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INTRODUCING FOR EMISSIONS MONITORING EXPERIENCES FOR AVIATION IN REPUBLIC OF KOREA

(Presented by the Republic of Korea)

EXECUTIVE SUMMARY

The Republic of Korea (ROK) proclaimed new ambitious GHG mitigation target for aviation sector in 2015. To achieve the target, ROK has been implemented three major administrable measures, i.e., Korean Emission Trading System (ETS), Agreement of Voluntary Activity (AVA) and National Inventory Report (NIR), therefore all of aircraft emissions are subjected to the management. The MRV system of each measure varies by their boundaries, participants, type of target, and so on.

This information paper intended to provide the information of Monitoring method for various GHG management measures. Additionally, the principals and considerations for design of GMBM scheme have been compared to various measures

<i>Strategic Objectives:</i>	This working paper relates to Strategic Objectives E – <i>Environmental Protection</i> .
<i>Financial implications:</i>	No additional resources requested.
<i>References:</i>	

1. EFFORTS TO REDUCE GREENHOUSE GAS EMISSION FOR AVIATION IN REP. OF KOREA

1.1 Though the Republic of Korea (ROK) falls Non-Annex I countries, the 37% mitigation from 2030 business-as-usual (BAU, 850.6 MtCO₂eq) announced by the ROK has been submitted to the United Nations Framework Convention on Climate Change (UNFCCC). As well as, government established the GHG mitigation plan for international aviation sector as 1.3% of aircraft fuel efficiency by 2025 and has been submitted to ICAO. The amount of GHG reductions, with robust implementation of action plan, will be 13% of emission prediction by 2025 (25million tons of GHG).

1.2 To achieve the ambitious GHG mitigation target, as the administrable measure, the Korean government set more effort to the Agreement of Voluntary Activity (AVA) with national aircraft operators for international flight which has been implemented since 2010. For domestic flights, Emission Trading Scheme (ETS) has been introduced since 2015. Accordingly, aviation stakeholders make aggressive efforts to reduce GHG emissions from both domestic and international flights.

2. PURPOSE OF IP

2.1 According to the draft Assembly Resolution on a Global Market-Based Measures (GMBM) scheme, the SARP and related guidance material will be developed for implementation of monitoring, reporting and verification (MRV) system by June 2017 and all Member States will prepare for implementation of MRV system from Jan. 2018.

2.2 This information paper introduce and share the lesson learned by Republic of Korea, prior to the start of GMBM scheme, based on the experiences of MRV system under AVA and ETS. Especially it is focused on the procedures and specification of measuring steps.

3. GHG REDUCTION SYSTEM OF AVIATION

3.1 Target Management System (TMS) has been operating, designed for achieving GHG reduction for domestic flights. Under TMS, aircraft operators with annual emissions amount to over 50,000 tCO₂eq are obligated to submit a report on their historical emissions levels and set their emissions targets. TMS has being served as a preparative scheme of the obligatory ETS, which started in 2015. Companies whose annual emissions amount to over 125,000 tCO₂eq are subject to the ETS. Aircraft operators under TMS and ETS have to monitoring and reporting their emissions using same MRV system which regulated by Government. All of commercial aircraft operators in Korea are currently incorporated into ETS. Data collected under the TMS and ETS is used to compile the national inventory.

3.2 Not only domestic emissions but also international emissions should be monitored and reported under AVA, following its own guideline. In addition, all the flights in and out of EU ETS Aviation Territories should be reported its emissions in accordance with EU-ETS Aviation monitoring and reporting regulation (MRR).

4. MONITORING METHOD FOR GHG EMISSIONS OF AVIATION

4.1 GHG covered

4.1.1 CO₂ is subjected to international flight, and Non-CO₂ are also subjected to domestic flight.

4.2 Activity Data

4.2.1 Type of fuel, total fuel consumption, domestic and international fuel consumption, number of landing/take-off cycles (LTOs) are required for calculating emission in accordance with IPCC guideline.

4.2.2 Reduction target are allocated according to the Revenue Tonne-kilometer (RTK) and Tonne-kilometer (t-km) in AVA and EU ETS respectively. Tonne-kilometer data is calculated by multiplying the distance by payload. Therefore, distances and payload data are required additionally. Distance is an equal the great circle distance (GCD) under AVA, and is calculated by adding the additional coefficient of 95 km to GCD under EU-ETS.

