International Civil Aviation Organization

CAEP-SG/20221-WP/36
18/11/22
English only

WORKING PAPER

COMMITTEE ON AVIATION ENVIRONMENTAL PROTECTION (CAEP)

STEERING GROUP MEETING

São Paulo, Brazil, 5 to 9 December 2022

Agenda Item 4: Fuels Task Group (FTG)

VIEWS OF THE UNITED STATES ON SUSTAINABLE AVIATION FUELS EFFORTS WITHIN ICAO

(Presented by the United States)

SUMMARY

The United States is committed to the development and deployment of Sustainable Aviation Fuels (SAF). This Working Paper provides a high-level overview of recent developments within the United States to support SAF deployment. It also provides views of the United States on ICAO efforts related to SAF. This includes the ICAO Vision for SAF, the Fuels Task Group (FTG), as well as the coming CAAF/3 Conference.

Action by the CAEP-SG is in paragraph 5.

1. INTRODUCTION

1.1 The United States is committed to the development and deployment of Sustainable Aviation Fuels (SAF). Our most recent State Action Plan recognizes the importance of these fuels as we seek to decarbonize the aviation sector. Appendix A to this paper provides an overview of current U.S. policies and activities related to SAF development and deployment, which we believe are critical to this effort.

1.2 The work of the FTG is instrumental in developing harmonized global standards to guide SAF development globally. We fully support this work and thank the many experts, States, and observers who contribute to the FTG.

1.3 At the 41st ICAO Assembly, Resolution A41-21 requested, among other things, "the Council to regularly monitor progress on the implementation of all elements of the basket of measures

towards the achievement of the LTAG, including through … the review of the ICAO Vision for SAF."[1] We share thoughts on how CAEP can contribute to this in Section 2.

1.4 FTG plays a critical role in enabling the deployment of SAF. In particular the FTG's work to develop LCA values for SAF feedstocks and processes enables the use of these fuels within CORSIA which coupled with requirements in Annex 16, Volume IV to Monitor, Verify and Report emissions reductions from CORSIA Eligible Fuels (CEF), allow States and ICAO to accurately track the use and benefits of these fuels. Sections 3 and 4 of this paper provide input of FTG's ongoing work. Actions for CAEP are in Section 5.

2. INITIAL VIEWS ON THE ICAO VISION FOR SAF

2.1 Aviation CO_2 emissions are the result of the combination of demand for air travel (e.g., as measured in passenger kilometres or tonne kilometres of demand), the efficiency of air travel (e.g., as measured in energy use per revenue tonne kilometre) and the life cycle emissions that result from using aviation fuel (e.g., as measured in CO_2 emissions per energy). This breakout is useful in that it clearly separates the contribution towards emissions reductions of the air vehicle (i.e., technology and operations) from the fuel given a demand level.

2.2 ICAO has measures in place regarding aircraft fuel efficiency. This includes the CO_2 standard, an aircraft level fuel economy standard as well as the aspirational goal of improving aircraft fuel efficiency by 2% per annum measured in mass of fuel per revenue tonne kilometre. However, there are no goals in place for the fuel.

2.3 One could argue that a fuel goal is not needed as we have CORSIA, which provides incentives for the use of sustainable aviation fuels and lower carbon aviation fuels. Further, the 2050 net zero goal will require the extensive use of fuels with little or no net greenhouse gas emissions.

2.4 However, there could be utility in providing interim goals for the use of sustainable aviation fuels and lower carbon aviation fuels between now and 2050. One could provide these goals in terms of volumes of fuel with a given life cycle emissions reduction. However, it is hard to consider different fuels in a consistent way – e.g., one could envision volumetric goals for LCAF with a 10% reduction, SAF with a 50% reduction, and SAF with a 100% reduction in life cycle emission.

2.5 Because of this challenge, the United States would suggest that ICAO consider a carbon intensity-based metric as a means of assessing how aviation fuels are progressing in reducing the greenhouse gas emissions from aviation.

