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ENVIRONMENT

# Session 5: CORSIA Calculation of CO<sub>2</sub> Offsetting Requirements

ICAO Secretariat





## A reminder from the previous presentations...

- MRV system is a key component of CORSIA implementation:
  - **Monitoring** of fuel use on each international flight and calculation of related CO<sub>2</sub> emissions
  - **Reporting** of CO<sub>2</sub> emissions information between operators, States and ICAO
  - **Verification** of reported emissions data to ensure completeness and avoid misstatements

## This presentation...

- Overview how CORSIA CO<sub>2</sub> Offsetting Requirements are calculated (based on the MRV system)
- Overview how compliance with the CORSIA CO<sub>2</sub> Offsetting Requirements is achieved



# Session 5: CORSlA Calculation of CO<sub>2</sub> Offsetting Requirements

## Part 1





## Part II, Chapter 3 of the Annex 16, Volume IV:

### CO<sub>2</sub> Offsetting Requirements from International Flights and Emissions Reductions from the Use of CORSIA eligible fuels, specifically:

- Applicability of CO<sub>2</sub> Offsetting Requirements (Chapter 3, 3.1)
- CO<sub>2</sub> Offsetting Requirements for Individual Operators (Chapter 3, 3.2)
- Emissions Reductions from the Use of CORSIA eligible fuels (Chapter 3, 3.3)
- Total final CO<sub>2</sub> Offsetting Requirements for a given compliance period with Emissions Reductions from the Use of CORSIA eligible fuels (Chapter 3, 3.4)





- Annex 16 Vol. IV – Part II Chapter 3, 3.1 \*
  - **From 1 January 2021 to 31 December 2035**, the offsetting requirements shall be applicable to an aeroplane operator with international flights between participating States.
  - New entrants (aeroplane operators) are exempted from the CORSIA offsetting requirements for the first 3 years or until its annual emissions exceed 0.1% of total 2020 emissions, whichever comes first.

\* In accordance with Assembly Resolution A39-3, paragraphs 9, 10, 12



- ICAO CORSIA Implementation Elements
  - One of the Implementation Elements "CORSIA States for Chapter 3 State Pairs" will provide information on States participating in the CORSIA that define the international routes between State pairs subject to offsetting requirements for every year from 2021.

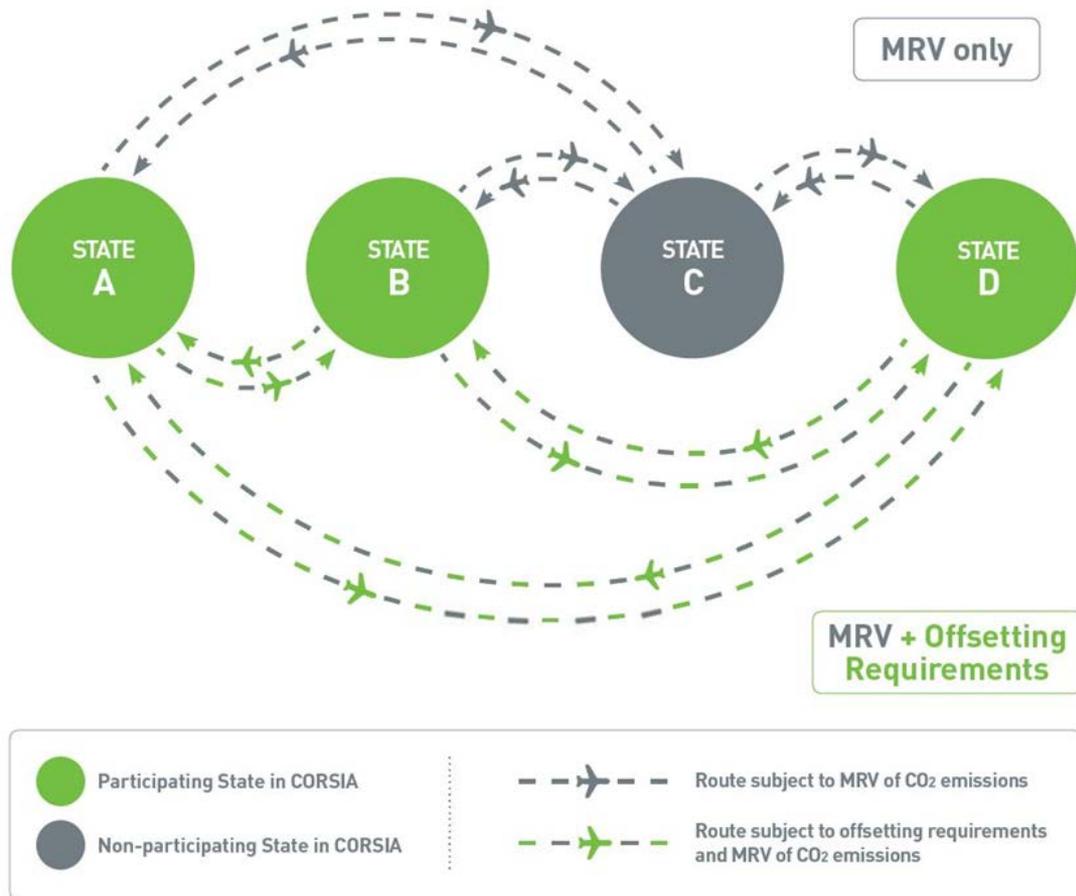


# Applicability of CO<sub>2</sub> Offsetting Requirements: Route-based Approach



**Routes subject to MRV of CO<sub>2</sub> emissions:**  
ALL ICAO MEMBER STATES with aeroplane operators conducting international flights are required to monitor, report and verify (MRV) CO<sub>2</sub> emissions from these flights every year from 2019, independent of their participation in the CORSIA.