4.2.3 Payload define varied according to system. Under AVA guideline, the payload is calculated by adding up the freight and mail weight, revenue passengers, non-revenue passengers, positioning crew and checked baggage weight. The basic value for the passengers and checked baggage is set to 90 kg per passenger for international flight. When calculating the weight of the passengers and checked baggage, the duty crews for the flight and infants without seats are excluded from this calculation. According to EU ETS, the payload means the total mass of freight, mail, passengers and baggage carried onboard the aircraft during a flight. Excludes crew members and the basic value for the passengers and checked baggage is set to 100 kg per passenger.

4.3 Tier requirement

4.3.1 Minimum requirement of estimation (Tier) is categorized three groups (Table 1) according to size of installation (sum of the annual emissions from all aircraft) in accordance with ETS guideline. The Tier requirements to determine the respective parameters (Emission Factor [EF], Net calorific Value [NCV]) of source stream shown in Table 2.

Table 1. Classification according to size of installation

Group	Description
Group A	Flight with total annual emissions lower than 50 ktCO ₂ eq per year
Group B	Flight with total annual emissions higher than 50 ktCO ₂ eq and lower than 500 ktCO ₂ eq per year
Group C	Flight with total annual emissions higher than 500 ktCO ₂ eq per year

Table 2. Minimum Tier requirement according to size of installation

Index	Calculation Method			Fuel Consumption			Net Calorific value			Emission factor		
	A	B	C	A	B	C	A	B	C	A	B	C
Facility Size												
Tire requirement	1	1	2	1	1	2	2	2	2	1	1	2

4.3.2 Emission method is applied different in EU ETS between large Emitter and small emitter, with criteria of a number of flight (aircraft operators operating fewer than 243 flights per period for three consecutive four-month periods) and amount of emissions (aircraft operators operating emitting less than 25,000 tCO₂).

4.4 Calculation of Emission

4.4.1 Tier 2 method is divided into Landing and Take-off (LTO) and cruise phases is applied to calculate the amount of GHG emission under ETS, AVA and NIR. Thus, the number of LTOs by aircraft type and fuel consumptions are required.

4.4.2 Emissions are calculated multiplying the fuel consumption and emission factors under EU ETS aviation scheme. Large emitter should monitored their actual fuel consumption per flight. In case of small emitter, instead of monitoring actual consumption, fuel consumption can be estimated using any system approved by the European Commission, such as Small Emitters Tool, in order to reduce administrative costs.

4.5 Choice of Emission Factors

4.5.1 The emission factor (EF) is applied with LTO EF and cruise EF, in accordance with 2006 IPCC guidelines. AVA is applied CO₂ EF in accordance with ICAO guideline when using Tier 1 and is applied CO₂ EF in accordance with 2006 IPCC guidelines when using Tier 2.

4.6 Fuel consumption

4.6.1 Fuel consumption data is based on the amount of fuel that was actually consumed by each flight, including fuel consumption of the auxiliary power unit (APU). Fuel consumption data is acquired for the Aircraft Communications Addressing and Reporting System (ACARS) equipped aircraft in the following ways (Method A) and amount of fuel lift is acquired for fuel slip provided by supplier.

Method A: Actual fuel consumption for each flight = Amount of fuel remaining in the fuel tank after the previous flight + Amount of fuel supplied to the aircraft fuel tank for the next flight – Amount of fuel remaining in the fuel tank for subsequent flight is completed

4.6.2 For aircraft not equipped with ACARS, data are recorded by the pilot in the technical flight log and fuel consumption is calculate in the following ways (Method B). APU fuel consumption must be included in total fuel consumption to consider average hourly fuel burn for APU per aircraft type, because of APU fuel consumption is excluded when using Method B. Average hourly fuel burn for APU per aircraft type is shown in table 3.