2.6 This carbon intensity could be calculated based on the relative amounts of conventional jet fuel, LCAF, and SAF (along with their life cycle greenhouse gas reductions) being used in a given year. The CORSIA baseline value of 89 gCO_2/MJ could be used for the conventional jet fuel as FTG have previously show this value should not vary with time. As CORSIA reports are provided to ICAO, the ICAO Secretariat can provide a fleet-wide carbon intensity for international aviation fuel. In case this carbon intensity-based metric is considered too difficult to communicate outside of FTG and CAEP, it could easily be expressed in terms of fleet-wide Emissions Reduction Factor from CEF which is already defined in Annex 16, Volume IV. For example, a fleet-wide carbon intensity of 89 gCO_2/MJ (i.e., 100% use of

[1] ICAO, Resolution A41-21: *Consolidated statement of continuing ICAO policies and practices related to environmental protection - Climate change*, available at: https://www.icao.int/environmental-protection/Documents/Assembly/Resolution_A41-21_Climate_change.pdf

conventional jet fuel) corresponds to a fleet-wide Emissions Reduction Factor of 0%. A carbon intensity of 71.2 gCO_2/MJ corresponds to an Emissions Reduction Factor of 20%.

2.7 Should it be deemed useful, an aspirational goal could also be developed for carbon intensity. One could imagine a carbon intensity goal being developed based on projections and aspirations for the future use of LCAF and SAF, with varied life cycle emissions reductions. Such a goal would be desirable as it is neutral to the fuel feedstock and conversion technology being used.

3. PROPOSED PATH FORWARD ON CORSIA ELIGIBLE FUELS (CEF) WITH SIGNIFICANT ELECTRICITY INPUT

3.1 The United States appreciates the efforts of the FTG to carefully examine not only power-to-liquid fuels, but all fuels that could have significant electricity input. These fuels are indeed different from the SAF and LCAF that have been examined thus far by the FTG and they merit additional consideration.

3.2 The approaches being proposed by the FTG to address the challenges that have been outlined are sensible and the United States agrees that it makes sense to develop the appropriate data on a number of areas before defining the path forward for sustainability and the calculation of life cycle emissions.

3.3 The United States further appreciates that the FTG have not used the term “renewable” to describe the electricity being used, as that could preclude nuclear energy. At some point in the future, the FTG and CAEP will need to consider nuclear energy as the electricity source. However, it is likely best to hold off on these discussions while the other aspects of the work progresses as outlined by the FTG.

4. SUSTAINABILITY CERTIFICATION, THE STACKING OF CREDITS, AND THE CAAF/3 MEETING

4.1 The United States appreciates the ongoing work to identify necessary refinements to the CEF eligibility criteria. As ICAO Member States seek to significantly increase the development and deployment of these fuels, it will be critical to ensure that these fuels are truly sustainable.

4.2 While not directly within the FTG work program, the United States has concerns regarding the potential proliferation of monitoring and reporting schemes for SAF. CORSIA contains an accurate and robust monitoring system for SAF within CORSIA, and the non-ICAO, non-CORSIA systems may cause confusion and result in operators being unable to receive the emissions reduction benefits they believe they are entitled to. Importantly, the schemes may conflict with CORSIA Standards and Recommended Practices in terms of who may claim which emissions reductions. Thus these non-CORSIA schemes could prevent the use of these fuels by operators within CORSIA due to no fault of their own.

4.3 The CAAF/3 meeting could be a good opportunity to discuss monitoring and reporting schemes for SAF as well as bring together investors who may be interested in SAF production. This forum could then allow for a robust discussion on how to further enhance SAF use in creative ways while avoiding conflicts with CORSIA.

5. ACTION BY THE CAEP-SG

5.1 The CAEP-SG is invited to:

a) note the ongoing efforts of the United States to develop and deploy SAF;

b) discuss ways for CAEP to contribute to the review of the ICAO Vision for SAF; and,

c) discuss potential topics for discussion at the coming CAAF/3 meeting.

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APPENDIX A

UPDATE ON KEY ACTIVITIES WITHIN THE U.S. SUPPORTING THE DEVELOPMENT OF SAF

SAF Grand Challenge and the Roadmap

The SAF Grand Challenge is the result of Department of Energy (DOE), DOT (FAA), and U.S. Department of Agriculture (USDA) launching a government-wide Memorandum of Understanding (MOU) that will attempt to reduce the cost, enhance the sustainability, and expand the production and use of SAF while:

- Achieving a minimum of a 50% reduction in life cycle greenhouse gas emissions compared to conventional fuel.

- Meeting a goal of supplying sufficient SAF to meet 100% of aviation fuel uplift by 2050.

The SAF Grand Challenge and the increased production of SAF will play a critical role in a broader set of actions by the United States government and the private sector to reduce the aviation sector's emissions in a manner consistent with the goal of net-zero emissions for the U.S. economy, and to put the aviation sector on a pathway to full decarbonization by 2050.

