aerodrome locations.

Analysis

There are three options for the estimation of GCDs:

Option 1 – Specify that operators should use as a default the GCDs between airports with ICAO codes held by Eurocontrol's WHS84 model;

[7] Bomford, Guy 1980 *Geodesy* Clarendon Press, Oxford

Option 2 – Specify criteria for ensuring reliable and robust GCD datasets, but let operators choose their own;

Option 3 – Provide no guidance and specify neither a particular dataset, nor criteria for ensuring the robustness of GCD data from existing datasets.

Option 1 would stipulate that operators should utilise data from Eurocontrol, ensuring consistent, reliable and robust data. The Eurocontrol WHS84 model contains GCDs between all airports with ICAO codes and can be reliably used to get the standard GCD distances between all airports. Eurocontrol can provide GCD data for all intra-EU airport pairs and for all airport pairs involving extra-EU countries for which a flight has taken place in the past. The only exception where GCD data would not exist in Eurocontrol would be for airports outside Europe from which no flights to Europe have ever departed or no flights from Europe have ever arrived. Even in these cases, on the date of the first flight, a GCD would be generated and made available by Eurocontrol.

This option – having only one data source for the vast majority of flights, if not all – would harmonise the methodology used by operators and would ensure a fair allocation, given that some variation in airport location data may exist due to the size of airports.

Option 2 would ensure that the GCD data that is used is reliable and robust, whilst not restricting the sourcing of GCD data. There are two main options to calculate GCD:

- Calculate GCD by approximating the Earth as a sphere with average radius 6372.795 km; gives an error of approximately 0.5% (32km) for a long-haul flight from London Gatwick to Newark (6,404km).
- Calculate GCD by approximating the Earth as a spheroid with polar radius of 6356.750 km and equatorial radius of 6378.135 km. This is the more accurate method to use, but requires more complex calculation.

However, because the opportunity would exist for different data sources to be used for the same aerodrome pair, there is some potential that two operators may use slightly different GCDs to calculate tonne-kilometre data. It is not known at this stage what other GCD datasets exist.

Option 3 is the least restrictive approach. However it would not ensure the use of consistent GCD data, or would it specify that the source used is reliable and robust.

Conclusion

There needs to be a degree of consistency and an assurance that the data used are robust, so it would not be appropriate to allow aircraft operators to select their location values without any guidance. It is therefore recommended that Option 1 is chosen such that operators should use Eurocontrol data as a default where available for their aerodrome pairs. Where Eurocontrol data is not available, an alternative method should be provided by the aircraft operator offering robust and reliable datasets providing at least the same accuracy as the sphere method described in Option 2.

Question 10	**Do you consider a standard source of GCD data from Eurocontrol as the most appropriate approach for your needs? If not, explain why and detail what would be the preferred approach for your specific situation.**

4.2.2 Calculation of payload

Issue

Payload comprises three sets of data: mass of freight, mass of mail, and mass of passengers. The Aviation ETS legislation provides some requirements for calculating the mass of passengers:

- the number of passengers excludes crew members; and
- aircraft operators may choose one of the following two options to report passenger and checked baggage data:
  - to apply either the actual or standard mass for passengers and checked baggage contained in its mass and balance documentation for the relevant flights; or
  - to apply a default value of 100 kg for each passenger and his checked baggage.

However, there is no further requirement defined on how to calculate and report freight and mail data.

Analysis

Three options are analysed to calculate freight and mail data:

Option 1 – Do not impose specific uncertainty requirements for freight and mail mass measurements;

Option 2 – Use as a default data from the mass and balance documentation (where available) for freight and mail mass

Option 3 – Provide tiers[8] of approaches for freight and mail mass measurements. These would have decreasing levels of uncertainty, in-line with methodology for setting tiers for monitoring and reporting activity data in the MRG 2007 Decision;

Option 1 would leave considerable discretion to operators and competent authorities that could affect the scheme's implementation and would introduce inconsistencies between operators. This option would be acceptable if evidence could be provided that common practice in the aviation industry led to results precise enough, so that the annual measurement uncertainty would be reached in any event, and that no additional legal requirement would need to be introduced.

Option 2 is considered as the most appropriate approach for commercial operators, which already collect data on payload as part of their JAR-OPS / EU OPS[9] safety requirements for

[8] Tiers of approaches are introduced by the existing MRG (Commission Decision 2007/589/CE) to determine the following variables: activity data (fuel/material flow and Net Calorific Value), emission factors, composition data, oxidation and conversion factors. The tier system balances the need for flexibility to accommodate different sectors and technologies with the need for a level playing field for operators across the EU. Higher tiered approaches involve higher accuracy in measurement or calculation.

[9] JAR-OPS refers to the Joint Aviation Requirement for the operation of commercial air transport (aeroplanes), published by the Joint Aviation Authorities. EU OPS refers to Commission Regulation (EC) No 8/2008 of 11 December 2007 amending Council Regulation (EEC) No 3922/91 as regards common technical requirements and administrative procedures applicable to commercial transportation by aeroplane.

mass and balance[10]. This information must be recorded in flight documentation, which must be kept for 3 months.

The EU OPS set in their Subpart J "Mass and Balance" that "*an operator must establish the mass of the traffic load, including any ballast, by actual weighing or determine the mass of the traffic load in accordance with standard passenger and baggage masses as specified by OPS 1.620*". Traffic load is defined as "*the total mass of passengers, baggage and cargo, including any non-revenue load"*. Appendix 1 to OPS 1.620 sets the procedure for establishing revised standard mass values for passengers and baggage. This procedure ascertains that "*the weighing machine to be used for passenger weighing (…) must be accurate to within 0,5% or 200 g whichever is the greater*". However, no specific accuracy is required for weighing freight and mail. According to JAR-OPS/EU OPS, the method for determining the applicable passenger, baggage and cargo mass must be provided by each operator in their Operations Manual.

Mass of passengers and baggage are important factors in ensuring safe operation of the aircraft and therefore accurate information is needed by the pilot. There will naturally be some uncertainty that would be challenging to calculate, however if option 2 was applied, verifiers would simply need to check that the reported data was consistent with mass and balance documentation. This option represents a balance of uncertainty/accuracy with cost, in line with the MRV principles.

However, non-commercial operators are not covered by JAR-OPS and they will not have the same documentation. As they are generally smaller operators (according to EBAA, 40% of business aviation operators have only one aircraft and 85% have fewer than five), they will have less instrumentation. Therefore, estimating the uncertainty of the monitoring system would be more straightforward but reaching a certain uncertainty threshold would be more difficult.

