RECOMMENDED PRACTICE 1678

CO_2 EMISSIONS MEASUREMENT METHODOLOGY

CSC(36) 1678

Expiry: Indefinite

Type: A

RECOGNIZING there is a growing interest from shippers to receive CO_2 information from their transportation providers;

RECOGNIZING ALSO that, with multiple measurement methodologies available, there is a need and value to have one, consistent international standard to measure CO_2 emissions generated by air cargo, in order to support requirements from regulators and shippers;

CONSIDERING that actual routing (i.e. distance and conveyance) is unknown at booking time, the predictive calculation methodology is not recommended, as the extent of uncertainties gives rise to unsatisfactory accuracy of results;

ACKNOWLEDGING that methodologies and emission factors are available for other modes of transport (maritime, road, rail);

It is therefore RECOMMENDED that:

Where Members wish to measure the CO_2 emissions of their air cargo services, the following principles and methodology described herein shall be used.

1. SCOPE OF RECOMMENDED PRACTICE

1.1. This Recommended Practice defines a standard methodology for airlines and any third party to measure the CO_2 emissions generated by air cargo at shipment level covered by a single Air Waybill (AWB).

1.1.1. The CO_2 emissions are calculated from the fuel consumption linked to the vehicle operational processes (for aircrafts, it includes processes such as airborne, taxiing, turnaround, auxiliary power usage – as defined in the IATA's Fuel Measurement Protocol).

1.1.2. The upstream emissions are not included. Note: the calculation of upstream emissions might be required by local regulations. In such cases, the airlines have to follow the associated guidelines and multiply the CO_2 emissions by a given factor.

1.1.3. The handling processes (such as cargo storage in the warehouse, handling devices and vehicles, loading and offloading activities) are not included.

1.1.4. The administrative processes or overhead (such as operation of buildings, staff commuting, IT infrastructure) are not included.

1.1.5. The non CO_2 emissions are not included.

1.2. The implementation of this Recommended Practice demonstrates the willingness of IATA Members to introduce a harmonized and agreed industry-wide solution to address and comply with the challenges of the air cargo carbon footprint measurement and reporting.

2. GENERAL PRINCIPLES

2.1. Allocation

2.1.1. All the CO_2 emissions generated by a commercial flight shall be allocated to revenue load (passengers, cargo and mail).

2.1.2. All CO_2 emissions from full freighter operations are allocated to revenue load (cargo and mail).

2.1.3. In order to align with existing methodologies, the use of the incremental approach (marginal accounting) is not recommended for belly cargo.

2.1.4. For belly cargo, in order to provide an equitable split of CO_2 emissions between passengers and cargo and to achieve alignment and harmonization within the industry, airlines shall use the same principles developed in IATA's Carbon Emissions Calculator Methodology supporting passenger carbon offsetting programs .This consists in taking into account the infrastructure associated with passenger use (for example the weight of seats).

2.2. Data

2.2.1. It is recommended that airlines use their own historical data (fuel burn, payload distance flown) to measure the CO_2 emissions of their operating flights.

2.2.2. Considering that using actual data for each individual flight on which a shipment is transported would be misleading for the shippers, it is recommended that airlines calculate averages based on their historical data. The minimum acceptable time range for averages' calculation is the previous calendar year (as per the IATA's Fuel Measurement Protocol) but airlines may want to choose equivalent or shorter time ranges (such as previous fiscal year, last twelve months, last six months, etc.).

2.2.3. Any third-party (interline partners, code-share partners, customers, etc.) will use operating airline's data if available or data available in the public domain. Note: the data available in the public domain may be out dated.

3. METHODOLOGY

The three-step approach described hereafter shall be followed:

- Step 1: identify the different legs comprising the complete transportation service
- Step 2: calculate the CO_2 emissions for each leg
- Step 3: sum the results for all legs

3.1. Step 1: identification of the different legs of the transportation service

3.1.1. When measuring the CO_2 emissions at shipment level, the scope that shall be taken into account is the transportation service from Origin to Destination as per the MAWB.

