International Civil Aviation Organization

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WORKING PAPER

CONFERENCE ON AVIATION AND ALTERNATIVE FUELS

Rio de Janeiro, Brazil, 16 to 18 November 2009

GLOBAL FRAMEWORK FOR AVIATION ALTERNATIVE FUELS

(Presented by the Secretariat)

SUMMARY

This paper proposes a Global Framework for Aviation Alternative Fuels based upon the discussions on Agenda Items 1 through 4, for the consideration of the CAAF.

Action by the CAAF is in paragraph 2.

1. INTRODUCTION

1.1 A Global Framework for Aviation Alternative Fuels is presented in the Appendix that summarized the key milestones identified in papers submitted to the Conference on Aviation and Alternative Fuels by Contracting States and Observer organizations. It is envisioned that this Framework will be a living document that will be used to initially update the 15th meeting of the Conference of Parties to the United Nations Framework Convention on Climate Change (UNFCCC COP15) in December 2009 on the projected activities related to the development and deployment of aviation and alternative fuels. It is proposed that this document will be made available on the ICAO website and updated whenever new information is provided by member States and International Observer Organizations.

1.2 This Framework will also be used to inform the 37th Session of the ICAO Assembly in September 2010.

2. ACTION BY THE CONFERENCE

2.1 The Conference is invited to:

a) endorse the Global Framework for Aviation Alternative Fuels incorporating activities by Contracting States, Observer Organizations, and ICAO, provided in the Appendix; and

b) acknowledge that the Global Framework for Aviation Alternative Fuels endorsed by the CAAF will comprise in conjunction with the outcomes of the HLM-ENV the

basis of the input of ICAO to the on-going negotiations under the UNFCCC, and specifically to initially update the 15th meeting of the Conference of Parties to the United Nations Framework Convention on Climate Change (UNFCCC COP15) in December 2009.

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APPENDIX

GLOBAL FRAMEWORK FOR AVIATION ALTERNATIVE FUELS FIRST EDITION 2009

1. FOREWARD

a) Sustainable alternative fuels show promise of being an intrinsic part of an approach toward reducing the carbon footprint of aviation. As such, it is important to consolidate information about the many initiatives already underway to facilitate and accelerate the development and deployment of sustainable alternative fuels for aviation over the short, medium, and long term.

b) The purpose of the Global Framework for Aviation Alternative Fuels is to showcase existing activities and communicate what the international community expects to achieve in the area of aviation sustainable alternative fuels.

c) The Global Framework is envisaged as a living document, highlighting the work already accomplished and describing the objectives of future activities. An online version of the Framework will be updated, as new information becomes available, illustrating the status of key objectives and providing background and reference materials for relevant activities.

d) The initial Global Framework was approved during the final day of the first ICAO Conference on Aviation and Alternative Fuels (CAAF/09) for communication to COP15 on the accomplished and projected activities related to the development and use of sustainable alternative aviation fuels as a part of the ICAO strategy for addressing international aviation's contribution to climate change.

2. WHY SUSTAINABLE ALTERNATIVE FUELS FOR AVIATION ARE IMPORTANT

a) Engineering improvements, technology enhancements, and advanced operations (including efficiency improvements in air traffic management) all have a role to play to reduce aviation fuel use and associated carbon emissions. Significant progress has been made in establishing technology goals for reducing aircraft greenhouse gas emissions. On a per-flight basis, efficiency is expected to improve continuously through 2050 and beyond. ICAO is spearheading efforts to promote and harmonize worldwide initiatives for operational practices that result in reducing aviation's contributions to anthropogenic emissions. However, even under the most aggressive technology forecast scenarios, the anticipated gain in efficiency from technological and operational measures does not offset the overall emissions[1] generated by the expected growth in traffic. The gap between air transport emissions growth reduced by efficiency improvements and a

[1] "Aspirational Goals and Implementation Options". High-Level Meeting on International Aviation and Climate Change, 7 to 9 October 2009, Working Paper 5. HLM-ENV/09-WP/5. http://www.icao.int/Highlevel2009/Docs/HLMENV_WP005_en.pdf

chosen lower level of emissions represents a "mitigation gap" that must be closed using other strategies.

b) A promising approach toward closing the GHG emissions mitigation gap is the development and use of sustainable alternative fuels for aviation. Today such fuels are not available in sufficient quantities to meet the overall fuel demand for commercial aviation. Sustainable drop-in alternative fuels produced from biomass or renewable oils offer the potential to reduce life-cycle greenhouse gas emissions and therefore reduce aviation's contribution to global climate change. They could be an important tool in the efforts to close the mitigation gap while allowing the sector to respond to growing demand. Using these fuels may also offer reduced emissions of particulate matter, lessening aviation's impact on air quality, as the result of the significantly lower fuel sulphur content.

c) Finally, as aviation is heavily dependent over a short- and medium-term horizon on drop-in liquid fuels, the development and use of sustainable alternative fuels will play an active role in improving the overall resource allocation and security of supply, stabilize fuel prices.

