Session 4: CORSIA MRV System: Verification of CO_2 Emissions

ICAO Secretariat

CORSIA

Overview

- This presentation will:
  - Provide an overview of the CORSIA verification process for CO_2 emissions
  - Outline the accreditation process for verification bodies
  - Provide information on the ICAO CORSIA Verification Course

Leaflet #8 on Verification

ICAO ENVIRONMENT

CORSIA AT A GLANCE SERIES

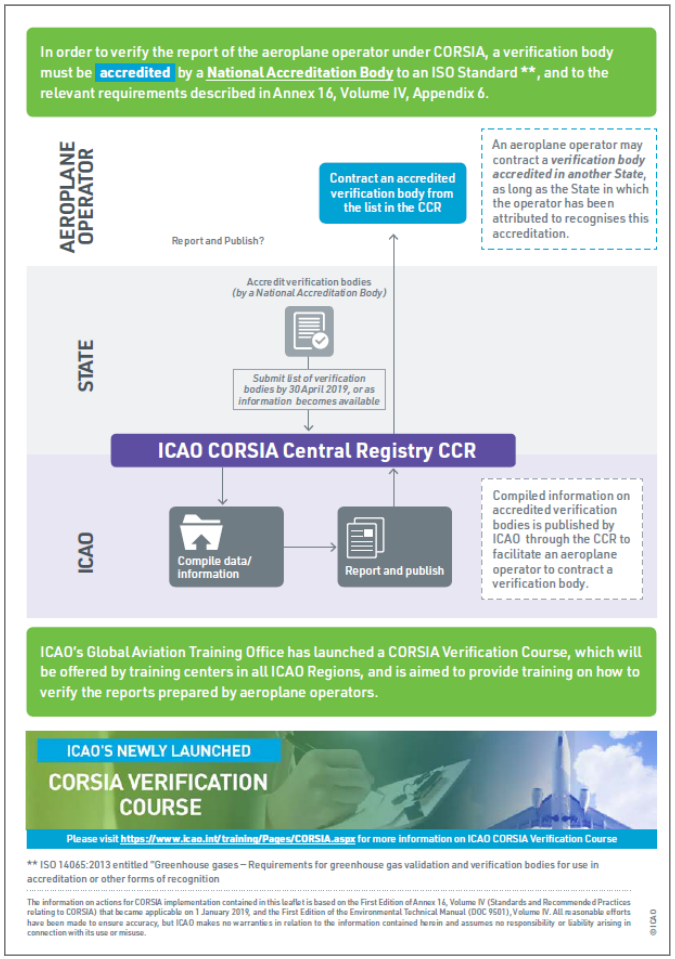
CORSIA VERIFICATION

Verification of data compiled by aeroplane operators ensures the consistency of information, and identifies any potential errors in the CO_2 Emissions Reports (including additional information on the use of CORSIA eligible fuels, if applicable) and Emissions Unit Cancellation Reports.

CORSIA foresees **a three-step** verification pathway, which involves different stakeholders:

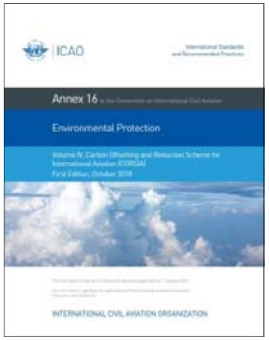
1. **An internal pre-verification** by the aeroplane operator is *recommended*.
   - ✓ An aeroplane operator conducts an internal verification of its data before submitting the report to the verification body.
2. **A third-party verification** of the report is performed by an independent third-party verification body, before the operator reports to the State Authority.
   - ✓ A verification body conducts the verification according to an ISO Standard*, and the CORSIA-specific requirements described in Annex 16, Volume IV, Appendix 6.
3. After the third-party verification, State Authority conducts **an order of magnitude check**.
   - ✓ This is the check performed by a State to verify the data against different sources of information that the State has access to.

* ISO 14064-3:2006 entitled "Greenhouse gases – Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions."



Main Reference Documents

ICAO Standards and Recommended Practices (SARPs)



Annex 16 - Environmental Protection, Volume IV: CORSIA

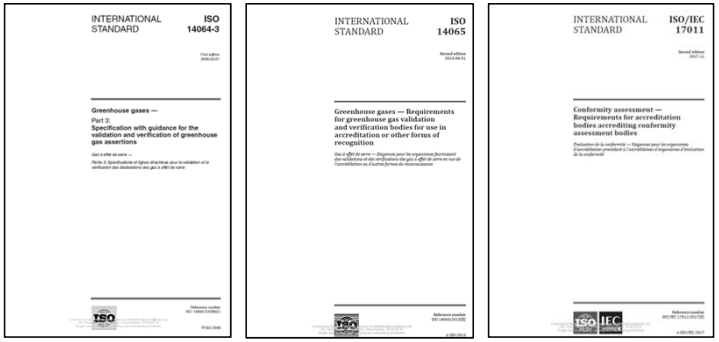
- Part II, Chapter 2, 2.4; Chapter 4, 4.4; and Appendix 6

ICAO Guidance

Environmental Technical Manual (ETM), Volume IV (Doc 9501): CORSIA

- Chapter 3, 3.3.

ISO Standards



*- **ISO 14064-3:2006:** "Greenhouse gases – Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions."*

