



Advisory Circular

CIVIL AVIATION SAFETY AUTHORITY
OF PAPUA NEW GUINEA

AC91-15

Initial Issue

Guidelines for the Monitoring, Verification and Reporting of Carbon Dioxide (CO₂) Emissions from International Flight Operations Under CORSIA (Carbon Offsetting & Reduction Scheme for International Aviation).

02 November 2021

General

Civil Aviation Safety Authority (CASA) Advisory Circulars (ACs) contain guidance information about standards, practices, and procedures that the Director has found to be an **Acceptable Means of Compliance (AMC)** with an associated rule.

An AMC is not intended to be the only means of compliance with a rule, and consideration will be given to other methods of compliance that may be presented to the Director. When new information becomes available, they will be added to the relevant AC.

Purpose

This Advisory Circular (AC) provides guidance for the monitoring, verification and reporting of Carbon Dioxide (CO₂) emissions under CORSIA from international flight operations.

Related Rules

This AC relates specifically to the Civil Aviation rules listed under Section 5 of this AC.

Change Notice

This is the initial issue of AC91-15.

Approval

This Advisory Circular has been approved for publication by the Director of Civil Aviation

Table of Contents

Contents

General	1
Purpose	1
Related Rules	1
Change Notice	1
Table of Contents.....	2
1 Introduction.....	4
2 Scope	4
3 Applicability.....	4
4 Definitions & Abbreviations	4
4.1 Definitions	4
4.2 Abbreviations	5
5 Related Rules	6
6 References	6
7 Background.....	7
a. CORSIA	7
b. Scope of this AC.....	7
8 Emissions Monitoring Plan (EMP).....	9
a. Version Control.....	9
b. Operator Identification and description of Activities.....	9
c. Fleet and Operational Data.....	10
d. Methods and means for calculating emissions.....	10
i. Density Calculation	10
ii. Method A.....	11
iii. Method B.....	11
iv. Block off/Block On	11
v. Fuel Uplift.....	11
vi. Fuel Allocation with block hour	11
vii. ICAO CORSIA CO ₂ Estimation and Reporting Tool (CERT).....	11
8.4.7.1 Operator Information.....	12
8.4.7.2 CO ₂ Estimation	12
8.4.7.3 CO ₂ Summary Assessment	12
e. Data Management.....	12
i. Data Source.....	12
ii. Data flow	12

iii.	Quality Control of Data	12
iv.	Data Gaps	13
v.	Risk Management	13
8.5.5.1	Identification and Analysis of hazards	13
8.5.5.2	Risk Assessment and Mitigations	13
8.5.5.3	Hazard Log	13
9	Verification	13
a.	Accreditation	13
b.	Verification	13
c.	Accredited Verification Report	14
10	Reporting	14
a.	Identification of Operator	14
b.	Underlying Basic Information for the Compliance Period	14
c.	Aeroplane Fleet	14
d.	Fuel Density	14
e.	Reporting	14
i.	Reporting State Pairs	14
ii.	Reporting Aerodrome Pairs	14
11	Offsetting	15
a.	Growth Factor	15
b.	Sustainable Aviation Fuel (SAF)	15
c.	Purchasing and Cancelling of Emission Units	15
d.	Emissions Units Cancellation Report	16
12	Tools	16
12.1	FRED+	16
APPENDIX A:	Decision Tree for Emissions Monitoring Options	17

1 Introduction

The International Civil Aviation Organization (ICAO) has progressively taken steps to address climate change issues since 2013. A number of standards and recommended practices (SARPs) have been adopted to protect the Environment. The environmental protection SARPs are therefore contained in Annex 16, to the Convention.

The SARPs are contained in Vol I (Aircraft Noise), Vol II (Engine Emissions), Vol III (CO₂ emissions) and Vol IV (Carbon Offsetting & Reduction Scheme for International Aviation (CORSA)), respectively.

2 Scope

This AC provides guidance on compliance under CAR Part, 21.91 and it is relevant to operators conducting Part 119 operations under Parts 121 and 125.

3 Applicability

This AC is applicable to all operators using or intending to use aero planes for international flight operations which produce annual Co₂ emission greater than 10000 tonnes from the use of an aeroplane(s) with a maximum certificated take-off mass greater than 5700 kg with the exception of humanitarian, medical and firefighting flights.

