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**WORKING PAPER**

# THIRD CONFERENCE ON AVIATION AND ALTERNATIVE FUELS (CAAF/3)

**Dubai, United Arab Emirates, 20 to 24 November 2023**

**Agenda Item 5: Reviewing the 2050 ICAO Vision for SAF, including LCAF and other cleaner energy for aviation, in order to define a global framework**

## DEVELOPING AN ICAO VISION: AN INDUSTRY VIEW

(Presented by the Air Transport Action Group (ATAG), Airports Council International (ACI), Civil Air Navigation Services Organisation (CANSO), International Air Transport Association (IATA), International Business Aviation Council (IBAC) and International Coordinating Council of Aerospace Industries Associations (ICCAIA))

**SUMMARY**

At the 41st ICAO Assembly, ICAO adopted a collective long term aspirational goal (LTAG) of net-zero carbon emissions by 2050 for international aviation, this followed the commitment of the global aviation industry to achieve net zero $CO_2$ emissions for civil aviation by 2050. CAAF/3 will provide an opportunity to set the global framework that is needed for the development, deployment and production of sustainable aviation fuel (SAF) and lower carbon aviation fuel (LCAF), that are key elements of the LTAG. This paper focuses on the need for a global Vision for SAF deployment, namely a goal of around 80% reduction in $CO_2$ intensity of the fuel used by aviation in 2050 compared with today's fossil fuel.

Action by the Conference is in paragraph 4.

## 1. INTRODUCTION

1.1 At the 41st ICAO Assembly, ICAO adopted a sector-wide long-term global aspirational goal (LTAG) for international aviation of net-zero carbon emissions by 2050. In October 2021, the aviation industry, including the signatories to this paper agreed to strengthen the industry decarbonisation commitments first set in 2009, to a net zero carbon 2050 goal.[2]

1.2 Reaching our shared global aspirational goal will require a global effort including (alongside new technologies and operational and infrastructure efficiencies) a significant and rapid shift towards new forms of sustainable energy, with a particular emphasis on drop-in renewable liquid hydrocarbon fuels commonly referred to as sustainable aviation fuel, or SAF.

[1] English, Arabic, Chinese, French, Russian and Spanish versions provided by ATAG.

[2] The Air Transport Action Group net-zero commitment from the whole industry included underlying commitments from airlines (IATA AGM, October 2021), the *Business Aviation Commitment on Climate Change* (IBAC, October 2021); and airports (ACI WAGA, June 2021).

1.3 This transition will require unprecedented and rapid collaboration and effort from a range of aviation and non-aviation stakeholders: governments, the aviation industry, energy providers and the finance community. The scale of the challenge is daunting, but the ICAO Conference on Aviation Alternative Fuels (CAAF/3) provides an important inflection point to steer global policy direction and financing for the transition.

1.4 The aviation industry has been clear about the necessity to see an almost complete transition towards SAF by 2050, in line with analysis from industry (*Waypoint 2050*, the IATA net zero roadmaps) and ICAO (the LTAG report) which all identify SAF as the largest lever of climate action before 2050. To this end, the manufacturing community through ICCAIA has committed to ensure the ability for engines and aircraft to be able to operate using 100% appropriately approved SAF, including solutions for both new and in-service products, by 2030.

1.5 Airlines are already committing to significant quantities of SAF in the early years. But these voluntary efforts alone will not achieve a global and significant distribution of SAF. As volumes increase, costs should reduce, making SAF increasingly viable for airlines and consumers – an ICAO Vision will help spur the needed investment to increase supply.

1.6 This paper outlines the key elements in the outcome of the CAAF/3 meeting – alongside a global framework of supportive measures (such as capacity building, financing and policy), a global ICAO Vision, or goal, will be an important signal about the industry's required energy transition:

- To national and regional governments helping SAF deployment with appropriate supportive policy measures (see WP/23 on policy), aiming for a common long-term objective, whilst appreciating the different speeds at which each State will move towards this Vision.

- To ICAO, governments, industry and other stakeholder groups to help identify the scale and speed of the transition and design appropriate capacity building and other supporting mechanisms, especially for developing States (see WP/24 on capacity building).

- To the financial community to help fund the necessary investment in SAF production around the world (see WP/25 on financing). Setting a goal will help focus their attention on the long-term investment strategy required for the transition in aviation.

- The current status on SAF production and use (presented in an industry working paper on the state of SAF) shows that even if the SAF industry is nascent, a strong dynamic already exists on both demand and production sides. But a steep ramp up of SAF production will be needed to achieve the net zero carbon emission goal in the future: having a Vision will help focus the minds of all stakeholder groups and help track our progress towards the decarbonisation of air travel.

## 2. AN ICAO VISION

2.1 A global long-term ICAO Vision for SAF will be crucial to set the investment and policy environment on course towards the collective net zero carbon goal. **An ICAO Vision of around an 80% reduction in aviation fuel carbon intensity[3] from the use of SAF in 2050, compared to traditional fossil fuel, should provide the needed impetus for development.**

2.2 This cannot be achieved without accelerating the scale-up of SAF from now until 2050: urgent action is needed today to identify measures that can stimulate SAF investment and production globally to effectively contribute to the ICAO LTAG.

