



## **GROUP ON INTERNATIONAL AVIATION AND CLIMATE CHANGE (GIACC)**

### **THIRD MEETING**

**Montréal, 17 to 19 February 2009**

**Agenda Item 3: Planning of actions and policy elements to be developed by the Group**

### **REPORT OF WORKING GROUP 3**

(Presented by Brazil with comments by Germany and Nigeria)

#### **A PROPOSAL REGARDING MONITORING AND EVALUATION**

#### **1. PRELIMINARY REMARKS**

1.1 During GIACC's second meeting, it was agreed to form three working groups to expedite the work on the Action Plan to reduce aviation emissions.

- Working Group 1: Global Aspirational Goals
- Working Group 2: Measures to Achieve Emissions Reductions
- Working Group 3: Monitoring and Implementation

1.2 The group's membership as well as its terms of reference are included in Appendixes A and B to GIACC/2-Flimsy No. 2, presented by the Secretariat during GIACC/2.

1.3 In accordance with Flimsy No. 2, each working group was assigned a set of tasks related to the template discussed at GIACC/2. Additional tasks may be included as long as groups deem necessary to achieve their mandate. Each working group will perform its tasks bearing in mind the following:

- a. The terms of reference for the working groups as agreed at GIACC/2, consistent with ICAO's Resolution A36-22, Appendix K.
- b. The deliberations of the 1<sup>st</sup> and 2<sup>nd</sup> meetings of GIACC.
- c. Each working group chairperson will present, to the 3<sup>rd</sup> meeting of GIACC, a report on the work performed and the related recommendations prepared by the working group.
- d. The reports to be presented and related recommendations will be considered by the GIACC as its work progress.

1.4 The central task entrusted to the Working Group on Monitoring and Implementation is to recommend to GIACC how best to monitor and report on progress towards a global aspirational goal regarding aviation CO<sub>2</sub> emissions, in accordance with international obligations, for those States to which

these obligations are applicable, such as the ones included in Annex 1 of the UNFCCC. To achieve this task, the following actions have been identified:

- a. To identify relevant data available from current sources and to establish the accuracy of the data at a global level and at more disaggregated levels.
- b. To establish how to improve continuously the required data.
- c. To identify and recommend roles of states and ICAO in monitoring progress towards global aspirational goals.
- d. To identify measures to assist developing countries.
- e. To identify how ICAO can report on progress of Annex1 Parties with respect to Article 2.2 of the Kyoto Protocol.

1.5 As deliverable, GIACC/WG3 will have to produce a report for GIACC/3 setting out proposals for data collection and communication. A work of coordination with the Global Aspirational Goals Working Group (GIACC/WG1) is considered necessary. The report will also have to provide suggestions on how to address the needs of developing countries, taking into account ICAO principles and practices, especially the principle of common but differentiated responsibilities, as well as, identify the scope of application monitoring on Member States and define the role of ICAO in this regard.

1.6 This paper presents some thoughts related to the work to be developed by GIACC/WG3 and demonstrates that most of the subjects that are currently included in its mission and set of tasks have been, in its entirety or in part, object of research by CAEP's working groups.

## **2. THE EXISTING KNOWLEDGE: THE WORK OF CAEP**

2.1 A lot of work regarding several areas related to the GIACC's work has been done by CAEP in recent years. It is expected that GIACC and its working groups benefit from the analysis of this material since it represents the joint efforts of a great number of researchers working with CAEP's working groups.

2.2 Although CAEP's efforts are spread in a variety of subjects, particularly relevant to the GIACC's process is its work on emissions, databases and models and economic analysis and forecasts. Attention has also been put on the policy making aspect of this work and many guidance material and manual have been edited by CAEP under the auspices of ICAO. In the following paragraphs the work of CAEP's working groups are briefly reviewed. We focus our attention on the issues that pertains directly to the work that is under development by GIACC, as established in its terms of reference.

### **2.3.1 CAEP's Working Group 2: Operations**

2.3.1.1 CAEP's Working Group 2 has responded to the higher priority from ICAO for the work of GIACC. Its mission is to assess the relevance of all factors related to aviation that are considered to have direct or indirect impact on global climate change.