4 Definitions & Abbreviations

4.1 Definitions

For the purposes of this AC, the following terms are defined:

Administrative partnership. Delegation of administering tasks in this Volume from one State to another State(s).

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 owner. Person(s), organization(s) or enterprise(s) identified via Item 4 (Name of owner) and Item 5 (Address of owner) on the certificate of registration of an aeroplane.

Aviation alternative fuel. A non-petroleum-based drop-in aviation fuel.

Conventional aviation fuel. A petroleum-based drop-in aviation fuel.

Conversion process. A type of technology used to convert a feedstock into aviation alternative fuel.

Feedstock. A type of unprocessed raw material used for the production of aviation alternative fuel.

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

Note – Latitude and longitude coordinates of aerodromes can be obtained from the ICAO Location Indicators database.

National accreditation body. Authorized body which attests that a verification body is competent to provide specific verification services.

New entrant. Any aero plane operator that commences an aviation activity falling within the scope of this Volume on or after its entry into force and whose activity is not in whole or in part a continuation of an aviation activity previously performed by another aero plane operator.

Notifying State. The State that has submitted to ICAO the request for the registration of or change in the three-letter designator of an aero plane operator over which it has jurisdiction.

Pathway. A specific combination of feedstock and conversion process used for the production of aviation alternative fuel.

Reporting period. A period which commences on 1 January and finishes on 31 December in a given year for which an aero plane operator or State reports required information.

State pair. A group of two Contracting States composed of a departing Contracting State or its territories and an arrival Contracting State or its territories.

CORSIA sustainable aviation fuel. A renewable or waste-derived aviation fuel that meets the CORSIA sustainability Criteria under this volume.

Verification body. A legal entity that performs the verification of an Emissions Report and, when required, an Emissions Units Cancellation Report, as an accredited independent third party.

Verification of report. An independent and systematic evaluation process of an emissions report and, when required, a cancellation of eligible emissions unit report, which has been sufficiently documented.

Verification report. A document, drafted by the verification body, containing the verification statement and required supporting information.

Verification team. A group of verifiers, or a single verifier that also qualifies as a team leader, belonging to a verification body conducting the verification of an Emissions Report and, when required, an Emissions Units Cancellation Report. The team can be supported by technical experts.

4.2 Abbreviations

For the purposes of this Advisory Circular, the following abbreviations are defined:

AC	Advisory Circular
ACARS	Aircraft Communications Addressing and Reporting System
CERT	CO ₂ Estimation and Reporting Tool
CO ₂	Carbon dioxide

CO ₂ e	Carbon dioxide equivalent
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
GHG	Greenhouse gases
IAF	International Accreditation Forum
IAW	In accordance with
IEC	International Electro Technical Commission
ISO	International Organization for Standardization
MRV	Monitoring, Reporting and Verification
MJ	Mega joule
RTK	Revenue Tonne Kilometers

4.3 Symbols

No symbols are used in this AC.

5 Related Rules

The Civil Aviation Rules relating to the monitoring, verification and reporting of Carbon Dioxide (CO₂) emissions from international flight operations are listed below.

21.23 (1)(ii) Airworthiness Requirements. Defines type acceptance certificate compliance against aircraft noise, engine emissions and aeroplane CO₂ emissions standards/requirements.

21.25 (a)(3) Data Requirements. Defines type acceptance certificate data requirements against aircraft noise, engine emissions and aeroplane CO₂ emissions requirements.

21.41(10) Airworthiness Standard and Restricted Category Requirement. Defines standard or restricted category airworthiness certificate requirements for aircraft noise, engine emissions and aeroplane CO₂ emissions standards/requirements.

21.83 Acceptance of design changes by the issue of an airworthiness certificate. Defines evidence of compliance against aircraft noise, engine emissions and aeroplane CO₂ emissions requirements for design changes.

21.95 Approval of Technical Data (a)(6)(i) and (b)(1). Defines statement of compliance against aircraft noise, engine emissions and aeroplane CO₂ emissions requirements as specified in **Appendix B of Airworthiness Design Standards (d)(1)(i)(ii) and (e)(1).**

91.903 Engine Emission Compliance: Defines the requirements for engine emissions compliance.

91.905 Aeroplane CO₂ Emissions Compliance: Defines the requirements for CO₂ emissions monitoring, verification and reporting to CASA PNG.

