

# ICAO Options for Allocating International Aviation CO<sub>2</sub> Emissions between Countries – an Assessment

## 1. Background

The issue of how to allocate responsibility for the CO<sub>2</sub> emissions generated by international aviation between countries is a long standing question. In the 1990s a range of allocation options was explored within the UNFCCC but no agreement was reached. At the present time the group of high level experts that has been formed to advise on the establishment of the ICAO Market Based Measures (MBM) Framework is tackling this issue. The experts have arrived at three potential alternatives for carbon allocation and for the geographic scope of market based measures when implemented at a national or regional level or for allocating responsibility to states under a global scheme.

This paper is essentially a brief overview of the pertinent arguments and puts forward the author's thoughts on the objective merits of the allocation options now under consideration.

## 2. The Three Allocation Options

The three broad options for allocating carbon obligations identified by the MBM experts are to impose obligations based:

1. On all departing international flights from a State.
2. On all international flights carried out by operators registered in a given State.
3. On international flights on the basis of the nationality of airspace travelled through.

These categories define the three identified options at a high level – clearly there are many sub-options and variants of these that may be explored during the discussions.

## 3. Assessment Criteria

The suitability of the allocation options needs to be assessed using agreed selection criteria. Inevitably there will be a diversity of views on the criteria that should be used for this task. Nevertheless, three high level assessment categories can be identified that broadly capture the issues that will need to be addressed if acceptable and sustainable allocation outcomes are to be achieved:

1. *Transparency/trust* – it is important that third parties can independently verify carbon emissions.
2. *Simplicity* – complex allocation systems are inefficient and threaten transparency.
3. *Fairness/equity* – carbon obligations need to be placed on the entities that are emitting the CO<sub>2</sub> and, ideally, there should be total capture of international aviation's carbon footprint.

### **Comments on Assessment Criteria**

#### *Transparency/Trust*

- It is fundamental that all carbon allocations are open to public scrutiny. Without transparency it is unlikely that there will be any broad acceptance of any ICAO outcome. At the very least, independent experts such as academics and industry analysts should be able to compute and verify international aviation carbon emissions, on an ongoing basis, using publicly available data.

In addition to public scrutiny, other parties will be seeking transparency

- ❖ individual States will need to be able to verify the carbon emissions of other States both to judge whether they are being fairly treated (this would be comparable to the Monitoring, Reporting and Verification (MRV) obligations under the UNFCCC) and to ensure that the accounting methodologies provide a sound basis for enforcement
- ❖ aircraft operators will need to be able to ensure that they are not being exposed to unfair economic imposts compared to their competitors
- ❖ other sectors of the economy (particularly competing transport modes) will have an interest in knowing the quantum of the carbon obligations being met by international aviation.

#### *Simplicity*

- Simplicity reduces the administrative workload, and hence costs, for airlines and governments.
- Simple systems are less likely to result in allocation errors and/or be open to accusations of allocation malpractice or to enforcement disputes.
- Simplicity aids transparency.

#### *Fairness/equity*

- Carbon obligations should be imposed on the entities that are directly generating CO<sub>2</sub> emissions (eg airline passengers) or are indirectly benefitting from the generation of the CO<sub>2</sub> (eg the country of origin of a flight).
- It is fundamental that any system results in all, or almost all (say 95%), of international aviation's carbon being allocated between countries and avoids double counting. If there is significant carbon leakage, the outcome will be seen as inequitable by the broad community and there will be continuing pressure on ICAO and on international aviation to take further action.

## **4. Assessment of Allocation Options**

The following paragraphs give an overview assessment of the merits of the three options when tested against the assessment criteria discussed in the previous section.

### **Option 1 – Allocation based on departing flights**

#### *Transparency/Trust – Good*

- Tracking and reporting fuel uplifted is the simplest and most transparent way to allocate CO<sub>2</sub> emissions for departing flights. Allocation based on fuel uplifted provides an excellent avenue for scrutiny (fuel use data can be directly converted to CO<sub>2</sub> generation data). Data on aviation fuel use is gathered, and made publically available, in many countries. For example, data on aviation fuel use is routinely reported by the International Energy Agency (IEA) for a large number of States.
- Scrutiny of allocations can also be carried out using relatively simple computer models to compute the average CO<sub>2</sub> emissions of flights between city pairs.
- It is common practice to compute and validate the CO<sub>2</sub> emissions of international aviation using data on uplifted fuel. UNFCCC Annex 1 countries report CO<sub>2</sub> generation for international aviation as a memo item based on the quantum of aviation fuel uplifted by international aviation in the reporting country.

