澳門特別行政區
REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU
民航局
AUTORIDADE DE AVIAÇÃO CIVIL
CIVIL AVIATION AUTHORITY

AC
No. : AC/GEN/012R00
Date : 13 May 2020

AERONAUTICAL CIRCULAR
CIVIL AVIATION AUTHORITY – MACAO, CHINA

SUBJECT:

Monitoring, reporting and verification (MRV) of aeroplane operator annual CO_2 emissions

EFFECTIVE DATE:

01 June 2020

CANCELLATION:

Nil.

GENERAL:

The President of Civil Aviation Authority, in exercise of his power under Article 35 of the Statutes of Civil Aviation Authority, approved by the Decree-Law 10/91/M, established this Aeronautical Circular (hereinafter "AC").

PURPOSE:

The First Edition of Annex 16 — Environmental Protection, Volume IV — *Carbon Offsetting and Reduction Scheme for International Aviation* (CORSIA) (hereinafter "Annex 16 Vol IV") was adopted by the Council of the International Civil Aviation Organization (ICAO) on 27 June 2018 and became effective on 22 October 2018.

Following the implementation of Annex 16 Vol IV, aeroplane operators shall monitor, report and verify their fuel use from flights effective 1 January 2019.

The purpose of this AC is to implement the interim measures for monitoring, reporting and verification (MRV) of aeroplane operator annual carbon dioxide (CO_2) emissions from civil aviation activities. These measures are formulated for the purpose of implementing the standardized procedure for data management related to CO_2 emissions from civil aeroplane flight activities and promoting the truthfulness, accuracy and completeness of data related to CO_2 emissions from civil aeroplane flight activities.

SCOPE OF APPLICATION

This AC is applicable to operators of aeroplane(s) registered in Macao, that produce an annual CO_2 emissions greater than 10,000 tonnes from conducting flights using an aeroplane(s) with a maximum certificated take-off mass greater than 5,700 kg, with the exception of humanitarian, medical, firefighting and state flights.

DEFINITIONS

In this regulation, unless the context otherwise requires:

Accountable entity: The aeroplane operator who is responsible for the management of carbon dioxide emissions data for the corresponding aeroplane flight activities.

Accreditation: Third-party certification to a verification body that officially demonstrates its ability to perform specific verification tasks.

Accreditation body: A body authorized by a State or Region which attests that a verification body is competent to provide specific verification services, such as the China National Accreditation Service for Conformity Assessment.

Aerodrome: A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aeroplane.

Aerodrome pair: A group of two aerodromes composed of a departing aerodrome and an arrival aerodrome.

Aeroplane: A power-driven heavier-than-air aircraft, deriving its lift in flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight.

Aeroplane operator: The person, organization or enterprise engaged in or offering to engage in an aeroplane operation.

Air operator certificate (AOC): A certificate authorizing an operator to carry out specified commercial air transport operations.

Annual CO_2 Emissions Report: An annual data report for CO_2 emissions from aeroplane flight activities that an aeroplane operator monitors and complies in accordance with this AC and the approved Emissions Monitoring Plan, which reflects the CO_2 emissions of aeroplane flight activities for a specific year.

Conventional aviation fuel: Petroleum-based aviation fuel.

Data gaps: Gaps in emissions-related data that occur when an aeroplane operator is missing data relevant for the determination of its fuel use for one or more flights. It can occur due to various reasons, including irregular operations, data feed issues or critical system failures.

Flight plan: Specified information provided to air traffic services units, relative to an intended flight or portion of a flight of an aircraft.

Fuel uplift: Measurement of fuel provided by the fuel supplier, as documented in the fuel delivery notes or invoices for each flight (in litre).

Great Circle Distance (GCD): The shortest distance, rounded to the nearest kilometre, between the origin and the destination aerodromes, measured over the earth's surface modelled according to the World Geodetic System 1984 (WGS84).

Leg: The flight section an aeroplane takes each time from take-off to landing during a flight operation.

Materiality: A situation that may affect an Emissions Report or an aeroplane operator's decision due to one or several cumulative errors, omissions, or misinterpretations.

Emissions Monitoring Plan: A plan that an aeroplane operator prepares to describe its procedures related to its CO_2 emissions data collection, management, flow and risk control, so as to conform to the CO_2 emissions monitoring requirements as stipulated in this AC. The Emissions Monitoring Plan is the basis for the aeroplane operator to implement CO_2 emissions monitoring and is also one of the basis for verification of Emissions Report.

Verification body: A legal entity that performs the verification of an Emissions Report, as an accredited independent third party.

Verification of report: An independent, systematic and sufficiently documented evaluation process of an Emissions Report.

Verifier: A competent independent person responsible for verifying and reporting on the verification process.

Verification team: A group of verifiers, or a single verifier, belonging to a verification body conducting the verification of an Emissions Report. The team can be supported by technical experts.

