Council – 225th Session

Subject No. 50: Questions relating to the environment

Analyses in Support of the 2022 CORSIA Periodic Review:
Review of analysis of possible market distortion
(in context of CORSIA design elements)

Presented by CAEP

Questions Addressed at the 225th Council Session

The Council requested CAEP to present the following inputs for the review, as outlined in the C-DEC 222/12 and the CORSIA Periodic Review Terms of Reference:

Excerpt from C-DEC 222/12 reference: 10. f. i.

Assessment of CORSIA's market […] on States and aeroplane operators and on international aviation, including analysis of possible market distortions;

Background: CORSIA Design Elements

- **Key CORSIA Design Elements captured and agreed as part of Assembly 39-3 (40-19) Resolution:**

Scope of Applicability (MRV Provisions)	**Scope of Applicability** (Offsetting Requirements)	**Calculation of Offsetting Requirements**
Operators with CO_2 emissions from int. aviation below 10,000 tCO_2 (excluded)	**State Pairs to or from a State not participating** (excluded)	**100% Sectoral approach with transition to partial Individual approach after 2030**
Aircraft size with MTOM<5700kg (excluded)	**New Entrants during years 1, 2 and 3 or until 0.1% 2020 emissions are reached** (excluded)	**CORSIA Sector Baseline** *(used as basis for Sector Growth Factor SGF)*
Humanitarian, firefighting, medical and States' flights (excluded)		**Operator's Baseline** *(used as basis for Operator's Growth Factor OGF)*

Interpretations and scope of assessment

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:

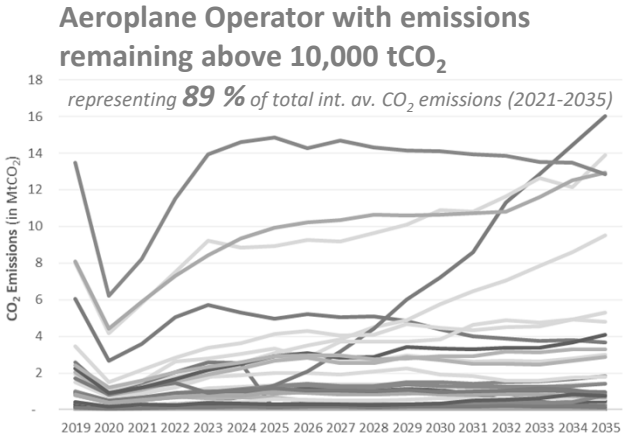
Numerous conditions affect the international aviation market (i.e., departing from the ideal of perfect competition) e.g., differences in price of jet fuel, labor, taxes.

Scope of CORSIA Analyses:

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

Background: Operators CO_2 Emissions Patterns

Charts depict CO_2 emissions patterns for a sample of 50 aeroplane operators modelled (for illustration). Total CO_2 emissions percentage for all operators in the category.



CAEP developed and calibrated models that capture the potential dynamics of operators' growth and/or decline in CO_2 emissions over time.

Models support <u>scenario-based</u> assessments of CORSIA's impact

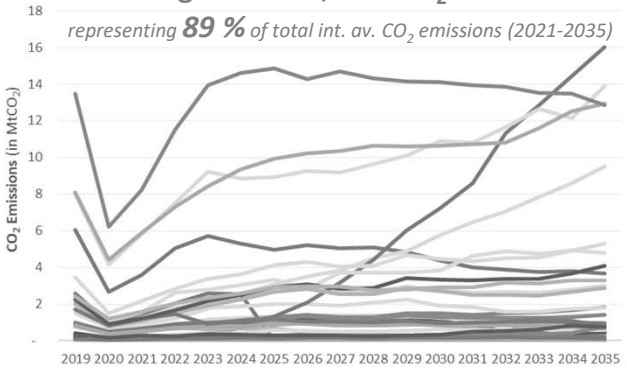
(i.e., operator level CO_2 emissions patterns are not forecasts and not meant to be attributed to a specific operator).

Background: Operators CO_2 Emissions Patterns

Charts depict CO_2 emissions patterns for a sample of 50 aeroplane operators modelled (for illustration). Total CO_2 emissions percentage for all operators in the category.

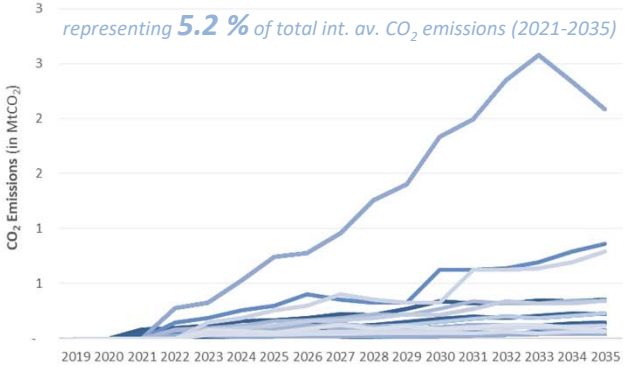
Aeroplane Operator with emissions remaining above 10,000 tCO_2

*representing **89 %** of total int. av. CO_2 emissions (2021-2035)*



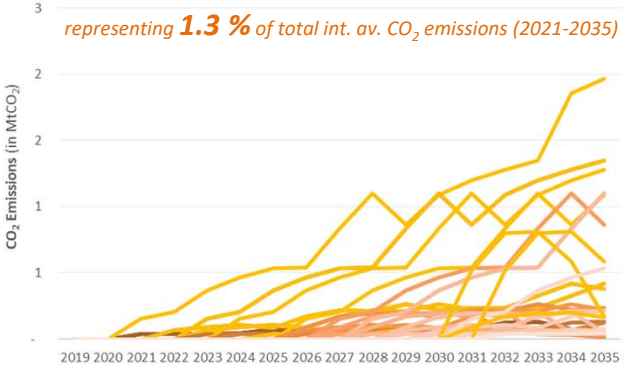
New Entrants

*representing **5.2 %** of total int. av. CO_2 emissions (2021-2035)*



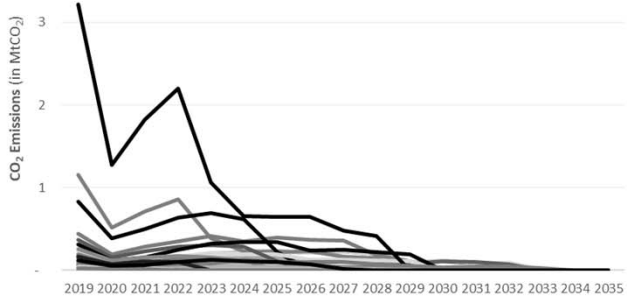
New Operator (Subsidiary)

*representing **1.3 %** of total int. av. CO_2 emissions (2021-2035)*



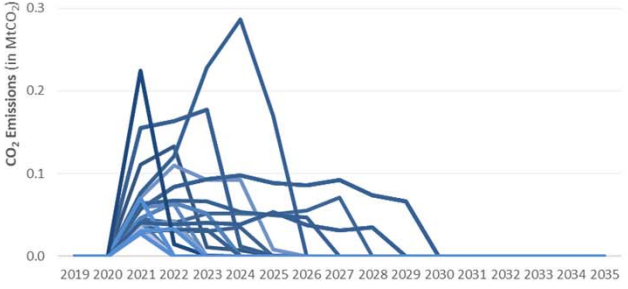
Aeroplane Operator with emissions that drop below 10,000 tCO_2

*representing **2.5 %** of total int. av. CO_2 emissions (2021-2035)*



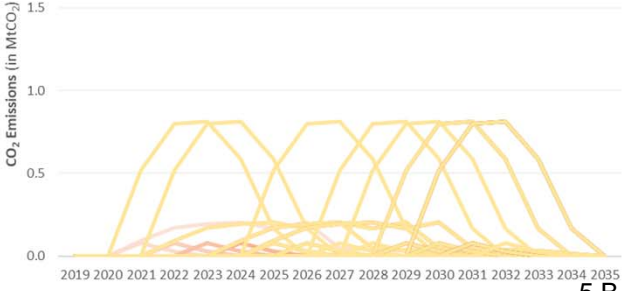
New Entrants with emissions that drop below 10,000 tCO_2

