ICAO ENVIRONMENT

NO COUNTRY LEFT BEHIND

Updates on CAEP Working Group 2 on Airports and Operations and Green Airports

Second Phase of the ICAO Assistance Project with the EU Funding :
“Capacity Building for CO_2 Mitigation from International Aviation

Third Meeting
25 to 27 July 2023

Deniz Kaymak
Associate Environment Officer, ICAO

Outline

CAEP Working Group 2 (WG2) on Airports and Operations

- Overview of WG2 and Current Work
- Guidance Materials on Airports and Operations
- Examples of Actions from SAPs

Green Airports

- Innovation and Aviation
- Innovation at Airports
  - SAF integration to Airports
  - Cleaner energy transition and sustainable infrastructure

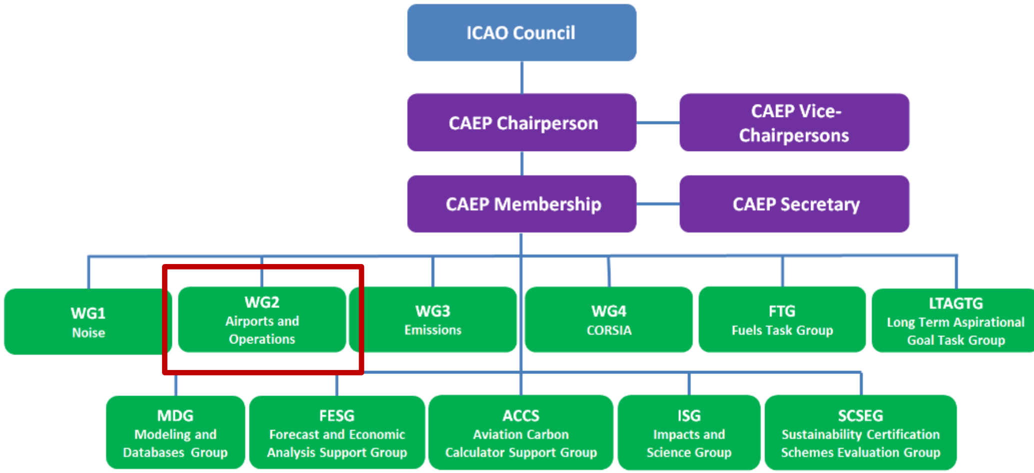
CAEP Working Group 2 (WG2) on Airports and Operations

ICAO CAEP Working Group 2

- Environmental issues related to airports and aircraft operations in the vicinity of the airports.

- Develop and disseminate:
  - wide range of guidance materials related to airports and operations
  - practical and ready-to-use information to support the planning and implementation of airport infrastructure projects: **"Eco Airport e-collection"**

CAEP Structure



ICAO CAEP Working Group 2 – Topics Covered

- Airports and Airport Operations
- Air Navigation and Traffic Management
- Operational Measures to Reduce Noise and Emissions
- Climate Adaptation
- Community Engagement

ICAO CAEP Working Group 2- Current Work

Climate Adaptation	Update of the Climate Adaptation Synthesis Report produced in the CAEP/11 cycle (2016-2019).
Air Navigation and Traffic Management	Review and update of the Continuous Descent Operations Manual - ICAO Doc. 9931
New E-Publications for Eco-Airport Toolkit Collection	GHG Management and Mitigation, Environmental Impacts of Unmanned Aircraft Operations, Innovation and Technology in Airport Sustainability, Single Use Plastics, Sustainable Energy at Airports etc.
Operational Measures to Reduce Noise and Emissions	

Guidance Materials on Airports and Operations

- **Doc 9184 – Airport Planning Manual – Part 2 – Land Use and Environmental Management to include best practices on land use planning, environmental management and climate change adaptation**
- **Operational Opportunities to Reduce Fuel Burn and Emissions (Doc.10013)**
- **Airport Air Quality Manual (Doc 9889)**
- **Environmental benefits Analysis of Aviation System Block Upgrade (ASBU) (included in SAP Guidance document)**
- **Circular 351 Community Engagement for Aviation Environmental Management**
- **ICAO Doc 10177 on Operational Opportunities to Reduce Aircraft Noise (upcoming)**

https://www.icao.int/environmental-protection/Pages/CAEP-WG2.aspx

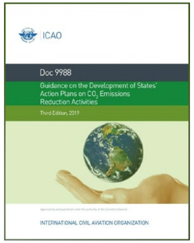
Guidance Materials on Airports and Operations