#### *Simplicity - Good*

- Scrutiny is straightforward if the fuel uplifted approach is adopted. The quantity of aviation fuel uplifted to international operations is simple to measure and track (eg in Australia it is routine practice for government agencies to differentiate between fuel used for domestic and international operations in order to impose excise duties on domestic aviation fuel).

- As indicated above, data on fuel use is already gathered and published by governments for purposes such as the imposition of excise on domestic aviation fuel; energy reporting (IEA); CO<sub>2</sub> reporting (UNFCCC); fuel use reporting (ICAO). Therefore in many situations little additional work would be required for independent validation of allocations under this option.

#### *Fairness/Equity – Good*

- All flights on a given route are captured.
- The country in which the fuel is uplifted is benefitting in some way from the operation (eg the flights are boosting tourism and business/conference travel; are facilitating citizens travelling; etc). These benefits may be less clear in the case of a hub airport which essentially acts as a refuelling point, nevertheless the State involved is gaining the economic benefits of hosting a transport hub.
- Determining the carbon allocation directly from the quantity of fuel uplifted provides a direct means of allocating the carbon. There is no need for secondary CO<sub>2</sub> computations. This provides a system that is seen to be fair and is less prone to CO<sub>2</sub> ‘computational error’ (whether accidental or deliberate).

#### *Other considerations*

This option is particularly attractive in that it can be progressively implemented. A carbon management regime could be built up over time route by route, airport by airport, or country by country.

There are some computational issues relating to tankering and to the domestic/international fuel split which need to be taken into account when carrying out validation based on fuel use. However, these can usually be addressed through application of simple computer modelling.

Some current carbon accounting systems (eg the EU ETS) use actual fuel use per flight, rather than fuel uplift, as the basis for reporting. This adds a layer of complexity and an administrative burden for both the airlines and the aviation authorities which, while improving the accuracy of allocations to operators, weakens the transparency of the system.

### **Option 2 – Allocation based on nationality of carriers**

#### *Transparency/Trust – Good/Fair*

- This is a more complex option than Option 1 with respect to third party scrutiny. In particular, operational data sets covering many countries are required to compute fuel use (operational datasets from all States in which the national carriers operate – this compares with the need for only one operational dataset if the validation relates solely to the CO<sub>2</sub> emissions generated by flights from one country as in Option 1).
- Emissions monitoring based solely on aircraft operator fuel use involves confidentiality issues which can make third party scrutiny difficult. Some airlines are now reporting fuel use and CO<sub>2</sub> generation in their annual reports. This data provides valuable validation points.

#### *Simplicity – Fair*

- This option is administratively more complex than Option 1 since there is a need to access and verify data provided by fuel suppliers from multiple countries in order to compute CO<sub>2</sub> emissions.

#### *Fairness/Equity - Poor*

- Carbon obligations are not necessarily imposed on the countries gaining the direct economic benefits of the aviation activity (if a foreign airline is travelling between two ‘overseas’ airports). In practice this will not be an issue if carbon costs are fully passed on to passengers or freight forwarders.

- This option will lead to competitive distortions on routes where only some operators have carbon obligations.
- Transparency weaknesses inherent in this approach are likely to make it difficult to gauge the quantum of the relative carbon obligations being met by different operators on different routes.
- Depending on the design of the allocation system, this approach could lead to the establishment of ‘flags of convenience’ airlines.

### **Option 3 – Allocation by nationality of airspace**

#### *Transparency/Trust – Poor*

- Detailed information on individual flight paths and/or fuel used by individual aircraft on specific operations is unlikely to be made available to third parties for validation purposes. Even if this information were made available to third parties the CO<sub>2</sub> computations would likely be onerous.