*representing **1.4 %** of total int. av. CO_2 emissions (2021-2035)*



New Operator (Subsidiary) with emissions that drop below 10,000 tCO_2

*representing **0.4 %** of total int. av. CO_2 emissions (2021-2035)*



Assessment of CORSIA's impact on Aeroplane Operators

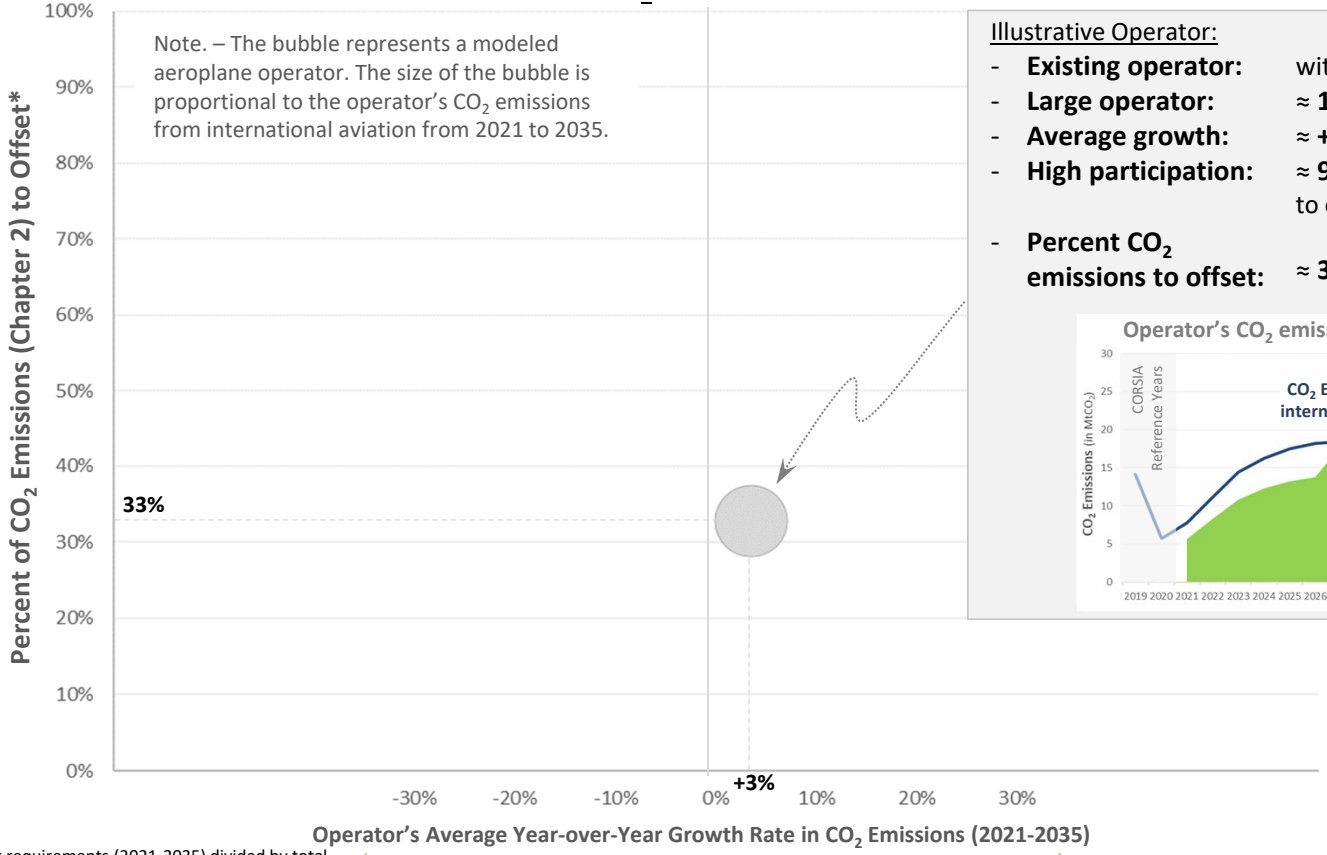
- **Given aeroplane operators' characteristics** (e.g., type of operator, CO_2 emissions profile, operations across State pairs subject to offsetting requirements)**, CAEP calculated offsetting requirements for each operator.**

- **The individual operator's offsetting requirements are put in context of the operator's size (in terms of CO_2 emissions) by tracking percent of CO_2 emissions to offset** calculated as offsetting requirements divided by total CO_2 emissions from international aviation (aka Chapter 2).
- **For the purpose of CORSIA Analyses, the spread in percent of CO_2 emissions to offset across operators is used as a proxy for estimating potential market distortion.**

- **The rate of growth of an operator's CO_2 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 CO_2 Emissions to assess its impacts.**

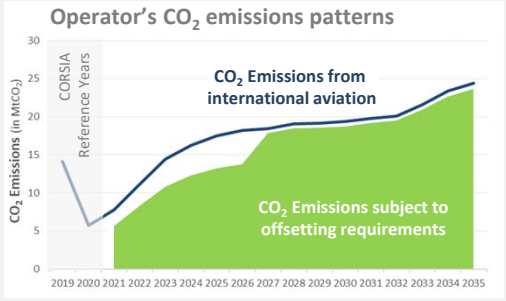
Assessment of CORSIA's impact on Aeroplane Operators

Offsetting Requirements in context of **CO_2 Emissions from International Aviation (Chapter 2)***



Illustrative Operator:

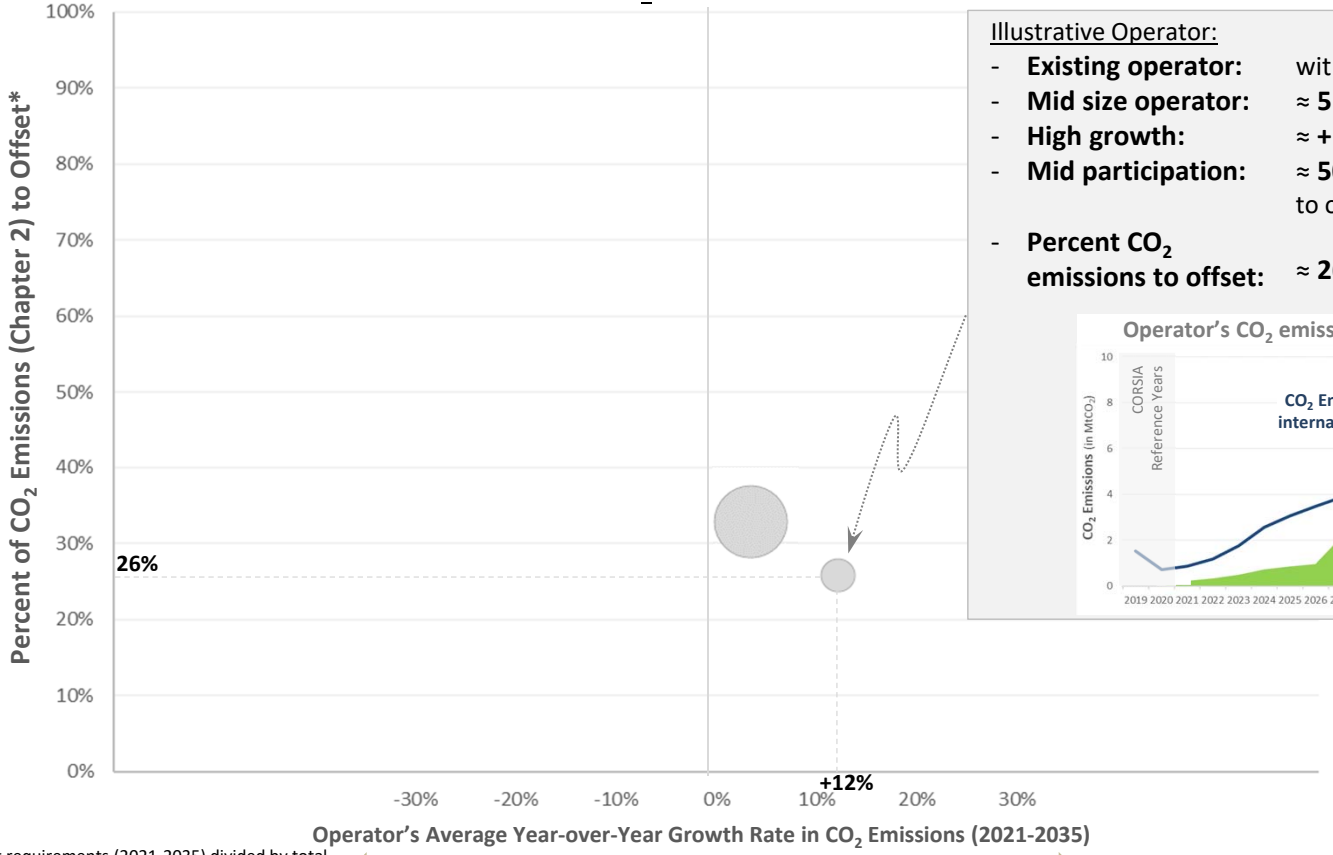
- **Existing operator:** within scope in 2019-2020
- **Large operator:** ≈ **18** $MtCO_2$ per year
- **Average growth:** ≈ **+3%** per annum
- **High participation:** ≈ **90%** of CO_2 emissions subject to offsetting requirements
- **Percent CO_2 emissions to offset:** ≈ **33%**



* Metric calculated as offsetting requirements (2021-2035) divided by total CO_2 emissions from international aviation aka Chapter 2 (2021-2035).

