EUROCONTROL Small Emitters Tool
Version 2012.01.22
Explanatory Notes for Application to 2011 Traffic in EU ETS

Purpose of the EUROCONTROL EU ETS Small Emitters Tool

The Small Emitters Tool has been designed to provide aircraft operators with fuel consumption and carbon dioxide estimates for certain flights covered by the EU Emisisons Trading Scheme (EU ETS). In particular, it can be used by Small Emitters using the simplified method for fuel and emissions reporting, and by any Aircraft Operator that needs such information to cover gaps in its data.

Simplified Monitoring for Small Emitters
According to European Commission Decision 2007/589/EC amended by Decision 2009/339/EC, Small Emitters may use a simplified method to determine their fuel consumption and carbon dioxide emissions for EU ETS monitoring and reporting purposes.

The **S**mall **E**mitters **T**ool (SET) is the EUROCONTROL fuel consumption and carbon dioxide (CO_2) estimation tool approved by the European Commission via the Commission Regulation (EU) No. 606/2010. It can be used by Small Emitters in fulfilment of their monitoring and reporting obligations pursuant to Article 14(3) of the Directive 2003/87/EC (the EU ETS Directive) and Part 4 of Annex XIV to Decision 2007/589/EC (the monitoring and reporting guidance).

Data Gaps for Aircraft Operators
The Small Emitters Tool may also be used by all aircraft operators pursuant to Part 5 of Annex XIV to Decision 2007/589/EC for the purposes of estimating the fuel consumption of particular flights covered by the EU ETS, where the data necessary to monitor the emissions of carbon dioxide are missing as a result of circumstances beyond the control of the aircraft operator and which cannot be determined by an alternative method defined in the operator's monitoring plan.

Accessing the Small Emitters Tool

The SET is made available in the form of an Excel file that can be downloaded from:

http://www.eurocontrol.int/environment/public/standard_page/small_emitters.html

It is important to stress that users of the SET, in particular aircraft operators including small emitters and verifiers using it for ETS reporting purposes, must use the version of the SET applicable for the reporting year, i.e.:

- **v2010.01.01 when reporting traffic and emissions for 2010 activities;**
- **v2012.01.22 when reporting traffic and emissions for 2011 activities.**

The tool is updated on a regular basis in order to improve, when possible, its accuracy.

Overview of the SET methodology

The Small Emitters Tool is an algorithm that estimates fuel burn and CO_2 emissions. It is designed to estimate the fuel burn for an entire flight (*not* for specific flight phases) considering the characteristics of the air traffic covered by the EU ETS. It estimates the fuel burn as a function of (i) the distance flown on a flight from the departure to the destination aerodromes and (ii) the aircraft type (the aircraft type being identified via its ICAO Doc 8643 four-letter code designator).

The tool then further converts this fuel burn estimate into CO_2 emissions taking into consideration the engine type of the aircraft type: for aircraft equipped with jet or turboprop engines an emissions factor of 3.15 is used and for piston-engine aircraft an emissions factor of 3.10 is used.

The SET algorithm is also embedded in the ETS Support Facility (ETS-SF) that EUROCONTROL operates on behalf of the Competent Authorities of the EU ETS States to support them in the regulatory oversight of the aviation sector in the ETS. The Support Facility is also used to provide aircraft operators with draft annual emissions reports and flight activity reports for ETS compliance and verification purposes. EUROCONTROL performs this task at the request of the Competent Authorities.

Further details about the SET and the ETS-SF related support services that EUROCONTROL provides can be found at:

http://www.eurocontrol.int/environment/public/standard_page/ETS_Index.html

SET VERSIONS

The fuel burn/emissions algorithm underpinning the SET was originally developed in 2009 to calculate the historical aviation emissions for the period 2004-2006 on behalf of the European Commission (see 2011/149/EU: Commission Decision of 7 March 2011)**.** As part of this exercise, the algorithm was fine-tuned with fuel burn data from about 700,000 flights provided confidentially and on a voluntary basis to EUROCONTROL by aircraft operators from around the world. The data encompasses a representative range of aircraft types as far as the generation of CO_2 is concerned. It is a statistical model designed to produce a reliable estimate of the total CO_2 emitted.

A first version of the SET was released on 2nd March 2011 for use by aircraft operators reporting their 2010 fuel burn and emissions to ETS Competent Authorities. As a result of feedback received from operators since then, EUROCONTROL has further improved the quality of the SET, leading to the release of an updated version on 22nd January 2012. EUROCONTROL has worked closely with the European Business Aviation Association (EBAA) to organise the provision of further data to improve the model's estimation of fuel burn for a number of aircraft types used by that industry sector. The support of EBAA and the aircraft operators concerned has been invaluable and is greatly appreciated.

This new version (v2012.01.22) does not show significant changes to the estimated total CO_2 for the 2010 traffic captured by the ETS, compared with the results from the initial version (that was used for historical emissions calculations) on the same traffic sample. Nevertheless, at the "micro level" dealing with individual flights, the difference in estimated fuel burn and emissions could be quite significant for those aircraft types for which new fuel burn data has been used to fine-tune the model's performance, in particular for business aviation.