1. General

1.1 Accountable Entity

1.1.1 The aeroplane operator is the accountable entity for compliance of this AC.

1.1.2 If an aeroplane operator and a wholly-owned subsidiary aeroplane operator or a subsidiary where it has a controlling interest seek to be considered as a single aeroplane operator for the purpose of this AC, the consolidated accountable entity shall declare this in the submitted Emissions Monitoring Plan.

1.1.3 The accountable entity is responsible for the accuracy and completeness of the information submitted in its Emissions Monitoring Plan and the Emissions Report.

1.1.4 The accountable entity may entrust the administrative and compilation work of Emissions Monitoring Plan and Emissions Report to a third party, as long as the entrusted third party is not the same entity as the verification body. Liability for compliance shall not be delegated.

1.2 Flight Activity Category

First Type: both ends of the flight leg are within the mainland China (i.e. excluding the areas of Hong Kong, Macao and Taiwan).

Second Type: one end of the flight leg is within the mainland China (i.e. excluding the areas of Hong Kong, Macao and Taiwan) and another is in the areas of Hong Kong, Macao or Taiwan; or both ends are in the areas of Hong Kong, Macao or Taiwan.

Third Type: one end of the flight leg is in the People's Republic of China (including the areas of Hong Kong, Macao and Taiwan), and another end is in another country; or the two ends of the flight leg are in different countries except the People's Republic of China (including the areas of Hong Kong, Macao and Taiwan).

Fourth Type: Both ends of the flight leg are in the same country outside the People's Republic of China (including the areas of Hong Kong, Macao and Taiwan).

1.3 Attribution of flight to an aeroplane operator

The aeroplane operator shall identity flights that are attributed to it according to the following principles:

(a) **ICAO Designator**: When Item 7 (aircraft identification) of the flight plan contains the ICAO Designator, that flight shall be attributed to the aeroplane operator that has been assigned this Designator;

(b) **Registration marks:** When Item 7 (aircraft identification) of the flight plan contains the nationality or common mark, and registration mark of an aeroplane that is explicitly listed in an AOC (or equivalent), that flight shall be attributed to the aeroplane operator that holds the AOC (or equivalent); and

(c) **Other:** When the aeroplane operator of a flight has not been identified via (a) or (b), that flight shall be attributed to the aeroplane owner who shall then be considered the aeroplane operator.

1.4 Record keeping

An aeroplane operator must keep records required by Sections 2, 3 and 4 of this AC for at least 10 years.

1.5 Compliance timeline

(a) The aeroplane operator shall submit an Emissions Monitoring Plan to this Authority for approval within three months of falling within the scope of applicability. The relevant requirements of the Emissions Monitoring Plan are detailed in Section 2;

(b) The aeroplane operator shall submit to this Authority the verified Emissions Report and the associated Verification Report for 2019 before 30th June 2020. Starting from 2021, the aeroplane operator shall submit the verified Emissions Report and the associated Verification Report for the previous year before 30th April of each year. The relevant requirements for the Emissions Report and the associated Verification Report are detailed in Sections 3 and 4.

2. Monitoring

2.1 Submission and approval of Emissions Monitoring Plan

2.1.1 The aeroplane operator(s) shall compile the Emissions Monitoring Plan in accordance with the requirements stipulated in Annex 3 of this AC.

2.1.2 If this Authority considers that the aeroplane operator's Emissions Monitoring Plan is incomplete and/or inconsistent with the Emissions Monitoring Plan requirements as stipulated in Annex 3 of this AC, the aeroplane operator shall modify the Emissions Monitoring Plan until it is approved.

2.1.3 The aeroplane operator shall resubmit the Emissions Monitoring Plan in a timely manner to this Authority for approval if a material change, as defined in Annex3, is made to the information contained in the Emissions Monitoring Plan. Other non-material changes shall also be stated in the Emissions Report of that reporting year. If the actual monitoring work implemented deviates from the approved Emissions Monitoring Plan due to technical reasons, the aeroplane operator shall describe it in the Emissions Report of that reporting year.

2.2 Flight activity monitoring

2.2.1 The aeroplane operator shall monitor and record the flights attributed to it in accordance with the requirements set in paragraphs 1.2 and 1.3 of this AC. Recorded information of each flight activity shall at least contain the information listed in Annex 3 of this AC. The flight data record shall be logically rational, complete, traceable and non-repetitive.

2.2.2 The aeroplane operator needs to provide sufficient evidence for the humanitarian, medical, firefighting or state flights performed for exemption in the Emissions Report.

2.2.3 Flight activities of wet-leased aeroplane shall be monitored and recorded by the lessee, not the lessor.

2.3 Emissions data monitoring

2.3.1 The aeroplane operator shall monitor and record the fuel type and fuel use from flights attributed to it in accordance with the approved Emissions Monitoring Plan. The fuel use monitoring methods shall comply with the requirements stipulated in Annex 1 of this AC.

