

SUMMER 2023

ECACNEWS

European Civil Aviation Conference Magazine

#79

The global decarbonisation landscape

Sustainable aviation fuels – technology and policy initiatives around the world

Other sustainability initiatives

ECAC Spotlight
Legal Task Force

FLIGHT PATH TO SUSTAINABILITY – delivering net-zero carbon aviation by 2050



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#79 – Summer 2023

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The global aviation community, including governments and the aviation industry, reached a historic agreement at the 41st ICAO Assembly in 2022, with the adoption of a long-term global aspirational goal of net-zero carbon emissions from international aviation by 2050, which puts the sector on a pathway firmly aligned with the temperature objectives of the Paris Agreement.



ALESSIO QUARANTA

President of ECAC

The use of sustainable aviation fuels (SAF) will be fundamental to the achievement of the net-zero goal, and 2023 brings an important milestone in this regard: the 3rd ICAO Conference on Aviation and Alternative Fuels (CAAF/3) in November is an opportunity to agree on a collective target and global framework to support the development, production, and deployment of cleaner fuels.

This 79th edition of ECAC News provides an overview of the significant existing efforts being taken by States, the industry, and the scientific community towards putting international aviation on a pathway towards a sustainable future. You will find an overview of the international transportation decarbonisation landscape, and how new policies and technology development initiatives are being boosted around the world, from Africa to Colombia, the United Arab Emirates and the United States. This provides evidence that the global aviation community is already taking strong steps towards decarbonisation, and of the role government policies can play to facilitate achievement of the climate commitment made at the last ICAO Assembly.

In this edition, you will also read about the political determination to put Europe on a pathway to net-zero carbon emissions by 2050 notably through the use of sustainable aviation fuels (SAF). The agreement reached by the Directors General of Civil Aviation of the 44 ECAC Member States in May 2023 was that each State would strive to adopt policy measures as soon as possible to promote the use of SAF and make our common global climate goals a reality, while promoting a level playing field for sustainable air transport. The publication of ECAC's policy guidance on SAF in February 2023 was an important milestone in sharing the lessons learnt from pioneering States taking SAF policy action aimed at supporting others in developing national SAF supply roadmaps, both within Europe and beyond.

And beyond SAF, you will find further insights into the aviation sector's efforts to improve efficiency gains and to address new challenges such as climate adaptation and resilience, or the potential of information technology to reduce aviation-related impacts on the environment.

Aviation's long-term carbon reduction aspirations and other environmental challenges will require a common vision, global commitment, and cooperative efforts for the years to come. It is therefore a priority that ECAC Member States, their partner States and regional organisations (ACAO, AFCAC and LACAC) and other international partners work together and learn from each other, joining our efforts in the pathway to net-zero carbon emissions by 2050.

In that spirit, I would like to thank all the contributors to this edition of ECAC News and invite you to read the articles, which I hope you will find an inspiring read! ●

A handwritten signature in dark ink, reading "Alessio Quaranta". The signature is fluid and cursive, with the first name and last name clearly distinguishable.



The global decarbonisation landscape

Making the common ICAO long-term climate goal a reality



ECAC Executive Secretary, Patricia Reverdy, speaks with Salvatore Sciacchitano on ICAO's ambitions for climate change

PATRICIA REVERDY: Robust climate action for the aviation sector is crucial to achieving the Paris Agreement's objectives. What is ICAO's objective?

SALVATORE SCIACCHITANO: Simply put, aviation regulators have agreed to a goal of net-zero carbon emissions by 2050 for international aviation. This will complement governments' Paris Agreement objectives, which encompass domestic aviation.

We are on a significant journey that is only just beginning. The technical and commercial feasibility of this goal has been confirmed by the ICAO Council's Committee on Aviation Environmental Protection (CAEP), and its studies are available on our website.

The achievement of this goal will rely on multiple CO₂ emissions reduction measures, with governments for their part agreeing through ICAO to focus on and encourage advances in aircraft and related technologies, more efficient flight operations and routes to reduce fuel burn, and of particularly crucial importance, the increased production and deployment of sustainable aviation fuels (SAF).

However, how quickly the aviation community can innovate to achieve these objectives, and how reliably we will be able to assure access to the much-needed financing to support them, will be the most critical factors impacting our success. These are the key considerations in ICAO's climate action strategy and advocacy.

ICAO has had a long-standing mandate to assist States with the coordination of their environmental protection responsibilities. Where does this net-zero objective fit in?

As things proceed towards the realisation of the net-zero objective, governments will be complementing reductions with emissions offsetting through the landmark Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) agreement, which countries have also adopted at ICAO, and which will play a key role in assuring the

near-term environmental sustainability of the recovery of global air transport from the impacts of the COVID-19 pandemic.

However, it is important to understand that offsetting is not one of the solutions supporting the net-zero objective.

When countries adopted their net-zero target at last year's ICAO Assembly, they formally recognised that the largest potential impact on aviation CO₂ emissions reduction will come in the near term from sustainable and lower carbon aviation fuels (LCAF), and cleaner energy sources.

This was on the basis of the conclusions of an earlier feasibility study produced by CAEP, which highlighted among its many other findings that direct substitution SAF can significantly impact residual CO₂ emissions, driving important global reductions between now and 2050.

Current SAF production is, however, miniscule compared to the current consumption of traditional aviation fuels. What is ICAO's perception of that reality?

ICAO is very conscious and frank about the fact that the tremendous potential of SAF to contribute to achieving countries' long-term aspirational goal is counter balanced by the enormous challenge we face to scale up its development and distribution.

This is why we're convening the third ICAO Conference on Aviation and Alternative Fuels (CAAF/3), which will be held later this year in Dubai from 21 to 24 November, and which will be a crucial opportunity to lay the groundwork for the years ahead.

It's about fostering international partnerships and cooperation, actively engaging with financial institutions such as development banks, private equity entities, and fuel producers through ICAO Council briefings, regional meetings and bilateral exchanges.

We expect the event to result in the adoption of a SAF policy framework that would provide the investors with perspectives and confidence needed to ramp up financing.

interview
with



SALVATORE SCIACCHITANO
President of the Council
of ICAO



PATRICIA REVERDY
Executive Secretary of ECAC



“
... the largest
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It will build on ICAO Member States' clear understanding of the need for greater partnership and engagement between the air transport and finance communities. This was illustrated by a recent in-depth briefing on the actions and outcomes now needed to achieve net zero that comprised six international development banks – including the World Bank – and the Air Transport Action Group.

There is some tremendous potential inherent in this closer collaboration between ICAO and the international finance community, and both ICAO and the governments who cooperate through it have a critical role to play in developing harmonised international policy frameworks and a level global playing field to accelerate much-needed investment.

ICAO has been broadening its tent and fostering new international partnerships and cooperation with the energy and financial sectors to accelerate much-needed investment in this area.

We are also helping countries to build local capacities and foster international contacts to optimise their SAF potential through our Assistance, Capacity Building and Training for Sustainable Aviation Fuels (ACT-SAF) programme.

To date, more than 120 States and international organisations are now very actively participating in this initiative.

What outcomes from these initiatives does ICAO expect in terms of milestones on the road to 2050?

We expect these combined initiatives and events to raise important awareness among national decision makers, and to accelerate the development of the regulatory and policy frameworks needed to assure investor confidence and scale up global SAF development and deployment.

I'd like to take this opportunity to also highlight that it's not just about SAF. While SAF production and

deployment will be an important near-term priority for the greening of international aviation, in the mid to longer term we should begin to see some very substantial emissions reduction contributions arising from the cutting-edge innovations now taking place in aeronautics, propulsion and energy storage, materials sciences, and many other areas of science and technology.

ICAO continues to encourage aviation and clean energy innovators to come together to discuss and share their progress, through dedicated events we've established for that purpose. These are in fact the focus of our stocktaking event taking place in July this year.

Further important reductions progress will be derived from infrastructure and aeronautical modernisation to optimise the latest advances in satellite navigation, and to promote the increased adoption of efficiency solutions such as air traffic flow management and performance-based navigation (PBN).

These and many more forward-looking developments in the area of air navigation capacity and efficiency will be explored at the ICAO Air Navigation World event taking place at the end of August this year.

You mentioned earlier that CORSIA is a particularly important element in aviation's climate action strategy in the near term. With traffic levels expected to exceed pre-pandemic levels soon, where are we at in terms of implementation?

CORSIA is being implemented in three phases: a three-year pilot phase that will conclude this year, a three-year first phase beginning next year, and the second phase that will cover the emissions through to 2035. For the first two phases, participation is voluntary. From 2027 onwards, participation will be determined based on 2018 Revenue Tonne Km (RTK) data.

As of 1 January 2023, 115 States had announced their intention to participate in CORSIA. Nine more States (Antigua and Barbuda, Kuwait, Samoa, Seychelles, Sierra Leone, Solomon Islands, Mauritius, Malawi, and Haiti) announced their intention to participate in CORSIA from 1 January 2024, bringing the total number of participating States to 124.

To ensure that operators and participating States are able to accurately measure and report their CO₂ emissions, ICAO has developed extensive rules and procedures which States have since adopted to govern a robust CO₂ emissions monitoring, reporting and verification (MRV) system. Some 97% of CO₂ from global international aviation is now being annually reported under this framework, through the CORSIA Central Registry, and for the first-ever such measure designed to regulate emissions on a global basis this represents a significant achievement.

Most recently, and for the first time, SAF were certified under CORSIA. Making use of the two ICAO-approved sustainability certification schemes designed for this purpose, the development marks a significant milestone for both SAF production and aviation climate action by States.

The SAF were produced from wastes and are characterised by 75% to 84% lower CO₂ emissions compared to conventional aviation fuels. The successful certification of these sustainable aviation fuels ensures that they present real environmental benefits on a life-cycle basis, and it also confirms the performance of the certification process itself.

In short, the pandemic did not derail governments' commitment to addressing the climate action of their international flights. On the contrary, their pre-pandemic commitments, including CORSIA, have provided a robust platform for assuring the sustainability of the recovery.

There is no doubt that aviation stakeholders are keen to ramp up the momentum on climate action, and quickly. Does ICAO have a key call to action?

Collaboration, and a unified global approach, are fundamental to the overall objectives we share to mitigate, decrease, and eventually eliminate air transport emissions.

ICAO will continue to fulfil its important role in supporting and optimising the capacities and consensus of States towards increasingly ambitious environmental targets.

While air transport has been widely recognised in the past as a "hard-to-decarbonise" sector, it has been very encouraging to see that we're focusing

ICAO will continue to fulfil its important role in supporting and optimising the capacities and consensus of States towards increasingly ambitious environmental targets.

much less today on calculating our global emissions percentage, and much more on what we are doing, and must do, about it.

I mentioned earlier that innovation and financing priorities are fundamental to all of our current objectives and ambitions toward the decarbonisation of international aviation.

As we have just explored briefly, there is no shortage of innovation today in any area of aviation sustainability, and as a standards-developing agency, ICAO recognises that it has a significant role to play in making its own assessment and review processes much more efficient so that they don't impede the progress that is so urgently needed.

We will also be much more active in bringing together governments and industry in this area, and in leveraging the opportunities this presents for increased public and private sector partnerships, efficiencies, and results.

Simply put, the full engagement of the entire aviation ecosystem must now be brought to bear on this very urgent and important priority. We must work together towards agreed and common goals, to achieve the success of net-zero carbon emissions by 2050 that the world is demanding from us. ●

Salvatore Sciacchitano is the sixth and current president of the ICAO Council. He was elected on 25 November 2019 for a three-year term beginning 1 January 2020. Mr Sciacchitano was re-elected on 24 October 2022 for a second three-year mandate beginning 1 January 2023.



Climate change in international aviation – a global compact



EILEEN POH

Chair of the Council of ICAO
Climate and Environment
Committee
Representative of Singapore
on the Council of ICAO

“
The 41st ICAO
Assembly adopted
a long-term global
aspirational goal
(LTAG) for inter-
national aviation
of net-zero carbon
emissions by
2050.”

Global commitment to net-zero carbon emissions

The collective global long-term aspirational goal for international aviation of net-zero carbon emissions by 2050 (LTAG) adopted by the 41st ICAO Assembly, marks the momentous global commitment of States to address international aviation emissions in support of the United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement's temperature goal.

The global air transport industry is jointly onboard with this climate change journey, having adopted a similar 2050 net-zero carbon goal in 2021. This collaborative commitment was made by the world's major aviation industry associations and largest aircraft engine makers to accelerate efficiency measures, energy transition and innovation across the aviation sector and in partnership with governments around the world.

Global structure

The commitments of States and the industry to achieve LTAG have ignited the engines for action and collaboration to create the ecosystem to support decarbonisation of aviation. ICAO recognises that there is no one-size-fits-all formulation to achieve LTAG, and envisions the deployment of a whole basket of measures comprising technological advances, operational optimisation, cleaner energy fuel and a global market-based measure. Extensive work has been done by experts to identify the suite of actions to decarbonise the sector under each of the different streams.

A global commitment requires a global structure. The ICAO Council has placed the implementation of LTAG as a priority, guided by the four pillars of policy planning, regulatory framework, implementation support and financing. The global policy serves to provide direction on the focus areas for the LTAG initiatives to move the sector in a coherent and co-ordinated manner. It provides important market signals on the global course of action and time-frame.

The global regulatory framework provides clarity, certainty and consistency on the operating ecosystem, ensuring safety, airworthiness and sustainability integrity to provide confidence for the development and investment of new revolutionary technology and innovation to support LTAG beyond business-as-usual operations. The existing framework will be enhanced beyond the sustainability criteria, certification, monitoring, reporting and verification processes already in place for the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). Concurrently, the ICAO Air Navigation Commission is developing a roadmap for the timely development of the relevant ICAO Standards and Recommended Practices (SARPs) to support revolutionary technology in unconventional airframe and aircraft propulsion concepts, and innovative processes in future air navigation and airports to provide greater predictability to the industry and investors.

The new ICAO Implementation Support Policy by the ICAO Secretary General will better facilitate resource mobilisation to support States' implementation of ICAO SARPs, and ensuring that no country



is left behind (NCLB) in the process. The global LTAG implementation will benefit from this new structure with the One-ICAO approach to coordinate and enhance cooperation in the wide range of LTAG implementation activities. An ICAO Assistance, Capacity-building and Training for LTAG (ACT-LTAG) will be set up to help catalyse actions by banding together different resources from States, the industry, financial institutions and other sectors towards the common purpose of implementing the expansive basket of measures to decarbonise aviation.

The LTAG is a challenging goal with heavy investments and financing required. The ICAO Assembly resolution provides for the development of measures or mechanisms for States with particular needs in order to have better access to private investment capitals, funding and financing. The ICAO Council has set up a work programme to consider the establishment of a climate finance initiative or funding mechanism under ICAO to achieve the LTAG. The Council president has also initiated a series of Council dialogue sessions, beginning with the World Bank, regional multilateral development banks (MDBs), commercial banks, pension funds, private investors, financial institutions, fuel producers, and the energy sector, to build interest in funding and financing LTAG implementation, such as in sustainable aviation fuel (SAF) production and the role of ICAO in facilitating access to funding and financing.

Global access and collaboration

In the more immediate term, SAF will be the key focus. It has been widely acknowledged that SAF has the highest potential to decarbonise the sector, contributing more than half of the CO₂ reduction in 2050 through life-cycle CO₂ emissions reduction. The “drop-in” fuel blend of up to 50% conventional jet fuel requires no aircraft modification or changes to airport infrastructure and is globally accessible.

The third ICAO Conference on Alternative Aviation Fuels (CAAF/3), which will convene in Dubai, United Arab Emirates from 20 to 24 November 2023 just before the UNFCCC COP28, will be an important rallying of political, technical, operational and financing commitments to upscale SAF production across all geographical regions. CAAF/3 is expected to deliberate on policy toolkits for States to set up the ecosystem for SAF production using different feedstock and technologies depending on geographical locations and resource availability. There will be discussions on a global cleaner aviation energy



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framework to provide certainty and consistency to SAF stakeholders for ease of access to SAF financing.

Furthermore, leveraging on appropriate “book and claim” mechanisms can help to extend availability of SAF globally, in particular to airlines without direct access to SAF. Corporate bodies are already using the book and claim system to offset their corporate travel footprint directly with SAF producers, providing an indirect source of funding to further de-risk investments and making SAF production more bankable globally. It will also benefit developing States with high feedstock and SAF production supplies but low air traffic volume and low SAF uptake. However, there remain concerns among some States that book and claim could favour SAF production in developed States at the expense of developing States, which will have to be addressed.

Many States have an interest to pursue SAF production for energy security, as a new economic stream, bringing in foreign direct investments (FDI), and for technology transfer. ICAO therefore launched the ACT-SAF programme in 2022 comprising a diverse group of partners to support States with the implementation of SAF in-country. As of June 2023, 80 States and 40 organisations are in the ACT-SAF programme providing funding and contributing expert resources to assist with feasibility studies on feedstock and development of policies for SAF production. The European Union and its Member States are among the strong partners of ACT-SAF.

Global market-based scheme

Finally, there is the global market-based measure scheme, CORSIA – a scheme supporting the global nature of international aviation. It will enter its second voluntary phase from 1 January 2024. The global scheme was established in response to the aviation industry’s need to tap into more abundant out-of-sector emissions reduction credits given the



Eileen Poh has over 30 years of experience across a wide spectrum of aviation and airport-related businesses in both the public and private sectors. She held leadership roles in airport investment development and business planning, air hub development, and climate change. She has led in bilateral and multilateral air services and climate change negotiations and was involved in the andragogy transformation for aviation training. She is currently the representative of Singapore on the Council of ICAO. Eileen has a BSc from the National University of Singapore. She was awarded the Singapore Public Administration Medal (Silver) in 2017.

limited emissions reduction opportunities in the sector. CORSIA is designed as a gap filler to achieve the medium-term aspirational goal before SAF and lower carbon aviation fuel (LCAF) production can meet the offset demands. As a global scheme, CORSIA avoids a patchwork of national or regional schemes that could lead to market distortion, duplicity, higher costs and use as a non-trade barrier.

Under Annex 16 Vol IV of the Chicago Convention, ICAO has developed a robust and comprehensive system of implementation elements, including eligible unit criteria, methodology for offsetting from SAF and LCAF with defined sustainability criteria, certification requirements, and independent evaluation and certification of the sustainability integrity of fuels, to ensure the global recognition and acceptance by all ICAO Contracting States for qualifying SAF use in CORSIA and international aviation. More recently, the ICAO Council unanimously approved the stringent vintage start date of 2021 for credit offsets for CORSIA's first phase.

So far, 121 States from all regions, covering some 80% of global international aviation traffic, have volunteered to participate in CORSIA's first phase. These States include Small Island Developing States and Landlocked States who can opt to be exempted from CORSIA but chose otherwise. It demonstrates States' confidence in the fair operations of the system with an inclusive coverage of emissions in this delicately balanced, hard-fought global compact under ICAO. These States continue to participate despite adjustments made at the 41st ICAO Assembly for a more ambitious baseline

of 85% of the 2019 global traffic levels with adjustments to the individual offsetting component in the later phases to account for the faster growing developing States. Any attempts to introduce national or regional market-based measures for international aviation will be incompatible with CORSIA, jeopardising the global compact.

Global action

Climate change is a global phenomenon, requiring global solutions. This is more apparent and acute in international aviation with the cross-border nature of air transportation. It is well recognised in the aviation sector that the global compact under ICAO is the only way to ensure the sustainable operations of international aviation to promote people-to-people connectivity, to facilitate trade flows, and to provide for essential supplies for the social and economic development of States.