SET DESIGN

The tool is built using sample data on actual fuel burn that was mainly collected in 2009 from a variety of aircraft operators from all aviation sectors (business jets, legacy carriers, charter airlines, low fares operators, cargo airlines etc..). As mentioned above, additional fuel burn data was gathered in 2011 to improve the modelling of aircraft types used by business aviation operators.

Once the sample data received have successfully passed certain validation tests, they are considered to be sufficiently representative of an aircraft type's overall traffic pattern and fuel

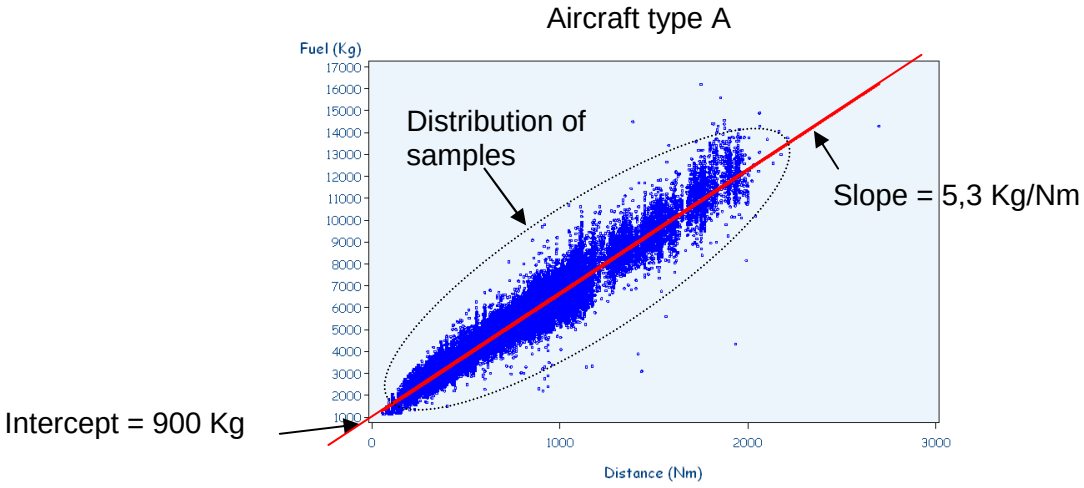
burn, and are then used to extrapolate linear models of fuel burn versus distance flown for each aircraft type.

The SET covers all aircraft types that have been referenced in flight plans and billing messages from EUROCONTROL's Central Flow Management Unit and its Central Route Charges Office since 2004. This encompasses 402 different aircraft types with MTOW above 5.7 tonnes and 391 types below 5.7 tonnes.

Data samples for the 61 most popular aircraft types have been gathered. These 61 types account for about 90% of the total estimated CO_2 emissions associated to the air traffic falling under the ETS in 2010.

The fuel burn model for a given aircraft type is represented in the SET by a linear model defined by two parameters: the **intercept** (at distance zero - which should not be interpreted as the average LTO fuel consumption) and the **slope** (kg of fuel per nautical miles flown). The fuel consumption and CO_2 emissions for a specific flight are then calculated, as follows:

Fuel_burn_quantity_in_kg = **Intercept** + (**slope** * distance_flown_in_nm);
and
CO_2_quantity_in_kg = Fuel_burn_quantity_in_kg * 3.15 (or 3.10)



For the remaining aircraft not modelled using fuel burn data samples, three complementary approaches have been used to establish a linear fuel burn model for all aircraft types captured by the ETS:

A) The "equivalent aircraft" approach used when a fuel burn model based on data samples is not available for the aircraft type in question, but is available for an aircraft of equivalent design (generally speaking a stretched or shorter version of an aircraft, e.g. A30B for an A306). In this case, the ratio of the respective MTOWs (maximum take off weights) creates aircraft variants in the SET whose fuel burn performance is taken as being proportional to the ratio between the MTOW of the aircraft to be modelled and the MTOW of the "equivalent aircraft".

B) Using existing fuel burn information about aircraft types covered by the "ANCAT"[1] methodology, after these models have been transformed into linear models (because in their native form the ANCAT models are not linear). These models are further offset by values derived from the aircraft types in the data samples that belong to the same weight class and type (jet, turboprop or piston).

C) For the remaining aircraft types, a simplified linear model is developed based on aircraft type weight category (below 43 tonnes, between 43 and 90 tonnes, and above 90 tonnes) and engine type (Jets, Turboprops). The principle is to use the curves of the parameters (intercept and slope) versus aircraft weight that are available for the samples' types, using the same categorisation as above, and to extrapolate the parameters' values for the given aircraft type weight being considered.

IMPROVING THE ACCURACY OF THE SET

EUROCONTROL plans to update the aircraft type models in the SET through periodic gathering of up-to-date fuel burn data samples from aircraft operators. This will reassure users that the fuel burn model parameters for each aircraft type in the SET are as close as reasonably possible to the average operational reality. It must be remembered, however, that as the SET has been designed to provide the average estimated fuel burn for a given flight, the accuracy of the estimate of the overall fuel burn for a set of flights operated with the same aircraft type will improve as the number of flights increases.

[1] The Group of Experts on the "Abatement of Nuisances Caused by Air Transport", drawn from the Sates of the European Civil Aviation Conference