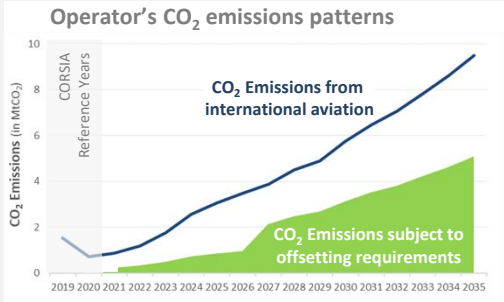
Assessment of CORSIA's impact on Aeroplane Operators

Offsetting Requirements in context of **CO_2 Emissions from International Aviation (Chapter 2)***



Illustrative Operator:

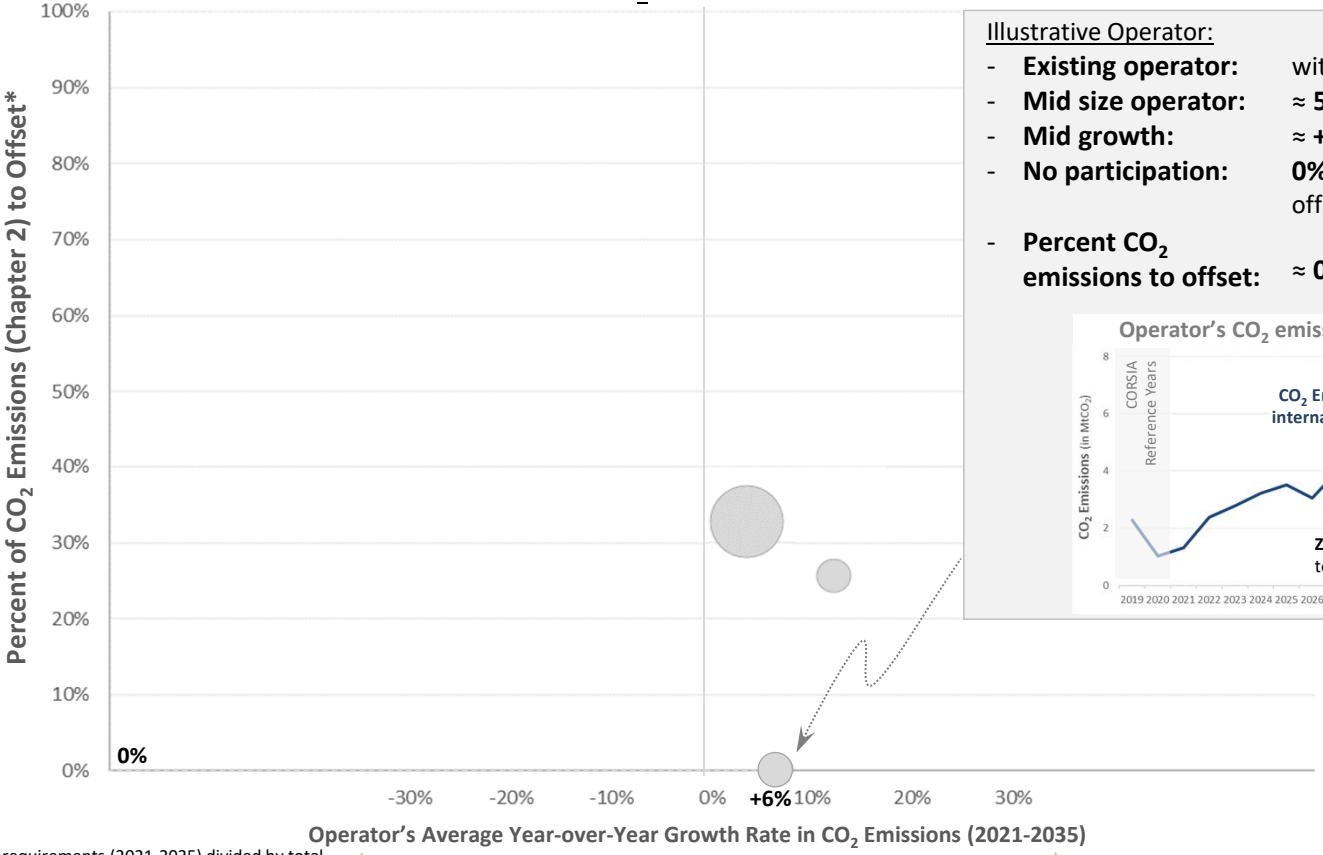
- **Existing operator:** within scope in 2019-2020
- **Mid size operator:** ≈ **5** $MtCO_2$ per year
- **High growth:** ≈ **+12%** per annum
- **Mid participation:** ≈ **50%** of CO_2 emissions subject to offsetting requirements
- **Percent CO_2 emissions to offset:** ≈ **26%**



* Metric calculated as offsetting requirements (2021-2035) divided by total CO_2 emissions from international aviation aka Chapter 2 (2021-2035).

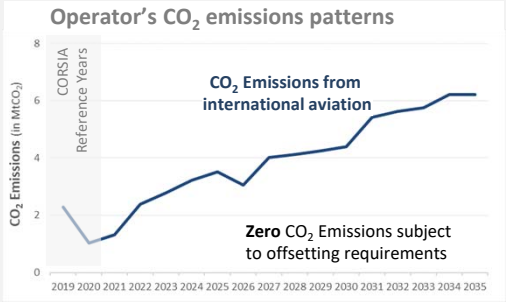
Assessment of CORSIA's impact on Aeroplane Operators

Offsetting Requirements in context of **CO_2 Emissions from International Aviation (Chapter 2)***



Illustrative Operator:

- **Existing operator:** within scope in 2019-2020
- **Mid size operator:** ≈ **5** $MtCO_2$ per year
- **Mid growth:** ≈ **+6%** per annum
- **No participation:** **0%** of CO_2 emissions subject to offsetting requirements
- **Percent CO_2 emissions to offset:** ≈ **0%**



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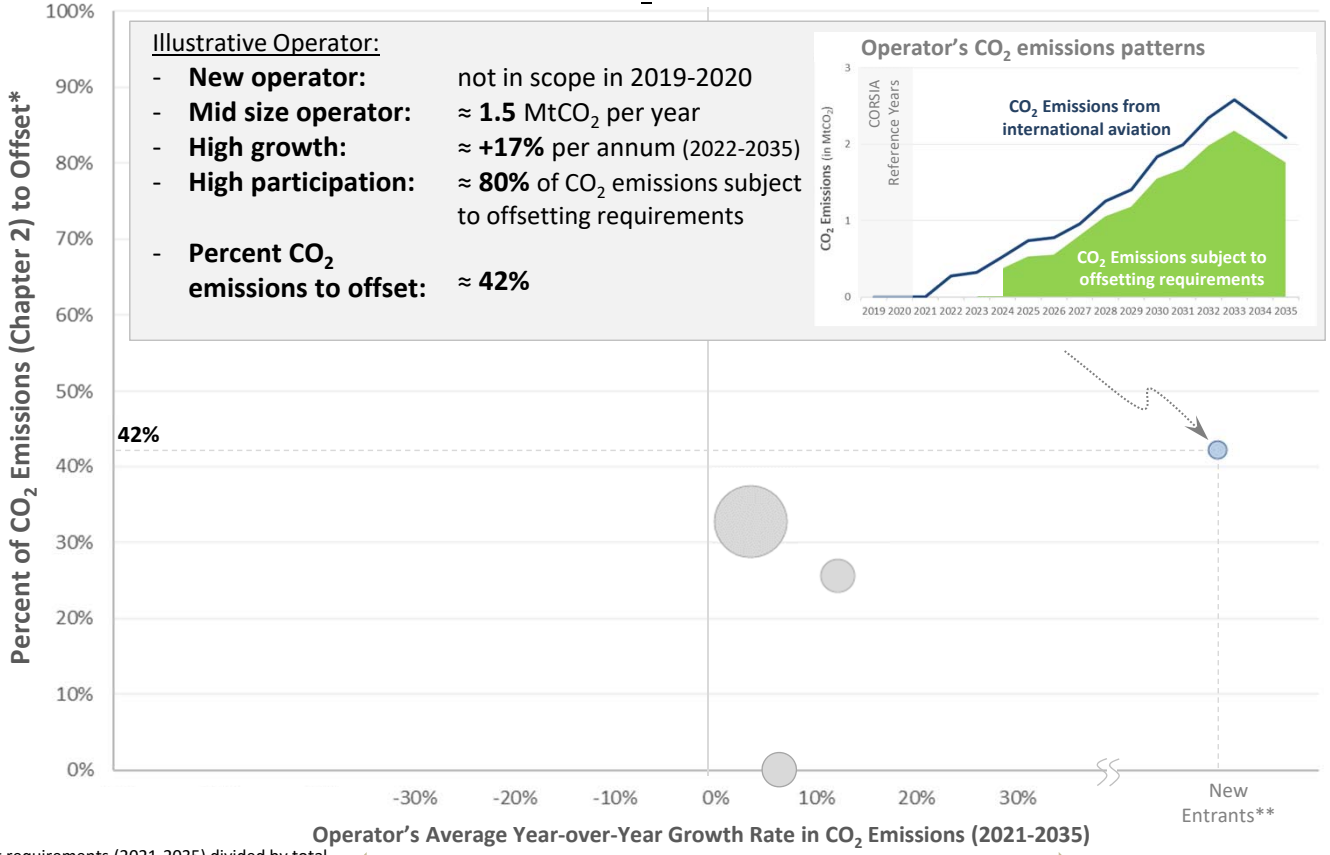
Assessment of CORSIA's impact on Aeroplane Operators