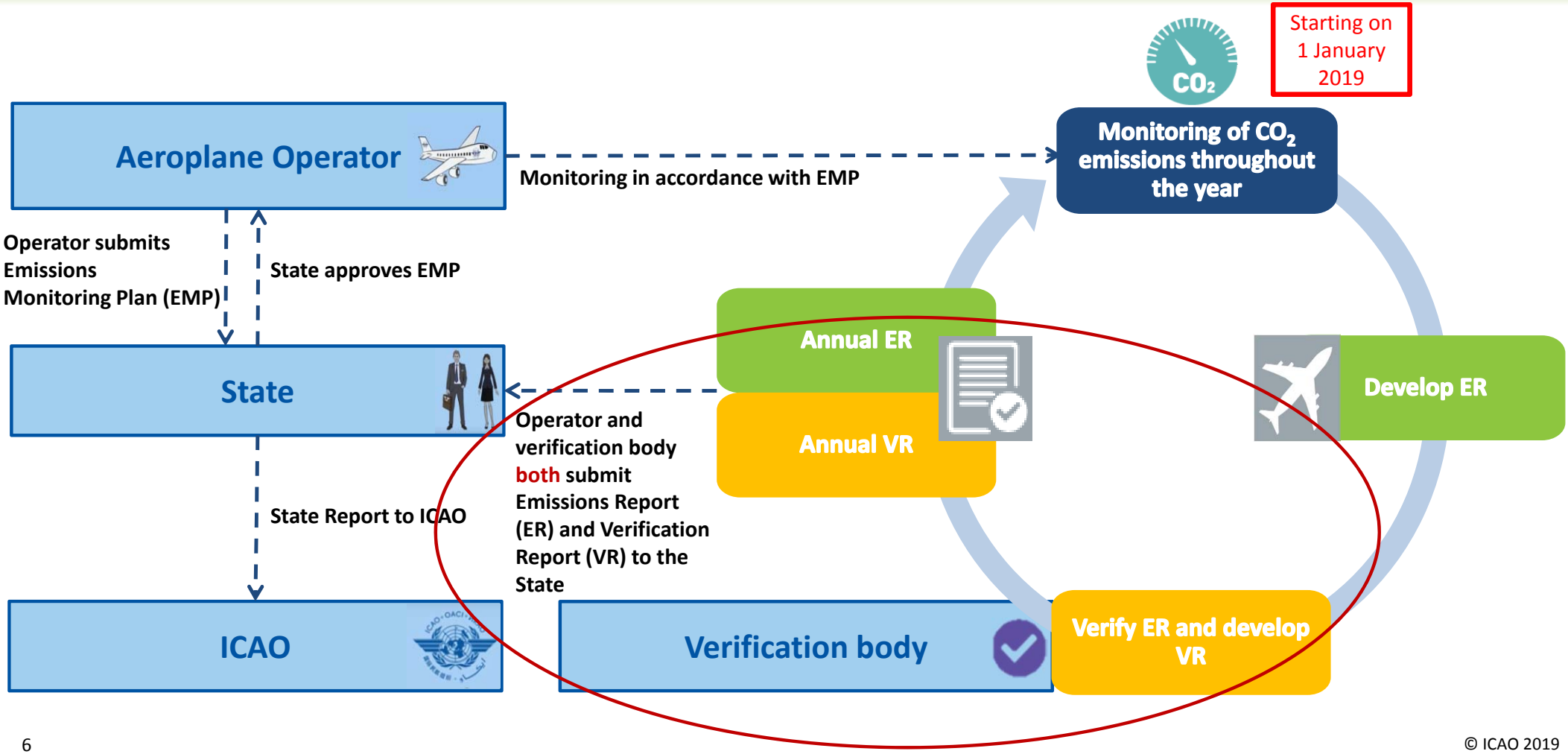
*- **ISO 14065:2013** "Greenhouse gases – Requirements for greenhouse gas validation and verification bodies for use in accreditation or other forms of recognition."*

*- **ISO/IEC 17011:2004** "Conformity assessment – General requirements for accreditation bodies accrediting conformity assessment bodies".*

Verification Process

CORSIA

Annual Cycle for MRV Activities



What is Verification?

- A process to ensure that the information is accurate without errors prior to an aeroplane operator's reporting to State
- Requires an independent third-party
- Already in use in various forms (financial auditing, greenhouse gas inventories, emissions reduction projects etc.)

Verification in CORSIA

- Verification is an essential part of the CORSIA, as it ensures the accuracy of the information related to:

  - The amount of CO_2 emissions from international flights

Covered in this session

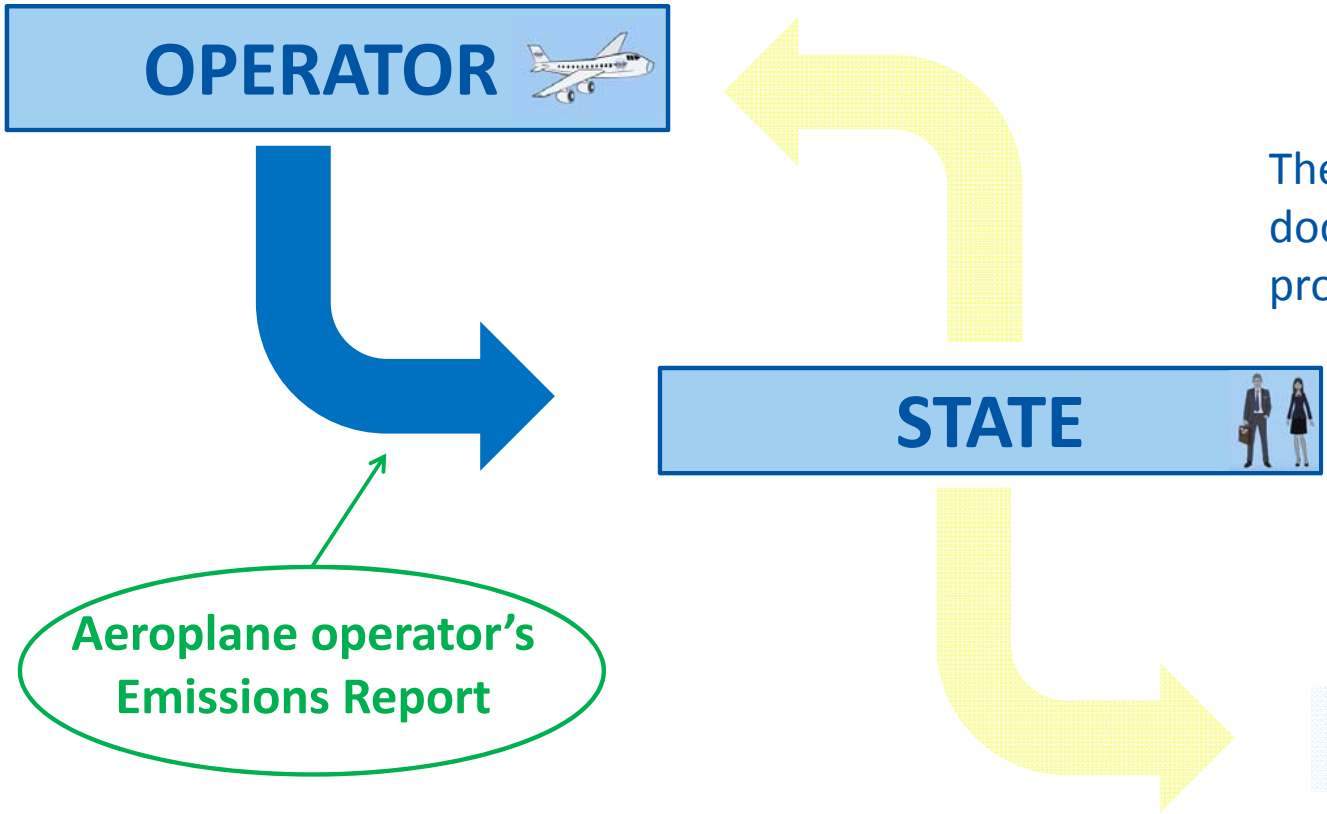
  - The purchase of emissions units from eligible programmes to address offsetting requirements
  - The cancellation of eligible emissions units