2.3.2 The aeroplane operator shall record the fuel density value (which can be the actual value or a default value of 0.8 kg per litre) that is used to calculate the fuel mass. The procedure for informing the use of actual or standard density shall be detailed in the Emissions Monitoring Plan.

2.3.3 CO_2 emissions from flights are calculated by the following equation:

$$CO_2 = \Sigma\, M_f * FCF_f$$

where:
CO2 = CO2 emissions (in tonnes);
Mf = Mass of fuel f used (in tonnes); and
FCFf = Fuel conversion factor of given fuel f

Fuel conversion factors for the various types of conventional aviation fuel are detailed in Annex 1.

2.3.4 The aeroplane operator shall use China Aviation CO_2 Estimation and Reporting Tools by the Civil Aviation Administration of China (CACERT) to:

(a) assess whether or not the aeroplane operator falls within the scope of applicability of this AC;

(b) filling any CO_2 emissions data gaps.

2.4 Total tonne kilometre

2.4.1 The total tonne kilometre operated by an aeroplane operator is the summation of the products of each flight's payload multiplied by the Great Circle Distance of the flight. See Annex 1 for details.

2.4.2 The payload of each flight includes passengers, cargo and mail carried, measured in weight.

2.4.3 If a particular data of a flight used to calculate the total tonne kilometre is missing, that particular data item is counted as 0.

3. Reporting

3.1 Annual CO_2 Emissions Report

3.1.1 The aeroplane operator shall compile the annual Emissions Report in accordance with the report template in Annex 4 of this AC.

3.1.2 When the parent-subsidiary aeroplane operators report as a single entity, disaggregated CO_2 emissions data relating to each subsidiary aeroplane operator shall be appended to the main Emissions Report. CO_2 emissions data for private jets entrusted for operation shall be listed out separately.

3.1.3 The aeroplane operator shall report the total CO_2 emissions and tonne kilometre of each aircraft type for each type of flight activity category as specified in paragraph 1.2. For the Third Type of flight activities, aeroplane operator shall additionally report, for each aerodrome pair, the total number of flights operated, the associated total CO_2 emissions and total tonne kilometre.

3.1.4 If an aeroplane operator considers disclosure of some of the data would harm its commercial interests, it may request in writing to this Authority that some particular data not be published, explaining the reasons why disclosure would harm its commercial interest. Based on this request, this Authority shall determine whether this data is confidential.

4. Verification

4.1 Verification of Emissions Report

4.1.1 The aeroplane operator shall engage a verification body accredited by the China National Accreditation Service for Conformity Assessment (CNAS) for the verification of its annual Emissions Report.

4.1.2 The verification body shall conduct the verification in accordance with the standards stipulated by the China National Accreditation Service for Conformity Assessment (CNAS) and the relevant requirements in Annex 5 of this AC.

4.1.2 The verification body is responsible for the authenticity, accuracy and completeness of the Verification Report.

4.2 Competencies of verifiers

Verifiers engaged in the verification activities described in this AC shall possess the required professional knowledge, education and training in order to be qualified to conduct the CO_2 emissions verification of an aeroplane operator.

Annex 1 Fuel Use Monitoring Methods

1. Fuel Use Monitoring Methods

1.1 Method A

1.1.1 The aeroplane operator shall use the following formula to compute fuel use according to Method A:

$$F_N = T_N - T_{N+1} + U_{N+1}$$

where:

F_N = Fuel used for the flight under consideration (=flight $_N$) determined using Method A (in tonnes);

T_N = Amount of fuel contained in aeroplane tanks once fuel uplifts for the flight under consideration (i.e., flight $_N$) are complete (in tonnes);

T_{N+1} = Amount of fuel contained in aeroplane tanks once fuel uplifts for the subsequent flight (i.e., flight $_{N+1}$) are complete (in tonnes); and

U_{N+1} = Sum of fuel uplifts for the subsequent flight (i.e., flight $_{N+1}$) measured in volume and multiplied with a density value (in tonnes).

1.1.2 Sources of data for T_N and T_{N+1} are either from onboard measurement device or log book. Fuel uplift U_{N+1} is determined by the measurement by the fuel supplier, as documented in the fuel delivery notes or invoices for each flight, otherwise, it can also be determined by onboard measurement device or log book.

1.1.3 Where no fuel uplift for the flight or subsequent flight takes place, the amount of fuel contained in aeroplane tanks (T_N or T_{N+1}) shall be determined at block-off for the flight or subsequent flight. In exceptional cases the variable T_{N+1} cannot be determined. This is the case when an aeroplane performs activities other than a flight, including undergoing major maintenance involving the emptying of the tanks, after the flight to be monitored. In such case the aeroplane operator may substitute the quantity "T_{N+1}" with the amount of fuel remaining in tanks at the start of the subsequent activity of the aeroplane or fuel in tanks at Block-on, as recorded by technical logs. " U_{N+1}" takes a value of zero (0).

