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ENVIRONMENT

Council – 224th Session

Subject No. 50: Questions relating to the environment

Analyses in Support of the 2022 CORSIA Periodic Review (Summary Presentation)

Presented by CAEP





At its 222nd session*, and subsequent 223rd session, the Council...

...requested CAEP to present the following inputs for the review, as outlined in the Terms of Reference and C-DEC 222/12 para. 10.f, for Council’s consideration during the 224th Session:

- ii. further assessment of the impact of COVID-19 on CORSIA, including inter alia, its impact on the baseline beyond the pilot phase, on the different phases of CORSIA implementation, and on the growth factors, as set out in paragraph 5(e) of C-DEC 220/13, and drawing upon the analysis referenced in paragraph (d) above;
- iii. analyses of forecast prices for CORSIA eligible emissions units through 2026, while drawing upon input from TAB on unit supply;
- i. assessment of CORSIA’s market and cost impact on States and aeroplane operators and on international aviation, including analysis of possible market distortions; and
- iv. CAEP’s initial assessment on the implementation of CORSIA by States, particularly the functioning of MRV provisions and the effectiveness of monitoring methods, based on lessons learned from implementation since 1 January 2019, and CAEP’s initial suggestions for improvements to the scheme;

Status



Addressed

Presented at C223. Final analysis expected for C225.



Addressed

Presented at C223. Final analysis expected for C225.



Addressed

Initial analyses at C224 and planned final analyses for C225.



Addressed

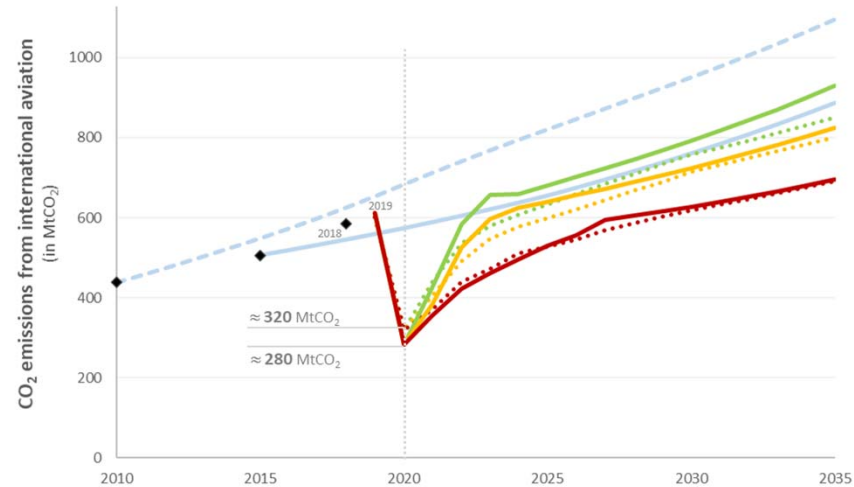
Initial work at C224 and planned recommendations for C225.

* Reference: C-DEC 222/12. Questions reordered for presentation flow purposes.

Update on question addressed at C223 with additional updates at C225.

New questions for C224

- CAEP is expecting its next update of the forecast CO₂ emissions from international aviation in early Oct. 2021.
- The analyses supporting the assessment of COVID-19 on CORSIA will be updated for the 225th session of the Council.
- This future update will also include any relevant CO₂ emissions scenarios associated with the Long-Term Aspirational Goal (LTAG) analyses (not expected to be available until Oct. 2021).





Question from Council (CDEC222-12):

i. assessment of CORSIA's market and cost impact on States and aeroplane operators and on international aviation, including analysis of possible market distortions;

Impacts on States:

Impacts on States are limited to the implementation of the **Monitoring, Reporting and Verification (MRV) costs** to be estimated quantitatively for the 225th session of Council (pending availability of data from State letter).

Impacts on aeroplane operators:

Impacts on aeroplane operators assessed through offsetting requirements in context of CO₂ emissions (Chapter 2 and 3). **Cost impacts assessed for pilot and phase one (2021-2026)** to be extended to 2027-2035 for 225th session of Council.

Impacts on international aviation:

Assessed for all operators and States combined i.e., total of offsetting requirements and MRV costs.



Question from Council (CDEC222-12):

i. assessment of CORSIA's market and cost impact on States and aeroplane operators and on international aviation, including analysis of possible market distortions;

Background:

Numerous conditions affect the international aviation market (i.e., departing from the ideal of perfect competition) e.g., differences in price of jet fuel, labor, taxes.

Scope of CORSIA Analyses:

For the purpose of CORSIA analyses, market distortion was evaluated by focusing on differences in offsetting requirements across aeroplane operators.



Assessment of CORSIA's impact on international aviation



- **Cumulative costs from emissions units from 2021 to 2026 under a mid-price scenario could range from \$0.8 to 2.3 billion to \$0 to 0.8 billion under an average 2019-2020 baseline and 2019 baseline respectively. Additional details available in C-WP/15209.**
- **Total cost could be reduced by \$0.05-0.4 billion if emissions reductions from CORSIA Eligible Fuels (CEFs) are claimed, although this does not include the costs associated with acquiring the CEFs.**
- **For context, cumulative revenues from international aviation could be on the order of \$2,200-2,800 billion from 2021-2026.**
- **Relative impact of CORSIA (i.e., costs from offsetting requirements divided by estimated revenue from international aviation): 0% to 0.1%.**
- **Global airline industry operating margin ranged from 5.7% to 8.6% from 2015-2019 (pre-Covid19) and are estimated at -28.2% and -9.4% in 2020 and 2021 respectively.**
- **Other factors/sources of variability in operators' operating costs:**
 - **Regional variation in jet fuel prices i.e., -3% to +3% (on 07/23/2021).**



Assessment of CORSIA's impact on aeroplane operators

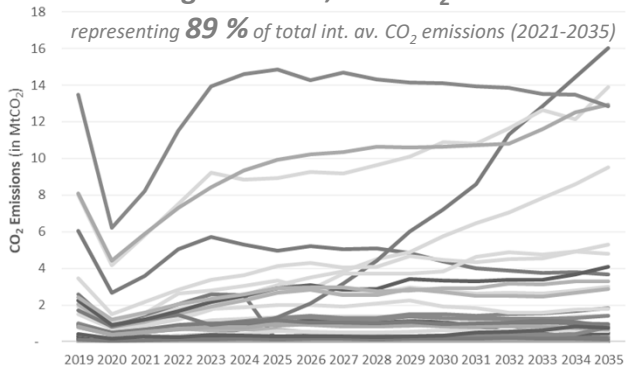
including analysis of possible market distortions



Background: Operators CO₂ Emissions Patterns

Charts depict CO₂ emissions patterns for a sample of 50 aeroplane operators modelled (for illustration). Total CO₂ emissions percentage for all operators in the category.

Aeroplane Operator with emissions remaining above 10,000 tCO₂



CAEP developed and calibrated models that capture the potential dynamics of operators' growth and/or decline in CO₂ emissions over time.

Models support scenario-based assessments of CORSIA's impact (i.e., operator level CO₂ emissions patterns are not forecasts and not meant to be attributed to a specific operator).

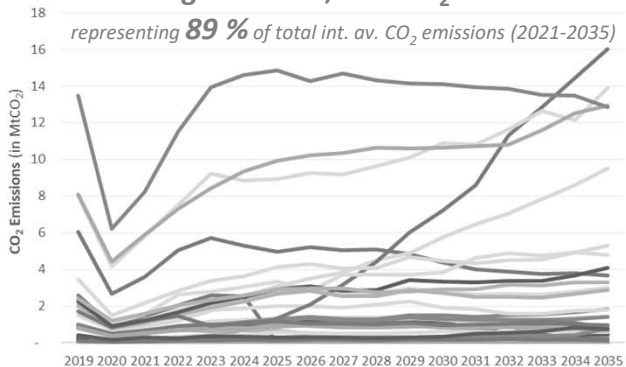


Background: Operators CO₂ Emissions Patterns

Charts depict CO₂ emissions patterns for a sample of 50 aeroplane operators modelled (for illustration). Total CO₂ emissions percentage for all operators in the category.

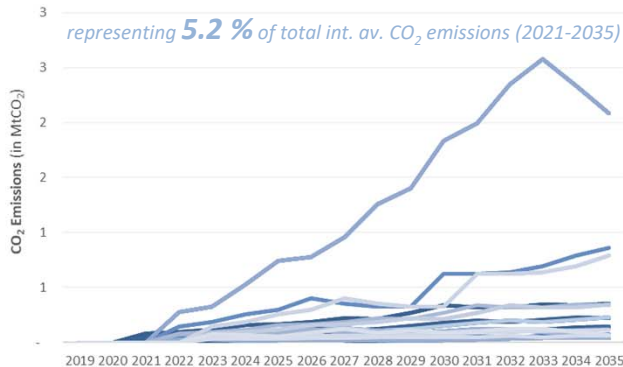
Aeroplane Operator with emissions remaining above 10,000 tCO₂

representing **89 %** of total int. av. CO₂ emissions (2021-2035)



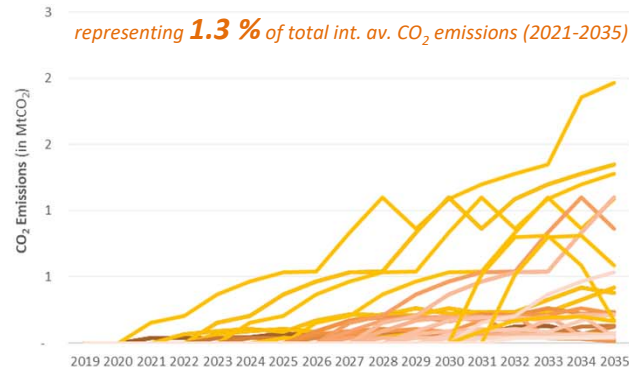
New Entrants

representing **5.2 %** of total int. av. CO₂ emissions (2021-2035)