6 References

The following documents are referenced in this AC.

Civil Aviation Safety Authority PNG:

CAR Part 21 Certification of Products and Parts

CAR Part 91 General Operating and Flight Rules

International Civil Aviation Organization:

Annex 16 Volume I, Environmental Protection: Aircraft Noise

Annex 16 Volume II: Environmental Protection: Engine Emissions

Annex 16 Vol III: Environmental Protection: Aeroplane CO₂ Emissions

Annex 16 Vol IV: Environmental Protection: Carbon Offsetting & Reduction Scheme for International Aviation (CORSA) and other supporting documents such as Doc 9501.

International Air Transport Association: FRED+

7 Background

a. CORSA

At the 39th ICAO Assembly, member States adopted the carbon offsetting and reduction scheme for international aviation (CORSA). Papua New Guinea had volunteered to participate. As of July 2018, 72 ICAO member States have volunteered.

There are four (4) phases of implementation. The first phase is essentially a preparation phase. This is the phase where ICAO, States and Airlines prepare to comply with Annex 16 Vol IV. This is the phase where necessary instruments of national legislation and subordinate regulations are set and shared with industry. This phase is thus the baseline period (2018-2020) which sets the scene for the required planning to implement the requirements.

The starting of Voluntary offsetting participating phase is called the “pilot phase” and covers the period (2021-2023). It is in this phase that carbon offsetting actually begins.

The first phase is the period (2024- 2026) and is the voluntary offsetting participating phase where operators are required to implement offset requirements based on CO₂ emissions of the previous compliance period. There are specific requirements for this phase.

For the second phase is the period (2027-2035), where all state with an individual share of international aviation activity in year 2018 above 0.5% of total activity or whose cumulative share reaches 90 % of total activity, are included.

b. Scope of this AC

The scope of this AC is to provide guidance on Operator Emissions Monitoring Plan (EMP) which is an essential primer of the baseline period. Subsequent updates of this AC would capture other CORSA requirements based on the following Timeline. Table 1 shows an abbreviated timeline showing key milestones and deliverables.

Table 1: CORSIA Timeline and Actions

Time	CASA PNG	Operator
May-June 2021	Assist DOT as CORSIA Focal Point	CORSIA Focal Point
June-July 2021	NPRM Phase 5-Updates to Parts 21 & 91 as well as CORSIA Advisory Circular	CORSIA Assessment and Plan for EMP (monitoring methods, verification process and reporting process)
2 November 2021	NPRM Phase 5 and CAR 21 and 91 amendments become effective	Must Comply
30 November 2021	Liaise & Consult with Operators	Submit an EMP to CASA PNG for Approval
30 November –December 2021	1: Approve Operator EMPs 2: Submit list of Operators to ICAO	Initiate all processes and procedures for CO ₂ monitoring
1 January 2022	Liaise with Operator on risks Liaise with ICAO on Registry Liaise with ICAO on verifiers	Start monitoring CO ₂ emissions from international flights in accordance with EMP
	Liaise with ICAO on Registry	Compile CO ₂ data
1 Jan-31 May 2022	Liaise with ICAO on sector data	Compile 2019 CO ₂ emissions data into a Verification Report
	Liaise with ICAO on emissions unit	Perform an internal pre-verification
	Liaise with ICAO and Operator	Identify an accredited verifier
	Liaise with Operator on verification and reporting	Engage a verification body for the verification of the 2019 Emissions Report
31 May 2022	Liaise with Operator	Submit the verified 2019 Emissions Report and associated verification report to CASA PNG.
1 June- August 2022	Conduct order of magnitude check.	Continue monitoring for next compliance period

Time	CASA PNG	Operator
1 August 2022	Submit 2019 Emissions data to ICAO	Continue monitoring for next compliance period
31 December 2022	Provide all required parameters to ICAO	Continue monitoring for next compliance period

8 Emissions Monitoring Plan (EMP)

The EMP Template can be downloaded from the ICAO website using this link. <https://www.icao.int/environmental-protection/CORSIA/Pages/Templates.aspx> or Doc 9501 Environment technical Manual Appendix 1 The subsequent sections are elements of the EMP. There are five (5) sections which can be populated easily. The guidance herein provides clarity and context. Three (3) additional sections are described herein to provide extra guidance which would be useful in verification and reporting.

a. Version Control

Once an EMP is approved, it must be configuration controlled so that the current version of the plan is utilized for each compliance period. The EMP must be submitted for approval should there be any material change.

