International Civil Aviation Organization

Thirteenth Meeting of the Air Traffic Management Sub-Group (ATM/SG/13) of APANPIRG

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Agenda Item 6: ATM Coordination (Meetings, Route Development, Contingency Planning)

DATA-DRIVEN AND PERFORMANCE-BASED CASE STUDY ON IMPROVING AIRSPACE EFFICIENCY AND CAPACITY

(Presented by IATA)

SUMMARY

This paper presents the on-going project and case study led by IATA in collaboration with industry stakeholders. The project aims to develop a methodology which enables data-driven and performance-based analysis comparing existing airspace structure with proposed optimizations. It provides results highlighting key metrics on flight efficiency and environmental impact.

The current case study focuses on the Flight Information Regions (FIRs) at Europe-Asia interface that are significantly affected by rapid traffic growth, geopolitical tensions and airspace constraints. Once validated, this approach will be made available to the industry for future case studies in other airspaces and inform decision making on airspace development and collaboration initiatives.

1. INTRODUCTION

1.1 At the Fourth Meeting of the South Asia, Indian Ocean and Southeast Asia ATM Coordination Group (SAIOSEACG/4), the Proposal on New ATS Routes to Increase Airspace Capacity Between EU and East Asia (WP15) was presented by IATA and discussed by the meeting. During the meeting, IATA committed to carry out a comprehensive study on the proposal and provide with the necessary information to support the pre-assessment by the States and Air Navigation Service Providers (ANSPs).

1.2 As the follow-up action of the discussion, IATA launched a special project named “Data-driven Airspace Efficiency Study” in June 2025, aiming to develop a statistical model and conduct the comprehensive study on specific cases. The output of the study will support the pre-assessments by the States and ANSPs.

1.3 This paper provides a briefing on the study and planned activities to support the kick-off discussion within the group, specifically on the industry challenges in airspace efficiency and how the developed methodology could support the States and ANSPs in the region in identifying the airspace issues and address them proactively with key metrics on flight efficiency and environmental impact.

2. DISCUSSION

Key Industry Challenges and the Case Study

2.1 The current challenges faced by operators and the industry have been identified as follows (**Table 1**):

Table 1: Current Challenges for Operator and the Industry

Challenges for Operators	Challenges for the Industry
• Airspace structure and capacity issues – ATFM delay, vertical/lateral efficiency… • Geopolitical and operational disruptions (e.g., airspace and route closure with short notice by NOTAMs) – ATFM delay, increased flight time and distance, additional fuel burn and emissions… • Inflexible routes and limited alternatives – operational flexibility, efficiency and costs… • Limited and inflexible entry/exit points – operational flexibility and efficiency… • Limited options for diversion or emergency forced landing – operational costs and flight safety… • Operational limitations (e.g., crew duty time for long-haul flights) – ATFM delay, operational costs… • ANS charges – operational costs and sustainability…	• Multi-party coordination among the stakeholders in complex airspace – cross-region/State/FIR and civil-military coordination, consultation with airspace users • Fragmented airspace plannings – uncoordinated airspace/route design and development • Collection of real data – airspace simulation and evaluation, data-driven decision making • Performance-based approach – KPI monitoring to identify and proactively address the airspace issues (safety, capacity, efficiency and environmental impact, etc.) • Slow adoption of the new technologies/concepts – e.g., models and tools to support the evaluation of the "What-if" scenarios, FRA planning and implementation • Environmental protection – industry targets to minimize the environment impact

2.2 With the traffic recovery underway across Europe, Middle East and Asia, currently the route network at Europe-Asia interface has become one of the busiest and fastest growing air corridors. This includes the FIRs of Central Asia and Western China (the data of annual flights for the FIRs are as follows (**Table 2**). Additionally, the geopolitical tensions and airspace disruptions continue to cause traffic congestion and delays, leading to inefficient flight operations, increased fuel burns and emissions, and a higher ATC workload in this area.

Table 2: Annual Number of Flights by FIR

	2022	2023 (YoY)	2024 (YoY)
ZWUQ	26,008	157,178 (+504.34%)	429,905 (+173.51%)
ZLHW	431,380	912,827 (+111.61%)	1,313,810 (+43.93)
ZMUB	35,339	48,554 (+37.39%)	73,755 (+51.90%)
UAAA	112,721	160,231	191,599

	2022	2023 (YoY)	2024 (YoY)
		(+42.15%)	(+19.58%)
UACN	104,802	139,104 (+32.73%)	152,113 (9.35%)
UAII	141,243	188,397 (+33.39%)	223,576 (+18.67)

2.3 Considering the airspace complexity, rapidly growing demand on airspace capacity and efficiency, environmental and sustainable targets committed by the industry, IATA decided to focus on the Europe-Asia interface as the first case study of this project, to measure the cost and benefits of the proposed optimizations and validate the statistical model and tools for future airspace restructuring initiatives.

Proposed Solutions and Planned Activities

2.4 To address the operational issues at Europe-Asia interface, IATA has worked with the stakeholders for a proposal crossing ZMUB FIR as the alternate option for operators, by creating flexible entry/exit point and new efficient ATS routes in ZWUQ and ZMUB FIRs and implementing FRA within and across the FIRs (the proposed solutions and detailed information were presented at SAIOSEACG/4) (**Figure 1**).