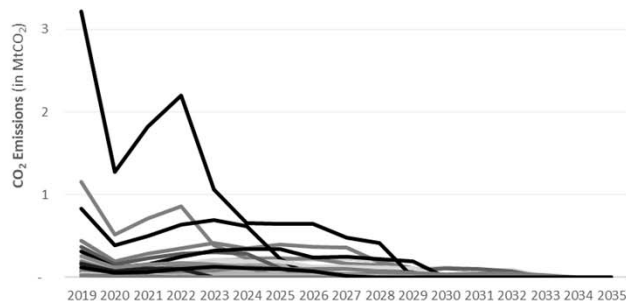
New Operator (Subsidiary)

representing **1.3 %** of total int. av. CO₂ emissions (2021-2035)



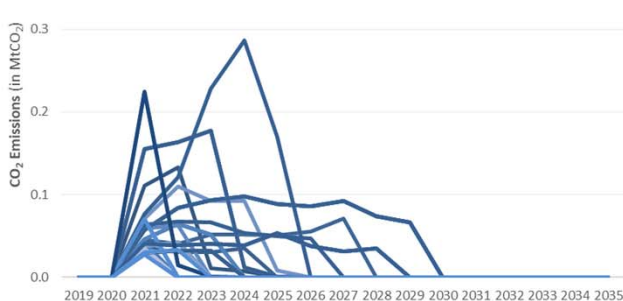
Aeroplane Operator with emissions that drop below 10,000 tCO₂

representing **2.5 %** of total int. av. CO₂ emissions (2021-2035)



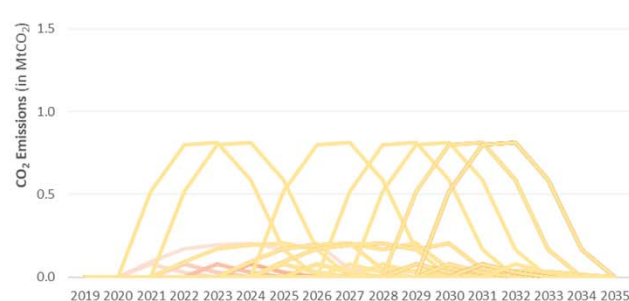
New Entrants with emissions that drop below 10,000 tCO₂

representing **1.4 %** of total int. av. CO₂ emissions (2021-2035)



New Operator (Subsidiary) with emissions that drop below 10,000 tCO₂

representing **0.4 %** of total int. av. CO₂ emissions (2021-2035)



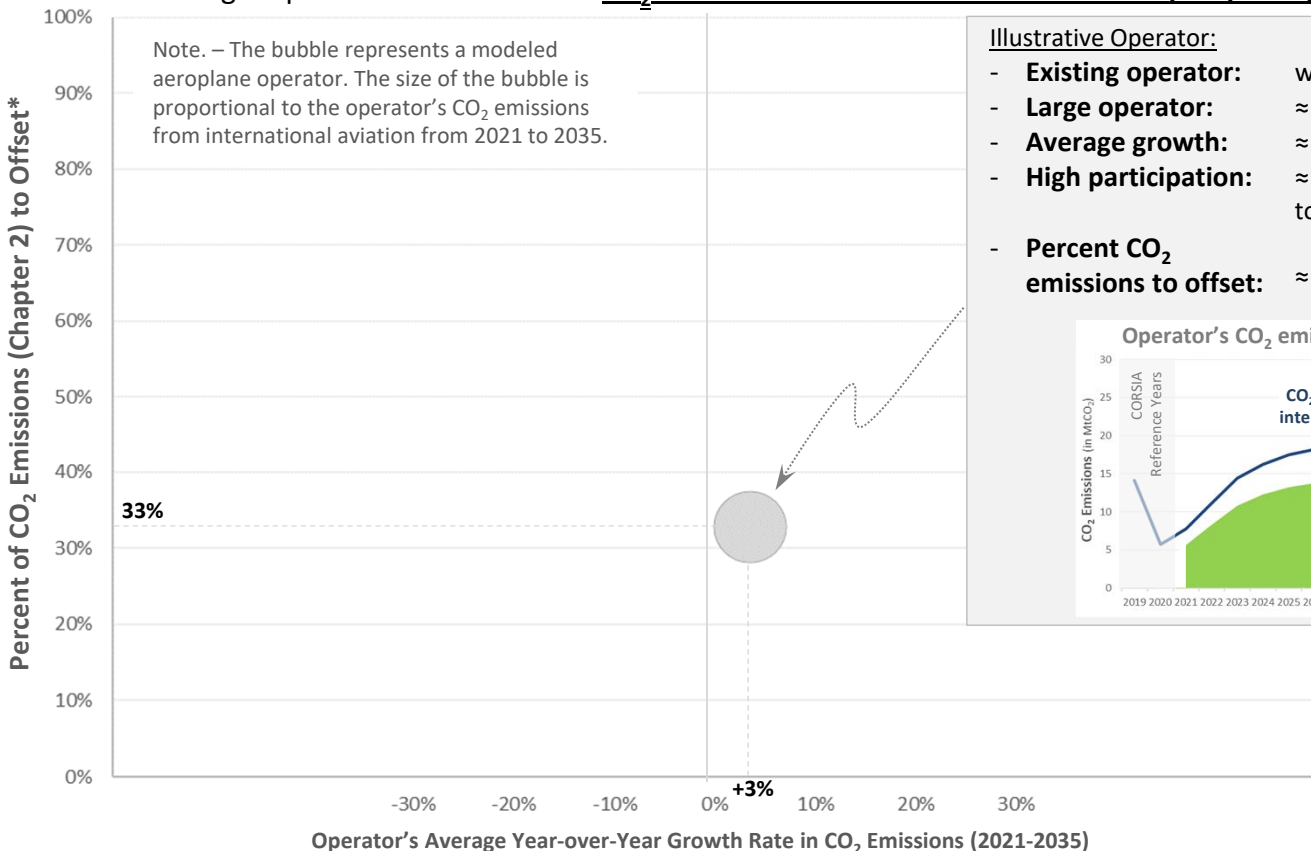


- **Given aeroplane operators' characteristics** (e.g., type of operator, CO₂ emissions profile, operations across State pairs subject to offsetting requirements), **CAEP calculated offsetting requirements for each operator.**
- **The individual operator's offsetting requirements are put in context of the operator's size (in terms of CO₂ emissions) by tracking percent of CO₂ emissions to offset** calculated as offsetting requirements divided by total CO₂ emissions from international aviation (aka Chapter 2).
- **For the purpose of CORSIA Analyses, the spread in percent of CO₂ emissions to offset across operators is used as a proxy for estimating potential market distortion.**
- **The rate of growth of an operator's CO₂ emissions is also a key factor influencing offsetting requirements post 2030 when the individual approach is introduced. CAEP tracks Operator's Average Year-over-year Growth Rate in CO₂ Emissions to assess its impacts.**



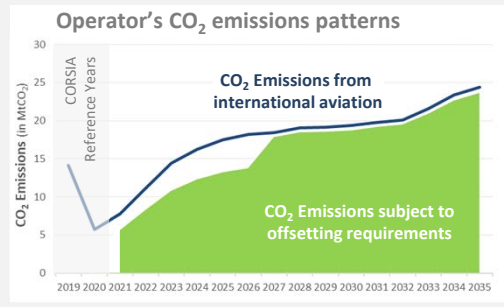
Assessment of CORSIA's impact on Aeroplane Operators

Offsetting Requirements in context of CO₂ Emissions from International Aviation (Chapter 2)*



Illustrative Operator:

- **Existing operator:** within scope in 2019-2020
- **Large operator:** ≈ 18 MtCO₂ per year
- **Average growth:** ≈ +3% per annum
- **High participation:** ≈ 90% of CO₂ emissions subject to offsetting requirements
- **Percent CO₂ emissions to offset:** ≈ 33%



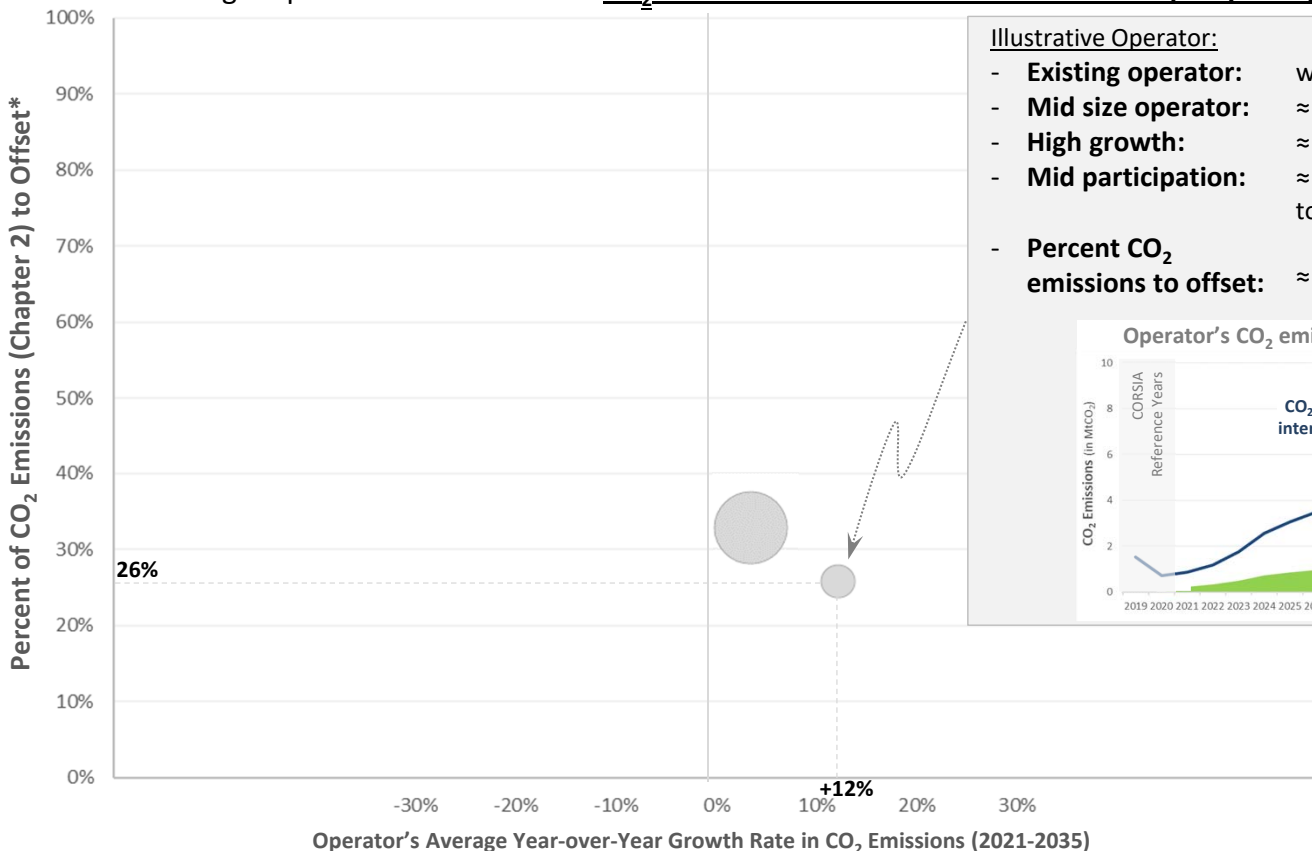
* Metric calculated as offsetting requirements (2021-2035) divided by total CO₂ emissions from international aviation aka Chapter 2 (2021-2035).





