59th CONFERENCE OF DIRECTORS GENERAL OF CIVIL AVIATION ASIA AND PACIFIC REGIONS

Cebu, Philippines
14 to 18 October 2024

AGENDA ITEM 4: AIR NAVIGATION

DATA-DRIVEN APPROACH TOWARDS ENHANCING EFFICIENCY AND PERFORMANCE OF AIR TRAFFIC MANAGEMENT

(Presented by Singapore)

SUMMARY

At the Fourteen Meeting of the Air Navigation Conference, ICAO projected the 2050 passenger traffic to be 12.4b, which is 2.7 times that of today's 4.6b. The increased activities of new entrants such as Advanced Air Mobility and delivery drones, as well as the transit of High Altitude Operations and commercial space vehicles through controlled airspace, would further increase airspace and operational complexities for air navigation service providers (ANSPs) and air traffic controllers (ATCOs). To support the anticipated growth in air traffic and complexities, existing air traffic management (ATM) processes and systems would need to be modernised.

This paper is aimed at discussing the adoption of a data-driven approach on efficiency and performance by ANSPs, which could support them in identifying areas for continual improvements.

DATA-DRIVEN APPROACH TOWARDS ENHANCING EFFICIENCY AND PERFORMANCE OF AIR TRAFFIC MANAGEMENT

1. INTRODUCTION

1.1 At the Fourteenth Meeting of the Air Navigation Conference (AN-Conf/14) held in Montreal, Canada, on 26 Aug – 6 Sep 2024, ICAO projected that passenger traffic would grow 2.7 times from 4.6 billion today to 12.4 billion in 2050. This would translate to a growth in air traffic volume of a similar magnitude. At the same time, increased activities of new entrants such as Advanced Air Mobility and delivery drones, as well as the transit of High Altitude Operations and commercial space vehicles through controlled airspace, would further increase airspace and operational complexities for air navigation service providers (ANSPs) and air traffic controllers (ATCOs).

1.2 To support the anticipated growth in air traffic and complexities, existing air traffic management (ATM) processes and systems would need to be modernised. It is imperative to be ready over the next decade or so. Given the typically long planning cycles for systems implementation, preparations should commence early with the aim of avoiding congestions and delays which would have associated safety and environmental concerns, impacting the future of aviation.

1.3 The AN-Conf/14 discussed several initiatives at ICAO which would support the enhancements of efficiency or airspace capacity. These included: 30 / 10 NM separation minima over high seas across Flight Information Regions (FIRs); modernised ATM including the new digital flight plan and phasing out of legacy systems; Connected Aircraft and Hyperconnected ATM; Trajectory Based Operations (TBO); future-readiness to handle new entrants (e.g. unmanned systems) and operations (e.g. High Altitude Operations and commercial space travels); cybersecurity and information system resilience; and implementation support for States.

1.4 It should be noted that as various building blocks need to be put in place in preparation for seamless ATM operations, the advent of TBO would be in the medium to longer term. In the meantime, there are opportunities for States and ANSPs, together with industry, to improve current efficiency and capacity through collaboration projects and innovation. Separate papers are tabled at this DGCA Conference to discuss those issues. This paper is aimed at discussing the adoption of a data-driven approach on efficiency and performance by ANSPs, which could support them in identifying areas for continual improvements.

2. DISCUSSION

2.1 The Global ATM Operational Concept (Doc 9854) envisages a performance-based global air navigation system. Greater details are provided in the Manual on Air Traffic Management System Requirements (Doc 9882) and the Manual on Global Performance of the Air Navigation System (Doc 9883). The Global Air Navigation Plan (GANP, Doc 9750) includes a segment on key performance indicators (KPIs). These were developed for consideration by the region and States to facilitate the Performance-Based Approach (PBA).

2.2 Asia Pacific region has made significant progress over the past few years towards a data-driven approach to efficiency and performance enhancement. In 2019, the APANPIRG/30 endorsed the Performance Measurement Framework (PMF) developed by the Regional ATM Performance Framework Small Working Group (RAPMF/SWG) of the ATM/SG. This PMF provides the stages of implementation for KPIs identified under the KPAs in the GANP and takes a step-by-step approach to ensure that the region develop data and performance management capabilities in a harmonised manner. At the same APANPIRG meeting, States were encouraged to utilise the PMF and to commence performance measurement.