In this case, material change can be the change that significantly impacts the following;

- operator's fleet,
- ownership,
- operational routes,
- emission monitoring methods, changes in accredited verifiers,
- a hazard with regards to data integrity is escalated and
- when there is a possible non-compliance against the applicable CAR.

Non material change is known to be routine changes in the process or procedures of the normal course of conducting business.

The data flow requirements in Section 8.5.2 must be complied with, in defining the change process. However, both material and non-material changes of an EMP must be reported for the relevant compliance period.

b. Operator Identification and description of Activities

All items in the spreadsheet are required to identify an operator and associated activities are self-evident. However, the Operator must possess an ICAO Designator or Registration Mark that is unique to state of registry. Such marks or designation is the same as commonly used for air traffic control purposes (item 7 on ICAO flight plan). When aeroplanes are leased, operators need to make sure they keep records of fuel use and emissions monitoring method in their EMP.

In addition, the Subsidiaries need to be wholly owned and be in the same state to report as a single entity.

c. Fleet and Operational Data

All aeroplanes engaged in international civil aviation must be identified by make, model and type by the ICAO designations including the fuel type approved for use on the type.

All sectors between states/city pairs need to be defined including the aeroplane that services that sector. If an aeroplane is used for domestic and international operations, then clear records of fuel use must be kept for each operation.

d. Methods and means for calculating emissions

Starting 01 January 2019, all aeroplane operators will be required to monitor CO₂ emissions from international flights. The Monitoring methods and reporting of calculation on CO₂ emission annually is considered according to the Annex 16 volume IV, Appendix 4,2.3 for the reporting period 2019-2020 and also 2021 until 2035.

Appendix A is a decision tree for an operator to determine whether they are eligible to use the ICAO CORSIA CO₂ Estimation and Reporting Tool (CERT). The CERT is described in Section 8.4.7 and can be used by all operators to fill in data gaps. Table 2 shows the thresholds for the use of CERT.

Table 2: CERT Applicability

CERT	Aeroplane Operators CO ₂ Emissions (tonnes) 2019-2020*		
	≤ 10KCO ₂	< 500KCO ₂	≥ 500KCO ₂
Function/Use			
Preliminary CO ₂ Assessment	✓	✓	✓
CO ₂ Estimation & Reporting	No CORSIA Requirement	✓	Not eligible to use CERT**
Filling Data Gaps	No CORSIA requirement	✓	✓

NOTES

* From 2021-2035 operators can use CERT to estimate and report emissions if their annual emissions from international flights subject to offsetting requirements are less than 50,000 tonnes of CO₂ annually.

** If an operator uses CERT for 2019 CO₂ estimations and reporting (based on their preliminary CO₂ assessments) but exceeds the threshold of 500 000 tonnes in 2019, CASA PNG could permit the operator to continue to use CERT during 2020.

Operators who emit ≥ 500 000 tonnes of CO₂ annually in 2019 and 2020 must use either one of the following (Method A, Method B, Block off/Block on, Fuel Uplift or Fuel Allocation with Block Hour). The five methods are equivalent and there is no hierarchy. Operators must select one method that is commensurate to their operations and define the parameters used in the selected method. This is just fuel consumed in kilograms or tonnes, going from Point A to Point B, with all mandatory reserves and unusable fuel remaining.

i. Density Calculation

Whatever the selected method is, the operator must specifically state fuel composition and density to be used. The composition is whether fuel used is a blend of sustainable aviation fuel (SAF) or standard fuel. The density for the fuel type must either be:

1. Actual density
2. Standard density for the fuel type
3. Density determined by a set of algorithms.

Density is important to convert between volume (litres) of fuel to mass (kg) of fuel where;

Density (ρ) = $\frac{m}{v}$, where m = mass and v = volume

The calculation of CO₂ emissions is thus:

$$CO_2 = \sum_0^{ff} M_{ff} \cdot FFCFF_{ff}$$

where: CO₂ = CO₂ emissions (in tonnes); M_f = Mass of fuel f used (in tonnes); and FCF_f = Fuel conversion factor of given fuel f, equal to 3.16 (in kg CO₂/kg fuel) for Jet-A fuel and 3.10 (in kg CO₂/kg fuel) for AvGas or Jet-B fuel.