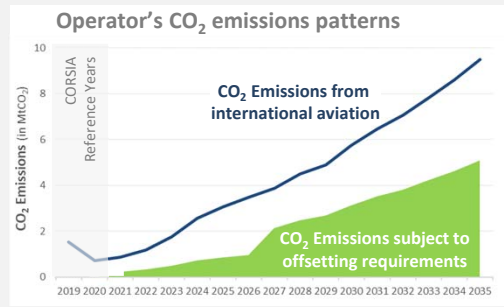
Assessment of CORSIA's impact on Aeroplane Operators

Offsetting Requirements in context of CO₂ Emissions from International Aviation (Chapter 2)*



Illustrative Operator:

- **Existing operator:** within scope in 2019-2020
- **Mid size operator:** ≈ 5 MtCO₂ per year
- **High growth:** ≈ +12% per annum
- **Mid participation:** ≈ 50% of CO₂ emissions subject to offsetting requirements
- **Percent CO₂ emissions to offset:** ≈ 26%



Operator's Average Year-over-Year Growth Rate in CO₂ Emissions (2021-2035)

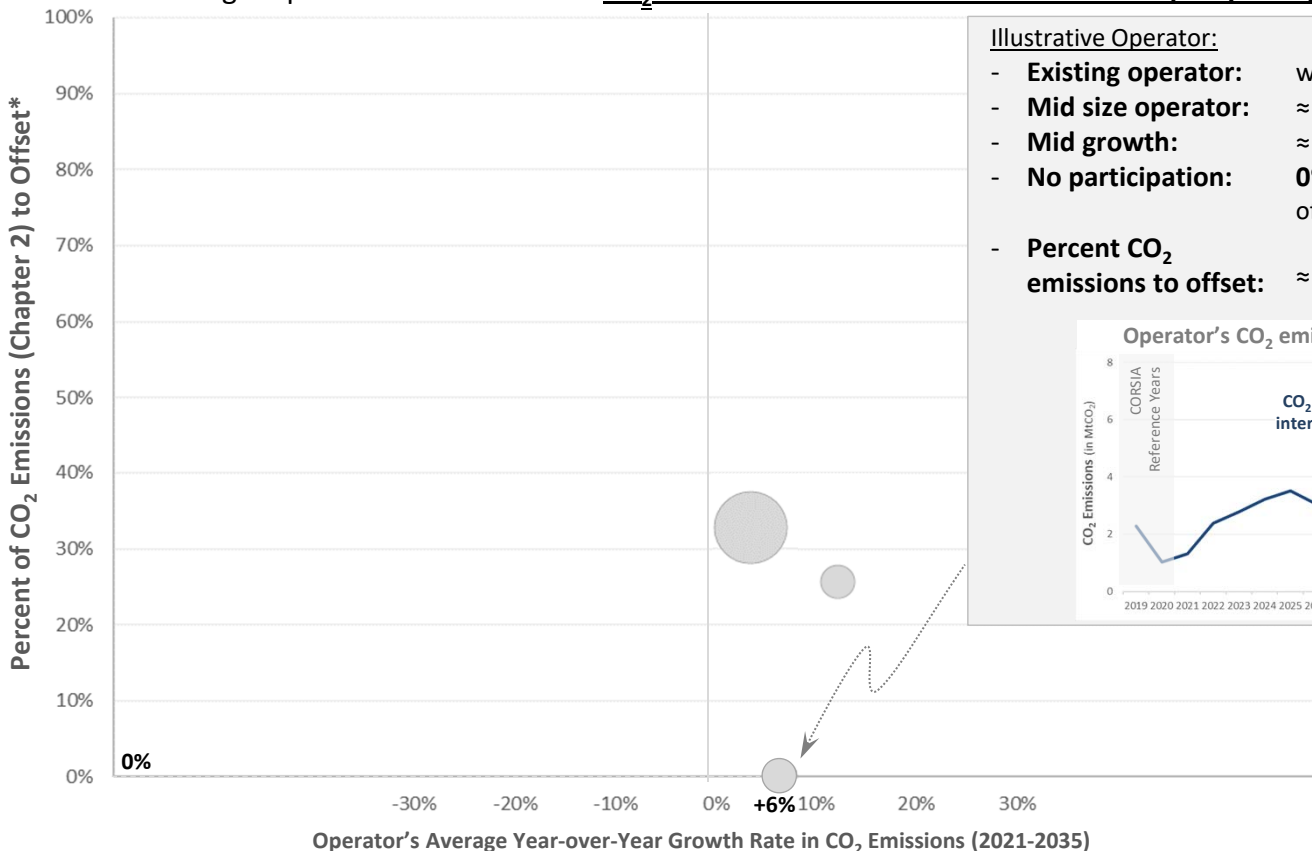
* Metric calculated as offsetting requirements (2021-2035) divided by total CO₂ emissions from international aviation aka Chapter 2 (2021-2035).





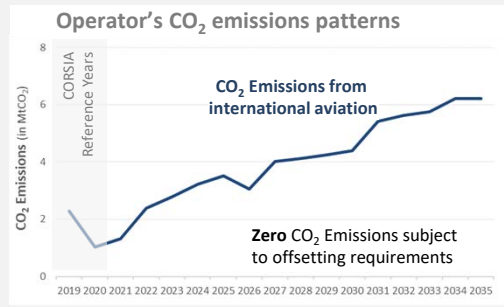
Assessment of CORSIA's impact on Aeroplane Operators

Offsetting Requirements in context of CO₂ Emissions from International Aviation (Chapter 2)*



Illustrative Operator:

- **Existing operator:** within scope in 2019-2020
- **Mid size operator:** ≈ 5 MtCO₂ per year
- **Mid growth:** ≈ +6% per annum
- **No participation:** 0% of CO₂ emissions subject to offsetting requirements
- **Percent CO₂ emissions to offset:** ≈ 26%



Operator's Average Year-over-Year Growth Rate in CO₂ Emissions (2021-2035)

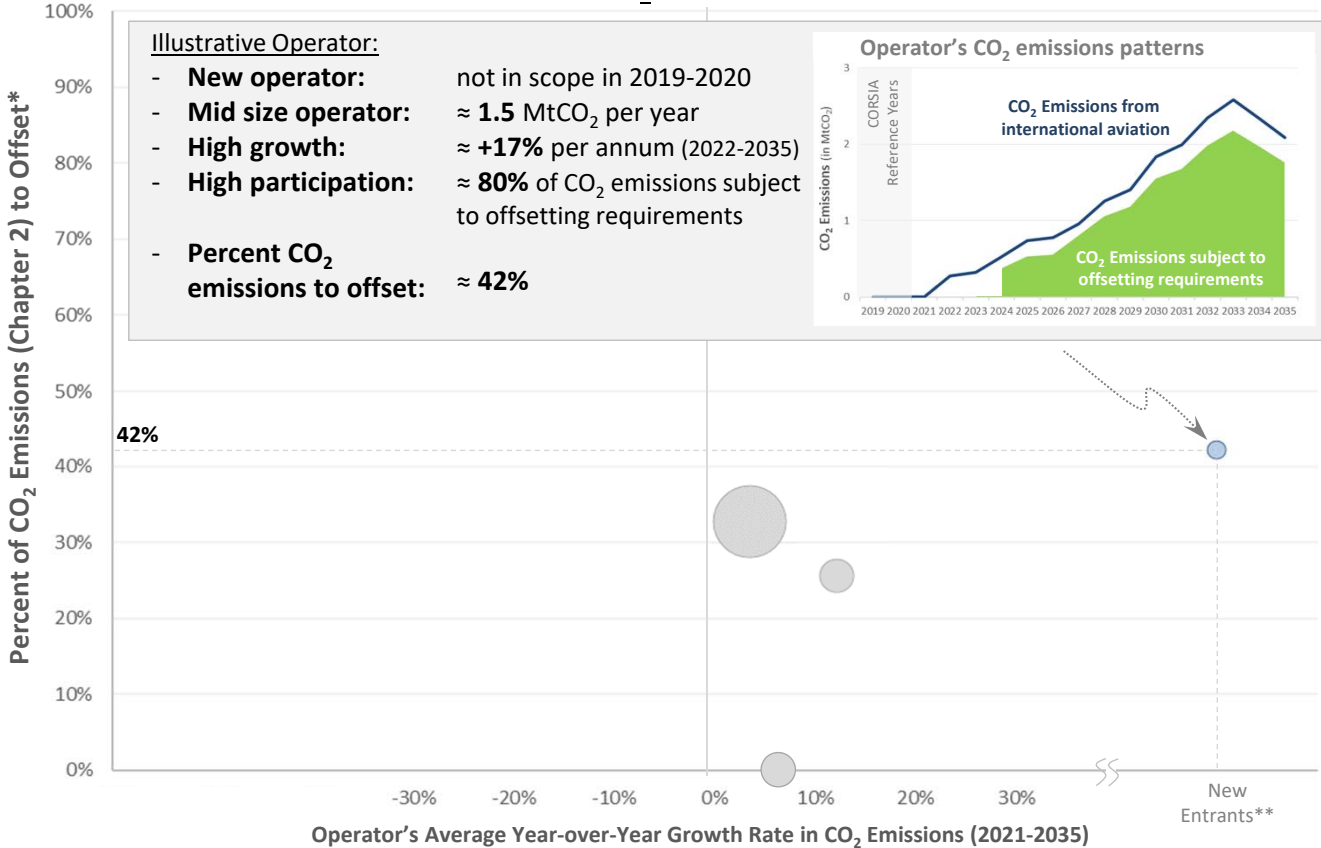


* Metric calculated as offsetting requirements (2021-2035) divided by total CO₂ emissions from international aviation aka Chapter 2 (2021-2035).