[3] Carbon intensity of the fuel refers to the lifecycle carbon dioxide emissions equivalent per unit energy of the fuel compared to the current baseline (2023): CORSIA uses 89g$CO_2$e/MJ as the baseline reference.

2.3 The IS3 scenario outlined in the LTAG report shows that a complete transition to SAF is possible by 2044 and is in line with the industry's preferred ICAO Vision of an 80% reduction in average jet fuel carbon intensity by 2050. Notably, the IS3 "low readiness/attainability and high aspiration" scenario represents what is possible with "maximum possible effort."

2.4 Given its focus on 2050, the same analysis and scenario were not intended to provide a precise projection of the feasible or necessary capacity in the 2030 timeframe. The bottom-up production assessment of CAEP FTG – being updated at time of submission – will provide a view of the 2030 potential for SAF production. Industry believes that any near-term or interim goal for SAF should be based on a bottom-up assessment such as the FTG forecast and reminds States that a positive outcome of CAAF/3 and additional supportive policy measures could help catalyse investment and production beyond current forecasts.

2.5 Any global aspirational goals developed by CAAF/3 and subsequent CAAF meetings should be periodically reviewed as the situation evolves; they should be on a global average basis, not be attributable to individual States and regions as each State will need to chart its own most appropriate path.

2.6 All suitable feedstocks and production capabilities across the world will have to be mobilised as quickly as possible. It is a requirement to achieve net zero carbon emissions in 2050 but it is also an opportunity for each ICAO Member State to contribute to this collective goal while generating jobs and new energy industries.

2.7 This will also require strong cooperation between States and the industry, including the aviation and energy sectors, but importantly also the finance and investment sectors. ICAO has a strategic role to play to set the Vision and the global framework of SAF development, deployment and production across the world and stimulate this cooperation between all stakeholders.

2.8 Also under consideration at CAAF/3 will be the subject of lower carbon aviation fuels (LCAF). Whilst the industry is clear that LCAF, as a fossil fuel, is not 'sustainable aviation fuel' in its true sense, LCAF can provide lifecycle carbon emissions reduction[4] through optimisation of the fuel production and transportation processes. It is estimated that LCAF would have around a 10% reduction in carbon intensity compared to traditional fossil fuel. It is therefore also considered a CORSIA eligible fuel alongside SAF. LCAF should be seen as a transition tool – an opportunity to reduce emissions in the short-term using existing production processes. As the industry transitions to SAF, all remaining fossil aviation fuel should also ideally transition to be LCAF. However, given the comparatively modest reductions in carbon that are possible from LCAF, it must be emphasised that SAF will be required for aviation decarbonisation and net-zero for the industry in the long term.

## 3. ENABLING FACTORS FOR A VISION: THE GLOBAL FRAMEWORK

3.1 Unlocking the potential of SAF, including the significant opportunities for many developing countries to drive local new energy industries, will require a catalyst beyond the current trend. Vital to this will be several key steps, many of which are identified in industry working papers for CAAF/3:

- Regional and national policies that genuinely drive the supply of SAF, based on locally-appropriate and sustainable feedstocks;
- Supportive activities to help ensure SAF deployment can take place globally, including, *inter alia*: comprehensive capacity building; access to finance for all States; the frameworks and tools needed

[4] The ICAO LTAG reported average carbon intensities from LCAF ranging from 77 to 84 $gCO_2e/MJ$, corresponding to emissions reductions from LCAF ranging from 6% to 13% (ICAO, LTAG Report, Appendix M5). To be eligible for emissions reductions under CORSIA, LCAF must achieve a minimum 10% reduction in carbon intensity relative to the CORSIA baseline of 89g $CO_2e/MJ$.

for an efficient production and distribution of SAF;

- Strong support from industry, including the aviation sector, but importantly the finance and investment sector and the energy industry; and
- A global Vision for SAF deployment identified at ICAO in support of the long-term aspirational goal, for which action must start now.

3.2 Therefore, we support government policies and initiatives that stimulate investment in innovation of new SAF production and feedstock technologies, promote a significant increase in production capacity, enable a reduction in costs/price, and encourage greater industry uptake. A "toolkit" of measures would help to improve market certainty for financiers and fuel producers, consequently increasing available SAF volumes and driving down the price. Coupled with a Vision for deployment of SAF, CAAF/3 could send a strong signal to the financial markets of how the energy transition in aviation can progress.

3.3 Public-private partnerships can play a key role in increasing the development and use of SAF through policy definition and alignment, along with financial incentives. Blended finance will help bridge the gap between development agency support, national policy support and private financing to help drive the significant scale-up required. Policymakers have the chance to accelerate these processes by providing sustained and predictable support to the multi-year development of novel technologies, and by stimulating the ramp-up of capacity.