2.3 At APANPIRG/33 in 2022, ICAO proposed for proponent States to form an informal

collaborative group for the formation of a Data Analytics Group (DAG) at the ATM/SG. At the ATM/SG/11 in 2023, the DAG was officially formed under the ATM/SG. Its current membership comprises Australia, China, Hong Kong (China), Indonesia, Papua New Guinea, Philippines, Singapore, Sri Lanka, Thailand, and the United States. The progress of the DAG was presented in the recent ATM/SG/12-WP/7[1] in 2024, which saw support for performance measurement.

2.4 To date, the DAG has agreed to initiate performance measurements for the 8 KPIs identified in Table 1. The methodologies are harmonised and normalised for a common understanding within the APAC region.

KPA	**KPI**	**Variant**	**GANP KPI Code**
Capacity	Airport peak capacity	Departure	KPI09-D
		Arrival	KPI09-A
Capacity	Airport peak throughput	Departure	KPI10-1D
		Arrival	KPI10-1A
Efficiency	Additional taxi-out time	Advanced	KPI02-2
Efficiency	Additional taxi-in time	Advanced	KPI13-2
Predictability	Departure punctuality	± 15 mins	KPI01-2A
Predictability	Arrival punctuality	± 15 mins	KPI14-2A

Table 1 – KPIs to be reported by DAG

2.5 The methodology for measurement of each of the KPIs has been developed by the Performance Expert Group within the GANP study group, and agreed collectively by the DAG. The methodology takes into account airports of differing sizes, airport and airspace layouts, operating environments and complexities, and applies algorithms to normalise the measurements. For instance, the additional taxi-out time KPI considers the time from actual off-block time to runway take-off time. A key component is developing a reference time representative of an unimpeded flight. The harmonized methodology agreed by the DAG was to group departing flight by common population (gate clusters and departure runway) by assessing the taxi-out routes and the distribution of travel times. Within each population, the reference taxi-out time is set at the 20-percentile taxi-out time. Using 20-percentile as a reference taxi-out time eliminates outliers (flights with unrealistically short or long taxi-out time) and also takes into account the distance of the gates to the departure runway. There are similar considerations for the additional taxi-in time KPI.

2.6 Measuring and monitoring these KPIs could support States in detecting adverse capacity / efficiency / predictability trends early, so that actions could be initiated to address them early. It could also support identification of issues common among adjacent States, and thus, catalyse regional efforts to jointly tackle these issues, which would be more impactful than efforts by individual State.

2.7 Over time, the KPIs could be expanded for the region and States to track improvements as Asia Pacific progresses towards the Asia Pacific Seamless ANS Plan, which supports the ICAO Long Term Aspirational Goal (LTAG). This can include other GANP KPIs such as additional time in terminal airspace, ATFM delays and additional fuel burn.

2.8 In terms of best practices, the European Region has implemented a data-driven approach towards enhancing efficiency and performance of ATM. Europe's performance guidance document, EUR030, and the EUROCONTROL Performance Review Unit provide information on the performance of the European states. European States are able to monitor their individual and the region's collective performance, and collaboratively develop solutions and new innovations to enhance

1 ATM/SG/12 – WP/7 *Progress of the APAC Data Analytics Ad-hoc Group* can be found at https://www.icao.int/APAC/Meetings/2024%20ATMSG12/WP07%20Progress%20of%20the%20APAC%20Data%20Analytics%20Ad-Hoc%20Group.pdf

performance.

3. ACTION BY THE CONFERENCE

3.1 The Conference is invited to:

(a) note the information in this working paper;

(b) encourage States to participate in the DAG and contribute data to its work;

(c) encourage States to adopt a data-driven approach towards enhancing efficiency and performance of ATM; and

(d) call on ICAO to support States in their endeavours by organising seminars on establishing KPIs using the methodology developed by the DAG.

– – – – – – – –