The global motion to take action towards achieving the LTAG has begun. One hundred and forty States, covering approximately 98% of global international aviation traffic, have submitted State Action Plans on their contributions to emissions reductions from international aviation and highlighting opportunities for collaboration.

States, industry and other aviation and non-aviation stakeholders are committed and united on the urgency to collaborate to take action to secure the success of net-carbon zero emissions in international aviation, alongside the global climate action under the Paris Agreement. ●

These are my perspectives as chair of the ICAO Council Climate and Environment Committee from consultations with Council Member States, the industry and all stakeholders in this global endeavour.

“

[...] the global compact under ICAO is the only way to ensure the sustainable operations of international aviation to promote people-to-people connectivity, to facilitate trade flows, and to provide for essential supplies for the social and economic development of States.”



Jewel Changi Airport



How aviation can create an effective roadmap towards decarbonisation

In a significant development, the International Civil Aviation Organization's (ICAO) assembly embraced an ambitious objective last year by establishing an aspirational target for international aviation to achieve net-zero emissions by 2050.

This commitment reinforces existing goals and commitments undertaken by the aviation industry and individual States. However, adopting a net-zero emissions target also acknowledges the formidable challenge faced by aviation, recognising it as one of the most challenging sectors to decarbonise, requiring all available options, including battery-electric and hydrogen-powered aircraft.

However, anticipated advancements and scalability of technologies, such as sustainable aviation fuels (SAFs), projected to help reduce greenhouse gas (GHG) emissions by 46%-65%, offer the sector a clear trajectory – although realising their potential will require active promotion and appropriate incentives and regulation.

By examining the emissions distribution outlined in the Air Transport Action Group's *Waypoint 2050* report, we find that 96% of aviation emissions originate from aircraft with more than 100 seats. Remarkably, 66% of these emissions are attributed to highly successful single-aisle aircraft dominating the market. The remaining 4% is associated with aircraft with up to 100 seats, commonly deployed for regional routes. Therefore, to decarbonise the bulk of those emissions, in the short term the focus lies on SAFs, which offer a technically

feasible solution utilising the current infrastructure of aircraft and airports.

However, the key challenge lies in scaling up the production and supply of SAFs. According to the *Making Net-Zero Aviation Possible* report, meeting the demand will necessitate 300 SAF production plants by 2030, with a projected requirement of up to 3400 plants by 2050. This need presents a significant challenge regarding feedstock availability, particularly as biomass resources are limited. To scale SAF in line with the 2050 targets, rapid deployment of power-to-liquid plants is likely to be required after 2030 to overcome the feedstock constraint of bio-based routes. Industry will play a key role in meeting this challenge, but it is clear government targets, frameworks and policies will be needed to support the widespread adoption of SAF fuels within the aviation industry.

When considering the broader context of decarbonisation, the significance of electrification may surpass initial estimations. While projections indicate its importance in emissions reductions at around 2%, this technology is crucial in supporting the decarbonisation roadmap. Notably, battery-electric aircraft offer the advantage of eliminating in-flight emissions.



**ALEJANDRO
DE QUERO CORDERO**

Sustainability Lead
for Aerospace and Drones,
World Economic Forum

“Governments must better understand how to create an enabling environment, facilitating the development and deployment of alternative propulsion aircraft through research, infrastructure support and regulatory updates”.

In recent years, numerous concepts for electrical vertical take-off and landing vehicles have emerged. However, they are not intended to entirely replace existing commercial, regional routes, which typically operate on less than 800-kilometre distances. According to the World Economic Forum report, *Target True Zero: Unlocking Sustainable Battery and Hydrogen-Powered Flight*, by 2035, lithium-ion battery-electric aircraft are expected to have a maximum operating range of approximately 400 kilometres, increasing to 600 kilometres by 2050.

If battery-electric aircraft continue to evolve, electrification could be significant within a global decarbonisation framework. Electric motors combined with other technologies, such as electric propulsion with SAFs or hydrogen, as in a hybrid aircraft, can significantly extend the aircraft's range.

This broader range enhances the regional market's potential, positioning hybrid aircraft as a viable alternative to new turboprop designs that can substantially reduce emissions compared to smaller jets. Additionally, hybrid aircraft can help to facilitate safety and security certification processes for electric motors and hydrogen concepts. Moreover, in the short term, hybrid aircraft can contribute to decarbonising on-ground operations during taxiing, take-off and landing stages, offering immediate environmental benefits.

Several technical efforts must be combined to successfully implement battery-electric aircraft: ensuring renewable charging sources, optimising battery life cycles and enhancing energy density. Maximising energy density can significantly improve the range and efficiency of battery-electric aircraft, further supporting their viability as a sustainable aviation solution.

Overall, a big portion (around 26%) of emissions reduction still depends on another important technology: hydrogen. That means accelerating the production capacity of green hydrogen by 2035.

A sufficient supply of green hydrogen is essential, as blue hydrogen may not yield significant climate improvements compared to conventional jet fuel. Additionally, advancements in fuel cell technology and lighter storage tanks are vital for optimising the efficiency and range of a hydrogen-powered aircraft. Designing aircraft with hydrogen performance in mind, including strategic placement of hydrogen tanks, is thus crucial for maximising their capabilities and reducing environmental impact.

Efforts should also focus on researching and mitigating the potential impact of contrails formed by hydrogen-fuelled aircraft containing increased water vapour. By prioritising these considerations, the aviation industry can unlock the full potential of hydrogen technology and drive the transition towards a sustainable and decarbonised future.

All these technical questions and roadmaps must be supported by regulation. Governments and regulatory bodies may feel overwhelmed about the steps to be followed. In response, the World Economic Forum and the Aviation Environment Federation have collaborated to create the report *Target True Zero: Government Policy Toolkit to Accelerate Uptake of Electric and Hydrogen Aircraft*. The aim of this toolkit is to provide governments with both the opportunity and the options to help develop approaches towards accelerating the development of zero-emissions aircraft technologies as part of an overall decarbonisation plan for the sector.



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As regulators, framing a net-zero aviation strategy will require a comprehensive understanding of market segments, aircraft sizes, airport infrastructure and the potential for renewable electricity or hydrogen supply. This understanding may differ across countries but governments must define clear goals and milestones for battery-electric and hydrogen propulsion based on these insights, to attract investors and drive industry action. Building stakeholder partnerships will help to assist this objective by identifying priority actions, while alignment on aviation strategies with economy-wide plans for hydrogen and renewable energy development is also essential for progress.

On the other hand, governments must better understand how to create an enabling environment, supporting International Civil Aviation Organization initiatives while facilitating the development and deployment of alternative propulsion aircraft through research, infrastructure support and regulatory updates. As the aviation industry's security and safety certifications are crucial to public acceptance, harmonising certification approaches is potentially the most important step to accelerate progress.

When alternative propulsion aircraft are ready to enter into service, policy measures should also be considered to encourage their rapid adoption, taking into account cost-effectiveness and technical feasibility.

Governments must define clear goals and milestones for battery-electric and hydrogen propulsion to attract investors and drive industry action.

Such measures could include financial incentives such as reduced fees and charges, low-interest loans and market-based measures to address cost differentials and increase competitiveness. At the same time, mandates, restrictions and eco-labelling can further drive technology transfer and create consumer demand for lower-emission alternatives.

The global aviation industry is responsible for just under 3% of global carbon emissions and is projected to emit more as travel demand rises in emerging economies. There is no single measure to decarbonise the sector, and realising net zero will require a broad focus that maximises the potential of technological advancements, financial incentives and partnerships; but doing so will put the sector on track with its decarbonisation roadmap. ●

Currently serving as the sustainability lead for aerospace and drones at the World Economic Forum, **Alejandro de Quero Cordero** focuses on promoting sustainable practices, particularly in the areas of electrification, hydrogen and infrastructure for the Airports of Tomorrow initiative.

Before joining the World Economic Forum, he spent over seven years at GF Machining Solutions, a Swiss machine tool manufacturer. During this time, he developed his engineering skills in various cutting-edge technologies, as well as successfully managing relationships and overseeing projects with aerospace manufacturing companies, including major commercial aircraft engine manufacturers and spacecraft manufacturing companies. With a strong engineering background as an aerospace engineer and a passion for sustainability, Alejandro actively contributes to driving innovation and fostering sustainable practices in the aviation sector.

The World Economic Forum is contributing to efforts to decarbonise the aviation industry with a new initiative: Airports of Tomorrow.



This initiative addresses the key challenges of aviation industry decarbonisation by promoting collaboration across four different pillars:

1. Airport infrastructure, working to build on-site energy production required to roll out novel propulsion technologies.
2. Sustainable aviation fuels (SAF) and Scope 3 emissions, focusing on the supply of SAF.
3. Financing, bringing certainty to governments and investors and helping de-risk the investments needed by creating finance solutions to funding the changes required.
4. Connecting start-ups with experts in the World Economic Forum community through UpLink, the Forum's innovation platform.



Sustainable aviation fuels – technology and policy initiatives around the world

United Arab Emirates and aviation fuel

Global commitment for aviation fuel transitioning initiatives towards sustainable aviation fuel

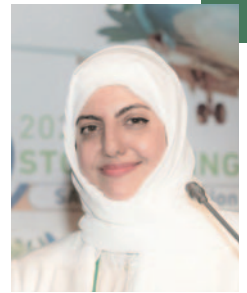
Since the foundation of the United Arab Emirates (UAE), environmental stewardship has been a central pillar in the leadership's vision to build our shared future.

Sheikh Zayed bin Sultan Al Nahyan, the UAE's founding father, was a tireless advocate for environmental protection, supporting and overseeing the implementation of a series of measures to protect the natural world and its resources. Sheikh Zayed's vision was so strong that today it is the principle and the legacy that drives us towards addressing the challenges of climate change in all sectors, including international aviation. The UAE has already put in place foundations for green growth and climate change, which align with the UAE's track record of supporting the international climate policy architecture, as green growth and climate change represent a critical element of the UAE's international cooperation efforts. In 2021, the UAE announced its net-zero-by-2050 strategic initiative making the Emirates the first in the MENA region to do so. The UAE is to invest 600 billion dirhams (USD 163 billion) in clean energy to achieve 2050 net-zero targets. In October 2022, and during the ICAO Assembly, the aviation sector announced the endorsement of aviation net zero by 2050.

Since 2011, the UAE has participated in many events, conferences and task forces in ICAO. Today, more than 30 UAE experts are working with their international counterparts in different fields including aviation fuels, which the UAE is keen to elevate to the next level where it will shape the future and lead to significant emissions reductions.

It was a great opportunity to demonstrate the UAE's achievements towards reducing CO₂ emissions from the aviation sector and our ambitions towards accelerating aviation eligible fuels (low-carbon aviation fuel (LCAF) and sustainable aviation fuel (SAF)) through initiatives and projects.

In March 2021, the UAE prime minister's office approved the establishment of the UAE National Committee for LCAF and SAF to carry out all the needed studies towards setting a national policy and strategy for LCAF and SAF, which will balance our environmental and economic needs. In April 2021, the UAE joined the United Kingdom team and the World Economic Forum in the Clean Skies for Tomorrow initiative, as all the participating governments agreed on the need to have a policy toolkit as an aid to assist States in identifying the appropriate tools best suited for setting their national policy and strategy related to eligible aviation fuel. The UAE ambassadors have been engaged in all the stages of creating the *Clean Skies for Tomorrow: Sustainable Aviation Fuel Policy Toolkit*, and this involvement continued in 2022 (<https://www.weforum.org/reports/clean-skies-for-tomorrow-sustainable-aviation-fuel-policy-toolkit/>).



MARYAM AL BALOOSHI

United Arab Emirates
representative in the ICAO
Committee on Aviation
Environmental Protection (CAEP),
Manager – Environment Aviation
Safety Affairs Airworthiness,
United Arab Emirates General
Civil Aviation Authority

In 2021, the UAE announced its net-zero-by-2050 strategic initiative making the Emirates the first in the MENA region to do so. The UAE is to invest 600 billion dirhams (USD 163 billion) in clean energy to achieve 2050 net-zero targets. In October 2022, and during the ICAO Assembly, the aviation sector announced the endorsement of aviation net zero by 2050.

The UAE has also continued adapting and announcing a number of initiatives to reach a balanced approach towards future aviation fuel, such as:

- 1 | On 16 November 2021: Emirates, GE Aviation and Boeing signed a Memorandum of Understanding to develop a programme that would see an Emirates Boeing 777-300ER, powered by GE90 engines, conduct a test flight using 100% sustainable aviation fuel by the end of 2022.
- 2 | In March 2022, the UAE, in collaboration with the World Economic Forum, established an official project to study the opportunity for power-to-liquids (PtL) technologies in the UAE. This study provided a robust analysis of the economic benefits, including the export, diversification and job creation opportunities, and a clear explanation of the importance of PtL and the associated value chain to achieve the UAE's climate ambitions. The full study was announced in July 2022. ([UAE and WEF Power-to-Liquids Roadmap July 2022](#))
- 3 | On 23 May 2022, the Abu Dhabi National Oil Company (ADNOC), oil major BP, and the Abu Dhabi future energy company, Masdar, joined forces to develop clean hydrogen and technology hubs. Other partnerships include a feasibility study for a low-carbon hydrogen project in the UAE and an expanded ADNOC-BP-Masdar partnership to explore the production of sustainable aviation fuels from municipal waste and green hydrogen in Abu Dhabi. ([Abu Dhabi's ADNOC and Masdar deepen partnership with BP \(gulfbusiness.com\)](#))
- 4 | In January 2023, and during Abu Dhabi Sustainability Week, the Ministry of Energy and Infrastructure along with the General Civil Aviation Authority launched the UAE SAF Roadmap, which was drawn up with the engagement of a large number of stakeholders from aviation, energy and carbon experts, financial institutions, governments, etc. ([National Sustainable Aviation Fuel Roadmap of the United Arab Emirates](#))
- 5 | In March 2023, the UAE won the bid to host the third edition of the ICAO Conference on Aviation and Alternative Fuels. This conference is taking place following ICAO's 41st Assembly resolution on aviation net zero where fuel plays a critical role towards achieving such an ambitious goal. The UAE welcomes the global community to an open dialogue, through ICAO, to support every country in understanding their needs in capacity building, infrastructure improvement, production requirements and resources to enable them to be in energy transitioning phase.



Ministry of Energy and Infrastructure and UAE General Civil Aviation Authority representatives with the World Economic Forum on the occasion of the UAE PtL launch.

SAF Roadmap: Ministry of Energy and Infrastructure and UAE General Civil Aviation Authority launch the UAE SAF Roadmap during Abu Dhabi Sustainability Week.

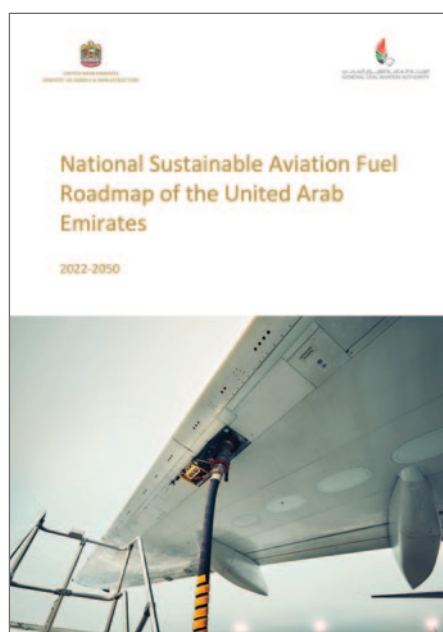


- 6 | On 11 May 2023, Emirates, as one of the largest airlines in the world, announced that it had committed USD 200 million to fund research and development projects focused on reducing the impact of fossil fuels in commercial aviation. This is the biggest single commitment by any airline on sustainability, with funds to be disbursed over three years. Emirates will identify partnerships with leading organisations working on solutions in advanced fuel and energy technologies. (Emirates creates US\$ 200 million aviation sustainability fund)
- 7 | Also in May 2023, Etihad and SATAVIA signed a multi-year commercial agreement to deliver contrail management and future carbon credits within day-to-day operations. In the same month, carbon transformation company Twelve and Etihad Airways partnered to advance sustainable aviation fuels made from CO₂ and renewable energy. (Etihad and SATAVIA sign multi-year commercial agreement to deliver contrail management and future carbon credits within day-to-day operations)
- 8 | On 16 May, Masdar and Airbus announced their partnership to shore up the growth of the global sustainable aviation fuel market. The signature ceremony was held in the presence of Dr Sultan Ahmed Al Jaber, minister of industry and advanced technology, chairman of Masdar and COP28 president-designate; Guillaume Faury, chief executive officer, Airbus, and Mohamed Jameel Al Ramahi, chief executive officer, Masdar. (Masdar, Airbus to shore up growth of global sustainable aviation fuel market - GulfToday)
- 9 | On the regional level, the UAE has shared its experience with a number of States on how to establish work on aviation fuel, and how to communicate with the relevant entities. As a chair of the regional environment committee in the Arab Civil Aviation Organization, the UAE has a responsibility to understand the regional challenges and escalate them to ICAO, which happened during our participation in the ICAO Regional Seminars for Aviation Fuel in Cairo in May 2023.

As the host of COP28, the UAE aims to make significant progress in climate change discussions. We, as the General Civil Aviation Authority, will work closely with ICAO, States, regional organisations, and the industry in seeking to highlight the sector's efforts and accomplishments to create a sustainable future, and to make the upcoming ICAO Conference on Aviation and Alternative Fuels a remarkable one.

In conclusion, the UAE is committed to collaborating with stakeholders at all levels to support and encourage the aviation sector in achieving its international emissions reduction goals. As the host of COP28, the UAE aims to make significant progress in climate change discussions. We, as the General Civil Aviation Authority, will work closely with ICAO, States, regional organisations, and the industry in seeking to highlight the sector's efforts and accomplishments to create a sustainable future, and to make the upcoming ICAO Conference on Aviation and Alternative Fuels a remarkable one. ●

Maryam Al Balooshi, environment manager at the United Arab Emirates General Civil Aviation Authority (GCAA) since 2010, was the first Arab expert in the field of aviation environment, when in 2006 she became the founder of aviation environment in the UAE and the region. She was one of the first experts in the world to be seconded to the environment department at the International Civil Aviation Organization (ICAO), in 2010. Since 2016 Maryam has been the official UAE member of the ICAO Committee on Aviation Environmental Protection (CAEP), and in 2010 she was regional chair and founder of the Aviation Environment Committee. She has been State lead negotiator for aviation climate change, and State COP member since 2010.





The promotion of sustainable aviation fuels (SAF) in the African region and the challenges of climate financing



ADEFUNKE ADEYEMI

Secretary General, on behalf
of the African Civil Aviation
Commission (AFCAC)

Since the ICAO High-level Meeting (HLM) on the Feasibility of a Long-Term Aspirational Goal for International Aviation CO₂ Emissions Reduction (HLM-LTAG) in July 2022, a sharp focus has been placed on civil aviation to achieve net zero.

During the 41st ICAO Assembly, Member States resolved to work together to strive to achieve a collective long-term global aspirational goal for international aviation of net-zero carbon emissions by 2050. ICAO Resolution A41-21 is underpinned by the technical work done by the ICAO Committee on Aviation Environmental Protection (CAEP).