**Routes subject to offsetting requirements:**  
Emissions from international flights where both the origin and destination States participate in the CORSIA, are subject to offsetting requirements every year from 2021. Reference: A39-3, paragraph 10.





# CO<sub>2</sub> Offsetting Requirements for Individual Operators



## Annex 16 Vol. IV – Part II Chapter 3, 3.2

The State shall calculate, for each of the operators attributed to it, the amount of CO<sub>2</sub> emissions required to be offset in a given year prior to consideration of the CORSIA eligible fuels:

$$OR_y = \%S_y * (OE_y * SGF_y) + \%O_y * (OE_y * OGF_y)$$

OR<sub>y</sub> = Offsetting requirements in year y;

OE<sub>y</sub> = CO<sub>2</sub> emissions covered by CORSIA in year y;

SGF<sub>y</sub> = Sector's Growth Factor;

OGF<sub>y</sub> = Individual growth factor;

%S<sub>y</sub> = Per cent sectoral in year y;

%O<sub>y</sub> = Per cent individual in year y.

### HOW TO CALCULATE CO<sub>2</sub> OFFSET REQUIREMENTS?

**Operator's annual emissions X Growth Factor = CO<sub>2</sub> offset requirements**

The Growth Factor changes every year taking into account both the sectoral and the individual operator's emissions growth. The Growth Factor is the percent increase in the amount of emissions from the baseline to a given future year, and is calculated by ICAO.





# CO<sub>2</sub> Offsetting Requirements for Individual Operators



- **2021 - 2029: 100% sectoral approach:**

Operator's requirements  
in year y (from 2021)

→

$$OR_y = OE_y \times \frac{(SE_y - SE_{B,y})}{SE_y}$$

Operator's emissions covered by  
the CORSIA in year y (from 2021)

↑

SGF<sub>y</sub> - Sector's  
Growth Factor in  
year y (from 2021)

Sectoral emissions in baseline  
(av. 2019/2020) with route-  
coverage by CORSIA in year y

Sectoral emissions, with route-  
coverage by CORSIA in year y

In pilot phase (2021-2023), each State can choose  $OE_y$  either:

- The operator's emissions in a given year (i.e. 2021, 2022, 2023); or
- The operator's emissions referring back to a single year of 2020.

The State shall notify ICAO which option it has selected by 30 June 2020.

Note: Sector's Growth Factor (SGF<sub>y</sub>) is  
calculated by ICAO every year from 2021.

## In practice, the State will...

1. Use the operator's reported emissions
2. Use the sector's growth factor, calculated by ICAO
3. Multiply 1. with 2. to determine the operator's offsetting requirements

Reference: Assembly  
Resolution A39-3,  
paragraph 11.



# CO<sub>2</sub> Offsetting Requirements for Individual Operators

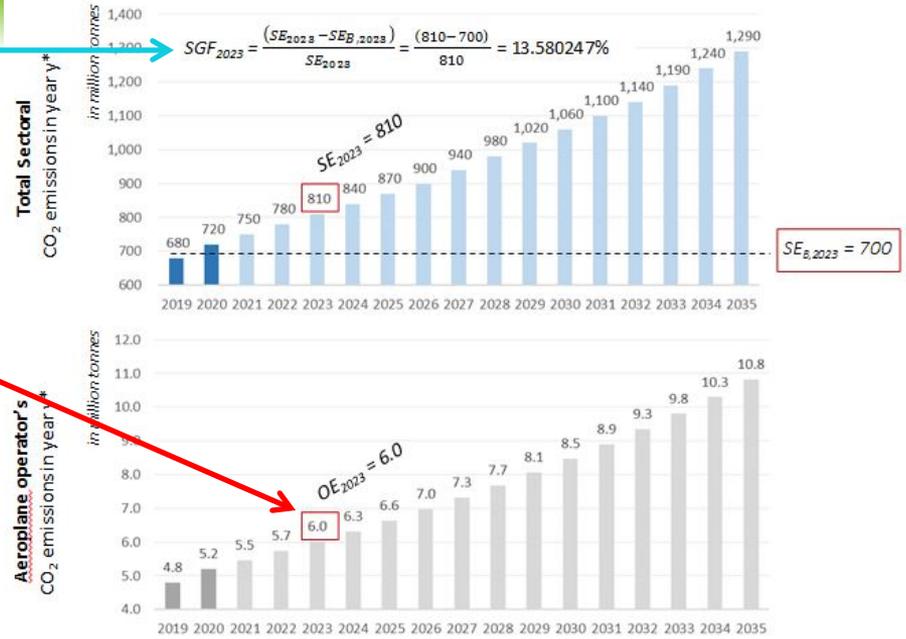


Example of how the State would calculate offsetting requirements in 2023 if it chooses to use the aeroplane operator's CO<sub>2</sub> emissions in a given year (i.e. 2023).