Assessment of CORSIA's impact on Aeroplane Operators

Offsetting Requirements in context of CO₂ Emissions from International Aviation (Chapter 2)*



** Disclaimer: Impacts on New Entrants and New Operators (Subsidiaries) are provided for illustration.

CAEP is considering a range of 6 baseline options for these types of operators (e.g., Option A "no baseline", Option F "operator's share of CO2 emissions in year y applied to the sector's baseline in year y"). The spread of percent CO₂ emissions to offset vary across options.

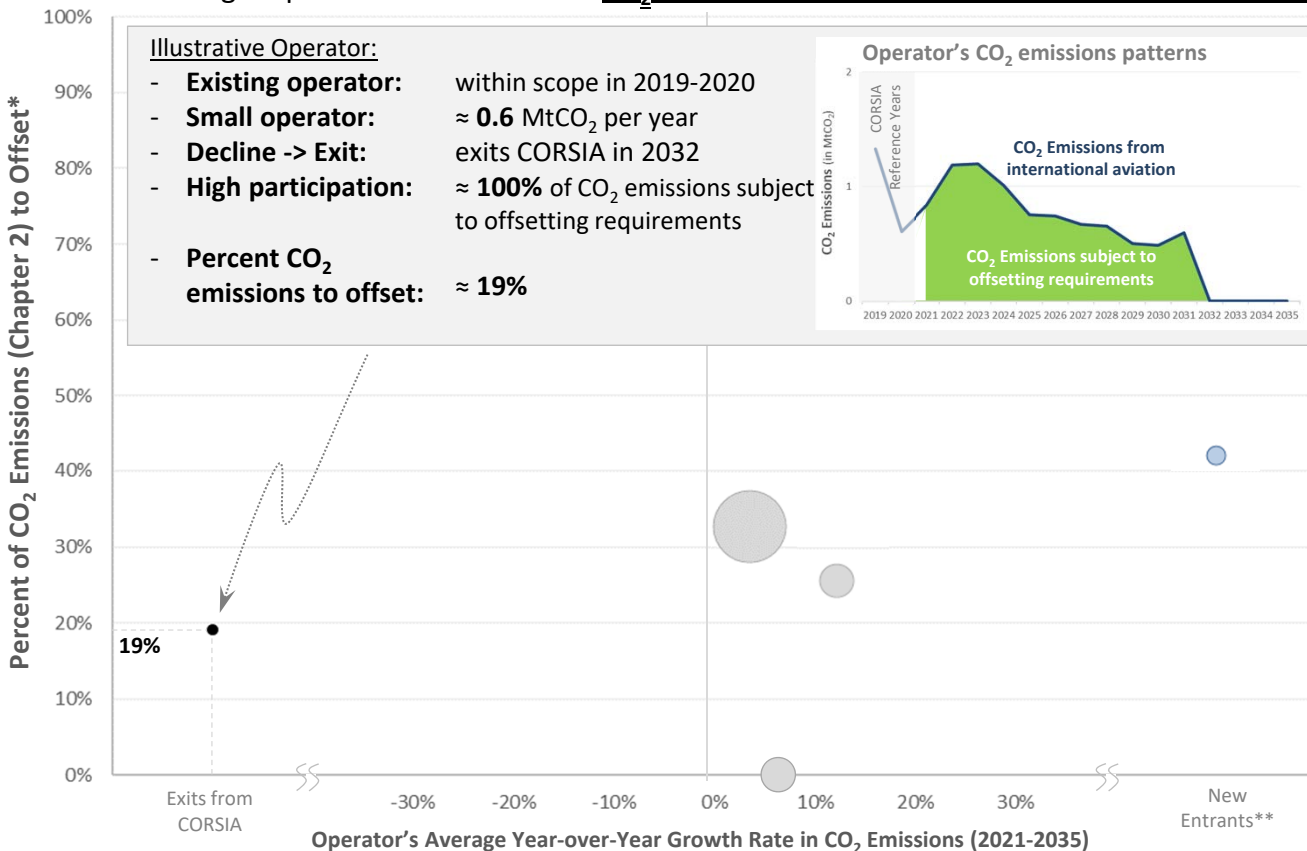
Assumption on this chart based on Option D (i.e., average of emissions in years 1 and 2) for illustration purposes only.

Pending additional/ongoing work by CAEP and expected recommendation at CAEP/12.

* Metric calculated as offsetting requirements (2021-2035) divided by total CO₂ emissions from international aviation aka Chapter 2 (2021-2035).



Offsetting Requirements in context of CO₂ Emissions from International Aviation (Chapter 2)*



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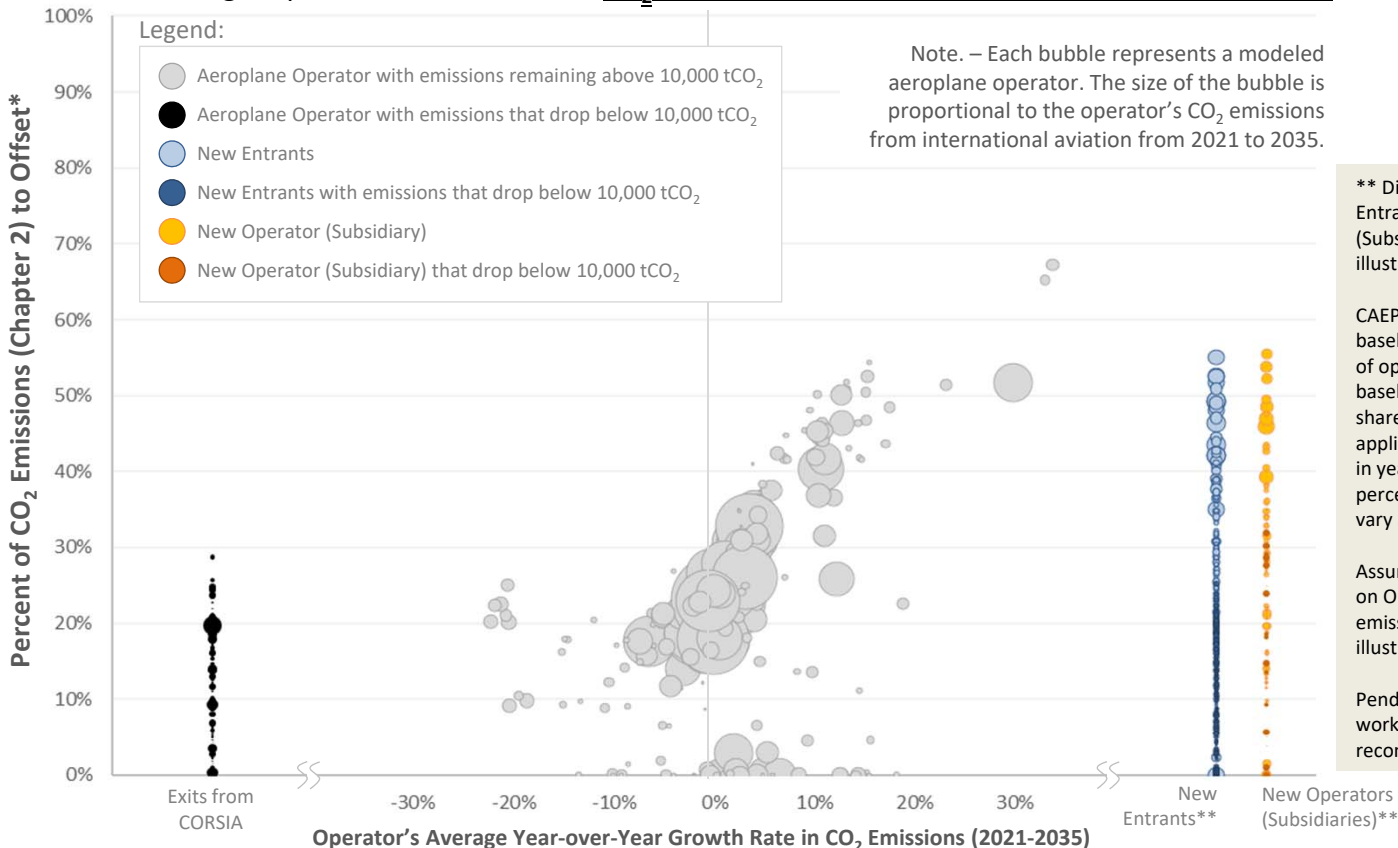
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Offsetting Requirements in context of CO₂ Emissions from International Aviation (Chapter 2)*



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Pending additional/ongoing work by CAEP and expected recommendation at CAEP/12.

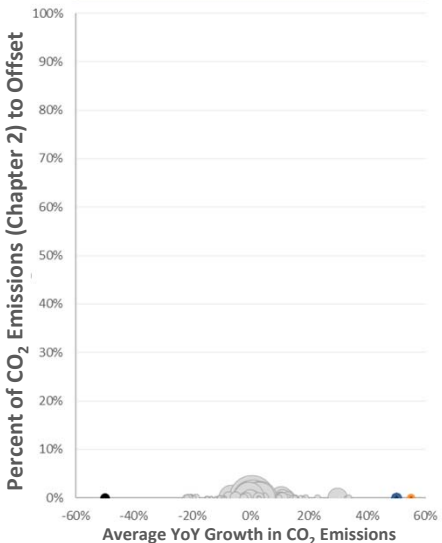
* Metric calculated as offsetting requirements (2021-2035) divided by total CO₂ emissions from international aviation aka Chapter 2 (2021-2035).