2.3.1.2 The mission of the Air Traffic Management Task Group (WG2/TG2) is to assess the impact that improvements on ATM have in aviation emissions. It is expected that the implementation of the CNS/ATM (Communication, Navigation, Surveillance/Air Traffic Management) system, that represents a generalized upgrade in the GNSS (Global Navigation Satellite System) technology used in air transportation, will optimize the world air traffic system capacity, mainly with respect to the arrivals and departures per minute rate, at the air transport terminals, something that will allow significant economies of fuel and less emission in a global level.

2.3.1.3 As a matter of fact, TG2 has responsibility to examine the concept of environmental impact assessment applied to CNS/ATM and define the appropriate methodologies in order to quantify the benefits resulting from the implementation of CNS/ATM plans/programs and to identify appropriate ATM improvements.

2.3.1.4 An important task assigned to WG2/TG2, this one especially related to GIACC's Working Group 3, is **to develop an ICAO guidance on computing, assessing and reporting on aviation emissions at national and global levels**. A more specific task definition is proposed so that it only addresses CO<sub>2</sub> for aircraft emissions during operation (gate to gate). The group recognized that the term aviation could include all emissions from all sources related to air transport activities during all life-cycle phases. A more detailed discussion about this subject is presented in next section of this paper (Cf. Section 4).

2.3.1.5 Another task assigned WG2/TG2 that is consistent with GIACC's WG/2 is the development of environmental indicators. The initial task was to make a review of present guidance and practice in support of wider ICAO activities in environmental performance indicators (EI). As this activity develops and based on this review it should be possible to develop EI guidance, recommended practices and/or checklists etc.

## 2.3.2 CAEP's Modeling and Database Task Force (MODTF)

2.3.2.1 The modeling and database working group is responsible to providing to CAEP information and expertise regarding databases, models and its evaluation that can be used to inform other analysis such as stringencies (on noise and emissions), CNS/ATM impacts (economic, environmental and operational), market-based measures, economic forecast, and others. Of particular relevance for GIACC process is the work related to modeling and evaluation of databases.

2.3.2.2 Actually the ICAO's Statistics and Database Section maintains a complex and comprehensive set of databases that include information on airports, aircraft movements, passenger traffic, aircraft fleet, aircraft performance, and aircraft engines, which includes certification data on noise and emissions. These data are available to states at no charge. Some of these databases are discussed briefly below.

2.3.2.3 The Campbell-Hill Fleet Database identifies on an aircraft tail-specific basis, the commercial aircraft (passenger and cargo/freight) in the existing fleet worldwide. Details include region of domicile, State of domicile, operator, aircraft type, engine type, aircraft maximum takeoff and landing weights, and number of seats.

2.3.2.4 The ICAO Aircraft Noise Database (NoiseDb) provides certification noise levels for each aircraft type and model entry. Data includes Airframe Parameters (manufacturer name, aircraft type, aircraft version, modification(s), weight, slats/flaps), Engine Parameters (engine type, engine number, propeller type, modification(s), thrust, bypass ratio), Regulation Parameters (regulation application, chapter/stage number, certification authority, dossier, certification date), and Noise Levels (flyover, sideline, approach, cumulative).

2.3.2.5 The NoiseDb is linked with the Emissions Certification Database that provides a common source of mapping certified airframe-engine configurations to the relevant certified emissions data in the ICAO Aircraft Engine Emissions Databank (EED).

2.3.2.6 The ICAO Aircraft Engine Emissions Databank (EED) contains information on exhaust emissions of those aircraft engines that have entered production, irrespective of the numbers actually produced. It has been compiled mainly from information supplied for newly certified engines. The information was provided by engine manufacturers, who are solely responsible for its accuracy. For some engines, the data has been revised to reflect evidence from subsequent engine tests. It also includes

data on older engines which did not have to comply with the emissions standards and some data from a very limited number of in-service engines measured before or after overhaul.