Offsetting Requirements in context of **CO_2 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 CO_2 emissions to offset vary across options.

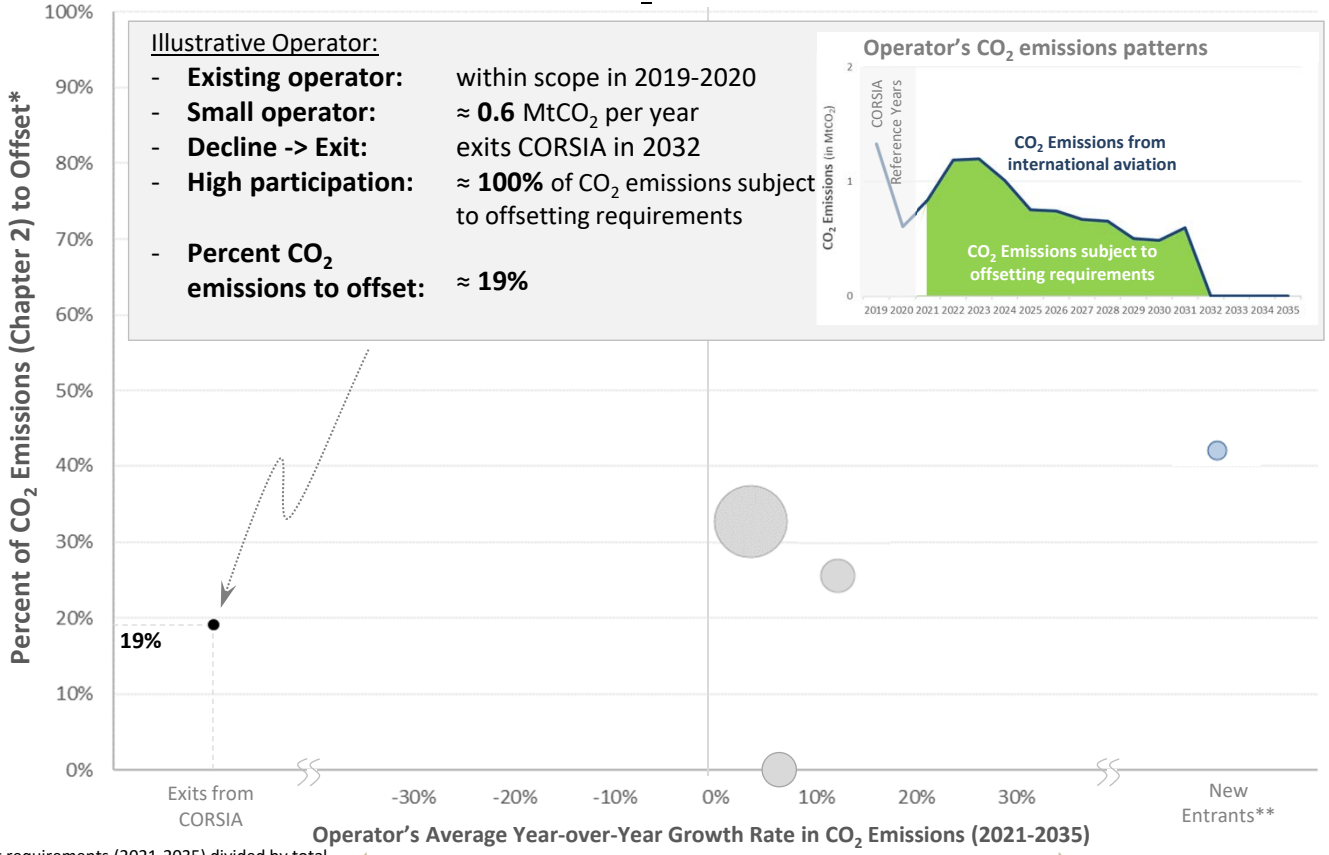
Assumption on this chart based on Option D (i.e., average of emissions in years 1 and 2) for illustration purposes only.

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

* Metric calculated as offsetting requirements (2021-2035) divided by total CO_2 emissions from international aviation aka Chapter 2 (2021-2035).

Assessment of CORSIA's impact on Aeroplane Operators

Offsetting Requirements in context of **CO_2 Emissions from International Aviation (Chapter 2)***



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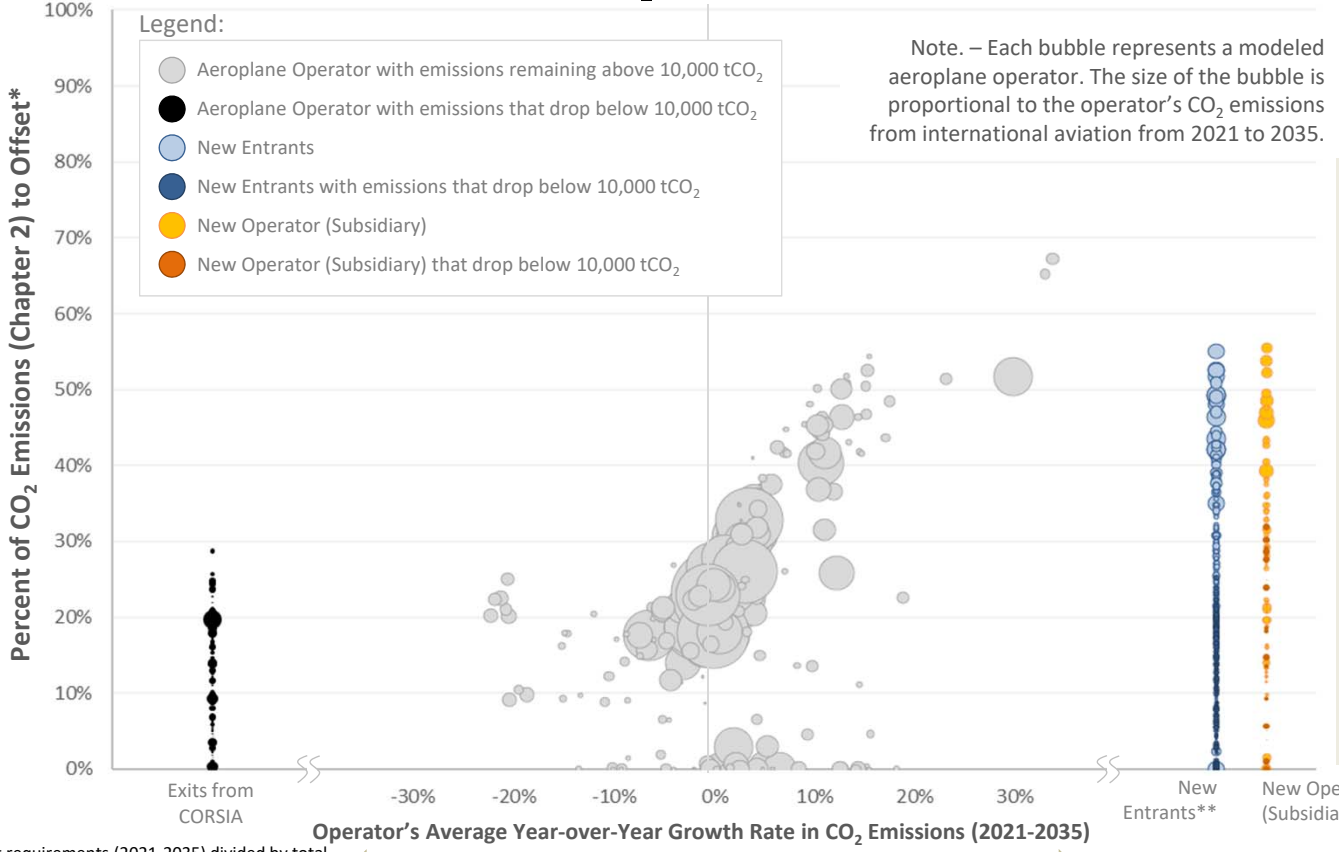
Assessment of CORSIA's impact on Aeroplane Operators

Offsetting Requirements in context of **CO_2 Emissions from International Aviation (Chapter 2)***



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* Metric calculated as offsetting requirements (2021-2035) divided by total CO_2 emissions from international aviation aka Chapter 2 (2021-2035).