Covered in Session #6: CORSIA Offsetting Requirements

Verification Information Flow

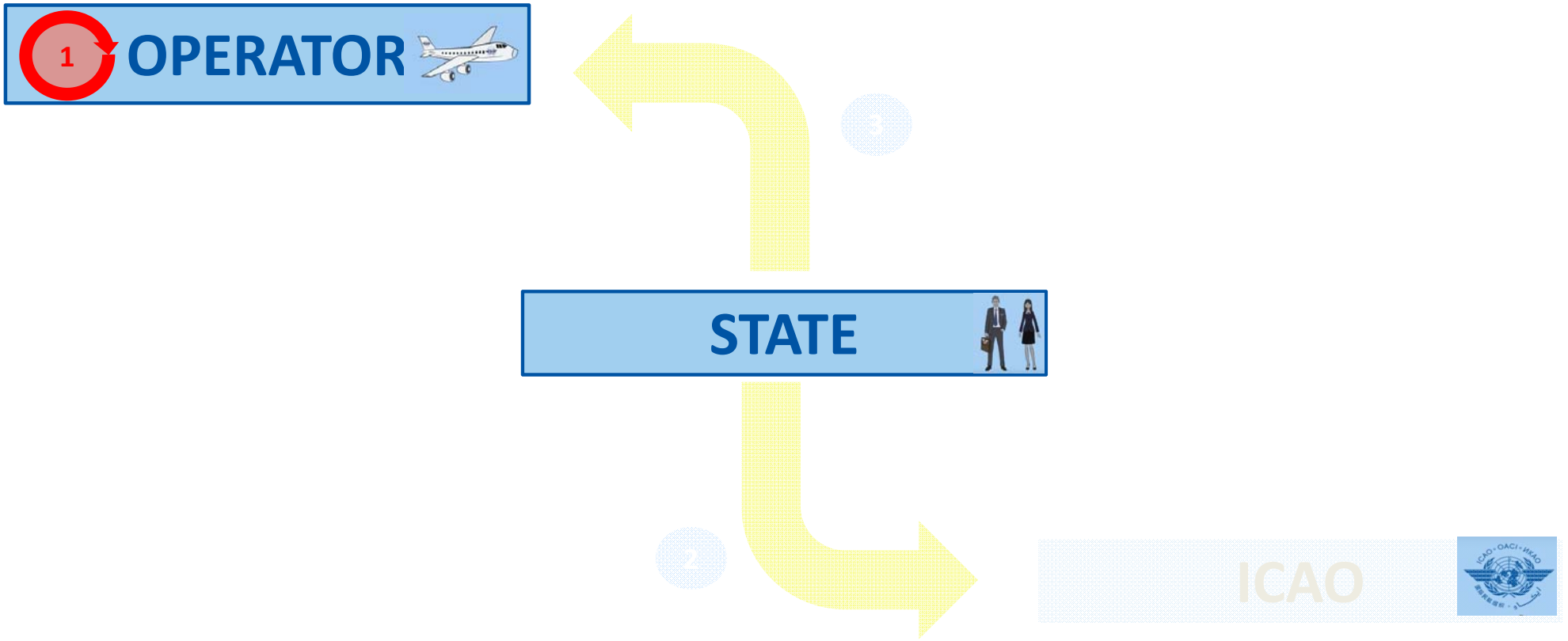
Aeroplane operator reports to State through the annual Emissions Report

The annual Emissions Report is a document subject to a verification procedure



Verification Information Flow

1 Internal pre-verification



Voluntary Internal Pre-Verification

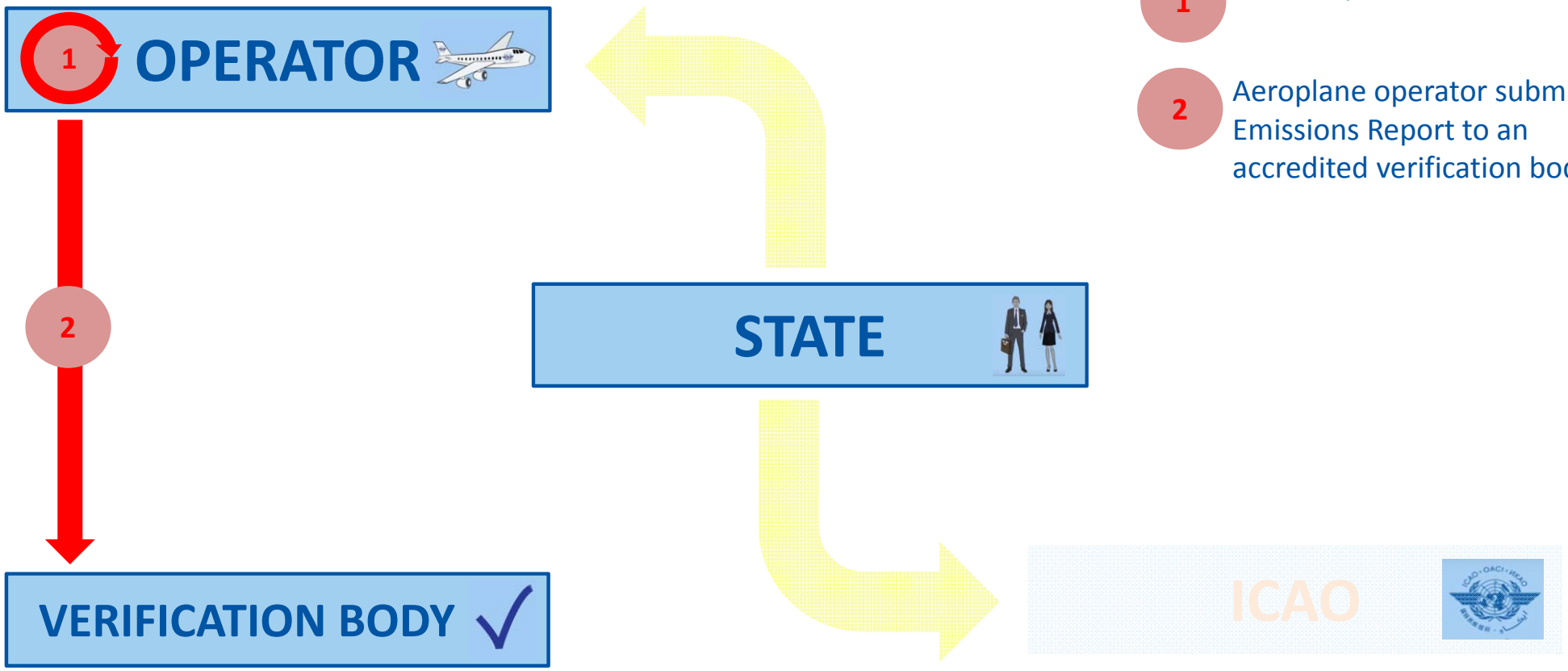
- Aeroplane operator's internal pre-verification:
  - In order to prepare for third-party external verification, an aeroplane operator should consider conducting a voluntary internal pre-verification in order to ensure there will be no large data issues during the verification
  - Each operator decides how to conduct the internal pre-verification of its annual Emissions Report
    - Guidance is provided in ETM (Doc 9501), Volume IV, 3.3.4.1 and Table 3-8.