2.3.2.7 The Aircraft Noise and Performance (ANP) Database provides, for a wide range of aircraft types, the required data to enable the practical implementation of the recommended methodology in computerized noise modeling systems, and facilitates data commonality within the international community of aircraft noise modelers. The database is currently supported by EUROCONTROL, in collaboration with FAA/Volpe.

### 2.3.3 The Forecast and Economics Support Group (FESG)

2.3.3.1 Recently the FESG reviewed and approved an updated traffic and fleet forecast. The forecasts are fully compatible with the requirements of MODTF, which sets minimum standards that databases and models have to satisfy in order to be used by ICAO. Forecasting and Operations Module (FOM): The FOM is used to generate aircraft movements for future years using the FESG forecast. The data and methodological assumptions were developed for CAEP/5 and FESG and MODTF have completed a re-evaluation of the validity of those assumptions and incorporated identified improvements.

### 2.3.4 Working Group 1 and Working Group 3

2.3.4.1 CAEP's Working Groups 1 and 3 deal with technical matters related to noise and emissions respectively. They also develop and evaluate models and databases that eventually can be used by GIACC's working groups.

2.3.4.2 WG1 and WG3 will provide a linked database of aircraft/engine combinations, containing noise and emissions certification data, that is valid for assigning "Growth and Replacement" aircraft to generate future fleets. This database is expected to be developed using the most recent version of the ICAO noise and emissions certification databases. For the purpose of modeling, consideration will also need to be given to what performance data should be assigned to each, for both the terminal-area and en-route regimes. Models will be updated to include the latest aircraft engine combinations that will be covered in the linked database of aircraft/engine combinations.

2.3.4.3 Finally it is worth mentioning that WG3 has 3 Task Groups that deal directly with issues connected to GIACC's mission, such as: characterization of emissions (CETG), certification (CTG) and long term technology goals (LTTG).

## 3. THE EXISTING KNOWLEDGE: OTHER SOURCES

3.1 Given the sense of urgency inherent to the work of GIACC, it is also desirable to resort to sources other than the work of CAEP for data collecting purposes. In this regard, for instance, reports from individual states could be considered, since they can provide a broader picture when analysed as a whole. In order to facilitate monitoring, ICAO member States should report fuel consumption by using the template presented in ICAO State Letter "ENV 1/1-08/44", as well as additional information about the fleet.

3.2 In addition, the process could benefit from data collected from operators around the world. It is important to make sure that airlines will cooperate to the greatest extent possible as to the provision of the requested information and to settle safeguards related to the appropriate use of the data collected.

3.3 To further develop any or both courses of action, some preliminary steps are required, such as to define i) the precise information – and its respective sources – to be assessed vis-à-vis the work of WG1 and ii) the best way to coordinate the global collection of information. Some discussion on the obstacles to data collection and the means to overcome them is also needed.

#### **4. COMPUTING, ASSESSING AND REPORTING AVIATION EMISSIONS**

4.1 The CAEP's Steering Group tasked WG2 to develop guidance on computing, assessing and reporting on aviation emissions at national and global levels. The Appendix of working paper CAEP-SG/20082-WP/13 presents a first draft of a possible guidance document that could constitute a preliminary proposal for GIACC's Working Group 3 and will be briefly reviewed in this section. States, in the context of the GIACC's Plan of Action, should report emissions on the basis of the methodology outlined in the WP/13.

4.2 As a first step towards a guidance document, WP/13 provides a review of existing methodologies for computing, assessing and reporting aviation emissions. The methodologies are described according to their application areas that use aviation emissions. Although recognizing that the term "aviation emissions" can encompass a large variety of activities the task assigned to WG2 is related solely to aviation carbon emissions at national and global scale with emphasis on operations.

4.3 WP/13 proposes a report that aims to provide an inventory of different aviation related emissions calculations methods that have been developed and promoted by industry, standards organizations and international bodies including ICAO, IPCC, UNFCCC, European Union, FAA, US EPA, ICCAIA, IATA, ACI, SAE.

