

A Win-Win Solution to Abate Aviation CO₂ Emissions

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Overview

- Aviation future CO₂ emissions are predicted to grow and abatement options for the aviation industry are expensive
- The aviation industry will have a future need for the atmosphere's limited capacity to absorb carbon dioxide (CO₂) emissions → Airlines have an incentive to lead the way in imposing appropriate incentives to reduce emissions
- An efficient emissions price should equal the social cost of carbon
- The offset system proposed by ICAO, in its current form, does not provide appropriate incentives to reduce emissions
- Adding a **CO₂ benchmark** to the proposed offset system will:
 - ✓ Price marginal emissions at the social cost of carbon
 - ✓ Provide the leadership needed to protect aviation's future emissions capacity needs
 - ✓ Reduce the number of offsets required to achieve carbon neutral growth

Efficient climate policy

- Due to negative externalities from CO₂ emissions, a price on these emissions (a market-based measure) can improve economic welfare
- An efficient carbon price will equate the marginal cost of abating emissions with the marginal benefit from reducing emissions
 - Maximizes the net benefits from abating emissions
- The Social Cost of Carbon (SCC) is an estimate of the marginal benefit of reducing emissions
 - It provides an estimate of the economic damages avoided by reducing emissions by one ton
 - The most common estimate of the SCC is around \$40 per ton of CO₂
- **Providing incentives to execute all emissions abatement options that cost less than the SCC is the key to efficient climate policy**
- **ICAO's proposed offset system does not provide airlines with incentives to reduce emissions by an efficient amount**

A CO₂ benchmark for aviation

- Appropriate incentives can be imposed on airlines using a route-level (or route group) **CO₂ benchmark** (CO₂ emissions per revenue ton kilometer, RTK) system
 - ✓ Can operate as an add on to ICAO's proposed offset system
 - ✓ Will lower the number of offsets required for the industry to achieve carbon neutral growth
 - ✓ Is revenue neutral at the industry level
 - ✓ Provides an additional lever to address fairness concerns
- Under a CO₂ benchmark, airlines will only face the SCC on a small fraction of emissions; not on total emissions
 - Airlines will only be required to purchase emissions permits for emissions above the benchmark level

CO₂ benchmark vs. CO₂ standard

- The CO₂ Standard recently agreed upon by ICAO CAEP sets aircraft performance limits using a metric related to fuel efficiency as a function of aircraft shape and mass
- The CO₂ benchmark would apply to each airline's total operations
 - Facilitates flexibility in meeting the benchmark (e.g., an airline could change how it operated its existing fleet or upgrade to more fuel efficient aircraft)
- The CO₂ benchmark could operate concurrently with the CO₂ standard

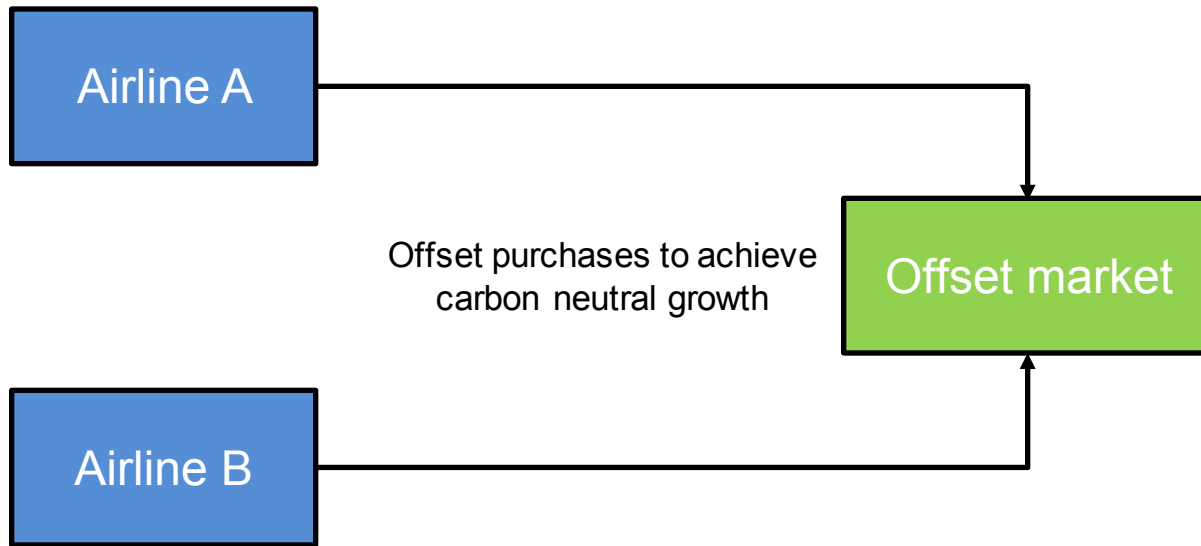
Operation of a CO₂ benchmark for aviation

- Set a benchmark for CO₂ emissions per RTK for each route (or route group)
- An airline's fleet-wide CO₂ benchmark will be a weighted average of the routes it serves
- Airlines with fleet-wide CO₂ emissions per RTK lower than the benchmark are credited with permits
- Airlines with CO₂ emissions per RTK higher than the benchmark are required to purchase permits
- Permits are traded among airlines leading to a market price
- A more (less) stringent CO₂ benchmark will result in a higher (lower) permit price
- The CO₂ benchmark should be set so that the price of permits is equal to the SCC

