

**54th CONFERENCE OF
DIRECTORS GENERAL OF CIVIL AVIATION
ASIA AND PACIFIC REGIONS**

*Ulaanbaatar, Mongolia
07 – 11 August 2017*

AGENDA ITEM 5: AVIATION AND ENVIRONMENT

**USE OF SUSTAINABLE ALTERNATIVE FUELS
FOR INTERNATIONAL AVIATION**

(Presented by Singapore)

SUMMARY

Sustainable Alternative Fuels for Aviation (SAF) is part of the International Civil Aviation Organization (ICAO) basket-of-measures to address international aviation emissions. While SAF is often seen as a longer term measure, there has been some advancement in its development with some airlines deploying SAF on a continuous basis. ICAO is also developing guidelines on the use of SAF. Singapore recently conducted a series of Green Package Flights involving the use of a suite of green measures including SAF to explore the environment benefits of a combination of measures and to determine the procurement, logistics and operational requirements of using SAF from the perspective of a State regulator.

States/Administrations are invited to:-

- a) Note some of the considerations taken in the use of SAF in the CAAS-SIA Green Package Flights;
- b) Urge ICAO to include the key elements identified relating to regulatory requirements and procedures, dropped-in fuel certification, and life cycle emissions factor in ICAO's guidelines for SAF; and
- c) Encourage States/Administrations to share their concerns and experiences in the development and deployment of SAF particularly at the ICAO Conference on Aviation and Alternative Fuels in October

USE OF SUSTAINABLE ALTERNATIVE FUELS FOR INTERNATIONAL AVIATION

1. INTRODUCTION

1.1 Assembly Resolution A39-2 highlights the importance of a comprehensive approach for the sustainable growth of international aviation, consisting of a suite of measures including technology and standards, sustainable alternative fuels (SAF), operational improvements and market-based measures.

1.2 Developments in SAF is of interest to both the aviation industry and policymakers given its potential to support the long-term reduction of international aviation emissions. ICAO is convening the Second ICAO Conference on Aviation and Alternative Fuels (CAAF2) in October 2017, to develop an ICAO Vision on Aviation Alternative Fuels and encourage States/Administrations to take action to further develop and deploy SAF for aviation. While the use of SAF is not new, with several airlines having conducted trial flights since 2008, the industry has been struggling with the business feasibility of SAF.

1.3 The Civil Aviation Authority of Singapore (CAAS), in partnership with Singapore Airlines (SIA), conducted a series of Green Package Flights over a three-month period on SIA's San-Francisco-Singapore flights between May – July 2017. The trial flights concurrently deployed optimized flight operations, the latest-generation fuel efficient aircraft and sustainable biofuels to assess the consolidated effect of these measures. It also serves to provide insights into the procurement, logistics and operational requirements of using SAF.

1.4 The Green Package Flights support the efforts under the Sustainable Singapore Blueprint (SSB) to develop Singapore as a Leading Green Economy, where businesses adopt more efficient and sustainable processes and measures to reduce their resource and environmental impact, and contribute towards a Sustainable Singapore.

1.5 This paper shares the specific experience and perspectives gained on the deployment of SAF in the Green Package Flights and invites States/Administrations to discuss some of these key elements for inclusion in ICAO guidelines for SAF.

2. ISSUES ON SUSTAINABLE AVIATION FUEL DEPLOYMENT

2.1 Regulatory requirements and procedures

2.1.1 CAAS provided regulatory support for the use the SAF in the Green Package Flights. CAAS' Airworthiness Requirements mandates the aircraft operator to observe and maintain a system of quality control to ensure only the correct type of fuel produced to approved specifications are used with the refueling agencies involved in the supply chain, assuring the quality of fuel with minimum contamination. In the absence of guidelines from ICAO and technical experts in SAF, CAAS consulted with the U.S Federal Aviation Authority (FAA) which governed the source of SAF supply in San Francisco, USA as well as the European Aviation Safety Agency (EASA). Both relied on internationally recognized, tested and certified SAF processes and suppliers that meet the aircraft and engine's approved operating specifications. This same arrangement was used by CAAS for the Green Package Flights.

