Aviation non CO$_2$ Mitigation
What should regulators do?

Bill Hemmings
whemmings@gmail.com
8 November 2020
before 1 January 2020, the Commission shall present an updated analysis of the non-CO2 effects of aviation, accompanied, where appropriate, by a proposal on how best to address those effects”.

The 2017 regulation also calls on the Commission to speed up work on the 2008 NOx proposal, promote research into contrail formation and evolution into cirrus clouds, into the direct effects of sulphate aerosols and soot, and on effective mitigation including operational and technical measures.
Work assigned to EASA

Subcontracted to a consortium led by MMU
Led by Prof David Lee
Comprising team of scientists/experts
Three working groups
  - Climate impacts
  - Mitigation Options
  - Regulatory Options

EASA report submitted to EC – DG Move/Clima
EC report to EP ENVI Committee expected this week
Staff Working Document expected to attach EASA study
1. Add non CO2 impacts to GHG emissions inventories

As CO2 equivalents – CO2e

Which inventories?
• National emissions for domestic emissions
• Aviation bunkers - UNFCCC memo item
• ICAO emission reports?

At EU level
• EU GHG inventory
• EU GHG UNFCCC inventory
• EU 2030 – 2050 targets
2. Aviation CO2e at Point of Sale display

All websites to show the CO2e per pax per flight sector

How to implement?

car labelling Directive' (Directive 1999/94/EC) aims to help consumers buy or lease cars which use less fuel and thereby emit less CO2 encourage manufacturers to reduce the fuel consumption of new cars.
As a demand-side policy, the directive is complementary to help car manufacturers to meet their specific CO2 emission targets set under Regulation (EC) 443/2009.

EASA has been working on its own voluntary labelling scheme

How to implement POS EU and globally?

for all flights departing an EU airport

Agreed EU calculations?

Voluntary measures = very different figures/methodologies
3. Action on Mitigation Options

Technology; radical new aircraft designs
   lower mach number and cruise altitude
   New aircraft technologies – electric & Hydrogen aircraft

Cleaner burning engines
   ICAO NvPM standard
   Lean burn NOx engines – tradeoff with CO2 reduction

Cleaner fuels – less soot
   EU aviation Refuel initiative
   ICAO/industry biofuels in initiatives

Improved aircraft fuel efficiency
   ICAO CO2 standard is ineffective

Aviation demand control
   ETS reform, fuel, ticket and carbon emissions taxes
4. Contrail Avoidance

AIC = 60% of aviation climate impacts
Fly higher or lower
Need to be able to predict when contrails will occur
And change flight plans – 12 hours out
Requires improved weather forecasting
And cooperation of air traffic control systems
For N Atlantic – EU and US authorities
Small CO$_2$ penalty – divert one in 20 transatlantic flights
This CO$_2$ penalty has always prevented progress
Now Covid is slowing progress
What will the EC report say?
5. Regulatory Options
Internalise non CO$_2$ climate costs

Then incentivise reductions through charging
First put non CO$_2$ in emissions inventories

Include in ETS – EC reluctant
Include in ticket taxes – especially longhaul
Include in aviation carbon emissions taxes - UK
Include in Corsia?
NOx charge with distance – 2008 report
ICAO cruise NOx standard?
Pricing CO2 and non CO2

How to regulate aviation's full climate impact as intended by the EU council from 2020 onwards

Janina D. Scheelhaase

*German Aerospace Centre, Institute of Air Transport and Airport Research, Cologne, Germany*

Table 4

Cost for complying with the EU ETS per mile and per passenger mile in the year 2020.

Source: DLR modelling results, based on Scheelhaase et al. (2014a). Belly freight has not been taken into account for the selected flights.

<table>
<thead>
<tr>
<th>Departure</th>
<th>Destination</th>
<th>Distance</th>
<th>Cost per mile (€)</th>
<th>CO₂ regime</th>
<th>Cost per passenger and mile (€)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>CO₂ + Non-CO₂ regime</td>
<td></td>
<td>CO₂ + Non-CO₂ regime</td>
</tr>
<tr>
<td>AMS</td>
<td>CDG</td>
<td>248</td>
<td>0.13</td>
<td>0.09</td>
<td>0.0013</td>
</tr>
<tr>
<td>CGN</td>
<td>TXL</td>
<td>289</td>
<td>0.12</td>
<td>0.07</td>
<td>0.0009</td>
</tr>
<tr>
<td>BCN</td>
<td>DUS</td>
<td>726</td>
<td>0.19</td>
<td>0.04</td>
<td>0.0018</td>
</tr>
<tr>
<td>DUB</td>
<td>FMM</td>
<td>814</td>
<td>0.23</td>
<td>0.06</td>
<td>0.0013</td>
</tr>
<tr>
<td>MUC</td>
<td>PMI</td>
<td>756</td>
<td>0.25</td>
<td>0.06</td>
<td>0.0022</td>
</tr>
<tr>
<td>DUS</td>
<td>DXB</td>
<td>3114</td>
<td>0.52</td>
<td>0.13</td>
<td>0.0025</td>
</tr>
<tr>
<td>MUC</td>
<td>MIA</td>
<td>5008</td>
<td>0.41</td>
<td>0.12</td>
<td>0.0024</td>
</tr>
<tr>
<td>CDG</td>
<td>LAX</td>
<td>5670</td>
<td>0.67</td>
<td>0.15</td>
<td>0.0028</td>
</tr>
<tr>
<td>PRG</td>
<td>JFK</td>
<td>4082</td>
<td>0.50</td>
<td>0.12</td>
<td>0.0026</td>
</tr>
</tbody>
</table>