Note. – For the purpose of calculating CO₂ emissions the mass of fuel used includes conventional aviation fuel and sustainable aviation fuel.

ii. Method A

Fuel is uplifted at Point A for a flight from point A to point B. Fuel in tank at point A is X. At point B additionally fuel (Z) is uplifted with Y being total fuel in tank at B. Fuel consumed is X-Z+Y.

iii. Method B

For a flight from Point A to Point B, identify amount of fuel remaining in aeroplane at Block-on at end of the previous flight (P). Determine fuel required for next flight (Q). The required fuel is uplifted. The aeroplane flies to point B. Determine fuel on board at block-on at point B (i.e. the end of the flight) (R).

Fuel consumed is thus, P-R+Q (kgs). If P and R were the same, Q is the fuel uplifted.

iv. Block off/Block On

Block –on and Block-off sequences need to be defined. For example, park brakes OFF (Block-on) to park brakes ON (block off). Then subtract the Block-on fuel (L) from the Block-off fuel (M) for each flight to determine total fuel consumption (O). Fuel consumed in (O)=(M)-(N) going from Point A to Point B.

v. Fuel Uplift

Fuel was uplifted at Point A. Aeroplane flies to point B. Fuel consumed is the difference between fuel in tank at A and Fuel in tanks at B.

vi. Fuel Allocation with block hour

Compute fuel burn for individual flights by multiplying average fuel burn ratio by block hour for flight under consideration.

vii. ICAO CORSIA CO₂ Estimation and Reporting Tool (CERT)

The ICAO CO₂ Estimation and Reporting Tool (CERT) can be downloaded from the following link <https://www.icao.int/environmental-protection/CORSIA/Pages/CERT.aspx>

The procedure is:

1. Accept license agreement
2. Download CERT Excel File
3. Enable all Macros
4. Populate Data by each Tab at the bottom of spreadsheet.

The required data input is self-evident. The following adds context and clarity.

The methods applicable and optional for PNG aeroplane operator as per recommended are;

1. As in 8.4.4 Block off/Block On
2. As in 8.4.5 Fuel Uplift

Refer to Appendix B

8.4.7.1 Operator Information

The operator information required herein (CERT) is a subset of the information required in the EMP. The only thing to be mindful of is when using leased aeroplanes. The Leased aeroplanes may have registration marks or ICAO designators already.

Be careful as who reports the CO₂ emissions. Only one operator (lessor/lessee) can perform the MVR and comply with the requirements.

8.4.7.2 CO₂ Estimation

This is where all flights are recorded by aeroplane type, origin and destination. Great circle distance is also required. The Co₂ estimates are as per Section 8.4.1. This is a complete list of all daily, weekly and monthly flights.

8.4.7.3 CO₂ Summary Assessment

The CO₂ summary is a summary of the information entered into the spreadsheet.

e. Data Management

Data management is about the integrity of the data. Any reports based on the data must be complete and correct. Therefore, in this section, the people who are to measure, record, store and analyses the data need to be specified. This is to be followed by the processes and/or procedures being articulated. An important consideration is the tools to be deployed. The data management system has to be configured with a continuous improvement process embedded within it.

Data must be stored for up to ten (10) years, kept confidential, documented and have record keeping plans if necessary.

i. Data Source

The sources of data must be clearly defined. These sources must be redundant. Therefore, the expectation is that there would be a primary, a secondary and a tertiary source. The sources must have their own process of data recording.

ii. Data flow

The flow of the data from the source to its end must be articulated and also defined in the Emission Monitoring Plan (EMP). A flow chart may suffice to summarize the system used to record.

iii. Quality Control of Data

A quality control process must be applied to the data so data is robust with minimal error. The expectation herein is that normal aeroplane design, maintenance, and operation quality control

processes and procedures would be extended to the process of CO₂ emission data monitoring, verifying and reporting. A 5% error tolerance can be applied at the end of each monitoring period.

iv. Data Gaps

There should be no data gaps. The quality control under section 8.5.3 should prevent data gaps. Otherwise, data gaps have to be resolved. If data gaps persist at the end of the compliance period then, an explanation/argument has to be provided. Data can be estimated to fill data gaps using the criteria in Table 2.

v. Risk Management

The EMP must show the assessment of risk for CORSIA. Risk has a probability and consequence element and therefore any mitigation must indicate whether mitigation is on reducing probability or reducing the consequence. The Mitigation must be as low as it is reasonably practicable.