Providing tiers of approaches (option 3) would be only necessary to estimate uncertainties of weighing instruments when no mass and balance documentation can be provided. This is likely to happen only in smaller operators and therefore it would not be possible to define different tiers according to different sizes or emissions thresholds of operators, as it is the case in the existing Monitoring and Reporting Guidelines for stationary installations. Accordingly, the preferred approach for operators that cannot provide mass and balance documentation would be to require a specific uncertainty threshold to all operators, based in existing uncertainty standards of the industry weighing instruments. An uncertainty assessment could be required for these operators in order to prove compliance with the thresholds defined.

Conclusion

Option 2 should be considered as the default option for commercial airlines. For operators without mass and balance documentation requirements, a specific level of uncertainty will be required according to industry standards, which may need to be proved through an uncertainty assessment.

Question 11	**If an aircraft operator chooses to use measurements of actual passenger weight, what type of weighing instruments are used in the industry and what are their**

[10] See JAR-OPS Section 1, Subpart J for details of Mass and Balance requirements for commercial aircraft operators.

	typical levels of uncertainty across a whole year?
Question 12	**For non commercial operators, where freight and mail mass data are not required by JAR-OPS/EU-OPS what type of weighting instruments are used for weighing freight and mail mass and what are their typical levels of uncertainty across a whole year?**

4.2.3 Uncertainty

The proposed Aviation ETS Directive specifies that annual emissions reports must include information on uncertainty. However, it does not specify that applications for free allowances by submitting tonne-kilometre data should include an uncertainty assessment.

The uncertainty in supplied tonne kilometre data (which is used for allocating allowances) will be less important to provide if standardised datasets are used. For example if all operators are provided with great circle distances from one source (e.g. Eurocontrol) each with the same associated uncertainty or they all use default values for passenger and checked baggage mass, there will be no need to take this uncertainty into account. However, for any contribution to tonne-kilometre data which does not come from a standardised data source (e.g. freight and mail not included in mass and balance documentation), an uncertainty assessment could be necessary.

Question 13	**Do you consider that an uncertainty assessment should be required for tonne-kilometre data? If so, in which cases? and what would be the added value of this?**

4.2.4 Templates for tonne-kilometre data monitoring plan and report

The draft templates proposed for providing information about the tonne-kilometre monitoring plan and report are intended to show the data needs for reporting, but they will undergo revision after the consultation. Specifically, more linkable database software such as XML based formats will be considered.

Question 14	**For competent authorities, do the proposed tonne-kilometre templates fit your purpose?**
Question 15	**For operators, do the proposed tonne-kilometre templates fit your purpose?**
Question 16	**Are there other parameters that should be covered in the tonne-kilometre templates? If so, which?**
Question 17	**Is there a need to link to the content of the tonne-km templates to special software/databases? If yes, which ones?**

4.3 Monitoring and reporting annual emissions

4.3.1 Tiers of approaches

The existing monitoring and reporting guidelines as set in the Commission Decision 2007/589/CE introduce the concept of tiers of approaches to determine the following variables: activity data (fuel/material flow and net calorific value), emission factors, composition data, oxidation and conversion factors. The tier system forms the backbone of greenhouse gas emissions monitoring of stationary installations covered under the EU ETS. It balances the need for flexibility to accommodate different sectors and technologies with the need for a level playing field for operators across the EU. It furthermore provides a transparent way to improve the quality of the monitoring system over time to reach the required tier level.

The increasing numbering of tiers from one upwards reflects increasing levels of accuracy, with the highest numbered tier as the preferred tier. In the existing MRG the operator may apply different approved tier levels to the different variables used within a single calculation (e.g. fuel/material flow, net calorific value, emission factors, composition data, oxidation or conversion factors). The choice of tiers according to the current MRG depends on the level of emissions of the installations. Thus, installations with higher emissions must use tiers providing higher accuracy and installations with lower emissions are allowed higher uncertainties. Three categories of installations are defined for the application of tiers in the existing MRG for stationary installations:

- Category A installations: installations with average reported annual emissions over the previous trading period (or a conservative estimate or projection if reported emissions are not available or no longer applicable) equal to or less than 50 kilotonnes of fossil CO_2 before subtraction of transferred CO_2,
- Category B installations: installations with average reported annual emissions over the previous trading period (or a conservative estimate or projection if reported emissions are not available or no longer applicable) of greater than 50 kilotonnes and equal to or less than 500 kilotonnes of fossil CO_2 before subtraction of transferred CO_2 and,
- Category C installations: installations with average reported annual emissions over the previous trading period (or a conservative estimate or projection if reported emissions are not available or no longer applicable) of greater than 500 kilotonnes of fossil CO_2 before subtraction of transferred CO_2.

The highest tier approach shall be used by all operators to determine all variables for all source streams for all category B or C installations. Only if the highest tier is technically not feasible or would lead to unreasonably high costs, may a next lower tier be used for that variable within a monitoring methodology. The choice of tiers is subject to approval by the competent authority.

According to data provided by Eurocontrol, the existing categories of installations per emission thresholds would be applicable to the aviation sector. Given the number of existing exclusions, and the nature of the industry, separate guidance for smaller operators is not considered necessary. Taking into consideration the proposed monitoring and reporting plans for both tonne kilometre data and annual emissions, the cost and complexity of verifying smaller operators will be lower due to the lower number of emissions sources.

A tiered approach would not be deemed necessary for the aviation sector if similar levels of uncertainty can be proved for the whole industry, in which case a single tier, with a maximum associated uncertainty threshold would be required for the whole industry.

Question 18	**Do you think that different levels of accuracy (or uncertainty) in monitoring and reporting of annual emissions should be required for different aircraft operators according to pre-defined categories of operators per annual emissions?**
Question 19	**If yes, what are the reasons and what would be the benefit of such differentiation?**

4.3.2 Major and minor source streams in aviation

Issue

The MRG 2007 Decision defines:

- minor source streams as "*those source streams selected by the operator to jointly emit 5 kilotonnes of fossil CO_2 or less per year or to contribute less than 10 % (up to a total maximum contribution of 100 kilotonnes of fossil CO_2 per year), to the total annual emissions of fossil CO_2 of an installation before subtraction of transferred CO_2, whichever is the highest in terms of absolute emissions*" and
- de minimis source streams as "*a group of minor source streams selected by the operator and jointly emitting 1 kilotonnes of fossil CO_2 or less per year, or that contribute less than 2 % (up to a total maximum contribution of 20 kilotonnes of fossil CO_2 per year) of total annual emissions of fossil CO_2 of that installation before subtraction of transferred CO_2, whichever is the highest in terms of absolute emissions"*

Reduced MRG requirements are allowed for minor and de minimis source streams. This provision was introduced to cover very small usage (e.g. back-up generators that are tested once a year). According to the existing MRG guidelines, operators can use (subject to competent authority approval) tier 1 methods to estimate emissions from minor source streams and no tier (estimations) for de minimis source streams.