Calculated by ICAO

Reported by operators

Calculated by States



$$SGF_{2023} = \frac{(SE_{2023} - SE_{E,2023})}{SE_{2023}} = \frac{(810 - 700)}{810} = 13.580247\%$$

\* from flights subject to offsetting requirements, as defined in Annex 16, Volume IV, Part II, Chapter 3, 3.1

Illustration of calculation of offsetting requirements in year y e.g., 2023 (if the aeroplane operator chooses to use its CO<sub>2</sub> emissions in the given year y)

$$OR_{2023} = OE_{2023} * SGF_{2023} = 6\,000\,000 \text{ tonnes} * 13.580247\% = 814\,815 \text{ tonnes}$$

- where:
- OR<sub>y</sub> = Aeroplane operator's offsetting requirements in the given year y;
  - OE<sub>y</sub> = Aeroplane operator's CO<sub>2</sub> emissions covered by Annex 16, Volume IV, Part II, Chapter 3, 3.1 in the given year y; and
  - SGF<sub>y</sub> = Sector's Growth Factor.



# Emissions Reductions from the Use of CORSIA Eligible Fuels



- Recap: From 2021, operators can claim emissions reductions by reporting on CORSIA eligible fuels.

Covered in sessions #2 and #4 on CORSIA MRV system:  
Monitoring of CO<sub>2</sub> emissions;  
Reporting and verification of CO<sub>2</sub> emissions

- Annex 16 Vol. IV – Part II Chapter 3, 3.3

- The aeroplane operator that intends to claim for emissions reductions from the use of CORSIA eligible fuels in a given year shall compute emissions reductions as follows:

$$ER_y = FCF * \left[ \sum_f MS_{f,y} * \left( 1 - \frac{LS_f}{LC} \right) \right]$$



$ER_y$  = Emissions Reductions from the use of CORSIA eligible fuels in the given year  $y$  (in tonnes);

$FCF$  = Fuel Conversion Factor, equal to 3.16 kg CO<sub>2</sub>/kg fuel for Jet-A fuel / Jet-A1 fuel and 3.10 kg CO<sub>2</sub>/kg fuel for AvGas or Jet-B fuel;

$MS_{f,y}$  = Total mass of a neat (*unblended*) CORSIA eligible fuel claimed in the given year  $y$  (in tonnes);

$LS_f$  = Life cycle emissions value for a CORSIA eligible fuel (in gCO<sub>2</sub>e/MJ); and

$LC$  = Baseline life-cycle emissions values for aviation fuel (= 89 gCO<sub>2</sub>e/MJ for jet fuel, and =95 gCO<sub>2</sub>e/MJ for AvGas).



- ICAO CORSIA Implementation Elements
  - One of the Implementation Elements "CORSIA Eligible Fuels" will provide the necessary methodologies to determine the emissions reductions from the use of CORSIA eligible fuels.

## **In practice, the operator will...**

1. Use the amounts of CORSIA eligible fuels purchased, based on purchase records
2. Use the life-cycle emissions values to determine emissions reduction factors
3. Submit valid sustainability certification document
4. Report and claim reduction of offsetting requirements



## CO<sub>2</sub> Offsetting Requirements with Emissions Reductions from the Use of CORSIA Eligible Fuels



- **Total final offsetting requirements** are those CO<sub>2</sub> emissions required to be offset and are determined by subtracting the requirements with emissions reductions from the use of CORSIA eligible fuels
- Annex 16 Vol. IV – Part II Chapter 3, 3.4
  - The amount of CO<sub>2</sub> emissions required to be offset by an operator, after taking into account emissions reductions from the use of CORSIA eligible fuels in a given compliance period (2021 - 2035), shall be calculated by the State:

$$FOR_c = (OR_{1,c} + OR_{2,c} + OR_{3,c}) - (ER_{1,c} + ER_{2,c} + ER_{3,c})$$

$FOR_c$  = Operator's total final offsetting requirements in given compliance period c;

$OR_{y,c}$  = Operator's offsetting requirements in given year y (y = 1, 2 or 3) of compliance period c; and

$ER_{y,c}$  = Emissions reductions from use of CORSIA eligible fuels in given year y (y = 1, 2 or 3) of compliance period c.

**Recommendation:** The aeroplane operator is encouraged to make CORSIA eligible fuel claims on an annual basis. However, the aeroplane operator has the option to decide when to make a CORSIA eligible fuel claim within a given compliance period.

**In practice, the State will...** sum up the operator's offsetting requirements for the 3 year compliance cycle, and corresponding reductions from CORSIA eligible fuels, to determine the operator's total final offsetting requirements during the cycle.



# CO<sub>2</sub> Offsetting Requirements with Emissions Reductions from the Use of CORSIA Eligible Fuels



The State accounts for the benefits from the use of CORSIA eligible fuels and informs the operator of its total final CO<sub>2</sub> offsetting requirements for a 3-year compliance period.





# Session 5: Compliance with the CORSA CO<sub>2</sub> Offsetting Requirements

## Part 2





## Part II, Chapter 4 of the Annex 16, Volume IV:

Provides States and operators with procedures how to comply with CO<sub>2</sub> offsetting requirements by cancelling eligible emissions units, specifically:

- Cancelling CORSIA Eligible Emissions Units (Chapter 4, 4.2)
  - Reporting Emissions Unit Cancellation (Chapter 4, 4.3)
  - Verification of Emissions Unit Cancellation Report (Chapter 4, 4.4)
- *Note:* Appendix 1 additionally provides administration procedures relevant to Chapter 4.

