Airports and Operations Working Group Report

By David Brain (EUROCONTROL), Iryna Kustovska (Ukraine)[1] and the ICAO Secretariat

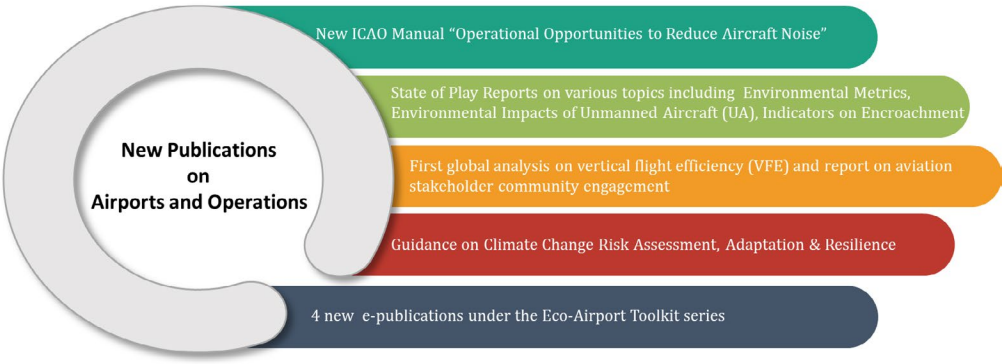

FIGURE 1: New Publications on Airports and Operations

Introduction

The Committee on Aviation Environmental Protection (CAEP)'s Working Group 2 - Airports and Operations (WG2) addresses environmental issues relating to airports, aircraft operations near airports, and aircraft operations in general. The objective of the work programme of WG2 is to develop and disseminate guidance to States, aviation authorities and planners on environmental issues related to airport expansion, construction, and operation, and to define operational procedures, strategies, and opportunities. The development of global best practices in these areas continually evolve and can lead to the improvement of environmental management policies.

When visualizing the ICAO basket of measures to reduce CO_2 emissions, Air Traffic Management (ATM) and operations are often overlooked as one of the main measures to support the decarbonization process. However, despite being depicted as a small wedge, ATM and operations offer the highest potential for reducing CO_2 and related emissions in the short to medium term. This has clearly been demonstrated in the work of the CAEP Long Term Aspirational Goal (LTAG)-Task Group (TG) work whose results are elaborated in the LTAG Supplement of this report.

WG2 – Airports and Operations - is the operational working group of CAEP and has been responsible for delivering some of the key analyses to support the calculation of the benefits that may be realized from implementing the operational measures defined in the ICAO-GANP Aviation System Block Upgrades (ASBU) framework together with new innovative measures looking out to the coming decades.

In the CAEP12 cycle, WG2 undertook a very ambitious work programme. This included the delivery of a new ICAO Manual "Operational Opportunities to Reduce Noise" (a sister manual to ICAO Doc.10013 "Operational Opportunities to Reduce Fuel Burn and Emissions"), three State of Play reports: "Environmental Metrics"; "The Environmental Impacts of Unmanned Aircraft (UA) at and Around

1 David Brain and Iryna Kustovska are Co-Rapporteurs of Working Group 2 of the ICAO Council's Committee on Aviation Environmental Protection (CAEP).

ICAO Region	CDO		CCO	
	Excess fuel / CO_2 (kg)	Fuel costs (million $)	Excess fuel / CO_2 (kg)	Fuel costs (million $)
APAC	47/149	336.9	13/41	94.2
ESAF	23/73	8.2	2/6	0.6
EUR/NAT	37/117	218.7	4/13	22.5
MID	60/190	50.9	9/28	7.9
NAM	43/136	336.6	5/16	41.2
CAR/SAM	24/76	44.3	3/9	6.4
WACAF	20/63	2.7	1/3	0.1
Total	**41/130**	**992.2**	**7/22**	**161.5**

Table 1: Results of the climb and descent parts of the global VFE study per ICAO region

Airports"; and, an "Investigation of Possible Indicators on Encroachment", as well as several reports on the first global analysis on vertical flight efficiency (VFE) and a report on aviation stakeholder community engagement. In addition, WG2 delivered guidance material on "Climate Change Risk Assessment, Adaptation & Resilience" and four e-publications under the eco-airport toolkit series, both of which are elaborated in Chapter 9 of this report.

The development of the new ICAO Manual "Operational Opportunities to Reduce Aircraft Noise" encompassed the identification, and review of both standard and innovative operational opportunities and techniques for minimising noise in civil aviation operations. The manual provides background on current practices that are available to aircraft operators, airport operators, air navigation services providers (ANSPs), other industry organisations and States to reduce aircraft noise impacts. It also highlights recent developments - resulting from emerging innovation - and considers what concepts and enabling technologies currently being developed by the aerospace manufacturing industry and airspace service providers may become available in the near future.

