European Commission

MRV Guidance for aviation in the EU ETS

Annual Emissions

Draft Technical Report

September 2008










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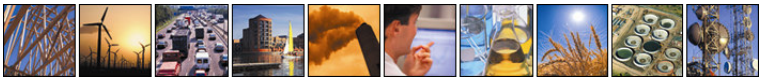

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MRV Guidance for aviation in the EU ETS

Draft Technical Report

September 2008

Entec UK Limited

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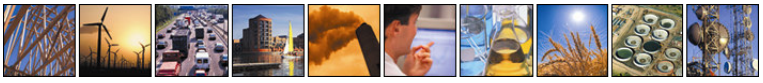
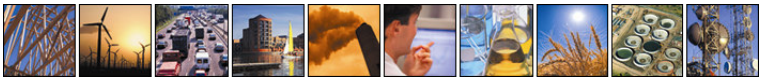


Executive Summary

This report has been produced to provide a technical evidence base to support the European Commission in developing guidelines for the monitoring, reporting and verification (MRV) of annual emissions data by aircraft operators in the European Union Emissions Trading Scheme (EU ETS). The report outlines key technical issues, suggests preferred technical solutions and supports the guidelines found in the proposed draft Annex XV to the Monitoring and Reporting Guidelines 2007 and other proposed changes to the same report. The final form of MRV guidance will depend on public consultation and more targeted consultation with key stakeholders.

This report assumes that the current proposals are in force. However, the reader should be aware that at the time of writing, the legislation was still under negotiation in the codecision procedure, so any future changes should be taken into account when reading this report. The European Parliament's position on the proposed amendment to Directive 2003/87/EC to include aviation in the EU ETS, adopted on 8 July 2008, is the legislative basis for recommendations outlined in this report. This document is referenced accordingly.



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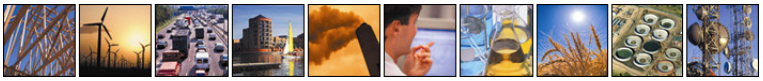
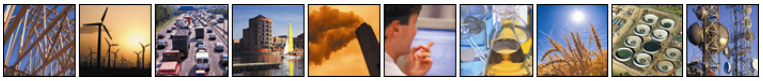




1. Introduction

1.1 Project overview

On 20 December 2006 the European Commission adopted a proposal for a Directive[1] to amend Directive 2003/87/EC[2] (the EU ETS Directive) so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community. The Commission's proposal is subject to the codecision procedure. The Council has already sent its common position to the European Parliament, which has approved with amendments the proposed Directive in 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 and therefore the adopted text will soon become a Directive and enter into force.

Aircraft operators would then be required to surrender sufficient allowances to account for their verified emissions. Under the scheme, aircraft operators will also be able to apply for free allocations of allowances at the start of the reporting period by submitting verified activity data for a baseline year.

The proposed Directive is subject to codecision by the European Parliament and the Council and has not yet been finally approved. However, in anticipation of its adoption, the Commission is preparing for its implementation and the aim of this project is to assist this.

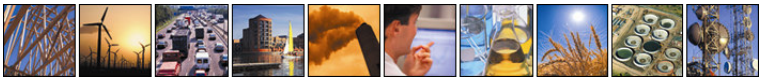
Monitoring, reporting and verification (MRV) are crucial to the functioning of the EU ETS and key to its environmental effectiveness. The objectives of the study are the following:

- To provide the Commission with assistance in the development of monitoring, reporting and verification guidelines for aviation's inclusion in the EU ETS;

[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



- To identify any necessary changes to the general monitoring and reporting guidelines[4] applying to all sectors included in the EU ETS from 2008 and to propose options for additional draft guidelines specific to aviation activities;
- To provide for an open consultation phase.
- As set out above, there are two elements to monitoring, reporting and verification for aviation's inclusion in the EU ETS.
  - MRV of tonne-kilometre data – When aircraft operators apply for their allowances, they will have to submit verified tonne-kilometre data for their aviation activities for a reference year;
  - MRV of annual emissions – Throughout each compliance year, aircraft operators will have to monitor their emissions and then submit a verified emissions report at the end of the year.

This report considers the issues surrounding the MRV of **annual emissions data**. A separate report considers the MRV of tonne-kilometre data.

1.2 Structure of the report

The report begins by setting out the context for MRV and the requirements for aircraft operators, Member States, competent authorities (CAs) and the European Commission. It then examines the more technical aspects of MRV before considering the costs of setting-up and operating the MRV process.

The report is split into sections covering each of these issues as follows:

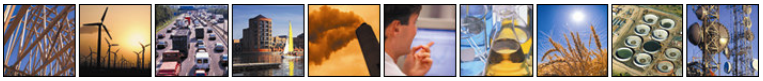
- Legislative requirements – setting out what is or will be required;
- Administrative process – a high level consideration of the process for monitoring, reporting and verifying annual emissions;
- Monitoring and reporting – the details of how emissions should be monitored and reported;
- Control and verification – how monitoring and reporting should be controlled and verified;
- Administrative costs – estimates of the costs of monitoring and reporting.

1.3 Overview of approach

Many of the MRV requirements are already specified in the existing legislation (namely the EU ETS Directive[5] and the Monitoring and Reporting Decision[6]) and the proposed amendments. Therefore in order to avoid duplication

[4] 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.

[5] Directive 2003/87/EC.



and to assist participants in the scheme, this report focuses on areas where additional EU-level guidance is needed[7]. The overall approach is, as far as possible, to apply the existing monitoring and reporting (MR) Decision to the aviation sector, taking into account the specific MRV requirements included in the aviation proposal.

Based on this premise, the following approach was taken:

- **Overview of the current approach**. Description of existing MRV requirements as established by the MRG 2007 Decision and the EU ETS Directive.
- **Applicability to aviation**. Each element of the MRG 2007 Decision was considered to confirm its applicability to the sector (areas that can be applied directly to aviation are listed in **bold**) and issues were highlighted where the existing guidance was considered insufficient or inappropriate (areas that are considered further in this report are listed in *italic*);
- **Issues for guidance**. A range of options were developed for resolving each of these 'issues for further guidance'. These were then evaluated and a recommended technical solution was provided (recommended changes or additions to the MRG 2007 Decision are listed in **bold**). Based on this, specific changes to the existing MRG 2007 Decision and any additional Decisions were then identified.

The report is structured to reflect this approach.

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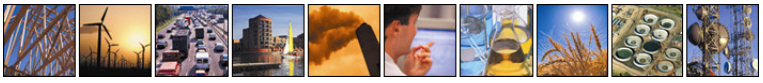
[6] Commission Decision 2007/589/EC.

[7] There are other areas where aircraft operators will require guidance, however some of these are more appropriately handled at Member State level. The focus of this report is on EU-level guidance where this is appropriate and within the EU's competence.



2. Legislative requirements

2.1 Overview

The Commission's proposal is not a stand-alone Directive, it amends existing legislation. The legislative requirements for aviation MRV in the EU ETS are set out in the following places:

- **Directive 2003/87/EC** – The existing European Union Emissions Trading Scheme Directive (the EU ETS Directive);
- **Commission Decision 2007/589/EC** – The Monitoring and Reporting Decision (the MRG 2007 Decision);
- **Commission Proposal COM(2006)818** – The proposed changes to the EU ETS Directive to include aviation activities (the aviation proposal);
- **Commission Proposal COM(2008)16** – The proposed changes to the EU ETS Directive announced following the review of the EU ETS (the EU ETS Review proposal).
- **Position of the European Parliament adopted at second reading on 8 July 2008** with a view to the adoption of Directive 2008/.../EC 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 2006/0304 (COD) – Approval with amendments of the proposed Directive after receiving the common position by the Council.

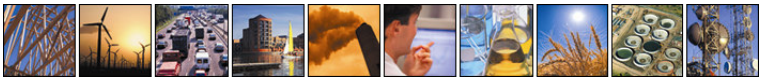
The EU ETS Directive and the MRG 2007 Decision are existing legislation, but the aviation proposal and the review proposal are still in the codecision process. This project therefore presents a challenge as the legislation, upon which it is based, is not yet finalised.

However, in order to progress, the report is based on the Commission's original proposals and takes into account the recent Position of the European Parliament adopted at second reading. It does not take into account any of the changes to the Review proposal. Clearly there is the potential for changes to be introduced to the aviation proposal throughout the codecision process and these should be taken into account when reading this report. Some of the potential changes are highlighted under section 2.4.

2.2 Existing MRV requirements

2.2.1 The EU ETS Directive

The EU ETS Directive sets out the rules and framework for the EU ETS as a whole. Article 14(1) of the EU ETS Directive required the Commission to adopt guidelines for monitoring and reporting. Articles 14(2) and 14(3) respectively require Member States to ensure that emissions are monitored and reported in accordance with the



guidelines. It also sets out the compliance cycle (i.e. how allowances are issued, emissions verified and allowances surrendered).

2.2.2 The MRG 2007 Decision

The MRG 2007 Decision fulfils the requirement of Article 14(1) above and its Annexes set out the guidelines for the monitoring and reporting of greenhouse gas emissions covered under the EU ETS Directive. The key principles of MRV are defined in the MRG 2007 Decision, as quoted in Box 1.

Box 1 Key principles of Monitoring, Reporting and Verification

Completeness. Monitoring and reporting for an installation shall cover all process and combustion emissions from all emission sources and source streams belonging to activities listed in Annex I to Directive 2003/87/EC and of all greenhouse gases specified in relation to those activities while avoiding double-counting.

Consistency. Monitored and reported emissions shall be comparable over time, using the same monitoring methodologies and data sets. Monitoring methodologies can be changed in accordance with the provisions of these Guidelines if the accuracy of the reported data is improved. Changes in monitoring methodologies shall be subject to approval from the competent authority and shall be fully documented in accordance with these guidelines.

Transparency. Monitoring data, including assumptions, references, activity data, emission factors, oxidation factors and conversion factors shall be obtained, recorded, compiled, analysed and documented in a manner that enables the reproduction of the determination of emissions by the verifier and the competent authority.

Trueness. It shall be ensured that the emission determination is systematically neither over nor under true emissions. Sources of uncertainties shall be identified and reduced as far as practicable. Due diligence shall be exercised to ensure that the calculation and measurement of emissions exhibit highest achievable accuracy. The operator shall enable reasonable assurance of the integrity of reported emissions to be determined. Emissions shall be determined using the appropriate monitoring methodologies set out in these Guidelines. All metering or other testing equipment used to report monitoring data shall be appropriately applied, maintained and calibrated, and checked. Spreadsheets and other tools used to store and manipulate monitoring data shall be free from error. Reported emissions and related disclosures shall be free from material misstatement, avoid bias in the selection and presentation of information, and provide a credible and balanced account of an installation's emissions.

Cost effectiveness. In selecting a monitoring methodology, the improvements from greater accuracy shall be balanced against the additional costs. Hence, monitoring and reporting of emissions shall aim for the highest achievable accuracy, unless this is technically not feasible or will lead to unreasonably high costs. The monitoring methodology itself shall describe the instructions to the operator in a logical and simple manner, avoiding duplication of effort and taking into account the existing systems in place at the installation.

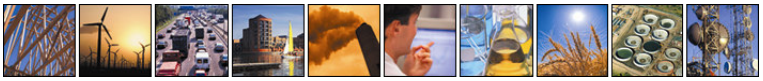
Faithfulness. A verified emissions report shall be capable of being depended upon by users to represent faithfully that which it either purports to represent or could reasonably be expected to represent.

Improvement of performance in monitoring and reporting emissions. The process of verifying the emission reports shall be an effective and reliable tool in its support of quality assurance and quality control procedures, providing information upon which an operator can act to improve its performance in monitoring and reporting emissions.

From Annex I of the Monitoring and Reporting Decision (2007/589/EC)

The Annexes are split into general guidelines (Annex I) followed by more detailed specific requirements for different activities in Annexes II to XII. 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 aim of the MRG 2007 Decision is to ensure that emissions are reported in a consistent manner throughout the EU and that the verified emissions reports submitted by operators are free from material misstatement



(misrepresentations, errors and omissions). This is vital to ensure the integrity and public confidence required for the Scheme to operate effectively and achieve real emissions reductions.

2.3 Future requirements

2.3.1 The aviation proposal

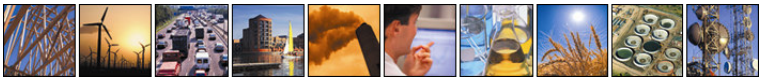
Subject to ongoing amendments, the Commission proposal COM(2006)818 (the aviation proposal) has been a key document in outlining aviation's inclusion into the EU ETS. The areas of the proposal that are relevant to MRV are the amendments to Annexes I, IV and V of the EU ETS Directive, which refer respectively to: the coverage of the scheme; monitoring and reporting principles; and verification criteria. The position of the European Parliament adopted on the 8th of July 2008 approving with amendments the proposed Directive sets the latest requirements for MRV of aviation emissions.

Coverage

Under the position of the European Parliament adopted at second reading all flights which arrive or depart from an aerodrome situated in the territory of a Member State to which the Treaty applies shall be included from 1 January 2012.

Only carbon dioxide emissions will be included in the scheme.

Certain flights are excluded from the scheme and therefore the emissions data for these flights must **not** be included in the annual emissions report submitted by the aircraft operators. These include:



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 5700kg;

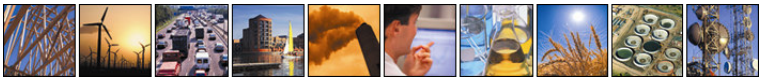
i) flights performed in the framework of public service obligations imposed in accordance with Regulation (EEC) No 2408/92 on routes within outermost regions as defined in Article 299(2) of the Treaty or on routes where the capacity offered does not exceed 30 000 seats per year; and

j) flights which, but for this point, would fall within this activity, performed by a 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.



Monitoring and reporting

The aviation proposal would amend Annex IV of the EU ETS Directive (referring to monitoring and reporting principles) to set out how emissions from aviation should be calculated and reported.