- **The charts contained in the previous slides depicted CORSIA's potential overall impact on Aeroplane Operators from 2021 to 2035.**
- **The timing and effects of the factors that influence offsetting requirements (e.g., phased implementation of CORSIA, Sector Growth Factor, transition to individual approach from 2030) vary over time.**
- **The next set of charts illustrate how offsetting requirements (and differences across operators) evolve over time from the Pilot Phase (2021-2023) to the last compliance cycle of the Second Phase (2033-2035).**



Pilot Phase (2021-2023)



Share of **CO₂ Emissions**
across all CORSIA Phases:

15 %

Share of **Offsetting**
Requirements (all phases):

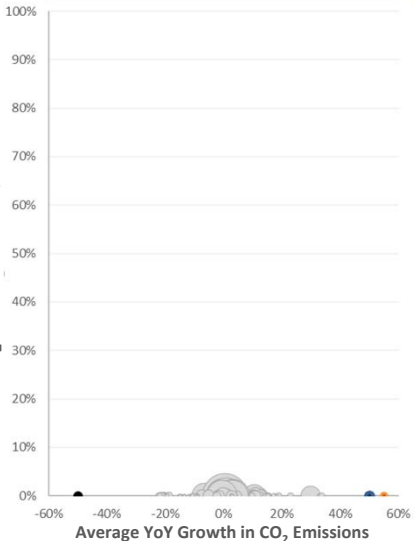
0 %

Assumptions: Traffic and Emissions Profile (Mid Covid19 Scenario), CORSIA Baseline Ref. Year (2019 for 2021-2023 and average 2019-2020 for 2024-2035), Sectoral/Individual (80% / 20% in 2030-2032, 30% / 70% in 2033-2035), States for Chapter 3 State Pairs (Edition 2 - July 2021), New Entrant baseline option D.

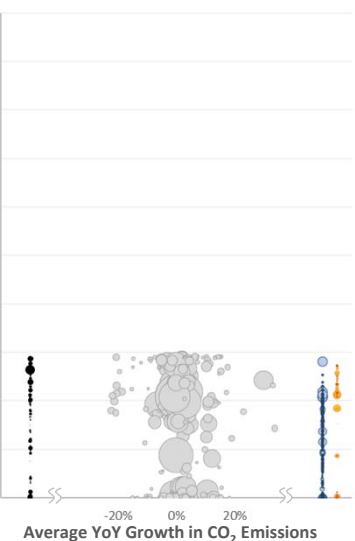


Percent of CO₂ Emissions (Chapter 2) to Offset

Pilot Phase (2021-2023)



1st Phase (2024-2026)



Share of CO₂ Emissions
across all CORSIA Phases:
Share of **Offsetting**
Requirements (all phases):

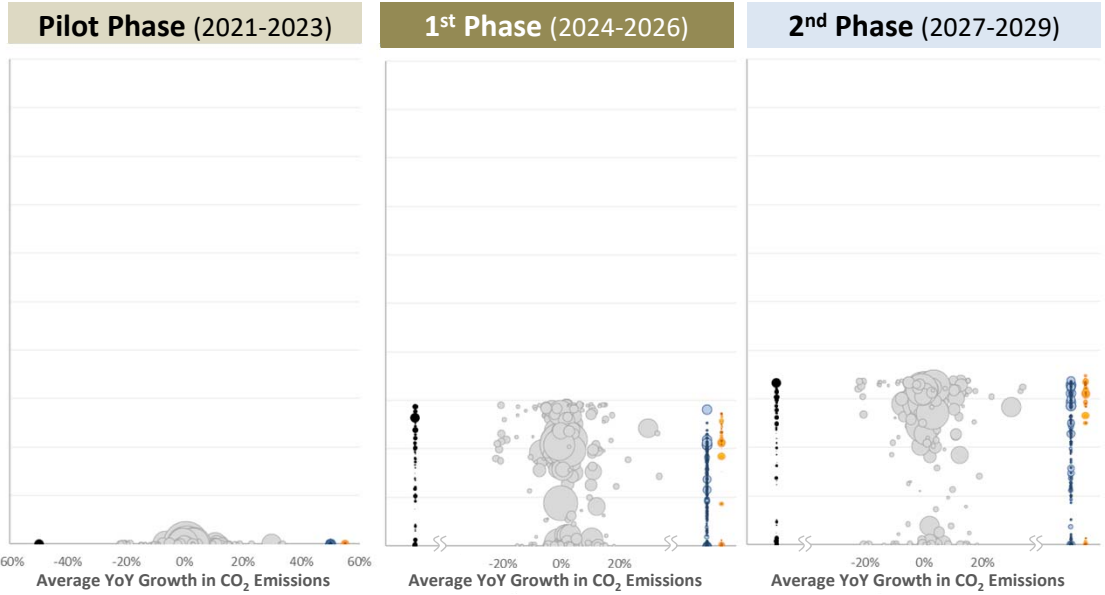
15 %
0 %

19 %
12 %

Assumptions: Traffic and Emissions Profile (Mid Covid19 Scenario), CORSIA Baseline Ref. Year (2019 for 2021-2023 and average 2019-2020 for 2024-2035), Sectoral/Individual (80% / 20% in 2030-2032, 30% / 70% in 2033-2035), States for Chapter 3 State Pairs (Edition 2 - July 2021), New Entrant baseline option D.



Percent of CO₂ Emissions (Chapter 2) to Offset



Share of CO ₂ Emissions across all CORSIA Phases:	15 %
Share of Offsetting Requirements (all phases):	0 %

	19 %
	12 %

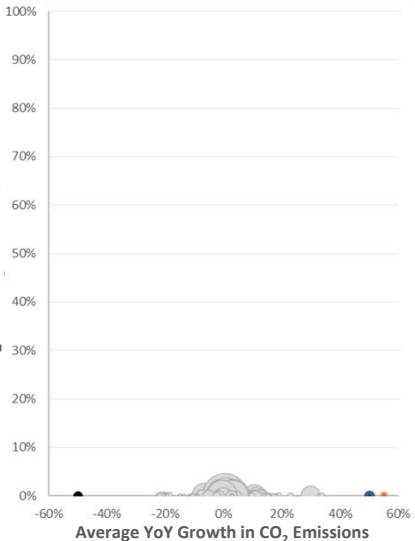
	20 %
	23 %

Assumptions: Traffic and Emissions Profile (Mid Covid19 Scenario), CORSIA Baseline Ref. Year (2019 for 2021-2023 and average 2019-2020 for 2024-2035), Sectoral/Individual (80% / 20% in 2030-2032, 30% / 70% in 2033-2035), States for Chapter 3 State Pairs (Edition 2 - July 2021), New Entrant baseline option D.

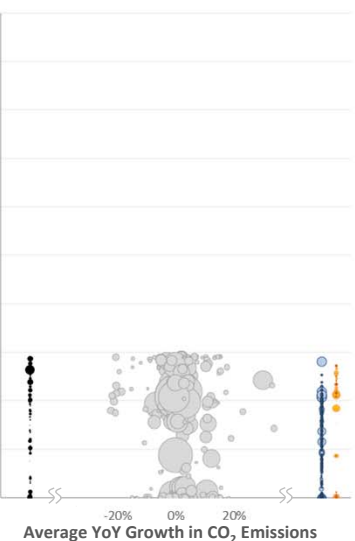


Percent of CO₂ Emissions (Chapter 2) to Offset

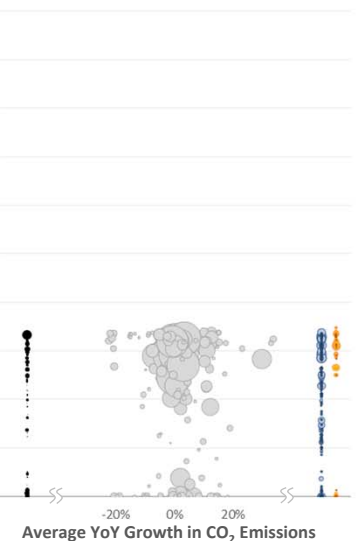
Pilot Phase (2021-2023)



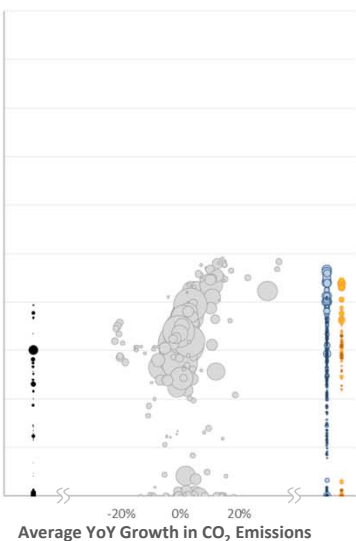
1st Phase (2024-2026)



2nd Phase (2027-2029)



2nd Phase (2030-2032)



Share of CO₂ Emissions
across all CORSIA Phases:

Share of **Offsetting**
Requirements (all phases):

15 %

0 %

19 %

12 %

20 %

23 %

22 %

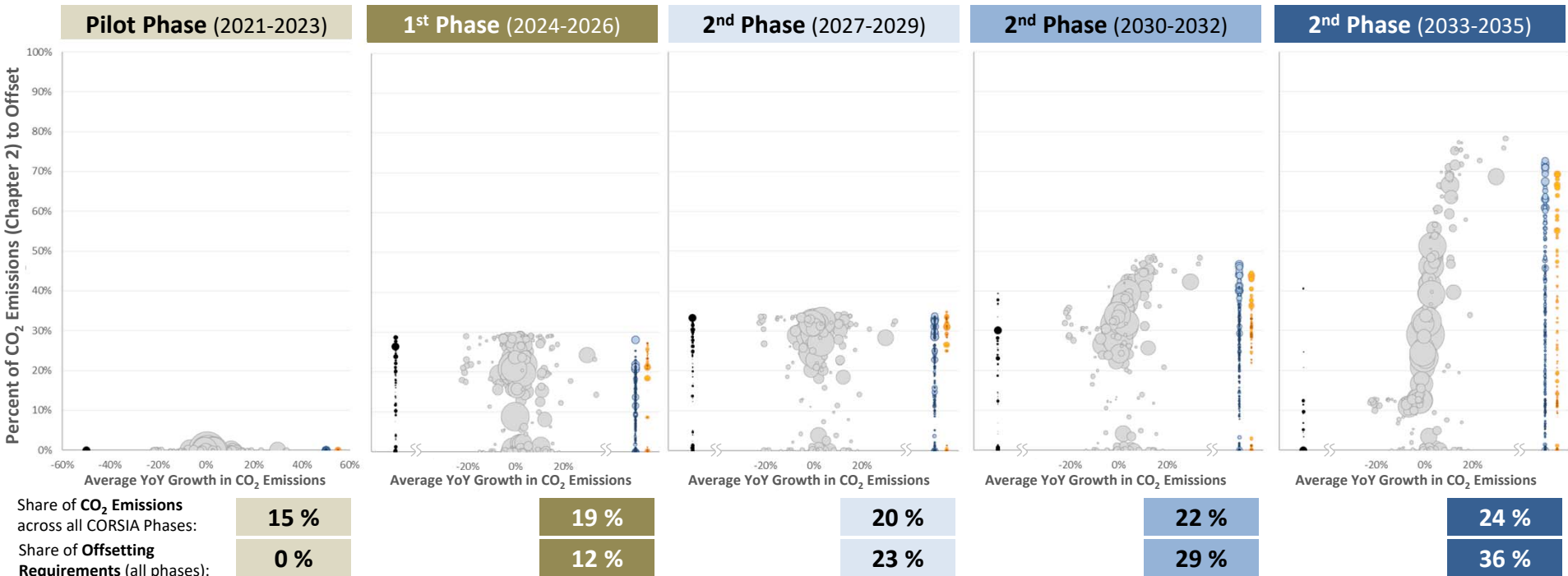
29 %

Assumptions: Traffic and Emissions Profile (Mid Covid19 Scenario), CORSIA Baseline Ref. Year (2019 for 2021-2023 and average 2019-2020 for 2024-2035), Sectoral/Individual (80% / 20% in 2030-2032, 30% / 70% in 2033-2035), States for Chapter 3 State Pairs (Edition 2 - July 2021), New Entrant baseline option D.