In the CAEP/11 cycle, WG2 delivered the first ever-global Horizontal Flight Efficiency (HFE) analysis[2] that demonstrated that global HFE levels in 2017, based on the data studied, varied between 94% and 98%. In CAEP/12, WG2 followed on this thread of work with the first global Vertical Flight Efficiency (VFE) analysis with the work initially focusing on the climb and descent phases with the availability of sufficient global data from Flightradar24.

This analysis revealed that for the descent phase, the average per flight inefficiency (or non-optimised Continuous Descent Operation (CDO)), generated an average extra consumption of 41kg fuel per flight across all ICAO regions. The ratio between the extra consumption in the most efficient regions and least efficient regions was three-fold (20-60kg per flight). The costs of fuel of the inefficiencies per region were determined by multiplying the additional fuel burn with the kerosene price and number of flights for each region. For the climb phase, the average per flight inefficiency (or non-optimised Continuous Climb Operation (CCO)), generated an average extra consumption of 7kg fuel per flight across all ICAO regions. As seen in Table 1, the inefficiencies are larger in the descent phase by a ratio of approximately six to one on a global basis, in fuel burn and fuel costs values between the descent and climb phase. The total estimated benefit pool for 2019 was estimated to be around $1,000 Million (USD) for the descent phase and $160 Million (USD) for the climb phase.

Unfortunately, sufficient time and effort was not available to continue the work on the en-route phase within WG2. Despite this, a small group of WG2 experts worked together to initiate the development of two new methodologies to measure global vertical flight efficiency in the en-route phase and now the aim will be to complete this work through EUROCONTROL, the European Organization for the Safety of Air Navigation.

From these global analyses together with studies previously undertaken by the International Panel on Climate Change (IPCC), Civil Air Navigation Services Organization (CANSO) and CAEP, it can be seen that horizontal and vertical flight

2 https://www.icao.int/environmental-protection/Documents/EnvironmentalReports/2019/ENVReport2019_pg138-144.pdf

inefficiency is estimated to contribute to around 6-7% of total fuel burn when using such proxy metrics based on distance and/or time. However as noted at the 2020 ICAO Stocktaking event, it is likely that further operational inefficiencies exist that may be demonstrated by the use of indicators that are based directly on fuel burn or CO_2 emissions. In addition, the introduction of novel and innovative measures into the ATM system may result in a larger efficiency benefit pool than what is currently the case with the integration into the ATM system of new measures that effectively remove fuel burn from the ATM system e.g. electric taxi.

As well as supporting the CAEP LTAG Task group on the feasibility study for a long term aspirational goal on CO_2 emissions, WG2 was also responsible for the Global ASBU (Aviation System Block Upgrade) Environmental Benefits Assessment in CAEP/11, a study detailed on pages 131-137 of the 2019 ICAO Environmental Report.

In CAEP/12, WG2 was asked to assess the 2019 updated ASBU documentation detailed in the GANP for potential to support further detailed analyses. Although, there were additional benefit mechanisms identified in the 2019 ASBU documentation (later to be included in the LTAG analysis), it was concluded that overall, these potential benefits were likely already covered to a large extent by the benefits identified in the ASBU analysis looking out to 2025. In addition, implementation data would be difficult to obtain based upon timeframes of 2031+. Therefore, WG2 concluded that there was little added value in undertaking further ASBU analyses in the CAEP/12 cycle.

To assess the benefits of any operational measures, developing new environmental metrics is currently at the forefront of stakeholder thinking as the environmental KPA takes center stage in the performance of a post-COVID aviation system. If new metrics based on fuel burn / CO_2 emissions are to be developed, they should focus on fuel efficiency related to the actions of all stakeholders involved in the ATM system. CAEP/12 approved a State of Play "Report on Environmental Metrics" delivered, with the objective to provide an overview of common metrics used by States and operational stakeholders to assess the environmental performance of aviation. This report detailed thirty-eight environmental metrics - categorized into one of four main categories: Airline Fleet Operations, ATM Operations, Airport Operations, State/Regional/Global Levels and linked to one of four categories: Sustainable Aviation Fuel (SAF), Greenhouse gases (GHG), (Local) Air Quality and Noise - that could be considered as widely applicable to describe environmental performance at the global level. However, whether or not they are appropriate to describe a specific performance depended on the specific circumstances of the stakeholder(s) themselves, including Local/State/Region regulations, resource constraints, data availability, etc. States and operational stakeholders that do not yet use such metrics or are considering revising such metrics if already in use would be able to refer to the state-of-play document as a basis for further work.