- Eco airports e-collection
- Climate Adaptation Synthesis Report
- Environmental Community Engagement for Performance-Based Navigation
- State of Play Report on Environmental Metrics of Relevance to the Global Aviation System
- State of Play Report on Review of Measures to Better Understand Encroachment around Airports
- Guidance Report on Climate Change Risk Assessment, Adaptation, and Resilience

https://www.icao.int/environmental-protection/Pages/CAEP-WG2.aspx

Guidance Materials on Airports and Operations

Environmental benefits Analysis of Aviation System Block Upgrade (ASBU) (included in SAP Guidance document)



ICAO Doc 9988
Chapter 4 Operational Improvements

Block 0 Module	*Benefits*
Improved Flexibility and Efficiency in Descent Profiles — Continuous Descent Operations **(B0-CDO)**	Fuel efficient descent profiles.
Improved Operations through Enhanced En-route Trajectories — Free-route Operations **(B0-FRTO)**	Greater routing possibilities, reducing potential congestion on trunk routes and busy crossing points resulting in reduced flight lengths and fuel burn.
Improved Traffic Flow through Sequencing — Runway Sequencing **(B0-RSEQ)**	Reduced holding and low level vectoring has a positive effect on fuel usage.
Improved Flexibility and Efficiency in Departure Profiles — Continuous Climb Operations **(B0-CCO)**	Fuel efficient climb profiles.
Improved Flow Performance through Planning based on a Network-wide View — Network Operations **(B0-NOPS)**	Reduced fuel burn when delays are absorbed on the ground with shut engines; rerouting generally increases flight distance, but this is generally compensated by other airline operational benefits.
Improved Safety and Efficiency through the Initial Application of Data Link En-route — Trajectory-based Operations **(B0-TBO)**	Routes/tracks and flights can be separated by reduced minima, allowing flexible routings and vertical profiles closer to the ones preferred by the users.
Increased Runway Throughput through Optimized Wake Turbulence Separation **(B0-WAKE)**	Reduced delays and associated fuel consumption.

ICAO Doc 9988 Appendix C
Table C-2. Rules of thumb for estimating expected results by measure

Category	*Sub-category*	*Measure (References)*	*Rule of thumb*	*Example*
Operational improvements *(continued)*	More efficient ATM planning, ground operations, terminal operations, en-route operations, airspace design and usage, aircraft air navigation capabilities *(continued)*	Measures to improve fuel efficient departure and approach procedures: *CCO* (CAEP/10 Report 2016)	Use IFSET or FS = 90-150 kg (0.09-0.15 tonnes) of fuel * number of CCOs	A State averages 2,000,000 flights per year. Currently, 50 of its airports offer CCO which accounts for approximately 200,000 departure movements. Expert judgement estimates that CCO is performed by 80% of the departures, a total of 160,000 departure movements. The annual fuel savings can be estimated as: — 0.09 * 160,000 = 14,400 tonnes of fuel saved (low end of range) — 0.15 * 160,000 = 24,000 tonnes of fuel saved (high end of range)
		Measures to improve fuel efficient departure and approach procedures: *PBN SID* (CAEP/10 Report 2016)	Use IFSET or FS = 0 kg to 30 kg of fuel (0 to .03 tonnes) * number of departure movements on PBN SID	A State averages 1,000,000 flights per year. Currently, 50 of its airports have implemented PBN SID which is estimated to be used by 200,000 departure movements. Expert judgement is that 100% of these departures fly the PBN SID. The annual fuel savings can be estimated as: — 0.0 * 200,000 = 0 tonnes of fuel saved (low end of range) — 0.03 * 200,000 = 6,000 tonnes of fuel saved (high end of range)
		Measures to improve collaborative decision making: *A-CDM (non-U.S. version)*	Use IFSET or FS = time savings (1 to 3 min) * number of movements	An airport with an average of 100,000 movements (both departures and arrivals) annually is implementing A-CDM. On average, aircraft at the airport burn 12 kg (0.012 tonnes) per minute during taxi. The benefit of A-CDM (non-U.S. version) is achieved during the total taxi phase (taxi-in and taxi-out). The annual fuel savings can be estimated as: — 1 * 0.012 * 100,000 = 1,200 tonnes of fuel saved (low end of range) — 3 * 0.012 * 100,000 = 3,600 tonnes of fuel saved (high end of range)
		Measures to improve collaborative decision making: *A-CDM (U.S. version)*	Use IFSET or FS = time savings (1 to 2 min) * number of departure movements	An airport with an average of 50,000 departure movements annually is implementing A-CDM. On average, aircraft at the airport burn 12 kg (0.012 tonnes) per minute during taxi. The benefit of A-CDM (U.S. version) is achieved only during the taxi-out phase. The annual fuel savings can be estimated as: — 1 * 0.012 * 50,000 = 600 tonnes of fuel saved (low end of range) — 2 * 0.012 * 50,000 = 1,200 tonnes of fuel saved (high end of range)