Verification

Finally, the aviation proposal would amend Annex V of the EU ETS Directive (referring to verification criteria) to include aviation activities and in particular to specify that verifiers shall check that all covered flights have been taken into account and that no excluded flights are included in the emissions data submitted by operators.

2.3.2 The EU ETS Review proposal

On 23 January 2008, the Commission adopted a proposal to amend the EU ETS Directive following its Review. 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 MRG 2007 Decision;
- A proposed Regulation on Verification to provide a more solid legal basis for verification and accreditation;
- Further improvements to verification through amendments to Annexes IV and V of the EU ETS Directive.

None of these proposed changes necessarily affect the nature of this project and any recommendations made through this project can be integrated into these Regulations if necessary.

2.4 Form of guidance

The existing legislation, as set out above, would be applied to the aviation sector when it joins the scheme. The most suitable vehicle for providing further guidance is the MRG 2007 Decision. Therefore, where there are issues and guidance is required, amendments or additions will be made through the MRG 2007 Decision.

As highlighted above, the codecision process may change the aviation proposal, which may have further consequences for the MRV guidance (some of these potential changes are highlighted below to provide context). The most recent changes approved by the European Parliament have been considered in this report.

The figure below illustrates the interaction between the existing legislation and the proposals. It highlights where the aviation MRV guidance fits in.

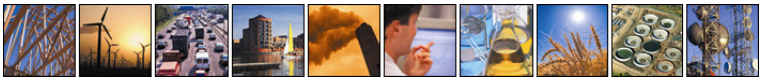
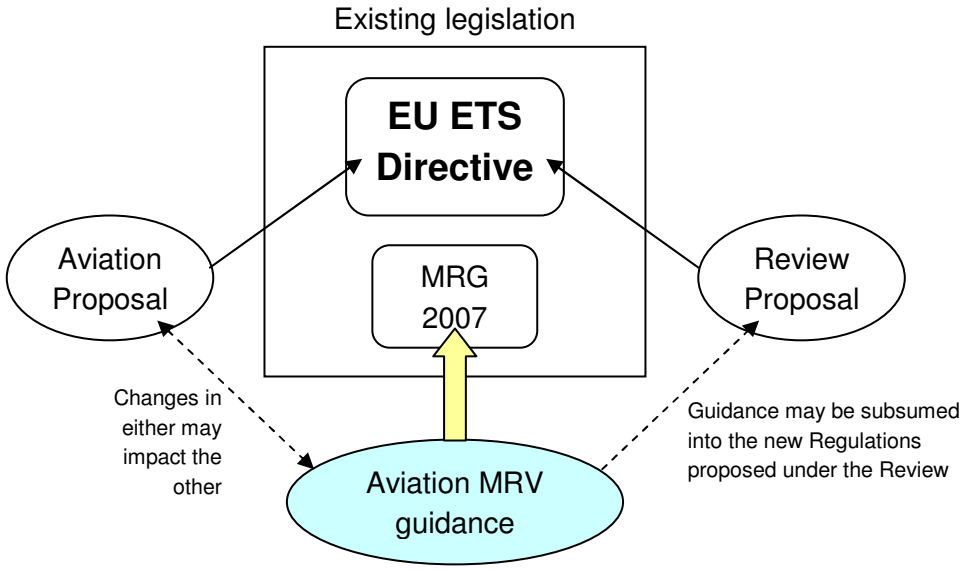
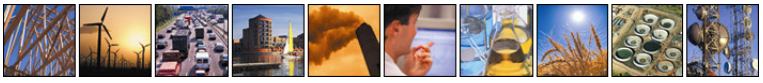


Figure 2.1 Form of guidance



The recommended guidance in this report is therefore in 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). It will not suggest amendments to the aviation proposal, but where appropriate will highlight where such amendments may be required.



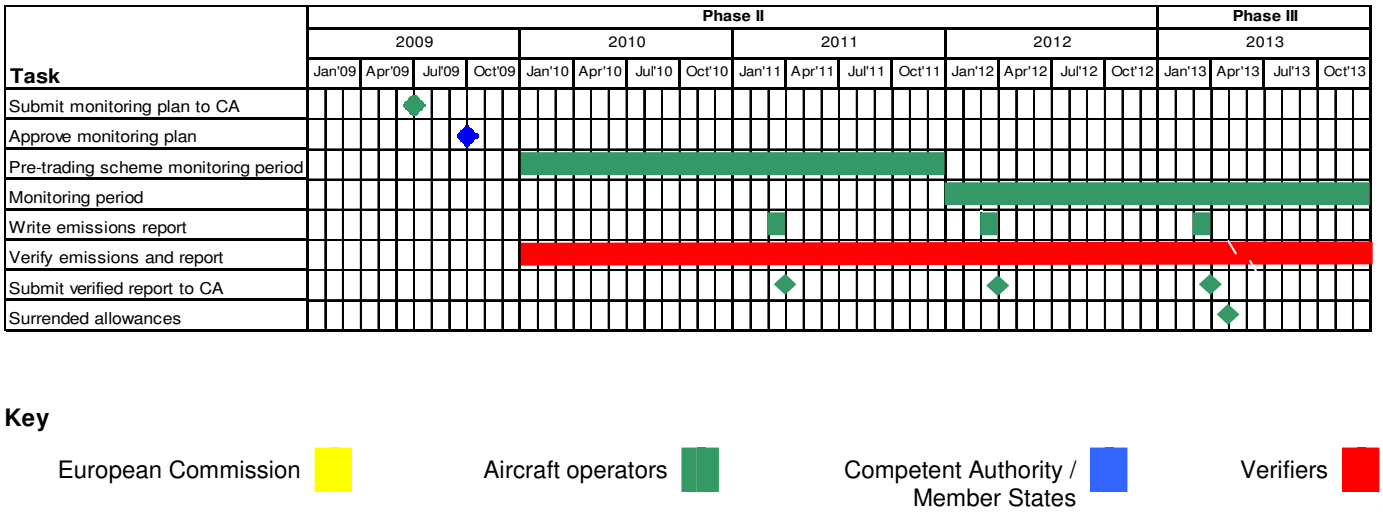
3. Administrative process

This section covers the high-level administrative process required. It sets out the current requirements and considers how applicable the existing MRG 2007 Decision is to inclusion of aviation, highlighting issues where further guidance is required. It then goes into more detail for each of these highlighted issues, identifying the issue, options for resolving it and recommended technical solutions.

3.1 Overview of requirements

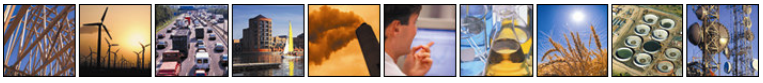
This section outlines the administrative process for the monitoring, reporting and verification of annual emissions. Annex I of the existing MRG 2007 Decision sets out the specific administrative processes for the current approach, and the proposed Aviation Directive, considering the latest Parliament position, sets the basis for the monitoring and reporting periods for aviation.

Figure 3.1 Monitoring, reporting and verification of emissions from aviation



Stage 1 – Submission and approval of Monitoring plan (MP)

The first step of the process is for aircraft operators to complete a monitoring plan (MP) describing how they intend to monitor and report fuel consumption and emissions in accordance with the EU ETS Directive and any guidelines and standard formats (as developed through this process). This plan must be submitted by the aircraft operator to the administering Member State CA. The CA then assesses and approves the plan before the start of the reporting period. It is suggested that the monitoring plan is submitted by the aircraft operator approximately six months before the start of the monitoring period, so as to ensure that Competent Authorities have enough time to approve it



before the monitoring period starts. The aircraft operators could have the possibility to send an updated Monitoring Plan before the start of the trading period in 2012, so as to ensure higher quality of the monitoring plans following lessons learnt in the "pre-trading" period.

Stage 2 – Monitoring period

The aircraft operator must then monitor and report emissions in accordance with the Monitoring Plan from the start of the first reporting year (1 January 2010). Aircraft operators will need to monitor and report their emissions during two "pre-trading" years: 2010 and 2011 before the start of the first trading period in 2012.

Stage 3 – Reporting and verification

After the end of each reporting year (31 December), aircraft operators must submit an emissions report for verification by an accredited external verifier. The verifier reviews records and calculations made by the operator to confirm that the monitoring was performed in accordance with the plan and the requirements of the MRG 2007 Decision and that the emissions reported are free from material misstatements. The operators will need to correct any misstatements found by the verifier before the verifier will issue their verification opinion and essentially 'confirm' the validity of the operator's emission report.

Once the verifier has issued an External Verification Report, the operator must then submit it to the MS competent authority by 31 March each year. The operator's emissions figure is entered into the registry and confirmed by the verifier.

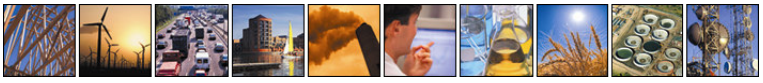
Stage 4 – Surrender allowances

Once the competent authority has acknowledged the verified emission report, the aircraft operator must then surrender the equivalent number of allowances by 30 April from their registry account. The first compliance period is year 2012 and the first surrender of allowances by the aircraft operators will happen by the 30th of April 2013. Allowances will need to be surrendered every subsequent year.

Penalties and enforcement action

If the verified emission report is not submitted on time, the operator's registry account is frozen and the operator may face enforcement action by the CA.

If insufficient allowances are surrendered by 30 April to cover the year's emissions (as set out in the verified emissions report), then the operator will face a penalty of €100 per allowance (tonne of CO_2) not surrendered and will still need to surrender the right number of allowances in due course.



3.2 Applicability of administrative processes set in the MRG 2007 Decision to aviation

Annex I of the MRG 2007 Decision sets out the current administrative requirements and is therefore the basis of this analysis. Each section within Annex I that is relevant to the administrative process for aircraft operators is assessed for its applicability to the sector.

3.2.1 Definitions

The current definitions described in section 2 of Annex I of the MRG 2007 Decision are directly applicable to aviation, with only minor alterations to selected definitions as outlined below.

References to 'operator' need to be changed to read 'operator or aircraft operator'

1. 'aircraft operator' means the person who operates an aircraft at the time it performs an aviation activity listed in Annex I or, where the operator is not known or is not identified by the owner of the aircraft, the owner of the aircraft. The ICAO designator should be used to identify the operator wherever possible (proposed addition based on discussion in section 5.1);

flight' means an activity listed in Annex I as 'operation of an aircraft from take-off to its next landing', as defined by ICAO. Thus take-off is the aerodrome of departure, and next landing is the aerodrome of arrival;

1.(e) 'monitoring methodology': The text needs to include aircraft operators in the description, e.g. by adding "or aircraft operator";

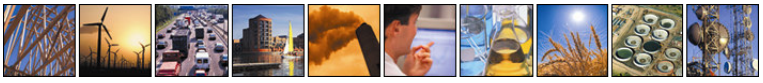
1.(f) 'monitoring plan': The text needs to include aircraft operators in the description, e.g. by adding "or aircraft operator" after "installation";

4.(a) 'unreasonable costs': The last sentence needs to include aircraft operators in the description, e.g. by adding "or aircraft operators" after "installation" in both instances;

5.(e) 'reasonable assurance', (g) 'level of assurance', (h) 'non-conformity', (i) 'material non-conformity': All these definitions require small amendments to include aircraft operators in the descriptions, e.g. by adding "or aircraft operator".

Definitions 1(c) and 1(d) refer to 'emission source' and 'source stream' respectively. These terms have been defined with stationary installations in mind, and it is not clear how these should be applied to aviation.

- **Minor changes to some of the definitions are required to ensure that they also apply to aviation**



► **Thus far, we have proposed using the term emissions source to refer to emissions from aircraft. Source stream refers to the fuel type combusted in any given aircraft. This is reflected in the proposed monitoring and reporting plan.**

3.2.2 Monitoring and Reporting Principles

The current monitoring and reporting principles described in section 3 of the MRG 2007 Decision are directly applicable to aviation, with only minor alterations as outlined below.

Trueness. The last sentence needs to include aircraft operators in the description, e.g. by replacing "installation's" with "installation's or aircraft operator's".

Cost effectiveness. The last sentence needs to include aircraft operators' systems in the description, e.g. by replacing "in place at the installation" with "in place at the installation or used by aircraft operators".

► **The MR principles can be applied to aviation with a few minor amendments**

3.2.3 Monitoring Plan

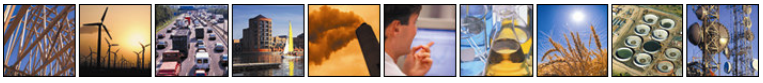
Section 4.3 of Annex I of the MRG 2007 Decision sets out the requirements for Monitoring Plans (MP) as detailed below.

Main requirements

Paragraph 1 references the relevant Article in the EU ETS Directive. This will need to be updated to reflect the proposal for a Monitoring Plan for aircraft operators (Article 3d(b) in the proposed aviation Directive.

► **Section 4.3 paragraph 1 needs to be updated to make reference to the requirements in the proposed aviation Directive for a monitoring plan for aircraft operators**

Paragraph 2 requires the monitoring methodology to be approved by the CA and for the methodology to be specified under the conditions of the permit or in general binding rules.



The first half of this paragraph (relating to CA approval) will apply to aircraft operators. However, the second part is not suitable for aviation as they would have no requirement for a greenhouse gas permit. The current text can remain as it does not explicitly refer to aircraft operators.

CA Approval

Paragraph 3 requires competent authorities to check and approve the monitoring plan before the start of the reporting period and after any substantial changes to the monitoring methodology (substantial changes are defined in Paragraph 6).

Paragraph 7 requires operators to notify the CA of all other changes and proposed changes in monitoring methodology or the underlying data sets after operators become aware of them. Paragraph 8 requires operators to clearly state, justify and fully document changes to the monitoring plan.

Overall, the same approach to approval, notification and documentation should be applied to aviation in order to be consistent with the rest of the scheme. Therefore, where this chapter refers to "installations" it should refer to "installations or aircraft operators"

- **Requirements for CA approval should remain the same**
- **Requirements for notification and documentation of changes should remain the same**

However, there are no specific deadlines for submitting plans to CAs to allow them sufficient time for the approval process. To ensure fair and consistent treatment of aircraft operators and enable sufficient time for the CA approval process options for further guidance are considered below using the aviation proposal's timetable.