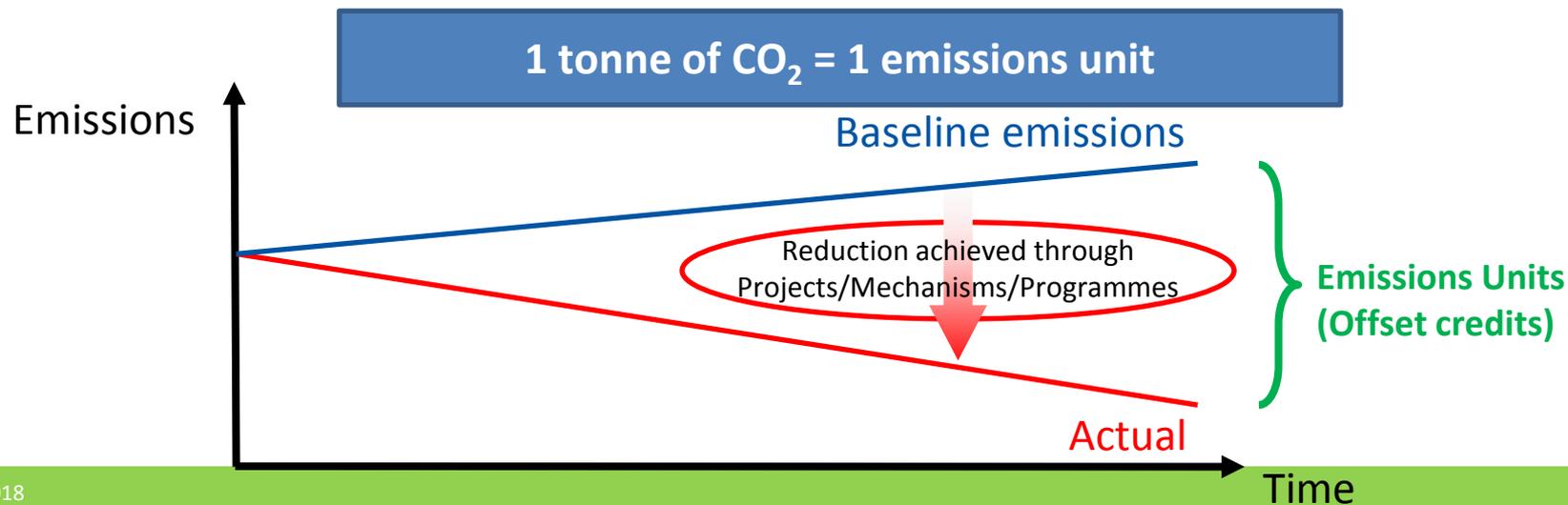




# Cancelling CORSIA Eligible Emissions Units – What are Emissions Units?



- Arising from emissions reduction achieved by the implementation of projects elsewhere (various sectors – including domestic aviation)
- Issued by crediting schemes through mechanisms, programmes, projects
- Calculation of the difference between baseline emissions (in the absence of the project activity) and actual emissions (after the project is implemented)





# Cancelling CORSIA Eligible Emissions Units – What are Carbon Markets?



- Emissions reduction projects generate emissions units that are sold in carbon markets on a per-tonne basis
- Owners of emissions units can cancel these units to offset emissions
- There are different types of carbon markets: compliance markets; and voluntary markets
- Buying and selling of units affect prices of emissions units



ICAO Seminar on Carbon Markets in February 2018 for further information:  
<https://www.icao.int/Meetings/carbonmarkets/Pages/default.aspx>



- Annex 16 Vol. IV – Part II Chapter 4, 4.2

- The operator shall meet its total final CO<sub>2</sub> offsetting requirements for a given compliance period by cancelling CORSIA Eligible Emissions Units\* within a CORSIA Eligible Emissions Unit Program registry;

*Note:* “Cancel” means the permanent removal and single use of a CORSIA Eligible Emissions Unit within a CORSIA Eligible Emissions Unit Program designated registry such that the same emissions unit may not be used more than once.

- Request each program registry to make visible on the public website, information on each of the operator’s cancelled CORSIA Eligible Emissions Units.