1.2 Method B

1.2.1 The aeroplane operator shall use the following formula to compute fuel use according to Method B:

$$F_N = R_{N-1} - R_N + U_N$$

where:

F_N = Fuel used for the flight under consideration (i.e., flight $_N$) determined using Method B (in tonnes);

R_{N-1} = Amount of fuel remaining in aeroplane tanks at the end of the previous flight (i.e., flight $_{N-1}$) at Block-on before the flight under consideration (in tonnes);

R_N = Amount of fuel remaining in aeroplane tanks at the end of the flight under consideration (i.e., flight $_N$) at Block-on after the flight (in tonnes); and

U_N = Fuel uplift for the flight considered measured in volume and multiplied with a density value (in tonnes).

1.2.2 Sources of data for R_{N-1} and R_N are either from onboard measurement device or log book. Fuel uplift U_N is determined by the measurement by the fuel supplier, as documented in the fuel delivery notes or invoices for each flight, otherwise, it can also be determined by onboard measurement device or log book.

1.2.3 Where an aeroplane does not perform a flight previous to the flight for which fuel consumption is being monitored (e.g., if the flight follows a major revision or maintenance), the aeroplane operator may substitute the quantity R_{N-1} with the amount of fuel remaining in aeroplane tanks at the end of the previous activity of the aeroplane, as recorded by technical logs.

1.3 Method C (Block-off/ Block-on)

1.3.1 The aeroplane operator shall use the following formula to compute fuel use according to Method C:

$$F_N = T_N - R_N$$

where:

F_N = Fuel used for the flight under consideration (=flight $_N$) determined using Method C (Block-off / Block-on) (in tonnes);

T_N = Amount of fuel contained in aeroplane tanks at Block-off for the flight under consideration i.e., flight $_N$ (in tonnes); and

R_N = Amount of fuel remaining in aeroplane tanks at Block-on of the flight under consideration i.e., flight $_N$ (in tonnes).

1.3.2 Sources of data for T_N and R_N are either from onboard measurement device or log book.

2. Fuel conversion factor for conventional aviation fuel

Fuel type	Fuel conversion factor
No. 3 Jet fuel / Jet-A fuel / Jet-A1 fuel	3.15 kg-CO_2/kg fuel
AvGas / Jet-B fuel	3.10 kg-CO_2/kg fuel

3. Total tonne kilometre

An aeroplane operator shall use the following formula to compute its total tonne kilometre.

$$TK = \Sigma(Pa \times Wa + Pc \times Wc + Pi \times Wi + F + M) \times D / 1000$$

among them:

TK = total tonne kilometre (unit: tonne kilometre)

Pa = number of adults (unit: person)

Pc = number of children (unit: person)

Pi = number of infant (unit: person)

Wa = adult weight (unit: kg / person)

Wc = child weight (unit: kg / person)

Wi = infant weight (unit: kg / person)

F = freight weight (unit: kilograms)

M = mail weight (in kilograms)

D = flight leg distance / Great Circle Distance (unit: km)

3.1. The data items that an aeroplane operator needs to monitor and record include the number of adults, the number of children, the number of infants, the freight weight, the mail weight, the four-character Airport code or latitude and longitude of the departure airport, the four-character Airport code or the latitude and longitude of the arrival airport for each flight attributed to it for the reporting year.

3.2. Standard weight for passengers (including carry-on baggage and checked baggage weight) is: 90 kg/person for adults, 45 kg/person for children, and 9 kg/person for infants.

3.3. The weight of the freight and mail is the weight of the freight and mail (including the container and the pallet) transported in the corresponding flight leg.

3.4. Flight leg distance is the Great Circle Distance (GCD) between the departure airport and the arrival airport and is calculated by the latitude and longitude of the airport in accordance with the method specified by WGS84.

3.5. The data referred to in paragraphs 3.2 and 3.3 of this Annex shall be taken from the loading manifest or equivalent source document.

Annex 2. China Civil Aviation CO_2 Estimation and Reporting Tools (CACERT)

1. How to use

Aeroplane operators and verification bodies shall use the Aviation CO_2 Estimation and Reporting Tools by the Civil Aviation Administration of China (CACERT) for estimation of CO_2 emissions of a particular flight by inputting the "aircraft type, departure and arrival airport" of the flight concerned:

Input	**Tool**	**Output**
Aircraft type Departure airport Arrival airport	**CACERT**	CO_2 emissions

When there is a lack of information about the departure/arrival airports or the Great Circle Distance, user may input "aircraft type and block-on/block-off time" of the flight for estimation of CO_2 emissions:

Input	**Tool**	**Output**
Aircraft type Block-on time Block-off time	**CACERT**	CO_2 emissions

2. Update of CACERT

CACERT is updated by the Civil Aviation Administration of China annually and information about its update will be notified to the users in due time.