Guidance Materials on Airports and Operations

Eco airports e-collection

ICAO fosters the **exchange of information on best practices for Green Airports**, covering such subjects as smart buildings, renewable energy, green mobility, climate change resilience resource and biodiversity protection, community engagement and sustainability reporting

With the aim of sharing and harmonizing best practices amongst airports. ICAO has developed **practical and ready-to-use information to support the planning and implementation of airport infrastructure projects**

The material is provided as general information only

[Eco-Airport Toolkit e-collection (icao.int)]

Examples of actions

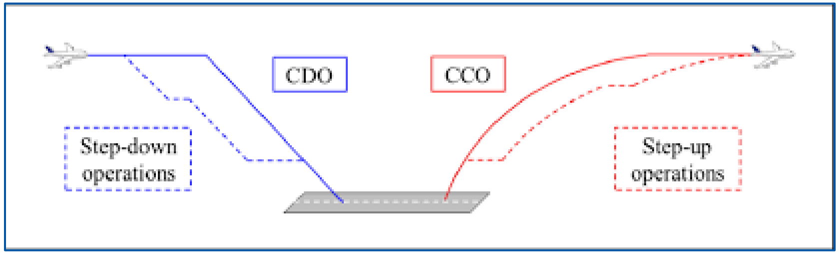
Mitigation Measures related to Airports and Operations from SAPs

Fuel-Efficient Departure and Approach Procedures in Cabo Verde

Design and implementation of CCO and CDO procedures at all international airports

- ✓ allow the operators to fly a profile that is as close as possible to the optimum profile with continuous climb or descent during their approach for the international airport

- ✓ enables to attain initial cruise climb Flight level at an optimum air speed and engine thrust reducing fuel burn and emission and noise reduction



Implementation of Performance Based Navigation (PBN) in Nigeria

- ✓ improve air navigation facilities and air traffic management systems
- ✓ reduced flight times, terminal delays, fuel consumption, and distance flown
- ✓ increase in flight efficiency and reduction in fuel burn and CO2 emissions