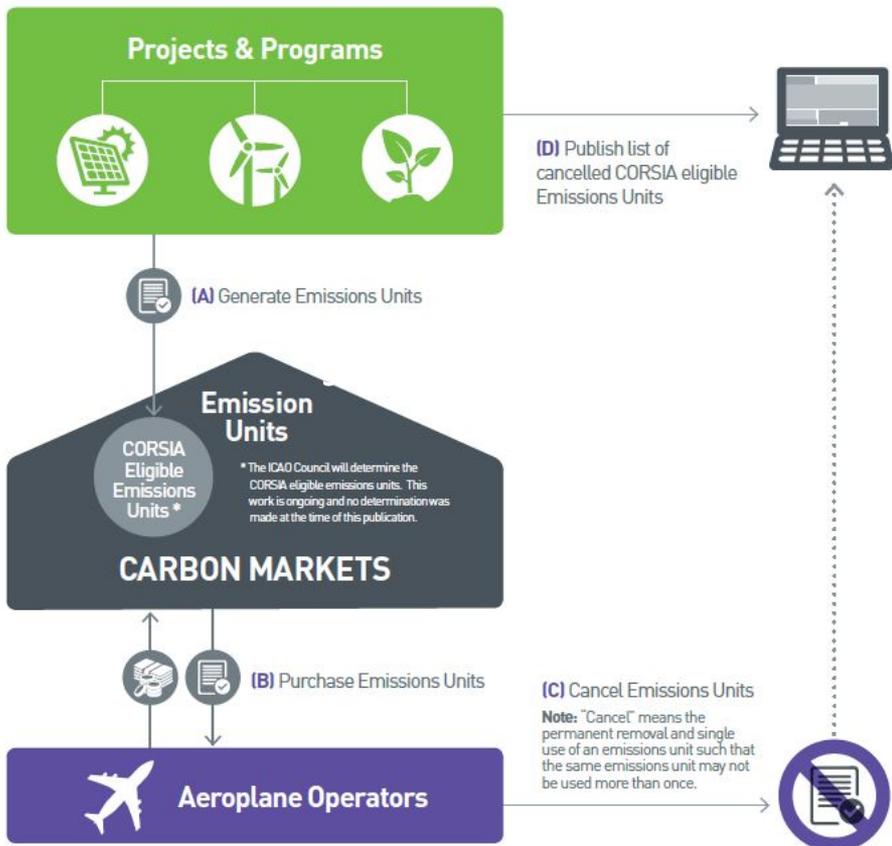
- ICAO CORSIA Implementation Elements

- One of the Implementation Elements "CORSIA Eligible Emissions Units" will provide information on approved CORSIA Eligible Emissions Units and Emissions Units Criteria.

**\*The ICAO Council will determine the CORSIA eligible emissions units.**



# Cancelling CORSIA Eligible Emissions Units – Carbon Markets and the CORSIA



- Generate:** Emissions reduction projects generate emissions units.
- Purchase:** Emissions units are purchased in carbon markets on a per-tonne basis, where 1 Emissions Unit = 1 tonne of CO<sub>2</sub>.
- Cancel:** Operators cancel CORSIA eligible emissions units. Cancellation takes place within a registry designated by a CORSIA Eligible Emissions Unit Program.
- Publish:** Operators request each CORSIA Eligible Emissions Unit Program Registry to make visible the cancellation information on the registry's public website.