Assessment of CORSIA's impact on Aeroplane Operators

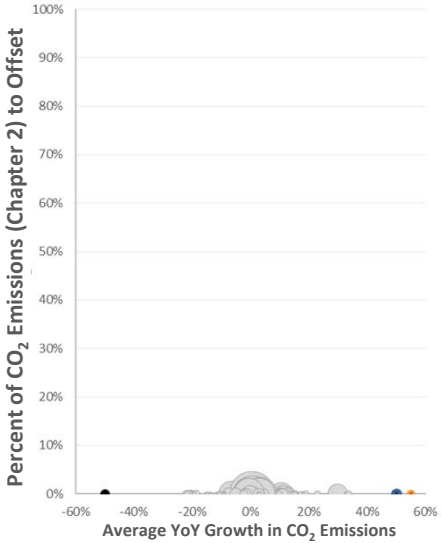
- **The charts contained in the previous slides depicted CORSIA's potential overall impact on Aeroplane Operators from 2021 to 2035.**

- **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).**

Assessment of CORSIA's impact on Aeroplane Operators

Pilot Phase (2021-2023)

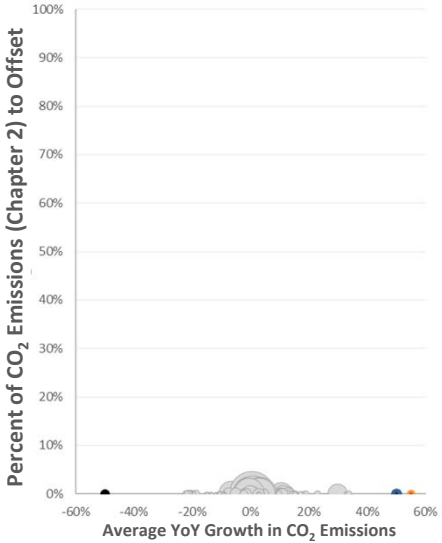


Share of **CO_2 Emissions** across all CORSIA Phases:	**15 %**
Share of **Offsetting Requirements** (all phases):	**0 %**

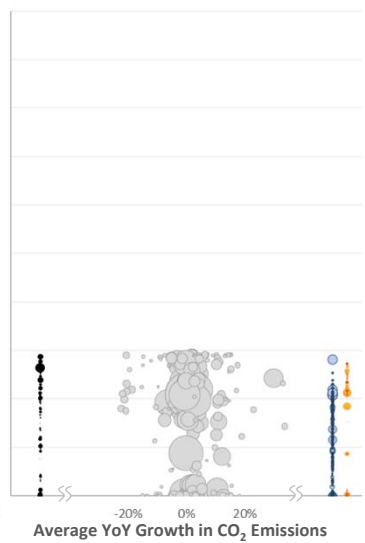
Assumptions: Traffic and Emissions Profile (Mid Covid19 Scenario), CORSIA Baseline Ref. Year (2019 for 2021-2023 and average 2019-2020 for 2024-2035), Sectoral/Individual (80% / 20% in 2030-2032, 30% / 70% in 2033-2035), States for Chapter 3 State Pairs (Edition 2 - July 2021), New Entrant baseline option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

Assessment of CORSIA's impact on Aeroplane Operators

Pilot Phase (2021-2023)



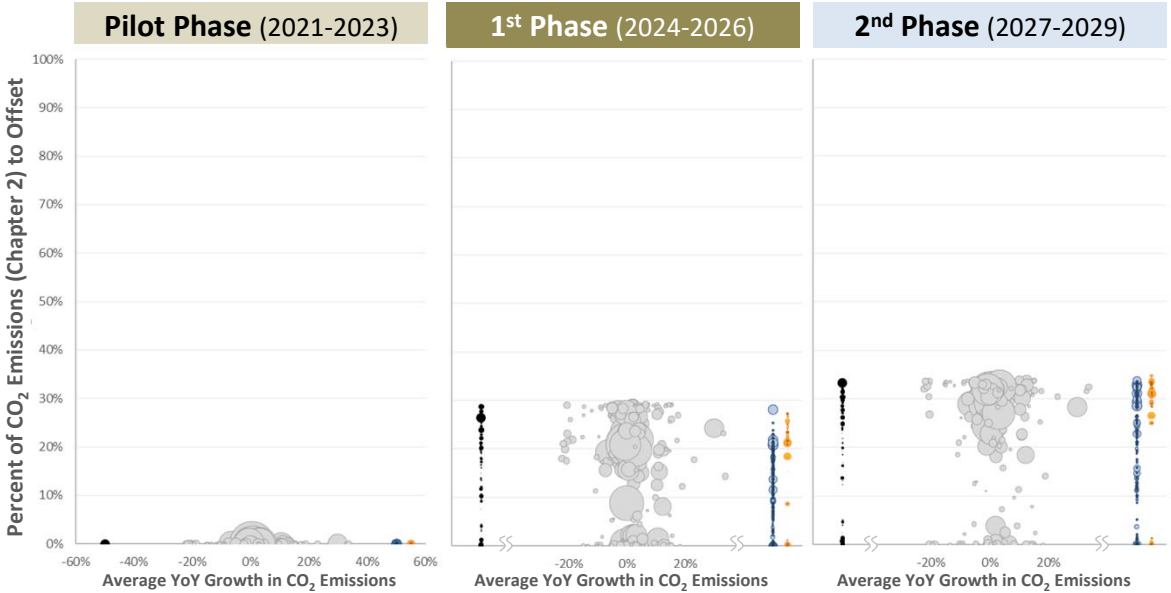
1st Phase (2024-2026)



	Pilot Phase (2021-2023)	1st Phase (2024-2026)
Share of **CO_2 Emissions** across all CORSIA Phases:	**15 %**	**19 %**
Share of **Offsetting Requirements** (all phases):	**0 %**	**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.

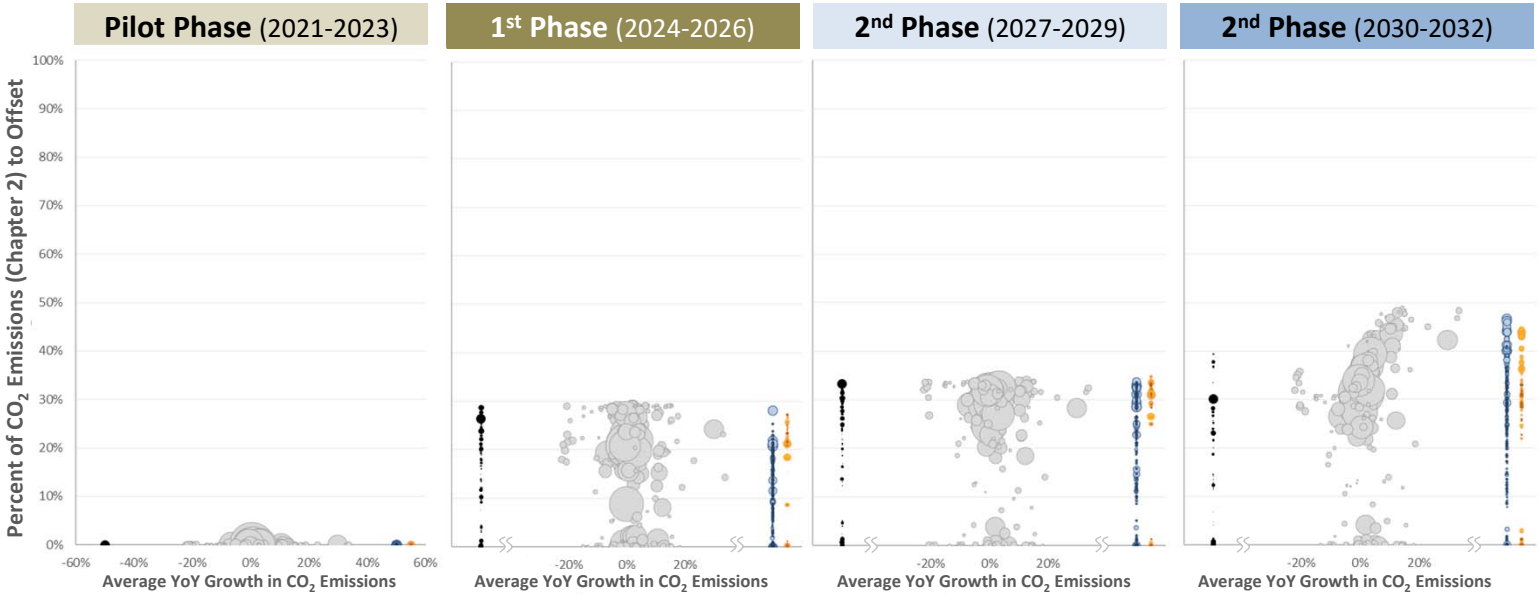
Assessment of CORSIA's impact on Aeroplane Operators