Annex 3. Emissions Monitoring Plan

1. Introduction

The procedures specified in this Annex are concerned with the requirement of Emissions Monitoring Plan of aeroplane operators under this AC. Aeroplane operators shall report in accordance with the report template of this Annex.

2. Content of Emissions Monitoring Plan

2.1. Aeroplane operator identification

2.1.1 Name, address, 3-letter ICAO designator code of the aeroplane operator with legal responsibility.

2.1.2 Details of ownership structure of the accountable entity, including its parent company and subsidiaries. If the aeroplane operator in a parent-subsidiary relationship seeks to be considered as a single aeroplane operator for purposes of this AC, confirmation shall be provided that the subsidiary(ies) is/are either wholly-owned by the parent company or the parent company has a controlling interest in the subsidiary. An authorization document from the subsidiary must also be provide to the parent company.

2.1.3 Description of the aeroplane operator's activities such as scheduled/non-scheduled, passenger/cargo, domestic/international operations.

2.1.4 Information about the aeroplane operator's Air Operator Certificate or equivalent document.

2.1.5 Contact information for the personnel (at least 2 personnel contact information) within the aeroplane operator's company who are responsible for the Emissions Monitoring Plan, and who shall be able to fully explain all the contents of the Emissions Monitoring Plan.

2.2. Fleet data

2.2.1 List of the aeroplane types and type of fuel (e.g. No. 3 Jet fuel, Jet-A, Jet-A1, Jet-B, AvGas) used in aeroplanes operated for flights at the time of submission of the Emissions Monitoring Plan, recognizing that there may be changes over time. The list shall include:

(a) Aeroplane types with a maximum certificated take-off mass of 5,700 kg or greater and the number of aeroplane per type, including owned and leased aeroplanes (including wet-leased aeroplane); and

(b) Type of fuel(s) used by the aeroplanes (e.g., No. 3 Jet fuel, Jet-A, Jet-A1, Jet-B, AvGas).

2.2.2 Aeroplane types designators shall be in accordance with the designators contained in ICAO Doc 8643.

2.2.3 If the aeroplane operator operates flights by aeroplanes entrusted for management, flights operated with this type of aeroplane shall be listed out separately.

2.3. Operations data

2.3.1 The aeroplane operator shall ensure that sufficient flight information is recorded to accurately describe the flight activity of the aeroplane. Flight information shall include at least: date of flight, operator's three-letter code, flight number, aircraft type, aeroplane registration number, block-off time, take-off time, landing time, block-on time, departure airport, arrival airport.

2.3.2 Flight information is needed for a flight operated, excluding any cancelled fight. Sources of data may be from onboard measurement device, flight log system, accounting system for landing or navigation fees of the financial department of an aeroplane operator.

2.3.3 To ensure completeness of monitoring of data (i.e. no repeated recording, no data missing), aeroplane operator shall specify the time standard used for all flight dates and times (UTC or Beijing time), which shall not be changed once adopted.

2.3.4 The aeroplane operator shall describe the procedures used to distinguish the flight activity category (First, Second, Third, Fourth Type).

2.3.5 During the monitoring period, if a wet-leased aeroplane is operated alternately between two (inclusive) aeroplane operators, the actual aeroplane operators shall describe how to identify the attribution of each flight. The lessor shall provide the lessee with the information on the flight activity and the lessee shall describe the working procedures for the exchange of information.

2.4. Fuel use monitoring

2.4.1 For the First Type and Second Type of Flight Activities as described in paragraph 1.2 of this AC, Monitoring Method A or Method B as described in Annex 1 shall be used for monitoring of fuel use. For the Third Type and Fourth Type of Flight Activities, aeroplane operator may choose among the three Monitoring Methods as described in Annex 1 for monitoring of fuel use.

2.4.2 To ensure the accuracy of the fuel meter system, the aeroplane operator shall describe the maintenance procedures for the onboard measurement device fuel meter system. To ensure the accuracy of the fuel uplift, the aeroplane operator shall describe the information on the procedures for determining and recording the fuel uplift and fuel density.

2.4.3 To ensure the completeness and accuracy of fuel use data records, aeroplane operators shall have at least one set of primary (ex. onboard measurement device) and one set of secondary (ex. log books) source of data.

2.4.4 When a data is missing from both data sources, aeroplane operator shall use the CACERT (see Annex 2 for details) to estimate the fuel use of a specific flight leg.

2.5. Total tonne kilometre

2.5.1 In line with the formulae described in Annex 1, an aeroplane operator shall describe in detail the procedure for the monitoring of its total tonne kilometre operated.

2.5.2 The standard weight of passengers used for calculation of total tonne kilometre shall be in accordance with the standards described in Annex 1.