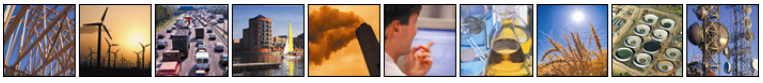
- *New guidance is required on the timing of submission of Monitoring Plans*

Contents of Monitoring Plan

Paragraph 4 sets out the contents of the monitoring plan (for most installations – special derogations for installations with low emissions are set out in Section 16 of the MRG 2007 Decision).

These are aimed at stationary installations and are not totally applicable to aviation. Minor changes are therefore needed for aviation as outlined below:

All instances of 'installation' need to be replaced with 'installation or aircraft operator';



(c) Add 'or for aircraft operators, a list of aircraft and source streams to be monitored for each activity carried out by the aircraft operator';

Redefine installation in the context of aviation (in the proposed Annex XV to the MRG);

Replace use of the term 'installation' in an aviation context with 'aircraft operator' (this could be outlined in the proposed XV to the MRG).

- **Contents of the Monitoring Plan should remain the same with minor amendments to refer to aircraft operators**

When changes are needed

Paragraphs 5 and 9 require operators to change their methodology if it improves accuracy (unless it is technically not feasible or would lead to unreasonably high costs) or if they are no longer in conformity. These principles can apply to aviation, therefore the text should be updated to refer to aircraft operators by changing 'installation' to 'installation or aircraft operator'.

- **Requirements for changes should remain the same. Section 4.3 paragraph 9 should be updated to refer to aircraft operators.**

Quality Assurance and Evaluation of Monitoring Plans

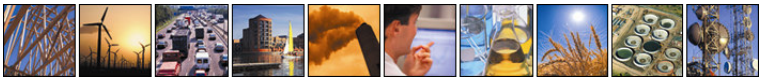
Paragraph 10 requires Member States to carry out an annual quality assurance and evaluation process to facilitate learning and improvement as well as ensure consistency. In line with the Monitoring and Reporting Principles, this should apply equally to aviation.

- **Requirements for annual quality assurance and evaluation should remain the same**

3.2.4 Change in operations

The EU ETS Directive and MRG 2007 Decision do not specify how closures and rationalised installations should be treated. Rules dealing with these situations have developed within Member States' own legislation and policies.

However, proposed aviation Directive recommends a more harmonised approach for aviation. The recitals of the latest European Parliament position state that "*aircraft operators that cease operations should continue to be issued with allowances until the end of the period for which free allowances have already been allocated*". Where an



aircraft operator is bought by another, the two operators will need to agree on how to handle allowances as part of the negotiations. Where appropriate, allowances can be transferred to the new operator.

This harmonises the way in which operators retain and can transfer allowances. However, it raises questions about how an operator informs the CA about ceasing operations and when they should surrender allowances for their final year of operation. Should operators be required to notify the CA and surrender allowances at the time of notification OR should allowances be surrendered on the usual surrender date?

- **Aircraft operators are allowed to retain their allowances if they cease to operate**
- **Guidance is needed on the procedures to follow when operators cease activities and/or fall below the threshold**
- **Given the legal weight of the monitoring plan as outlined in the latest position of the European Parliament adopted in July 2008, change in operations can be reflected therein. The monitoring plan for annual emissions can be used as the basis for updating changes in operations.**

3.3 Issues for guidance

Following on from the initial analysis, this section assesses in more detail the issues that have been highlighted in *italics* above. Firstly, the issue is explained, then a brief analysis (including consideration of multiple options where appropriate) leads to a recommended technical solution[8].

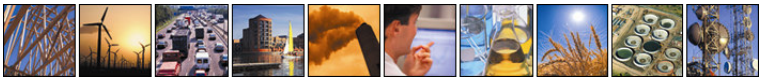
3.3.1 Application of 'emission source' and 'source stream' to aviation emissions

Issue

As outlined in Annex I of the MRG decision, an 'emission source' is defined as: "a separately identifiable part (point or process) of an installation from which relevant greenhouse gases are emitted."

A 'source stream' is defined as: "a specific fuel type, raw material or product giving rise to emissions of relevant greenhouse gases at one or more emission sources as a result of its consumption or production."

[8] These are the preferred solutions from a purely technical perspective and that there may be other factors which influence the final decision taken by the Commission.



Aside from the reference to installation, as the definition currently stands, when applied to aviation it could imply that each aircraft engine is an 'emission source' due to the term "*separately identifiable part (point or process)*" and that each type of fuel is a 'source stream'.

It is not clear what the implications of this are and whether this is suitable for aircraft operators.

Analysis

The two terms are used throughout the MRG 2007 Decision as follows:

- The Monitoring Plan – monitoring plans must contain a list of emission sources and source streams to be monitored for each activity carried out within the installation;
- Calculation methodology – This is based on emissions from source streams;
- Measurement methodology – This is based on emissions from an emission source.

For monitoring plans, listing all the emission sources (i.e. engines) for each activity carried out by an aircraft operator is unnecessarily complicated and it would be more practical to list the aircraft and routes that an aircraft operator flies. However, this issue can be clarified in Annex XV.

Basing the calculation methodology on source streams (i.e. fuels) is entirely appropriate for aviation, however given that there are only three fuels in use for the sector (jet kerosene, aviation gasoline, jet gasoline), it is likely that most aircraft operators will have very few source streams (most will only have one).

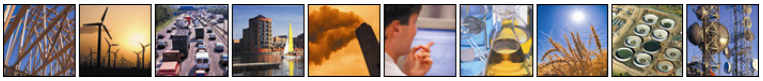
Aircraft operators must apply the calculation methodology, so the measurement methodology is irrelevant to the sector. However, if aircraft operators were to use the measurement methodology, it would be most appropriate for this to be based on the aircraft engine, therefore the definition of emission source is applicable. In any case, this is a hypothetical argument as the proposal specifies that aircraft operators will use a calculation methodology.

Recommendation

Overall, the application of these definitions needs to be modified given the nature of the aviation sector. While the engine itself (depending on the location of the relevant metering) could be considered an "emissions source", it is the only considerable emissions source. Emissions are attributed to individual mobile sources. The source stream of aviation will be defined as the fuel, in most cases there will only be one source stream.

However, for clarity and to reduce administrative burden, in their monitoring plans aircraft operators should list the aircraft and routes operated rather than all emission sources.

► **Definitions of 'emission source' and 'source stream' should be adapted to aviation.**



- **Annex XV should clarify that in their monitoring plans, aircraft operators should list aircrafts instead of all emission sources.**

3.3.2 Timing of submission of Monitoring Plan

Issue

Neither the proposals nor the MRG 2007 Decision specify a timetable by which Monitoring Plans must be submitted for approval, just that they must be approved by competent authorities before the start of the trading period.

Currently, deadlines for submitting plans have been set by the CAs of each Member State. In most cases, the deadlines given were several months before the start of the first year in which formal monitoring and reporting for the Scheme commenced. However, in the first phase timelines were tight and some plans were not finally approved until after its commencement. This must be avoided where possible otherwise operators will monitor and report in accordance with a plan that is not yet approved and may need to change.

Operators must submit Monitoring Plans well in advance of the commencement of the trading period to allow sufficient time for the CAs to review and then approve them. It remains to be seen whether the permitting requirements currently in place for stationary installations will apply to the aviation sector. Guidance related to Article 6 of the EU ETS Directive dictates monitoring requirements for permitted installations. The Council's common position, published in April 2008, indicates that there is a sound legislative basis for the enforcement of monitoring plans in the aviation sector, despite the lack of permits.[9] Existing contractual requirements for the sector make the imposition of permits somewhat challenging. The Open Air Skies agreement for example, signed between the United States and the European Union, prevents the imposition of any legal environmental obligations.

Options

The options identified are:

Option 1: CAs determine deadlines for submitting and approving Monitoring Plans (i.e. the current situation that exists with EU ETS installation operators);

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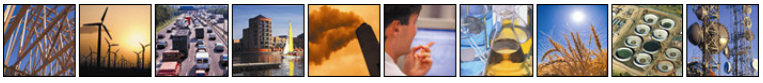
[9] "Administering Member States shall ensure that each aircraft operator submits to the competent authority in that State a monitoring plan setting out measures to monitor and report emissions and tonne-kilometre data for the purpose of an application under Article 3e and that such plans are approved by the competent authority in accordance with the guidelines adopted pursuant to Article 14."



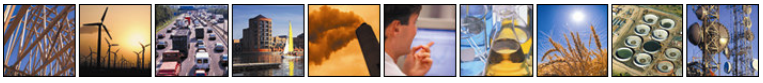
Option 2: set specific deadlines in Annex XV e.g. Monitoring Plans must be submitted at least six months before the start of the Phase;

Option 3: operators submit Monitoring Plans at the same time as their tonne-kilometre monitoring plan (see the other technical report).

Analysis

The current timelines as proposed by the Commission indicate that monitoring plans for both data sets will be submitted separately (as outlined under "Administrative Processes" in section 3). This indicates that operators will be required to submit monitoring plans to the competent authority for approval in July 2009 for tonne kilometre data, six months prior to the start of the benchmarking year in 2010. Monitoring plans for annual emissions will need to be submitted in July 2011; six months prior to the start of the first trading year in 2012.

- **Include provisions in Annex XV to require operators to submit their annual emissions Monitoring Plans for approval at least six months prior to the start of the phase for annual emissions data, and six months prior to the start of the benchmarking year for tonne kilometre data.**



4. Monitoring and reporting

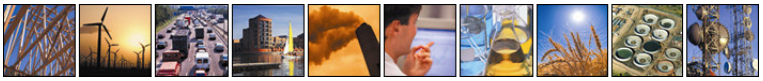
4.1 Overview of current approach

This section looks at the detailed technical guidance on monitoring and reporting. This is currently found in Annex I of the MRG 2007 Decision, which sets out the general guidelines; and Annex II, which sets out specific guidance for combustion emissions.

4.1.1 Annex I of the MRG 2007 Decision (General Guidelines)

The majority of Annex I of the MRG 2007 Decision covers the monitoring and reporting of emissions.

- Section 4 of Annex I of the MRG 2007 Decision sets out the general guidelines for monitoring of emissions;
- Section 5 defines the general approach for calculation-based methodologies, including installation categories and the use of tiers of approaches (both explained below);
- Section 6 defines the general approach for measurement-based methodologies;
- Section 7 outlines how uncertainty should be assessed;
- Section 8 details the content of emissions reports;
- Section 9 set out rules on retention of information;
- Section 10 specifies requirements for operators regarding data acquisition and handling, and control of risks (to data quality), as well as for verifiers concerning annual emissions verification;
- Section 11 lists the non-activity-specific emission factors and net calorific values for the combustion of fuel (used for Tier 1 methodologies);
- Section 12 lists the CO_2-neutral biomass included in the scheme;
- Section 13 defines how activity-specific data and factors should be determined (used for higher Tier methodologies);
- Section 14 sets out the format for reporting emissions;
- Section 15 defines the reporting categories according to the IPCC reporting format;
- Section 16 sets out requirements for installations with low emissions.



Calculation-based methodologies

Section 5.1 of the MRG 2007 Decision defines the basic calculation formula. It specifies that for each fuel, the CO_2 emissions from combustion installations should be calculated by applying the following formula to each activity.

Box 2	**Calculation of CO_2 emissions**
*CO_2 emissions = Activity data * emission factor * oxidation factor*	

Installation categories

Installations are categorised into three categories based on average annual emissions:

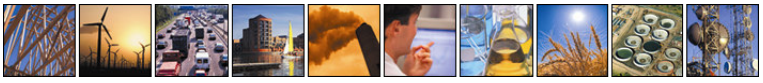
Category A – installations with average reported annual emissions equal to or less than 50kt of CO_2;

Category B – installations with average reported annual emissions greater than 50kt and equal to or less than 500kt;

Category C – installations with average reported annual emissions greater than 500kt.

Tiers of approaches (for calculation-based methodologies)

Section 5.2 of Annex I of the MRG 2007 Decision specifies different 'Tiers' for each of the factors used in equations ranging from lower accuracy and higher uncertainty measurement methods (tier 1) to more accurate and less uncertain methods (tiers 3 and 4). Where tiers are considered to have equivalent accuracy/uncertainty they are referred to as 'a' and 'b' e.g. Tiers 2a and 2b.



Box 3 Uncertainty, accuracy and precision

Definitions associated with conducting an uncertainty analysis include *uncertainty, accuracy, precision* and *variability*. These terms are sometimes used loosely and may be misunderstood. They have in fact clear statistical definitions that should be used in order to be clear about what is being quantified and reported. Several definitions are given here, in alphabetical order:

Accuracy: Agreement between the true value and the average of repeated measured observations or estimates of a variable. An accurate measurement or prediction lacks bias or, equivalently, systematic error.

Confidence Interval: The true value of the quantity for which the interval is to be estimated is a fixed but unknown constant, such as the annual total emissions in a given year for a given country. The confidence interval is a range that encloses the true value of this unknown fixed quantity with a specified confidence (probability). Typically, a 95 percent confidence interval is used in greenhouse gas inventories. From a traditional statistical perspective, the 95 percent confidence interval has a 95 percent probability of enclosing the true but unknown value of the quantity. An alternative interpretation is that the confidence interval is a range that may safely be declared to be consistent with observed data or information. The 95 percent confidence interval is enclosed by the 2.5th and 97.5th percentiles of the probability density function (PDF).

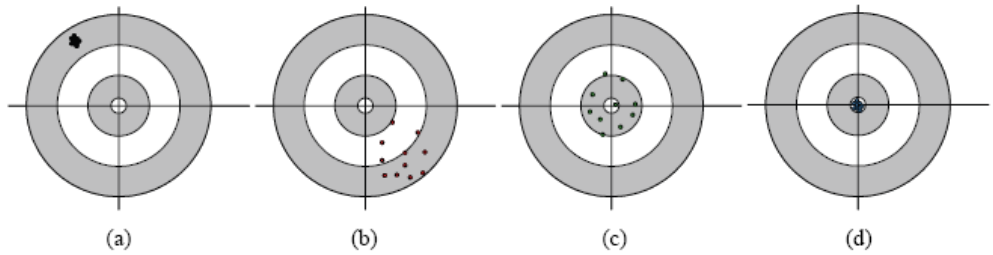
Precision: Agreement among repeated measurements of the same variable. Better precision means less random error. Precision is independent of accuracy.