Voluntary Internal Pre-Verification

Example of guidance for operators' internal pre-verification: ETM, section 3.3.4.1

Completed by	Topic	Task	MRV	Simplified MRV
Internal Auditor	**Emission Calculation & Fuel Data used**	Consult Emissions Monitoring Plan to determine how emissions are calculated and perform some cross checks to see if the applied calculation works by adding logics to the report	x	x
		If based on real fuel figures, cross check how those are recorded and if this has been done correctly or if there are any reoccurring error sources e.g. below	x	
		Calculate if the arrival fuel of the previous flight + the recorded fuel uplift are roughly the same figure as the departure fuel	x	
		Cross check if 2 equal fuel uplifts have been recorded for 2 or more consecutive flights and if those are genuine or typing errors	x	x
		Check report for very low/high fuel uplifts/figures to see if those are genuine or typos	x	x

Verification Information Flow



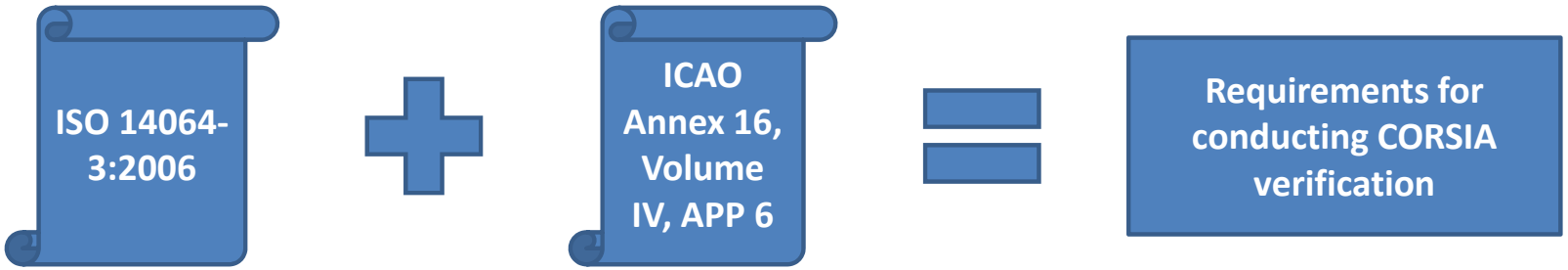
1 Internal pre-verification

2 Aeroplane operator submits Emissions Report to an accredited verification body

Verification by the Verification Body

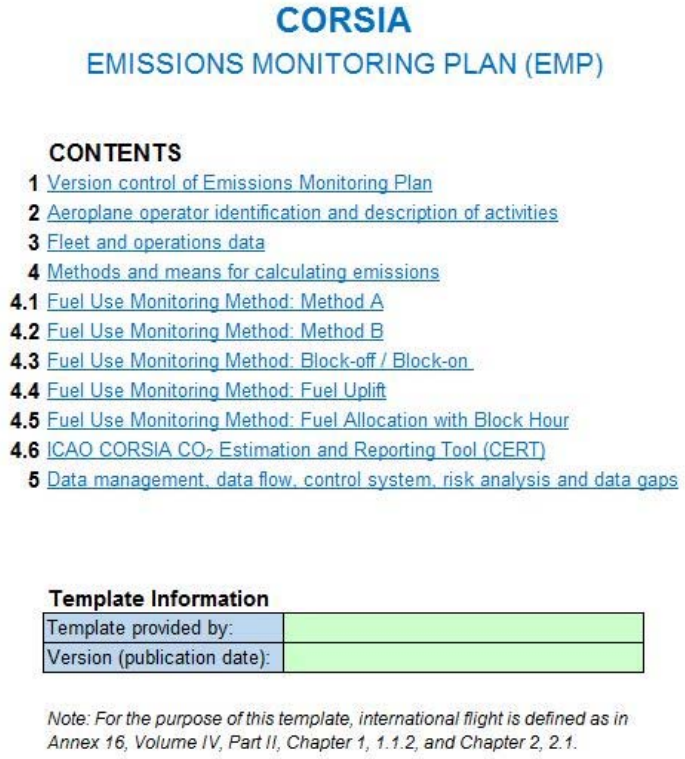
- The aeroplane operator shall engage an accredited verification body for the verification of its annual Emissions Report

- A verification body shall conduct the verification according to ISO 14064-3:2006, and the CORSIA-specific requirements described in Annex 16, Volume IV, Appendix 6



Verification by the Verification Body

- Some CORSIA-specific considerations:
  - Aeroplane operator's Emissions Monitoring Plan (EMP) is the starting point for verification:
    - Has the operator's EMP been approved by the State?
    - Does the EMP meet the requirements of Annex 16, Volume IV?
    - Has the Emissions Report been drafted in accordance with the approved EMP that meet the requirements of Annex 16, Volume IV ?



CORSIA

EMISSIONS MONITORING PLAN (EMP)

CONTENTS

Template Information

Template provided by:	
Version (publication date):	

Note: For the purpose of this template, international flight is defined as in Annex 16, Volume IV, Part II, Chapter 1, 1.1.2, and Chapter 2, 2.1.