3. Data management, data flow and control

3.1. The aeroplane operator shall provide the following information:

(a) roles, responsibilities and procedures on data management;

(b) procedures to handle data gaps and erroneous data values, including:

i. Secondary data reference sources which would be used as an alternative;

ii. Alternative method in case the secondary data reference source is not available;

(c) documentation and record keeping plan;

(d) assessment of the risks associated with the data management processes and means for addressing significant risks;

(e) a data flow diagram summarizing the systems used to record and store data associated with the monitoring and reporting of CO_2 emissions.

3.2. The aeroplane operator shall specify which departments are involved in data management and workflow, and describe their associated roles and responsibilities.

3.3. The aeroplane operator shall specify the working procedures and the conditions applied for use of secondary source of data.

3.4. The aeroplane operator shall specify the filing procedures for the data, the records and the original documents.

4. Revision of Emissions Monitoring Plan

When the aeroplane operator identifies that the actual monitoring work deviates from the monitoring plan, the Emissions Monitoring Plan shall be updated in time and reported to this Authority. Emissions Monitoring Plan changes are either material or non-material. Material changes are changes in monitoring methods, which require that the Emissions Monitoring Plan be revised for re-approval by this Authority. Non-material changes are general changes that do not require re-approval by this Authority.

5.1 Material changes

5.1.1 The aeroplane operator shall promptly revise the Emissions Monitoring Plan for re-approval by this Authority under the following circumstances:

(a) change of the name of the accountable entity;

(b) change in the aeroplane operator's designation code;

(c) reorganization of the accountable entity, the number of aeroplane, the number of flights, and emissions have significant changes;

(d) changes in the number of entities considered as a single operator for the purpose of reporting;

(e) changes in fuel use monitoring method(s) used, such as changes in data source, data flow and fuel use monitoring method;

(f) the data source, data flow and fuel use monitoring method used for newly added aircraft types are different from the existing fuel use monitoring method(s);

(g) upon review by a verification body or by this Authority it is concluded that the actual monitoring method deviates from the approved monitoring plan.

5.1.2 In the case of (a) to (g) above, the aeroplane operator shall voluntarily revise the Emissions Monitoring Plan and submit the revised Plan to this Authority for approval.

5.2 Non-material changes

The aeroplane operator shall revise the Emissions Monitoring Plan and file to this Authority under the following circumstances (re-approval is not needed):

(a) change in contact person(s) information, such as change in legal representative, contact person, address, telephone number, etc;

(b) aircraft types increases/decreases by more than 3 types and such increase/decrease will not affect the emissions monitoring method;

(c) size of fleet increases/decreases by more than 30%.

5. Template of an Emissions Monitoring Plan is detailed in attached Table 1.

Annex 4. Reporting

1. Introduction

The procedures specified in this Annex are concerned with the reporting requirements of aeroplane operator's CO_2 emissions under this AC. The aeroplane operators shall report in accordance with the report template of this Annex.

2. Emissions Report filing requirements

2.1 The accountable entity of the Emissions Report shall be consistent with the approved Emissions Monitoring Plan.

2.2 If an Emissions Monitoring Plan is revised and approved by this Authority for the reporting year, the material change(s) need to be specified in the Emissions Report of that reporting year.

2.3 If changes happened to the monitoring process for the reporting year, which resulted in a deviation from the approved Emissions Monitoring Plan, aeroplane operator shall describe in detail the deviation.

2.4 If the responsible entity includes multiple aeroplane operators, each aeroplane operator's data shall be reported separately.

3. Template of an Emissions Report is detailed in attached Table 2.

Annex 5. Verification

1. Introduction

The verification body shall be accredited by the China National Accreditation Service for Conformity Assessment (CNAS) and meet the following additional requirements in order to be eligible to verify the Emissions Report of an aeroplane operator.

2. Verification body

2.1 Avoidance of conflict of interest

2.1.1 If the leader of the verification team undertakes six annual verifications for one aeroplane operator, then the leader of the verification team shall take a three consecutive year break from providing verification services to that same aeroplane operator. The six-year maximum period includes any greenhouse gas (GHG) verifications performed for the aeroplane operator prior to it requiring verification services under this AC.

2.1.2 The verification body, and any part of the same legal entity, shall not be an aeroplane operator, the owner of an aeroplane operator or owned by an aeroplane operator.

2.1.3 The verification body, and any part of the same legal entity, shall not be a body that trades emissions units, the owner of a body that trades emissions units or owned by a body that trades emissions units.

2.1.4 The relationship between the verification body and the aeroplane operator shall not be based on common ownership, common governance, common management or personnel, shared resources, common finances and common contracts or marketing.

2.1.5 The verification body shall not take over any delegated activities from the aeroplane operator with regard to the preparation of the Emissions Monitoring Plan, the Emissions Report (including monitoring of fuel use, calculation of CO_2 emissions and calculation of total tonne kilometre).