CAEP describes increasing possible levels of ambition, with up to 87% of CO₂ reduction by 2050 from aircraft technology (21%), operations (11%), and fuels (55%).

In Africa, much is being done to promote the growth of the aviation sector. It is projected that Africa will have a 4% growth (2018-2050). The African Union's (AU) Agenda 2063 flagship projects, namely the Single African Air Transport Market (SAATM), African Continental Free Trade Area (AfCFTA), and the African Passport and Free Movement of People, will contribute to this growth in African aviation industry over time.

This expected growth of aviation in Africa must be based on environmental sustainability. A high-level roundtable session on [Sustainable Development of Air Transport in Africa](#) in the margins of the 36th African Union Assembly of Heads of State and Government in Addis Ababa, Ethiopia on 19 February 2023 identified soaring aviation fuel prices that continue to put African airlines under strain. This necessitates alternative sources of aviation fuels, mainly the use of sustainable aviation fuels (SAF), to ensure competitiveness in addition to enhancing efforts to decarbonise the industry by 2050.

“The limited availability of SAF in the African market and the fact that Africa is yet to expand production will, however, hamper the uptake of SAF in the continent’s aviation industry.”

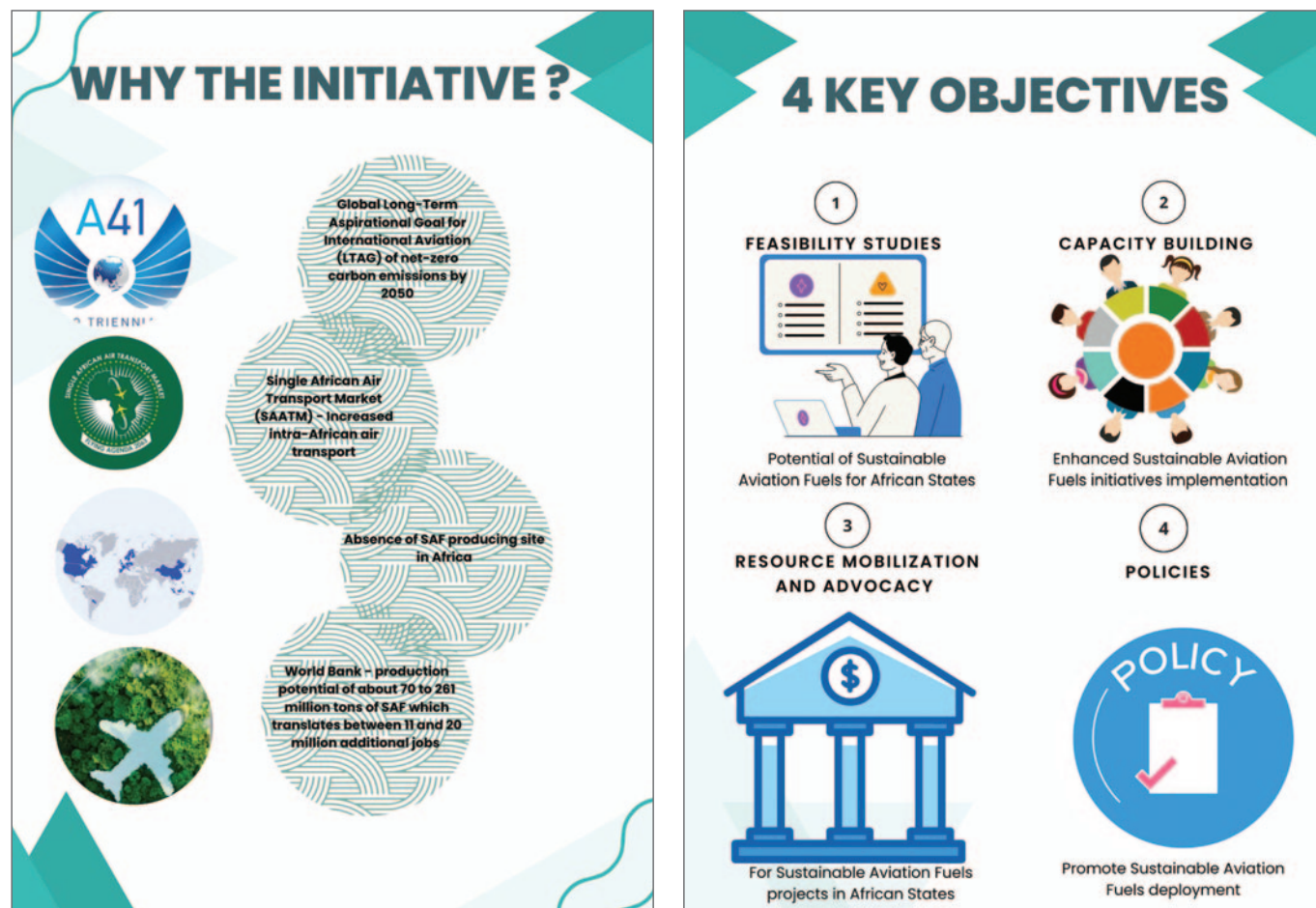
AFRICAN UNION COMMISSION INFRASTRUCTURE AND ENERGY COMMISSIONER,
H.E. DR AMANI ABOU-ZEID

The promotion of sustainable aviation fuels in the African region

Sustainable aviation fuels present the greatest potential of CO₂ reductions; however, SAF production or deployment in Africa is still very low compared to other regions of the world.

In response to all these concerns, AFCAC, being the AU specialised agency for all civil aviation matters, has developed an initiative to [accelerate the development and deployment of sustainable aviation fuels in Africa](#).

Representation of the AFCAC initiative



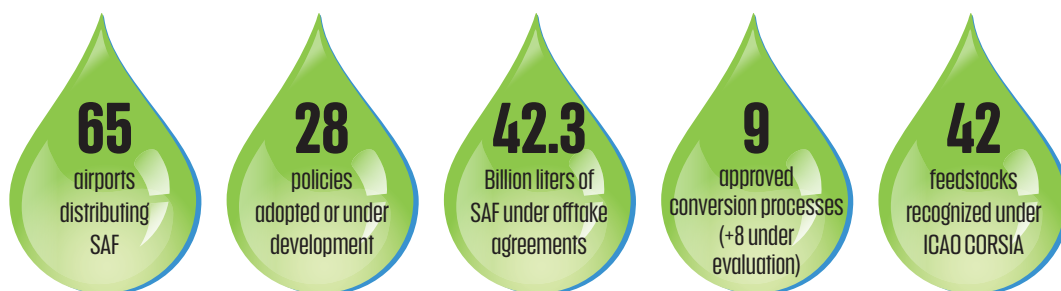
Challenges of climate financing

The amount of climate finance in Africa falls dramatically short of what is needed. According to the African Development Bank (AfDB) paper on [Financing a Just Transition in Africa: Challenges and Opportunities](#), the total annual climate finance mobilised in Africa in 2020 was only USD 29.5 billion against a need of USD 250 billion annually.

At the HLM, AFCAC, through [HLM-LTAG-WP/15](#), and then during the 41st ICAO Assembly through [A41-WP/438](#), identified the challenges of availability and access to climate finance as a threat to efforts to decarbonise the aviation sector. AFCAC called for the establishment of mechanisms that will increase availability and ease of access to climate finance to support efforts to decarbonise aviation.

“Africa has fewer financial opportunities thanks to the continent’s structural issues, risk profile and political uncertainties.”

WORLD ECONOMIC FORUM ON FINDING FINANCING SOLUTIONS FOR THE FUTURE
OF ENERGY IN AFRICA, 23 SEPTEMBER 2021



Source: ICAO – © klaradohmalova

Adefunke Adeyemi

was appointed as Secretary General of the African Civil Aviation Commission (AFCAC), the specialised agency of the African Union (AU) on all civil aviation matters and the executing agency of the Yamoussoukro Decision (YD) and the Single African Air Transport Market (SAATM), on 1 September 2022. Her role is to promote safety, security, air transport liberalisation, environmental protection and overall sustainability of the African air transport sector across the continent.

With an international career spanning over 20 years, Adefunke is recognised as one of the 50 most inspirational Nigerian women. She was recently honoured as one of the 200 globally Most Influential People of African Descent (MIPAD) in affiliation with the United Nations Decade for People of African Descent. She is also the 2021 recipient of the Ato Girma Wake Lifetime Achievement Award for Services to African Air Transport and Trade development. She studied law at the University of Lagos, Nigeria and qualified as a barrister and solicitor of the Nigerian Supreme Court in 1998. She holds a Master of Law (LLM) from the University of Cambridge, United Kingdom and a Master of Business Administration (MBA) from Nanyang Business School, Singapore in collaboration with Wharton Business School, Philadelphia and Berkeley Hass Business School, California.

The ICAO Assembly Resolution [A41-21](#) identifies access to finance as the core for decarbonising aviation and as such must be initiated as soon as possible.

A stocktake of the [SAF Tracking tools](#) tells the story of sustainable aviation fuels in Africa: two airports delivering SAF in Africa, zero policies on SAF in Africa, and very minimal volumes uptake in Africa.

Accelerating the development and deployment of SAF in Africa must overcome the challenge of access to sufficient and sustainable climate financing.

In recognition of this fact, AFCAC is leading its initiative by focusing on mobilising resources through the AU and other partners to finance construction of at least two SAF production sites in Africa as a pilot project.

There are examples of successful initiatives in Africa that form a good starting point:

- Feasibility studies on the use of SAF in Burkina Faso and Kenya
- Flight by Kenya Airways from Nairobi to Amsterdam using SAF (figure 1).

The biggest challenge will be to keep the momentum. ●

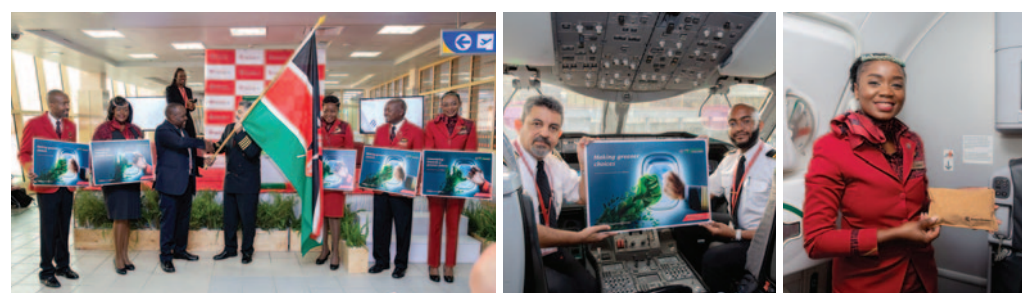
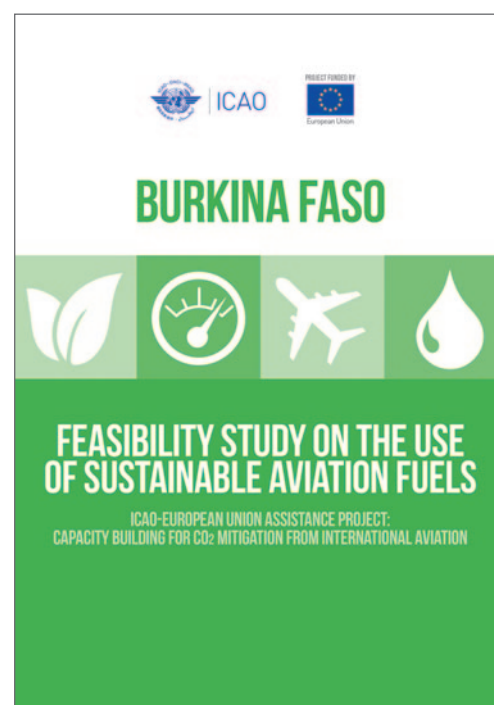


Figure 1

Colombia, a great opportunity for deforestation-free sustainable aviation fuels

The 41st ICAO Assembly adopted a long-term global aspirational goal (LTAG) for international aviation of net-zero carbon emissions by 2050. This vital goal relies in part on the heavy use of biomass-based sustainable aviation fuels (SAF) that use, amongst others, agricultural raw materials and waste. In this context, the production of SAF in Colombia is a viable option to reduce greenhouse gas emissions, and much more...

Colombia is supporting the implementation of SAF programmes based on its decades-long successful and extensive production and use of biofuels. SAF may be produced building on this experience and has the potential to significantly strengthen good agricultural practices adopted by the existing biofuels industry, and leverage the zero deforestation and human rights policies that are currently being considered in the European Union and the United States.

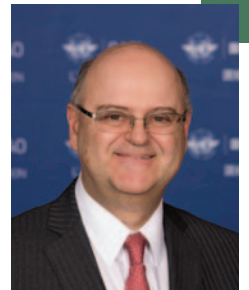
This is possible given that the country has ample planting area with zero deforestation, as evidenced by the recent update on the delimitation of the national agricultural border by the Ministry of Agriculture and Rural Development, the Ministry of Environment and Sustainable Development, and the Agricultural Rural Planning Unit (UPRA for its acronym in Spanish)⁽¹⁾, which shows that Colombia today has 38 million hectares of agricultural frontier where only a maximum of 7 million are actually cultivated.

Colombia's biofuels experience started in 2007 with a biofuels inclusion law that has led to the use today of 10% of biofuels produced from sugarcane and palm oil, as part of the fuels energy mix in gasoline and diesel fuel, without generating deforestation pressures. Evidence of this is shown by the baseline study on deforestation prepared in Colombia by IDEAM's⁽²⁾ update of its 2011-2017 baseline for 2018 where, for example, the deforestation associated with palm cultivation in Colombia is 0.4% of the total. Many efforts are being invested

in bringing that number to zero per cent, including through the criminalisation of that practice. It is very important to note that the existing Colombian palm industry is different from palm grown in other regions, and that its crude palm oil (CPO) and waste are now ready to be certified under the ICAO Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), given their low indirect land-use change (ILUC) emissions, thus becoming an additional potential feedstock for Colombian SAF.

Colombia has also taken significant steps in research and technological development, enhancing the cultivation of new sugarcane varieties and the application of innovative practices driving its productivity to amongst the top three in the world. This is also the case of the development and use of the American Palm, which is more productive and long-lasting than the *Elaeis guineensis* variety, and the esterification of fatty acid oils obtained from acidic vegetable oils (including used cooking oils and used vegetable oils) with glycerine.

Colombia will be able to produce green hydrogen at a low cost and has the potential to become a reliable and competitive supplier of SAF.



MAURICIO RAMIREZ KOPPEL

Permanent Representative
of Colombia to the International
Civil Aviation Organization
(ICAO)

SAF has the potential to significantly strengthen good agricultural practices adopted by the existing biofuels industry, and leverage the zero deforestation and human rights policies that are currently being considered in the European Union and the United States.

(1) UPRA: Oil palm and agricultural border in Colombia. 2019

(2) IDEAM: IDEAM (2020), "Baseline of deforestation 2011-2017 in African oil palm-growing areas."



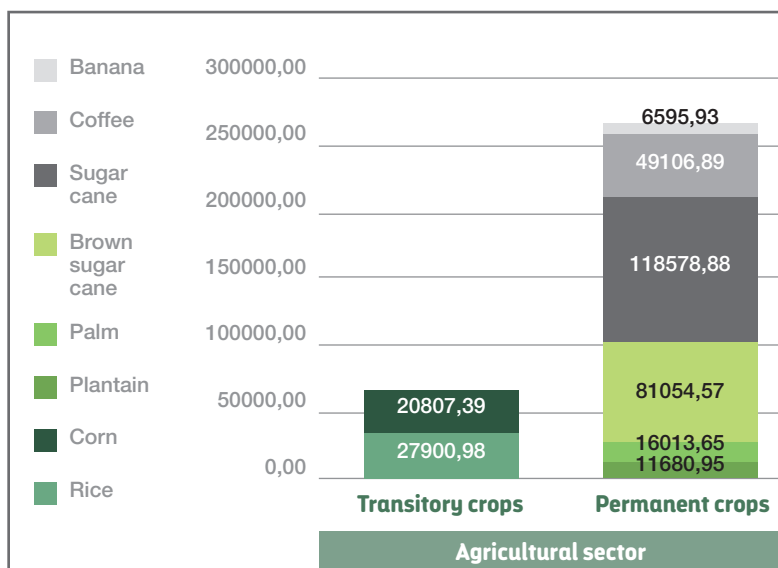
BIOMASS

- In 2019, the area planted with agricultural and forestry crops exceeded **5.6 million** hectares
- Agricultural production in 2019 reached **33.1 million** tons
- Livestock 2019 production reached **5 million** tons
- We have a plant residual biomass potential of more than **43 million** tons per year



Source: UPME. Adopted By INERCO consultants, Colombia 2018

Agricultural biomass potential



“Colombia is prepared to be an important stakeholder in this new SAF industry with its labour and environmental benefits, while being able – in the short term – to reach a volume of certified raw materials sufficient to feed one or more viable units of SAF production.”

Finally, Colombia has also realised its significant potential regarding certifiable biomass and has produced a residual biomass inventory. The results show the existence of more than 43 million tons per year of agricultural and livestock biomass. This important potential has led to the installation of the first biomass pelletising plant with a capacity of 25 000 tons per year, recently certified by the Sustainable Fuel Register (SFR).

Colombia's environmental commitment on sustainability and productivity as factors that differentiate its agricultural sector in national and international

markets is firm, and SAF, under the CORSIA programme, will strengthen this commitment by increasing the controls and obtaining certifications described in the image below.

As an example, the Roundtable on Sustainable Palm Oil (RSPO) and the International Sustainability and Carbon Certification (ISCC) already account for 30% of national CPO production, which represents approximately 600 thousand tons per year, and even more areas of sugarcane have Bonsucro certification.



Bearing in mind that the agro-industrial sector accounts for more than 10% of gross domestic product and 22% of employment, and in line with the country's efforts, the government's emphasis on energy transition, and the consolidation of the peace process, Colombia – through its mission at ICAO – has actively supported all efforts to achieve sustainable aviation, the CORSIA programme, the approval of certification mechanisms, and the promotion of aid to countries through implementation of the ICAO Assistance, Capacity-Building and Training for Sustainable Aviation Fuels (ACT-SAF) programme. Colombia welcomes the implementation of SAF as a necessary evolution from first generation biofuels. Ecopetrol (state petroleum company) and private sector companies have welcomed this challenge and are acting accordingly to be able to produce certified SAF by implementing green hydrogen production, initiating certification processes, and defining economic and technological paths. Through this development, we are deepening the processes that allow maximising agricultural productivity, without the need to expand the agricultural border. SAF projects in Colombia will support air transport decarbonisation while generating new dignified jobs respectful of human rights, in many cases in areas of high violence identified in the peace process.

In conclusion, the transportation, energy and agricultural authorities have strengthened the interest in the implementation of SAF under ICAO's CORSIA programme, supporting the 2050 net-zero emissions aviation LTAG; this will consolidate the implementation of practices and certification processes as stipulated on the SAF criteria adopted by the ICAO Council and the Assembly. Colombia will ensure this production is achieved with the highest respect for human rights and strict compliance with labour standards, requiring the best agro-industrial practices, by encouraging respect for the established zero-deforestation limit and accelerating the development of production chains in the country under national and international standards, maximising productivity, agro-industrial research and development, and promoting environmental sustainability.



Santa Marta biofuels and industrial complex, Daabon

Given Colombia's wide range of certifiable feedstocks in relevant quantities and an electricity grid that will be 100% renewable in less than a decade, Colombia will be able to produce green hydrogen at a low cost and has the potential to become a reliable and competitive supplier of SAF, strictly complying with the sustainability criteria developed by ICAO under the CORSIA scheme.