Uncertainty: Lack of knowledge of the true value of a variable that can be described as a probability density function (PDF) characterising the range and likelihood of possible values. Uncertainty depends on the analyst's state of knowledge, which in turn depends on the quality and quantity of applicable data as well as knowledge of underlying processes and inference methods.

Inventories should be accurate in the sense that they are neither over nor underestimated as far as can be judged, and precise in the sense that uncertainties are reduced as far as practicable. The figure below provides a conceptual comparison of accuracy and precision. An accurate inventory is one that is free of bias but that could be precise or imprecise

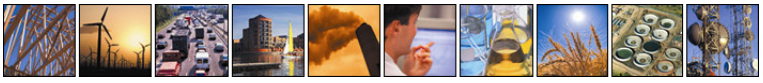
A precise inventory may appear to have low uncertainty but if the inventory is inaccurate, then the inventory systematically over or underestimates the true emissions or removals. Inaccuracy, or bias, can occur because of failure to capture all relevant emissions or removal processes or because the available data are not representative of real-world situations. There is no predetermined level of precision, in part because of the inherent variability of some categories.

(a) inaccurate but precise; (b) inaccurate and imprecise; (c) accurate but imprecise; and (d) precise and accurate



Extract from IPCC 2006 Guidelines for National Greenhouse Gas Inventories. Volume 1: General Guidance and Reporting. p3.7

The principle is that the highest tier approach should be used unless it can be proved to the CA that the highest tier is technically not feasible or will lead to unreasonably high costs. In such cases, the next lowest tier should be used (although there are some derogations for installations with low emissions, detailed in section 16 of Annex I to the MRG 2007 Decision). The minimum tiers (known as minimum requirements) that must be used by the different



activities within the categories of installation are provided in Table 1 of the MRG 2007 Decision[10]. The minimum requirements for combustion installations using commercial standard fuels[11] are set out below.

Table 4.1 Minimum requirements for commercial standard fuels currently required by the MRG 2007 Decision

Variable	Minimum requirement
Fuel consumption	Determined by the operator or fuel supplier within the following maximum uncertainty, taking into account the effect of stock changes where applicable Category A installations: ±5% (Tier 2) Category B installations: ±2.5% (Tier 3) Category C installation: ±1.5% (Tier 4)
Net Calorific Value	Tier 2a – Country-specific NCV as reported in the national inventory submitted to the UNFCCC. OR Tier 2b – The net calorific value from purchasing records provided by fuel supplier, provided it has been derived from accepted national or international standards
Emission factor	Tier 2a – Country specific emission factors as reported in the national inventory submitted to the UNFCCC. OR Tier 2b – Based on density measurement
Oxidation factor	Tier 1 – An oxidation factor of 1.

Extracted from the Monitoring and Reporting Decision (Table I, Annex I).

Section 6.2 and Annex XII set out the use of tiers for measurement-based methodologies. Given that this approach is not likely to be used by aircraft operators, there is no further consideration of measurement-based methodologies in this report.

4.1.2 Annex II of the MRG 2007 Decision (Guidelines for combustion emissions)

Annex II of the MRG 2007 Decision sets out specific guidance for combustion installations including clarification on the boundaries and details of the specific methodology and available tiers for each variable. Combustion emissions from all sectors are monitored and reported in accordance with Annex II.

Section 1 defines the boundaries and which activities should be included;

Section 2 details how to determine CO_2 emissions. This begins with guidance for general combustion activities, then details more specific activities which are not applicable to aviation (e.g. carbon black production, flares, process emissions from SO_2 scrubbing).

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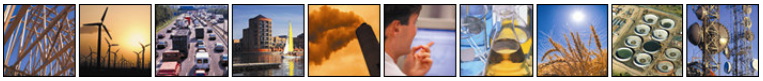
[10] 'Fall-back' approaches are allowed where meeting even the lowest tier (Tier 1) is not technically feasible or would entail unreasonable costs.

[11] Defined as *'internationally standardised commercial fuels which exhibit a 95% confidence interval of not more than ±1% for their specified calorific value, including gas oil, light fuel oil, gasoline, lamp oil, kerosene, ethane, propane and butane.'*



The calculation for general combustion activities is set out below.

Box 4	**Calculation of CO_2 emission for general combustion activities**
Where:	*CO_2 emissions = Activity data * emission factor * oxidation factor* *Activity data* (energy content of fuel) [TJ] = *fuel consumed* [t or Nm^3] * *net calorific value of fuel* [TJ/t or TJ/Nm^3]

Extract from Annex II to the MRG 2007 Decision

In the following sections of this report, Annex I (general guidelines) is evaluated for its applicability to aviation. Aviation-specific guidance is also considered. However, it should be noted that elements of Annex II of the MRG 2007 Decision may be applicable to aviation, but also that the aviation proposal would amend Annex IV of the EU ETS Directive (setting out the principles for monitoring and reporting) to specify a slightly different approach than that specified in Annex II of the MRG 2007 Decision and consequently there is some conflict between the two sets of requirements. This issue is explored below.

4.2 Applicability of Annex I to aviation

This section examines elements of Annex I that are relevant to monitoring and reporting of emissions from aviation activities and assesses its applicability to the sector. Significant issues and potential areas of conflict are briefly described and then further elaborated upon under 'Issues for additional guidance'.

4.2.1 Monitoring of greenhouse gas emissions (section 4)

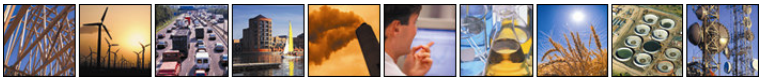
Boundaries (Section 4.1)

The current text is aimed at stationary installations and whilst some elements are relevant to aviation, it is not entirely suitable for aircraft operators and further guidance will be required.

► *Clearer guidance is needed on the boundaries of the scheme.*

Methodology (Section 4.2)

Section 4.2 describes how operators should determine their emissions through either a calculation-based method or a measurement-based method (e.g. continuous emissions monitoring). The latter can only be used if it gives more accurate results than the former and covers the same sources. A combination of the two can also be used subject to CA approval.



Under the aviation proposal aircraft operators would be required to use a calculation-based method. Therefore only the first part of this section is applicable to aviation. In any case, while use of an emissions measurement method to monitor aviation emissions is not likely, there are potential avenues to do so (e.g. real time fuel flow monitoring) and there is no reason not to allow operators to apply this option, provided they can prove that it is a more accurate method (within reasonable costs).

► **No changes are required to section 4.2**

4.2.2 Calculation-based methodologies for CO_2 emissions (Section 5)

Section 5 contains requirements for calculation formulae, tiers, fall back approaches, activity data, emission factors, oxidation and conversion factors, and transferred CO_2 used in emission calculations by installations.

Calculation formulae (Section 5.1)

Operators can apply the generic equations given in section 5.1 or must use alternative approaches as defined in the activity specific guidelines in Annexes II to XI.

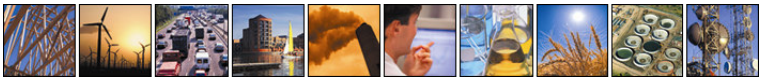
This section can be applied to aviation, since there will be an activity-specific Annex developed for aviation. No specific changes are required.

► **The general calculation for CO_2 emissions can apply to aviation**

Tiers of approaches (Section 5.2)

Paragraphs 1-5 in section 5.2 set out the principle of using tiered approaches and the minimum required tiers for factors including activity data (fuel use and net calorific value), emission factors, composition data, oxidation and conversion factors. Operators can apply different tier levels within a calculation (e.g. they could use Tier 2 for fuel use, but Tier 3 for the emission factor) and the choice of tiers is subject to approval by the CA through the operator's monitoring plan.

This approach could be applied to aviation as it allows flexibility for the wide variety of aircraft operators that will fall under the scheme without compromising the monitoring and reporting principles. However, 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. This will need to be confirmed through the stakeholders consultation process



- **The tiered approach can be applied to aircraft operators, although it could be deemed as unnecessary if similar levels of uncertainty can be proved for the whole industry. This will be verified through the consultation process.**

However as set out in paragraphs 5 and 6, the minimum tier requirements only apply to 'major source streams'. There are derogations for 'minor source streams'[12] which may apply the Tier 1 methods and for 'de minimis source streams'[13], which may apply 'no tier' approaches (i.e. estimation).

In principle such derogations could be suitable for aviation, however the suitability of the definitions of 'minor source stream' and 'de minimis source stream' needs to be assessed for aircraft operators (see above for consideration of definition of 'emission source' and 'source stream').

- *Further guidance is required for the definition of 'minor source streams' and 'de minimis source streams' for aircraft operators. The possibility that either or both definitions are not applicable to aviation should be considered.*

Paragraph 7 sets out when operators must propose changes to the tiers applied. For consistency, these should apply to aircraft operators.

- **Requirements for when changes to tiers should be proposed can apply to aircraft operators**

Paragraph 8 provides further guidance on how to treat biomass fuels. These can apply to aviation, although further consideration should be given to the definition of biomass to ensure that it is suitable for aviation (see below).

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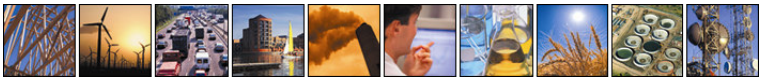
[12] Minor source streams are source streams that fall below a minimum level. They are more precisely defined as "*source streams selected by the operator to jointly emit 5 kilotonnes of fossil CO_2 or less per year or to contribute less than 10% (up to a total maximum contribution of 100 kilotonnes 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*"

[13] De minimis source streams are a subset of minor source streams. They are defined 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*".



Although biomass is not normally used in aviation, this issue is increasingly pertinent as some aircraft operators have recently trialled the use of bio-fuels.

► **Treatment of biomass fuels should be the same for aircraft operators**

Paragraph 9 - If the highest tier is temporarily not feasible for technical reasons, operators must achieve the next highest tier, until conditions to achieve the higher tier are restored. This can apply to aviation.

► **Provisions for temporary use of a lower tier should apply to aviation**

Paragraph 10 - All changes in tiers must be notified to the CA and well documented. If there are any gaps in the data, a conservative approach must be taken to estimating emissions. This is in line with the monitoring and reporting principles and should apply to aviation.

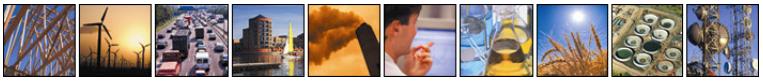
► **Requirements for documentation of changes to tiers and estimation should apply to aviation**

The minimum requirements for commercial standard fuels[14] currently required by the MRG 2007 Decision were previously defined in Table 4.1. The suitability of both the category classifications and the minimum requirements must be assessed.

The types of fuel used in aviation are outlined below. It is not clear whether these fuels can be classified as 'commercial standard fuels'. Further analysis is required to assess whether jet fuels and aviation gasoline fall under this definition.

Box 5	**Types of fuel used in aviation**

[14] Defined as *'internationally standardised commercial fuels which exhibit a 95% confidence interval of not more than ±1% for their specified calorific value, including gas oil, light fuel oil, gasoline, lamp oil, kerosene, ethane, propane and butane.'*



There are several types of fuel used in aviation, broadly falling into 3 categories. They have more common designations and are typically produced against international fuel standards (usually ASTM in the USA and Def Stan in the rest of the world).

- **Jet Kerosene** – Also known as AvTur, this is medium distillate used for aviation turbine power units. It has the same distillation characteristics and flash point as kerosene (between 150°C and 300°C but not generally above 250°C). In addition, it has particular specifications (such as freezing point) which are established by the International Air Transport Association (IATA). The most common jet kerosenes in use are Jet A1 and Jet A, which are typically produced to the requirements of Def Stan 91-91 and ASTM D1655, respectively. However, at many commercial airports where joint storage and hydrant systems are in place, industry has settled on using the Joint Fuelling System 'Check List' to define fuel quality (more fully known as the Aviation Fuel Quality Requirements for Jointly Operated Systems – AFQRJOS), which is a combination of the most stringent requirements of Def Stan 91-91 and ASTM D1655. Fuel supplied to this standard is designated 'Jet A1 to checklist'.
- **Jet Gasoline** – This includes all light hydrocarbon oils for use in aviation turbine power units. They distil between 100°C and 250°C. It is obtained by blending kerosenes and gasoline or naphthas in such a way that the aromatic content does not exceed 25 percent in volume, and the vapour pressure is between 13.7 kPa and 20.6 kPa. Additives can be included to improve fuel stability and combustibility. This type of wide-cut kerosene (a blend of gasoline and kerosene) is rarely used except in very cold climates – Jet B is the most common designation and is produced against a variety of standards such as the Canadian Specification CAN/CGSB 3.23.
- **Aviation Gasoline** – Aviation gasoline is motor spirit prepared especially for aviation piston engines, with an octane number suited to the engine, a freezing point of -60°C, and a distillation range usually within the limits of 30°C and 180°C. Known as AvGas, it is used only in small piston engine aircraft, and which generally represents less than 1 percent of fuel used in aviation. It has a range of designations, most commonly Avgas 100 and Avgas 100LL (low lead). Avgas is typically supplied against Def Stan 91-90 or ASTM D910 standards.

Throughout this report, Jet Kerosene and Jet Gasoline are collectively referred to as 'jet fuels'. The term 'aviation fuels' is used to cover all 3 types of fuel.

Sources: IPCC 2006 Guidelines for National Greenhouse Gas Inventories, IATA and various fuel suppliers.