## 4. ACTION BY CAAF/3

4.1 The Conference is invited to:

a) recognise the need for a global framework to support the development, deployment and production of SAF, LCAF and other cleaner aviation energies across the world, in order to support the achievement of the long-term goal of net zero carbon emissions in 2050, including capacity building (such as the ICAO ACT-SAF guidance), and support for a finance mechanism (such as the ICAO Finvest Hub);

b) acknowledge that the definitions and associated sustainability criteria described in the CORSIA scheme is the reference to apply when dealing with SAF and LCAF in this ICAO global framework for aviation cleaner energies;

c) agree on a metric to measure progress in the use of SAF and LCAF in the form of average carbon intensity reductions from SAF and LCAF at given points in time;

d) agree to set a 2050 goal at 80% reduction in the average carbon intensity of jet fuel used in 2050, compared with today's fossil fuel;

e) agree that any interim goal must be set at the right level to stimulate the production of cleaner energies and satisfy aviation needs on the path towards net zero by 2050, whilst being achievable, supporting the steep scale-up of SAF production, and taking into account local conditions and circumstances in each State;

f) recognise that production levels consistent with the SAF scale-up trajectory required for net zero carbon by 2050 will necessitate unprecedented effort and close coordination from government, the finance sector, energy sector and industry alike;

g) agree on a set of policies that can support these objectives while keeping the price of SAF at a reasonable level and that will not endanger the sustainable growth of air transport, that can be deployed by States in a range of circumstances and capabilities; and

h) note the engagement of the industry to collaborate to support these objectives.

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# APPENDIX

## Conversions of SAF Vision numbers

Goals can be expressed in a range of ways. Industry proposes a percentage reduction of average carbon intensity in 2050, but this requires an understanding of how that translates into carbon reduced or production (and therefore investment) required. This is an illustrative example of how that would play out based on the expected traffic growth explored in the *Waypoint 2050* model:

| Metric conversions | **2050** (range of *Waypoint 2050* scenarios: F2-F4) |
|---|---|
| **Reduction in average lifecycle $CO_2$ intensity of aviation fuel** (compared with the current 89g $CO_2$e/MJ average) | 80% |
| **Total expected jet fuel use** (global) | ≈ 370 – 490 Mt fuel (≈ 460 – 620 bn litres) |
| **Total expected jet fuel use** (international only) | ≈ 240 – 320 Mt fuel (≈ 300 – 400 billion litres) |
| **SAF % of fuel use** (global) | 80-100% |
| **Mt of SAF** (global) | ≈ 370 – 490 Mt SAF at 80% ERF and 100% SAF *(≈ 290 – 390 Mt SAF at 100% ERF and 80% SAF)* |
| **Mt of SAF** (international only) | ≈ 240 – 320 Mt SAF at 80% ERF and 100% SAF *(≈ 190 – 260 Mt SAF at 100% ERF and 80% SAF)* |
| **Litres of SAF** (global) | ≈ 460 – 620 billion litres SAF at 80% ERF and 100% SAF *(≈ 370 – 490 billion litres SAF at 100% ERF and 80% SAF)* |
| **Litres of SAF** (international only) | ≈ 300 – 400 billion litres SAF at 80% ERF and 100% SAF *(≈ 240 – 320 billion litres SAF at 100% ERF and 80% SAF)* |
| **$CO_2$ emissions reduction from SAF** (global) | ≈ 890 – 1,245 Mt $CO_2$ |
| **$CO_2$ emissions reduction from SAF** (international only) | ≈ 580 – 810 Mt $CO_2$ |
| **Illustrative production facilities requirement** (based on the ICAO rules of thumb developed for the LTAG report and the following illustrative mix of fuel pathways: HEFA: 15% / AtJ: 34% / FT: 27% / PtL: 24%) described in the LTAG Report (biomass-based fuels, gaseous waste-based fuels, and atmospheric $CO_2$-based fuels)[5] | 1,024 |
| **Capital cost for plant construction** (based on the ICAO rules of thumb developed for the LTAG Report) | $1.449 trillion |

These numbers are based on forecast fuel use in a given year, using the model developed for the *Waypoint 2050* analysis and based on the following assumptions:

- SAF emissions reduction factors (ERF) ranging from 80% to 100% in 2050.
- Central traffic scenario reaching 22 trillion RPKs in 2050, corresponding to a compounded annual growth rate of 3.1% from 2019 to 2050.
- Share of international aviation $CO_2$ emissions (as percentage of global aviation emissions) of ≈ 65% (consistent with the ICAO CAEP/12 traffic forecast[6]).

— END —

[5] Rules of thumb developed for current ASTM approved pathways only; additional pathways expected in future
[6] ICAO, 2022 Environmental Report, available at: www.icao.int/environmental-protection/Documents/EnvironmentalReports/2022/ICAO%20ENV%20Report%202022%20F4.pdf (p. 24).