Within this international regulatory framework, Colombia is prepared to be an important stakeholder in this new SAF industry with its labour and environmental benefits, while being able – in the short term – to reach a volume of certified raw materials sufficient to feed one or more viable units of SAF production, estimated at 500 thousand tons per year with a potential to gradually scale up, by 2038, to more than one million additional tons and up to six million tons per year by 2050.

The accomplishment of this potential will result in investments of more than USD 10 billion and more than two million direct and indirect jobs within the current agricultural frontier. ●

Mauricio Ramirez Koppel is a civil engineer with an MsCE from Massachusetts Institute of Technology. He is the permanent representative of Colombia to ICAO. On the ICAO Council, he has held the position of chair of the Technical Cooperation Committee, the Finance Committee and the Climate and Environmental Committee, as well as the role of vice-president of the Council. Mauricio has served in public office in Colombia as deputy minister of public works and transportation, director of the Institute of Urban Development of Bogota, director of the National Highways Institute (in charge also of rural roads, railways, and waterways). In the private sector he has extensive experience in engineering and industrial companies and projects. His experience in civil aviation comes from more than 25 years as a private pilot and aircraft owner, with gliders, ultralights, multi-engine and IFR ratings, member of the General Council of the Civil Aeronautics Administration, member of the National Aeronautics Council and the National Air Safety Council, board member of the Colombian Air Club, and president of IAOPA Colombia.

FEEDSTOCKS

Biomass



Plant oils



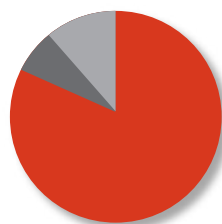
Sugar cane



Synthetic oils

- **Animal fats**
 - > Tallow (beef)
 - > Choice white grease (pork)
 - > Poultry fat
- **Waste greases**
 - > Used cooking oil
 - > Yellow grease

GREEN DIESEL & JET COSTS OF PRODUCTION



■ Feedstock ■ Processing ■ Capital

Type of Feedstock are fundamental in the cost structure

United States' policies to encourage sustainable aviation fuels development and deployment



NATE BROWN

Acting Energy Division Manager,
Office of Environment and
Energy, Federal Aviation
Administration (FAA)



DAN WILLIAMS

Senior International Advisor,
Office of Environment and
Energy, Federal Aviation
Administration (FAA)

Introduction

ICAO's adoption of a long-term aspirational climate goal (LTAG) for international aviation in autumn 2022 provides a target to decarbonise the aviation sector and signals momentum from industry and Member States to get there. Reaching that goal will require significant support and collaboration among governments and industry, and accelerated efforts to reduce aviation emissions. The United States (US) has its own goal of achieving net-zero emissions from aviation by 2050, as described in our 2021 *United States Aviation Climate Action Plan*⁽¹⁾. Achieving the LTAG globally, and the US goal domestically, will require the development and deployment of sustainable aviation fuels (SAF). Recognising that there is no one-size-fits-all solution, the United States has enacted several policies to encourage SAF development and deployment domestically.

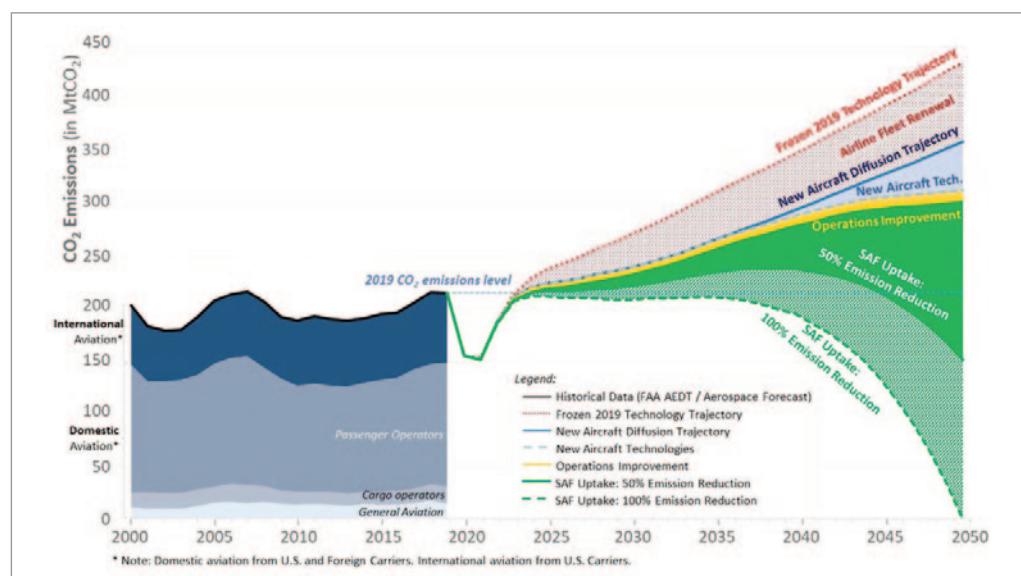
The US SAF Grand Challenge

According to the action plan, SAF will be critical to the long-term decarbonisation of aviation, and significant coordination and work is needed in the

years ahead to produce the necessary volumes of SAF. Looking at last year, the total procurement of SAF in the US was approximately 15 million gallons, which represents a tiny fraction of the ~20 billion gallons of jet fuel consumption.

Given this gap, the Biden administration has undertaken an ambitious effort to support a dramatic expansion in industry-led SAF production through a government-wide "SAF Grand Challenge." Led jointly by the US Department of Transportation and the departments of Energy and Agriculture and working with the Environmental Protection Agency, the SAF Grand Challenge commits the US government to work with industry to rapidly scale up SAF production with the goal of meeting the fuel needs of US aviation by 2050. The effort also set a near-term goal of 3 billion gallons (~10% of fuel use) per year by 2030. US industry has welcomed this ambition and responded in kind – Airlines for America has endorsed the goal of 3 billion gallons of SAF production in 2030 and SAF producers have outlined fuel production plans that will contribute to the goal.

Figure 1: US aviation CO₂ trajectory and the important role of SAF⁽²⁾



(1) https://www.faa.gov/sites/faa.gov/files/2021-11/Aviation_Climate_Action_Plan.pdf

(2) From 2021 U.S. Aviation Climate Action Plan, available at:

https://www.faa.gov/sites/faa.gov/files/2021-11/Aviation_Climate_Action_Plan.pdf

In September 2022, the agencies published the SAF Grand Challenge Roadmap⁽³⁾ laying out a framework for federal agency activities designed to support industry to expand supply, reduce costs, and enhance the sustainability of SAF. The roadmap expands support for research, development, demonstration and deployment of SAF. Activities include research and development to reduce costs of production across the supply chain; expand the feedstock and conversion technology portfolio; leverage and repurpose existing production infrastructure; demonstrate sustainable feedstock production systems; reduce the carbon intensity of SAF supply chains; ensure robust standards that quantify and guarantee environmental integrity; and enable approvals of higher blend levels of SAF. Actions to expand SAF supply and end use include: regional feedstock and fuel production development and demonstration; outreach, infrastructure, and commercialisation support; and American Society for Testing and Materials (ASTM) approvals of diverse SAF pathways. An inventory of relevant programmes is underway. Outreach to industry and other stakeholders is being coordinated with support from the Commercial Aviation Alternative Fuel Initiative (CAAFI)⁽⁴⁾.

Inflation Reduction Act

Successful development of SAF supply will also depend upon well-designed economic incentives to help bridge the cost gap between SAF and petroleum jet fuel and de-risk critical infrastructure development. Provisions in the recently passed Inflation Reduction Act (IRA) build upon existing policies and provide those necessary incentives.

The SAF Grand Challenge commits the US government to work with industry to rapidly scale up SAF production with the goal of meeting the fuel needs of US aviation by 2050.



© Scharfmann – depositphotos

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 programme.

The BTC provides a tax credit starting at USD 1.25 per gallon for qualified fuel blenders supplying SAF with at least 50% life-cycle greenhouse gas (GHG) emissions reductions compared to conventional jet fuel. Fuels exceeding the minimum threshold are eligible for an additional USD 0.01 per gallon credit for each additional percentage point of emissions reductions (up to a maximum of USD 1.75 per gallon). The BTC is technology- and feedstock-neutral, allowing SAF to be made from biomass, waste streams, direct air capture and other sources, and will expire 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 similarly based on a sliding scale that rewards cleaner fuels with higher credits ranging from USD 0.35 to USD 1.75 per gallon.

In addition, IRA also allocates USD 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 SAF, and to develop or apply low-emission aviation technologies. The Fueling Aviation's Sustainable Transition (FAST) Grant Program is being developed and administered by the FAA and will provide USD 245 million to support production of SAF at scale.

(3) <https://biomassboard.gov/sustainable-aviation-fuel-grand-challenge-roadmap>

(4) www.caaafi.org

Aviation will require SAF wherever it operates. The diversity of SAF technologies and feedstocks means that SAF production can be an economic, energy security, and sustainability opportunity globally.

Nate Brown is currently the acting energy division manager for the Federal Aviation Administration's (FAA) Office of Environment and Energy. He is responsible for a portfolio of sustainable aviation fuels (SAF) research and leads FAA coordination on SAF with industry and United States' government agencies via the Commercial Aviation Alternative Fuels Initiative (CAAFI) and the SAF Grand Challenge. He is also a member of the ICAO Committee on Aviation Environmental Protection (CAEP) Fuels Task Group.

Dan Williams is currently the senior international advisor for the FAA's Office of Environment and Energy. He is also currently serving as the United States' member to the ICAO Committee on Aviation Environmental Protection (CAEP).

Global SAF supply

Aviation will require SAF wherever it operates. The diversity of SAF technologies and feedstocks means that SAF production can be an economic, energy security, and sustainability opportunity globally.

To support global SAF development, FAA has initiated a Collaborative Research Network for Global SAF Supply Chain Development. This effort involves FAA funding to multiple US universities to collaborate with university partners in Latin America, South-East Asia, and Sub-Saharan Africa. The project will apply data and analytical tools to understand the potential environmental and economic benefits from SAF supply development in countries in these regions. The project will develop a network of PhD students through workshops, student exchanges, and internships also planned with international partners who will be able to further these efforts on their own.

Conclusion

The aviation sector is taking ambitious action to address the climate challenge. The FAA is helping to lead a comprehensive government approach to meeting US climate goals for aviation. We continue to support and develop US government programmes on research, development, demonstration and deployment of SAF. We work directly with industry and through the Commercial Aviation and Alternative Fuels Initiative (CAAFI) to implement the SAF Grand Challenge roadmap and its supporting policy framework, including enactment of the SAF tax credit and FAST Grant programmes contained in the IRA legislation. Going forward, we will measure and evaluate the impact of our efforts to expand production of SAF against the goals that we have set, and continue to engage with our stakeholders to evaluate additional support programmes and policy that may be needed. ●



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ECAC Member States on a pathway to net-zero carbon emissions by 2050 through the promotion of sustainable aviation fuels

Directors General of Civil Aviation of the 44 European Civil Aviation Conference (ECAC) Member States agreed at their 160th meeting in May 2023 (DGCA/160) that each State would strive to adopt policy measures as soon as possible to promote the use of sustainable aviation fuels (SAF), thus contributing to putting European countries on the pathway to net-zero carbon emissions by 2050, and making the common global climate goals a reality while promoting a level playing field for sustainable air transport.

SAF is a main enabler of the aviation sector's transition towards the net zero carbon long-term aspirational goal (LTAG) agreed at ICAO's 41st Assembly in 2022. SAF is a key element of the ICAO basket of measures to reduce aviation emissions, which also includes technology and standards, operational improvements, and market-based measures, i.e. the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).

Since 2009, ICAO, its Member States and the aviation industry have recognised the use of SAF as an important means of reducing aviation emissions and aviation's dependence on fossil fuels. Since then, ICAO Member States have been encouraged to establish policies that support the use of SAF.

SAF can offer significant reductions in greenhouse gas (GHG) emissions (expressed as CO₂eq) on a life-cycle basis compared to conventional fossil jet fuel, if using robust sustainability requirements such as those globally agreed by ICAO under the CORSIA standard, and depending on the origin and type of feedstock and the production technology used. Beyond CO₂, SAF can help to address the non-CO₂ impacts of flying including those on the climate and in local air quality.

In addition to addressing the climate emergency, the global energy crisis caused by the Russian Federation's invasion of Ukraine in 2022 has drastically raised energy security concerns and underlined the urgent need to reduce the energy dependency on fossil sources. In this context, speeding up the promotion of renewable energies, including SAF, has become an even higher political priority to contribute to transforming the European energy system and reducing energy imports.

The ECAC policy guidance on SAF

The European industry has engaged in voluntary initiatives for SAF development since 2010 and some European States have been global front-runners in taking SAF promotion policy action, generating valuable experience and conveying precious lessons learnt from those pioneering steps. Such knowledge is a key asset to support others in developing policy and industry roadmaps, both in Europe and beyond.

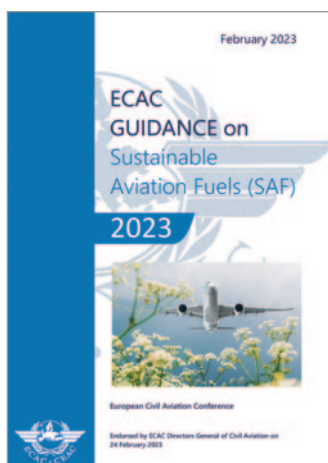
Building on those experiences, an ad hoc Sustainable Aviation Fuels Task Group (SAF-TG) was created in November 2021 under the aegis of the European Aviation and Environment Working Group (EAEG) Expanded. In 2022 the group developed a guidance document on sustainable aviation fuels aimed at facilitating technical understanding, sharing information and best practices, and making recommendations for designing policies to promote SAF in ECAC Member States in the most harmonised possible manner. The guidance was published in February 2023 after endorsement by the 44 ECAC Directors General, and it is openly available on the [ECAC website](#).

Information sharing on SAF-related policy plans and actions taken by different ECAC Member States, as well as European recommendations when developing national policies, add to the industrial and economic ability to successfully promote SAF across the region and beyond.



**CÉSAR VELARDE
CATOLFI-SALVONI**

Climate Change and Capacity-Building Specialist, European Civil Aviation Conference (ECAC)



“
The European industry has engaged in voluntary initiatives for SAF development since 2010 and some European States have been global frontrunners in taking SAF promotion policy action, generating valuable experience and conveying precious lessons learnt from those pioneering steps.”

This ECAC guidance has also built on other valuable previous work to enhance synergies and avoid duplication of efforts, notably the [Clean Skies for Tomorrow \(CST\) SAF Policy Toolkit](#), [ICAO guidance](#) material, and recommendations emerging from discussions of the [International Transport Forum \(ITF\)](#) and presented at the 41st ICAO Assembly. The guidance contains policy recommendations to ECAC Member States, and adapts the CST SAF Policy Toolkit recommendations presented at the Glasgow UNFCCC COP26 in 2021 and which draw from the experience and diversity of the CST SAF Ambassadors group, to the European context.

The ECAC material includes a range of policy options to support the scaled production and use of SAF in European States, in the same way the CST toolkit and the ICAO guidance do in the global context.

The European policy landscape and the SAF map

An increasing number of ECAC Member States are taking policy actions to promote the large-scale development and supply of SAF and have established, or are in the process of developing, national SAF-promotion policies. While France, Germany, Norway and Sweden progressively incorporated SAF blending obligations into their regulations between 2020 and 2023, Austria, Poland, Switzerland, Türkiye and the United Kingdom are currently developing national policy roadmaps to boost SAF supply in their territories. Other pioneering States such as Denmark, Finland, the Netherlands and Spain incorporated SAF mandates in their national policies but were put on hold as a new EU regulation was proposed in 2021.

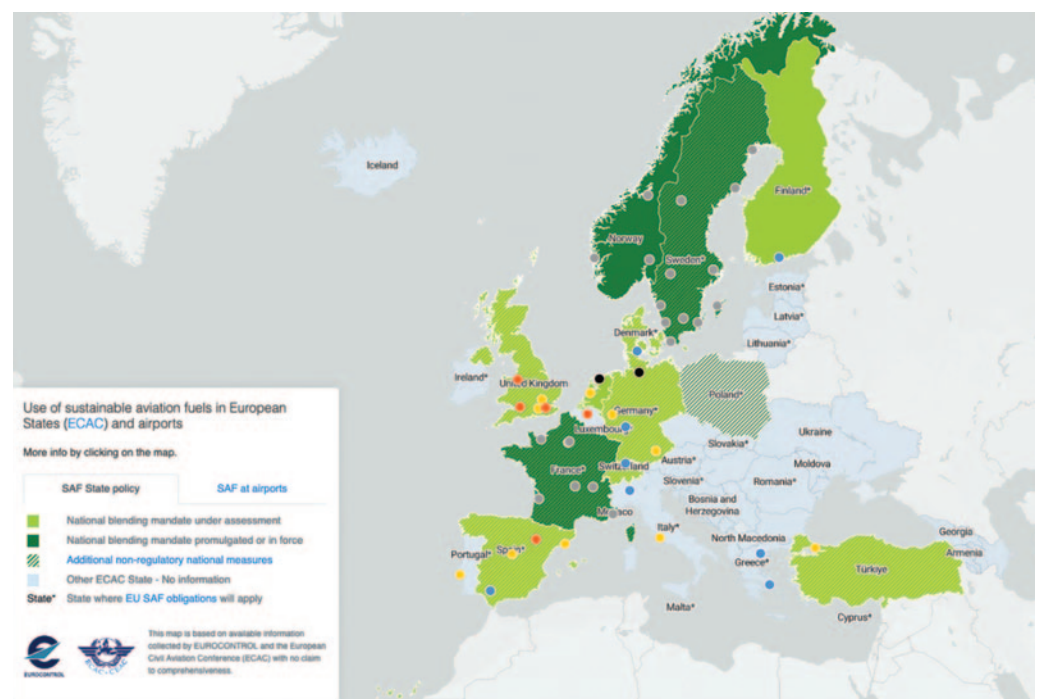
The ReFuelEU Aviation regulatory proposal was also boosted by the early steps taken by some EU States, demonstrating the need for a wider regional common approach at EU level and ensuring a level playing field for sustainable air transport. After agreement reached by the European Parliament and the Council of the European Union, the regulation is expected to be adopted in the second half of 2023 and will be the common regulatory measure for promoting SAF in the EU via mandatory blending supply quotas.

Aimed at giving visibility to these pioneering steps, a [European SAF map](#) incorporating a selection of industry initiatives and European States' SAF policies was developed by EUROCONTROL in cooperation with the ECAC Secretariat and is available on EUROCONTROL's public website. The map is based on publicly available information and updates provided by ECAC Member States.

It provides specific examples of policy and industry achievements, encouraging policy harmonisation at European level and motivating others to take action, while contributing to the update of ICAO's stocktaking exercise on information collection of global SAF initiatives.

State Action Plans

SAF, as an important element of the ICAO basket of measures to reduce aviation emissions, is also one of the elements to be included in the State Action Plans for international aviation CO₂ emissions reduction that ICAO asks States to submit and update every three years, before each ICAO Assembly, in order to monitor global progress towards the ICAO climate aspirational goals. These plans are also



expected to be an important future tool to follow up the LTAG-related achievements.