	Pilot Phase (2021-2023)	1st Phase (2024-2026)	2nd Phase (2027-2029)
Share of **CO_2 Emissions** across all CORSIA Phases:	**15 %**	**19 %**	**20 %**
Share of **Offsetting Requirements** (all phases):	**0 %**	**12 %**	**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.

Assessment of CORSIA's impact on Aeroplane Operators

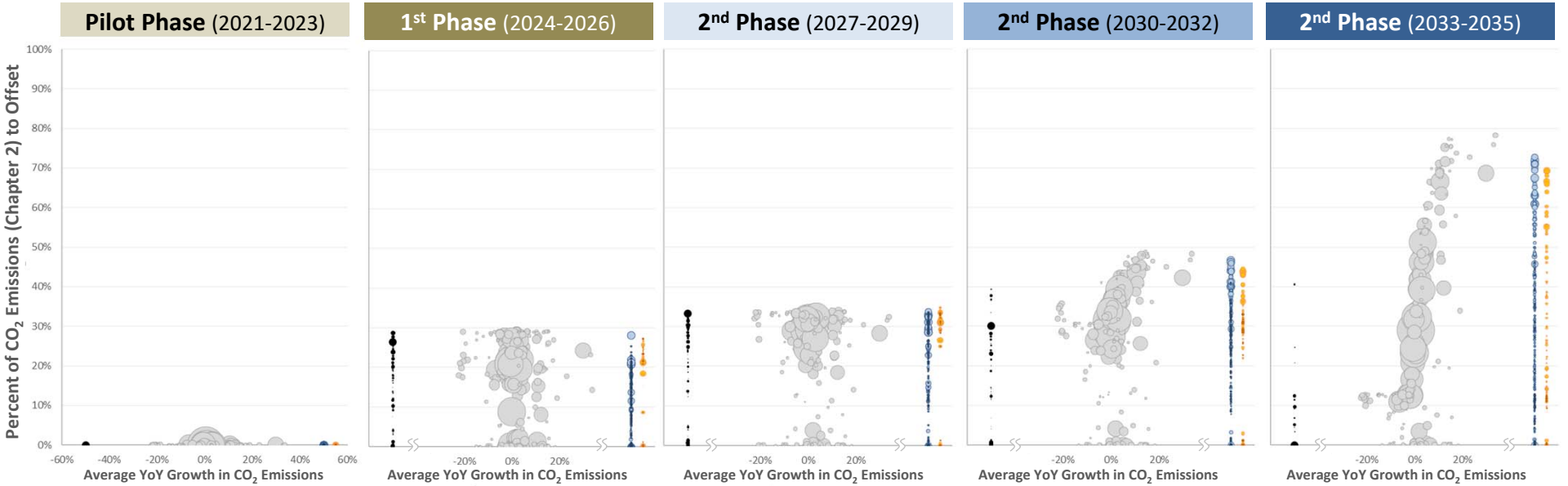


	Pilot Phase (2021-2023)	1st Phase (2024-2026)	2nd Phase (2027-2029)	2nd Phase (2030-2032)
Share of **CO_2 Emissions** across all CORSIA Phases:	**15 %**	**19 %**	**20 %**	**22 %**
Share of **Offsetting Requirements** (all phases):	**0 %**	**12 %**	**23 %**	**29 %**

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.**



	Pilot Phase (2021-2023)	1st Phase (2024-2026)	2nd Phase (2027-2029)	2nd Phase (2030-2032)	2nd Phase (2033-2035)
Share of **CO_2 Emissions** across all CORSIA Phases:	15 %	19 %	20 %	22 %	24 %
Share of **Offsetting Requirements** (all phases):	0 %	12 %	23 %	29 %	36 %

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.

ICAO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Asia and Pacific (APAC) Sub-office Beijing
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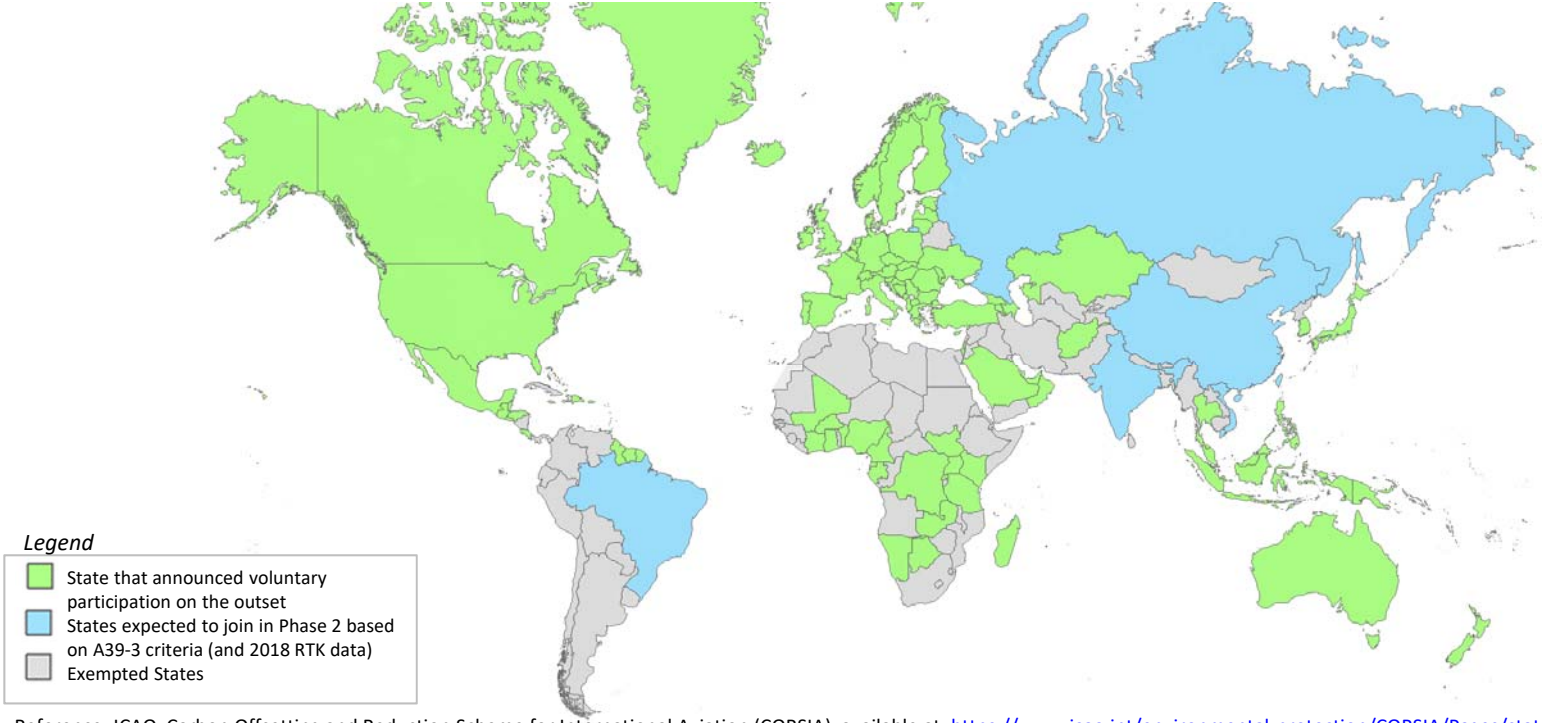
THANK YOU