Analysis

Given the existing exclusions to the aviation emissions trading scheme, it is not likely that any aircraft operator would require the use of minor and de minimis source stream definitions. The only likely situation where the definition of minor and/or de minimis source streams would be required would be if an aircraft operator infrequently flew flights with an unusual aircraft type and/or fuel (e.g. aviation gasoline instead of kerosene) and for which it would not have developed fuel metering procedures. If the total emissions of those source streams falled under the thresholds of the previous definitions of minor and de minimis source streams a reduced monitoring requirement would be appropriate to reduce the burden.

Conclusion

The provision of minor and de minimis sources was intended for occasional usage in stationary installations. A similar situation is not likely for aircraft operators as test flights and engineering flights are usually excluded from the scheme. However, the consideration of "minor sources" or

"de minimis sources" could be relevant in the context of the aviation sector for specific, infrequent flights for which no fuel metering procedures would have been developed.

Question 20	**Do you consider minor and de minimis sources relevant in the context of the aviation sector? In which situations?**
Question 21	**If you consider that minor and de minimis sources warrant consideration in the context of the aviation sector, would the thresholds considered for stationary installations be applicable and for which kinds of flights not falling under the current exclusions?**

4.3.3 Application of tiers to determine fuel consumption in the aviation sector

Issue

Annex IV of the forthcoming Aviation ETS Directive requires that a separate calculation is made for each flight and for each fuel and including the auxiliary power unit (APU) according to the formula:

Actual fuel consumption for each flight	=	Amount of fuel contained in aircraft tanks once fuel uplift for the flight is complete	-	Amount of fuel contained in aircraft tanks once fuel uplift for subsequent flight is complete	+	Fuel uplift for that subsequent flight

Therefore, the accuracy of the fuel consumption calculation relies on the accuracy of metering instruments for fuel uplifts and fuel contained in aircraft tanks before take off.

The current text of the proposed Directive after the EP second reading states that "*If actual fuel consumption data are not available, a standardised tiered method shall be used to estimate fuel consumption data based on best available information*".

Annex II of the MRG 2007 Decision provides the following tiers for fuel consumption in combustion installations, which may be applicable to aviation:

- Tier 1: The fuel consumption over the reporting period shall be determined by the aircraft operator within a maximum uncertainty of less than ±7.5%
- Tier 2: The fuel consumption over the reporting period shall be determined by the aircraft operator within a maximum uncertainty of less than ±5%
- Tier 3: The fuel consumption over the reporting period shall be determined by the aircraft operator within a maximum uncertainty of less than ±2.5%
- Tier 4: The fuel consumption over the reporting period shall be determined by the aircraft operator within a maximum uncertainty of less that ±1.5%

Analysis

Three options have been considered to deal with this:

- Option 1 – do not provide any tiers, and require that all aircraft operators report fuel consumption to the same level of uncertainty;
- Option 2 – use the same tiers as in Annex II;
- Option 3 – define new tiers for aviation on the basis of standard metering uncertainty for the industry.

Option 1 would give the most coherent approach as all aircraft operators would have the same requirement and would have no flexibility. This would be the preferred option if similar levels of uncertainty can be proved for the whole industry, in which case a maximum associated uncertainty threshold would be required for the whole industry. Operators would be required to submit an uncertainty assessment as part or their monitoring plans to prove compliance with the required uncertainty threshold.

However, applying a standard method for the calculation of fuel consumption and a standard uncertainty requirement to all aircraft operators could place a proportionately larger burden on small emitters or may result in relatively less rigorous reporting for larger emitters.

Option 2 would be consistent with the rest of the scheme and would provide some flexibility to operators, which would reflect differing circumstances. However, the typical uncertainty range of the aircraft's and tanker's fuel measuring equipment falls within a range ±0.5% to ±1.0%, while flow meters to measure actual fuel uplift are reported to have a volumetric accuracy typically between 0.05% and 0.2% for fuel uplifts. Therefore, the typical uncertainty most probably falls within Tier 4. For this reason, a standard maximum uncertainty level for the calculation of fuel consumption would be more appropriate for all those airlines that can provide accurate fuel consumption data on a flight by flight basis as required by the legislation.

The tiers as developed in the context of the MRG relate to metering uncertainties. According to Option 3 new metering uncertainty tiers would be defined based on actual metering uncertainties in the industry. This option is not considered appropriate as it would undermine the consistency with the rest of the scheme.

Both for safety reasons (JAR-OPS) and for cost control and tax reasons aircrafts must record fuel uplifts and fuel in aircraft tanks before takeoff. Also, before takeoff, pilots record the mass of fuel remaining at the end of the last flight (typically in mass units) from onboard fuel measuring instruments and calculate how much fuel needs to be uplifted for the next flight. This is conveyed to the fuel provider, who transfers the requested fuel into the plane's tanks measured in volumetric units. After each flight, the operational flight plan required by JAR-OPS may be transferred to the headquarters of each airline and flight documentation must be kept and filled for a certain period, generally 3 months.

Regarding measuring units, although airplanes display fuel in tanks in mass units, invoicing is currently done by volume. A specific gravity range between 0.77-0.83 kg/litre of kerosene is used in the industry. Some operators use a standard factor of 0.8 kg/litre of kerosene. However, the 0.8 kg/litre conversion factor could be wrong at different temperatures. Safety standards JAR-OPS specify actual density or as calculated according to a methodology in the operations value. Regarding accuracy of volume to mass conversions, the pilot examines any discrepancies between the volumetric reading of fuel uplift and the onboard instruments measuring fuel mass directly in kg. There are different discrepancies that are tolerated depending on the type of the plane.

Some planes even have instruments that record the amount of fuel actually burned in the engines during flights. However, this data may not include APU fuel use or any dumping of fuel for safety purposes although this may then be calculated using fuel company data and airplane gauges.