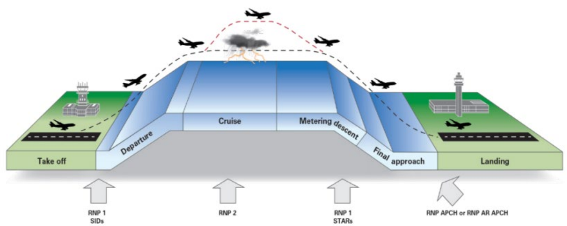
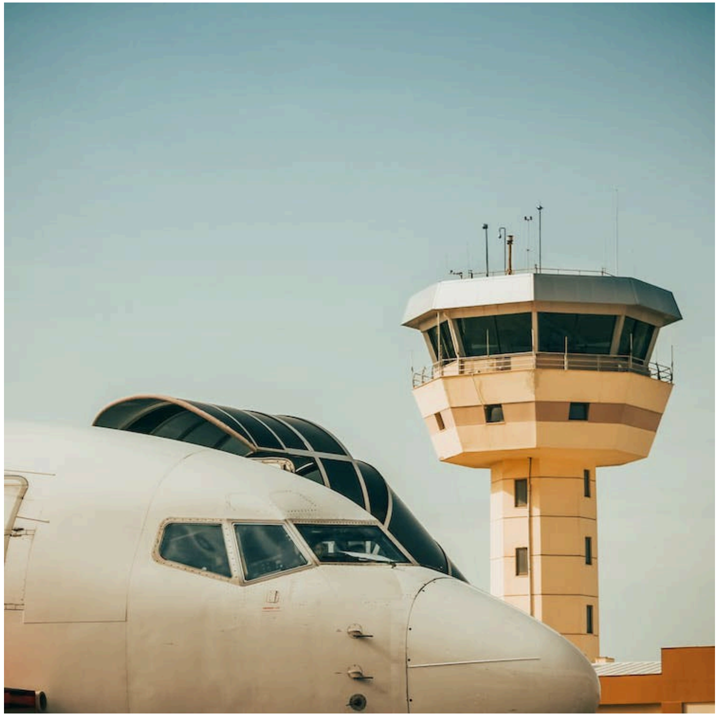


FIGURE 1: Application of PBN in the Nigerian Airspace

TABLE 1: New PBN RNARV10 Routes with Savings in Distance, Fuel and Emissions

S/No	Route Designator	Type of Route	Routing	FIRs Involved	Distance Savings (nm)	Fuel Savings (kgs)	CO_2 Savings (kgs)
1	UQ300	New Route RNAV10 IATA Request	KOKAM – NLY – ILBAS – EDGOT	Brazzaville, Kano	29	179	566
2	UY604	RNAV10 New, Nigerian Request	POT-BIPIV	Kano, Brazzaville	30	193	610
3	UQ181	New Route RNAV10 IATA Request	BIPIV - TENTU	Brazzaville, Kano, Accra	44	550	1750
4	UQ400	New Route RNAV10 IATA	BIPIV – NANOS	Brazzaville, Kano, Niamey	30	179	566
5	UQ324	New Route RNAV10 IATA Request	NY-GULEN-KELAK	Niamey, Kano, Ndjamena, Khartoum	50	618	1953
6	UY333	RNAV10 New, Nigerian request	KIGRA-OPDOL-UBEVA	Kano, Niamey, Algiers Tunis	44	550	1730
7	UY87	New Route RNAV10	TYE-KIDKI	Kano, Accra, Abidjan	15	91	287
8	UY57	New Route RNAV10 ACCRA Request	LIREX-SESIG	Kano, Accra, Abidjan	7	39	123
9	UQ200	New Route RNAV10 IATA Request	ADDIS – LAGOS (GWZ - GADUV	Addis, Khartoum, Ndjamena, Brazzaville, Kano	95	950	3002
10	UY87	New Route RNAV10	TYE-KIDKI	Kano, Accra, Abidjan	15	91	287

Implementation of measures to exploit the full capacity of Mali's airspace



This measure aims to implement measures to fully exploit the capacities of the airspace to allow aircraft to optimize their performance according to the ergonomics of the airspace and the flexibility offered by it.

✓ fuel savings: 2096.45 tonnes / year

Green Airports

"acceleration of the clean energy transition through the latest innovations at airports"

Innovation and Aviation

- The aviation industry is technology-driven
- Innovations will always be a key driver for the sector and its supply chain
- Innovation is critical for improving efficiency and operational capabilities and for creating value through:
  - ✓ improvements in air traffic management,
  - ✓ transition to cleaner energy,
  - ✓ production and delivery of sustainable aviation fuels,
  - ✓ development of sustainable and resilient infrastructure
  - ✓ transition to digital systems
- New opportunities to advance the sector

