



CONFERENCE ON AVIATION AND ALTERNATIVE FUELS

Rio de Janeiro, Brazil, 16 to 18 November 2009

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS FROM THE SECOND MEETING

1. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS FROM THE FIRST MEETING

1.1 The summary of conclusions and recommendations from the first meeting were approved as presented in CAAF/09-SD/1.

2. AGENDA ITEM 2

2.1 Conclusions – Technological Feasibility and Economic Reasonableness of Sustainable Alternative Fuels for Aviation

2.1.1 From the documentation and ensuing discussion during the second meeting on technological feasibility and economic reasonableness under Agenda Item 2, the Conference concluded the following:

- a) The supply chain that involves the life cycle of sugarcane ethanol, its renewability and low carbon content, make sugarcane ethanol potentially an environmentally sustainable product;
- b) The production of sugarcane ethanol in tropical climates enjoys an extremely favorable net energy gain;
- c) Using sugarcane ethanol as a fuel offers both technological feasibility and economic viability under certain conditions;
- d) There is availability for sustainable expansion of sugarcane plantations in various countries, including Brazil. This offers potential for the creation and expansion of the biofuels industry;
- e) Various countries already have the infrastructure needed for large-scale production of sugarcane;
- f) Sugarcane-based technologies being developed have the potential to work with the existing biofuels production infrastructure and have the potential to produce drop-in replacements for petroleum-derived fuels;

- g) There is potential for use of sugarcane as feedstock for the development of other sustainable biofuels;
- h) There is technical feasibility of using alternative drop-in fuels as blends with conventional fuels as demonstrated in CAAF/09-WP/10 and in CAAF/09-IP/12;
- i) The Fuel Readiness Level (FRL) scale has been developed by CAAFI sponsors and modified in consultation with a key energy supplier, an original equipment manufacturer (OEM) stakeholder, and a fuel process technology developer. It provides a gated process to govern communication of technology maturity leading to qualification, production, and deployment readiness;
- j) The FRL is appropriate for managing and communicating research status and development needs for R&D investors;
- k) The FRL is appropriate for managing and communicating the readiness for airworthiness authorities and appropriate timing for complementary and required environmental assessments;
- l) The FRL is appropriate for managing and communicating the practicality of deploying fuels for use in production aircraft, engines and aviation infrastructure; and
- m) The FRL is appropriate for use as a process for aviation fuel development and deployment risk mitigation.

2.2 Recommendations – Technological Feasibility and Economic Reasonableness of Sustainable Alternative Fuels for Aviation

2.2.1 From the documentation and ensuing discussion during the second meeting on technological feasibility and economic reasonableness under Agenda Item 2, the Conference adopted the following recommendations:

- a) Acknowledge that Brazil's efforts in the areas of (a) research, (b) technological development and (c) public policies for evaluation of the use of ethanol in piston engine aircraft may be applicable to other member States;
- b) Acknowledge the importance of international standardization for an "aviation ethanol" fuel specification with specific consideration given to aircraft range;
- c) Encourage States to develop technology and feedstock independent policies based on performance criteria both in production and in use;
- d) Acknowledge the potential for use of sugarcane as well as other feedstocks for development of sustainable drop in biofuels;
- e) Encourage qualification of new drop-in fuels that result in the broadest spectrum of feedstocks and refining processes;
- f) Encourage governments to establish public policies that promote and protect the use of existing fuel infrastructures for drop-in certified aviation bio drop-in fuels (trucks, pipelines, airports, etc.);

- g) Encourage governments to establish public policies that create appropriate investments and incentives for alternative drop-in fuels;
- h) Encourage governments to establish public policies that accelerate R&D and commercial scale production of alternative drop-in fuels;
- i) Encourage governments to establish public policies that specifically target alternative drop-in fuel use for civil aviation;
- j) Recommend that ICAO support the overall process already engaged in the study, development and approval of alternative drop-in fuels for aviation; and
- k) Recommend that the Fuel Readiness Level (FRL) be adopted as a best practice to govern communication of technology maturity as a pre-condition to qualification, production and deployment readiness, including potentially different maturity levels of the fuel production chain, for example, feedstock, conversion technology and fuel qualification.

3. AGENDA ITEM 3

3.1 Conclusions – Measures to Support Development and Use of Sustainable Alternative Fuels for Aviation

3.1.1 From the documentation and ensuing discussion during the second meeting on measures to support development and use under Agenda Item 3, the Conference concluded the following:

- a) Background information has been presented on global aviation fuel industry qualification processes;
- b) Certification procedures and technical measures have been identified for the evaluation and approval of ethanol for use in piston engine aircraft;
- c) The benefits and advantages of cooperation among civil aviation authorities and voluntary consensus standards organizations facilitate the approval of new alternative fuels;
- d) As a result of these different experimentations, and due to the global characteristics of the air transport sector, the requirement for drop-in fuels as alternative fuel candidates has become obvious;
- e) Research in other types of energy should be carried further, and work is actually being carried on in some industry programmes but a positive outcome is more likely for other applications than for aircraft propulsion;
- f) Various experimental flight tests with non-drop in fuels proved to be applicable with low (or no) potential for commercial aviation;
- g) The development and possible future use of alternative fuels, in particular including biofuels, in aviation constitutes an attractive option for the development of the aviation sector, provided that technical requirements, including safety aspects as well as sustainability criteria are fulfilled;

- h) Policy decisions with respect to alternative fuels should be based upon a comprehensive assessment, including studies, development and testing of the technical feasibility, the environmental and social-sustainability dimension and economic aspects;
- i) Policy measures should have the objective to avoid unwanted and negative side effects, compromising the environmental benefits of biofuels;
- j) Sustainability criteria for aviation biofuels should be consistent with any general sustainability criteria for biofuels; and
- k) Global harmonization of sustainability criteria is needed.

3.2 Recommendations – Measures to Support Development and Use of Sustainable Alternative Fuels for Aviation

3.2.1 From the documentation and ensuing discussion during the second meeting on technological feasibility and economic reasonableness under Agenda Item 3, the Conference adopted the following recommendations:

- a) Endorse the urgent need for measures to facilitate access to financial resources, technology exchange, and capacity building specific to aviation alternative fuels;
- b) Request ICAO to organize a meeting of States, financial institutions, fuel producers, feedstock producers, aircraft manufacturers, and operators to consider a framework for financing of infrastructure development projects dedicated to aviation alternative fuels and incentives to overcome initial market hurdles;
- c) Endorse the use of the global industry qualification process as the appropriate means for approving a new drop-in alternative jet fuel;
- d) Recommend that the development of drop-in alternative fuels for aviation must be further pursued;
- e) Recommend that fuel cell technology be pursued with the aim of providing energy for on-board electrical supply and/or on ground operations;
- f) The ICAO Council and member States build their policy decisions and roadmaps on a comprehensive analysis of environmental, social and economic sustainability aspects, also taking into account technical requirements including safety aspects;
- g) Member States to work together through ICAO and other relevant international bodies, to exchange information and best practices, and in particular to reach a common definition of sustainability requirements, taking into account existing criteria and ongoing work; and
- h) Promising perspectives for biofuels should not lead to any relaxation or reduction of efforts related to other measures to reduce the environmental impact of aviation.

4. **AGENDA ITEM 4**

4.1 **Conclusions – Production and Infrastructure of Sustainable Alternative Fuels for Aviation**

4.1.1 From the documentation and ensuing discussion during the second meeting on production and infrastructure under Agenda Item 4, the Conference concluded the following:

- a) Acknowledge that cost benefit analysis is an appropriate methodology for effectively guiding investments into the development and production of sustainable alternative fuels for aircraft;
- b) Conclude that best practices for cost benefit analysis (CBA) methodology that can be tailored to sustainable alternative fuel production, using assumptions and input data that specifically reflect the external costs of aviation and the complex benefits that result from mitigating aviation's GHG emissions, can ensure that projects are fairly assessed and investments are made most effectively;
- c) The use of sustainable alternative fuels, in particular biofuels, is a promising way of effectively reducing aviation's life cycle CO₂ emissions;
- d) Candidate alternative aviation fuels need to meet stringent technical and operational requirements, in particular the "drop-in" requirement. They are acceptable only if they meet carbon lifecycle and other sustainability requirements according to generally accepted criteria and meet sufficient supply requirements;
- e) There are a variety of candidate fuels expected to meet these requirements, some of which have been successfully flight and ground tested as a demonstration for the feasibility of using alternative fuels in aviation. It is very likely that several fuels will be used simultaneously in future operational practice; and
- f) Development of feedstock growth and production facilities is now needed urgently to reach sufficient production quantities. A worldwide spread of production would ease logistics and offer new opportunities for developing countries. Substantial financial investments are needed for a successful deployment of sustainable alternative fuels for aviation at a competitive price from the beginning.

4.2 **Recommendations – Production and Infrastructure of Sustainable Alternative Fuels for Aviation**

4.2.1 From the documentation and ensuing discussion during the second meeting on production and infrastructure under Agenda Item 4, the Conference adopted the following recommendations:

- a) ICAO facilitate the dissemination of best practices for cost benefit analysis which are appropriate for evaluating sustainable alternative fuels for aircraft;
- b) States consider measures to support aviation alternative fuels research and development, investments in new feedstock cultivations and production facilities, as well as measures to stimulate commercialisation and use of sustainable alternative fuels for aviation to help reduce aviation CO₂ emissions; and
- c) ICAO, in its position for UNFCCC COP15 in Copenhagen, highlights the significant importance of the CO₂ reduction potential from sustainable alternative aviation fuels and seeks support from States at COP15 for the development and implementation of these fuels by considering *inter alia* the measures outlined above.

— END —