Conclusion

Due to safety requirements, most aircraft operators record and store mass and balance documents including the amount of fuel in tanks before takeoff. Pilots also normally record the mass of fuel remaining at the end of last flight from onboard fuel measuring instruments and calculate how much fuel needs to be uplifted for the next flight. Fuel uplift records are also kept for accounting and tax reasons.

If authoritative sources exist to prove similar low uncertainty ranges in the industry then the issue of tiers may be less relevant for aviation and it would be possible to set a standard approach for the whole sector. The possibility of using calibration certificates to prove this will be investigated as part of the public consultation process.

However, if some categories of operators could show that the calculation of fuel consumption on a flight by flight basis would involve unreasonable costs, an alternative method for fuel consumption could be used. This could be based on the total annual fuel consumption of an aircraft operator derived from fuel supply invoices and applied to flights covered by the EU ETS. This would need to be done in a way that does not underestimate fuel consumption, given that built-in conservatism would be needed for such an aggregate approach.

Question 22	**Is there a standard level of uncertainty for fuel metering in the industry, which could be proved through calibration certificates? Please provide details of sources proving the level of uncertainty in fuel metering in the aviation industry (eg. according to metering devices, suppliers specifications or to safety requirements)**
Question 23	**Is there any specific requirement for the use of standard fuel density factors in the industry?**
Question 24	**Should the MRV guidelines for aviation explicitly mention (temperature dependent) standard density conversion factors to be used in fuel measurement? In this case, which would be the most appropriate standard density values applied to aviation fuels and why?**
Question 25	**Should density measurement be required every time instead of using standard values? What would be the benefit of this?**
Question 26	**Are there any barriers that prevent some aircraft operators from gathering data on actual fuel consumption per flight? Could you please describe the situations where this data would not be available?**
Question 27	**Could aircraft operators not able to provide information on fuel consumption per flight provide instead total annual fuel consumption figures for their operations covered by the EU ETS? In this case, what estimation method could be used to ensure that fuel consumption covered by the EU ETS is not underestimated?**
Question 28	**The MRG 2007 Decision requires that all information needed to reconstruct reported emissions data, including all fuel consumption data, should be kept for at least 10 years. Would there be any obstacles to data storage for this period? How could these obstacles be overcome?**

4.3.4 Application of tiers of approaches to determine net calorific values (NCV) in the aviation sector

Issue

Annex II of the MRG 2007 Decision sets the following tiers to determine net calorific values for combustion emissions:

- Tier 1: Reference values for each fuel are used as specified in Section 11 of Annex I (emission factors from 2006 IPCC guidelines).
- Tier 2a: The operator applies country-specific net calorific values for the respective fuel as reported by the respective Member State in its latest national inventory submitted to the Secretariat of the United Nations Framework Convention on Climate Change
- Tier 2b: For commercially traded fuels the net calorific value as derived from the purchasing records for the respective fuel provided by the fuel supplier is used, provided it has been derived based on accepted national or international standards.

- Tier 3: The net calorific value representative for the fuel in an installation is measured by the operator, a contracted laboratory or the fuel supplier in accordance with the provisions of Section 13 of Annex I.

Analysis

Three options have been considered:

— Option 1 – do not provide any tiers, and require that all aircraft operators use the same NCV;

— Option 2 – use the same tiers as in Annex II;

— Option 3 – derive new tiers for NCV.

Option 1 is rigid and would apply a default value across all aircraft operators. Standard values could be the default values provided by the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: 44.1 TJ/Gg for jet kerosene and 44.3 TJ/Gg for aviation gasoline.

Option 2 would be consistent with the rest of the scheme, would offer flexibility to aircraft operators and would simplify matters for competent authorities (by providing a standard approach). However, some of the existing tiers would not be applicable. Tier 2a would be challenging, as aircrafts are fuelled in very different airports, which makes it difficult to apply country-specific net calorific values for the estimation of fuel consumption on a flight by flight basis. Tier 3 does not seem necessary for commercially traded fuels that count on standard fuel specifications, as stated in the existing MRG. Tier 2b would be possible if fuel suppliers can provide aircraft operators with the NCV of supplied fuel according to fuel specifications. Aircraft operators should be able to report NCV based on suppliers specifications as aircraft fuels are specified for safety reasons. However, there are likely to be some differences between the default IPCC NCV and the NCV provided in fuel suppliers' specifications, due to the different basis of the figures (eg suppliers' figures refer to minimum energy content) and the aggregate nature of the IPCC figures. For example, the IPCC default value for jet kerosene is 44.1 TJ/Gg but the minimum NCV set out in the majority of world jet kerosene fuel specifications is 42.8 TJ/Gg. These differences between the IPCC and supplier provided values can lead to over or underestimation of emissions.

Option 3 is not considered appropriate as there is no case for deriving new tiers for NCV for aviation. Aviation fuels are subsets of standard fuels and are tightly controlled for safety reasons.

Conclusion

A tiered approach for NCV, consistent with the rest of the scheme could lead to over or under estimation of emissions depending on the tier used by each aircraft operator. There are some differences between the IPCC default values and fuel specifications provided by fuel suppliers, the latter usually referring to minimum energy content. Therefore, in order to avoid comparative disadvantages among operators and considering that most operators use similar fuels a single standard approach is preferred for the choice of NCV of aviation fuels.

If IPCC default values are considered as the most appropriate, a reference should be added in Annex I Section 11 of the MRG to net calorific values for jet kerosene, jet gasoline and aviation gasoline, based on 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Question 29	**Do you want to have the option of using specific values for NCV to define the energy content of aviation fuels or would you prefer standard values for everyone?**
Question 30	**If standard values are used would the IPCC default values for NCV be appropriate? If not, why not?**
Question 31	**How accurate in practice is the NCV data provided by fuel suppliers?**
Question 32	**If none of the above options is appropriate for your specific situation, which would be your preferred method to provide accurate NCV for aviation fuels?**

4.3.5 Application of tiers of approaches to determine emission factors in the aviation sector

Issue

According to the MRG 2007 Decision emission factors must be expressed as tCO_2/TJ for combustion emissions as a first choice. "*The use of emission factors for a fuel expressed as tCO_2/t rather than tCO_2/TJ is restricted for cases where unreasonable costs would otherwise be incurred by the operator*". There is, therefore the possibility to use emission factors expressed as tCO_2/t of fuel if they can lead to at least equivalent accuracy in emissions estimation and if the use of emission factors expressed as tCO_2/TJ with the same level of accuracy could lead to unreasonable costs.