Method B: Ramp fuel – Remain Fuel

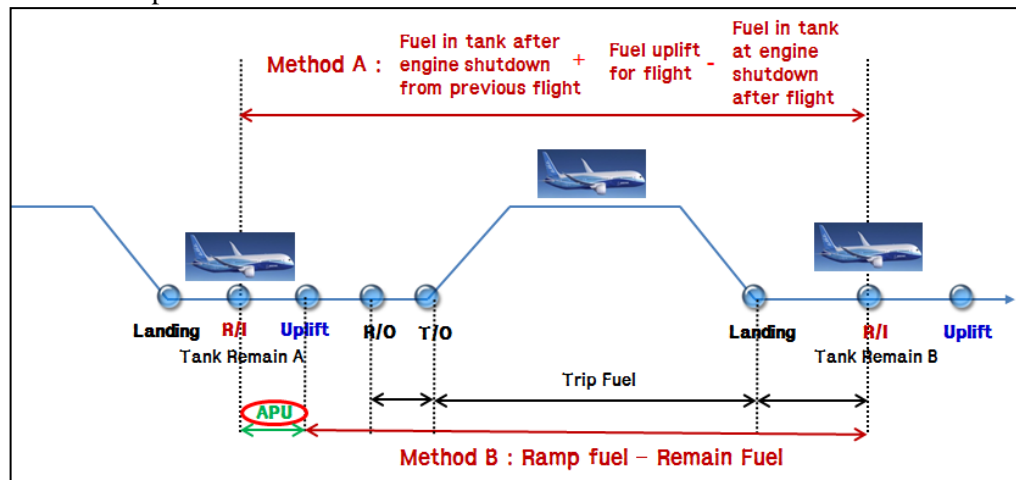


Figure 1. Phased of in-flight performance

Table 3. Average hourly fuel burn for APU per aircraft type

Aircraft Type	APU Fuel Burn kg/hr
A330-300	210
A320-200	125
B747-400	450
B777-200	312
B737-700	110

Source: Guidance material and best practices for fuel and environmental management, IATA, 2009

4.6.3 Fuel consumption defines the amount of fuel that was actually consumed by each flight, with the exception of military aircraft under ETS. AVA and EU ETS have several additional exemptions as follows; circular flights, training flight, emergency services, and humanitarian flights, etc.

5. APPROACH TO THE PRINCIPALS/CONSIDERATIONS OF GMBM AND MRV SYSTEM

5.1 Following the MRV system of GMBM, which will start pilot implementation in 2018, aircraft operator should establish the internal process especially for measuring and reporting and should be regarded as one of the most important tasks.

5.2 GMBM has been considered including environmental integrity, simplicity, and cost-effectiveness, as well as the need for differentiation without discrimination, and the goal of avoiding excessive cost or administrative burdens. These three considerations should reflect to the MRV system development. The MRV system discussed above can be summarized as follow.

Table 4. Comparison of MRV guideline by GMBM considerations

Principle	International Flight		Domestic Flight	
	AVA (Agreement of Voluntary Activity)	EU-ETS aviation	Korean ETS	NIR (National Inventory Report)
Simplicity	<ul style="list-style-type: none"> Administrative complexity may cause by emission/RTK report and efficiency target for various type of aircraft operators Data gathering system required 	<ul style="list-style-type: none"> Report using online tool(File management system) Use data gathering system connect with ACARS 	<ul style="list-style-type: none"> Aircraft operators assign designated person and data gathering system required for data collecting, calculation and report 	<ul style="list-style-type: none"> National aircraft operator should collect and report emission data to Admin. The admin internally verify the reported data without the 3rd party verification
Environmental Integrity	<ul style="list-style-type: none"> Internal review for data accuracy Using fuel efficiency target, which is more practical 	<ul style="list-style-type: none"> For small emitter, fuel consumptions are estimated by GCD calculation The 3rd party verification 	<ul style="list-style-type: none"> Responsible for tier level by emission amount The 3rd party verification required 	<ul style="list-style-type: none"> Internal review by higher Admin. No the 3rd party verification

		required.		
Cost effectiveness	<ul style="list-style-type: none"> • Designated person, GHG monitoring system • Admin's site verification 	<ul style="list-style-type: none"> • Aircraft operator is required for data gathering system and maintenance person • The 3rd party verification cost 	<ul style="list-style-type: none"> • Initial cost for GHG monitoring system (data gathering, linking, reporting) is about 8-10 thousands US dollar • At least one designated person • The 3rd party verification cost 	<ul style="list-style-type: none"> • Aircraft operator is required for data gathering and reporting system and person • Admin is required for data gathering, reviewing person

5.3 Choosing the proper principles and operating rules are very important because MRV schemes can be different according to the character of system applied for MRV. It is considered that for the countries not only experienced the MRV system, but also for the countries that newly adapt the system, a wide range of assistance should be provide in order to help early settlement.

— END —