Operation of a CO₂ benchmark for aviation

- Airlines will be incentivized to implement all efficiency improvements that cost less than the SCC
 - Airlines with CO₂ emissions per RTK lower than the benchmark will be able to sell additional permits by improving efficiency
 - Airlines with CO₂ emissions per RTK higher than the benchmark will have to buy less permits by improving efficiency
- As airlines will reduce CO₂ emissions per RTK, the CO₂ benchmark will reduce the number of offsets required to achieve carbon neutral growth

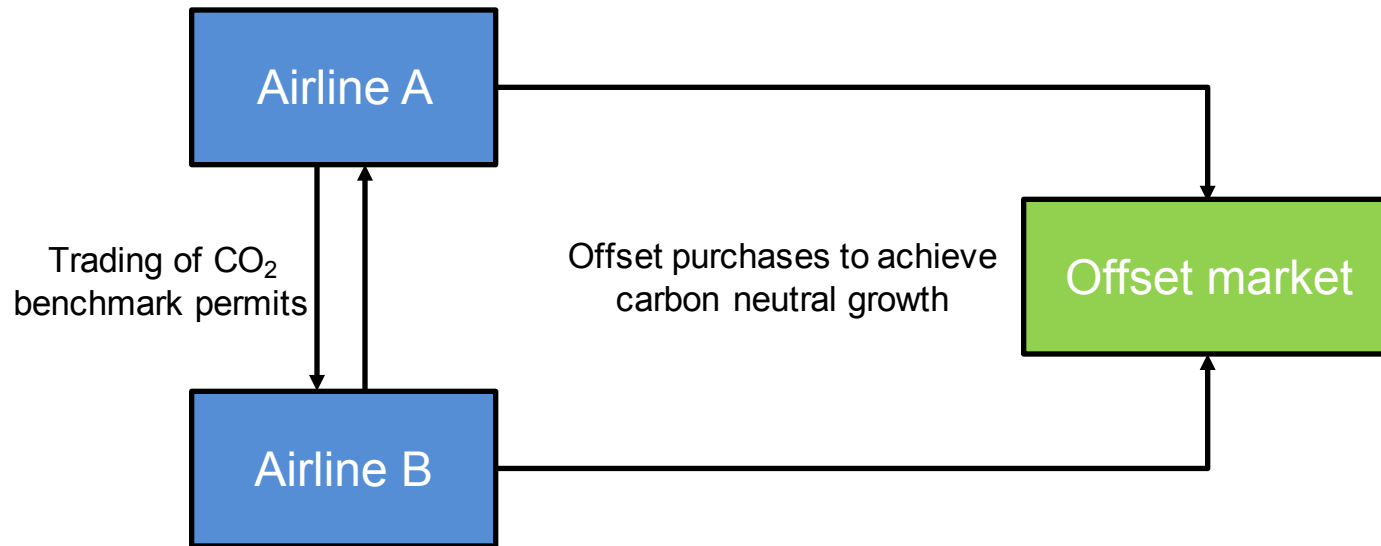
Overview of a CO₂ benchmark system



ICAO: (1) Sets regulations for the purchase of offsets by each airline to achieve carbon neutral growth (as under the current proposal).

Airlines: (1) Buy offsets to achieve carbon neutral growth.

Overview of a CO₂ benchmark system



ICAO: (1) Sets regulations for the purchase of offsets by each airline to achieve carbon neutral growth (as under the current proposal). (2) Sets the CO₂ benchmark for each route (or route group).

Airlines: (1) Buy offsets to achieve carbon neutral growth. (2) Buy CO₂ benchmark permits if their CO₂ emissions per RTK exceed the CO₂ benchmark and sell permits if they operate below it.

The **CO₂ benchmarks** can be increased or decreased so that the price of CO₂ benchmark permits equals to the SCC (e.g., a more stringent CO₂ benchmark will increase the permit price).

CO₂ benchmark permits and offsets are not interchangeable

An example

- Imagine that the aviation industry consists of two airlines...

	Airline A	Airline B
RTKs per year	1 million	1 million
CO ₂ intensity	95 kg/RTK	85 kg/RTK
Industry CO ₂ intensity	90 kg/RTK	
Total emissions	180 million kg	

- Now suppose we establish a benchmark for industry CO₂ emissions of 88 kg/RTK – moderately more stringent than the current industry average of 90 kg/RTK
- Both airlines will have an incentive to reduce emissions
 - Airline A will improve efficiency to reduce the number of permits it needs to buy
 - Airline B will improve efficiency so that it can sell more permits

An example

- A possible equilibrium under a CO₂ benchmark system is...

	Airline A	Airline B
RTKs per year	1 million	1 million
CO ₂ intensity	93 kg/RTK	83 kg/RTK
Buy or sell permits?	Purchases permits for 5 million kg of CO ₂ ([93-88]×1 million)	Sells permits for 5 million kg of CO ₂ ([88-83]×1 million)
Total emissions	176 million kg	

- Airline A emits 93 million kg of CO₂ but only has to purchase permits for 5 million kg of CO₂
- The system is revenue neutral for the aviation industry – purchases by one airline create additional revenue for other airlines
- Aviation CO₂ emissions have decreased by 4 million kg, which reduces the number of offsets needed for carbon neutral growth

Conclusions

- A CO₂ benchmark can be used to incentivize the aviation industry to abate an efficient level of emissions
- The CO₂ benchmark can operate within the proposed offset system and will reduce the number of offsets required to achieve carbon neutral growth
- Less stringent CO₂ benchmarks can be used for some routes (or route groups) to address fairness concerns
- By pricing marginal emissions at the SCC, the CO₂ benchmark will provide the global leadership needed to protect aviation's future emissions capacity needs

Appendix

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