3. THE OBJECTIVES OF USING SUSTAINABLE ALTERNATIVE FUELS FOR AVIATION

a) Development of sustainable alternative fuels for aviation is an essential component of future aircraft fuel supply. ICAO has undertaken efforts to promote improved understanding of the potential use and emission effects of sustainable alternative fuels. It was noted in the ICAO alternative fuels workshop (Montreal, 10-12 February 2009) that aviation fuels could be a win-win solution for reducing aviation's dependence on fossil fuels and a key element to help reduce the impact of aviation on climate change. Given sufficient demand or incentive, significant supplies of jet fuel that offer a significant reduction in life-cycle CO_2 emissions could be available in the mid-term. Certification of alternative fuels for use in aviation is already underway.

4. ICAO'S ROLE IN SUSTAINABLE ALTERNATIVE FUELS FOR AVIATION

a) ICAO is facilitating on a global basis the promotion and harmonization of initiatives that encourage and support the development of sustainable alternative fuels for international aviation The following summarize the key activities in which ICAO will be engaged in to promote this objective:

1) **Activity A:** Providing fora for education and outreach on sustainable alternative fuels for aviation

2) **Activity B:** Providing fora for facilitating the exchange of information on financing and incentives for sustainable alternative fuels for aviation programmes working with the relevant UN and regional financial entities.

3) **Activity C:** Facilitating development of standardized definitions, methodologies and processes to support the development of sustainable alternative fuels for aviation, taking into consideration the work that has been done so far in this area

4) **Activity D:** Supporting a platform for access to research roadmaps and programmes

5. **SUMMARY OF ACCOMPLISHMENTS ON SUSTAINABLE ALTERNATIVE FUELS FOR AVIATION**

2008 - *Accomplishments*

Tests and Demonstrations

- Airbus flew its A380 test aircraft with one of its four engines running on a 40% blend of Gas To Liquid (GTL) fuel with conventional jet fuel on 1 February 2008
- Virgin Atlantic flew a Boeing 747-400 on 23 February 2008 with one engine operating on a 20% biofuel mix produced from babassu oil and coconut oil
- Air New Zealand flew a Boeing 747-400 with one engine on 50% jatropha derived Hydrotreated Renewable Jet (HRJ) biofuel and 50% kerosene on 30 December 2008

2009 - *Accomplishments*

Educational Forums/Outreach

- ICAO Workshop on Aviation and Alternative Fuels 10 to 12 February 2009
- Annual US/CAAFI Meeting 30 September to 1 October 2009

Fuel certification/Qualification

- ASTM D-7566 (Standard Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons) approved September 1, 2009, first new jet fuel approval in 20 years

Tests and Demonstrations

- Continental Airlines flew a Boeing 737-800 with one engine using 50% jet fuel and 50% algae and jatropha mix on 7 January 2009
- JAL flew a 50% HRJ bio-fuel (derived from camelina, jatropha and algae) and 50% kerosene mix on a Boeing 747-300 on 30 January 2009
- Qatar Airways performed the first revenue flight with alternative fuel on October 12th, 2009. An A340-600 flew from London to Doha with its four engines running with a 48.5% blend of GTL with conventional jet fuel
- KLM flew a 50% HRJ bio-fuel (derived from camelina) and 50% conventional Jet A1 mix on a Boeing 747-400 on 23 November 2009

Policies, Methods and Processes

- European Union requirement lifecycle greenhouse gas emission savings from the use of biofuels shall be at least 35%
- ICAO High-Level Meeting on Aviation and Climate Change 7 to 9 October 2009
- Conclusions and Recommendations from CAAF 2009 (16 to 18 November 2009) on
    1. Environmental sustainability and interdependencies
    2. Technological feasibility and economic reasonableness
    3. Measures to support development and use
    4. Production and infrastructure.
- CAAF2009 declaration and global framework in conjunction with the outcomes of the High-Level Meeting on International Aviation and Climate Change (HLM-ENV) presented as the ICAO input to COP15 (7 to 18 December 2009)

2009 – *Accomplishments (continued)*

Standardized Definitions and Processes

- CAAF/09 adopted the Fuel Readiness Level (FRL), developed by CAAFI, as a best practice;
- CAAF/09 defined: drop-in jet fuel blend, drop-in neat jet fuel;
- CAAF/09 recommended the use of life cycle analysis as the appropriate means for comparing the relative emissions from alternative jet fuels to conventional jet fuel;
- CAAF/09 endorsed the use of the existing industry qualification and certification processes as the appropriate means for approving a new alternative jet fuel;
- CAAF/09 took efforts to ensure the consideration of aviation alternative fuels within relevant international, regional and State efforts to develop sustainability criteria for all alternative fuels; and
- Roundtable on Sustainable Biofuels (RSB) published version 1.0 of Principles and Criteria for Sustainable Biofuel Production on 14 November 2009

Key ICAO activities related to sustainable alternative fuels for aviation in 2009

Activity A – Educational Forums / Outreach

- Workshop on Aviation and Alternative Fuels;
- Conference on Aviation and Alternative Fuels;
- Articles in ICAO Journal Vol. 64, numbers 1 and 5
- ICAO High-Level Meeting on Aviation and Climate Change encouraged wider discussions on the development of alternative fuel technologies and the promotion of the use of sustainable alternative fuels, including biofuels, in aviation in accordance with national circumstances;
- ICAO High-Level Meeting on Aviation and Climate Change encouraged States and international organizations to share their efforts and strategies to promote alternative fuels for aviation, and to bring the results of CAAF/09 to COP15;

Activity B – Facilitating Exchange of Information on Financing and Incentives

- Initial discussions between ICAO and the World and Inter-American Development Banks regarding the financing of sustainable alternative fuel programmes for aviation.