**The ICAO Council will determine the CORSIA eligible emissions units.**

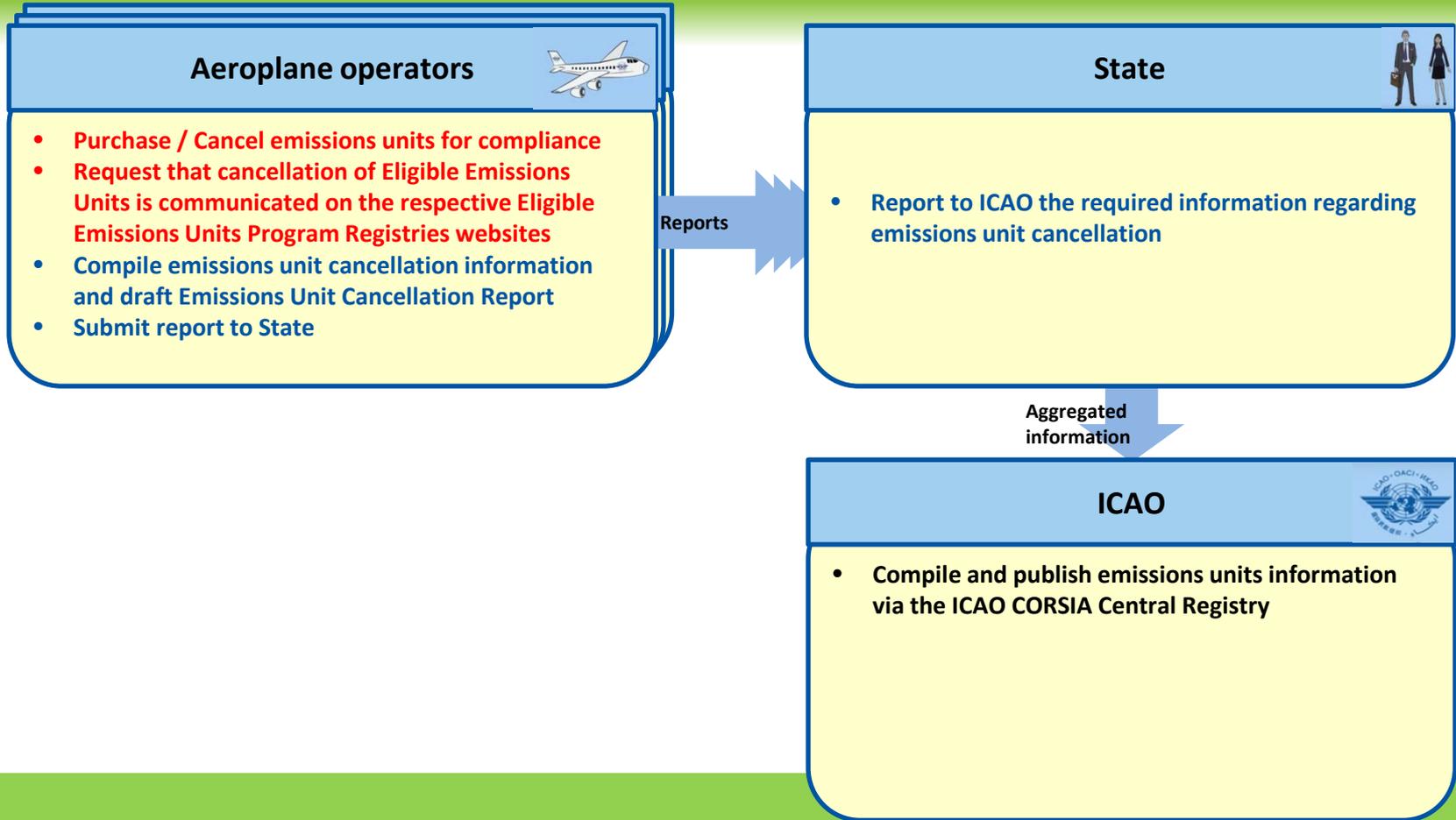


- Annex 16 Vol. IV – Part II Chapter 4, 4.3 and Appendix 5
  - For a given compliance period, operator shall report to the State the cancellation of CORSIA Eligible Emissions Units by submitting an Emissions Unit Cancellation Report. (Appendix 5, Table A5-7)
  - State shall approve the Emissions Unit Cancellation Report and submit to ICAO. (Appendix 5, Table A5-8)



Field #	Data Field	Details
Field 1	Aeroplane operator information	1.a Name of aeroplane operator 1.b Detailed contact information of aeroplane operator 1.c Name of a point of contact 1.d Unique identifier by which an aeroplane operator is attributed to a State, in accordance with Part II, Chapter 1, 1.2.4 1.e State
Field 2	Compliance period years reported	2. Year(s) in the reported compliance period for which offsetting requirements are reconciled in this report
Field 3	Aeroplane operator's total final offsetting requirements	3. Aeroplane operator's total final offsetting requirements (in tonnes), as informed by the State
Field 4	Total quantity of emissions units cancelled	4. Total quantity of emissions units cancelled to reconcile the total final offsetting requirements in Field 3
Field 5	Consolidated identifying information for cancelled emissions units	For each batch of cancelled emissions units ( <i>batch</i> defined as a contiguous quantity of serialized emissions units), identify the following: 5.a Quantity of emissions units cancelled; 5.b Start of serial numbers; 5.c End of serial numbers; 5.d Date of cancellation; 5.e Eligible emissions unit program; 5.f Unit type; 5.g Host country; 5.h Methodology <sup>2</sup> ; 5.i Demonstration of unit date eligibility; 5.j Program-designated registry name; 5.k Unique identifier for registry account to which the batch was cancelled; 5.l Aeroplane operator in whose name the unit was cancelled; and 5.m The unique identifier for the registry account from which the cancellation was initiated.

Table A5-7. Emissions Unit Cancellation Report from operator to State



Cancel

Report



- Reporting of CO<sub>2</sub> Emissions  
(Annex 16, Volume IV, Part II, Chapter 2, 2.3)

Covered in Session 4:   
CORSIA MRV System: Reporting  
and verification of CO<sub>2</sub> emissions

- Reporting emissions units cancellation  
(Annex 16, Volume IV, Part II, Chapter 4, 4.3)

Covered in this Session 5:  
CORSIA Calculation of CO<sub>2</sub>  
offsetting requirements



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

- The amount of CO<sub>2</sub> emissions from international flights

(Annex 16, Volume IV, Part II, Chapter 2, 2.4)

Covered in Session 4:   
CORSIA MRV System: Reporting and verification of CO<sub>2</sub> emissions

- The purchase of emissions units from eligible programmes to address offsetting requirements
- The cancellation of eligible emissions units
- The confirmation of the single use of eligible emissions units