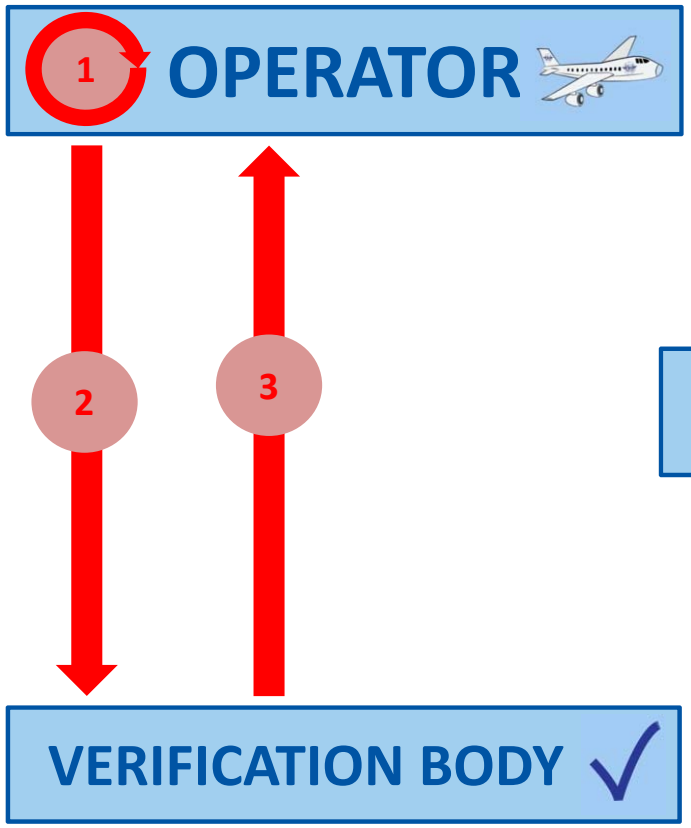
Verification by the Verification Body

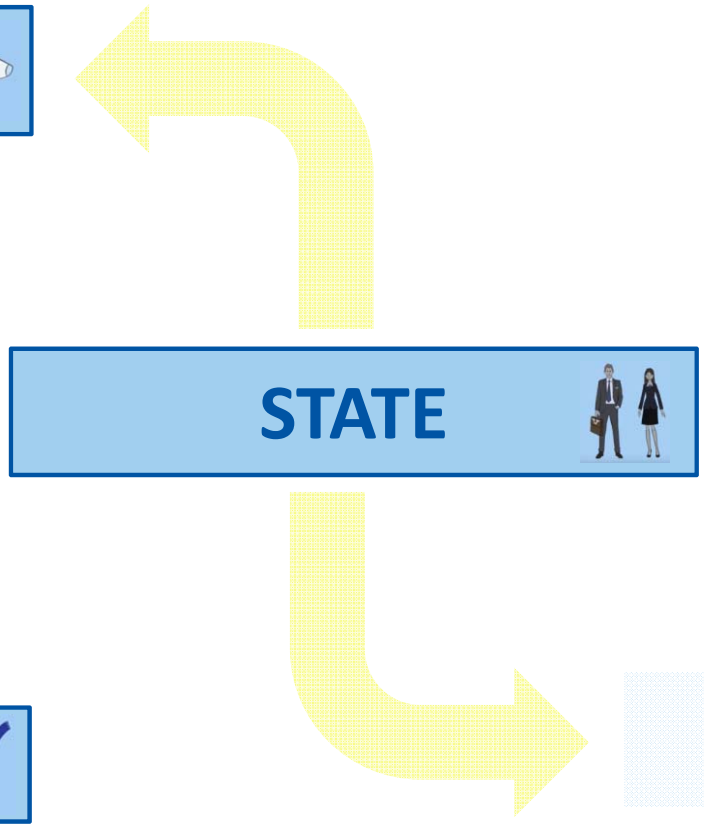
- Data testing in accordance with the Emissions Report sampling plan
- Understanding **aeroplane operator's data flow** is essential for the verification
- ETM, Volume IV, provides examples of aviation reference data sources

Table 3-10. Aviation reference data sources and documentation

Examples	*Categorization*	*Technical explanation*	*Usability rating*
Airline software systems	Secondary internal data	— Operational data containing details on flights, loads, routing etc. — Includes already processed data — Potentially internal quality assurance against primary data	Medium-Low
Flight / technical logs and typically included data	Primary internal data	— Operational data containing details on flights, loads, routing etc. — High level of reliability as safety relevant — Flight logs can be completed manually (hand written) or automatically	High
ATC flight plan and OFP	Primary internal data	— Operational data needed to operate a flight; contains i.e., aeroplane identification, flight route details — Does not provide evidence on fuel consumption or whether the flight has indeed taken place or not	Medium
Air traffic control data and invoices	Primary external data	— Operational data containing flight details, aeroplane, routing including speed and altitude — Data generated by third party (ATC); high reliability with sufficient evidence whether a flight took place or not	High
Fuel invoices	Primary external data	— Invoice from the fuel supplier (per flight)	High

Verification Information Flow





1 Internal pre-verification

2 Aeroplane operator submits Emissions Report to an accredited verification body

3 Verification body produces Verification Report

Verification Report

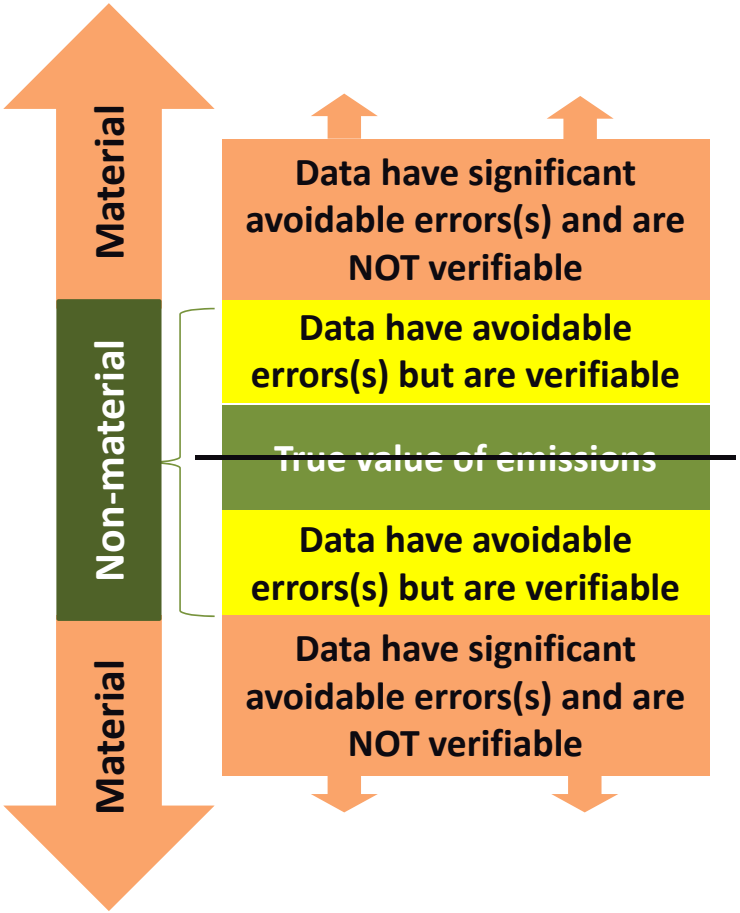
- Contents of the VR is provided in the Annex 16, Volume IV, Appendix 6, 3.10.1
  - Includes all verification-related information
- CORSIA specific content:
  - compliance of Emissions Report with the Emissions Monitoring Plan
  - non-compliances of the Emissions Monitoring Plan with SARPs

Demonstration of the Verification Report template after this presentation

Materiality Threshold

2 % > 500,000 tonnes

5 % ≤ 500,000 tonnes



Materiality Example

Item	Verification	Reported value	Verification body's value	Difference	Materiality
Flight 1	Incorrect fuel uplift	50	42	8	3.48%
Flight 2	Correct	12	12	0	
Flight 3	Incorrect block-on fuel	15	25	-10	-4.35%
Flight 4	Incorrect fuel uplift	52	42	10	4.35%
…	…	…	…	…	…
Total		230	222	8	3.48%

$$\frac{\text{Difference}}{\text{Total Reported value}} = \text{Materiality}$$

Misstatements and Non-Conformities

MISSTATEMENT:
Error, omission, misrepresentation

Examples

- Missing flights in the sequence of flights
- Non addressed data gaps as missing fuel uplift
- Implausible data, such as:
  - Fuel uplifts larger than tank capacity
  - Block-on fuel higher than Block-off fuel
  - Wrong unit, etc.

may cause

NON-CONFORMITIES:
Act or omission or an act that is not in accordance with EMP

Examples

- Incorrect application of the fuel use monitoring methods
- Incorrect application of the CERT
- Incorrect version of the EMP used
- Required quality procedures not followed, etc.