Appendix: Supporting Information

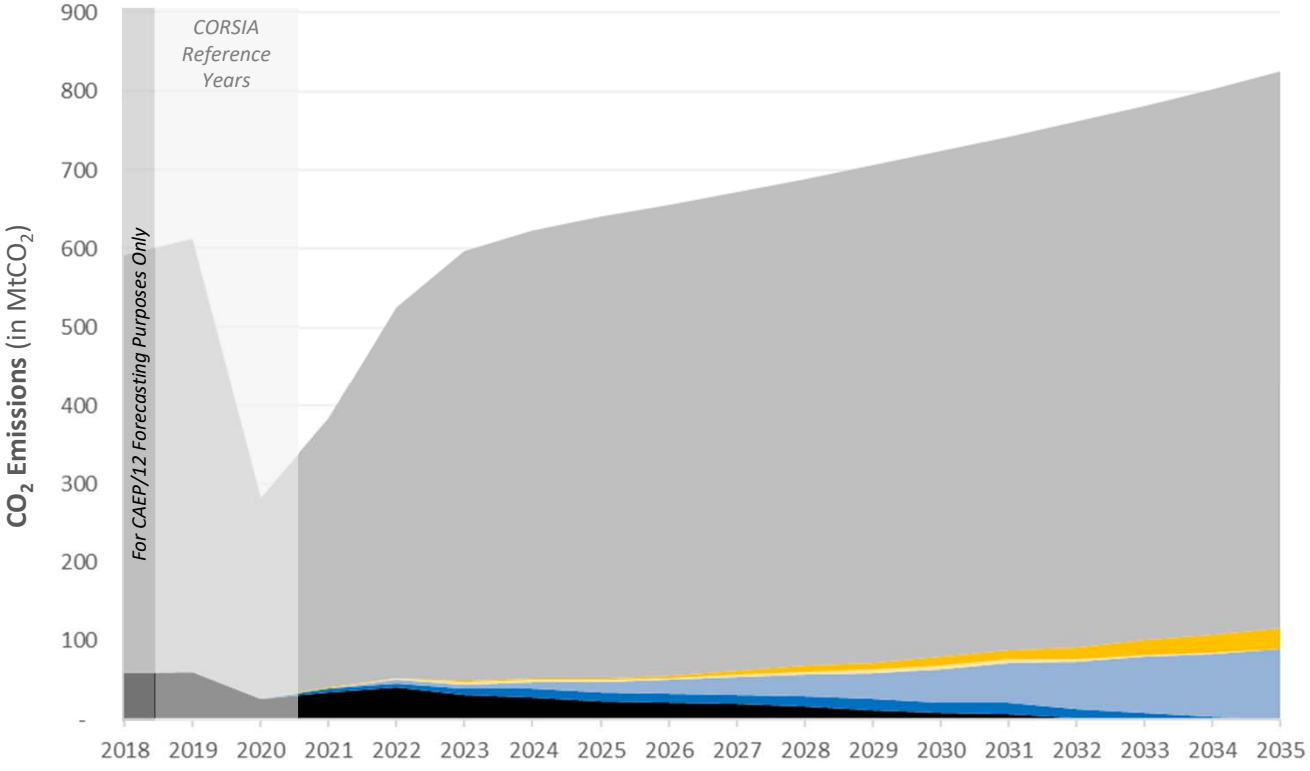
Assumptions on Phase In of States for Route Based Phased Implementation of CORSIA

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



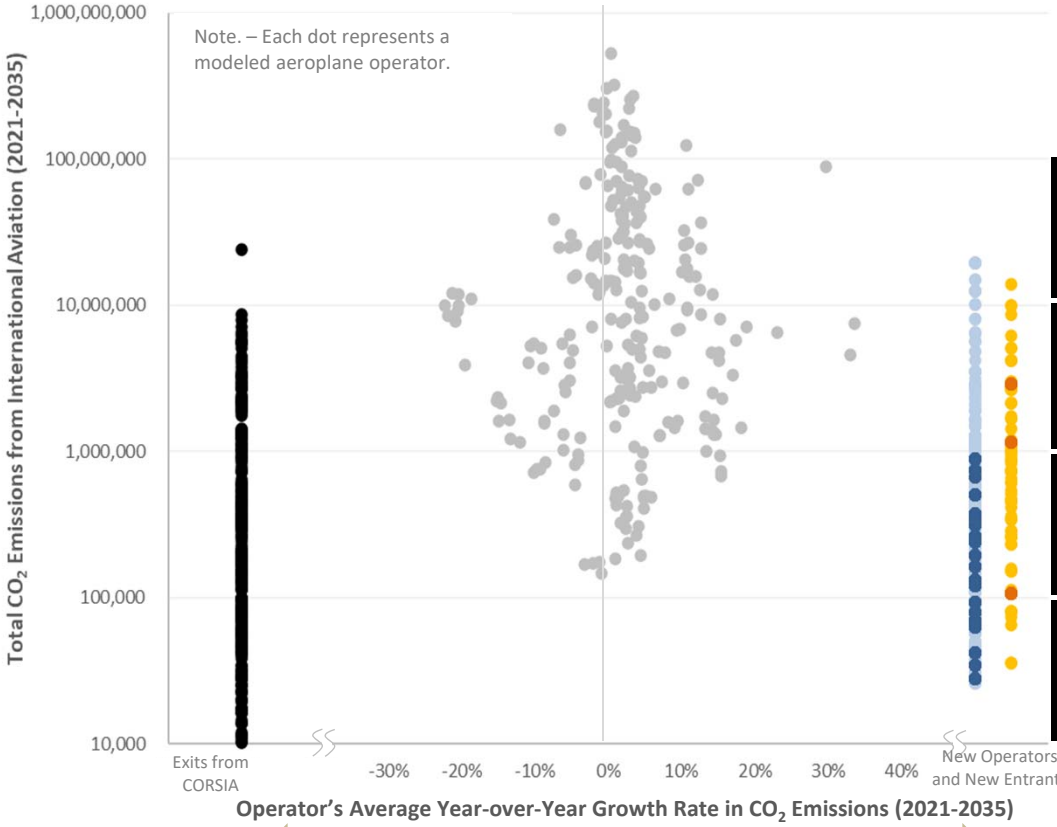
Reference: ICAO, Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), available at; https://www.icao.int/environmental-protection/CORSIA/Pages/state-pairs.aspx, last retrieved: 09 August 2021 and RTK data available at: https://www.icao.int/sustainability/Documents/RTK%20ranking/International%20RTK%20rankings_2018_SIDS_LDC_LLDC.pdf,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

WG4 developed models that capture the potential dynamics of operators' growth and/or decline in CO_2 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%

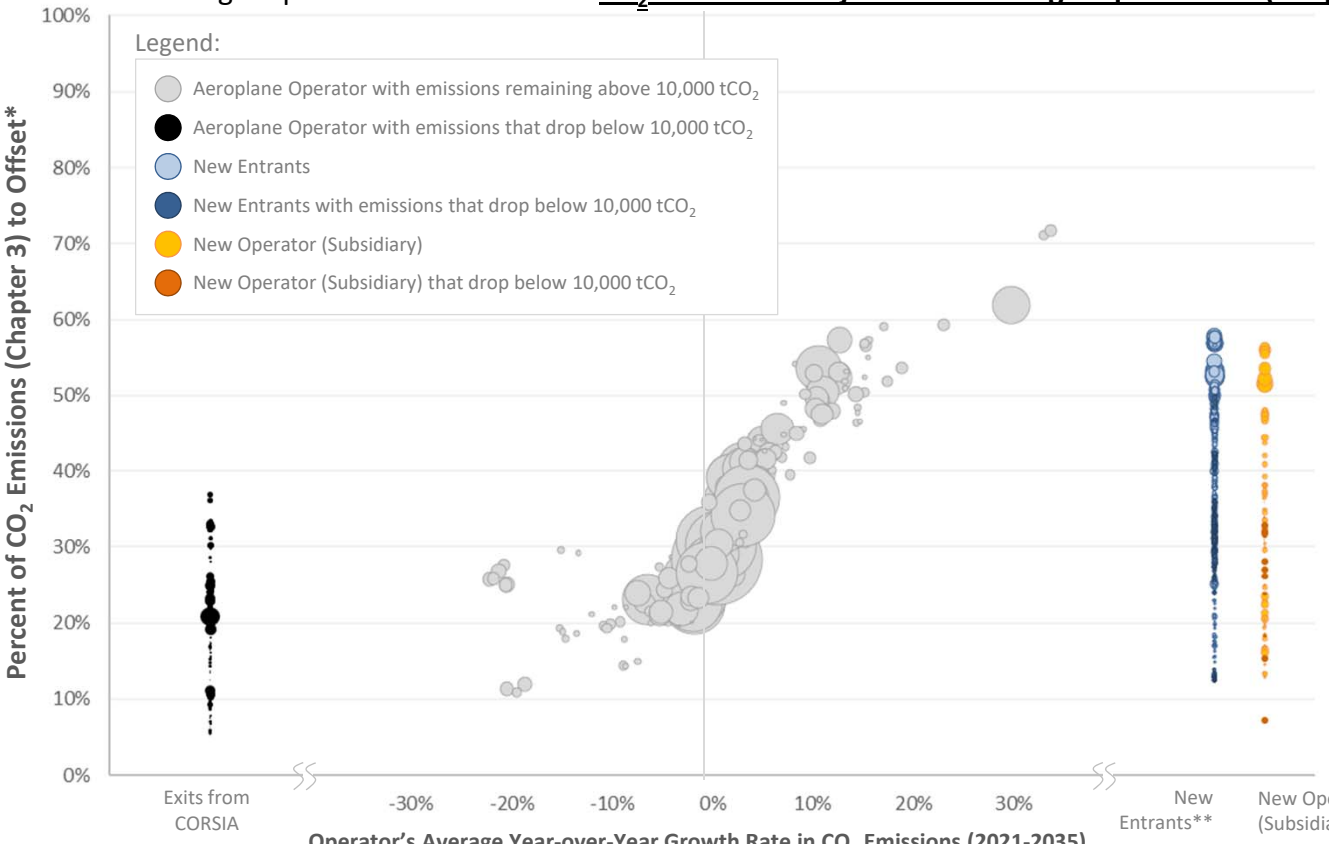
Supporting Information on Operators Landscape (by size) and Share of CO_2 Emissions and O.R.