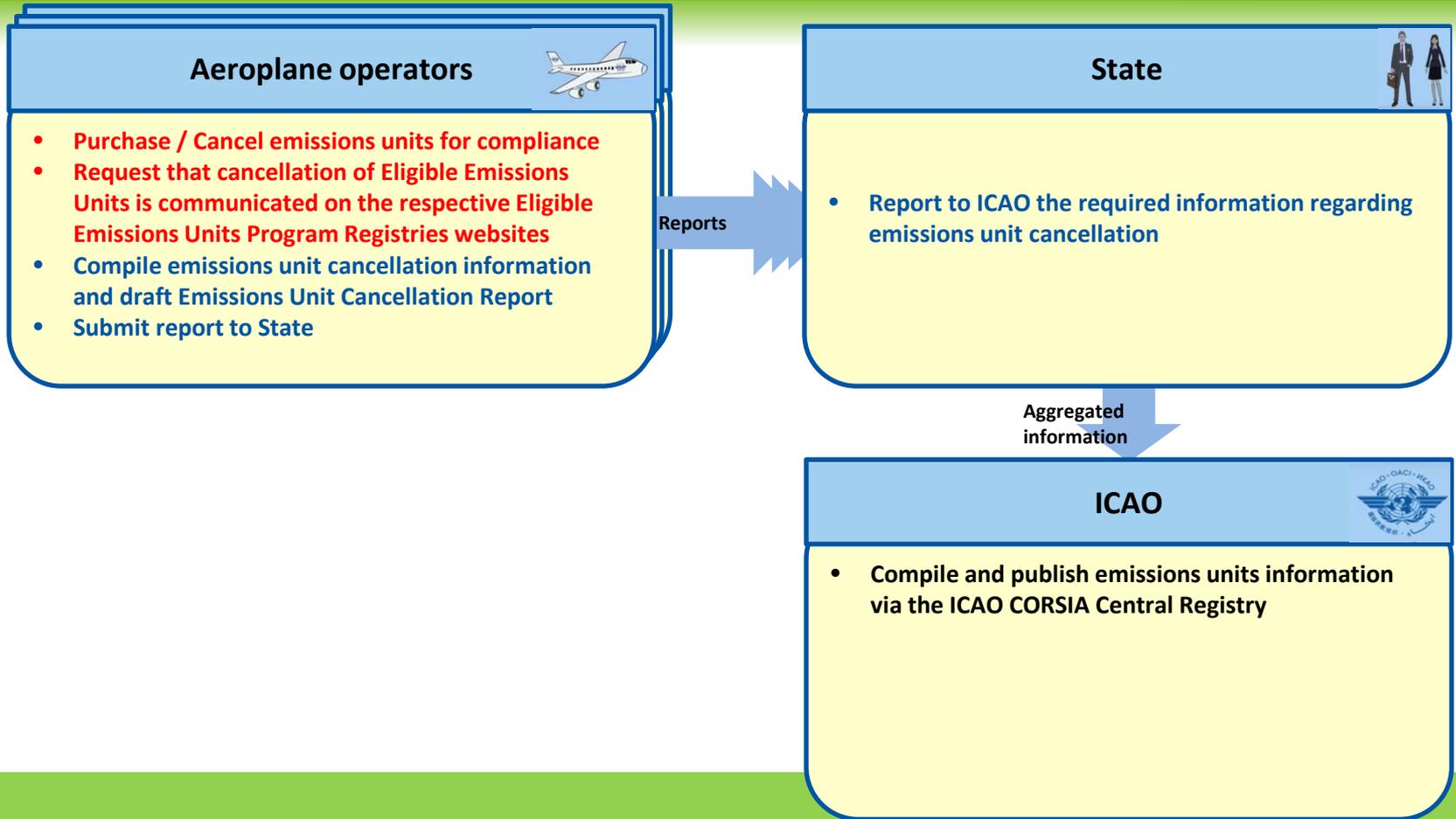
(Annex 16, Volume IV, Part II, Chapter 4, 4.4)

Covered in this Session 5:  
CORSIA Calculation of CO<sub>2</sub> offsetting requirements