Innovation and Aviation

- ICAO has been at the forefront of driving sustainability initiatives
- Long-term global aspirational goal – LTAG - for international aviation of net-zero carbon emissions by 2050
- Innovation is key for LTAG
- Achievement of LTAG will require collaborative efforts from all stakeholders in the aviation industry

  ✓ accelerated adoption of innovative aircraft technologies,

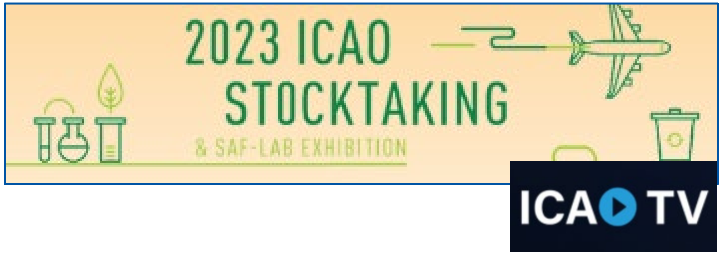
  ✓ implementation of efficient flight operations, and

  ✓ increased production and use of sustainable aviation fuels - SAF

Innovation and Aviation

ICAO Tracker Tool

Annual event and continuous process

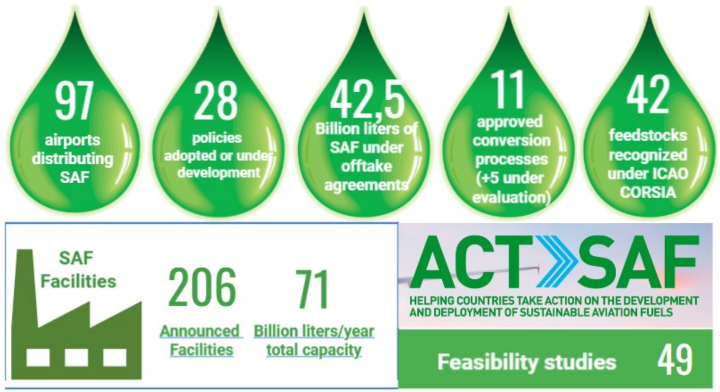


Innovation at Airports

Integration of sustainable aviation fuels

- Airports have a unique opportunity to facilitate the integration of sustainable aviation fuels
- Airports can create the required supply chain and infrastructure in collaboration with
  - ✓ fuel suppliers, airlines, and government agencies etc.
- Collaboration and engagement with stakeholders across the supply chain can:
  - ✓ drive innovation
  - ✓ increase the production capacity of sustainable aviation fuel, and
  - ✓ address any regulatory or logistical challenges associated

SAF Tracking tools (click for details)



https://www.icao.int/environmental-protection/GFAAF/Pages/Airports.aspx

Innovation at Airports

Cleaner energy transition and sustainable infrastructure

- Successful cleaner energy transition requires a supportive infrastructure framework
- Development of sustainable infrastructure:
  - ✓ integration of renewable energy,
  - ✓ implementation of smart grid technologies,
  - ✓ deployment of charging stations for electric vehicles etc.
- Collaboration between airports, governments, and private sector partners for sustainable infrastructure

Conclusion and Next Steps

- All ICAO Member States to include innovative mitigation measures into their SAPs from the ICAO Basket of Measures
- Airports will play a critical role in driving a cleaner energy transition and fostering sustainability, all ICAO Member States to consider integration of cleaner energy sources to their airports

Green Airports Seminar in 2024

New Eco-Airport Toolkit publication on "Innovation and Technology in Airport Sustainability"

Continue work closely with other international bodies inside and outside the aviation domain to track latest innovation to reduce the environmental impact of international aviation


North American Central American and Caribbean (NACC) Office
Mexico City
South American (SAM) Office
Lima
ICAO Headquarters
Montréal
Western and Central African (WACAF) Office
Dakar
European and North Atlantic (EUR/NAT) Office
Paris
Middle East (MID) Office
Cairo
Eastern and Southern African (ESAF) Office
Nairobi
Asia and Pacific (APAC) Sub-office
Beijing
Asia and Pacific (APAC) Office
Bangkok

THANK YOU