ECAC Member States have been encouraged to include in their State Action Plans a European common section for all ECAC States describing the mitigating measures taken collectively in Europe (including those led by the European Union), as well as a national section to present further measures implemented by each State or the description of the specific national actions taken to implement the pan-European measures.

ECAC Directors General's decision on taking SAF policy action (DGCA/160, May 2023) also included the agreement that each ECAC Member State would incorporate SAF policy and supply roadmaps in the next update of their State Action Plan. This should preferably be done by the end of June 2024, as set out in ICAO Resolution A41-21. They should be incorporated among the measures described in the respective national sections.

Building capacity

Some ECAC Member States have not yet had the opportunity or resources to initiate national SAF promotion strategies. ECAC has therefore agreed to prioritise the provision of support to those States via in-house training and by organising tailored national workshops under the ECAC Secretariat's Capacity-Building Programme for Environment and sponsored by ECAC's Special Reserves Fund. The programme will address capacity-building needs and requests from ECAC Member States on the preparation and drafting of their respective SAF roadmaps. It will use the ECAC guidance on SAF, and its recommendations, as a training reference.

So far, one collective tailored workshop has been organised in Paris, on 9 June 2023, with the participation of 17 ECAC Member States. A first in-house SAF training course was also delivered in Baku to experts from Azerbaijan on 19-20 June 2023.

The collective SAF workshop held in Paris was a custom-made activity for ECAC Member States in a similar policy context: all of them have, or are developing, a SAF policy (such as the ReFuelEU Aviation regulation) and are aiming to implement roadmaps to boost national SAF supply and industrial value-chains for SAF production. European pioneering States in SAF promotion shared their



Participants in the SAF in-house training held in Baku on 19 and 20 June 2023

experience, and the in-person format facilitated the establishment of networking links to promote further cooperation among experts from ECAC Member States facing similar national challenges on SAF promotion. Thirty experts from 17 Member States, EASA, the European Commission, EUROCONTROL and ICAO participated in fruitful exchanges, and the flexible programme encouraged and prioritised discussion and exchanges over information sharing.

The first tailored in-house training delivered in Baku and hosted by the Civil Aviation Administration of Azerbaijan gathered representatives of three national ministries (Transport, Energy and Ecology), national airlines, and fuel producers and suppliers. It resulted in fruitful exchanges and is expected to be followed by the creation of a national SAF Working Group to identify national industrial and social opportunities from SAF promotion, and the development of a roadmap that would include a pilot SAF supply project.

Additional in-house tailored SAF training activities are scheduled in the coming months, and support requests have already been received from several ECAC Member States. ECAC will also strive to support other non-European ICAO States to promote SAF, in cooperation with international partners, ECAC's sister regional organisations and by working together with ICAO.

The 3rd ICAO Conference on Aviation Alternative Fuels (CAAF/3) taking place in November 2023 in the United Arab Emirates is expected to be a key milestone for establishing global SAF supply goals, and European States are committed to be front-runners and support others on the pathway to net-zero carbon emissions by 2050 through the promotion of sustainable aviation fuels. ●

César Velarde Catolfi-Salvoni joined ECAC in 2020 as an aviation and environment specialist. He is responsible for the Capacity-Building Programme for Environment aimed at strengthening the competencies and knowledge of staff in ECAC Member States dealing with environment matters. Prior to joining ECAC, César's main duties focused on sustainable aviation fuels (SAF), having worked for the Spanish Civil Aviation Authority and the International Civil Aviation Organization (ICAO). He holds an engineering degree from the Polytechnic University of Madrid.



Other sustainability initiatives

An assessment of the impact of air traffic management measures on fuel efficiency

Global initiatives on sustainable development

The growth of air traffic requires innovative and efficient approaches to ensure environmental sustainability in the air transport sector. ICAO assemblies have adopted consolidated resolutions on environmental protection and considerations, outlining a comprehensive strategy to mitigate aviation's environmental impact. This strategy includes organisational, technical and operational measures such as aircraft and flight improvements, air traffic management efficiency, aircraft recycling, clean energy sources, and market-based mechanisms.

At the 41st Session of the ICAO Assembly, the Council of ICAO was asked to establish standards, methodologies and a mechanism to measure/estimate, monitor and verify greenhouse gas (GHG) emissions from international aviation. The ICAO Committee on Aviation Environmental Protection (CAEP) has developed a report on the feasibility of a long-term aspirational goal for international aviation on CO₂ emissions reduction that sets ambitious goals for achieving net-zero carbon emissions by 2050 in support of the Paris Agreement.

The role of air navigation in environmental protection

The ICAO Global Air Navigation Plan (GANP) outlines airspace optimisation measures vital for CO₂ emissions reduction. The GANP and the Aviation System Block Upgrades (ASBUs) are major initiatives developed by ICAO that address optimisation of airspace and operational procedures as elements to reduce greenhouse gas. ASBUs aim to harmonise the aviation sector globally, increase capacity, and improve environmental efficiency to accommodate the growing air traffic worldwide. According to CAEP, the implementation of ASBU Block modules 0 and 1 by 2025 is expected to result in annual fuel savings of 167 to 307 kg per flight, corresponding to a reduction of 26.2 to 48.2 metric tons of CO₂.

The European ATM Master Plan roadmap outlines operational and technological solutions to upgrade Europe's ATM system through the Single European Sky ATM Research (SESAR) initiative. Enhancing the capacity of the air navigation system, including en-route and terminal area movement, requires subsequent technological and operational advancements.

Performance-based navigation (PBN) is a conceptual solution that improves airspace design and integrates the international air navigation system. Implementation of PBN-based procedures increases flexibility by reducing spatial distribution, which increases environmental efficiency.

This article aims to estimate the fuel efficiency achieved as a result of upgrading the airspace structure of Azerbaijan. The empirical evaluation methodologies given in ICAO Doc 9988 were used to apply the air traffic statistics for 2015-2021.

Airspace upgrading measures

ATM operational measures are essential for ICAO's long-term aspirational goal of environmental sustainability. Improving ATM infrastructure and implementing advanced systems and procedures such as PBN, area navigation (RNAV), standard instrument arrivals (STARs), and standard instrument departures (SIDs) enables efficient use of airspace, resulting in increased fuel efficiency.

Based on the statistics of the "AZANS" Air Traffic Department for the period between 1996 and 2019, the number of flights within the Baku flight information region (FIR) increased from 35 000 to 158 057 (139 822 instrument flight rules (IFR)). The airspace capacity accommodates 40 to 65 aircraft per hour. According to EUROCONTROL's forecast for the next seven years, the annual growth in Azerbaijan's airspace traffic is expected to range from 2.6% to 6.6%, with an average growth rate of 4.4%.



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“Improving ATM infrastructure and implementing advanced systems and procedures such as performance-based navigation, area navigation, standard instrument arrivals, and standard instrument departures enables efficient use of airspace, resulting in increased fuel efficiency.”

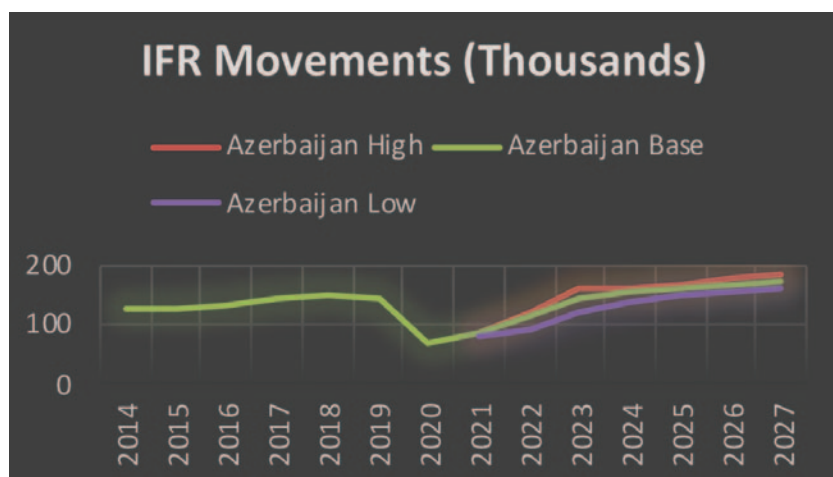


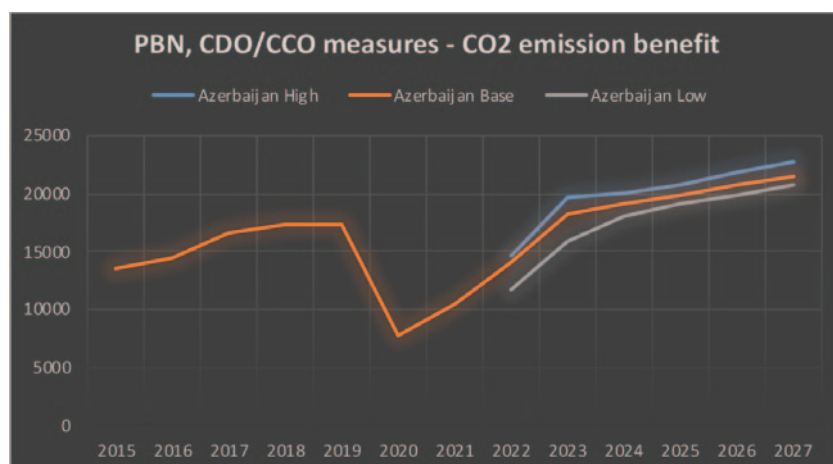
Figure 1 – Actual and forecasted IFR movements

Airspace optimisation integrates a flexible network of air routes without a fragmented structure, contributing to increased capacity. The dynamic and flexible air traffic service (ATS) route systems solutions ensure fuel benefits through:

- reducing route distances;
- optimising routes selection options;
- optimising route networks and flight levels (fuel-efficient route structure);
- optimised vectoring;
- strict adherence to planning;
- RNAV/RNP APCH (required navigation performance approach) operations capabilities;
- continuous descent operation (CDO);
- reducing go-arounds.

Modernising communications, navigation and surveillance/air traffic management (CNS/ATM) ground systems and introducing global navigation and satellite systems (GNSS) have facilitated the implementation of RNAV and RNP procedures as key elements of performance-based navigation, thereby increasing airspace flexibility.

Figure 2 – Actual (2015 - 2021) and projected (until 2027) CO₂ emissions benefit in tonnes



Precision navigation procedures in the airfield area and the use of parallel routes ensure environmentally optimised corridors in the airport and terminal manoeuvring area (TMA). This allows operators to save time and costs by optimising climb, descent, and engine operation profiles. Arriving aircraft use continuous descent operation profiles and land with minimum engine thrust, resulting in an estimated average fuel saving of 50 kg per flight.

Environmental benefits can also be increased by taking technological measures in both air traffic service ground operations and aerodrome design planning by optimising taxi routes, utilising rapid exit taxiways, and taxiing with one running engine. Moreover, the optimal layout of runways, taxiways, and aprons can minimise taxiing time and delays. The use of surface movement guidance and control systems (SMGCS) improves take-off/landing performance during low visibility conditions, reducing congestion, delays, and go-around operations. The above-mentioned measures can be achieved in the short term with relatively lower financial investment.

ATM fuel efficiency

Fuel efficiency assessment in ATM operations is based on statistical analysis of flights within the Baku flight information region (ICAO code UBBA) and fuel consumption from 2015-2021. Air traffic projections (figure 1) were calculated using EUROCONTROL STATFOR growth ratings data for States, considering slow, medium (baseline), and intensive development scenarios. The baseline average growth rate was estimated at 2.3%.

Based on the development scenarios, the pre-pandemic flight levels are expected to be reached by mid-2023 in the high scenario. However, in the base and low scenarios, this level is projected to be achieved by 2024 and 2025 respectively.

CO₂ emissions reduction (figure 2) was assessed by implementing performance-based navigation, continuous climb and descent operations (CDO/CCO) measures, and new air routes (figure 3) with reduced distances compared to the old routes.

Figure 2 shows the actual and forecasted curves of CO₂ emissions reduction based on implemented measures and traffic scenarios.

CO₂ emissions benefit for the period 2022-2027 were forecasted in relation to the projected air traffic scenarios.

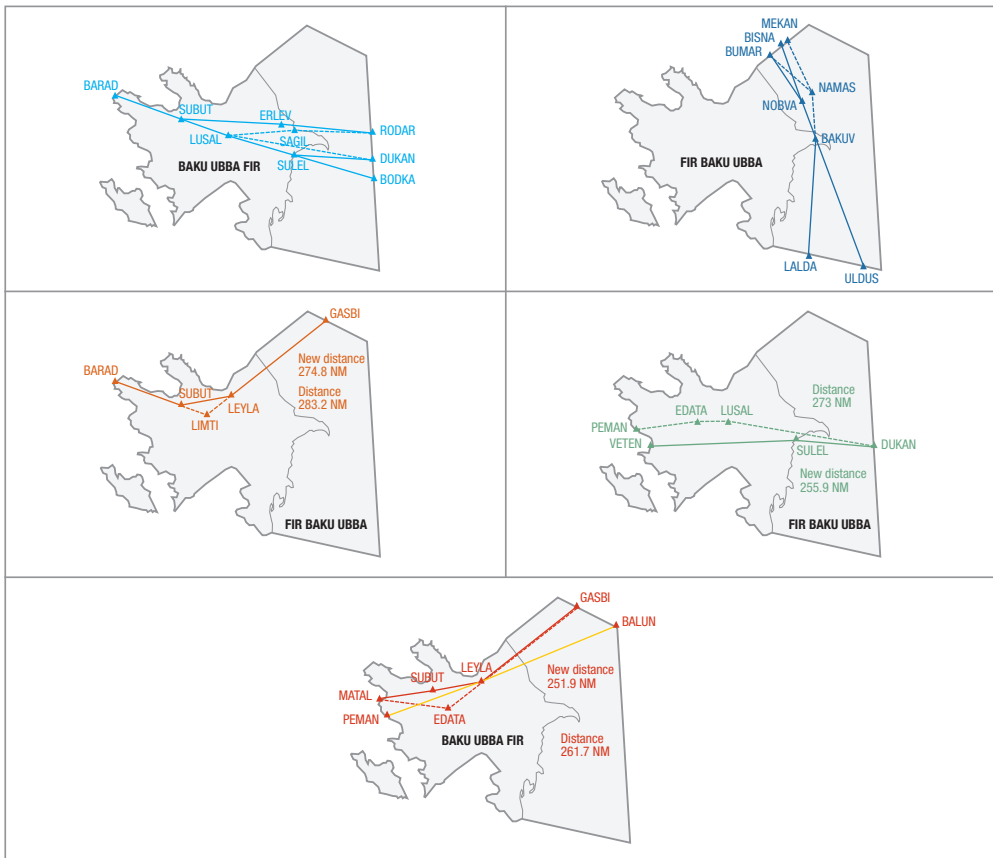
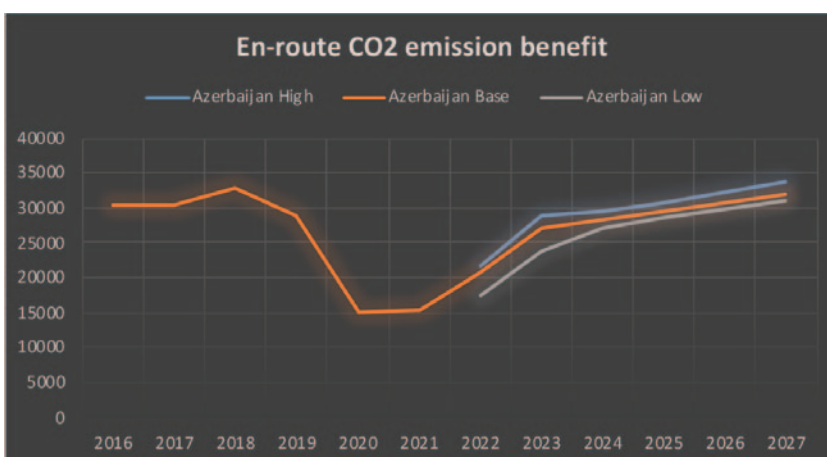


Figure 3 – Dashed lines old routes, and straight lines new routes within the Baku FIR

The introduction of advanced improvements and new airways has enhanced airspace flexibility, allowing for routes with reduced distances within the FIR boundary (figure 3).

Compared to the current air route network structure, the number of nodes has decreased by 41.67%, while the total length of flight segments and air routes has decreased by 32.03% and 5.82% respectively.

Figure 4 – Curve of CO₂ emissions benefit from en-route traffic.



Approximately 90% of flights were operated by wide-body, long-haul aircraft. The relative fuel consumption ranged from 6 to 9 tonnes per 1000 newton metres (NM) depending on payload. By considering the prevailing number of flights operated by each aircraft type, the average fuel consumption was approximately 6.3 kg/NM. These approximations help to evaluate overall average fuel efficiency, and facilitate effective air traffic planning and fuel consumption management.

ATM modernisation has significantly improved fuel efficiency, while the CO₂ emissions for the period 2015–2021 considerably reduced to 250 534 tonnes, with 165 898 tonnes attributed to the en-route flights, and 84 636 tonnes to PBN, CDO/CCO.

Figures 2 and 4 depict a logical correlation between flights and emissions reduction. Increased operations on shorter routes result in a proportional decrease in CO₂ emissions. However, the long-term impact of operational measures may be limited, as traffic intensity can lead to critical overvalue in emissions. Hence, to strengthen the objectivity of analysis, it is reasonable to introduce critical parameters to enable tracking progress towards achieving an environmentally desirable level and planning timely practical corrective actions.

“Environmental benefits can also be increased by taking technological measures in both air traffic service ground operations and aerodrome design planning.”

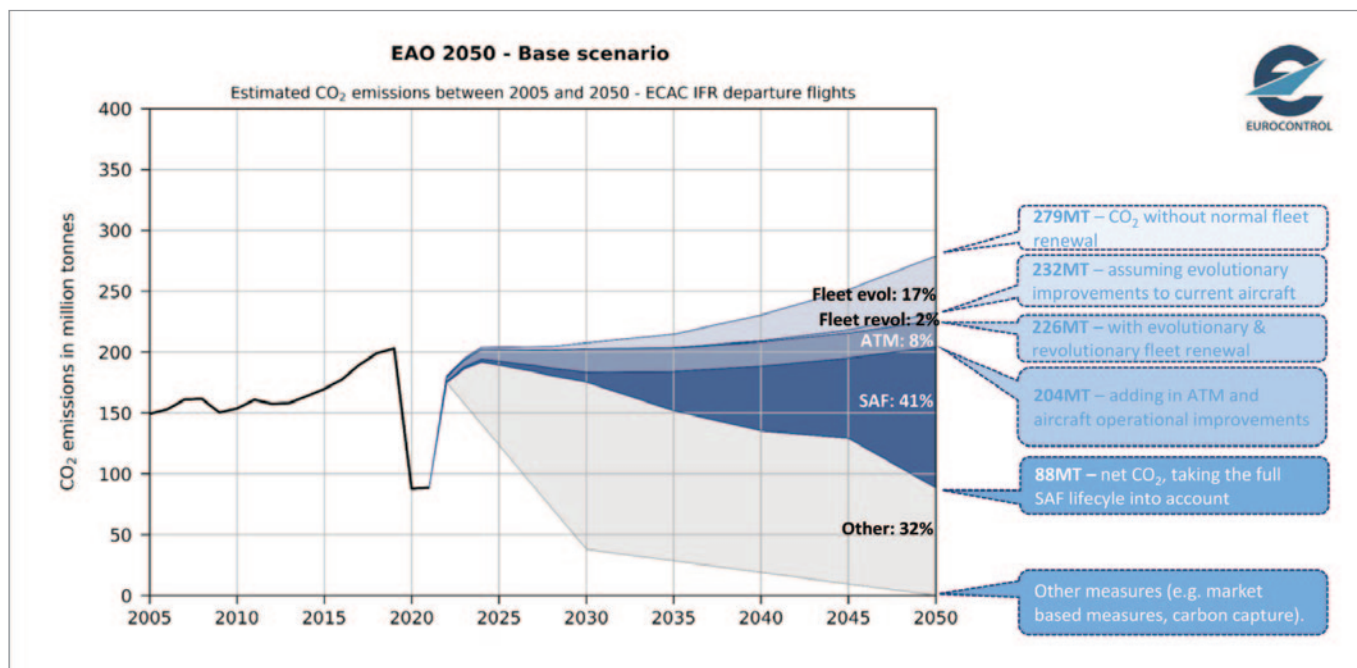


Figure 5 – EUROCONTROL's baseline scenario.