8.5.5.1 Identification and Analysis of hazards

At the time of the EMP, all known hazards are to be identified. If not, a process of hazard identification has to be carried out. Data risks have to be articulated in the EMP. As noted above, risk has a probability and a consequence element and so must be mitigated to as low as is reasonably practicable.

8.5.5.2 Risk Assessment and Mitigations

The assessment of identified hazards and the mitigations must be based on a hierarchy of decisions. The decision process and the process of escalation needs to be articulated. The escalation process is about who makes a decision, when it is made, the basis for the decision and if not, how it is escalated up the organization hierarchy?

8.5.5.3 Hazard Log

The risk management described above relies on a hazard log. A hazard log is required to make the risk management function properly. All identified hazards can be logged. The analysis and mitigation is recorded against each hazard with an indication of the hazard's pre and post hazard risk index. A notation to the acceptability of a hazard if it cannot be mitigated to an acceptable level is required.

9 Verification

a. Accreditation

The operator must use an accredited individual/organization (body) to verify the Operator Emissions Report. The verification body must be accredited to ISO 14065:2013. Such accreditation has to be performed by a national accreditation body working in accordance with ISO/IEC 170113. Alternatively, ICAO maintains a CORSIA Central Registry (CCR) for information and data transparency.

The link to the CCR is: <https://www.icao.int/environmental-protection/CORSIA/Pages/CCR.aspx>

b. Verification

All verification activities must be treated as regulatory (oversight/surveillance) audits. The operator must make all data readily available.

Confidentiality must be maintained during these verification activities. The reports and information presented in the report must be on a "need to know" basis.

There must be documented proof of all fuel (blended/standard/combinations) purchases. There will be a “no proof no emission units” approach for offsetting purposes.

Variations by at least 5% of the CO₂ emissions must be minimized. If minimization/error reduction is not possible than a mitigation/business case must be appended.

c. Accredited Verification Report

CASA PNG expects two verification reports. The first report is an internally verified report from the Operator and the second is the externally verified report. The second is the externally verified report from a Verification body who is accredited ISO 14065:2013 standard.

The aeroplane operator and the verification body both independently submit report, upon authorization by the operator, a copy of Emission Report and associated Verification Report for state as CASA to carry out order of magnitude check and approves the Emissions Report.

10 Reporting

The specific Report stated in 9. a. above, the Templates suggested by ICAO can be downloaded from the following link <https://www.icao.int/environmental-protection/CORSIA/Pages/Templates.aspx>

Alternatively, the report is structured in the same manner as the EMP. Most information should already be in the EMP.

a. Identification of Operator

The identification of the Operator should be the same as the EMP. The only difference is the identification of the accredited verifier.

b. Underlying Basic Information for the Compliance Period

Operator identification and operator international activities must be articulated. Leasing arrangements and ownership details need to be specific so there is no double counting.

c. Aeroplane Fleet

The aeroplane fleet for international operations must be clearly listed using ICAO designations.

d. Fuel Density

The fuel density information used for the report must be the density/densities defined in the EMP (see section 8.4.1).

e. Reporting

When reporting, the ICAO CERT Format can be used. Otherwise, the report must cover all elements of the approved EMP for the applicable compliance period and in this AC.

i. Reporting State Pairs

This is straightforward except when reporting operators need to count all sectors. A flight from country A to country B and vice versa is a counted as two (2) flights.

Reporting Aerodrome Pairs

This is straightforward except when reporting operators need to count all sectors. A flight from country A (Airport C) to country B (Airport D) and vice versa is counted as two (2) flights. If it stops in Country B (Airport E) followed by a return flight (E to A) then this scenario is considered as three (3) flights.