2.1.2 Hydro-processed Esters and Fatty Acids (HEFA) SAF made from used cooking oils was used for the Green Package Flights. HEFA is certified by the American Society for Testing of and Materials (ASTM) to have met the D7566 specifications, *Standard Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons*. SIA was required to submit technical information including the biofuel certification documents and flight performance data. CAAS reviewed the information to ascertain the impact on ground and flight operations, maintenance and certification basis of the aircraft. Quality control of SAF was based on the fuel certifications of internationally recognized certification bodies.

2.1.3 Given the lack of experienced and qualified SAF experts in most State regulators, it would be useful to States/Administrations for ICAO to provide a set of guidelines, procedures and considerations in the management of SAF deployment by air operators.

2.2 **Dropped-in fuel certification**

2.2.1 There are two systems to supply SAF for flights: (i) the segregated system involving the use of a refueler bowser to supply SAF directly to the aircraft; and (ii) the integrated system involving pumping SAF straight into the common hydrant system. The segregated system was used for the Green Package Flights as the quantity used was small and for the collection of data to ascertain the impact on the efficiency of the aircraft. However, for a sustained long term deployment of SAF in large quantities in the longer run, the integrated system would be critical for the economic viability of the use of SAF.

2.2.2 The D7566 certified HEFA used for the Green Package Flights is certified as a drop-in fuel and does not require separate facilities for its supply from fossil jet fuel. While a few airports already operate an integrated system for SAF, there is resistance and reluctance from many of the stakeholders for the hydrant system to introduce drop-in SAF into their hydrant system.

2.2.3 It would be helpful for ICAO to provide guidelines on the operational standards and practices for the integration of SAF in the hydrant system, taking into account the different operating and ownership structures for fuel hydrant system in airports to instill confidence. This would enable the economic and operational viability for the use of SAF on a sustainable basis.

2.3 **Life cycle emissions reduction factor**

2.3.1 The life cycle emissions reduction of SAF is another factor that impacts its overall economic viability. There is currently no ICAO recognized default emissions reduction value for the SAF in the market and hence CAAS depended on the assessment provided by SkyNRG, a Roundtable on Sustainable Biomaterials (RSB) certified supplier, and its independent sustainability board¹ for the calculation of the life cycle emissions reduction of the SAF used for the Green Package Flights.

2.3.2 The ICAO Alternative Fuels Task Force (AFTF) under the Committee of Aviation Environmental Protection (CAEP) is conducting technical analysis on the sustainability factors of SAF, including the lifecycle greenhouse gas emission estimates for different SAF and existing sets of sustainability criteria outside of ICAO. Setting the ICAO guidelines on the emissions reduction factors for SAFs early (minimally for existing types of SAF) would enable States/Administrations and air operators determine the environment and economic benefits to serve to encourage further supply and use of SAF.

2.4 **Collaboration with stakeholders**

2.4.1 The long-term development and deployment of SAF would require a detailed deliberation process involving all relevant government agencies, the industry, aviation and SAF stakeholders in the value chain with ICAO providing the necessary guidance and leadership to leverage on technological advancement and operational processes to make SAF more commercially viable and sustainable. Engagement of the States/Administrations and the industry in the workgroups and platforms to develop guidelines and standards that are feasible and sustainable on a global level would help ICAO attain the Vision on Aviation Alternative Fuels.

3. **SHARING EXPERIENCE**

3.1 As the available supply of SAF is currently limited, States/Administrations are urged

¹ SkyNRG's sustainability board consists of World Wildlife Fund –International, European Climate Foundation, Solidaridad Network, and the University of Groningen.

to share their concerns and experiences over the use of SAF in order for lessons to be drawn and to be included in ICAO's guidelines. The ICAO CAAF2 event in October 2017 would be an appropriate platform.

4. ACTION BY THE CONFERENCE

4.1 The Conference is invited to:

- a) Note some of the considerations taken in the use of SAF in the CAAS-SIA Green Package Flights;
- b) Urge ICAO to include the key elements identified relating to regulatory requirements and procedures, dropped-in fuel certification, and life cycle emissions factor in ICAO's guidelines for SAF; and
- c) Encourage States/Administrations to share their concerns and experiences in the development and deployment of SAF particularly at the ICAO Conference on Aviation and Alternative Fuels in October 2017.

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