The aviation legislation specifies that default IPCC factors shall be used unless activity-specific emission factors identified by independent accredited laboratories using accepted analytical methods are more accurate. This requires clearer guidance as activity-specific emission factors are generally more accurate than the default IPCC values.

Annex II of the MRG 2007 Decision sets the following tiers to determine emission factors for combustion emissions:

- Tier 1: Reference factors for each fuel are used as specified in Section 11 of Annex I, referring to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.
- Tier 2a: The operator applies country-specific emission factors for the respective fuel as reported by the respective Member State in its latest national inventory submitted to the Secretariat of the United Nations Framework Convention on Climate Change.
- Tier 2b: The operator derives emission factors for the fuel based on one of the following established proxies:
    - density measurement of specific oils or gases common e.g. to the refinery or steel industry, and
    - net calorific value for specific coals types.

  In combination with an empirical correlation as determined at least once per year according to the provisions of Section 13 of Annex I. The operator shall ensure that the

correlation satisfies the requirements of good engineering practice and that it is applied only to values of the proxy which fall into the range for which it was established.

- Tier 3: Activity-specific emission factors for the fuel are determined by the operator, an external laboratory or the fuel supplier according to the provisions of Section 13 of Annex I.

Analysis

The following options could be applied to dealing with emission factors for aviation:

- Option 1 – use the same tiers as in Annex II (default IPCC value is a tier 1 emission factor, tier 2a is country-specific factors and activity-specific emission factors are tier 3 – note that tier 2b would not be relevant);
- Option 2 – do not provide further guidance.

Without further guidance, the requirements in the aviation legislation would mean that all operators would have to use activity-specific emission factors, regardless of costs. Therefore, Option 2 would not clarify this situation and would place an unnecessarily stringent obligation on all aircraft operators. Allowing tiers of emission factors would allow aircraft operators to monitor and report to the highest accuracy within reasonable costs and technical feasibility. However, only tiers 1 and 3 would be applicable to the aviation sector. Tier 2a (country-specific emission factors) is an complex issue as aircraft are refuelled in several different countries and this approach would be challenging to verify.

Conclusion

Option 1 is the recommended approach. This would ensure that the requirements are consistent with the existing MR Decision. The tiers could then be applied in a similar way by requiring the highest emitters to move towards the more accurate method – unless it entails unreasonable costs. The Annex II tiers for monitoring and reporting emission factors should be available to aircraft operators with the exception of Tiers 2a and 2b.

Question 33	**Do you want to have the option of using specific values for emission factors of aviation fuels or would you prefer standard values for everyone?**
Question 34	**Would IPCC default emission factors expressed as tCO_2/TJ be considered as an appropriate standard value for all aircraft operators? If not, please explain why.**
Question 35	**Are there any barriers or concerns for aircraft operators developing activity-specific emission factors expressed as tCO_2/TJ?**
Question 36	**Could standard emission factors expressed as tCO_2 per tonne of fuel provide a more accurate measurement of emissions at lower costs? Could you provide official references for these standard emission factors?**

4.3.6 Estimation of fuel consumption and fall-back approaches

Issue

The legislative text considers that if actual fuel consumption data are not available, a standardised tiered method shall be used to estimate fuel consumption data based on best available information estimation of fuel consumption.

Analysis

The use of an estimation method does not seem necessary, as the legislation will result in aircraft operators monitoring their emissions (and therefore their fuel consumption). If fuel consumption data are not currently available, then part of being included in the scheme will mean that operators should set up processes in order to collect it. In any case, given that aircraft are required to have fuel meters for safety reasons and that fuel is one of the major costs of running an aircraft, data on the fuel in tanks and the fuel uplift should be readily available. It would be difficult to identify a situation where an aircraft operator would not be able to provide data. However in this extreme situation, aircraft operators could use the fall-back approach where they can design their own methodology subject to approval by the competent authority.

Conclusion

Fall-back approaches should not be normally used. If it can be proved that actual fuel consumption data is too costly or difficult to obtain, then aircraft operators may use the fall-back approach subject to approval by the Competent Authority.

Question 37	**Which situations could you consider that would require the use of a fall-back approach?**
Question 38	**What would be the minimum requirements for the approval of fall-back approaches by the Competent Authority?**

4.3.7 Treatment of biofuels

Issue

Although biomass is not currently used in aviation, this issue is increasingly pertinent as some aircraft operators have recently trialled combining aviation fuel with a bio-fuel. In the event that this occurs for flights included under the EU ETS there needs to be a monitoring method that allows the operator to calculate the percentage bio-fuel used and hence the amount that is considered to be carbon dioxide (CO_2) neutral. Where a fuel contains both fossil and bio-fuels, a weighted emission factor would be applied based on the fossil fuel carbon content.

Analysis

MRG 2007, Annex I Section 12 lists bio-fuels which can be reported as CO_2 neutral. A pure bio-fuel is defined as one in which the non-biogenic carbon fraction is less than 3% by mass. The aromatics requirement in aviation fuel makes it unlikely that a pure bio-fuel could be used.

Conclusion

Advice and requirements for the determination of a biomass fraction in a blended fuel are provided in the MRG 2007 Decision, sections 13.4, 13.5 and 13.6. The specific procedure to determine the biomass fraction shall follow CEN, ISO or national standards where available.

Question 39	**Is special treatment of bio-fuels necessary, or can the emission factor and NCV of bio-fuel blends be satisfactorily determined using the above requirements for standard fuels?**
Question 40	**Would fuel suppliers be able to provide the percentage biogenic carbon content for blended fuels determined using international or national standards?**

4.3.8 Uncertainty

Given that airline operators already adhere to strict requirements for accurate fuel monitoring, they should be able to provide details of uncertainty levels associated with fuel meters in their monitoring plans.

There is the possibility for aircraft operators to provide details of the aggregate metering uncertainty for their entire operations. This uncertainty range is estimated to fall in to a range of ±1.5% for all operators, which would suggest that the application of tiers will not be necessary for aircraft operators with respect to the quantification of emissions. As long as operators archive fuel meter calibration certificates, and calibrate fuel meters in accordance with manufacturers' instructions, the issue of tiers and the need to categorise emissions volumes for fuel consumption data may be irrelevant.