3.1.2. The contracted transportation service may include several segments which can be:

- Air segment operated by the airline
- Air segment operated by another airline (interline, codeshare)
- Road segment (known as "Road Feeder Service")
- Waterborne segment
- Rail segment

3.2. Step 2: calculation of CO_2 emissions for each leg

3.2.1. Calculation of CO_2 emissions at shipment level will be performed after the transportation service has occurred, as the routing is definitively known.

3.2.2. For non-air segments, it is recommended to use the recognized methodologies.

3.2.3. For air segments, two options are recommended for the calculation of the CO_2 emissions allocated to a shipment. These two options are equally valid.

3.2.3.1. Option 1 – Leg-based

*Shipment weight (t) * Leg-based emission factor (kgCO_2/t)*

Where

Shipment weight (t) is the mass of the cargo carried as per the MAWB. It includes the weight of any packaging provided by the shipper, but excludes the tare weight of aircraft Unit Load Device (ULD).

Leg-based emission factor ($kgCO_2/t$) is the average CO_2 emissions generated by the transportation of one tonne of cargo on a given city-pair.
For each defined city-pair, the leg-based emission factor is calculated as follow:

$$\frac{\text{Average total fuel burn for leg}_x\text{ (t)} * 1000}{\text{Average total payload for leg}_x\text{ (t)}} * 3.15 = \text{Leg}_x\text{ emission factor } (kgCO_2/t)$$

The calculation of average total fuel burn will be done in accordance with IATA's Fuel Measurement Protocol (see Attachment A).

3.15 is the internationally-recognized constant representing the number of tonnes of CO_2 produced by burning a tonne of aviation fuel.

For belly cargo, the calculation of average total payload will be done in accordance with IATA's Carbon Emissions Calculator Methodology developed for passenger carbon offsetting programs (see Attachment B).

For full freighter, as the weight of the seats for passengers transported in full freighter aircrafts is negligible, the calculation of average total payload will be done as follow:
Total payload (t) = total cargo weight (t) + total mail weight (t).

3.2.3.2. Option 2 – Network-based

Shipment weight (t) * Distance (km) * Network-based emission factor ($kgCO_2/tkm$)

Where

Shipment weight (t) is the mass of the cargo carried as per the MAWB. It includes the weight of any packaging provided by the shipper, but excludes the tare weight of aircraft Unit Load Device (ULD).

Distance (km) is the Great Circle Distance (GCD).
As per IATA's Fuel Measurement Protocol, GCD is the IATA recommended practice to be used for all aerodrome to aerodrome distance calculations. However, it does not exclude the usage of other existing and established methods (e.g. in case of mandatory reporting requirements like an Emissions Trading Scheme describing GCD+ fixed maneuvering term). In case an alternative method to GCD is used, the airline shall disclose the method in the reporting.

Network-based emission factor (kgCO_2/tkm) is the average CO_2 emissions generated by the transportation of one tonne of cargo per kilometer for a defined network.
Examples of network emission factors: by airline (whole fleet), for domestic/regional/international flights, for wide/narrow-body aircraft, by operated aircraft, etc.
For each defined network, the network-based emission factor is calculated as follow:

$$\frac{\textit{Average total fuel burn for network}_x\ (t) * 1000 * 3.15}{\sum_{i=1}^{n}(\textit{average total payload for flight}_i\ (t) * \textit{distance flown for flight}_i\ (km))} = \textit{Network}_x \textit{ emission factor } (kgCO_2/tkm)$$

The calculation of average total fuel burn will be done in accordance with IATA's Fuel Measurement Protocol (see Attachment A).

3.15 is the internationally-recognized constant representing the number of tonnes of CO_2 produced by burning a tonne of aviation fuel.

The calculation of the distance flown will be done in accordance with IATA's Fuel Measurement Protocol.

For belly cargo, the calculation of average total payload will be done in accordance with IATA's Carbon Emissions Calculator Methodology developed for passenger carbon offsetting programs (see Attachment B).

For full freighter, as the weight of the seats for passengers transported in full freighter aircrafts is negligible, the calculation of average total payload will be done as follow:
Total payload (t) = total cargo weight (t) + total mail weight (t).

3.2.4. When historical data do not exist (new route or new aircraft for instance), the airline will use equivalent data (similar city-pair or aircraft for instance) or airline's fleet emission factor or data available on the public domain.