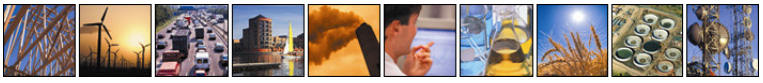
- *Further assessment is needed of the suitable categories for aircraft operators*
- *Minimum tier requirements need to be defined*
- *Further analysis is required of whether jet fuel and aviation gasoline can be classified as commercial standard fuels*

Fall-back approaches (Section 5.3)

Where it is not technically feasible or it would have unreasonable costs to achieve at least tier 1 monitoring, operators of installations can apply a fall-back approach. This involves customising the methodology and demonstrating to the CA that overall uncertainty thresholds for the total emissions figure are still achieved as set out below.

Table 4.2 Uncertainty threshold for fall-back approaches

Installation category	Uncertainty threshold to be met for total annual emission value
A	± 7.5%



B	± 5%
C	± 2.5%

Recital 11 of the MRG 2007 Decision makes clear that this provision has been introduced to provide an alternative for very specific or complex installations that find it very difficult to achieve tier 1 monitoring. Whilst this is a highly unlikely situation for aircraft operators, there may be situations where an aircraft operator has a complex operation for which it is challenging to apply tier 1 monitoring. In such extreme cases, then this approach could apply.

► **Fall-back approaches do not need to be amended.**

Activity data (Section 5.4)

In general, activity data such as fuel use must be expressed as energy in TJ[15]. This section also describes a method of calculating activity data through assessment of stock changes. Only the first part of this section is applicable to aviation and no changes are required.

► **Definitions of activity data apply to aviation.**

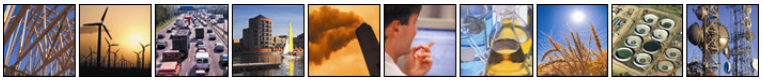
Emission factors (Section 5.5)

As described in section 5.5, emission factors are based on the carbon content of fuels expressed as tCO_2/TJ (for combustion emissions). This is to achieve highest transparency and widest possible consistency with national greenhouse gas inventories using emission factors expressed as tCO_2/TJ. Use of emission factors expressed as tCO_2/t for combustion emissions is restricted to cases where unreasonable costs could be incurred by the operator. The emission factors to be used for Tier 1 compliance are set out in Section 11 (see further consideration below).

Biomass fuels are considered as CO_2 neutral. Where a fuel contains both fossil and biomass fuels a weighted emission factor shall be applied based on the fossil fuel carbon content. Further details on how to perform the analyses and whether they are suitable for aviation are covered below (section 13 of the MRG 2007 Decision).

Inherent CO_2 is also discussed, but this is not relevant to aviation since none of the aviation fuels contain any inherent CO_2.

[15] In exceptional cases, t or Nm^3 may be used.



Relevant parts of this section apply to aviation since the emission factors to be used are expressed as tCO_2/TJ and, where bio-fuels are used, the same principles can be applied for determining the biomass fraction.

► **The general principles on the use of emission factors (section 5.5) apply to aviation.**

Oxidation factors and conversion factors (Section 5.6)

Section 5.6 explains the use of oxidation factors to reflect the proportion of carbon that is not oxidised in the process. In the case of aviation, it is proposed that an oxidation factor of 1 (i.e. total combustion) be applied, since very little carbon is not fully oxidised during combustion in aircraft engines.

There are no requirements for conversion factors in aviation as there are no process emissions.

► **The oxidation factor for aviation should be defined as 1 in the new Annex XV.**

Transferred CO2 (Section 5.7)

The section on transferred CO_2 (section 5.7) is not relevant to aviation since in all cases, CO_2 is emitted directly into the atmosphere.

► **Provisions for transferred CO_2 are not relevant to aviation.**

4.2.3 Measurement-based methodologies (Section 6)

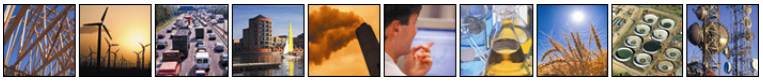
Section 6 covers measurement-based methods such as continuous emissions monitoring. The aviation proposal specifies that calculation-based methodologies should be used and in any case measurement-based methods are unlikely to be used. Therefore no changes are required.

► **No changes are required to section 6,**

4.2.4 Uncertainty assessment (Section 7)

Operators need to have an understanding of the main sources of uncertainty when calculating emissions and section 7 of the MRG 2007 Decision describes the nature of these assessments.

As set out in Section 7.1, if the competent authority has approved the tiers for use in a calculation-based methodology, then they have authorised the uncertainty directly resulting from the correct application of the



methodology. Therefore operators only need to report the combination of tiers that they have used and have no further requirement to report on uncertainty (although operators will still have to demonstrate that they meet the uncertainty requirements for some elements of the tier system).

Commercially traded fuels

For commercially traded fuels, operators can determine their annual fuel use based on the invoiced amount of fuel without further proof of associated uncertainties, but only where national and international standards ensure that respective uncertainty requirements are met for commercial transactions[16].

In other cases operators must provide written proof of uncertainty of activity data for each emission source to demonstrate compliance with Annexes II to XI.

If aviation fuels can also be classified as commercial standard fuels (or commercially traded fuels), then under this section, aircraft operators could use fuel invoices to determine activity data without further assessment of uncertainty (provided the activity data meets standards governing uncertainty requirements for commercial purposes). There are clear international standards for aviation fuels (see Box 5 above), however it is not clear if they can be classified as commercial standard fuels and this is considered below.

Section 7.2 covers uncertainty assessments for measurement methodologies which are not relevant to aviation.

► **Uncertainty assessment provisions should apply to aviation**

4.2.5 Reporting (Sections 8, 14 and 15)

Section 8 sets out the reporting requirements for installations (elaborating on the general requirements set out in Annex IV of the EU ETS Directive). It specifies the reporting format (detailed in Section 14) and the reporting codes (detailed in Section 15).

In line with the EU ETS Directive on Public Access to Environmental Information[17], annual reports are available to the public, but operators can indicate any information considered commercially sensitive[18], which can be withheld.

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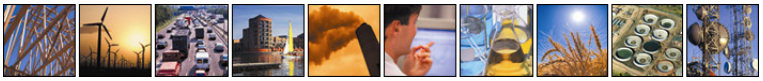
[16] Such as *DIN 51900-1:2000: Testing of solid and liquid fuels – Determination of gross calorific value by the bomb calorimeter and calculation of net calorific value* or *DIN 51612:1980 Testing of liquefied petroleum gases, calculation of net calorific value*.

[17] Directive 2003/4/EC on public access to environmental information and repealing Council Directive 90/313/EEC. This Directive aims to guarantee the right of access to environmental information held by or for public authorities and to ensure that such information is made available and disseminated to the public.



The section then goes on to list additional information that should be included in the report. The provisions in Section 8 are relevant and appropriate to aviation and in order to maintain consistency with the existing sectors, they should apply.

► General reporting requirements should remain the same

The reporting format is found in Section 14. The reporting requirements for aviation emissions (as set out in the Annex to the aviation proposal) differ to those for instalations, therefore an alternative format for aviation will need to be included. A suggested reporting format for annual emissions is provided in a template uploaded for consultation.

► Specify an aviation-specific reporting format in Section 14

In order to be consistent with other reporting requirements, EU ETS operators are required to report emissions using the codes from 2 reporting schemes:

- The Common Reporting Format for national greenhouse gas inventory systems set out by the UNFCCC;
- The IPPC code from the Regulation on the European Pollutant Release and Transfer Register (EPRTR) (Regulation EC 166/2006).

These codes are set out in Section 15.1 and 15.2 respectively. Aviation emissions are included in the UNFCCC Common Reporting Format.

Although the IPPC Directive and EPRTR Regulation cover CO_2, they do not include aviation activities, so there is no corresponding code and therefore Section 15.2 does not affect aviation.

The relevant codes in the UNFCCC Common Reporting Format are: 1A3(a) (Civil Aviation) and Memo Items (International Bunkers, Aviation)

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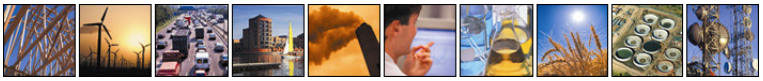
[18] Article 4(2)(d) of the Environmental Information Directive allows Member States to refuse to disclose environmental information if it would adversely affect "*the confidentiality of commercial or industrial information where such confidentiality is provided for by national or Community law to protect a legitimate economic interest, including the public interest in maintaining statistical confidentiality and tax secrecy.*"



- **Add the UNFCCC Common Reporting Format reporting codes for aviation to Section 15.1**

4.2.6 Retention of information (Section 9)

Section 9 describes the information that must be collated and stored by an operator for all emission sources and gases covered under the Scheme. Such information must be retained for at least 10 years after the submission of the annual emissions report.

These requirements can be applied to aviation with only a few minor amendments to insert 'or aircraft operators' where appropriate.

- **Retention of information requirements should be applied to aviation with minor amendments**

4.2.7 Emission factors (Section 11)

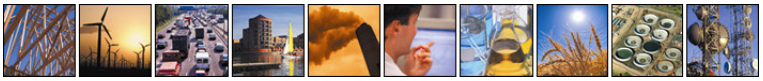
Section 11 contains a table of Tier 1 emission factors for the combustion of fuel and their net calorific values (NCV) to convert mass to energy units. These factors come from the IPCC 2006 Guidelines for national greenhouse gas inventories (except those for biomass).

The emission factors and NCVs for motor gasoline and kerosene are listed, but the IPCC Guidelines contain further classifications for aviation gasoline, jet gasoline and aviation kerosene. These values (reproduced below) should be inserted into this table clearly distinguishing between the two grades of kerosene (jet kerosene and other kerosene) and the three grades of gasoline (motor gasoline, jet gasoline and aviation gasoline).

Table 4.3 IPCC default Emission Factors and Net Calorific Values

Fuel	Emission factor (tCO_2/TJ)	Net Calorific Value (TJ/Gg)
Aviation gasoline	70.0	44.3
Jet gasoline	70.0	44.3
Jet kerosene	71.5	44.1

Source: IPCC 2006 Guidelines for National Greenhouse Gas Inventories. Volume 2: Energy. Table 1.2 and Table 1.4



- **Add the emission factors and NCVs for aviation gasoline, jet gasoline and aviation kerosene to Section 11 (using values from the IPCC 2006 Guidelines).**

4.2.8 List of CO_2-neutral biomass (Section 12)

Section 12 lists all the fuels that are considered to be biomass and weighted with an emission factor of 0 tCO_2/TJ, such as: plant oils and fats, manure, sewage sludge, etc.

Bio-fuels are not widely used in aviation[19], but any future bio-fuels used in aviation are likely to fall within the list and therefore no changes are required.

4.2.9 Determination of activity specific data and factors (Section 13)

Section 13 runs through the requirements for determining specific NCVs and emission factors through sampling, testing and analysis of fuel and material characteristics using international standards and, in most cases, accredited laboratories. Any method used must be approved by the CA.

This section will apply where aircraft operators decide to use activity-specific emission factors and/or NCVs, and have proven these to be more accurate and the method is accepted by the CA. Determination of activity-specific data and factors could apply more to operators with higher emissions levels.

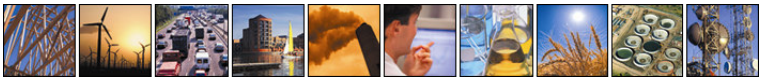
In order to ensure consistency and comparability, the same standards for determining emission factors and NCVs should be used. Therefore the procedures in section 13 apply equally to aviation and no changes are required.

- **Standards for determining activity-specific data and factors should be applied to aviation (where used) in order to ensure comparability.**

4.2.10 Requirements for installations with low emissions (Section 16)

Section 16 was added to reduce monitoring and reporting costs incurred by smaller installations that account for only a very small percentage of overall emissions in the EU ETS. Operators of installations with less than 25 $ktCO_2$ per year are exempt from some requirements. They can also use information from the fuel/equipment supplier to estimate uncertainty and purchasing records to determine fuel and material use.

[19] Although a recent Virgin Atlantic flight used 20% bio-fuel (coconut oil and babassu oil mix) in one of its engines.



In principle, this section could easily be applied to aviation and would maintain a consistent approach across the scheme. However, further analysis is needed to identify if the threshold is appropriate.

- *Further analysis of the suitability of the threshold for aircraft operators with low emissions is required*

4.3 Aviation-specific guidance

Aircraft operators will need sector-specific guidance on certain elements of monitoring and reporting. These are set out in the aviation proposal. However, it should also be noted that elements of Annex II are also applicable and may be preferable in the interests of reducing administrative burden and maintaining consistency with the rest of the scheme. This section considers both and identifies where additional guidance is required.

4.3.1 The aviation proposal

The Annex to the aviation proposal would amend Annex IV of the EU ETS Directive to specify how emissions from aviation activities should be monitored and reported.

It stipulates that emissions should be monitored by calculation and by using the following formula to each flight and each fuel.

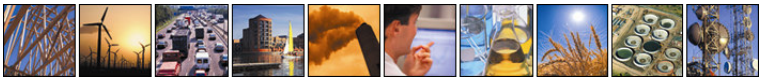
Box 6	**Formula for calculating emissions from aviation activities (from aviation proposal)**
Emissions = Fuel consumption * Emission factor	

The proposal specifies that this calculation must be applied to each flight and each fuel. For some operators this could be very burdensome. Further analysis on this issue is needed and, if this approach is found to be suitable, appropriate tiers or alternative methods to calculate emissions should be developed.

Fuel consumption

Actual fuel consumption (including fuel consumed by the auxiliary power unit) should be used **where possible**, defined as:

Box 7	**Methodology for calculating fuel consumption (as in aviation proposal)**



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	

Aircraft operators will have varying levels of emissions and therefore the uncertainty requirements will need to be tiered to allow flexibility. Further guidance on suitable tiers of approaches for fuel consumption is therefore needed.

However, given that fuel consumption is based on a mass balance equation, this equation could be used to verify reported emissions statements. Fuel usage can be based on overall stock changes and need not be reported on a flight level. This is further reflected in the proposed monitoring and reporting plan.

The issue of uncertainty as it relates to fuel consumption will apply to various aircraft types, assuming that the metering on different aircraft types is consistent.