It is likely that work on metrics will be a key priority at both the global and regional level in the coming years. At the global level, the GANP - PEG (GANP - Performance Expert Group) has been set up to define the performance framework of the ASBU framework, with the current emphasis on the Environment KPA. It is expected that in the coming months there will be a need to develop this framework to include new environmental performance ambitions, objectives and indicators together with focus areas around which to build the framework. At the regional level, groups are working to further develop environmental metrics that are based on fuel burn. For example, in Europe, the EASA / EUROCONTROL Transparency Working Group is looking into defining new environmental indicators that can more accurately measure and communicate fuel efficiency (e.g. through individual airspaces, phases of flight and operational scenarios) and the measures undertaken to mitigate fuel inefficiency. This includes highlighting the interdependencies between the different actors and ensuring that all stakeholders understand how collaboration is required to optimise the operational response.

Innovation in ATM is one of the areas where ICAO is focusing the GANP, one area of which relates to new entrants, in particular those at the lower altitudes (e.g. drones in U-Space) or operations at higher altitudes (e.g. Higher Airspace Operations (HAO) above the traditional flight levels of conventional aircraft types). Whilst ATM actors are cognizant of the need not only to undertake a careful assessment of the potential environmental impacts of any new vehicle or operation type and to assess to what extent these operations may be considered sustainable, it should be emphasised that an assessment of the extent to which traditional manned aviation traffic will be impacted

by the integration of the performance characteristics of the HAO vehicle or operation into the current manned aviation system, will also have to be undertaken.

WG2 delivered another State of Play report on the "Environmental Impact of Unmanned Aircraft" at and around Airports". WG2 found that this subject matter was extremely dynamic with new material on the subject emerging monthly, exacerbated by a wealth of new use cases appearing during the pandemic. This report will be further detailed in a following article of this Chapter.

Operational noise issues also need to be addressed at and around airports. ICAO advocates the use of the balanced approach to noise management which provides a simple framework for airports to address noise issues by focusing on the core aspects of noise management namely: reduction of noise at source, land-use planning, noise abatement operational procedures and operations restrictions. Whilst much of the focus remains with operations restrictions, encroachment on land-use around airports can have a significant impact on the ability of the airport to manage its noise impact.

WG2 delivered a third State of Play report at CAEP/12 on the "Investigation of Possible Indicators on Encroachment", focusing on the challenges and good practices related to population encroachment into the noise contours at airports, including the metrics used to measure this challenge. WG2 reviewed both ICAO documents and non-ICAO (i.e. State) documents to collect and aggregate all relevant available information into a single report, which set out some common challenges for airports relating to the issue of encroachment. These included accessing data and information to track levels of encroachment, maintaining positive dialogue and negotiations between the airport and municipality, competing economic interests, and competing planning priorities between the airport and the municipalities, as well as addressing conflicts with the interests of residents and property owners in the vicinity of airports.

Amongst the recommendations of this report were the importance of maintaining continuous dialogue with communities, local governments, and aviation stakeholders to ensure the correct application of land-use planning techniques in the development of airports and the need for any new guidelines to be based on technically robust and up-to-date scientific evidence and coordinated through extensive collaboration and community engagement with the relevant stakeholders.

WG2 also delivered a report on understanding aviation stakeholder community engagement needs in the context of delivering ATM change with the objective to understand States' needs and preparedness in terms of information, processes, and tools to effectively engage communities for further deployment of Performance Based Navigation (PBN) and airspace change/modernisation. This study deployed a global survey which initiated 42 responses across all ICAO regions with a number of key observations identified. These included that, even though most respondents felt prepared for the community engagement process, 12% of respondents did not feel prepared to engage communities. In addition, most respondents suggested that there was likely to be information, processes and tools that would be helpful to them as they embarked upon community engagement. The respondents also highlighted that the preferred media for the dissemination of details about such information, processes and tools would be through a Regional Module and/or a Circular or Manual.

Considering the experiences observed in the CAEP/12 cycle together with emerging priorities identified by CAEP WG2 Members and Observers and ongoing engagement with aviation stakeholders, WG2 plan to continue some current threads of work during the CAEP/13 cycle whilst also addressing several of these priorities. These include:

- Reviewing the ICAO CCO and CDO Manuals with a view to updating them;
- Identifying operational opportunities to reduce non-CO_2 emissions;
- Identifying best practices of noise monitoring systems;
- Considering the experiences / outcomes of the CAEP/12 reports to deliver enhanced community engagement guidance;
- Undertaking an analysis of environmental interdependencies in various operational scenarios;
- Updating the 2019 climate adaptation synthesis; and,
- Continuing developing the eco-airport toolkit e-publications to support global aviation environmental practitioners at and around airports.

For more information on WG2 membership and activities, contact officeenv@icao.int