3.3. Step 3: sum of the results for each leg

3.3.1. Airlines may publish results on a shipment level or may aggregate results by shipper for all transportation services within a given time-frame.

4. DEFINITIONS

For purpose of this Recommended Practice, the following definitions apply:

CO_2 (CARBON DIOXIDE): this is the main global greenhouse gas and thus the largest contributor to man-made climate change, produced from burning fossil fuels and deforestation.

UPSTREAM EMISSIONS: emissions linked to energy operational processes such as extraction or cultivation of primary energy, refining, transformation, transport and distribution of energy.

GREAT CIRCLE DISTANCE (GCD): this is the IATA recommended practice to be used for all aerodrome to aerodrome distance calculations. GCD is defined as the shortest distance between any two points on the surface of the earth, using the Vincenty distance formula associated with the World Geodesic System. The latitude and longitude of the aerodromes can be taken either from aerodrome data published in the national Aeronautic Information Publication (AIP) or from a source using such data (e.g. ICAO).

BELLY CARGO: cargo transported in passenger aircraft.

5. REFERENCES

IATA'S FUEL MEASUREMENT PROTOCOL: IATA's guidance to airlines to enable participation in IATA fuel consumption data collection efforts in support of the airline industry's fuel efficiency and global environmental objectives.

IATA'S CARBON EMISSIONS CALCULATOR METHODOLOGY DEVELOPED FOR PASSENGER CARBON OFFSETTING PROGRAMS: Methodology to calculate and allocate CO_2 emissions to passengers developed by IATA for its Carbon Offset Program and based on the UN's International Civil Aviation Organization (ICAO) methodology. IATA's methodology allows airlines to use their own verified data on fuel burn, passenger and cargo weights, seat configurations and load factors.

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Attachment "A"

Definition of Fuel Consumption
(Extract from IATA's Fuel Measurement Protocol, version 17 January 2014)

Each airline is requested to utilize one of the IATA recommended fuel consumption measurement methodologies:

- Method A - based on financial records
- Method B – block-off/block-on
- Method C&D – subsequent flight measurement after fuel uplift

In general fuel consumption must include:

- Landing and take-off cycle (LTO)
- Fuel consumed by the auxiliary power unit
- Taxiing, holdings
- Turn-around of aircraft
- Repositioning flights

Fuel consumption excludes:

- Engine run-ups
- Training flights
- Aircraft delivery flights
- State flights
- Search & rescue flights
- Transporting head of states and government ministers
- Police flights
- Military flights
- Fuel consumption when in Maintenance Repair and Overhaul (MRO)

Fuel uplift may be determined based on the measurement by the fuel supplier, as documented in the fuel delivery notes or invoices for each flight. Alternatively, fuel uplift may also be determined using aircraft on-board measurement systems. Uplift data shall be recorded in:

- Mass and balance documentation, or
- Aircraft Technical Log, or
- Electronically transmitted from the aircraft to the aircraft operator (e.g. via ACARS)

Fuel contained in the tank may be determined using aircraft on-board measurements systems and shall be recorded in:

- Mass and balance documentation, or
- Aircraft Technical Log, or
- Electronically transmitted from the aircraft to the aircraft operator (e.g. via ACARS)

The airline is requested to use the most accurate and complete measurement method for fuel consumption in accordance with the level of sophistication and measurement tools in place.

Note: Fuel consumption should not be planned fuel consumption, e.g. derived by using flight planning tools. Fuel consumption must be actual fuel consumed, using fuel uplift and measured values remaining in the fuel tanks of the aircraft. In the case of absence of consumed fuel data, and in exceptional cases, planned fuel consumption may be used as long as in the submission it is fully transparent and has been clearly indicated to the recipient of the data.

RECOMMENDED PRACTICE 1678
Attachment “B”

Calculation of total payload for belly cargo
(Extract from IATA Carbon Calculator Version 2.0)

We assume that fuel usage is proportional to weight. So passenger fuel usage is the ratio of total passenger weight to total weight multiplied by the total fuel used.

Total Passenger Fuel Usage = [(Total Passenger Weight / Total Weight)] x Total Fuel Used

Where,

Total Weight = Total Passenger Weight + Total Freight Weight

Total Passenger Weight (kg) = (Number of Seats * 50kg) + (Number of Passengers * 100kg)