



## **CONFERENCE ON AVIATION AND ALTERNATIVE FUELS**

**Mexico City, Mexico, 11 to 13 October 2017**

### **Agenda Item 4: Defining the ICAO vision on aviation alternative fuels and future objectives**

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

(Presented by Singapore)

##### **SUMMARY**

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

Action by the Conference is in paragraph 5.

### **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, aviation alternative fuels (AAF), operational improvements and market-based measures.

1.2 Developments in AAF is of interest to both the aviation industry and policymakers given its potential to support the long-term reduction of international aviation emissions. The Second ICAO Conference on Aviation and Alternative Fuels (CAAF/2) seeks to develop an ICAO Vision on AAF and encourage States and stakeholders to take action to further develop and deploy AAF. While the use of AAF is not new, with several airlines having conducted trial flights since 2008, the industry has been struggling with the commercial feasibility of AAF.

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 to July 2017. The trial flights concurrently deployed optimized flight operations, the latest-generation fuel efficient aircraft and AAF to assess the consolidated effect of these measures. It also serves to provide insights into the procurement, logistics and operational requirements of using AAF.

1.4 The Green Package Flights were also part of 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 AAF in the Green Package Flights and invites States to discuss these key considerations in the development of the ICAO Vision on AAF.

## **2. ISSUES ON AVIATION ALTERNATIVE FUELS DEPLOYMENT**

### **2.1 Regulatory requirements and procedures**

2.1.1 CAAS provided regulatory support for the use of AAF 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 refuelling 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 AAF, CAAS consulted the U.S. Federal Aviation Administration (FAA) which governs the source of AAF supply in San Francisco, as well as the European Aviation Safety Agency (EASA). Both relied on internationally recognized, tested and certified AAF processes and suppliers that meet the aircraft's 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) AAF 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 AAF 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 AAF was based on the fuel certifications of internationally recognized certification bodies.

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

### **2.2 Dropped-in fuel certification**

2.2.1 There are two systems to supply AAF for flights: (i) the segregated system involving the use of a refueler bowser to supply AAF directly to the aircraft; and (ii) the integrated system involving direct pumping of AAF 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 AAF in large quantities, the integrated system would be critical for the economic viability of using AAF.

2.2.2 The D7566 certified HEFA AAF used in the Green Package Flights is certified as a drop-in fuel and does not require separate facilities from conventional jet fuel (CJF) for its supply. While a few airports already operate an integrated system for AAF, there is resistance and reluctance from many of the stakeholders of the hydrant system to introduce drop-in AAF 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 AAF into the hydrant system, taking into account the different operating and ownership structures for fuel hydrant system in airports to instil confidence. This would support the economic and operational viability of using AAF on a sustainable basis.

### 2.3 Lifecycle emissions reduction

2.3.1 The lifecycle emissions reduction of AAF is another factor that impacts its overall economic viability. There is currently no ICAO recognized default emissions reduction value for AAF 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 board<sup>1</sup> for the calculation of the lifecycle emissions reduction of the AAF used in the Green Package Flights.

2.3.2 The ICAO Alternative Fuels Task Force (AFTF) under the Committee on Aviation Environmental Protection (CAEP) is conducting technical analysis on the sustainability factors of AAF, including the lifecycle greenhouse gas emission estimates for different AAF and existing sets of sustainability criteria outside of ICAO. Setting the ICAO guidelines on the emissions reductions of AAF early (minimally for existing types of AAF) would guide States and air operators in the type of AAF to develop and deploy to ensure environment and economic benefits, which would support further supply and use of AAF.

### 2.4 Economic sustainability

2.4.1 While the cost of AAF has been decreasing and approaching price parity with CJF in recent years, a significant premium still exists and price parity may not happen in the short to medium term. Even with a public-private partnership arrangement like the Green Package Flights, airlines would still have to bear part of this premium cost to deploy AAF which might not be sustainable for many airlines given the thin profit margin of the industry.

2.4.2 The sourcing of AAF to be used for the Green Package Flights was also a challenge due to the current limited commercial supply of AAF with existing supplies mostly locked-in by offtake agreements and concentrated in only a few European and U.S. cities, which further limits the accessibility of AAF supply. As such, the economic sustainability of AAF has to be addressed first to support commercial development and consequently wider deployment of AAF. This could happen with technological progress and development of new pathways and feedstock in the medium to long term.

2.4.3 It would be useful for ICAO to conduct some studies on the cost impact on airlines arising from the deployment of AAF, in consultation with the airline industry, as well as provide more platforms for sharing and exchanges on the development of AAF pathways and technologies. This could

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

enhance the development of the ICAO Vision on AAF and ensure its relevance, practicality and effectiveness.

### **3. COLLABORATION WITH STAKEHOLDERS**

3.1 The long-term development and deployment of AAF would require a detailed deliberation process involving all relevant government agencies, the industry, aviation and AAF stakeholders in the value chain with ICAO providing the necessary guidance and leadership to leverage on technological advancement and operational processes to make AAF more commercially viable and sustainable. Engagement of States 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 and States to attain the ICAO Vision on AAF.

### **4. SHARING OF EXPERIENCE**

4.1 As the AAF industry is still at the infancy stage with limited available supply of AAF currently, States and relevant stakeholders are urged to share their experiences with the use of AAF in order for lessons to be drawn and considered in the development of the ICAO Vision on AAF.

### **5. ACTION BY THE CAAF/2**

5.1 The CAAF/2 is invited to:

- a) note some of the considerations taken in the use of AAF in the CAAS-SIA Green Package Flights;
- b) request for ICAO to provide a set of guidelines and procedures for regulators to manage AAF deployment by air operators;
- c) request for ICAO to provide guidelines on the operational standards and practices for the integration of AAF into the hydrant system;
- d) emphasize the importance for the ICAO guidelines on the emissions reductions of AAF to be developed early to guide the development and deployment of AAF; and
- e) recognise the need to address the economic sustainability of AAF including through studies on the cost impact to airlines, and further sharing and exchanges among stakeholders on the development of AAF.

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