Exit from CORSIA	Operators in Reference Year(s)	New Entrants	New Operator (Subsidiary)
	26 Operators 51 % CO_2 51 % O.R.		
1 Operators 0.2 % CO_2 0.2 % O.R.	95 Operators 34 % CO_2 34 % O.R.	15 Operators 2.3 % CO_2 4.1 % O.R.	1 Operators 0.1 % CO_2 0.3 % O.R.
64 Operators 1.8 % CO_2 0.7 % O.R.	100 Operators 4.1 % CO_2 4.0 % O.R.	78 Operators 1.9 % CO_2 2.7 % O.R.	53 Operators 1.4 % CO_2 1.7 % O.R.
118 Operators 1.4 % CO_2 0.1 % O.R.	39 Operators 0.2 % CO_2 0.2 % O.R.	623 Operators 2.2 % CO_2 1.1 % O.R.	59 Operators 0.2 % CO_2 0.2 % O.R.
101 Operators 0.4 % CO_2 0.0 % O.R.		364 Operators 0.2 % CO_2 0.0 % O.R.	7 Operators 0.0 % CO_2 0.0 % O.R.

Assessment of CORSIA's impact on Aeroplane Operators

Offsetting Requirements in context of **CO_2 Emissions subject to Offsetting Requirements (Chapter 3)***



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

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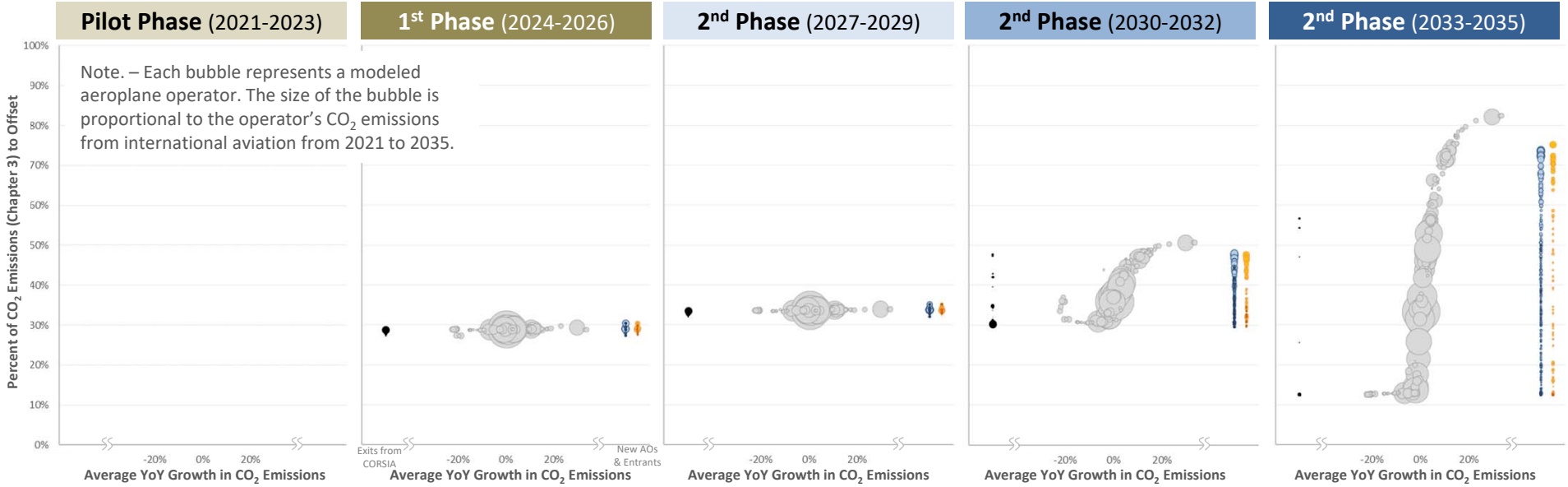
Assumption on this chart based on Option D (i.e., average of emissions in years 1 and 2) for illustration purposes only.

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

* Metric calculated as offsetting requirements (2021-2035) divided by total CO_2 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.**



	Pilot Phase (2021-2023)	1st Phase (2024-2026)	2nd Phase (2027-2029)	2nd Phase (2030-2032)	2nd Phase (2033-2035)
Share of **CO_2 Emissions** across all CORSIA Phases:	15 %	19 %	20 %	22 %	24 %
Share of **Offsetting Requirements** (all phases):	0 %	12 %	23 %	29 %	36 %

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.)

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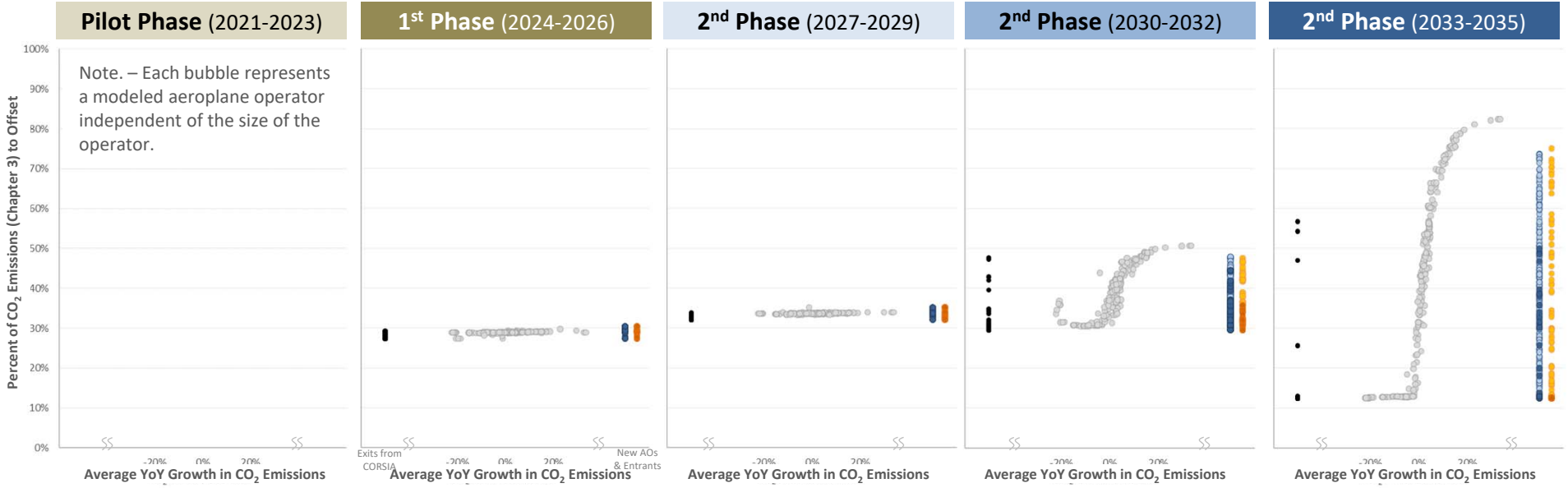

	Pilot Phase (2021-2023)	1st Phase (2024-2026)	2nd Phase (2027-2029)	2nd Phase (2030-2032)	2nd Phase (2033-2035)
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