A Win-Win Solution to Abate Aviation CO₂ Emissions

Niven Winchester*
Principal Research Scientist
Massachusetts Institute of Technology
niven@mit.edu

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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 $40 per ton of CO₂.
- Providing incentives to execute all emissions abatement options that cost less than the SCC is the key to efficient climate policy.
- ICAO’s proposed offset system does not provide airlines with incentives to reduce emissions by an efficient amount.
A CO$_2$ benchmark for aviation

• Appropriate incentives can be imposed on airlines using a route-level (or route group) CO$_2$ benchmark (CO$_2$ 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 CO$_2$ 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 CO$_2$ benchmark for aviation

- Set a benchmark for CO$_2$ emissions per RTK for each route (or route group)
- An airline’s fleet-wide CO$_2$ benchmark will be a weighted average of the routes it serves
- Airlines with fleet-wide CO$_2$ emissions per RTK lower than the benchmark are credited with permits
- Airlines with CO$_2$ 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 CO$_2$ benchmark will result in a higher (lower) permit price
- The CO$_2$ benchmark should be set so that the price of permits is equal to the SCC
Operation of a CO$_2$ benchmark for aviation

- Airlines will be incentivized to implement all efficiency improvements that cost less than the SCC
  - Airlines with CO$_2$ emissions per RTK lower than the benchmark will be able to sell additional permits by improving efficiency
  - Airlines with CO$_2$ emissions per RTK higher than the benchmark will have to buy less permits by improving efficiency
- As airlines will reduce CO$_2$ emissions per RTK, the CO$_2$ benchmark will reduce the number of offsets required to achieve carbon neutral growth
Offset purchases to achieve carbon neutral growth

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...

<table>
<thead>
<tr>
<th></th>
<th>Airline A</th>
<th>Airline B</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTKs per year</td>
<td>1 million</td>
<td>1 million</td>
</tr>
<tr>
<td>CO₂ intensity</td>
<td>95 kg/RTK</td>
<td>85 kg/RTK</td>
</tr>
<tr>
<td>Industry CO₂ intensity</td>
<td>90 kg/RTK</td>
<td></td>
</tr>
<tr>
<td>Total emissions</td>
<td>180 million kg</td>
<td></td>
</tr>
</tbody>
</table>

- 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 CO$_2$ benchmark system is...

<table>
<thead>
<tr>
<th></th>
<th>Airline A</th>
<th>Airline B</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTKs per year</td>
<td>1 million</td>
<td>1 million</td>
</tr>
<tr>
<td>CO$_2$ intensity</td>
<td>93 kg/RTK</td>
<td>83 kg/RTK</td>
</tr>
<tr>
<td>Buy or sell permits?</td>
<td><strong>Purchases</strong> permits for 5 million kg of CO$_2$ ([93-88]×1 million)]</td>
<td><strong>Sells</strong> permits for 5 million kg of CO$_2$ ([88-83]×1 million)</td>
</tr>
<tr>
<td>Total emissions</td>
<td></td>
<td>176 million kg</td>
</tr>
</tbody>
</table>

• Airline A emits 93 million kg of CO$_2$ but only has to purchase permits for 5 million kg of CO$_2$

• The system is revenue neutral for the aviation industry – purchases by one airline create additional revenue for other airlines

• Aviation CO$_2$ emissions have decreased by 4 million kg, which reduces the number of offsets needed for carbon neutral growth
Conclusions

• A CO$_2$ benchmark can be used to incentivize the aviation industry to abate an efficient level of emissions

• The CO$_2$ benchmark can operate within the proposed offset system and will reduce the number of offsets required to achieve carbon neutral growth

• Less stringent CO$_2$ benchmarks can be used for some routes (or route groups) to address fairness concerns

• By pricing marginal emissions at the SCC, the CO$_2$ benchmark will provide the global leadership needed to protect aviation’s future emissions capacity needs
Appendix

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