Bahrur Malikov has 24 years of experience in aviation including a short experience in the ECAC Secretariat environment section. After 17 years in the Air Navigation Services Unit of "Azeronavigation", he currently holds the position of deputy head of the Aerodrome Operators Oversight Department in the State Civil Aviation Agency, Ministry of Digital Development and Transportation of Azerbaijan. He is also a national continuous monitoring coordinator and ICAO Universal Safety Oversight Audit Programme Continuous Monitoring Approach (USOAP-CMA) focal point on CORSIA. Bahrur studied at the Riga Aeronautical Institute, and National Aviation Academy of Azerbaijan. He has a PhD in engineering and a background as an aviation engineer-pilot, and has more than 45 scientific research publications in atmospheric physics, aviation meteorology, environment protection and telemetry systems. Bahrur participates in the activities of various ICAO and ECAC regional working groups.

Based on EUROCONTROL's baseline scenario, the CO₂ emissions benefit from ATM operations is estimated at 8% compared to other measures (figure 5).

The contribution of individual States to the common European goal varies, and evaluating its feasibility requires validated parameters. To evaluate the feasibility of this goal, in our emission-reduction scenario we stipulate the value of 0.08 (8%) as the baseline level of fuel efficiency to be achieved.

This article proposes using the ratio of benefits to estimated total emissions, to the estimated volume of total emission in the case of "business as usual". The efficiency value (α) can be calculated as follows:

$$\alpha = \text{emission benefit} / \text{total emission (business as usual)}$$

$$\text{Total amount of emission (business as usual)} = \text{total actual emission} + \text{benefit emission}$$

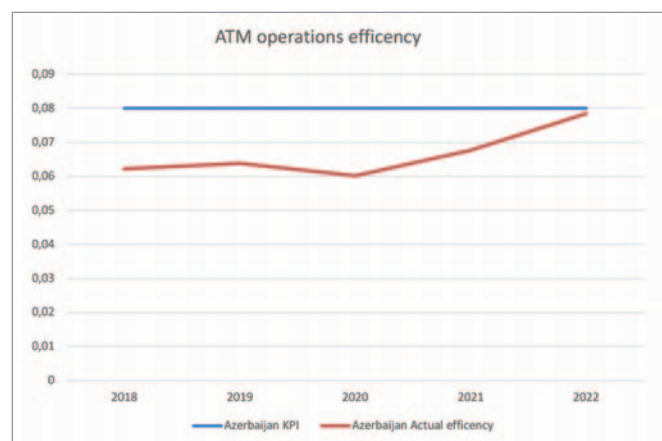


Figure 6

As can be seen, the efficiency value (α) is practically a percentage of the calculated total emissions for the case of "business as usual".

Thus, the value (α) refers to the level of emissions benefit in relation to the baseline (figure 6).

Figure 6 shows the projected curve of benefit efficiency approaching the baseline. The growth trend is driven by annual traffic growth through PBN procedures and shortened routes, indicating potential fuel benefits. However, this approximation is only applicable in the short term, necessitating additional measures for sustainable development: for example, Free Route Airspace or RNAV5 that provides a 250 km interval between very high frequency omni-directional range (VOR) systems and maintains routes within a 1% deviation. ATM measures discussed here are also covered in ASBU Blocks 0 and 1 module.

Typically, the benefits rendered by any operational measures are derivative of a function correlated with variations of values of flight distance (Δs), duration (Δt), and engine thrust (ΔP). Hence, the objective evaluation and optimisation of such systems can be successfully solved with multivariate mathematical statistics. ●

Adapting the aviation sector to a changing climate

Effects from climate change impact the global aviation sector's operations, infrastructure, business planning and finances. The climate has been changing increasingly rapidly since the start of the industrial revolution, and the impacts of that change are being experienced in a variety of different ways.

For example, summer 2022 saw unprecedented heatwaves across Europe, the result of which included degradation of runway and airport pavement material and heat stress for passengers and personnel. In June of 2023, unprecedented wildfires in Canada created poor visibility conditions along much of the East Coast of the United States, which disrupted flights operating at major airports, including in New York John F. Kennedy International Airport and Philadelphia International Airport. Europe has also experienced unprecedented forest fires in recent years, with major impacts in areas which had not previously been affected. The likelihood of forest fires increases with extreme temperatures and reduced precipitation.

While we cannot say that the individual high-heat days in Europe last summer or the specific wildfires in Canada this year were caused by climate change, in the aggregate we do know that these events, and events like these, are made worse by climate change, and that they will become more frequent as the global average temperature continues to rise⁽¹⁾. For example, the extreme temperatures in the United Kingdom in summer 2022 were at least ten times more likely because of climate change according to analysis carried out by the World Weather Attribution group⁽²⁾, while the extreme high temperatures experienced in Southern Europe and Northern Africa at the end of April this year [2023] would have been almost impossible without climate change⁽³⁾.

The United Nations' Intergovernmental Panel on Climate Change (IPCC) indicates in its *Sixth Assessment Report* that climate change is happening faster than previously projected, and that impacts

will be more extreme. Globally, climate change is contributing to more frequent and more intense storm events, increased precipitation, sea level rise, higher average and extreme temperature days, changing wind patterns, changes to biodiversity, changing icing conditions (atmospheric and ground level), among others. Climate change is hugely variable and the impacts are not consistent globally; for example, despite average temperatures rising, in some places more extreme cold spells may occur. This increase in extremes, as well as changes in the day-to-day climate, will have a disruptive impact for the European and global aviation sector.

So what are the implications of this change for the European and global aviation sector? There will be risks to aviation infrastructure and disruption to operations, as well as safety, economic and societal impacts. Of course, aviation already deals with disruptive weather on a regular basis, but climate change is expected to make those disruptions more intense and more frequent. There may be other operational impacts such as a need to reduce aircraft payload because higher temperatures impact take-off performance⁽⁴⁾, an increase in en-route turbulence⁽⁵⁾ or even changes in flight times due to changes in the jet stream. For example, on 9 February 2020 during a strong storm, a British Airways flight crossed the Atlantic in just four hours and 56 minutes. And a study carried out by EUROCONTROL, *Climate Change Risks for European Aviation 2021*, demonstrated that by 2050 flight times between Europe and North America, the Canary Islands and Asia will shorten slightly on almost all routes for all seasons⁽⁶⁾.



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(1) IPCC Sixth Assessment Report Working Group 1 Report <https://www.ipcc.ch/report/sixth-assessment-report-working-group-i/>

(2) <https://www.worldweatherattribution.org/without-human-caused-climate-change-temperatures-of-40c-in-the-uk-would-have-been-extremely-unlikely/>

(3) <https://www.worldweatherattribution.org/extreme-april-heat-in-spain-portugal-morocco-algeria-almost-impossible-without-climate-change/>

(4) "The impacts of climate change on Greek airports" G. Gratton, A. Padra, S. Rapsomanikis, P. Williams

(5) "Global Response of Clear Air Turbulence to Climate Change" L. Storer, P. Williams, M. Joshi

(6) The exception is North Europe to the Canary Islands in the winter. [EUROCONTROL Climate Change Risks for European Aviation 2021](#).

Finally, there may also be indirect effects on aviation, such as competing demand for water supply within a region, or even impacts on tourism passenger demand in some regions because of changing local climatic conditions. The EUROCONTROL climate change risks study showed that across the ECAC region there will be an increasing length of time when the climate will be suitable for tourism, with some countries experiencing more favourable conditions for tourism in the summer months, and others seeing existing tourism seasons extend into the spring and autumn.

So what can we do to prepare for those impacts?

The specific impacts that an organisation may have to prepare for and respond to will vary considerably depending on factors such as the type of organisation (for example airport, airline or air navigation service provider), forecast changes in climate, geographical location, risk tolerance, and organisational set-up. To find out what specific risks and vulnerabilities may exist for an organisation, it is usually advisable to carry out a climate change risk assessment. In order to conduct an accurate assessment, high quality data and forecasts for the study area are essential. Once potential vulnerabilities are identified, the organisation can design an adaptation plan and start to identify and implement adaptation measures based on how much risk it is willing to accept. For adaptation to be achievable, it may not be possible, or even worthwhile, to address every vulnerability. An organisation must prioritise what measures are taken based on where risk is greatest. There are always likely to be some limits to adaptation, such as the safe thresholds within which aircraft can operate.

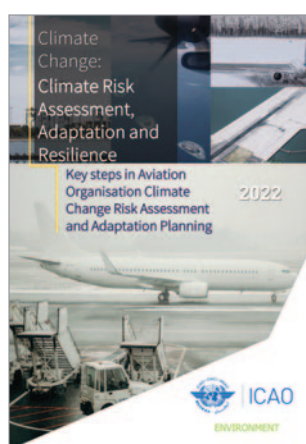
A good approach may be to identify the most critical elements in an organisation's system and address those first, taking into account the probability that those critical elements may be impacted by climate change. As an organisation performs routine maintenance and upgrades, future climate change forecasts and potential impacts should be taken into account when making organisational improvements, and in particular when developing new infrastructure, as small changes that do not add a lot of cost to the project may substantially increase resilience to climate change.

Climate change adaptation action in Europe

While it is essential for States and aviation sector organisations to carry out climate change risk assessment to identify and understand the impacts they need to address, due to the interconnectedness of the European and global aviation systems, a more network-focused approach to building resilience is also required to identify risks and minimise the impacts for all. To address this need for a coordinated and collaborative approach, EUROCONTROL and ACI EUROPE have established the European Aviation Climate Change Adaptation Working Group (EACCA-WG), a team of experts on environment, climate change, and operations from airport operators, air navigation service providers (ANSPs), aircraft operators, European aviation industry associations and aircraft manufacturers. The objective of the working group is to provide aviation stakeholders with guidance, peer support and good practices on adapting the European aviation sector to the impacts of climate change.

The group's first deliverable, *Aviation Preparations for Summer Adverse Weather*, was published in June 2023 and provides tangible recommendations for European aviation organisations to prepare for the possibility of extreme weather this summer. In the context of the European Union Climate Law, the European Union Aviation Safety Agency (EASA) has recently established the European Network on the Impact of Climate Change (EN-ICCA). The group will focus on the safety implications of climate change for aviation and any associated efficiency, capacity, economic and environmental interdependencies. The EACCA-WG, EN-ICCA and the ECAC Secretariat will coordinate closely to maximise the synergies between the two groups.

To provide further practical support for stakeholders, EUROCONTROL is currently developing a new platform called Flying Green to support aviation organisations with decarbonisation and climate adaptation – a key priority as outlined in EUROCONTROL's corporate "Raising the Bar" programme. For climate adaptation, we will offer a service called ClimAdapt. This service provides a toolkit consisting of checklists, guidance and a repository that aviation stakeholders can use to assess climate change vulnerabilities and identify adaptation measures. It will include a screening tool to



ICAO guidance documents on climate change risk assessment, adaptation and resilience



provide a high-level assessment to support stakeholders in deciding whether they should perform a climate change risk assessment, a cost estimate analysis tool to support decision making, and a repository of potential climate change impacts at European level by stakeholder group – and potential adaptation measures. We expect it to be ready in spring 2024.

Ultimately, any decision on whether, when and how to take action will be up to an individual organisation, and there are some general measures which can be considered. For example, to tackle the challenge of aircraft performance in higher temperatures, it may be possible to change departures to cooler parts of the day (as already happens in some warmer locations), or, as a more extreme measure, reduce payload. Airport cooling capabilities may need to be increased to keep temperatures at an acceptable level for passengers and staff, and airport surface materials should be assessed for their compatibility with future average and extreme temperatures. To tackle the forecast increase in heavy rainfall for most of Europe, and the associated risk of flooding, a review and increase of drainage capacity may be required, whilst to prepare for a decrease in rainfall, organisations can consider measures to reduce water consumption, or to recycle used water, both of which can also lead to a reduction in costs – a win-win!

To address operational disruptions from disruptive or extreme weather such as storms, operational measures such as airport collaborative decision making can increase robustness and flexibility, whilst improved use of meteorology (MET) forecasting, or real-time information sharing, can facilitate making operational decisions such as pre-emptively cancelling flights, reducing capacity or re-

routing traffic. When it comes to MET data, training is important so that the relevant people know how to interpret it and translate it into operational decisions, whilst more general training on how to handle a disruption to operations is also beneficial. On-board technology for detection of weather systems and areas of clear air turbulence and for real-time information sharing can also increase resilience. For example, in Europe the EUROCONTROL Network Manager is working to minimise the sort of weather disruption that climate change will exacerbate by working with EUMETNET (European Meteorological Network), a group of 31 European national meteorological services, to provide all actors with a network-wide forecast.

As a final example, when adapting to sea-level rise there is a scale of actions that can be taken, starting with not doing anything at all and actually allowing a small but safe amount of encroachment. Other options include constructing sea defences or, in more extreme cases, considering the relocation of the airport. Of course, this is just a snapshot of the impacts to be expected and the adaptation measures that can be taken. But the good news is that there is an increasing amount of guidance being produced by aviation sector organisations, which can provide support in taking climate adaptation action.

In conclusion, it is clear that we are increasingly aware of the physical impacts we are likely to face and, in some cases, are already experiencing from climate change. Yet there is still a lag between this awareness and initiating action to adapt to impacts. Working together as a sector, including sharing information and efficient practices, can help us to do more and to do it more quickly. Let's not get caught out tomorrow by the impacts that are on the radar today. ●

Rachel Burbidge, senior policy officer on environment and climate change, joined EUROCONTROL in 2005. She has been leading EUROCONTROL's work on climate change adaptation and resilience since 2009, authoring the organisation's ground-breaking challenges of growth work on climate adaptation, and several peer-reviewed journal articles. She co-leads the climate adaptation and resilience work of the ICAO Committee on Aviation and Environmental Protection (CAEP) Airport and Operations Working Group and leads EUROCONTROL's contribution to the ICAO CAEP Working Group on CORSIA, where she leads tasks on monitoring, reporting and verification. She has degrees in environmental studies and sustainable development.

Andrea Deitz is a foreign affairs specialist with the US Federal Aviation Administration (FAA) Office of International Affairs with experience working with the Asia Pacific and Caribbean regions to promote global civil aviation safety, security and efficiency. Andrea co-leads the climate adaptation work within the International Civil Aviation Organization (ICAO) Committee on Aviation Environmental Protection (CAEP) Working Group 2, which published the 2018 *Climate Adaptation Synthesis Report* and the 2022 guidance material on aviation climate change vulnerability, risk assessment, and adaptation measures. Andrea holds a Master of Arts in international security from George Mason University and a Bachelor of Arts in international relations from The College of William and Mary.

CLIMATE CHANGE ADAPTATION ACTION AT ICAO

The International Civil Aviation Organization is a global leader in the field of climate change adaptation for aviation. ICAO published the 2018 *Climate Adaptation Synthesis* in 2020, which consolidated the latest scientific information with research on the impacts of climate to the aviation sector, and an analysis of responses received to a survey on climate change adaptation for global aviation stakeholders.

In 2022, ICAO published three guidance documents on climate change risk assessment, adaptation and resilience. These documents are publicly available free of charge on the ICAO website and are applicable to civil aviation authorities (CAAs), air navigation service providers (ANSPs), airports, airlines, and other aviation stakeholders. The documents provide steps for aviation organisations to conduct climate change risk assessment and adaptation planning, identify some potential key vulnerabilities for aviation organisations, and provide a menu of adaptation options that organisations could consider after determining vulnerabilities through a risk assessment.

ICAO is currently working on an update to the 2018 *Climate Adaptation Synthesis*, which will include updates to the scientific and research information, as well as an analysis from a new survey conducted in 2023.



How can an “ecolabel” help aviation to decarbonise?

Tackling climate change and protecting the environment rank high on the public agenda. This poses a challenge for the transport sector, which is a major contributor to CO₂ emissions.

In line with the global goal of decarbonisation, the aviation industry has set itself the ambitious target of achieving net-zero carbon emissions by 2050. The airframe, engine and fuel technologies required to achieve this are still being developed.

Over the next decade, the main improvements will thus have to come from the way today's fleets are operated. Air traffic management (ATM) will play a key role in this.

Skyguide, the Swiss air navigation services provider (ANSP), contributes at national and European levels to the development and implementation of environmental good practices for air traffic management (ATM) operations and infrastructure. In recognition of its achievements, Skyguide was the first ANSP to be accredited for its environmental maturity in 2023 by the Civil Air Navigation Services Organisation (CANSO), the representative body of ANSPs worldwide.

How can an ecolabel such as “CANSO GreenATM” support aviation decarbonisation in general and in the case of Skyguide in particular? In this article, Skyguide explains the context in which GreenATM was developed, what this environmental accreditation programme entails and Skyguide's experience with it.



THIERRY BRÉGON

Head of Environmental Affairs,
Skyguide

“
If you can't
measure it, you
can't improve it.”

Setting the scene

Following the Paris Agreement on climate change, the European Commission launched the European Green Deal to make the European continent carbon neutral by 2050. Switzerland is not a member of the EU but has adopted a similar goal. Skyguide shall even reach it by 2040.

Compared to other sectors, transport is far from being on track to reach this objective. Yet it is civil aviation that is increasing its CO₂ emissions significantly. Driven by increasing demand for air transportation, the aviation sector – despite more efficient modern aircraft – continues to emit more and more CO₂ in total, reaching over one billion tonnes and accounting for 2.5% of man-made CO₂ emissions.

While environmentalists call for a reduction in traffic, industry and governments predict steady growth until at least 2070. The goal of decarbonising aviation by 2050 despite traffic growth therefore requires an ambitious programme.

All roadmaps to net-zero CO₂ say the same thing⁽¹⁾: the decarbonisation of aviation will be achieved mainly through sustainable aviation fuels. But improved aircraft and engine technology, better airspace management to minimise fuel consumption, and economic measures will also complete the picture.

Most of these solutions are still at the research and development stage and require substantial public funding before they can be deployed on a large scale. However, commercial aviation is a young industry that has always shown dynamism and

innovation, particularly in technology. The challenges of new aircraft and new fuels are therefore well within its grasp.

The general public's perception, however, is different. Only a small percentage of the population knows that aviation is responsible for 2.5% of CO₂ emissions⁽²⁾. The vast majority believes aviation's contribution to CO₂ emissions to be between 20% and 60%. It is thus important that the aviation industry is transparent and communicates about its environmental performance and efforts to reduce CO₂ emissions.