11 Offsetting

Details of the CORSIA offsetting requirements will be updated at the next revision of this AC. The following are necessary steps, which Operator need to understand and make provisions in their EMP.

a. Growth Factor

CASA PNG will calculate the offsetting requirements attributed to an aeroplane operator. One of indicators to be used is the growth factor. The growth factor is the percent increase in the amount of emissions from the baseline from data reported to CASA PNG. The growth factor changes every year taking into account both the sector's and individual operator's emissions growth. Therefore:

CO_2 offset requirements = Operator's annual emissions X Growth Factor

b. Sustainable Aviation Fuel (SAF)

During the baseline period and in any compliance period an Operator can use sustainable aviation fuels (SAF). The operator has to record and report the use of SAF in a compliance period.

CASA PNG will account for the benefits from the use of SAF. CASA PNG will inform the Operator of its final CO_2 offsetting requirements for compliance period.

c. Purchasing and Cancelling of Emission Units

The Operator knows by implication after reporting of its total CO_2 emissions. By extension, the emission units are known where,

1 Emission Unit=1 Tonne of CO_2

The reporting in Section 10, is thus a facility which allows ICAO to store the data as a pseudo bank.

The carbon market thus puts a value on an emission unit. The aggregate of emission units amounts to a monetary figure, which the Operator uses to invest in environmentally friendly projects. These environmentally friendly projects have to be vetted by ICAO.

When the investment transaction is complete, the Operator requests the pseudo bank to cancel its emission units. There may be a number of transactions and so the cancellation of emission units may be an on-going process. The Operator's balance of emission units should always be visible on the pseudo bank account.

NOTE: A Registry (pseudo bank) designated as a CORSIA Eligible Emissions Unit Programme is yet to be established.

d. Emissions Units Cancellation Report

When the balance of the emission units has been utilized, the Operator provides a verified Emissions Units Cancellation Report (EUCR) to CASA PNG. CASA PNG checks and does an order of magnitude check. Once CASA PNG is satisfied, the EUCR is sent to ICAO. As noted above, the final clearance is based on satisfying ICAO criteria of environmentally friendly projects. SAF is assumed friendly.

12 Tools

Monitoring fuel use is important for aeroplane operator and there may be tools used by industry for this purpose to monitor, verify and report CO₂ emissions. In this case, the CERT tool is one example.

Another example is FRED+, which was developed by IATA and is available at no cost, which could be used. FRED+ can be used to populate an EMP, a verification report and manage all CO₂ data. FRED+ can be used by anyone.