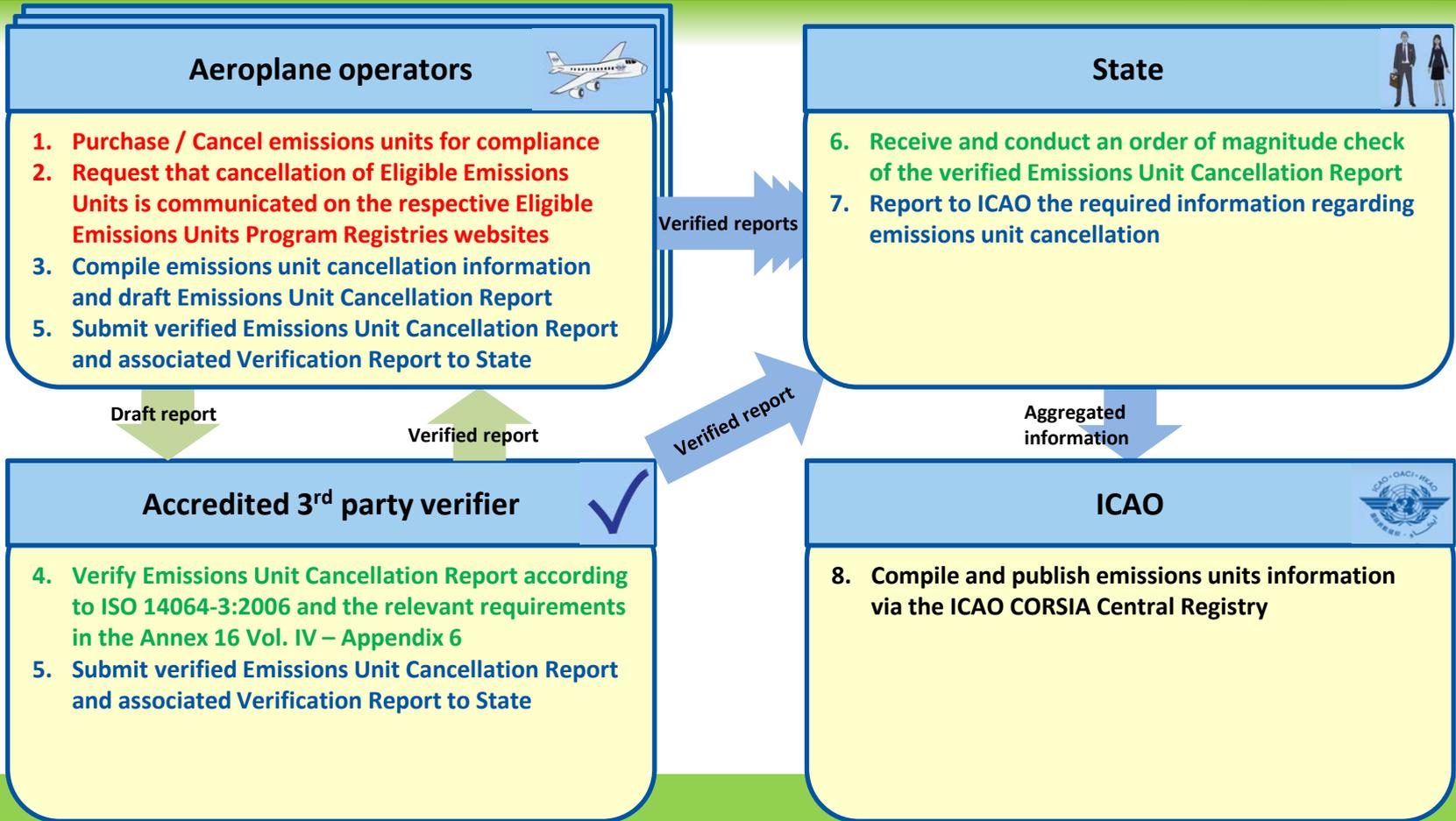


- Annex 16 Vol. IV – Part II Chapter 4, 4.4 and Appendix 6
  - The operator shall engage a verification body for the verification of its Emissions Unit Cancellation Report;
  - Verification body shall conduct the verification according to ISO 14064-3:2006, and the relevant requirements in Appendix 6;
  - Submission of Emissions Unit Cancellation Report and Verification Report to State by aeroplane operator and verification body;
  - State shall perform an order of magnitude check of the Emissions Unit Cancellation Report.
  - Verification body shall be accredited to ISO 14065:2013 and the relevant requirements in Appendix 6 by a national accreditation body.





Cancel  
Report



Cancel  
Report  
Verify



# Session 5: CORSlA Calculation of CO<sub>2</sub> Offsetting Requirements

## Summary



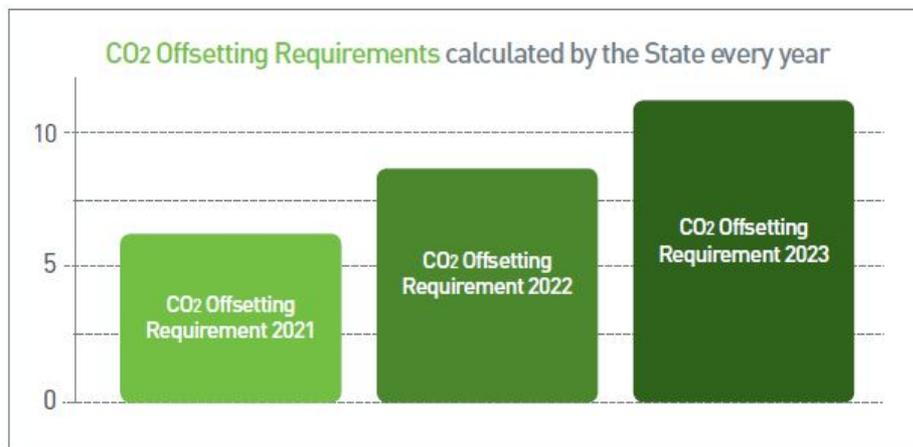


# 1 The State calculates the offsetting requirements attributed to an aeroplane operator.

$$\text{Operator's annual emissions} \times \text{Growth Factor} = \text{CO}_2 \text{ offset requirements}$$

In a given year from 2021, the **Growth Factor** is the percent increase in the amount of emissions from the baseline, and is calculated by ICAO.

The **Growth Factor** changes every year taking into account both the sector's and the individual operator's emissions growth.





2

The operator reports the use of CORSIA eligible fuels for a 3-year compliance period.

3

The State accounts for the benefits from the use of CORSIA eligible fuels and informs the operator of its total final CO<sub>2</sub> offsetting requirements for a 3-year compliance period.





## 4 The operator purchases and cancels eligible emissions units equivalent to its total final CO<sub>2</sub> offsetting requirements for the compliance period.



- A. **Generate:** Projects generate emissions units.
- B. **Purchase:** Emissions units are purchased in carbon markets by aeroplane operators.
- C. **Cancel:** Operators cancel CORSIA eligible emissions units within a registry designated by a CORSIA Eligible Emissions Unit Program.
- D. **Publish:** Operators request each CORSIA Eligible Emissions Unit Program Registry to make visible the cancellation information on the registry's public website.

## 5 The operator provides a verified Emissions Units Cancellation Report to the State, who checks the Report and informs ICAO.

**1**

The State calculates the offsetting requirements attributed to an aeroplane operator.

**2**

The operator reports the use of CORSIA eligible fuels for a 3-year compliance period.

**3**

The State accounts for the benefits from the use of CORSIA eligible fuels and informs the operator of its total final CO<sub>2</sub> offsetting requirements for a 3-year compliance period.

**4**

The operator purchases and cancels eligible emissions units equivalent to its total final CO<sub>2</sub> offsetting requirements for the compliance period.

**5**

The operator provides a verified Emissions Units Cancellation Report to the State, who checks the Report and informs ICAO.



# Questions?



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