Assessment of CORSIA's impact on Aeroplane Operators

- Offsetting requirements (and differences across operators) evolve over time and are driven by (1) phased implementation of CORSIA (i.e., States' participation), (2) Sector Growth Factor (e.g., CORSIA baseline) and (3) transition to individual approach from 2030.



Assumptions: Traffic and Emissions Profile (Mid Covid19 Scenario), CORSIA Baseline Ref. Year (2019 for 2021-2023 and average 2019-2020 for 2024-2035), Sectoral/Individual (80% / 20% in 2030-2032, 30% / 70% in 2033-2035), States for Chapter 3 State Pairs (Edition 2 - July 2021), New Entrant baseline option D.



Assessment of CORSIA's impact on States

(forthcoming for the 225th session of Council,
pending availability of data from State letter).



- **CAEP is working with the objective of delivering proposed amendments to Annex 16, Volume IV and related Environmental Technical Manual (ETM), Volume IV for approval and recommendation to the CAEP/12 meeting.**
- **During the CAEP/12 cycle, CAEP has consolidated additional technical recommendations from experts to improve the MRV requirements of CORSIA.**
- **A summary of the improvements to the Annex 16, Volume IV, and ETM, Volume IV are presented on the following slides.**
- **Following the compilation of the CAEP work at CAEP/12 meeting, a summary of the proposed amendments will be brought to the Council's attention.**



Amendments to Annex 16, Volume IV

Related section in Annex 16, Volume IV	Rationale
Part I, Chapter 1, Definitions	To align verification-related definitions with the latest ISO Standards.
Part II, Chapter 2, 2.1.5	To clarify a situation where an aeroplane operator that was within the scope of applicability of Chapter 2 in the previous year falls outside of scope in the given year.
Part II, Chapter 2, 2.2.1.3.5 and 2.2.1.3.6	To allow new aeroplane operators, that do not qualify as New Entrants, a choice between the ICAO CORSIA CERT and a Fuel Use Monitoring Method in year y and, subject to State's approval, in year y+1.
Part II, Chapter 2, 2.2.2.3; 2.2.2.7 and 2.2.2.8	To clarify the Emissions Monitoring Plan provisions for new operators that do not qualify as New Entrants.
Part II, Chapter 2, 2.4.1.2; 2.4.1.3; 2.4.2.1 and 2.4.2.2	To clarify the actions for the aeroplane operator in checking the verification body's CORSIA accreditation, to add relevant reference resources and to update references to the latest ISO standards.
Part II, Chapter 4, 4.4.1.2 and 4.4.2.1	
Part II, Chapter 4, 4.2.3	To capture the Council agreement on the recommendation to States on the publication of information on programme eligibility changes (C-WP/15158 refers).
Appendix 2, 2.2.2 and 2.3.2	To clarify the application of Method A and Method B for short term leasing.
Appendix 2, 2.6.1 and 2.6.2	
Appendix 6, 3.8.2 and 3.10.1	To address the potential misunderstandings related to the computation of average fuel burn ratios, and to move the verification-related provision currently contained in Appendix 2, 2.6.2.1 and 2.6.2.2 to Appendix 6.
Appendix 5 Tables A5-1; A5-2; A5-3; A5-6; A5-7 and A5-8	To clarify and ensure consistency of the terminology between Appendix 4, Appendix 5, and the ETM, Volume IV, and to clarify certain reporting requirements, as well as to address additional reporting requirements identified by AFTF (now FTG) on reporting of (1) production location of the neat CORSIA eligible fuel and (2) default or actual life cycle emissions value (LSf) for a given CORSIA eligible fuel. To include additional information in the list of verification bodies accredited in the State to avoid unnecessary individual research that could lead to errors.
Appendix 6 3.10.1 3.10.3 (new paragraph)	To include criteria against which the Emissions Unit Cancellation Report was verified. Additional paragraph has been added for Emissions Report, mirroring the existing paragraph for Emissions Units Cancellation Report in 3.10.2.



Amendments to ETM, Volume IV

- **The proposed amendments to the ETM, Volume IV to be approved at CAEP/12 include additional guidance material aimed to support the implementation of the proposed amendments to the Annex 16, Volume IV and clarifications to the existing guidance material.**
- **This includes, i.e.,:**
 - minor editorial improvements;
 - additional guidance on identifying flights that fall within the scope of Annex 16, Volume IV, Chapters 1 and 2, on qualifying as a New Entrant aeroplane operator, on applying Fuel Use Monitoring Methods, on data gap filling and error corrections to verified Emissions Reports, and on CORSIA verification, including guidance on remote verification; and
 - new reporting template and related guidance for an Emissions Unit Cancellation Report from an aeroplane operator to State.



- **CAEP plans on providing a further Analyses in Support of the 2022 CORSIA Periodic Review at the 225th session of the Council, including;**
 - updates to CO₂ emissions forecasts and assessment of the impact of COVID-19 on CORSIA base on CAEP/12 Trends and relevant (and applicable) information from LTAG scenarios,
 - updates on the supply and price of Emissions Units towards the analysis of the cost implications of CORSIA offsetting requirements, and
 - include costs associated with the implementation of the Monitoring, Reporting and Verification (MRV) costs (pending availability of data from State letter).



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North Atlantic
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Paris

Middle East
(MID) Office
Cairo

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Southern African
(ESAF) Office
Nairobi

Asia and Pacific
(APAC) Sub-office
Beijing

Asia and Pacific
(APAC) Office
Bangkok



THANK YOU



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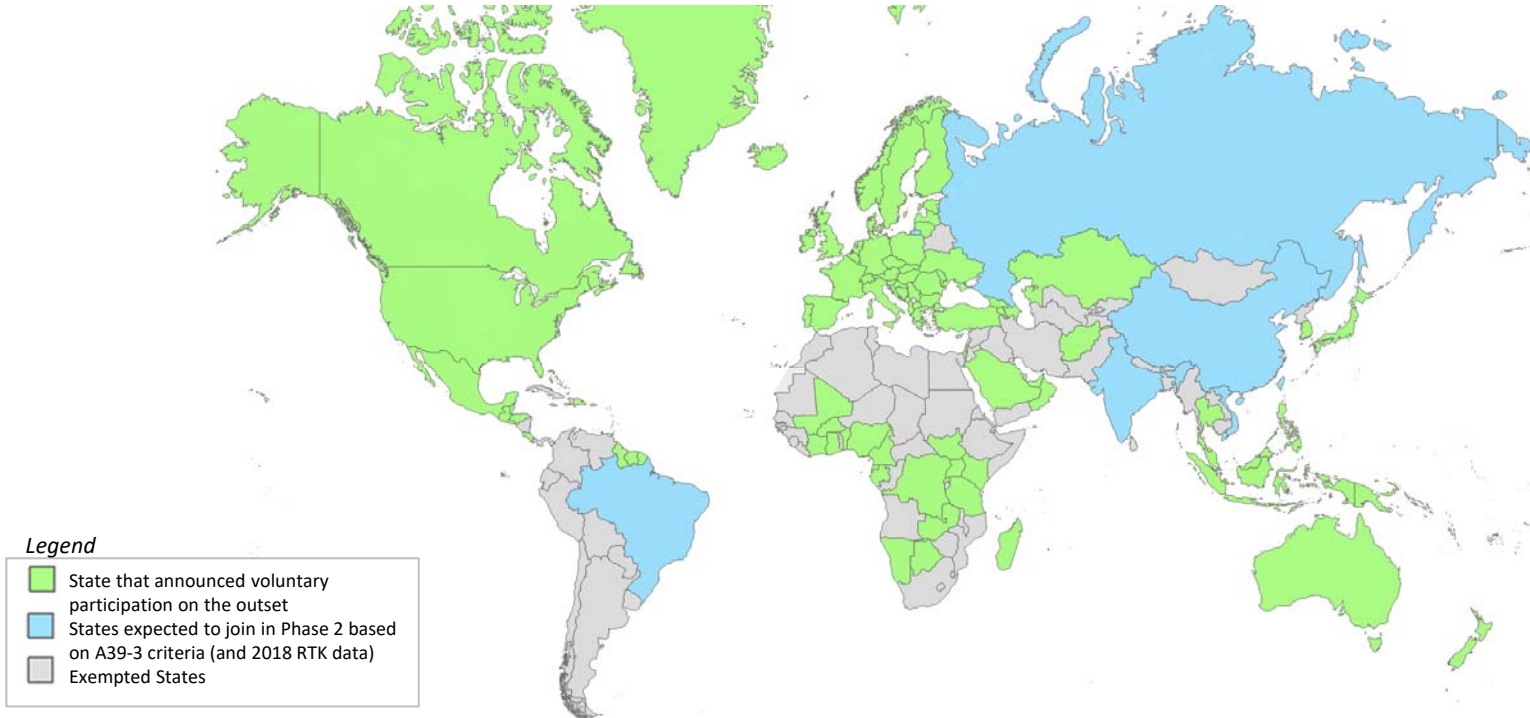
ENVIRONMENT