#### *Simplicity - Poor*

- It would appear that this option would require detailed operational and fuel burn data for every flight. Flight paths for operations on any city pair vary from flight to flight and day to day due to variables such as winds and other weather conditions, traffic volumes, etc. This complexity would impose a major administrative burden both on airlines and aviation authorities for both reporting and verification.
- Computation of fuel burn and CO<sub>2</sub> generation in any particular segment of airspace is complex. Given this, and the lack of data transparency, it is likely that reported emissions will be open to third party (and possibly airline) challenge.
- If the system involves CO<sub>2</sub> computation for every national airspace passed through en route between two airports it will require the gathering and verification of data from multiple aviation authorities for many flights. It is not clear that such a data gathering requirement is practicable.

#### *Fairness/Equity - Poor*

- If carbon obligations are incurred by a country when an aircraft passes through its airspace without landing, the obligations would be imposed on an entity which is gaining no economic benefit from the transport of the passengers or goods (other than a fee for en route ATM). Ideally the pass through costs of CO<sub>2</sub> pollution (and indeed any pollution) should be borne by the user (ie the passenger or freight receiver).
- If no carbon obligations were to be allocated for the sectors of flights which pass through international airspace there would be a very significant amount of carbon leakage (informal advice indicates that about 50% of the carbon footprint of international aviation would be unallocated). If international airspace is not captured there could be incentives for airlines to take ‘inefficient’ routes on some flights in order to avoid carbon charges.
- Aircraft routings based on the minimisation of total costs (including carbon charges) rather than on the minimisation of fuel use, may perversely result in curtailment of the use of beneficial ATM procedures such as flex-tracks.

#### *Other considerations*

While there may be a number of ways in which this Option could be implemented, they would all be problematic. Complexity questions could be reduced by simply imposing the carbon charge on emissions generated in the airspace of the departing country. However, this would inevitably mean that only a very small proportion of international aviation’s emissions would be managed.

## 5. Overview of Option Assessment

Option	Transparency/Trust	Simplicity	Fairness/Equity
1. Departing Flights	Good	Good	Good
2. Carrier Nationality	Good/Fair	Fair	Poor
3. Airspace	Poor	Poor	Poor

Overall, **Option 1** - a system based on imposing carbon obligations on departing flights - is the best approach when considered against all three of the selection criteria. This type of system could be introduced progressively on a route by route basis if so desired. An approach which bases the carbon obligation on the quantum of fuel uplifted (eg some form of carbon surcharge on the price of aviation fuel) would be the most transparent approach and the easiest scheme to administer (in particular the monitoring, reporting and verification of the CO<sub>2</sub> emissions). Such an approach would be consistent with current carbon reporting regimes (eg UNFCCC) and would be the most equitable as the carbon charge would apply equally to all operators on captured routes.

**Option 2** - the country of aircraft registration approach, while not as suitable as Option1, could be an acceptable compromise. This approach would have advantages in that it would align with some of the data reporting mechanisms currently used by ICAO. The main problems with this option would involve equity issues unless the scheme were globally adopted. In particular, there would be the real risk of competitive distortion on many routes. This approach also has transparency weaknesses and, if adopted, it would be necessary to establish an accessible MRV regime.

The airspace approach – **Option 3** - is demonstrably the poorest option. It provides virtually no room for independent scrutiny of allocations and, depending on the scheme design, could impose carbon obligations on countries which have no direct involvement in the economic benefits of flights. It is evident that any rigorous airspace approach would be extremely complex to administer. It would almost certainly result in significant carbon leakage and would be likely to lead to the adoption of practices that would reduce the overall CO<sub>2</sub> efficiency of international aviation.

## 6. Observations

This paper does not contain any new ideas – it is simply an attempt to gather together the nub of arguments that have been pursued over many years.

Ultimately if an allocation outcome is going to be acceptable it will need to be seen as being fair and equitable by the negotiating parties. In the end, if the most acceptable option is non-transparent and complex to administer these deficiencies will simply be the price of compromise and will need to be managed.

It is interesting that in this particular case, prima facie the most equitable approach is also the most transparent and administratively simple. Given this, it would appear that the ‘departing flights’ approach would be likely to gain the greatest support within the wider community and hence be the most sustainable solution.

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January 2013