2.2 Management and personnel

The verification body shall establish, implement and document a method for evaluating the competence of the verification team personnel against the competence requirements. The verification body shall maintain records to demonstrate the competency of the verification team and personnel.

2.3 Verification team

2.3.1 The verification team as a whole shall demonstrate knowledge in the following technical competencies:

(a) the requirements as outlined in this AC regarding monitoring, reporting and verification of an aeroplane operator CO_2 emissions;

(b) the requirements as outlined in Volume IV of ICAO Annex 16, the ICAO Assembly Resolution A39-3, the Environment Technical Manual (Doc9501) Volume IV – Procedures for demonstrating compliance with the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), and any public ICAO explanatory material;

(c) general technical processes in the field of civil aviation;

(d) aviation fuels and their characteristics;

(e) fuel related processes including flight planning and calculation of fuel consumption;

(f) process of monitoring and calculating the total tonne kilometre;

(g) development trend of aviation industry or situations that may affect the estimation of CO_2 emissions/total tonne kilometre;

(h) CO_2 emissions/total tonne kilometre quantification methodologies as outlined in this AC, including assessment of Emissions Monitoring Plans;

(i) fuel use monitoring and measurement devices, and related procedures for monitoring of fuel use in relation to CO_2 emissions, including procedures and practices for operation, maintenance and calibration of such measurement devices;

(j) CO_2/total tonne kilometre information and data management systems and controls, including quality management systems and quality assurance/quality control techniques;

(k) aviation related IT systems such as flight planning software or operational management systems;

2.3.2 At least two verifiers in each verification team appointed by the verification body shall have the qualifications described in paragraph 4.2 of the main text of this AC.

2.3.3 The verifier engaged in the independent review of the Verification Report shall also have the knowledge described in 2.3.1 above.

2.4 Use of contracted verifiers

The verification body shall document roles and responsibilities of the verification personnel, including contracted persons involved in the verification activity.

2.5 Confidentiality

The verification body shall ensure it has the express consent of the aeroplane operator prior to submission of the verified Emissions Report and the Verification Report to this Authority. The mechanism for authorizing this consent shall be specified in the contract between the verification body and aeroplane operator.

2.6 Records

The verification body shall keep records on the verification process for a minimum of ten years, including:

(a) client's Emissions Monitoring Plan and Emissions Report;

(b) Verification Report and related internal documentation;

(c) identification of team members and criteria for selection of team; and

(d) working papers with data and information reviewed by the team in order to allow for an independent party to assess the quality of the verification activities and conformance with verification requirements.

2.7 Agreement

The contract between the verification body and the aeroplane operator shall specify the conditions for verification, which shall focus on the following:

(a) scope of verification, verification objectives, level of assurance, materiality threshold and relevant verification standards;

(b) amount of time allocated for verification;

(c) flexibility to change time allocation if this proves necessary because of findings during the verification;

(d) conditions which have to be fulfilled to conduct the verification such as access to all relevant documentation, personnel and premises;

(e) requirement of the aeroplane operator to accept the audit as a potential witness audit by national accreditation body's assessors;

(f) requirement of the aeroplane operator to authorize the release of the Emissions Report and the Verification Report by the verification body to this Authority; and

(g) liability coverage.

3. Verification of Emissions Report

The verification team shall conduct the verification in accordance with the accredited standards and the following additional requirements.

3.1 **Level of assurance**

A reasonable level of assurance shall be required for all verifications under this AC.

3.2 **Objectives of verification**

When conducting the verification of an Emissions report, the verification body shall perform sufficient procedures to conclude whether:

(a) the GHG assertion is materially fair and an accurate representation of emissions over the period of the Emissions Report and is supported by sufficient and appropriate evidence;

(b) the aeroplane operator has monitored, quantified and reported its emissions/total tonne kilometre over the period of the Emissions Report in accordance with this AC and the approved Emissions Monitoring Plan;

(c) the aeroplane operator has correctly applied the method of flight attribution documented in the approved Emissions Monitoring Plan and in accordance with paragraph 1.3 of the main text of this AC, to ensure a correct attribution of leased aeroplane operated by other aeroplane operators under the same corporate structure;

3.3 Scope of Verification

3.3.1 When conducting the verification of an Emissions Report, the scope of the verification shall reflect the period of time and information covered by the report. This includes:

(a) the amount of CO_2 emissions of an aeroplane operator, calculated in accordance with the Fuel Use Monitoring Methods specified in Annex 1 of this AC;

(b) total tonnes kilometre, calculated in accordance with the Fuel Use Monitoring Methods specified in Annex 1 of this AC;

3.4 Materiality

3.4.1 When conducting the verification of an Emissions Report, the verification body shall apply the following materiality thresholds:

(a) of 2 per cent for aeroplane operators with annual emissions on flights activities, above 500,000 tonnes; and

(b) of 5 per cent for aeroplane operators with annual emissions on flights activities, equal or less than 500,000 tonnes of CO_2.