For the demonstration of an aggregate uncertainty range for a number of fuel meters for a given aircraft operator the error propagation law (as mentioned in the MRG 2007 Decision) could be applied in the following way:

"The overall uncertainty U_o is calculated as the square root of the sum of individual weighted uncertainties squared divided by the sum of the weighting factors.

$$U_o = \sqrt{((U_1.X_1)^2 + (U_2.X_2)^2 + \ldots + (U_n.X_n)^2) / (X_1 + X_2 + \ldots + X_n)}$$

U_n = uncertainty of meter n

X_n = flow through meter n"

This formula is meant to apply to meters associated with different processes as part of an installation. In the case of aviation it would be the instruments of the different aircraft (or fuel suppliers).

Question 41	**Do you agree with the proposed methodology to account for measurement uncertainty in a given aircraft operator?**
Question 42	**Is listing fuel metering uncertainties that apply to an entire aircraft operator appropriate? If not, why?**
Question 43	**Will it be possible to demonstrate an aggregate uncertainty range for a range of fuel meters through the error propagation law? If not, why? If yes, how?**
Question 44	**Should it be allowed to carry out monitoring without uncertainty assessment in the two pre-trading years?**

4.3.9 Templates for annual emissions monitoring plan and report

The draft templates proposed for providing information about the annual emissions monitoring plan and report are intended to show the data needs for reporting, but they will undergo revision after the consultation. Specifically, more linkable database software such as XML based formats will be considered.

Question 45	**Do the proposed annual emissions templates fit your purpose?**
Question 46	**Are there other parameters that should be covered in the annual emissions templates? If so, which?**
Question 47	**Can the proposed annual emissions templates be completed with your existing data records?**
Question 48	**Is there a need to link annual emissions templates to special software/databases? If yes, which ones?**

5 Verification

Under the EU ETS, the verification of emissions is completed by accredited third party verifiers. Similar to financial auditors, these verifiers will complete verification opinions based on compliance with operator monitoring plans approved by the relevant Competent Authorities.

There are three key issues that might need further guidance regarding the verification process: completeness, materiality and accreditation.

5.1 Completeness

According to the current Aviation legislation after the European Parliament second reading, the verifier shall in particular ascertain that all flights falling within an aviation activity listed in Annex I have been taken into account.

Completeness of data would be ensured by the same processes as are enforced and acceptable within the existing EU-ETS requirements for stationary installations. All operators would be required to have in place Quality Assurance and Quality Control procedures which identify the sources and the activity data. Besides, the retention of data records for 10 years will be required to demonstrate compliance. Verification of completeness will then be achieved through the sampling of this information and data and cross checking that against other internal record systems. In addition the EC has already recommended that Eurocontrol data (which includes all flight information) be requested by the operator in order that this may be a source of cross checking by the verifier. The verifier has to be given access to the operator's complete data relevant for monitoring and reporting as defined in the monitoring plan, in order to safeguard a reasonable level of assurance over the whole audit trail. Usually the verifier will then select and scrutinize a sample of the data.

Question 45	**Will the existing records of the aircraft operators, cross-checked with Eurocontrol data be enough to ensure completeness of flight and emission data?**
Question 46	**Will the use of the ICAO designator ensure that emissions data is not duplicated for aircrafts operated by different operators? If not, how could it be ensured that all flights within the EU ETS are taken into account for MRV by exactly one operator?**
Question 47	**Will additional checks be required to ensure completeness?**

5.2 Materiality

As defined in the current MRV Guidelines, "materiality level" means the quantitative threshold or cut-off point for errors, misstatements, omissions and non-conformities to be used to determine the appropriate verification opinion on the emission data reported in the annual emissions report.

For aviation, the proposed materiality threshold will conform to the industry standard of 2% for larger operators (Category C), and 5% for smaller operators (Categories A and B).

Question 48	**Do you agree with the proposed materiality levels?**
Question 49	**Do you think additional guidance should be provided to verifiers outlining a recommended data sampling procedure, such as one which would consider the appropriate temporal and spatial data representation? Or should verifiers be allowed to apply their own professional judgement as part of verification?**
Question 50	**Do you think that the proposed templates for the monitoring plan and annual reporting will help reduce the verification risk? Please explain.**

5.2.1 Accreditation

To be able to verify annual emission and tonne-kilometre data of the aviation sector, verifiers will need to be accredited by an accreditation body. This accreditation would show their competence and independence to carry out verification of aircraft operator emissions in accordance with the specified requirements.

The verification of stationary installations requires a site visit in order to confirm that the installation's monitoring is compliant with the approved monitoring plan. As aviation emissions occur across national borders, and as data is generated at each airport along the route of the aircraft, this will clearly not be possible. In the context of aviation, a visit to the offices where flight information is collated and stored will constitute a site visit. It is left to the verifier to determine if a site visit is not required, but such a visit should be assumed to be required unless deemed otherwise. One of the Member States will be responsible for the administration of each operator under the EU ETS. Thus the questions arise: should the same Member State be responsible for the accreditation and surveillance of the verifier, and where should the verification take place.

Question 51	**What are the specific competencies needed by a verifier active in the aviation sector additional to competencies for verifiers of stationary installations?**
Question 52	**Regarding extra-EU operators or EU operators who operate outside the EU, where will verification best take place in order to be cost efficient while still ensuring a reasonable level of assurance?**
Question 53	**If verification needs to take place outside the EU or outside the MS where an aircraft operator has been assigned, which of these would be the most suitable approach: 1) Each operator is verified by a verifier accredited in the country where it has been assigned; 2) there is a minimum requirement that the verifier acts under the accreditation of an EU accreditation body?**

6 Summary of questions

Question 1 Should there be common dates, set by the Commission, across all MS for the submission of tonne-kilometre monitoring plans to Competent Authorities, and for the approval of tonne-kilometre monitoring plans, or should the deadlines be left open for each Competent Authority to set to reflect their own circumstances?

Question 2 If common dates should be set by the Commission for the submission of tonne-kilometre monitoring plans to Competent Authorities, and for the approval of tonne-kilometre monitoring plans, do you agree with the timing proposed in this document?

Question 3 Should there be common dates, set by the Commission, across all MS for the submission of annual emissions monitoring plans to Competent Authorities, and for the approval of emission monitoring plans, or should the deadlines be left open for each Competent Authority to set to reflect their own circumstances?

Question 4 If common dates should be set by the Commission for the submission of annual emissions monitoring plans to Competent Authorities, and for the approval of emission monitoring plans, are those proposed in this document suitable?

Question 5 How should it be ensured that maximum benefit is derived from experiences learned during the pre-trading scheme monitoring period?