Activity C – Standardized Definitions and Processes

- CAAF/09 adopted the Fuel Readiness Level (FRL), developed by CAAFI, 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;
- CAAF/09 defined: drop-in jet fuel blend, drop-in neat jet fuel;
- CAAF/09 recommended the use of life cycle analysis as the appropriate means for comparing the relative emissions from alternative jet fuels to conventional jet fuel;
- CAAF/09 endorsed the use of the existing industry qualification and certification processes as the appropriate means for approving a new alternative jet fuel;
- CAAF/09 took efforts to ensure the consideration of aviation alternative fuels within relevant international, regional and State efforts to develop sustainability criteria for all alternative fuels;

Activity D – Platform for Access to Research Roadmaps and Programmes

- Plans and objectives presented during CAAF/09 were integrated into an ICAO Global Framework for Aviation Alternative Fuels.

6. SUMMARY OF FUTURE OBJECTIVES ON SUSTAINABLE ALTERNATIVE FUELS FOR AVIATION

2010 – *Projected Activities*

Educational Forums/Outreach

- Annual US/CAAFI Meeting
- …

Fuel certification/Qualification

- US/CAAFI anticipates HRJ qualification as a 50/50 blend with petroleum jet fuel
- …

Policies, Methods and Processes

- ICAO 37th Assembly Meeting in September 2010
  - Programme for sustainable alternative fuels for aviation is presented for consideration
- …

Key ICAO activities related to sustainable alternative fuels for aviation in 2010

Activity A – Educational Fora / Outreach

- ICAO Environmental Colloquium
- ICAO Environmental Report
- Articles in ICAO Journal Vol. 65

Activity B – Facilitating Exchange of Information on Financing and Incentives

- ICAO continues to facilitate access to financing for sustainable alternative fuels for aviation programmes.

Activity C – Standardized Definitions and Processes

- ICAO and its Contracting States continue efforts to develop a common lifecycle analysis framework for comparing the relative emissions from alternative fuels to conventional fuels for aviation working within national and international framework;
- ICAO continues to facilitate aviation's participation in ongoing efforts to develop a common definition of sustainability criteria for biofuels

Activity D – Platform for Access to Research Roadmaps and Programmes

- ICAO Global Framework for Aviation Alternative Fuels updated as required.
- ICAO future work programme on sustainable alternative fuels for aviation decided by the 37th Assembly.

2011 - *Projected Activities*

Educational Forums/Outreach

- SWAFEA International Conference
- Annual US/CAAFI Meeting
- …

Fuel Certification/Qualification

- US/CAAFI anticipates neat Fischer-Tropsch (FT) fuel certification
- …

Policies, Methods and Processes

- CAAF 2011
- Conclusion of the SWAFEA study for the European Commission
- …

2012 - *Projected Activities*

Educational Forums/Outreach

- Annual US/CAAFI Meeting
- …

Fuel Certification/Qualification

- US/CAAFI anticipates Fermented Renewable Jet (FRJ) blend research report
- US/CAAFI anticipates Pyrolitic Renewable Jet (PRJ) blend research report
- …

Policies, Methods and Processes

- Alpha-Bird program complete
- …

2013 – *Projected Activities*

Educational Forums/Outreach

- WAAF2013
- Annual US/CAAFI Meeting
- …

Fuel Certification/Qualification

- US/CAAFI anticipates neat HRJ certification
- US/CAAFI anticipates FRJ blend certification
- US/CAAFI anticipates PRJ blend certification
- …

Policies, Methods and Processes

- ICAO 38th Assembly
- …

2016 - *Projected Activities*

Policies, Methods and Processes

- US/Consortium for Continuous Low Energy, Emissions, and Noise (CLEEN) goal that 20% of jet fuel available for purchase by United States commercial airlines and cargo carriers be alternative fuels
- …

2017 – *Projected Activities*

Policies, Methods and Processes

- European Union requirement lifecycle greenhouse gas emission savings from the use of biofuels shall be at least 50%
- …

2018 – *Projected Activities*

Policies, Methods and Processes

- European Union requirement lifecycle greenhouse gas emission savings from the use of biofuels shall be at least 60%
- …

2020 - *Projected Activities*

Policies, Methods and Processes

- European Union target of 10% use of renewable energy sources in transport
- …

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