Appendix: Supporting Information



Assumptions on Phase In of States for Route Based Phased Implementation of CORSIA

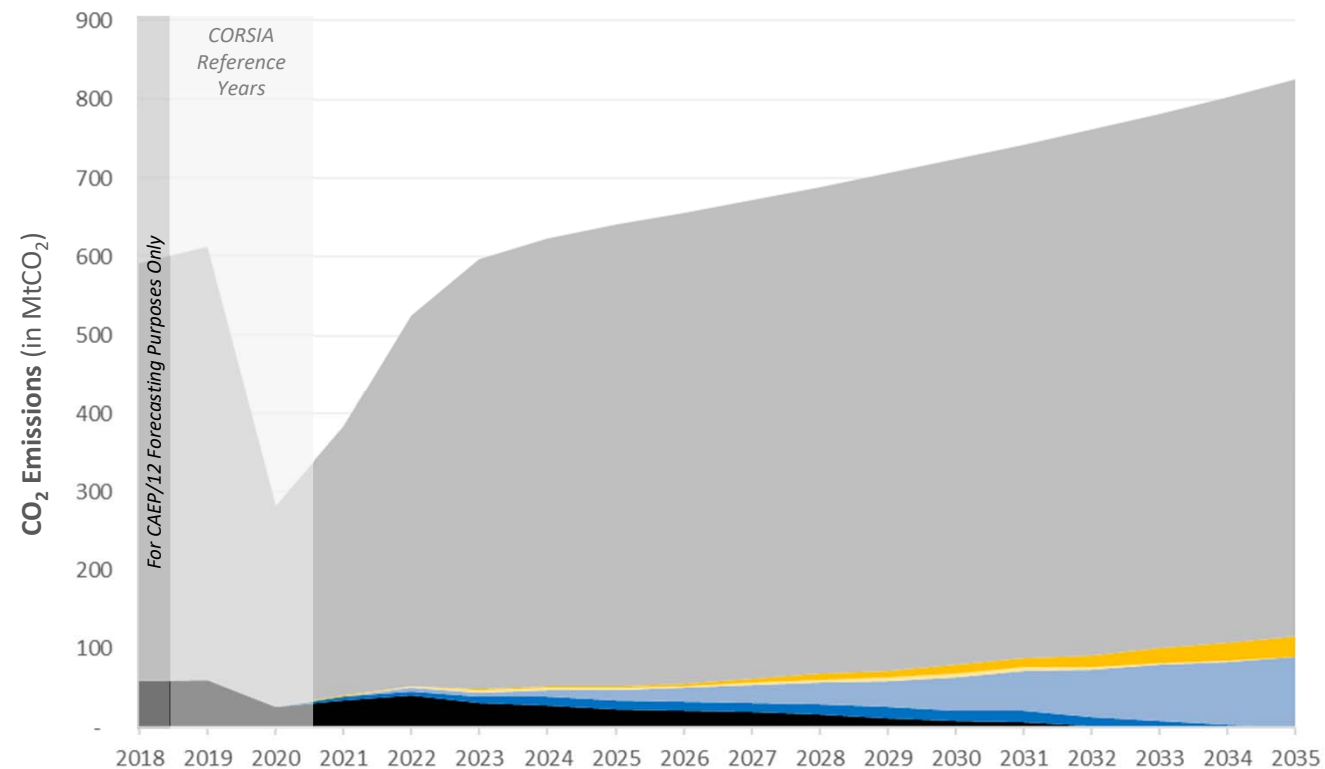
- As of July 1, 2021, 106 States have expressed intention to voluntarily participate starting Jan. 1, 2022.
- Five States are expected to join CORSIA in 2027 based on 2018 traffic RTK data.



Reference: ICAO, Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), available at: <https://www.icao.int/environmental-protection/CORSIA/Pages/state-pairs.aspx>, last retrieved: 09 August 2021 and RTK data available at: https://www.icao.int/sustainability/Documents/RTK%20ranking/International%20RTK%20rankings_2018_SIDS_LDC_LLDC.pdf, last retrieved: April 2020.



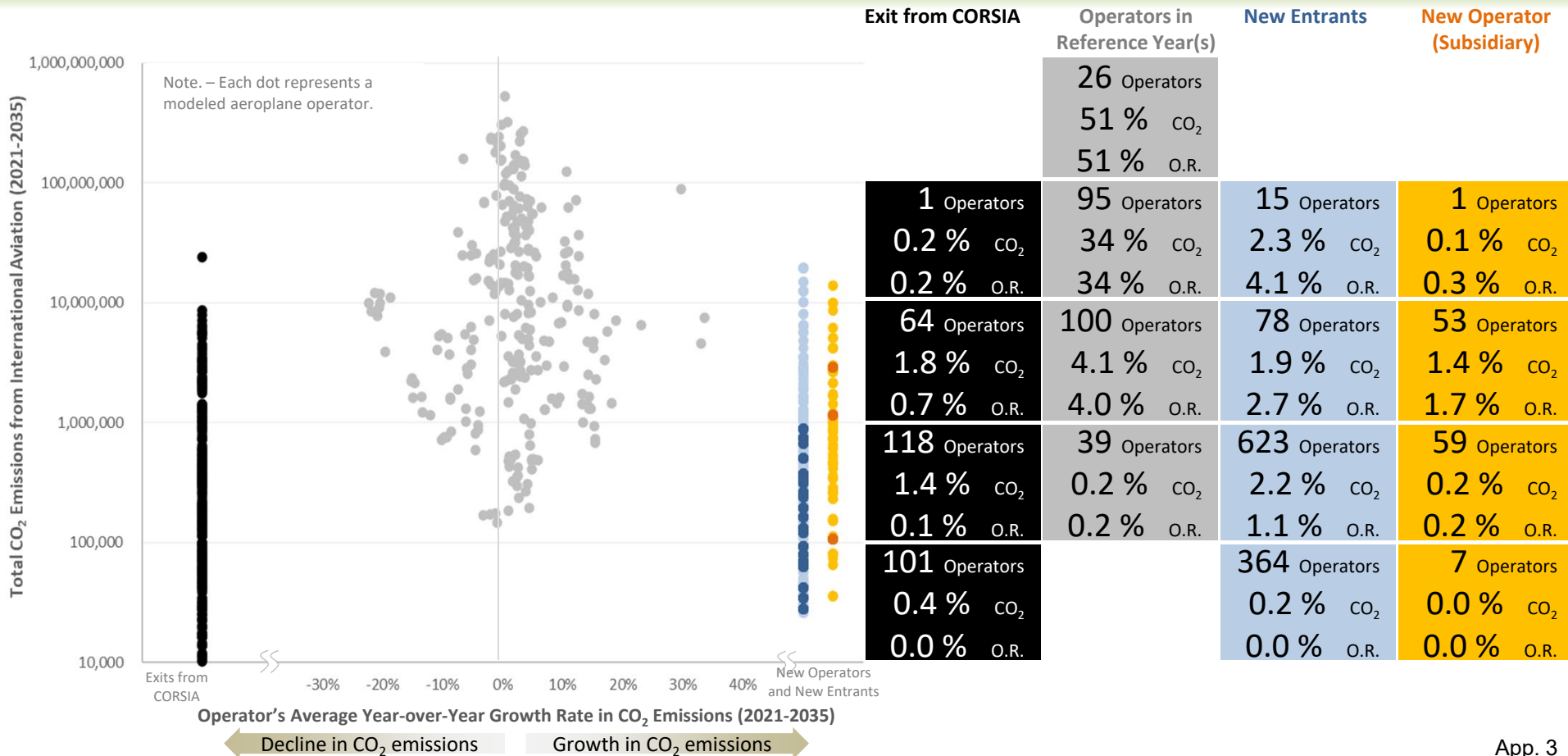
WG4 developed models that capture the potential dynamics of operators' growth and/or decline in CO₂ emissions



Aeroplane Operator Category	2019	2035
AOs in Scope in Reference Year(s)	90.1%	86.0%
New AO (Subsidiary)	-	3.0%
New AO (Subsidiary) Exit CORSIA	-	-
New Entrants (in scope in 2035)	-	11.0%
New Entrant AO Exit CORSIA	-	-
AOs in Scope in Reference Year(s) that Exit CORSIA	9.9%	-
	100.0%	100.0%