4.4 In particular, the proposed report should observe the internationally-accepted methodology developed by the Intergovernmental Panel on Climate Change (IPCC) in its Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, as well as its report on Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, which complemented those guidelines. States should use the same definitions and concepts as proposed in these documents, especially to distinguish between domestic and international aviation emissions. Those definitions were applied irrespective of the nationality of the carrier, passengers, crew and cargo.

4.5 It is worth mentioning that information regarding domestic aviation emissions are reported to the UNFCCC every four to five years through national communications of Annex I and non-Annex I Parties. The information received from Annex I Parties is reviewed on a regular basis. Annex I Parties also reported annually on specific policies and measures put in place for domestic aviation emissions as part of the GHG inventories.

4.6 WP/13 presents a preliminary approach for a structure of a report that States can use to monitor, inform, and, eventually, verify, their emissions. It is important to bear in mind that the need to address aviation's greenhouse gas emissions must be consistent with the methodologies proposed by the IPCC in the documents mentioned above.

4.7 It should be noted that the inventories relies heavily on fuel consumption and operational data on flights both for domestic and international aviation, something that the statistics systems of States can provide.

4.8 It was demonstrated previously that CAEP's working groups have made important progress in areas that are included within the scope of GIACC. The objective of this notes was, thus, to bring this work and experience to the attention of GIACC, in particular its Working Group 3, trying to avoid a senseless duplication of efforts that may compromise the group's mission.

#### **5. ACTIONS REQUIRED**

5.1 GIACC/WG3 is invited to:

- a) Note that comprehensive work has already been done by CAEP in areas related to issues connected to GIACC's mission, such as fuel and

technology goals; measures to reduce emissions; and reporting and monitoring and implementation;

- b) Note the work that has been done by other sources, such as consistent and appropriate data from States, Industry and Operators;
  - c) Establish Emissions Reporting Processes and Procedures to address new intake issues such as who shall notify, to whom notify and with which notification frequency. This approach shall clarify that only Annex I countries would be obliged to make notifications on the reduction of emissions as non-Annex I countries would be encouraged to report voluntary efforts on a regular basis.
  - d) Establish a liaison group constituted by CAEP Secretariat and CAEP members to liaise with GIACC's working groups and Secretariat to prevent that GIACC duplicates work that is currently being done by CAEP's working group;
  - e) Note the methodology for monitoring and implementation presented in CAEP-SG/20082-WP/13 as a preliminary step for the development of a proposal to be presented at GIACC/3;
  - f) Note that the proposal to be developed must be consistent with the methodologies, concepts and definitions adopted and recommended by IPCC for the national GHGs inventories regularly reported to UNFCCC and its Kyoto Protocol.
  - g) Regarding the schedule of the meeting, the President of the Council has approved the suggestion from the GIACC and working groups Chairs to have a three day meeting preceded by a one day coordination meeting for the working groups. The coordination meeting will be held on Monday, February 16<sup>th</sup>.
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**ATTACHMENT**  
**(English only)**

**GIACC/3**  
**Working Group 3**  
**Monitoring and Implementation**

**Action oriented recommendations**

How ICAO Member States should report international aviation GHG emissions:

- The template presented in ICAO State Letter “ENV 1/1-08/44” should be used for reporting;
- Annex I States should report annually to ICAO;
- Non-Annex I States are encouraged to report annually to ICAO;
- ICAO should provide, upon request, technical assistance and cooperation to developing countries on collecting, processing and disseminating data.

**Action oriented recommendations**

How ICAO Member States should report international aviation GHG emissions:

- ICAO should elaborate triennial comprehensive progress reports containing:
  1. Consolidated data on fuel consumption, fuel efficiency and traffic,
  2. Assessment of progress achieved in attaining global aspirational goals;

**Action oriented recommendations**

Data collection and Implementation

- ICAO should play a leading role in coordinating the collection and analysis of data gathered from all available sources;
- CAEP should continue to analyze data and report on measures adopted by Member States to reduce emissions;
- Data on fuel consumption from industry and operators around the world should be collected in close collaboration with pertinent international entities;
- ICAO should adopt the appropriate mechanisms to verify, taken into account the principle of CBDR, progress made by States in reducing international aviation GHG emissions;

— END —