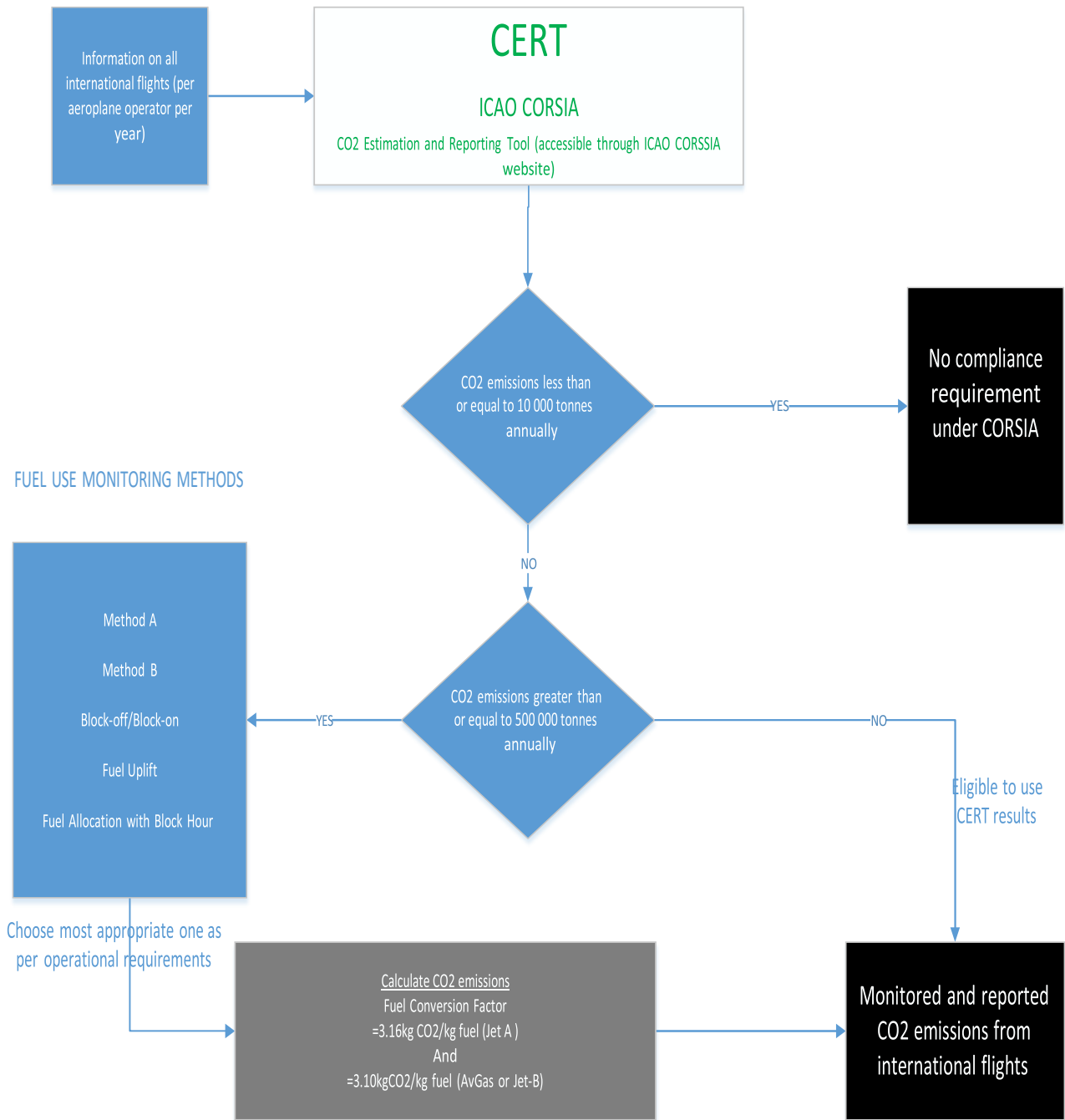
12.1 FRED+

FRED+ is a windows based platform utilizing SQL database system. It ensures data integrity, confidentiality and security. It is compatible with major fuel monitoring systems and all reports required under the CORSIA framework can be generated including dashboard functionalities.

To access FRED+, follow the following procedures:

- a. Designate staff member for CORSIA (there can only be one user per operator)
- b. Communicate name and details of focal point to FRED@iata.org
- c. Operator will receive unique registration token and access details.
- d. Focal point registers in FRED+ using unique token.
- e. Start using FRED+
- f. Submit data to CASA PNG when CORSIA starts.

APPENDIX A: Decision Tree for Emissions Monitoring Options



Appendix B

Draft CORSIA

(May 2020)

(LN)

CORSIA FEM-FORM (Draft)



Date: _____ ALN: _____ Flight No. _____ I.N. No: _____

Port of Departure: _____ Port of Arrival: _____

Take of Mass: _____ Fuel Type: _____ Fuel Weight (kg) _____

FMM: a) Block Off/ Block On: b) Fuel Uplift:

CO₂ Emissions for this flight:

Captain's Signature: _____

Reference

Formula: $CO_2 = \sum_f M_f * FCF_f$

- where:
CO2 = CO2 emissions (in tonnes);
Mf = Mass of fuel f used (in tonnes); and
FCFf = Fuel conversion factor of given fuel f, equal to 3.16 (in kg CO2/kg fuel) for Jet-A fuel / Jet-A1 fuel and 3.10 (in kg CO2/kg fuel) for AvGas or Jet-B fuel.

Note. - For the purpose of calculating CO2 emissions the mass of fuel used includes all aviation fuels.

The CORSIA FEM-FORM has been developed consistent with the Civil Aviation Act 2000. The State obligation's to monitor emissions from all aircraft operations is consistent with the requirements under Sections 69, 71 and 75 while upholding the obligations of the State under Section 6 of the Civil Aviation Act 2000 in compliance to Chapter IV of the ICAO Annex 16.

The CORSIA FEM-FORM and it's requirement shall be completed by the Captain in command of the flight consistent with their mandates under Section 63 (c) of the Civil Aviation Act 2000 for the purposes of this form.