In recognition of the critical role that drop-in synthesized hydrocarbon fuel from waste streams, renewable energy sources, or gaseous carbon oxides—or SAF—will play in addressing the climate change crisis, and its role for jobs and the economy, DOE, DOT, and USDA undertake the MOU to ensure the highest level of collaboration and coordination across the agencies.

Through the MOU, DOE, DOT, and USDA intend to accelerate the research, development, demonstration, and deployment needed for an ambitious government-wide commitment to scale up the production of SAF to 35 billion gallons per year by 2050. A near-term goal of 3 billion gallons per year is established as a milestone for 2030.

I.R.A. SAF and Clean Fuel Tax Credits

Provisions in the recently passed Inflation Reduction Act (IRA) seek to provide incentives to boost domestic production of SAF, and bridge the cost gap between SAF and petroleum jet fuel. Specifically, IRA includes three incentives for SAF: (1) SAF Blenders Tax Credit (BTC), (2) Clean Fuel Production Credit (CFPC), and (3) a new SAF and low-emissions aviation technology grant program.

The BTC provides a tax credit starting at $1.25 per gallon for qualified fuel blenders that supply SAF with at least 50% lifecycle GHG emissions reductions compared to conventional jet fuel. Fuels that exceed the minimum threshold are eligible for an additional $0.01 per gallon credit for each percentage point of emissions reductions over 50 percent (up to a maximum of $1.75 per gallon). The BTC is technology- and feedstock-neutral, which allows SAF to be made from biomass, waste streams, direct air capture, and other sources, and will end at the end of 2024.

The CFPC will be in effect from 2025 through 2027. Unlike the SAF BTC, the CFPC is not exclusive to SAF, though SAF is eligible for a higher credit than other types of biofuels due to the amount of investment

needed to make it cost competitive. The methodology for calculating the value of the CFPC is slightly more complex than the SAF BTC, but it is similarly based on a sliding scale that rewards cleaner fuels with higher credits ranging from $0.35 to $1.75 per gallon.

I.R.A. Section 40007 Program

In addition to the SAF BTC and CFPC, IRA also allocates $297 million for the Sustainable Aviation Fuel and Low-Emissions Aviation Technology Grant Program to enable state and local governments, airport sponsors, for-profit companies, research institutions, and non-profits to produce, transport, blend, or store sustainable aviation fuel, and to develop or apply low-emission aviation technologies. The grant program will be administered by the FAA, and will incentivize the mass production of SAF at scale and create domestic jobs and economic opportunities for farmers, manufacturers, start-ups, and others in the biofuels supply chain.

ASCENT update (Project 93)

FAA has been working for many years through the university-led ASCENT Center of Excellence (COE) and Volpe Transportation Center to develop domestic supply chains to enable SAF production. This effort has resulted in data, analytical tools, and analyses to understand the potential environmental and economic benefits that could result from the development of these supply chains while also working to understand the barriers to their development.

As an extension of these efforts, a new ASCENT Project 93 titled "Collaborative Research Network for Global SAF Supply Chain Development," is being stood up which will involve Washington State University (WSU), MIT, University of Hawaii (UH), and the DOT Volpe Transportation Center. Through collaboration with the World Bank and other international partners with similar interests, this work will enable the development of SAF supply chains around the globe.

Existing partners and collaborators of the ASCENT COE universities will be leveraged in the initial effort, which focuses on three distinct geographical areas with different characteristics – Africa, Latin America and the Caribbean (LAC), and South East Asia. WSU will focus on LAC (Colombia, Dominican Republic, Ecuador), MIT will focus on Africa (Kenya, South Africa), and UH will focus on SE Asia (Indonesia, Vietnam, Thailand). FAA is also actively seeking additional partners to support this work.

This project will identify waste and biomass feedstock availability, analyze new pathways to optimize SAF production, and assess infrastructure needs and logistical requirements for a holistic approach to SAF supply chain development. A focus will be on identifying existing industries and infrastructure that could be leveraged for SAF production thus ensuring rapid development. An updated bottom-up assessment of global SAF feedstock potential and key barriers to achieve this potential will also be undertaken.

Student training and capacity building is another key feature of this project. A network of PhD students will be developed who work with universities in the regions of interest to extend supply chain analysis techniques and tools from the ASCENT COE and Volpe Center to different world regions. Workshops and student exchanges and internships will also be pursued with international partners.

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