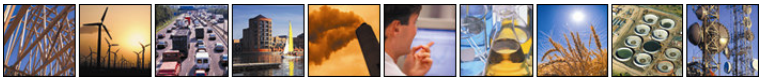
- *Tiers of approaches for fuel consumption should be defined*

The proposal also states that if actual fuel consumption data are not available, a standardised tiered method shall be used to estimate fuel consumption data. However, the definition of this method is not clear and further guidance is required, particularly on when such an approach is acceptable.

- *Further guidance is required on estimation of fuel consumption data*

There are no defined units in either of the specified calculations. Units will need to be explicitly stated in the guidance. Since the emission factors are based on net calorific values (i.e. tCO_2 per TJ), fuel consumption will have to be reported in units of energy (i.e. TJ). This will necessitate the use of net calorific values and an oxidation factor. There is no mention of an oxidation factor, which is therefore assumed to be 1 (i.e. total combustion – see analysis of Section 5.6 earlier in this section).

- **The units to use when calculating emissions from aviation activities should be specified in the new Annex XV**
- *Tiers of approaches for net calorific values should be defined*



Emission factors

Aircraft operators are required to use the default IPCC emission factors, unless activity-specific emission factors are more accurate. The use of emission factors is not clear and further guidance should be provided. Relevant sections of the existing MRG 2007 Decision can be applied to this option (see below).

- ► *Tiers of approaches for emission factors must be defined*

4.4 Issues for guidance

4.4.1 Guidance on boundaries of the scheme

Issue

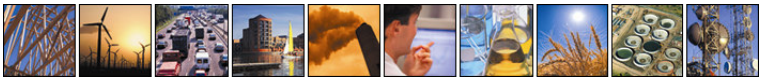
Section 4.1 of the MRG 2007 Decision defines the boundaries of the emissions to be monitored and Annexes II-XIII further elaborate upon this for particular sectors. Section 4.1 as it stands is not entirely suitable for aviation as it refers explicitly to the permit (which is not required for aircraft operators) and explicitly excludes emissions from mobile internal combustion engines.

The proposal defines aircraft operators as '*the person who operates an aircraft at the time it performs an aviation activity listed in Annex I or, where the operator is not known or is not identified by the owner of the aircraft, the owner of the aircraft*'. However, the aviation sector is highly fluid and for commercial airlines, there is a range of commercial arrangements. This may make it difficult to clearly identify which operator is responsible for each flight because of complex arrangements between airlines such as wet and dry leasing and code sharing (see box below). The definition is still open to interpretation and therefore requires further clarification.

Given the complexity of the aviation sector, it would be best to explicitly exclude the sector from section 4.1 and instead provide specific guidance in the new Annex XV.

Box 8	**Typical commercial arrangements in aviation**
Code share – Where a flight operated by an airline is jointly marketed as a flight for one or more other airlines. The airline that operates the flight (e.g. provides the aircraft, crew and ground handling services) is referred to as the operating carrier. The companies that sell tickets for that flight but do not actually operate it are referred to as marketing carriers.	
Dry lease – A lease of an aircraft where the aircraft is operated under the Air Operator Certificate of the lessee. It is normally a lease of an aircraft without crew, operated under the commercial control of the lessee and using the lessee's airline designator code and traffic rights.	
Wet lease – A lease of an aircraft where the aircraft is operated under the Air Operator Certificate of the lessor. It is normally a lease of an aircraft with crew, operated under the commercial control of the lessee and using the lessee's airline designator code and traffic rights.	

Definitions of leasing arrangements taken from *UKCAA Official Record Series 4. No 570 (30 Sept 2005). p2.*



Options

There are several options for identifying the operator of a commercial flight:

Option 1 – No further guidance;

Option 2 – Based on ICAO airline designator code;

Option 3 – Based on Air Operator's Certificate (AOC).

Analysis

Option 1 would leave the definition open to interpretation and could cause disagreements over responsibility (although the definition in the proposal specifies that if the operator cannot be identified, then the aircraft owner should be responsible).

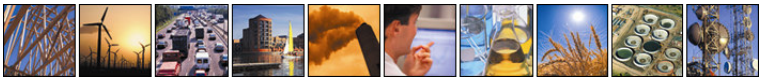
Using the ICAO designator would provide a unique identity for each commercial airline. Leased flights are carried out under the lessee's designator, which would be appropriate as they are responsible for the flight.

Using the AOC would create complications for leasing arrangements. Some leased flights (see box above) are carried out under the lessee's AOC, but others may be under the lessor's AOC.

Recommendation

Wherever possible, the ICAO designator should be used to identify the operator. The aircraft owner will need to determine the designator accordingly in cases where an aircraft is not covered by the ICAO system. This corresponds with the European Parliament's position in its second reading.

- **Amend Section 4.1 of Annex I to specify that boundaries for the aviation sector are defined in Annex XV and that Section 4.1 does not apply to aviation**
- **Provide further guidance for operators on the use of designators in cases where they are not covered by the ICAO system**



4.4.2 Definition of 'minor source stream' and 'de minimis source stream' for aviation.

Issue

The existing MRG 2007 Decision defines 'minor source stream' and 'de minimis source stream', allowing reduced requirements for these. This provision was introduced to cover very small usage (e.g. backup generators that are tested once a year). 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.

It is not clear how suitable or applicable these definitions are for aircraft operators or what the implication of such classification would be. The actual definitions as outlined in the MRG, are as follows:

Minor Source Stream:

As outlined in the 2007 Monitoring and Reporting Guidelines, 'minor source streams' refers to 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.

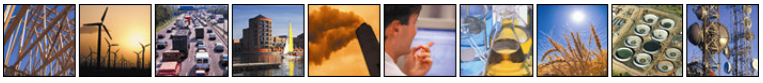
De Minimis Source Stream:

As outlined in the 2007 Monitoring and Reporting Guidelines, de minimis source streams comprise 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 CO2, whichever is the highest in terms of absolute emissions.

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.

The table below shows a very rough outline of typical fuel consumption and approximate scale of emissions for different commercial operators. It also shows the number of flights that could qualify as minor or de minimis



sources taking into account only the maximum limits of 5 or 1 ktCO$_2$. This situation would warrant a reduced burden on the aircraft operator, so the use of the minor source stream definition would be valid.

Table 4.4 Estimation of emission levels for different commercial airlines

	Airbus 320-200 (Short-haul)	Airbus 330-200 (Medium-haul)	Airbus 340-600 (Long-haul)
Flight distance (nm)	500	2,500	5,000
Fuel/trip (kg)	3,188	27,729	84,523
tCO2/trip	9.8	86.0	262.1
De minimis source stream (tCO2/year)	1000	1000	1000
Minor source stream (tCO2/year)	5000	5000	5000
Number of trips/year meet de minimis	102	12	4
Number of trips/year meet minor	510	58	19

Data largely based on Table 16 in CE Delft (2005) *Giving Wings to Emissions Trading.* CO$_2$ figures (rows 3 and 5) are from Entec calculation, based on NCV of 44.3TJ/Gg and emission factor 70tCO2/TJ.

Recommendation

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.

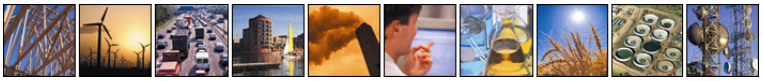
► **The application of either "minor source" or "de-minimis" does warrant consideration in the context of the aviation sector.**

4.4.3 Categories for aircraft operators

Issue

Existing installations are categorised according to their annual emissions output:

- Category A – installations with average reported annual emissions equal to or less than 50kt of CO$_2$;



- Category B – installations with average reported annual emissions greater than 50kt and equal to or less than 500 kt;
- Category C – installations with average reported annual emissions greater than 500kt.

These categories are used to define the minimum tier requirements for operators (larger emitters are required to use lower uncertainty/greater accuracy methods).

Such an approach seems applicable to aircraft operators, but the most suitable categories need to be defined.

Analysis

The suitability of emissions categories has been analysed on the basis of Eurocontrol data, which shows that these categories are applicable to aviation. This has implications for the application of tiers and data quality.

4.4.4 Commercial standard fuels

Issue

The MRG 2007 Decision contains special provisions for commercial standard fuels, which are defined as:

"internationally standardised commercial fuels which exhibit a 95% confidence interval of not more than ±1% for their specified calorific value, including gas oil, light fuel oil, gasoline, lamp oil, kerosene, ethane, propane and butane."

Operators can determine their annual fuel flow for commercial standard fuels (in the case of commercially traded fuels) using only the invoiced amount of fuel. They do not have to provide any further proof of uncertainties, provided that legislation or standards ensures that uncertainty requirements for activity data are met.

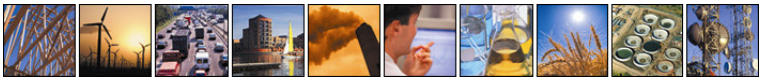
Analysis

Jet kerosene, jet gasoline and aviation gasoline are all subsets of kerosene and gasoline (which are classed as commercial standard fuels). They are supplied to international and national standards (see Box 5 above), which clearly define net calorific values and acceptable test methods (generally based on IP or ASTM standards).

As such, it seems that, in general, aviation fuels can be classed as commercial standard fuels provided that they meet specifications.

Recommendation

Aviation fuels should be classed as commercial standard fuels and included in the definition.



2.(h) 'commercial standard fuel': The text should include additional fuels that are applicable to aviation, e.g. by adding "jet kerosene, jet gasoline and aviation gasoline".

This would allow aircraft operators to use invoice data to determine their fuel uplift[20] and would reduce the administrative burden to them.

► **Include aviation fuels in the definition of commercial standard fuels**

4.4.5 Calculating fuel consumption and the application of tiers

Issue

When calculating emissions, actual fuel consumption (including fuel consumed by the auxiliary power unit) should be used where possible, defined as:

Box 9	**Methodology for calculating fuel consumption (as in aviation proposal)**						
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	

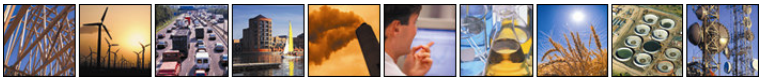
Annex II also provides tiers for fuel consumption in combustion installations, which may be applicable to aviation. In any case, further guidance is needed on suitable tiers of approaches for the factors that make up fuel consumption.

Options

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.

[20] Invoice data will not be able to provide figures for fuel in tanks.



Analysis

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.

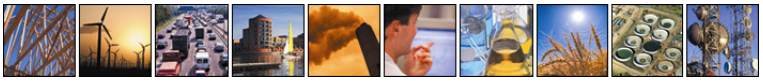
However, applying a standard method for the calculation of fuel consumption and a standard uncertainty requirement to all aircraft operators could place a proportionately larger burden on small emitters or may result in relatively less rigorous reporting for larger emitters.

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.

Recommendation

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.

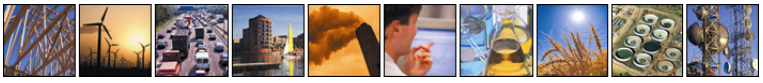
- **The applicability of tiers from the MRG to the aviation sector should be reviewed in light of the metering uncertainties for the industry. Issues raised as part of the public consultation may indicate that tiering will not be required for aviation as part of its reporting requirements. The possibility of using alternative methods when fuel consumption calculation is not possible on a flight by flight basis should also be investigated as part of the consultation process.**

The tiers as currently outlined in the MRG are as follows:

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%

For combustion installations using standard commercial fuels only tiers 2, 3 and 4 are applicable in the existing MRG 2007 Decision.

4.4.6 Estimation of fuel consumption

Issue

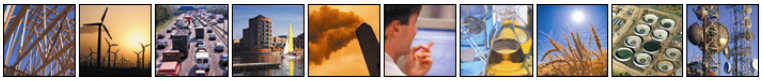
The proposal also states that if actual fuel consumption data are not available, a standardised tiered method shall be used to estimate fuel consumption data. However, the definition of this method is not clear and further guidance is required, particularly on when such an approach is acceptable.

Analysis

The use of an estimation method (for example applying average values of fuel consumption per distance, time or activity) is at odds with one of the main aims of the EU ETS, which is for aircraft operators to monitor 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 (see Section 5.3 of Annex I).

Recommendation

- **Specify that if actual fuel consumption data are not available, then aircraft operators may use the fall-back approach subject to approval by the CA.**



4.4.7 Tiers for net calorific values

Issue

According to the MRG 2007 Decision, "*in order to achieve highest transparency and widest possible consistency with national greenhouse gas inventories*" emission factors for combustion emissions should be expressed as tCO_2/TJ. Accordingly, activity data (fuel consumption) would need to be expressed as energy (TJ). As fuel is measured in mass or volume units, the use of NCV is needed to provide energy units. The calculation methodology set out in the Aviation legislation does not specify which NCV should be used.

The methodology for calculating aviation emissions should be further detailed to clarify the use of NCVs as set out below. Further clarification is also needed on the tiers of approaches for NCVs when calculating emissions from aviation activities:

Box 10	**Methodology for calculating fuel consumption (expressed in TJ)**				
Energy content of fuel consumption (TJ)	=	Fuel consumed (t or Nm^3)	*	Net calorific value of fuel (TJ/t or TJ/Nm^3)	

Options

Three options have been identified here:

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

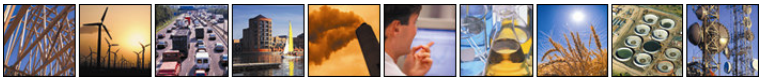
Option 2 – use the same tiers as in Annex II; including the possibility of using Tier 1 (default NCV from 2006 IPCC guidelines), although this tier is not currently available for commercial standard fuels.

Option 3 – derive new tiers for NCV.

Analysis

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 is not applicable, 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.

Recommendation

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. NCV are not usually provided for each fuel uplift and there are some differences between the IPCC default values and the 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.