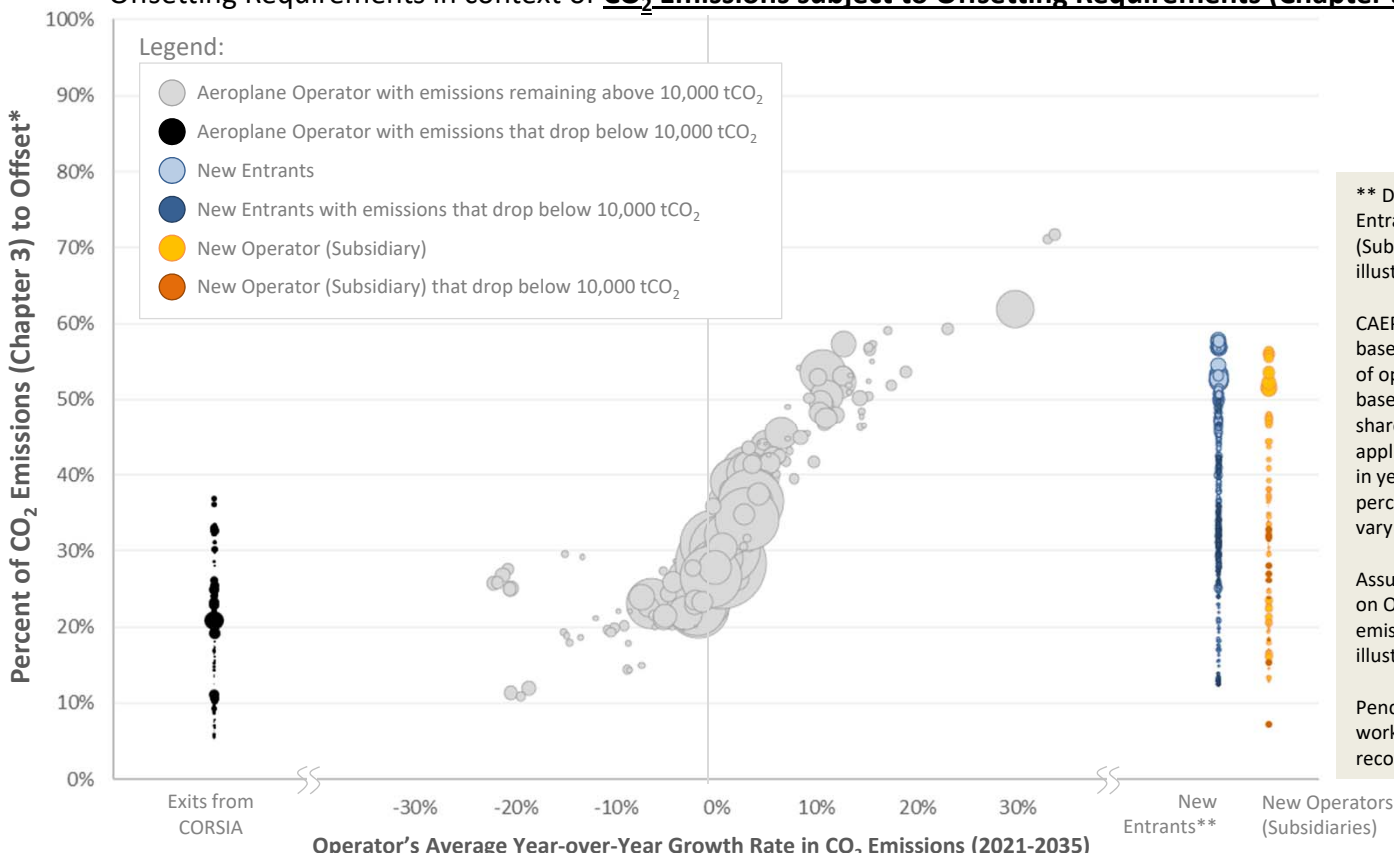
Supporting Information on Operators Landscape (by size) and Share of CO₂ Emissions and O.R.





Assessment of CORSIA's impact on Aeroplane Operators

Offsetting Requirements in context of CO₂ Emissions subject to Offsetting Requirements (Chapter 3)*



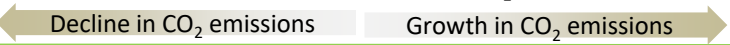
** Disclaimer: Impacts on New Entrants and New Operators (Subsidiaries) are provided for illustration.

CAEP is considering a range of 6 baseline options for these types of operators (e.g., Option A “no baseline”, Option F “operator’s share of CO₂ emissions in year y applied to the sector’s baseline in year y”). The spread of percent CO₂ emissions to offset vary across options.

Assumption on this chart based on Option D (i.e., average of emissions in years 1 and 2) for illustration purposes only.

Pending additional/ongoing work by CAEP and expected recommendation at CAEP/12.

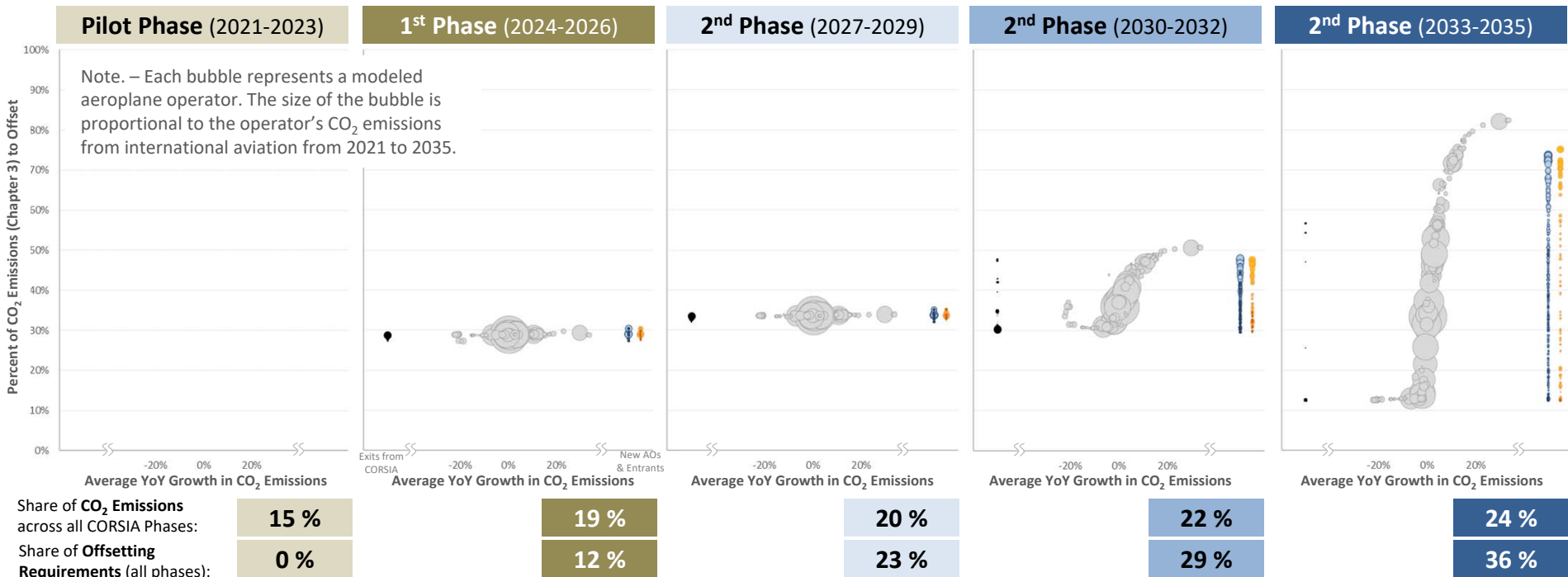
* Metric calculated as offsetting requirements (2021-2035) divided by total CO₂ emissions subject to offsetting requirements aka Chapter 3 (2021-2035).





Assessment of CORSIA's impact on Aeroplane Operators (cont.)

- Offsetting requirements (and differences across operators) evolve over time and are driven by (1) phased implementation of CORSIA (i.e., States' participation), (2) Sector Growth Factor (e.g., CORSIA baseline) and (3) transition to individual approach from 2030.

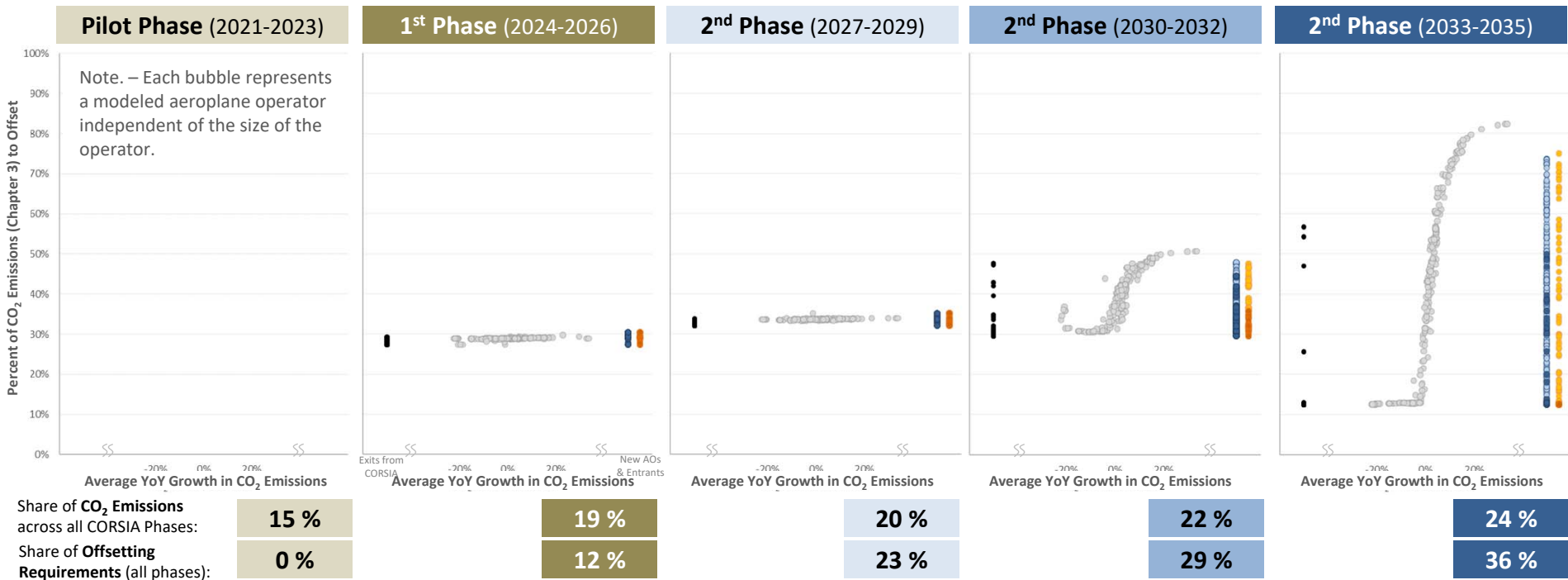


Assumptions: Traffic and Emissions Profile (Mid Covid19 Scenario), CORSIA Baseline Ref. Year (2019 for 2021-2023 and average 2019-2020 for 2024-2035), Sectoral/Individual (80% / 20% in 2030-2032, 30% / 70% in 2033-2035), States for Chapter 3 State Pairs (Edition 2 - July 2021), New Entrant baseline option D.



Assessment of CORSIA's impact on Aeroplane Operators (cont.)

- Offsetting requirements (and differences across operators) evolve over time and are driven by (1) phased implementation of CORSIA (i.e., States' participation), (2) Sector Growth Factor (e.g., CORSIA baseline) and (3) transition to individual approach from 2030.



Assumptions: Traffic and Emissions Profile (Mid Covid19 Scenario), CORSIA Baseline Ref. Year (2019 for 2021-2023 and average 2019-2020 for 2024-2035), Sectoral/Individual (80% / 20% in 2030-2032, 30% / 70% in 2033-2035), States for Chapter 3 State Pairs (Edition 2 - July 2021), New Entrant baseline option D.