3.4.2 When conducting the verification of an Emissions Report, the over and understatements described in paragraph 3.4.1 shall be allowed to balance out in both cases.

3.5 General

Prior to the development of the verification approach, the verification body shall assess the risk of misstatements and non-conformities and their likelihood of a material effect on the basis of a strategic analysis of the aeroplane operator's GHG emissions information. Depending on the information obtained during the verification, the verification body shall revise the risk assessment and modify or repeat the verification activities to be performed.

3.6 Verification plan

3.6.1 The verification team shall prepare the verification plan on the basis of the strategic analysis and assessment of risks. The verification plan shall include a description of the verification activities for each variable that has a potential impact on the reported emissions. The verification team shall consider the assessment of risk, and the requirement to deliver a verification opinion with reasonable assurance, when determining sample size.

3.6.2 The verification plan shall include the following:

(a) verification team members, roles, responsibilities and qualifications;

(b) any external resources required;

(c) schedule of verification activities; and

(d) sampling plan, including the processes, controls and information to be verified and details of the risk assessment conducted to identify these.

3.7 Sampling plan

The Emissions Report sampling plan shall include the following:

(a) number and type of records and evidence to be examined;

(b) methodology used to determine a representative sample; and

(c) justification for the selected methodology.

3.8 Assessment of GHG data and information

3.8.1 The verification team shall confirm that the Emissions Report data has been collected in accordance with the approved Emissions Monitoring Plan and monitoring requirements specified in this AC.

3.8.2 In accordance with the Emissions Report sampling plan, the verification body shall carry out substantive data testing consisting of analytical procedures and data verification to assess the plausibility and completeness of data. The verification team shall, as a minimum, assess the plausibility of fluctuations and trends over time or between comparable data items as well as identify and assess immediate outliers, unexpected data, anomalies, and data gaps.

3.8.3 Depending on the outcome of Emissions Report data testing and assessment, the assessment of risk, verification and sampling plans shall be amended, where necessary.

3.9 Evaluation of the GHG assertion

3.9.1 The verification body shall use an independent reviewer not involved in the verification activities to assess the internal verification documentation, and the Verification Report, prior to its submission to the aeroplane operator and this Authority.

3.9.2 The independent review, whose scope includes the complete verification process, shall be recorded in the internal verification documentation.

3.9.3 The independent review shall be performed to ensure that the verification process has been conducted in accordance with the accredited standards and this Volume, and that the

evidence gathered is appropriate and sufficient to enable the verification body to issue a Verification Report with reasonable assurance.

3.10 Verification statement

3.10.1 The verification body shall submit a copy of the Verification Report to the aeroplane operator. Upon authorization by the aeroplane operator, the verification body shall forward a copy of the Verification Report together with the Emissions Report to this Authority. The Verification Report shall include:

(a) names of the verification body and verification team members;

(b) time allocation (including any revisions and dates);

(c) scope of the verification;

(d) main results of impartiality and avoidance of conflict of interest assessment;

(e) criteria against which the Emissions Report was verified;

(f) aeroplane operator information and data used by the verification body to cross-check data and carry out other verification activities;

(g) main results of the strategic analysis and assessment of risk;

(h) description of verification activities undertaken, where each was undertaken (on-site vs off-site) and results of checks made on the CO_2 emissions information system and controls;

(i) description of data sampling and testing conducted, including records or evidence sampled, sample size, and sampling method(s) used;

(j) the results of all data sampling and testing, including cross-checks;

(k) compliance with the Emissions Monitoring Plan;

(l) any non-compliances of the Emissions Monitoring Plan with this AC;

(m) non-conformities and misstatements identified (including a description of how these have been resolved);

(n) conclusions on data quality and materiality;

(o) conclusions on the verification of the Emissions Report;

(p) justifications for the verification opinion made by the verification body;

(q) results of the independent review and the name of the independent reviewer; and

(r) concluding verification statement.

3.10.2 The verification body shall provide a conclusion on each of the verification objectives listed in paragraph 3.2 of this Annex, as applicable, in the concluding verification statement.

3.10.3 When conducting the verification of an Emissions Report, the verification body shall choose between two types of verification opinion statements, either 'verified as satisfactory' or 'verified as not satisfactory'. If the report includes non-material misstatements and/or non-material non-conformities, the report shall be 'verified as satisfactory with comments', specifying the misstatements and nonconformities. If the report contains material misstatements and/or material non-conformities, or if the scope of the verification is too limited or the verification body is not able to obtain sufficient confidence in the data, then the report shall be 'verified as not satisfactory'.

3.11 Verification record

3.11.1 On request of this Authority, the verification body shall disclose the internal verification documentation on a confidential basis to this Authority.

3.11.2 Where issues that may render a previously issued verification statement invalid or inaccurate are brought to the attention of the verification body, then it shall notify this Authority.

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