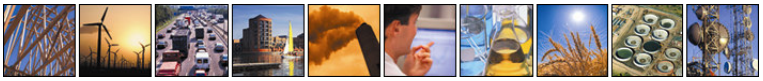
If IPCC default values are considered as the most appropriate, a reference should be added in Annex I Section 11 of the MRG to net calorific values for jet kerosene, jet gasoline and aviation gasoline, based on 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

- **Investigate in the consultation if standard NCV would be appropriate for the whole aviation sector.**
- **If IPCC default NCV are considered an appropriate standard, include reference net calorific values for jet kerosene, jet gasoline and aviation gasoline in Section 11 based on IPCC figures**

4.4.8 Tiers for emission factors

Issue

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.

Furthermore, Annex II of the MRG 2007 Decision also provides tiers for monitoring and reporting of emission factors for combustion. Currently tier 1 is the IPCC default value; tier 2a is a country specific emission factor; tier 2b is a factor derived from the density measurement and NCV for coal types; and tier 3 is the activity specific emission factor.

According to the MRG 2007 Decision emission factors should be expressed as tCO2/TJ for combustion emissions as a first choice. "The use of emission factors for a fuel expressed as tCO2/t rather than tCO2/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 tCO2/t of fuel if they can lead to at least equivalent accuracy in emissions estimation and if the use of emission factors expressed as tCO2/TJ with the same level of accuracy could lead to unreasonable costs.

Options

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.

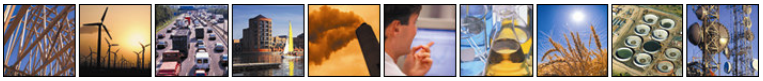
Analysis

The aviation proposal would mean that all operators would have to use activity-specific emission factors, regardless of costs. Option 2 would not clarify this situation and would place an unnecessarily stringent obligation on 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. It would allow aircraft operators to provide more accurate emission factors, which would be more appropriate as the default values are by their nature higher (as they are more conservative). However, tier 2a (country-specific emission factors) is not suitable as aircraft are refuelled in several different countries and this approach would be challenging to verify.

Recommendation

Option 1 would the recommended approach unless accurate standard values can be applied to the industry as a whole.

- **Clarify through the consultation if standard emission factors could be applied for the industry as a whole.**



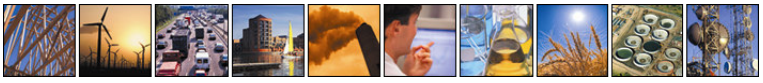
- **If tiers of approaches are preferred, consistently with the existing MRG, specify that the Annex II tiers for monitoring and reporting emission factor should be available to aircraft operators, with the exception of Tier 2a**

4.4.9 Minimum tier requirements

Subject to further analysis, the applicability of the tiered approach to aviation will be considered.

4.4.10 Aircraft operators with low emissions

Subject to further analysis, the exclusion of small operators from the aviation sector will depend on variability of operator emissions totals given existing exclusions.



5. Control and verification

5.1 Overview of current approach

Control and verification procedures for the EU ETS aim to ensure that the data reported by operators are accurate and free from errors. The current provisions followed by operators and verifiers are outlined in section 10 of the MRG 2007 Decision.

'Control' refers to the operator's systems and procedures used to ensure annual emissions data are:

- collected in accordance with the approved plan;
- handled and stored appropriately;
- free from misstatements (before going to the verifier);
- readily available for review by a verifier;
- retained for the required period of time.

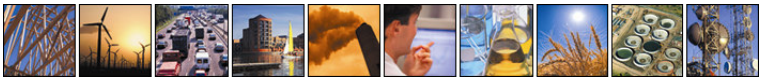
'Verification' by an independent, accredited verifier then involves checking these procedures to ensure that data has been monitored in accordance with the approved monitoring plan, the legislation and any guidelines, and that they are free from material misstatements. The verifier's findings are issued as a verification opinion.

Together these both play a major role in ensuring the integrity of the data on which the allowances will be surrendered.

The proposal specifies some additional provisions for the verification of aviation emission reports

> *(14) 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 operator's traffic including data from Eurocontrol requested by the 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 the case of annual emissions data therefore, the verifiers will need to have access to the full dataset detailing fuel use and fuel uplift for each flight and the subsequent emissions calculations. They will also need to see timetable data and the report provided by Eurocontrol as requested by the operator that lists all of the operator's traffic for the specific year. This information can be used to cross-check with data from the operator. They will also need the



monitoring plan and access to a representative sample of the raw data (including operational flight plans and fuel receipts).

5.2 Applicability to aviation

5.2.1 Error handling

Emissions reports must be verified by accredited external verifiers to check that reported emissions are free from material misstatements. Operators must correct any omissions, misrepresentations and errors found by verifiers, before a verified opinion can be issued, and submit the report by 31 March each year.

This section should be applied to aviation and no further changes are needed.

- **The MR approach for dealing with errors can apply to aviation.**

5.2.2 Control and verification (10)

Section 10 sets out requirements for data management by the operator and the process of verification by an independently accredited verifier.

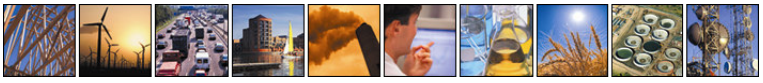
Much of the established process for data management and verification can be applied directly to the monitoring and reporting of aviation emissions. However, the words 'or aircraft' after 'installation' should be include to reflect the legislative text once agreed.

- **Section 10 can be applied to aviation with minor amendments**

Section 10.1 Data Acquisition and Handling and Section 10.2 Control System

Sections 10.1 and 10.2 require operators to implement effective data acquisition, handling and control systems, including internal risk assessment, procedures and responsibilities, corrective action systems, records and documentation, maintenance and calibration systems and internal reviews and validations of data to mitigate the identified risks before the start of the reporting period. This is to ensure that reported emissions are calculated correctly and that all data and information is documented and retained to facilitate verification.

- **Sections 10.1 and 10.2 can be applied to data management for aviation without any changes.**



10.3 Control Activities

Section 10.3 requires operators to control and mitigate inherent risks in control systems and to identify and implement control activities relating to; procedures and responsibilities (10.3.1) quality assurance (10.3.2), reviews and validation of data (10.3.3), any outsourced processes (10.3.4), corrections and corrective action (10.3.5) and records and documentation (10.3.6).

- **Sections 10.3.1 to 10.3.6 can be applied to aviation with only minor changes such as including reference to 'and aircraft emissions' where appropriate.**

Section 10.3.2 requires operators to calibrate, adjust and check measuring equipment at regular intervals prior to use, applying relevant traceable standards where available. If components of a measurement instrument cannot be calibrated, operators can propose alternative control activities, subject to CA approval.

In the case of aviation, maintenance of fuel gauges is an important part of meeting safety regulations. As discussed above, these checks are likely to be sufficient for EU ETS reporting and for meeting the requirements in section 10.3.2 to check measuring equipment at regular intervals.

Section 10.3.3 refers to reviews and validation of data. This should be applied to aviation and where an 'installation' is referred to this should be changed to 'an installation or aircraft'.

The remaining sections 10.3.4 (Outsourced processes), 10.3.5 (Corrections and corrective action), and 10.3.6 (Records and documentation) should be applied to aviation and no changes are required.

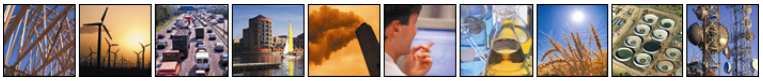
Although aircraft operators collate and maintain some activity data for other purposes (such as fuel records within flight plans) and some aircraft operators now report CO_2 and other GHG emissions, few have done so with the level of quality and transparency required by a regulatory scheme such as the EU ETS. Some may not have central databases into which the relevant information is inputted, quality checked, stored and from which it can be easily retrieved for EU ETS reporting.

To implement these provisions some operators will therefore need to upgrade their current procedures and systems. The potential costs of improving data management are discussed in section 7. Although this will be in initial cost, good data management can reduce ongoing costs in the longer term, such as ensuring easy access to records and information needed during verification.

10.4 Verification

10.4.1 General principles

The objective of the verification is to ensure that emissions have been monitored in accordance with the guidelines and that reliable and correct emissions data are reported. A verifier is *'a competent, independent, accredited*



verification body or person with responsibility for performing and reporting on the verification process, in accordance with the detailed requirements established by the Member State pursuant to Annex V of the EU ETS Directive 2003/87/EC.'

Verifiers must state, with reasonable assurance, whether the data in the emissions report are free from material mis-statements and that there are no material non-conformities. To do this they must, among other things, check the records, sample raw data and examine calculations and spreadsheets.

The general principles of verification in section 10.4.1 can equally apply to verification of aircraft emissions. To clarify this requirement the term 'or *attributed aviation emissions'* should be included after 'installations' in the third paragraph.

Materiality levels will need to be defined in the context of aviation. Although emissions categories have yet to be defined for aviation, it is possible to use a materiality of 2% for large operators (category C installations) and 5% for small operators (categories A and B).

► **The MRG 2007 Decision verification principles can be applied to aviation**

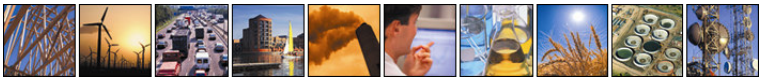
10.4.2 Verification methodology

Section 10.4.2 describes how the verifier must plan and perform the verification with the following steps:

- Strategic analysis;
- Risk analysis;
- Verification;
- Internal verification report;
- Verification report;

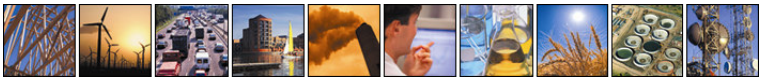
These steps can be applied to verification of aviation emissions.

As part of the "verification" step, the MRG 2007 Decision states that "*the verifier shall conduct a site visit, when appropriate, to inspect the operation of meters and monitoring systems, conduct interviews, and collect sufficient information and evidence*". The need to visit industrial installations is arguably greater than for airlines, since emission sources, monitoring methods and measurement equipment must all be checked thoroughly and against a detailed Monitoring plan. Aircraft operators, on the other hand, will typically have a larger number of potential "sites" i.e. airports where they land, take off and refuel, and many emission sources (aircrafts). However, flight information could be collated and stored in the airlines headquarters . Therefore, offices where information is collated and stored would constitute a "site visit". Still, as it is the case with the current MRG 2007 Decision, the



Decision on whether or not to undertake a site visit of any kind should rest with the verifier as part of their strategic analysis.

- **Verification methodology can be applied to aviation**



6. Summary of guidance

This section summarises the amendments required to Annex I of the MRG 2007 Decision to ensure that they can be applied to aviation and the additional guidance required in new Annex XV.

6.1 Amendments to Annex I of the MRG 2007 Decision

Section 2 – Definitions

- **Minor changes to some of the definitions are required to ensure that they also apply to aviation as follows:**

References to 'operator' need to be changed to read 'operator or aircraft operator'

1. 'aircraft operator' means the person who operates an aircraft at the time it performs an aviation activity listed in Annex I or, where the operator is not known or is not identified by the owner of the aircraft, the owner of the aircraft. The ICAO designator should be used to identify the operator wherever possible (proposed addition based on discussion in section 5.1);

'flight' means an activity listed in Annex I as 'operation of an aircraft from take-off to its next landing', as defined by ICAO. Thus take-off is the aerodrome of departure, and next landing is the aerodrome of arrival;

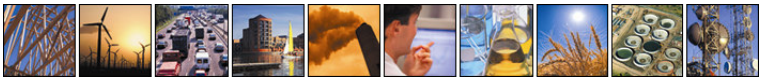
1.(e) 'monitoring methodology': The text needs to include aircraft operators in the description, e.g. by adding "or aircraft operator";

1.(f) 'monitoring plan': The text needs to include aircraft operators in the description, e.g. by adding "or aircraft operator" after "installation";

4.(a) 'unreasonable costs': The last sentence needs to include aircraft operators in the description, e.g. by adding "or aircraft operators" after "installation" in both instances;

5.(e) 'reasonable assurance', (g) 'level of assurance', (h) 'non-conformity', (i) 'material non-conformity': All these definitions require small amendments to include aircraft operators in the descriptions, e.g. by adding "or aircraft operator".

Definitions 1(c) and 1(d) refer to 'emission source' and 'source stream' respectively. These terms have been defined with stationary installations in mind, and it is not clear how these should be applied to aviation.



Section 3 – Monitoring and reporting principles

- **The MR principles can be applied to aviation with a few minor amendments**

Trueness. The text as it stands is almost sufficient. The last sentence needs to include aircraft operators in the description, e.g. by replacing "installation's" with "installation's or aircraft operator's";

Cost effectiveness. The text as it stands is almost sufficient. The last sentence needs to include aircraft operators' systems in the description, e.g. by replacing "in place at the installation" with "in place at the installation or used by aircraft operators".

Section 4 – Monitoring of greenhouse gases

- **Amend Section 4.1 of Annex I to specify that boundaries for the aviation sector are defined in Annex XV and that Section 4.1 does not apply to aviation**
- **Section 4.3 paragraph 1 needs to be updated to make reference to the requirements in the EU ETS Directive for a monitoring plan for aircraft operators**
- **Contents of the Monitoring Plan should remain the same with minor amendments to refer to aircraft operators**

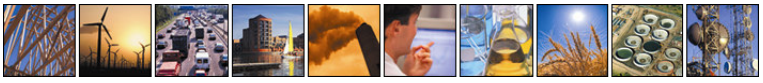
All instances of 'installation' need to be replaced with 'installation or aircraft operator';

(c) Add 'or for aircraft operators, a list of aircraft and source streams to be monitored for each activity carried out by the aircraft operator'.