Question 6 Do you think that the submission of an updated monitoring plan before the start of the first trading period in 2012 will contribute to improve the quality of monitoring and reporting in the emissions trading period? If yes, how and in what areas of the monitoring plan?

Question 7 In which circumstances would the ICAO designator not be considered as the appropriate way to define the aircraft operator?

Question 8 What evidence should be required to ensure that applications to the special reserve refer to additional or new activity?

Question 9 Is listing flight routes in a monitoring plan for tonne kilometre data sufficient to gauge potential expansion of aircraft operators? How could it be demonstrated that this growth is not a continuation of an aviation activity previously performed by another aircraft operator?

Question 10 Do you consider a standard source of GCD data from Eurocontrol as the most appropriate approach for your needs? If not, explain why and detail what would be the preferred approach for your specific situation.

Question 11 If an aircraft operator chooses to use measurements of actual passenger weight, what type of weighing instruments are used in the industry and what are their typical levels of uncertainty across a whole year?

Question 12 For non commercial operators, where freight and mail mass data are not required by JAR-OPS/EU-OPS what type of weighting instruments are used for weighing freight and mail mass and what are their typical levels of uncertainty across a whole year?

Question 13 Do you consider that an uncertainty assessment should be required for tonne-kilometre data? If so, in which cases? and what would be the added value of this?

Question 14 For competent authorities, do the proposed tonne-kilometre templates fit your purpose?

Question 15 For operators, do the proposed tonne-kilometre templates fit your purpose?

Question 16 Are there other parameters that should be covered in the tonne-kilometre templates? If so, which?

Question 17 Is there a need to link to the content of the templates to special software/databases? If yes, which ones?

Question 18 Do you think that different levels of accuracy (or uncertainty) in monitoring and reporting of annual emissions should be required for different aircraft operators according to pre-defined categories of operators per annual emissions?

Question 19 If yes, what are the reasons and what would be the benefit of such differentiation?

Question 20 Do you consider minor and de minimis sources relevant in the context of the aviation sector? In which situations?

Question 21 If you consider that minor and de minimis sources warrant consideration in the context of the aviation sector, would the thresholds considered for stationary installations be applicable and for which kinds of flights not falling under the current exclusions?

Question 22 Is there a standard level of uncertainty for fuel metering in the industry, which could be proved through calibration certificates? Please provide details of sources proving the level of uncertainty in fuel metering in the aviation industry (eg. according to metering devices, suppliers specifications or to safety requirements)

Question 23 Is there any specific requirement for the use of standard fuel density factors in the industry?

Question 24 Should the MRV guidelines for aviation explicitly mention (temperature dependent) standard density conversion factors to be used in fuel measurement? In this case, which would be the most appropriate standard density values applied to aviation fuels and why?

Question 25 Should density measurement be required every time instead of using standard values? What would be the benefit of this?

Question 26 Are there any barriers that prevent some aircraft operators from gathering data on actual fuel consumption per flight? Could you please describe the situations where this data would not be available?

Question 27 Could aircraft operators not able to provide information on fuel consumption per flight provide instead total annual fuel consumption figures for their operations covered by the EU ETS? In this case, what estimation method could be used to ensure that fuel consumption covered by the EU ETS is not underestimated?

Question 28 The MRG 2007 Decision requires that all information needed to reconstruct reported emissions data, including all fuel consumption data, should be kept for at

least 10 years. Would there be any obstacles to data storage for this period? How could these obstacles be overcome?

Question 29 Do you want to have the option of using specific values for NCV to define the energy content of aviation fuels or would you prefer standard values for everyone?

Question 30 If standard values are used would the IPCC default values for NCV be appropriate? If not, why not?

Question 31 How accurate in practice is the NCV data provided by fuel suppliers?

Question 32 If none of the above options is appropriate for your specific situation, which would be your preferred method to provide accurate NCV for aviation fuels?

Question 33 Do you want to have the option of using specific values for emission factors of aviation fuels or would you prefer standard values for everyone?

Question 34 Would IPCC default emission factors expressed as tCO_2/TJ be considered as an appropriate standard value for all aircraft operators? If not, please explain why.

Question 35 Are there any barriers or concerns for aircraft operators developing activity-specific emission factors expressed as tCO_2/TJ?

Question 36 Could standard emission factors expressed as tCO_2 per tonne of fuel provide a more accurate measurement of emissions at lower costs? Could you provide official references for these standard emission factors?

Question 37 Which situations could you consider that would require the use of a fall-back approach?

Question 38 What would be the minimum requirements for the approval of fall-back approaches by the Competent Authority?

Question 39 Is special treatment of bio-fuels necessary, or can the emission factor and NCV of bio-fuel blends be satisfactorily determined using the above requirements for standard fuels?

Question 40 Would fuel suppliers be able to provide the percentage biogenic carbon content for blended fuels determined using international or national standards?

Question 41 Do you agree with the proposed methodology to account for measurement uncertainty in a given aircraft operator?

Question 42 Is listing fuel metering uncertainties that apply to an entire aircraft operator appropriate? If not, why?

Question 43 Will it be possible to demonstrate an aggregate uncertainty range for a range of fuel meters through the error propagation law? If not, why? If yes, how?

Question 44 Should it be allowed to carry out monitoring without uncertainty assessment in the two pre-trading years?

Question 45 Do the proposed annual emissions templates fit your purpose?

Question 46 Are there other parameters that should be covered in the annual emissions templates? If so, which?

Question 47 Can the proposed annual emissions templates be completed with your existing data records?

Question 48 Is there a need to link annual emissions templates to special software/databases? If yes, which ones?

Question 45 Will the existing records of the aircraft operators, cross-checked with Eurocontrol data be enough to ensure completeness of flight and emission data?

Question 46 Will the use of the ICAO designator ensure that emissions data is not duplicated for aircrafts operated by different operators? If not, how could it be ensured that all flights within the EU ETS are taken into account for MRV by exactly one operator?

Question 47 Will additional checks be required to ensure completeness?

Question 48 Do you agree with the proposed materiality levels?

Question 49 Do you think additional guidance should be provided to verifiers outlining a recommended data sampling procedure, such as one which would consider the appropriate temporal and spatial data representation? Or should verifiers be allowed to apply their own professional judgement as part of verification?

Question 50 Do you think that the proposed templates for the monitoring plan and annual reporting will help reduce the verification risk? Please explain.