AO will correct all misstatements and non-conformities discovered during verification

Verification Statement

VERIFIED AS NOT SATISFACTORY

- ✖ Includes material misstatements and/or non-conformities;
- ✖ The scope of verification too limited;
- ✖ No sufficient confidence in data.

→ **Advise the AO to contact the State**

VERIFIED AS SATISFACTORY

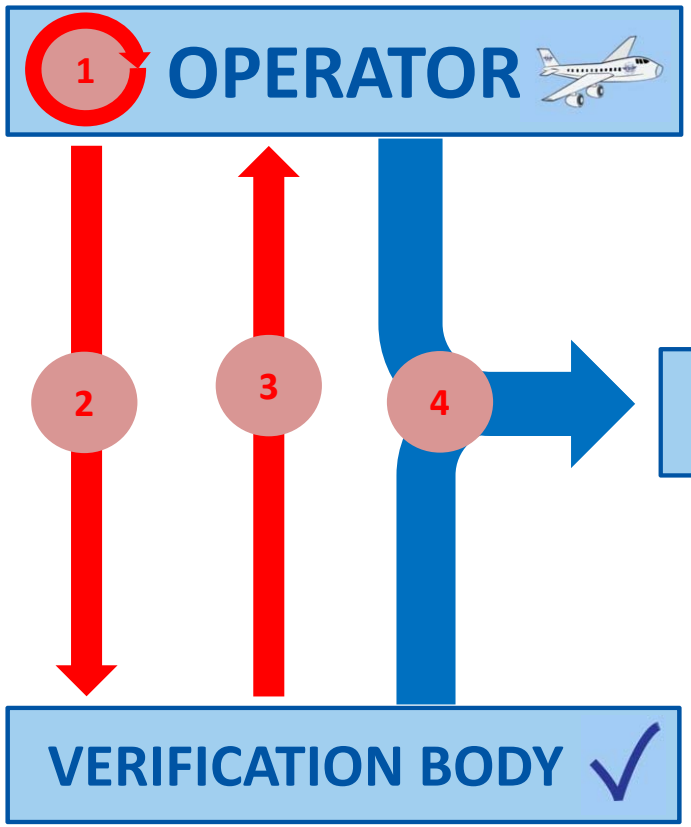
- ✓ NO misstatements and/or non-conformities

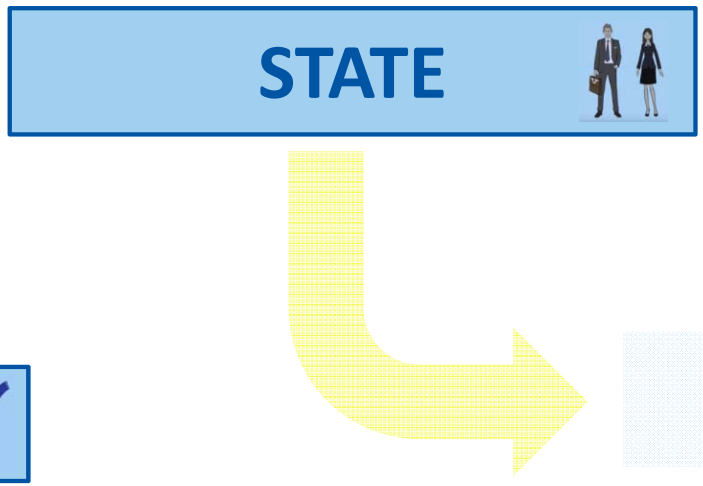
OR

VERIFIED AS SATISFACTORY with comments

- ✓ Includes non-material misstatements and/or non-conformities;
- ✓ Specify the misstatements and non-conformities.

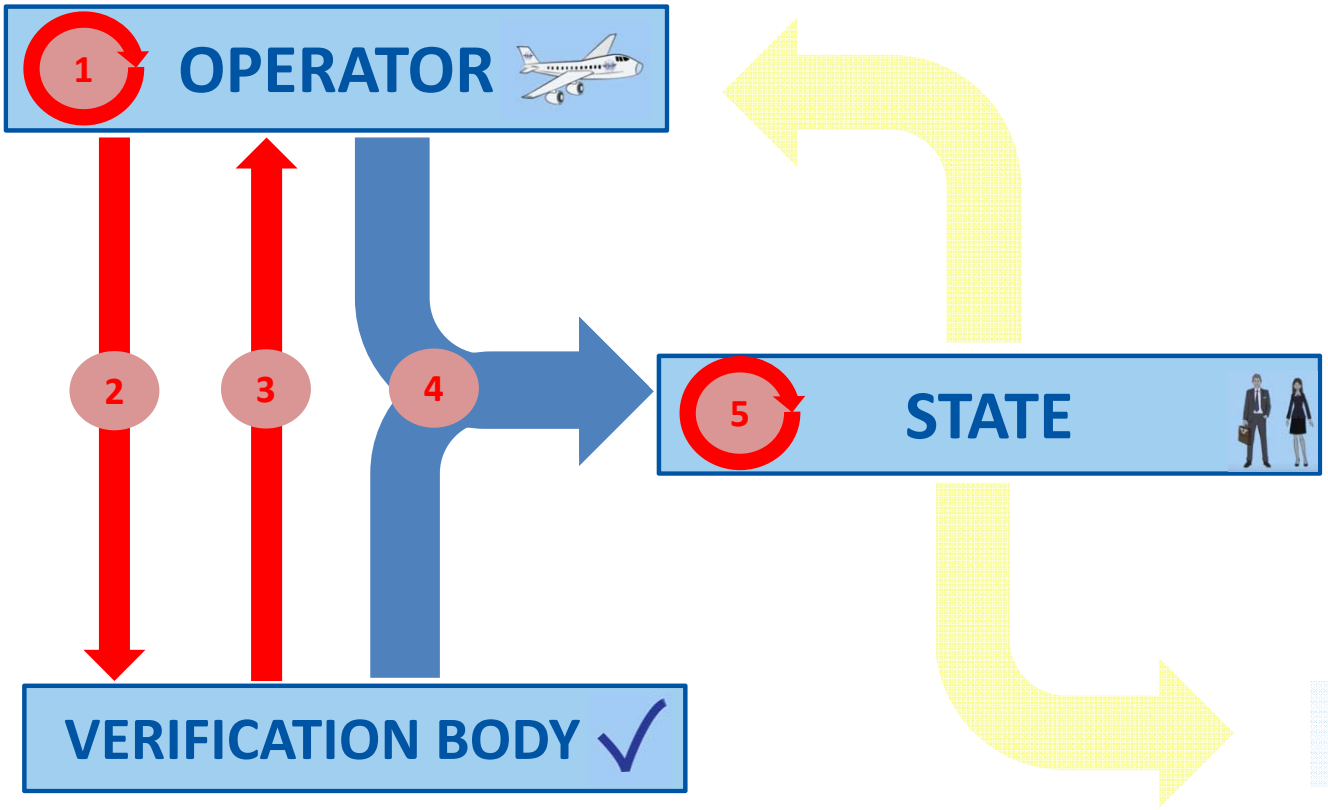
Verification Information Flow





1. Internal pre-verification
2. Aeroplane operator submits Emissions Report to an accredited verification body
3. Verification body produces Verification Report
4. Aeroplane operator and verification body submit Emissions Report and Verification Report to State