- **Section 4.3 paragraph 9 should be updated to refer to aircraft operators.**

Section 9 – Retention of information

- **Retention of information requirements should be applied to aviation with minor amendments**



Section 10 – Control and Verification

- **Section 10 can be applied to aviation with minor amendments**
- **Sections 10.3.1 to 10.3.6 can be applied to aviation with only minor changes such as including reference to 'and aircraft emissions' where appropriate.**

Section 11 – Emission factors

- **Add the emission factors and NCVs for aviation gasoline, jet gasoline and aviation kerosene to Section 11 (using values from the IPCC 2006 Guidelines)**

Section 14 – Reporting format

- **Specify an aviation-specific reporting format in Section 14**

Section 15 – Reporting categories

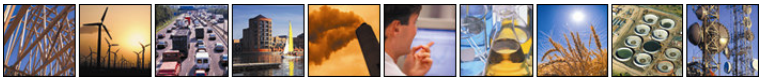
- **Add the UNFCCC Common Reporting Format reporting codes for aviation to Section 15.1**

Section 16 – Requirements for installations with low emissions

- *Further analysis of the need for exemptions for aircraft operators with low emissions to be outlined on the basis of the public consultation process.*

New Annex XV

The following sections need to be included in a new Annex XV for aviation:



Boundaries and completeness

- **Include additional guidance in Annex XV on using the ICAO airline designator to determine the aircraft operator responsible for commercial flights**
- **Annex XV should clarify that in their monitoring plans, aircraft operators should list aircraft instead of all emission sources**
- **Provisions to state that operators must submit their Monitoring Plans for approval at least six months prior to the start of the phase should be included**

Determination of CO_2 emissions

Activity Data

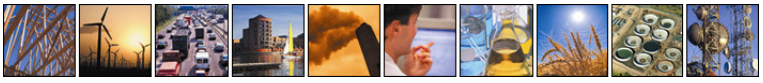
- **An equation to specify how to calculate energy content of fuel consumed (including units to use) should be specified in the new Annex XV**

Fuel Consumed

- **The applicability of tiers from the MRG to the aviation sector should be reviewed in light of the metering uncertainties for the industry.**
- **The possibility of using an alternative method when fuel consumption calculation is not possible on a flight by flight basis should also be investigated as part of the consultation process.**
- **Specify that if actual fuel consumption data are not available, then aircraft operators may use the fall-back approach**

Net Calorific Value

- **Investigate in the consultation if standard NCV would be appropriate for the whole aviation sector.**



- **If the IPCC default NCV are considered an appropriate standard value, include references for jet kerosene, jet gasoline and aviation gasoline in Section 11 of the MRG.**

Emission factor

- **Clarify through the consultation if standard emission factors could be applied for the industry as a whole.**
- **If tiers of approaches are preferred for emission factors, specify that the Annex II tiers for monitoring and reporting emission factors should be available to aircraft operators, with the exception of Tier 2a.**

Oxidation factor

- **The oxidation factor for aviation should be defined as 1 in the new Annex XV**

In reviewing any information related to tiers, it is worth bearing in mind that only 1 tier may end up being applied to the aviation sector. This will ultimately depend on confirmation of the monitoring plan as part of the consultation process.

The following text could be used for the preceding issues:

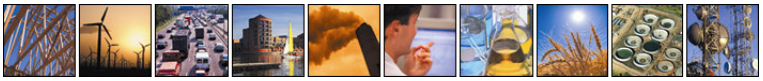
"CO_2 emissions from aircraft activities shall be monitored and reported in accordance with section 2.1.1.1 of Annex II, with the following exceptions proposed for Annex XV."

(a1) **fuel consumed by aircraft:**

Fuel consumed by aircraft shall be calculated by means of the following formula:

Fuel consumed [t or Nm^3] = fuel contained in aircraft tanks once fuel uplift for the flight is complete [t or Nm^3] - fuel contained in aircraft tanks once fuel uplift for subsequent flight is complete [t or Nm^3] + Fuel uplift for that subsequent flight [t or Nm^3]

Where actual fuel consumption data are not available, aircraft operators may use a fall-back approach as set out in Annex I.



Tier 1

The fuel consumption over the reporting period shall be determined by the aircraft operator within a maximum uncertainty of less that ±7.5%

Tier 2

The fuel consumption over the reporting period shall be determined by the aircraft operator within a maximum uncertainty of less that ±5%

Tier 3

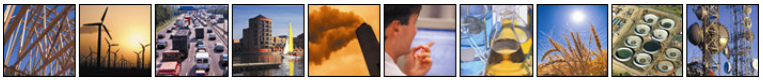
The fuel consumption over the reporting period shall be determined by the aircraft operator within a maximum uncertainty of less that ±2.5%

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%"

Minimum requirements

- *Further analysis of the suitability of the threshold for aircraft operators with low emissions.*



7. Administrative costs

7.1 Overview

One of the key principles of monitoring and reporting is to ensure that the process does not impose unreasonable costs upon operators and/or CAs while still achieving the highest accuracy level practicable. Increasing the cost-effectiveness of the guidelines without compromising accuracy can ensure that all parties involved are able to meet their obligations at a reduced cost. This section will therefore examine the potential administrative cost implications of MRV for annual aviation emissions for the different parties involved.

7.2 Operator costs

A study by PWC (2006) estimated the costs for operators of stationary installations for monitoring and reporting in Phase III as being around €40 million per year for all operators, with costs possibly declining in the future with IT advances and familiarity with the process. Assuming a total of approximately 11,000 stationary installations gives an average cost per installation of around €3,500 per year. On top of this, operators have to pay for verification and PWC estimated that this would add another €30-40 million per year, although this cost has been borne by the CA in certain Member States in the past.

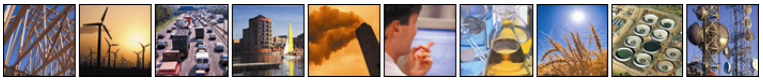
Many of the existing MR requirements are applicable to aviation, so it is reasonable to compare costs incurred by stationary installations with possible costs faced by aircraft operators as the administrative costs for stationary installations will give at least a rough estimation.

As for installations in 2004/5, this process is new to the majority of the aircraft operators it so will no doubt require additional costs in the initial stages of its operation. Operator costs can be divided into:

- Set-up costs for developing the monitoring plan and seeking approval from the CA;
- Ongoing costs for performing the required monitoring, reporting and data management; and
- Ongoing costs for reporting annual emissions and obtaining a verification opinion.

7.2.1 Setup Costs

Set-up costs will be different for different types of airlines. For example, airlines with existing systems able to provide information on fuel consumption per flight would expect lower setup costs.



7.2.2 Ongoing Costs - Monitoring Plans

Reviews by MS of stationary installation costs suggest Monitoring Plan preparation and submission to the CA will take 1-6 working days. As the process is new to most aircraft operators it is likely to be at the higher end of this estimate, at least for the initial phase of the scheme. Assuming €600/day for the staff days, gives costs of between €600 and €3600 per year for Monitoring Plans submissions. Although it is probable that larger aircraft operators may require more days to produce more detailed Monitoring Plans than smaller aircraft operators, it is also true that they will emit a far greater quantity of CO_2 meaning that small aircraft operators could be paying much more per tonne of CO_2 for monitoring plan preparation than larger operators (as is the situation for stationary installations).

7.2.3 Ongoing Costs - Annual Emissions Reports

Estimated work days needed for implementing systems, gathering and collating data as well as preparing and submitting the AER vary significantly in MS reviews from around 5 working days to as much as 15 working days. It is envisaged that the majority of this time will be spent on gathering and collating the data. Taking €600 again as a typical day rate for operators' staff time leads to an estimate of €3000 to €9000 per operator per year for ongoing reporting. As with the monitoring plan, in proportion to their overall emissions, small aircraft operators could be paying far more to prepare and submit their AER (per tonne of CO_2 they emit) than large operators.

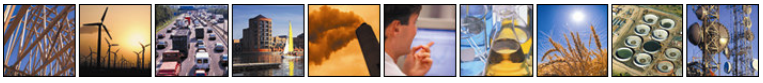
In the UK, AEAT (2006) estimated that the costs of data collation, data management and annual emissions reporting in the existing scheme is around €3000/yr per stationary installation and suggested that they make up around 30% of the administrative costs of the ETS incurred by operators. These annual costs are expected to come down gradually with improvements in systems and experience but are likely to be at least this high initially for aircraft operators as they get to grips with the new process.

Annual reports will also need to be verified and the cost of verification will be borne by the aircraft operator. Initial costs may be slightly higher for aviation verification as this will be the first time that the EU ETS verifiers will encounter aviation and this will be the first time that aircraft operators have encountered verification. As experience grows, however, the cost is likely to come down. PWC (2006) estimated verification costs across Europe are initially around €3000 to €4000 for each stationary installation per year.

For aviation, the verification process is estimated to take between 3 and 10 days depending on the size and complexity of the operator's flights and quality of the raw data and records available. Verifiers' daily rates are likely to be higher than operators and working on €900 per day leads to additional aircraft operator cost of between €2700 and €9000 or the equivalent of between €5.4m and €18m for all the aircraft operators covered.

7.2.4 Distribution of cost impact

Aircraft operators may have very different characteristics to each other and this will influence cost greatly. The aviation industry consists of operators of greatly varying size and complexity. Requirements and structures in



different countries, both within and outside the EU, differ enormously. For this reason the proportional costs of MRV for one aircraft operator may be significantly different from another.

A study by AEAT showed that when costs are normalised on a 'per tonne of emission' basis, they are significantly higher for smaller emitters. The results obtained show that that the annual operational costs (excluding one-off and voluntary costs) for small operators of stationary installations were up to 200 times larger per tonne of CO_2 than for the largest emitters. For small emitters it is in the range £1-2 per tonne CO_2 compared to less than 1 pence per tonne CO_2 for the largest emitters.

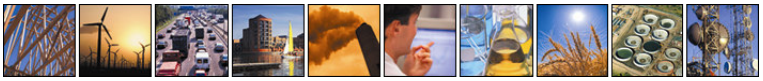
Table 7.1 Annual administrative costs for installations in the EU ETS

Sector	Category (CO_2 kilo tonnes)	Sample	Average annual emissions (tonnes CO_2)	Average Costs (£)	Average cost (£) per tonne of CO_2
Industry	A1a (≤5)	6	3,500	6300	2.04
	A1b (>5-10)	2	7,000	6300	0.98
	B (>50-500)	1	260,000	3534	0.01
	C (>500)	3	6,162,741	3238	<0.01
Services*	A1a (≤5)	9	3,550	4316	1.29
	A1b (>5-10)	21	7,235	5301	0.76
	A2 (>10-25)	6	15,244	3486	0.25

Source: *Costs of Compliance with the EU Emissions Trading Scheme (AEAT study commissioned by the* Environment Agency) Summary Report June 2006

It may be the case that some operators simply have more resources and therefore may spend significantly more in complying with MR requirements. At the same time some large operators may incur significantly lower additional costs for specific activities. For example, they may already have established reporting mechanisms in place, they may be familiar with regulatory practices or may even have already been part of an emissions trading scheme. If this is the case they will already have familiarity with the processes involved and will require fewer resources than other operators to comply. This is demonstrated in the table above which shows that the averaged costs for larger installations were much lower than small installation despite having several times more emissions.

If small operators that emit low emissions were excluded from the Scheme, the impact on the Scheme's overall emissions reduction potential would be negligible; however, the reduction in overall administrative burden would be significant. This is an argument in favour of relaxing the reporting requirements for the smallest operators with a 'lighter' regulatory touch.



The proposed amendments to exclude operators with less than a certain number of flights into and out of the EU, may result in a number of operators no longer being included in the scheme and therefore the burden on smaller operators will not be imposed.

Competent Authority Costs

The PWC survey showed that for the 25 Member States that were involved in Phase I of the EU ETS, costs for CAs were around €25-35 million per year for each Member State. Not all of these costs will go directly to the CA as some costs are likely to be recovered from the operators (e.g. in the UK operators pay yearly subsistence fees depending on the scale of their emissions). However, in other countries they are borne entirely by the CA.

MS will already have familiarity with the monitoring process for other sectors meaning that costs may decline for MS through increasing experience and implementation of IT systems (PWC, 2006). However, this is a new sector so depending on the differences that emerge between the existing monitoring process and the aviation process further costs may be incurred.

The PWC report estimates that regulations/national guidance will need to be amended to take account of new Decision: *"Assuming it takes roughly around 30 to 40 working days for a MS to make changes to existing legislation/guidance, this would equate to around 800 to 1000 days (€0.5-€0.6m) across the 27 MS"* for new guidelines to be implemented.

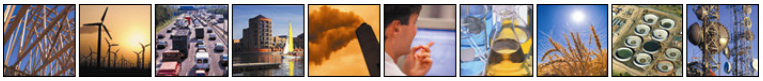
7.2.5 Ongoing Costs - Monitoring Plans

CAs will be responsible for checking the monitoring plans submitted by aircraft operators. Estimates of the time this will take are in the region of 3 to 4 days for stationary installations. Some CAs will be responsible for many more aircraft operators than others so their administrative burden will be significantly higher. The overall costs for all the CAs based on a day rate of €600 with 2000 aircraft operators in the scheme are in the region of €3.6- €4.8m, with a cost of between €1800 and €2400 per operator.

7.2.6 Ongoing Costs - Annual Emissions Report

CAs receive operator annual emission reports which they can then check along with the verification opinion statements. It is possible they will insert the data and information into a database, or simply retain hard copies of reports on file. PWC (2006) estimates that the processes involved in accepting the annual emissions report costs the CAs in 25 MS around €5 million per year. These costs are likely to be substantially lower for the aviation sector as there will be a lot fewer operators to deal with.

It is estimated that the process will only take between 0.2 and 0.75 days as it is a relatively simple procedure. This leads to a cost per operator of €120 and €450. This will mean a total cost to the different CAs, for checking the AER verification opinion of all aircraft operators covered by the scheme, of between €60,000 and €225,000.



8. Glossary of terms

[To be completed once report has been finalised]

Term	Definition
Material misstatement	'Material misstatement' means a misstatement (omissions, misrepresentations and errors, not considering the permissible uncertainty) in the annual emissions report that, to the professional 31.8.2007 EN Official Journal of the European Union L 229/9 judgment of the verifier, could affect the treatment of the annual emissions report by the competent authority, e.g. when the misstatement exceeds the materiality level;
MRG 2007 Decision	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 aviation proposal	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
The EU ETS Directive	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
The Review proposal	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
Jet fuels	Jet kerosene and jet gasoline
Aviation fuels	Jet kerosene, jet gasoline and aviation gasoline
MS	Member States
CA	Competent Authorities