Although the main impact of air navigation services is on the fuel consumed during all phases of flight, ANSPs need to reduce their own emissions as companies too. This is why Skyguide participates in the Swiss government's “Exemplary Energy and Climate” initiative, which was launched ten years ago in the wake of the Fukushima disaster and the government's decision to shut down Switzerland's nuclear power plants.

The Swiss government wanted companies close to the Confederation, like Skyguide, to lead the way in implementing best practices in the areas of renewable energy, buildings, mobility and green IT. For Skyguide, it was an opportunity to exchange ideas with experts from other companies and improve together. Skyguide learnt a lot and made a lot of progress, improving its energy efficiency by more than 50% in 15 years. This experience and the lessons learnt enabled us to perform successfully in the relevant categories of the CANSO green accreditation programme.

On the ATM front, Skyguide is participating in the Single European Sky ATM Research (SESAR) programme. This has led, for example, to improved

(1) <https://www.destination2050.eu/>

(2) <https://www.easa.europa.eu/eo/environmental-transparency>

synchronisation of traffic approaching the Terminal Area (TMA) of Zurich Airport, reducing holding times by 90%. In addition, Skyguide’s long-lasting involvement in the development of the European ATM Master Plan enables it to keep abreast of SESAR solutions and their performance benefits.

GreenATM

Like most service providers, ANSPs do not consume a lot of energy nor do they have a large fleet of vehicles. Their main environmental impact lies in the services they provide.

CANSO’s GreenATM accreditation programme⁽³⁾ recognises these specificities and weights the ATM part much higher than, for instance, the facility management part. The weights assigned to the cruise, terminal and taxi phases of flight correspond to their respective environmental impacts.

GreenATM compiles all existing best practices applicable to ANSPs and the services they provide. However, GreenATM also incorporates the systematic “plan-do-check-act” aspects of continuous improvement. The added value of GreenATM therefore lies in the combination of “what” there is to do and “how” it should be done.

With airports having their own accreditation programme and existing ecolabels for flights, aircraft and airlines, ANSPs were the only link in the aviation value chain without a global accreditation standard and label. GreenATM filled this gap.

A classical environmental management system certification would only tell an ANSP that it’s doing things right, but not that it’s doing the right things. GreenATM combines best practices from ATM, facility management and management systems to enable ANSPs to assess the extent to which they are doing the right things in the right way.

Like the CANSO Standard of Excellence in Safety Management Systems and Cyber Security, the GreenATM programme is based on the standard five-level maturity models. At Level 1, ANSPs are aware. At Level 2, they have developed strategies and plans, which are then implemented at Level 3. At Level 4, actions are being implemented together with proper “plan-do-check-act” quality processes. Level 5 rewards best in class.

GreenATM is structured into categories, topics, and requirements. Four categories cover all areas where ANSPs have a role to play in reducing their environmental impact.

Twenty-four topics with individual questionnaires are weighted differently according to their influence on the environmental performance of an air navigation service provider. For each requirement, there are questions that indicate the means to meet the requirement and the evidence to be provided.



Within Switzerland, Skyguide manages air traffic extremely efficiently, despite the complexity and small-scale nature of the airspace shared between civil and military air traffic.

When the idea of an ecolabel for ANSPs was put forward as a means of improving transparency, Skyguide was convinced, based on its experience with the Swiss Confederation’s “Exemplary Energy and Climate” initiative, that an ANSP ecolabel at global level would be useful and Skyguide thus decided to support the idea of an environmental ATM standard, which eventually took shape in the form of the CANSO GreenATM programme.

Skyguide’s experience

Skyguide believes that “if you can’t measure it, you can’t improve it”. Carrying out a gap analysis against a proven standard is a necessary first step towards improvement.

Skyguide was part of the team that developed GreenATM and could contribute its experience with the Swiss government’s “Exemplary Energy and

“ ANSPs play an important role in the decarbonisation of the aviation industry and this programme is a major step in inspiring the focus, progress and collaboration we need.”



Skyguide promotes soft mobility, public transport, reduction of business travel and work from home.

(3) <https://canso.org/our-focus/canso-green-atm/>



Skyguide was the very first ANSP accredited under the CANSO GreenATM programme.

“
skyguide
provides air
navigation services
for Switzerland
and adjacent parts
of the airspace
above neighbour-
ing countries. It
manages around
1.1 million flights
a year safely and
efficiently through
Europe’s most
complex airspace.”

Climate” initiative, and with the ATM Master Plan as a member of the SESAR working group responsible for its development.

Together with three other ANSPs from different continents, Skyguide took part in certification dry runs in the spring of 2022. These tests showed that the programme was already sufficiently mature. Skyguide felt ready to apply for GreenATM accreditation when the programme was launched at the end of 2022.

To assign high priority to this programme, Skyguide decided to make GreenATM accreditation one of its corporate objectives for 2023 and 2024. This means that all Skyguide employees are financially incentivised to ensure that Skyguide achieves GreenATM accreditation Level 3 in 2023 and additional points in 2024.

Skyguide uses energy efficient drones to calibrate its ground-based navigation equipment (ILS/DME and VOR/DME), hence reducing its CO₂ emissions by 137 tons a year.



With Skyguide Green Team support, **Thierry Brégou** leads environmental affairs at Skyguide. He is an engineer and has over 30 years of experience in the ATM field.

As CANSO’s annual Airspace World conference was held for the first time in Switzerland in 2023, Skyguide set itself the double goals of achieving Level 3 accreditation and being on time for the conference in March 2023. The latter objective gave Skyguide a challenging two-month timeframe in which to complete the accreditation audit.

Once the audit began, it quickly became clear that proper internal organisation and coordination between Skyguide, CANSO and the auditors was required. Close cooperation with experts was also essential. Each questionnaire took about three days to complete, so a total of three men/month were needed to complete the 24 questionnaires. Some 900 files were sent as evidence of compliance.

Skyguide realised from the auditors’ initial requests for clarification that it needed to explain at the appropriate “flight level” what it had achieved. The exchange with the auditors for briefing and progress monitoring was therefore crucial.

The ATM Master Plan functionalities, which are being developed primarily to increase capacity, were approached from an environmental perspective that was sometimes new to the experts and led to very constructive discussions.

The report resulting from this audit provided clear and useful additional guidance on how to move forward in each of the 24 categories. Skyguide is now in the process of implementing these measures.

Eventually, Skyguide became the world’s first ANSP to be accredited. Others have followed or are following and Skyguide is often asked to share its experience. Skyguide happily shares its experience to support others. The more ANSPs participate in the programme, the greater the environmental benefits we can create as an industry.

The exchange of environmental best practices through the CANSO Working Arrangements or a GreenATM Users Group, using a common language, will help ANSPs to share approaches to implement GreenATM best practices and thus effectively and visibly contribute to the decarbonisation of aviation.

“Reaching Level 3 of GreenATM is a great recognition of Skyguide’s engagement for the environment. By highlighting the areas in which Skyguide positively influences its own environmental footprint and that of its customers, we are convinced that this accreditation is a great opportunity to stimulate progress in the implementation of new solutions, and to aim at the next levels of GreenATM. ANSPs play an important role in the decarbonisation of the aviation industry and this programme is a major step in inspiring the focus, progress and collaboration we need”, said Alex Bristol, CEO of Skyguide. ●



A green pathway for aviation growth

Introduction

International aviation has proven its value in creating wealth, growth, and better quality of life for people in all regions of the world, seamlessly linking people, cultures and civilisations, facilitating global interactions, fostering cultural understanding, and strengthening the bonds between nations in our diverse and globalised societies. However, two major challenges that our society must solve now are climate change and energy security, and aviation is deeply involved in solving both.

Recovering after the COVID-19 pandemic and lacking an immediate technological solution similar to the electrification in road and rail transport, aviation is one of the economic sectors whose CO₂ emissions are steadily increasing annually. The continued growth of the sector – still with very high potential – and its exclusive dependence on fossil-based fuels due to their high energy density, means aviation faces a clear challenge to keep growing in line with expectations without severe consequences for the environment.

To ensure international aviation can continue to grow this century, a fuel switch has become indispensable. After more than a hundred years using virtually the same fuel and technology, it is necessary to eliminate the impediments that prevent the use of sustainable aviation fuels (SAF), and the guarantee of privileged access to them must be cleared, as opposed to competition over their consumption with other economic sectors with mature technology for the leap to zero-emission fuels. With ReFuelEU Aviation, the EU contributes to this goal.

This article delves into the environmental actions undertaken by the European Union (EU) and the International Civil Aviation Organization (ICAO) to promote aviation sustainability by implementing innovative measures. By setting ambitious and realistic targets, both entities strive to strike a balance between air transport's vital role and the urgent need to protect our planet.

EU's role in aviation sustainability

ReFuelEU Aviation, as part of the Fit for 55 package, focuses on the promotion of SAF as the single most powerful tool to remove aviation CO₂ emissions today. These blended fuels are fully compatible with the current technology. ReFuelEU Aviation sets mandates requiring fuel suppliers to gradually increase the share of SAF blended into the jet fuel supplied at EU airports and undoubtedly reduce aviation greenhouse gas emissions (GHG). By 2025, the minimum target will be of 2% SAF in all EU airports, with a gradual increase to 70% by 2050.



FLOR DIAZ PULIDO

Head of the Aviation Policy Unit,
Directorate-General Mobility
and Transport, European
Commission

To ensure international aviation can continue to grow this century, a fuel switch has become indispensable. With ReFuelEU Aviation, the EU contributes to this goal.



“Aviation acts as a vital lifeline, seamlessly linking people, cultures and civilisations, facilitating global interactions, fostering cultural understanding, and strengthening the bonds between nations in our diverse and globalised societies. However, it must be sustainable, or it will lose its licence to grow.”

These fuels produced from renewable sources such as biomass, waste or synthetic processes that capture CO₂ from the atmosphere will replace conventional jet fuel and aviation will be able to achieve substantial emissions reductions. Through its whole life cycle, SAF has the potential to reduce emissions by up to 80%, and for the synthetic aviation fuels this can even reach 100% when produced from renewable hydrogen and captured CO₂.

The implementation of ReFuelEU Aviation will be a collaborative effort involving airlines, fuel suppliers, airports and authorities at national and European level. It will provide the necessary legal certainty to the whole industry to set investments in SAF production in motion, stimulating the development of a robust supply chain both in Europe and worldwide. The initiative will also help promote research and innovation in SAF technologies making them more cost-effective and scalable.

ReFuelEU Aviation is at the same time just one of the pieces the EU has put together to complete our vision regarding the use of SAF in aviation. While ReFuelEU Aviation acts as a minimum “floor” obligation on the fuel suppliers’ side, the EU Emissions Trading System (EU ETS) and other policies bring the incentives for the airlines to uplift SAF.

Through the EU ETS Innovation Fund, the EU will mobilise millions of euros to finance SAF projects helping producers bridge the gap to upscale production of SAF. Already last year, two SAF projects were awarded under the EU ETS Innovation financing.

Besides, in Horizon Europe the EU will prioritise SAF research, notably related to advanced biofuels and synthetic fuels, to make sure that more and more SAF pathways bridge the distance between research and innovation and actual market uptake. And through the taxonomy exercise, SAF producers have access to green investments, which will decrease the financial costs of their investments.

On top of this, the recently adopted EU ETS for aviation brings incentives to the demand side as well, creating special “SAF allowances” for airlines to decrease the price difference with kerosene in the first years of the transitional period. Finally, the Renewable Energy Directive sets up transport targets for Member States that include SAF, stimulating national investments in SAF policies and the necessary legal certainty for producers to invest.

With all these initiatives, the EU covers all relevant stakeholders in both the private and public sectors, and acts both through obligations (like in ReFuelEU Aviation and the Renewable Energy Directive – RED) as well as incentives (such as EU ETS, ETS aviation and Horizon Europe). By doing so, the EU has completed the puzzle that lay scattered and unsuccessful before us, making sure that European aviation can keep growing in full respect of the Paris Agreement goals.

ICAO's global initiatives

With the adoption of the long-term aspirational goal of net-zero CO₂ emissions from international aviation by 2050, ICAO sent the signal that the aviation industry is totally aligned with the ambition and the targets of the Paris Agreement. ICAO adopted this goal based on a thorough report representing the work of over 200 experts for almost three years. The report shows unequivocally that the progressive uptake of SAF is by far the most significant contributor to global CO₂ emissions reduction.

ICAO is currently working on developing a comprehensive framework for the use of such fuels and aims at a decision regarding it at the upcoming Third Conference on Aviation and Alternative Fuels (CAAF/3) in November this year. This conference should adopt an update of the ICAO 2050 Vision, which needs to be brought in line with the realities of the long-term net-zero goal. The EU and its Member States are working in close collaboration with all partners to agree on a framework including a pathway of quantified targets, the acknowledgement of the importance of technical assistance, capacity building and access to financial resources.

ICAO, at its 41st Assembly in 2022, also agreed to stabilise and strengthen the CORSIA framework, which caps net emissions of international aviation below a steady level and incentivises the uplift of SAF to reduce the obligation of airlines to offset their emissions. The EU and its Member States fully apply CORSIA and are contributing to work on the review of the scheme, which is taking place every three years, to ensure it remains fit for purpose and facilitates the achievement of the net-zero long-term goal.

Global action for SAF

We must emphasise that the EU is committed to inclusivity, respecting differences, and aiming for the highest level of global cohesion possible while developing their SAF policy. As we embark on the journey towards decarbonising aviation, the EU is already supporting other States through the ICAO Assistance, Capacity-building and Training for Sustainable Aviation Fuels (ACT-SAF) programme and the ECAC Secretariat capacity-building workshops to bring everyone on board on this sustainable aviation path in the spirit of “no country left behind”.

In line with the European Green Deal commitment to help partner countries decarbonise, the project will support selected countries with EUR 4 million. The funding will go towards increasing SAF production, feasibility studies and assistance with the certification of these fuels. Implemented by ICAO and the European Union Aviation Safety Agency (EASA), the project involves 12 partner States (Cameroon, Egypt, Equatorial Guinea, Ethiopia, Gabon, India, Kenya, Mauritania, Mozambique, Rwanda, Senegal and South Africa) with possible expansions at a later stage.

In pursuing the decarbonisation of aviation, the EU understands the importance of collaboration and unity. We recognise that diverse perspectives, experiences and expertise are invaluable in finding innovative solutions and driving meaningful change. By actively involving all stakeholders we can harness collective intelligence and foster a sense of ownership and shared responsibility.

By facilitating open discussions, addressing concerns, and building consensus, we can create a cohesive approach that fosters trust, collaboration and effective decision making. Together, we can overcome challenges and capitalise on opportunities, enabling us to accelerate the transition to a

Two major challenges that our society must solve now are climate change and energy security, and aviation is deeply involved in solving both.

sustainable and decarbonised aviation sector. With a united front, we can work towards a greener, more resilient, and environmentally responsible aviation industry that benefits us all.

Conclusion

Aviation sustainability is a critical global issue, and the EU, ECAC and ICAO have demonstrated their commitment to addressing it through environmental action. Further than national and regional policies, the collaboration with ICAO is essential for achieving consistent global standards and fostering innovation. By sharing knowledge and coordinating their efforts, these entities maximise their impact and encourage other regions to adopt similar measures. However, continued efforts are necessary to accelerate the development and deployment of sustainable aviation technologies and practices.

As we navigate the path to a more sustainable future, it is imperative for all stakeholders in the aviation industry to actively participate. Together, we can ensure that aviation continues to connect people and economies while minimising its environmental footprint. By charting a greener sky, we can build a more sustainable and inclusive aviation sector for generations to come. ●

Flor Diaz Pulido graduated in law from the University of Las Palmas de Gran Canaria and the Autonomous University of Barcelona. She specialised in European law (master's, University of Granada) and pursued postgraduate studies in diplomacy and international relations. Flor has recently completed a second master's in aerospace law (Instituto Iberoamericano de Derecho Aeronáutico y del Espacio). Her career in the European Commission started in 1995 in DG Fisheries (legal affairs), moving to aviation internal market transport in 2000 and to passenger rights in 2010. She moved to DG GROW in 2013 (resource efficiency and raw materials) and to DG DEFIS in 2017 (European Space Policy, Galileo). Flor has been the head of the unit of Aviation Policy in DG MOVE since 2018, where she leads the European Union's work on aviation sustainability, the internal market and airport services, as well as coordination with ECAC and ICAO.





News from ECAC and JAA TO:

- ECAC Spotlight
- ECAC in brief
- JAA TO

ECAC Network on Diversity and Inclusion

WHAT IS THE NEW ECAC NETWORK ON DIVERSITY AND INCLUSION IN CIVIL AVIATION? WHAT ARE THE NETWORK'S OBJECTIVES?

The Network on Diversity and Inclusion is a new ECAC group established by Directors General of Civil Aviation in December 2022 to foster cooperation among ECAC Member States and enhance their diversity and inclusion capacities by exchanging experience and good practices. Its members are professionals dealing with diversity and inclusion topics in civil aviation administrations across ECAC Member States.

The network also deals with challenges faced by Member States in their activities, proposing actions to address them, and discussing other diversity issues relevant to the work of ECAC and/or of interest to ECAC Member States.

WHAT ARE THE KEY ACHIEVEMENTS OF THE NETWORK SO FAR?

One of the network's first main achievements has been the adoption of the first ECAC Diversity and Inclusion Charter by Directors General at their last meeting (DGCA/160, 23 May 2023). This charter outlines commitments and actions to promote diversity and inclusion in civil aviation to be taken by Member States and ECAC as an organisation.

WHAT TOPICS IS THE NETWORK CURRENTLY FOCUSING ON?

The network is currently focusing on various topics including increasing the representation of women in technical and leadership roles, and addressing unconscious bias in the workplace. Other topics address possible good practices and guidance about the importance of gender balance and cultural diversity in the aviation sector. These topics are inter-related, and each plays a crucial role in creating a workplace that values and respects all employees.

To promote the understanding of diversity and inclusion topics, the ECAC Secretariat recently organised a first diversity and unconscious bias training course for representative of Member States, and the feedback received from participants has been very positive. They stated that the training provided valuable insights which they could take home and apply to their respective work environments. We are therefore planning to repeat this training course in the second part of 2023.

WHAT CHALLENGES DO YOU SEE ARISING IN THE FUTURE?

Naturally, achieving the above-mentioned objectives comes with a series of challenges. Currently, one of the biggest challenges facing organisations (including those in the aviation industry) is addressing unconscious bias (e.g. affinity bias) in the workplace. Unconscious bias refers to the subtle ways in which our minds process information and it can lead to unfair treatment of certain employees. We therefore have to take the necessary steps to raise awareness of this unconscious bias among our employees and provide them with the tools they need to identify and address this issue.

WHAT MAIN CHALLENGES FOR ECAC MEMBER STATES DO YOU SEE EMERGING/ BEING DISCUSSED BY THE NETWORK AT FUTURE MEETINGS?

One of the key topics that could be addressed by the network at upcoming meetings will be the implementation of the actions set out in the ECAC Diversity and Inclusion Charter, and the development of diversity and inclusion national strategies. It is worth mentioning that these strategies and policies are not mandatory and not all Member States have implemented them. This topic is therefore likely to feature on the network's agenda in the months and years to come.

We would also like to liaise with industry stakeholders and engage in a dialogue with them to share ideas and good practices. We have already liaised with the main industry associations, and will have further discussion in the coming months.

SOME FINAL WORDS?