Verification Information Flow



1. Internal pre-verification
2. Aeroplane operator submits Emissions Report to an accredited verification body
3. Verification body produces Verification Report
4. Aeroplane operator and verification body submit Emissions Report and Verification Report to State
5. State's order of magnitude check of Emissions Report

Order of Magnitude Check

- The objective of the State's order of magnitude check of an aeroplane operator's Emissions Reports is to assess the completeness of data reported by the operator

- For an operator with an Emissions Report verified as "satisfactory", the order of magnitude check will take approximately 3 hours

Reference: Annex 16, Volume IV, Part II, Chapter 2, 2.4.1

Guidance for Order of Magnitude Check

Table 3-9 of the ETM provides checklist for States' order of magnitude check of Emissions Reports

Main sections:

- Aeroplane Operator
- Emissions Report information
- Aeroplane fleet
- OPTION 1: State pairs
- OPTION 2: Aerodrome pairs
- Data gaps
- Verification body
- Change of data by State
- Communication with aeroplane operator
- Communication with verification body

No.	Question / Issue	Additional Information	Status: OK/Yes/No /Not Applicable	Notes and Results of Checks
	Aeroplane Operator			
1	Aeroplane Operator/Verification Body both separately submit Emissions Report and Verification Report. Is the content of both submissions identical?	Minimum check: reported fuel consumption and number of flights. Get back to Aeroplane Operator in case of deviations.		
2	Is the name of the Aeroplane Operator given and unambiguous?	Ensure unambiguous identification of Aeroplane Operator. Get back to Aeroplane Operator in case of uncertainties.		
3	Is there a valid ICAO designator for Aeroplane Operating Agencies? Does it have the correct character length?	Ensure unambiguous identification of Aeroplane Operator. Get back to Aeroplane Operator in case of uncertainties.		
4	Basic information (address, AOC etc.) plausible?	Ensure unambiguous identification of Aeroplane Operator. Get back to Aeroplane Operator in case of uncertainties.		

Fuel Reported Check

- Are the types of fuel reported plausible and contained in the EMP? (*ETM (Doc 9501), Volume IV, Table 3-9, #31*)
  - Since emissions factors are fuel type-specific, deviation might lead to implausible amount of calculate emissions.

Example:

An aeroplane operator has reported the following information in its ER:

- Total amount of Jet A1 Fuel = 250,000 tonnes (FCF = 3.16 tonnes of CO_2/tonne of fuel)
- Total amount of AvGas = 50,000 tonnes (FCF = 3.10 tonnes of CO_2/tonne of fuel)

You can use this information to calculate the total CO_2 emissions:

CO_2 emissions= (250,000 x 3.16) + (50,000 x 3.10) = 790,000 + 155,000 = 945,000 tonnes

Compare the result with total reported CO_2 emissions

Number of Flights Check

- Is the given information regarding number of flights plausible? (*ETM (Doc 9501), Volume IV, Table 3-9, #30*)
  - Does aeroplane operator report a noticeable small number of flights on typical destinations of the airline?

Example based on reporting State pairs:

An aeroplane operator has reported the following information in its ER:

- Total no of flights per year = 7,500
- Total no of aeroplanes = 5

You can use this information to calculate an average number of flights per aeroplane:

Average = 7,500 flights / (365 days x 5 aeroplanes) = about 4 flights/aeroplane/day

Could be considered as plausible for an operator on short- and medium-haul flights

Two Specific Fuel Consumption Checks

- Are there State pairs with more than 250 tonnes average fuel consumption per flight? (*ETM (Doc 9501), Volume IV, Table 3-9, #38*)

- Are there State pairs with less than 2.5 tonnes average fuel consumption per flight? (*ETM (Doc 9501), Volume IV, Table 3-9, #39*)

Example:

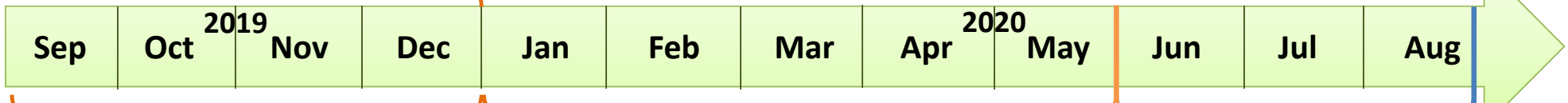
250/150 = 1.7

State of Departure	State of Arrival	Total No of Flights	Total Amount of Fuel (tonnes)	Average Fuel Consumption
State A	State B	150	250	1.7
State A	State E	150	2,000	13.3
State C	State D	40	15,000	375.0

Timeline for Verification of 2019 Data

Aeroplane Operator

1 Jan to 31 Dec 2019: Monitor **2019 CO_2 emissions from international flights**



Aeroplane Operator

Sep 2019:
Perform pre-verification

Verification Body

Sep – Dec 2019:
1. Pre-contract stage
2. Strategic analysis
3. Risk analysis
4. Verification plan

Aeroplane Operator

1 Jan – 31 May 2020:
Prepare Emissions Report for 2019

Verification Body

1 Jan – 31 May 2020:
5. Verification
6. Addressing misstatements and non-conformities
7. Verification Report
8. Independent Review

Aeroplane Operator and Verification Body

31 May 2020: Submit ER and VR to State

States

1 Jun – 31 Aug 2020:
Conduct order of magnitude check

31 Aug 2020:
Submit CO_2 emissions to ICAO

Accreditation Process for Verification Bodies

Accreditation of verification bodies (1/2)

- A verification body shall be accredited by a national accreditation body in order to be eligible to verify Emissions Reports in CORSIA:
  - ISO 14065:2013 “Greenhouse gases - Requirements for greenhouse gas validation and verification bodies for use in accreditation or other forms of recognition”
  - CORSIA-specific requirements as described in Annex 16, Volume IV, Appendix 6

- A national accreditation body shall be working in accordance with ISO/IEC 17011 “Conformity assessment - General requirements for accreditation bodies accrediting conformity assessment bodies”

Reference: Annex 16, Volume IV, Part II, (Chapter 2, 2.4.2) and Appendix 6

Accreditation of verification bodies (2/2)

- How to ensure sufficient availability of accredited verification bodies to aeroplane operators, in support of verification activities under CORSIA?
  - National accreditation bodies and verification bodies need to have the required knowledge
    - ICAO has developed a training course on CORSIA verification for both national accreditation bodies and verification bodies
  - Operators need to have access to verification bodies accredited for CORSIA
    - Annex 16, Volume IV allows an operator to work with a verification body accredited by the national accreditation body of another State
    - ICAO will compile and publish, on an annual basis, a list of verification bodies accredited for CORSIA to facilitate operators' access to accredited verification bodies

