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WORKING PAPER

ASSEMBLY — 41ST SESSION

TECHNICAL COMMISSION

Agenda Item 30: Aviation Safety and Air Navigation Policy
30.2 Latest developments related to the Global Air Navigation Plan (GANP)

PERFORMANCE FRAMEWORK TO ASSESS TRAJECTORY BASED OPERATIONS (TBO) CONCEPT

(Presented by China and Singapore)

EXECUTIVE SUMMARY

ICAO has introduced the trajectory-based operations (TBO) concept, which promises operational and environmental benefits to aviation. This paper recommends the need to define new key performance indicators (KPIs) for the Global Air Navigation Plan (GANP) performance framework to support ICAO and Member States in quantifying the effectiveness of TBO and building a business case for its implementation

Action: The Assembly is invited to:
a) note the information presented in the paper;
b) call on ICAO to define new KPIs within the GANP Performance framework applicable to the TBO concept; and
c) encourage States, planning and implementation regional group (PIRGs) and the aviation industry to adopt the GANP performance metrics as an initial step to quantify the benefits of TBO.

Strategic Objectives:	This working paper relates to all Strategic Objectives.
Financial implications:	Nil.
References:	A40-WP/212-TE/90, *ICAO performance measurement and stakeholders' engagement* Doc 9883, *Manual on Global Performance of the Air Navigation System* Doc 9750, *Global Air Navigation Plan* Resolution 40-1, *ICAO global planning for safety and air navigation* Global TBO Concept, Version 0.11[1]

[1] https://www.icao.int/airnavigation/tbo/PublishingImages/Pages/Why-Global-TBO-Concept/Global%20TBO%20Concept_V0.11.pdf

1. INTRODUCTION

1.1 Trajectory-based operations (TBO) is defined by ICAO as an air traffic management (ATM) environment where the flight trajectory of an aircraft is flown as close as possible to the user-preferred route, with as little disruptions as possible through collaborative decision-making mechanism. This includes reducing potential conflicts and resolving demand/capacity imbalances earlier and more efficiently. TBO can therefore bring significant operational and environmental benefits to aviation.

1.2 To understand the ICAO global TBO concept and its operational values, a multi-regional trajectory-based operations (MR TBO) lab demonstration project was rolled out involving collaboration effort between Canada, Japan, Singapore, Thailand, and the United States. Project partners collaborated to design and simulate operational scenarios to investigate the workings of TBO within and across regions. Some of the operational values beneficial for better flight efficiency include: alignment of strategic plan and tactical actions, improved strategic planning and enhanced predictability. It is expected that when TBO is fully implemented, the benefits will extend to other areas including capacity and environment protection. Given TBO's benefits, and in preparation for traffic growth to pre-COVID levels and beyond, ICAO and the member States should continue to push for the implementation of TBO globally.

1.3 As the world emerges from the COVID-19 pandemic, financial circumstances could remain difficult for airlines and air navigation services providers for some time, which could impede the implementation of TBO and defer the potential benefits that it can bring. This paper discusses areas of TBO implementation, which could be tackled globally for the benefit of aviation. In particular, to better support member States and users in the business case for prioritising TBO implementation, this paper recommends the establishment of additional performance metrics to quantify the benefits of TBO, which could facilitate building of business cases to prioritise its implementation.

2. DISCUSSION

2.1 ICAO introduced the performance framework in the fifth Edition (2016) of the GANP. The performance framework covers three key performance areas, i.e. capacity, efficiency and predictability, with the aim to eventually cover all 11 key performance areas stated in the ICAO Global ATM Operational Concept (GATMOC). These metrics can be found in the GANP portal (https://www4.icao.int/ganpportal/ASBU/KPI). As the performance framework in the GANP complements the aviation system block upgrade (ASBU) framework, the performance framework takes the perspective of air navigation service providers (ANSPs). The GANP-performance expert group (GANP-PEG) was formed in 2019 to study and expand the set of key performance areas (KPAs) and key performance indicators (KPIs) covered in the GANP.

2.2 In July 2015, EUROCONTROL, the Civil Aviation Authority of Singapore (CAAS) and the Federal Aviation Administration (FAA) commenced performance benchmarking on two GANP KPIs, namely KPI02 (taxi-out additional time) and KPI08 (additional time in terminal airspace). As the work progressed, the methodologies were refined and more conditions were developed to ensure statistical robustness. The first phase of the tripartite benchmarking concluded in September 2017. The work of the work group was presented at various ICAO fora and attracted the interest of other States, with Japan Air Navigation Services (JANS), Aeronautical Radio of Thailand Ltd. (AEROTHAI), Brazil's Department of Airspace Control (DECEA) and the Civil Aviation Authority of China (CAAC) joining the group subsequently, bringing richer and more diverse expertise to the group.

2.3 The work group continues as a collaboration between the seven organisations and is now known as the Performance Benchmarking Work Group (PBWG). It is not an ICAO work group nor is it affiliated to any other organizations, and aims to continue its work to include all the KPIs in the GANP. The PBWG is putting in place a system of developing, testing and implementing each KPI. To date, the PBWG has benchmarked eight of the 19 KPIs in the GANP, i.e. KPI01 (departure punctuality), KPI02 (taxi-out additional time), KPI08 (additional time in terminal airspace), KPI09 (airport peak capacity), KPI10 (airport peak throughput), KPI13 (taxi-in additional time), KPI14 (arrival punctuality) and KPI15 (flight time variability). Through the work and sharing within the PBWG, the PBWG has gained a global overview on performance measurement.

2.4 During the course of performance benchmarking, PBWG members observed that the existing set of KPIs were inadequate to quantify the performance of TBO. In other words, additional KPIs should be introduced and existing KPIs need to be adapted.

2.5 ICAO posted a draft Global TBO concept paper in the ICAO portal which states the potential KPAs within the *Manual on Global Performance of the Air Navigation System* (Doc 9883) that TBO will influence. These include predictability, capacity, efficiency, environmental impact, flexibility, global interoperability and participation by ATM community. The KPIs in the GANP are measured from the perspective of ANSPs. However, it would be more holistic to also include KPIs that are measured from the perspective of airspace users, so that the aviation sector can gauge how well the flight is optimised from gate to gate. This complements the TBO concept, which is flight-centric in nature. While the ANSPs may still take on an ATM-systemic approach in optimising the flights within a defined scope relevant to them, measuring efficiency of TBO flights from end-to-end (gate-to-gate) with additional and more specific KPIs will add a different and important perspective that factor in the point of view of the airspace user (AU) which will support a more holistic appreciation of the overall impact to the ATM system. New KPIs applicable to the TBO concept introduced within the GANP performance framework will ensure its relevance and enhances its robustness as ATM concept of operations evolves.

3. CONCLUSION

3.1 Expanding the performance framework to accommodate the TBO concept is key to helping ANSPs and airspace users (AUs) determine and track the benefits of TBO, and is essential to building a business case to prioritize its implementation. ICAO can further develop TBO implementation guidelines to include TBO implementation guidelines to include TBO performance measurement and management. The work could be undertaken by the existing GANP-PEG such that minimal ICAO resources would be required.

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