Diversity-related matters (inclusion, equity, accessibility, etc.) are key components organisations must address to achieve a more creative way of thinking, find innovative ways to address current and future challenges, and be more agile to adapt in a dynamic environment such as that of civil aviation. I encourage everyone to engage and become more active on diversity and inclusion activities – diversity matters to all of us! ●

interview with



GIOVANNA LASCHENA

Chair of the ECAC Network on Diversity and Inclusion in Civil Aviation, and Director Central DG Staff Coordination and International Relations, ENAC, Italy

Giovanna Laschena, a law graduate, is the director central DG staff coordination and international relations at ENAC, the Italian civil aviation authority, head of ENAC's crisis cell, and focal point for Italy at the European Aviation Crisis Coordination Cell (EACCC). She was ENAC deputy director general from November 2021 to December 2022 after ten years as director of air transport development and four years as deputy central director of economic and airport oversight. Giovanna joined ENAC in 2005 following 18 years with Italy's air navigation provider, ENAV. She is a member of the ECAC Medium-Term Objectives Task Force and chair of the ECAC Network on Diversity and Inclusion. She participates as head and member of the Italian delegation in bilateral negotiation with third countries, and participates as Italian representative in meetings and panels on air transport regulation, liberalisation and passengers' rights at ICAO, the European Commission, ECAC and other organisations.



Directors General spring meeting in Paris

PARIS, 23 MAY 2023

Optimising States' SAF production and distribution potential, and preparing to take best advantage of the energy revolution in aviation were highlighted as a major priority by ICAO Secretary General Juan Carlos Salazar during his address at the 160th meeting of ECAC Directors General of Civil Aviation in Paris on 23 May 2023. Other key issues considered to be priorities for the sector were innovation, including green innovation, and the importance of addressing solutions and challenges in a coordinated manner, as well as the importance of States and the aviation community remaining engaged towards strengthening their global health crisis preparedness and management frameworks.

European coordinator in the ICAO Council, Valdís Ásta Aðalsteinsdóttir (NORDICAO/Iceland), briefed the meeting on the main outcomes of the 228th ICAO Council Session and the European priorities for the 229th session in June 2023. Gunnar Ljungberg (DGCA Sweden) provided an update on the main achievements of the Swedish Presidency of the Council of the European Union, highlighting the conclusion of the ReFuelEU Aviation agreement and Chapter 4 of the Single European Sky 2+ package. Filip Cornelis (European Commission) underlined the important work achieved under the Swedish Presidency including on ReFuelEU, which he was confident would be finalised by the end of June. He noted SES 2+ was now moving into a critical new chapter and the hope that the strong foundation built under the Swedish Presidency would allow for further development of EUROCONTROL in its role as Network Manager.

Joining the meeting virtually, Director General of Civil Aviation of Ukraine, Oleksandr Bilchuk, updated directors on the current civil aviation situation in Ukraine and the challenges facing the aviation sector. Directors General reiterated their

strong support for and solidarity towards Ukraine and they welcomed measures taken by ECAC, EUROCONTROL, the European Union and EASA in support of Ukraine, underlining the importance of coordination between all parties.

Acknowledging the growing importance of facilitation in aviation, Directors General decided that the ECAC Quality Assessment Programme on assistance for persons with disabilities and persons with reduced mobility should be established as part of the organisation's capacity-building offer from 2024.

They also adopted the work programme of the ECAC Network on Diversity and Inclusion in Civil Aviation and welcomed the proposal to organise more training courses on diversity and unconscious bias for ECAC Member States based on the positive outcome of the pilot training held at the beginning of the year. A new ECAC Charter on Diversity and Inclusion was adopted, and Directors General agreed to create a new position of Focal Point for Diversity and Inclusion, to be approved through a special Plenary Session.

EUROCONTROL Director General, Raül Medina, provided information on the pillars of the "Raising the bar" programme, which is structured on three main pillars: technology and innovation, international engagement, and people; the Network traffic situation for 2023; and the support provided to Ukraine through the EUROCONTROL ATM Fund. Jeremie Teahan (EASA) briefed Directors General on recent EASA developments, including on environment activities and actions to be handled by the Preparations for Summer 2023 Task Force. ●



ECAC Coordinating Committee members meet with United States' government representatives in Washington

WASHINGTON DC, 30-31 MAY 2023

Members of the ECAC Coordinating Committee were welcomed by representatives of the Federal Aviation Administration (FAA), Transportation Security Administration (TSA), Department of Transportation (DOT) and State Department. The two-day meeting in Washington DC (CC-US/27) was held to exchange information on a broad array of key issues ranging from aviation security, innovative technologies and commercial space, to transatlantic cooperation and furthering the sustainable aviation agenda. This reinforced both sides' commitment to meaningful international engagement to enhance existing global aviation practices and to find common solutions to the challenges the industry and sector as a whole face today – and will face in future.

Day one saw the ECAC delegates visit the FAA Air Traffic Command Center where they learned about the approach the air navigation service provider is taking to identify and resolve air traffic management-related issues in a timely and efficient manner. The meeting then saw detailed discussions on a wide range of topics of mutual interest, including aviation security, safety, economics, the environment – and sustainable aviation – and technology and innovation.

Throughout the meeting, the US representatives emphasised their aim to continue sharing information to find collective practical solutions and to play a role in encouraging ICAO standards to be advanced globally. ECAC welcomed this and the opportunity to continue discussions on established aviation topics, as well as to raise new subjects, such as: diversity and inclusion, innovation in aviation security, and priorities in ICAO. ●

Coordinating Committee appointments

During DGCA/160, Directors General appointed by acclamation **Rannia Leontaridi**, (DGCA United Kingdom) as vice-president of ECAC, and **David Benito Astudillo** (DGCA Spain) as a member of the Coordinating Committee. ●

ECAC Member State appointments in April and May

- **Crispin Orr** (United Kingdom) as chair of the ECAC Air Accident and Incident Investigation Group of Experts (ACC) for a second three-year mandate.
- **Giovanna Laschena** (Italy) as chair of the ECAC Network on Diversity and Inclusion in Civil Aviation.
- **Mari Durban** (United Kingdom) as deputy chair of the ECAC Network on Diversity and Inclusion in Civil Aviation.
- **Kirsi Tervola-Joutsen** (Finland) as deputy chair of the Sub-Group on Persons with Reduced Mobility.
- **Ann-Kristin Hanssen** (Norway) as deputy chair of the Legal Task Force.
- **Päivi Jämsä** (Finland) as deputy chair of the Economic Working Group.

ECAC adopts first charter on diversity and inclusion

PARIS, 23 MAY 2023



Directors General of Civil Aviation of ECAC Member States adopted the first [ECAC Charter on Diversity and Inclusion](#). This significant milestone reflects ECAC's firm belief that diversity and inclusion are fundamental to building a sustainable and innovative air transport sector. By embracing these values, ECAC can foster a stronger, more equitable, accessible and resilient European air transport system that caters to the diverse needs of all stakeholders and the travelling public.

The Charter highlights ECAC Member States' commitment to creating and promoting a diverse, equitable, and inclusive environment where everyone feels valued and respected; diversity is not merely a goal but a means to achieve resilient workplaces. Implementing diversity and inclusion strategies and policies in ECAC Member States contributes to open work environments for all industry actors, enhancing performance, attracting and retaining talent, promoting innovation, and ultimately contributing to organisational success. ●

News from the ECAC Secretariat



BAS JACOBS joined the ECAC Secretariat in May as a trainee from the Netherlands to support the activities of the group on the legal status of ECAC (LEGS). Bas is currently pursuing an advanced LLM in Air and Space Law at Leiden University, for which he expects to graduate in August 2023. He is the Secretariat's first trainee and will work directly with the Executive Secretary, Patricia Reverdy, as his mentor.



In July, **ALAGIE JENG** joined the CASE II Project for a six-month secondment from the Gambia Civil Aviation Authority, where he is the aviation security (AVSEC) and facilitation quality control manager. He is a national AVSEC instructor/auditor, a certified ICAO AVSEC instructor/auditor and an AVSEC professional manager. As an expert of the African Civil Aviation Commission (AFCAC) Security and Facilitation Cooperative Expert Scheme for Africa and Indian Ocean, he is a member of AFCAC's Aviation Security and Facilitation Working Group. Prior to working in the aviation industry, Alagie was a schoolteacher.



MIGUEL MARTIN joined the ECAC CASE II Project at the beginning of July to work as a security specialist. Miguel has several years of experience as an AVSEC national auditor for the Spanish Civil Aviation Authority, where he was the Spanish representative in various ECAC working groups. He re-joins the ECAC CASE II Project team following a nine-month secondment there in 2022.

Strengthening collaboration as ECAC signs cooperation arrangement with ACI World

BARCELONA, 27 JUNE 2023

ECAC President, Alessio Quaranta, and ACI World Director General, Luis Felipe de Oliveira, signed a cooperation arrangement for the purpose of the EU-funded and ECAC-implemented CASE II Project, in the margins of the ACI EUROPE/ACI World Annual General Assembly, Conference and Exhibition.

This cooperation arrangement will enable the delivery of ACI Airport Excellence (APEX) in Security Programme airport security peer reviews to partner States in Africa, the Middle East, and Asia under the framework of the CASE II Project. These reviews will give airports in partner States the opportunity to have their security processes assessed according to international standards and leading practices. This arrangement reinforces the collaboration between ECAC and ACI World. ●



Aviation in-sector reductions and energy transition is focus of sixth ECAC Environmental Forum

PARIS AND ONLINE, 6-8 JUNE 2023

Climate change mitigation and steps towards achieving the 2050 net-zero CO₂ aspirational goal for international aviation (LTAG) agreed at the 41st ICAO Assembly in 2022 were the focus of the sixth ECAC Environmental Forum, held in Paris.

This event gathered environment experts from a wide spectrum of both government and industry stakeholders. The experts gave presentations on the latest UN Intergovernmental Panel on Climate Change (IPCC) report on climate change mitigation, on the status of knowledge of the non-CO₂ impacts of international aviation, on the main European expectations for COP28 later in 2023, and on different policies and roadmaps to achieve the ambitious in-sector reductions. The last of these focused particularly on sustainable aviation fuel (SAF) promotion but also on the future transition to the use of liquid hydrogen. Financing the energy transition also raised a productive debate among the participants.

ECAC's three sister regional organisations (Arab Civil Aviation Organization, African Civil Aviation Commission and Latin American Civil Aviation Commission) and the aviation administrations of the United



Delegates attending the sixth ECAC Environmental Forum in Paris

States and Canada brought the audience up to date on their environmental priorities, while ECAC Member States, the ECAC Secretariat, EASA, EUROCONTROL and the European Commission presented a number of European achievements and developments. A particular focus was placed on the main expectations for the ICAO CAAF/3 conference planned in November 2023. ●

Events to come



calendar

AUGUST

- 9** | 38th meeting of the Security Programme Management Group (SPMG/38), videoconference
29-30 | 21st annual meeting of the ECAC Certified Aviation Security Auditors group (AUD/21), Paris

SEPTEMBER

- 6** | 56th meeting of the Facilitation Sub-Group on Immigration (FAL-IMMIGRAT-SG/56), Paris
7 | 72nd meeting of the Facilitation Sub-Group on Persons with Reduced Mobility (FAL-PRM-SG/72), Paris
7 | 198th meeting of the Coordinating Committee (CC/198), Valletta
7-8 | 54th meeting of the Training Task Force (TrTF/54), videoconference
7-9 | 72nd Special meeting of ECAC Directors General (DGCA(SP)/72), Valletta
8 | 41st Plenary Session (ECAC/41), Valletta
8 | 4th meeting with facilitation experts on persons with reduced mobility and members of the Facilitation Sub-Group on Persons with Reduced Mobility (FAL-PRM-EXPERT/4), Paris
12-13 | 59th meeting of the Guidance Material Task Force (GMTF/59), videoconference
13 | 68th meeting of the ECAC Medium-Term Objectives Task Force (EMTO/68), videoconference
19 | 47th meeting of the Study Group on Cyber Security in Civil Aviation (CYBER/47), videoconference
26-27 | 5th Behaviour Detection Study Group Research & Development Workshop (BDSG-R&D-WKSHP/5), Paris
27-28 | 36th meeting of the Behaviour Detection Study Group (BDSG/36), Paris
28-29 | 5th sustainable aviation fuels tailored workshop (ENV/SAF-T-WKSHP/5), Banja Luka

OCTOBER

- 4-5** | 59th meeting of the Common Evaluation Process (CEP) Management Group (CEP-MG/59), videoconference
11-12 | 59th meeting of the Air Accident and Incident Investigation Group of Experts (ACC/59), Paris
11-12 | 86th meeting of the Technical Task Force (TTF/86)
12 | 66th meeting of the Facilitation Working Group (FAL/66), videoconference
18 | 39th meeting of the Security Programme Management Group (SPMG/39), videoconference
18 | 20th familiarisation webinar on basic knowledge on aviation and the environment (ENV-FAMWEB/20), videoconference
24-25 | ECAC/EU Dialogue with the European air transport industry, Valencia
25 | 5th meeting of the Network of Communication Specialists (NETCOM/5), Lisbon
25-26 | 40th meeting of the Security Forum (SF/40), Tirana
26 | 48th Legal Task Force (LEGTG/48), videoconference

Editorial

Dear readers of ECAC News,

Aviation and the environment are inevitably linked, as much of today's air transport is consuming great shares of the earth's available environmental spaces. As such, partisan debate sparks around the compatibility of aviation and environmental issues. Statistics such as the often-cited "2.5%" (global aviation's account of CO₂ emissions⁽¹⁾) try to objectivise the conversation and are the factual bedrock of important and visionary guidelines and policymaking (ICAO long-term aspirational goal (LTAG) Fly Net Zero 2050, ICAO Standards and Recommended Practices Annex 16, etc.). On the other hand, much of the conversation is influenced by subjective perception and the *emotional* component of flying. In fact, when asked for aviation's contribution to climate change, it is often less than people think.

Nevertheless, aviation stakeholders have made environmental protection part of their strategic objectives. As with the topic of this magazine, these include aircraft/engine technologies, new certification standards, operational improvements, sustainable alternative fuels (SAF), and decarbonisation. The next decades will see more technological innovations, which should enable industry stakeholders and policymakers to transform operations, draft regulation, and improve aircraft configurations and parts of the global aviation supply chain into more sustainable alternatives that help to reduce the

environmental footprint. Ultimately, conducting outreach activities and awareness programmes in cooperation with the highest international bodies (i.e. ICAO, United Nations Environment Programme, ECAC Environmental Programme Management Group, ECAC Sustainable Aviation Fuels Task Group) is vital for the implementation of standards.

At the turn of the half-year, the JAA Training Organisation (JAA TO) is performing at the highest levels, capacitating aviation professionals via various training solutions while also expanding its global brand name through thought leadership at conferences, or building the accreditations/partnership portfolio. It is for such activities that JAA TO (re)connects with aviation stakeholders and friends at many of the international symposia, some of which are highlighted below.

One particular success story I wish to highlight is the successful hosting of JAA TO's own High-Level Training series for ECAC Member States. For four years running, ECAC civil aviation authorities have come to avail and benefit from more and more of the rich resources that are available through this complimentary, exclusive and private platform. Read more in one of the highlights below.

I hope you enjoy reading this issue of ECAC News. ●

(1) Sources: <https://ourworldindata.org/co2-emissions-from-aviation#:~:text=Flying%20is%20a%20highly%20controversial,impacts%20on%20climate%20into%20account.&text=Flying%20is%20a%20highly%20controversial%20topic%20in%20climate%20debates,-There%20are%20a>



PAULA V. DE ALMEIDA
JAA TO CEO

JAA TO attends training symposia and ECAC meetings

In May, JAA TO attended the European Association of Aviation Training and Education Organizations' (EATEO) International Conference themed "Air transport: current and future challenges and prospects". JAA TO CEO, Paula V. de Almeida, and business strategist and relationship manager, Eric Schoonderwoerd, presented on the topic of "Contribution of training and education in facing the challenges in aviation". JAA TO, a founding member of EATEO, joined other European aviation stakeholders to explore and discuss the challenges and opportunities in the field of air transport.

As associated body of ECAC, JAA TO attended the open session of the 160th meeting of Directors General of Civil Aviation (DGCA/160) in Paris in May. During the meeting, ECAC Directors General welcomed ICAO Secretary General, Juan Carlos Salazar, to discuss the latest ICAO and European developments and priorities. JAA TO had the opportunity for a brief chat with Mr Salazar and Nicolas Rallo, the director of the ICAO EUR/NAT Regional Office. ●



JAA TO hosts 4th High-Level Training Session (HLT/4) for ECAC Directors General and heads of training



JAA TO hosted the 4th edition of its High-Level Training Sessions series (HLT/4) exclusively for ECAC Directors General and appointed high-level CAA representatives. This workshop series presents a unique and safe platform for best practice sharing and knowledge transfer among European aviation stakeholders on most relevant aviation topics.

This year, under the topic of **“Overflight and Destination Risk Management on Existing and Emerging Conflict Zones”**, JAA TO subject-matter-experts discussed existing mechanisms for State-to-operator and/or State-to-State sharing of information and actionable security intelligence and best practices.

Within HLT/4, JAA TO hosted a parallel session entitled **“Learning & Development Workshop for ECAC Heads of Training”** focusing on training needs assessment and capacity building for CAA

training plan development. ECAC heads of training and human resources senior managers joined this premiere workshop to better understand the aviation training requirements and learning and development strategies for tackling common challenges across their European authorities. The feedback received on this session was also very positive and yielded rich discussions for future formats.

On day two, the Hellenic Civil Aviation Authority (HCAA) and JAA TO signed a Memorandum of Understanding on sustainable training cooperation. HCAA governor, Christos Tsitouras, met with JAA TO CEO, Paula V. de Almeida, to officially finalise this comprehensive training cooperation to optimise HCAA personnel’s capacity building and organisational effectiveness. ●

Read the news release:
<https://jaato.com/news/HLT4/>

JAA TO signs training service agreement with Aviation Administration of Kazakhstan at ICAO GISS 2023 in Seoul

During ICAO’s Global Implementation Support Symposium (GISS) held in May 2023, JAA TO met with the Aviation Administration of Kazakhstan (AAK) to officially sign the first long-term cooperation agreement. The Framework Training Service Agreement includes the facilitation of several public courses and two courses at the Kazakh location.

Signing the agreement was Saltanat Tompiyeva, deputy general director for support and resources of the Aviation Administration of Kazakhstan, Paula V. de Almeida, JAA TO CEO, and Murat Yalcin, JAA TO head of sales, marketing and operations. JAA TO is proud to foster this relationship, laying the groundwork for future cooperation with this trusted aviation organisation in the region.

During ICAO GISS, JAA TO further performed its role as standing ICAO Platinum Training Centre of Excellence (TCE) and chair of the TRAINAIR PLUS Steering Committee (TPSC).

As TPSC chair, Paula V. de Almeida welcomed ICAO TRAINING fellow TPSC members and around 50 TRAINAIR PLUS Programme (TPP) members for the TPSC/13 meeting to discuss the latest experiences



of the TPP facilitation activities at the global and regional level, as well as to learn about the newest ICAO rebranding initiative.

Supporting ICAO TRAINING’s enablement initiatives for TPP members, JAA TO’s senior marketing and communications officer, Karl Schreiber, further presented a digital marketing workshop which provided the TPP community with the understanding for adopting marketing techniques to promote its training services and start a brand-building strategy. ●



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