Reference: Annex 16, Volume IV, Part II, (Chapter 2, 2.4.2) and Appendix 6

ICAO CORSIA Verification Course

ICAO CORSIA Verification Course

- The CORSIA Verification Course that has been developed by ICAO provides training on how to verify CO_2 Emissions Reports that have been prepared by aeroplane operators, in accordance with the provisions of the CORSIA Standards and Recommended Practices (SARPs).
  - https://www.icao.int/training/Pages/training-catalogue-details.aspx?catid=2657&language=0&region=&ITP=1

Course Objectives

- After having successfully completed this course, participants will be able to:
  - Perform the CORSIA monitoring, reporting, and verification (MRV) requirements as outlined in Annex 16, Volume IV - Environmental Protection - CORSIA, and Environmental Technical Manual (Doc 9501), Volume IV
  - Apply the verification requirements as outlined in Annex 16, Volume IV, and Doc 9501, Volume IV, including materiality threshold, verification criteria, verification scope and objectives and the Verification Report preparation and submission requirements
  - Correctly identify the scope of applicability for CORSIA MRV requirements, as well as for CORSIA offsetting requirements
  - Apply a working knowledge of the fuel use monitoring methods and of the ICAO CORSIA CO_2 Estimating & Reporting Tool (CERT) estimation tool as outlined in Annex 16, Volume IV.

Target Audience and Pre-requisites

- Target Audience:
  - Professionals with experience in the verification of CO_2 emissions using ISO 14064-3:2006, who want to get involved in the verification of aeroplane operators' CO_2 Emissions Reports under CORSIA.

- Pre-requisites:
  - Working knowledge of ISO 14064-3:2006 is required
  - Knowledge of ISO 14065:2013 is desirable

ICAO ENVIRONMENT

Upcoming Sessions for ICAO CORSIA Verification Course (as of 12 March 2019)

Location	Tentative Schedule 2019	Status
1. Montreal (ICAO HQ)	10-12 April	Confirmed
2. Washington DC, USA	15-17 April	Pending
3. Kingston, Jamaica	24-26 April	Confirmed
4. Brasilia, Brazil	8-10 May	Pending
5. Santiago, Chile	13-15 May	Tentative
6. Amsterdam, Netherlands	20-22 May	Confirmed
7. Abu Dhabi, UAE	3-5 June	Pending
8. Addis Ababa, Ethiopia	12-14 June	Confirmed
9. Johannesburg, South Africa	17-19 June	Confirmed
10. Casablanca, Morocco	24-26 June	Confirmed
11. Beijing, China	24-26 June	Confirmed

Also see: https://www.icao.int/training/Pages/training-catalogue-details.aspx?catid=2657&language=0&region=&ITP=1

Frequently Asked Questions

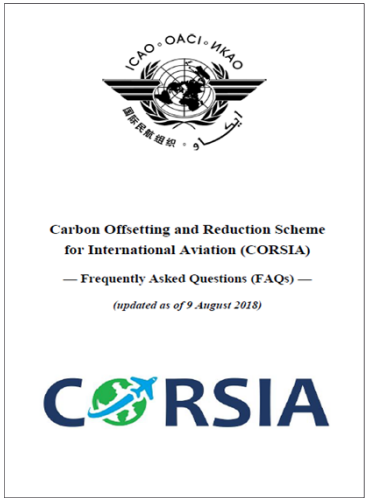
A selection of Frequently Asked Questions (FAQs) on CORSIA verification and related responses is available for download via the CORSIA webpage: www.icao.int/corsia

Does an aeroplane operator have to be certified under ISO 14065?

How does a verification team meet the technical expertise requirements?

What may a witness audit involve during the accreditation process of a verification body?

Is a third-party verification needed when using the ICAO CORSIA CERT?

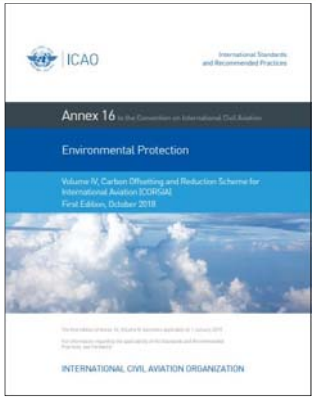


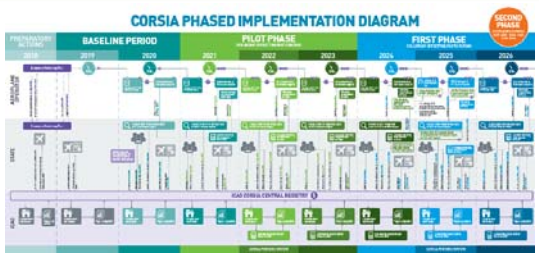
How does a verification team meet the knowledge requirements?

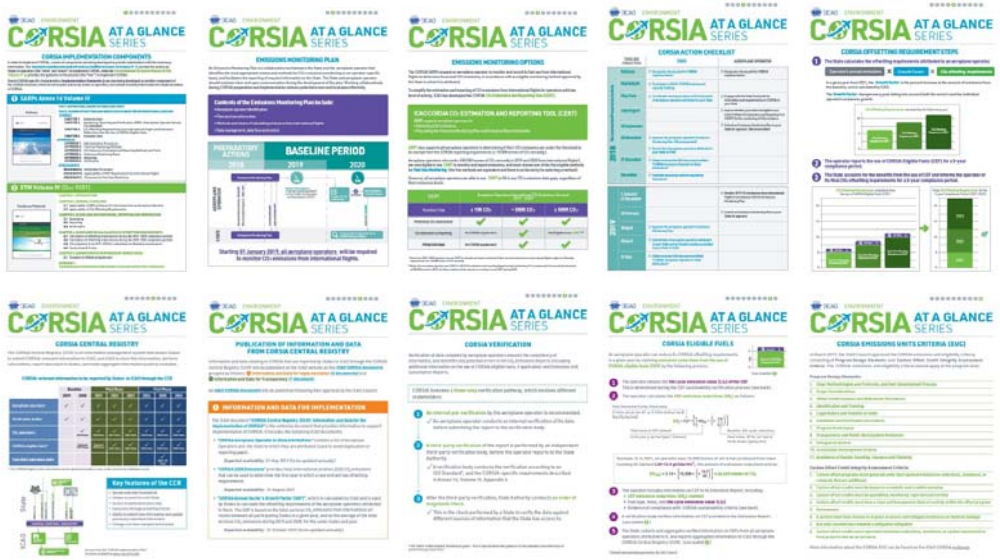
Does the verification body have to be from the administrating State?

How does an independent reviewer meet the knowledge and technical expertise requirements?

Thank you!







For more information, please visit our website: **http://www.icao.int/corsia**