Question 51 What are the specific competencies needed by a verifier active in the aviation sector additional to competencies for verifiers of stationary installations?

Question 52 Regarding extra-EU operators or EU operators who operate outside the EU, where will verification best take place in order to be cost efficient while still ensuring a reasonable level of assurance?

Question 53 If verification needs to take place outside the EU or outside the MS where an aircraft operator has been assigned, which of these would be the most suitable approach: 1) Each operator is verified by a verifier accredited in the country where it has been assigned; 2) there is a minimum requirement that the verifier acts under the accreditation of an EU accreditation body?

7 Appendix I: main features of the amendment of Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community[11]

Topic and legal reference	Description
Covered Activities **(Annex I)**	Flights which depart from or arrive in an aerodrome situated in the territory of a Member State to which the Treaty applies (Annex I). Activities include (but are not limited to) commercial passenger and freight carriers, business aviation, and other general aviation activities.
Exclusions **(Annex I)**	a) flights performed exclusively for the transport, on official mission, of a reigning Monarch and his immediate family, Heads of State, Heads of Government and Government Ministers, of a country other than a Member State, where this is substantiated by an appropriate status indicator in the flight plan; b) military flights performed by military aircraft and customs and police flights; c) flights related to search and rescue, fire-fighting flights, humanitarian flights and emergency medical service flights authorised by the appropriate competent authority; d) any flights performed exclusively under visual flight rules as defined in Annex 2 to the Chicago Convention; e) flights terminating at the aerodrome from which the aircraft has taken off and during which no intermediate landing has been made; f) training flights performed exclusively for the purpose of obtaining a licence, or a rating in the case of cockpit flight crew where this is substantiated by an appropriate remark in the flight plan provided that the flight does not serve for the transport of passengers and/or cargo or for the positioning or ferrying of the aircraft; g) flights performed exclusively for the purpose of scientific research or for the purpose of checking, testing or certifying aircraft or equipment whether airborne or ground-based; h) flights performed by aircraft with a certified maximum take-off mass of less than 5 700kg. i) flights performed in the framework of public service obligations imposed in accordance with Regulation (EEC) No 2408/92 on routes within outermost regions as defined in Article 299(2) of the Treaty or on routes where the capacity offered does not exceed 30 000 seats per year; and j) flights which, but for this point, would fall within this activity, performed by a

[11] Position of the European Parliament adopted at second reading on 8 July 2008

Topic and legal reference	Description
	commercial air transport operator operating either: - fewer than 243 flights per period for three consecutive four-month periods; or - flights with total annual emissions lower than 10 000 tonnes per year. Flights performed exclusively for the transport, on official mission, of a reigning Monarch and his immediate family, Heads of State, Heads of Government and Government Ministers, of an EU Member State may not be excluded under this point.
Covered Greenhouse Gases **(Annex I)**	Carbon dioxide
Responsibility for GHG emissions **(Article 3)**	Aircraft operators, defined as the person who operates an aircraft at the time it performs an aviation activity listed in Annex I or, where that person is not known or is not identified by the owner of the aircraft, the owner of the aircraft
Compliance periods **(Article 3c)**	1. Period from 1 January 2012 to 31 December 2012 2. Periods of eight years beginning on 1 January 2013 (as amended in the ETS review
Compliance **(Article 12)**	Administering Member States shall ensure that, by 30 April each year, each aircraft operator surrenders a number of allowances equal to the total emissions during the preceding calendar year from aviation activities listed in Annex I for which it is the aircraft operator, as verified in accordance with Article 15.
Allocation and issue of allowances to aircraft operators **(Article 3e)**	For each period referred to in Article 3c, each aircraft operator may apply for an allocation of allowances that are to be allocated free of charge. An application may be made by submitting to the competent authority in the administering Member State verified tonne-kilometre data for the aviation activities listed in Annex I performed by that aircraft operator for the monitoring year. For the purposes of this Article, the monitoring year shall be the calendar year ending 24 months before the start of each five-year compliance periods or 2010 for the period from 1 Jamuary 2012 to 31 December 2012. Applications shall be made at least 21 months before the start of each five-year period or for the period from from 1 Jamuary 2012 to 31 December 2012, by 31 March 2011.
Benchmarking **(Article 3e)**	A benchmark will be used to allocate some allowances free of charge to aircraft operators whose applications were submitted to the Commission in accordance with paragraph 2 of Article 3e. The benchmark will be expressed as allowances per tonne-kilometre and shall be calculated by dividing the number of allowances to be allocated free of charge by the sum of the tonne-kilometre data included in applications submitted to the Commission in accordance with paragraph 2 or Article 3e.
Special reserve for certain aircraft	For each 5 year period referred to in Article 3c 3% of the total quantity of allowances to be allocated shall be set aside in a special reserve for aircraft

Topic and legal reference	Description
operators **(Article 3f)**	operators: (a) who start performing an aviation activity falling within Annex I after the monitoring year for which tonne-km data was submitted under Article 3e (1) in respect for a 5 year period referred to in Article 3c(2); or (b) whose tonne-kilometre data increases by an average of more than 18% annually between the monitoring year for which tonne-kilometre data was submitted under Article 3e (1) in respect of a period referred to in Article 3c (2) and the second calendar year of that period and whose activity under point (a) or additional activity under point (b) is not in whole or in part a continuation of an aviation activity previously performed by another aircraft operator. Applications for a free allocation of allowancs from the special reserve must include, among others, verified tonne-kilometre data.
Monitoring periods **(Article 14, paragraph 3)**	Member States shall ensure that each operator or aircraft operator reports the emissions during each calendar year from the installation or from 1 January 2010, the aircraft, which it operates to the competent authority after the end of that year in accordance with the guidelines.
Monitoring and reporting plans **(Article 3g)**	The administering Member State shall ensure that each aircraft operator submits to the competent authority in that State a monitoring plan setting out measures to monitor and report emissions and tonne-kilometre data for the purpose of an application under Article 3e and that such plans are approved by the competent authority in accordance with the guidelines adopted pursuant to Article 14.
Verification **(Article 15)**	Member States shall ensure that the reports submitted by operators and aircraft operators pursuant to Article 14 (3) are verified in accordance with the criteria set out in Annex V and any detailed provisions adopted by the Commission in accordance with this Article, and that the competent authority is informed thereof. The Commission may adopt detailed provisions for the verification of reports submitted by aircraft operators pursuant to Article 14 (3) and applications under Articles 3e and 3f, including the verification procedures to be used by verifiers.