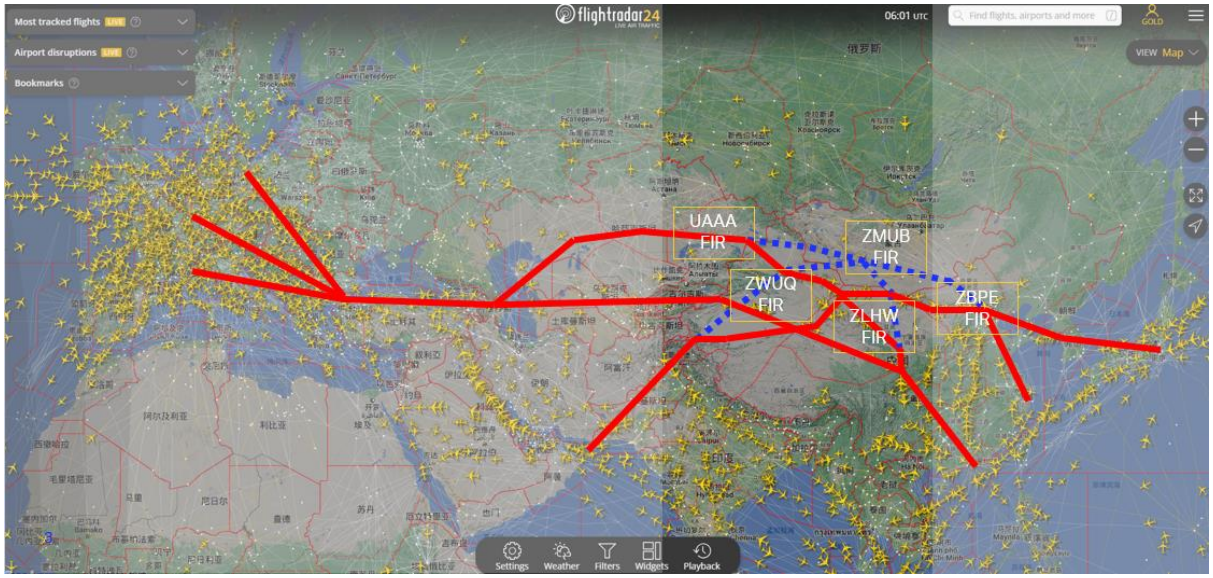

Figure 1: Proposal for Crossing ZMUB FIR as an Alternate Option for Operators

2.5 To complete the cost-benefit analysis of the proposed solutions, the following approach and steps of the study are recommended by the project team:

a) Real Data Collection and Analysis: conduct a structured survey to collect up-to-date and real data from most of the real users and service providers of the airspace (e.g., the surveyed audience operate 60%+ of the flights in this area), and analyze the data of real-time and/or historical flight schedule and flight plans over a sufficiently long period (e.g., 2-4 flight seasons).

b) Statistical Modelling: use the modelized digital platform (e.g., modernized flight planning system with enhanced tools on airspace capacity and weather information) to conduct the simulation and evaluation on the current and "What-if" scenarios.

c) Interviews with Key Stakeholders: conduct in-person/on-line interviews with the key personnel and experts from airspace users, ANSPs, airport operators, CAAs, etc., to validate the pain points and adapt solution concept to actual operational requirements.

d) Technical Visits to Key Facilities: organize the technical visits (can be joined by industry advisors) to key facilities of current operations and proposed solutions (e.g., ACCs, diversion and emergency forced landing airport) to validate the infrastructure and direct/in-direct costs needed to fulfill the future operational needs (e.g., CNS capabilities, ATFM functions, human resources, airport infrastructure, etc.).

e) Desk Research and Draft White Paper: sort out all the information above (e.g., the output of the data analysis and statistical modelling, the result of assessment and information from the interviews and technical visits, etc.) and conduct desk research and draft a white paper (including the introduction and background information, current situation and challenges, proposed solutions, data analysis and conclusion, recommendations and references, etc.), and importantly, utilize the industry recognized metrics concerned (e.g., ICAO GANP KPIs on ATM efficiency) to measure the overall benefits of the proposed solutions.

f) Industry Review and Validation with All Stakeholders: organize a plenary session (e.g., industry workshop) with all the stakeholders to have a review and conversation based on the draft conclusions and recommendations, then coordinate and further improve it based on feedback from the stakeholders.

2.6 When finalized the cost-benefit analysis, the white paper will be delivered to the industry for further coordination and consideration by the stakeholders.

2.7 The planned timeframe of the project is:

a) Q3 2025: complete data collection and analysis, stakeholder survey and interviews, and the technical visits;

b) Q4 2025: draft the white paper and measure potential costs/benefits, organize the industry workshop (tentatively in November in China) with all the stakeholders, collect feedback and summarize the findings; and

c) Q1 2026: finalize the white paper and feedback to ICAO and the States, share with all the stakeholders for future industry conversations.

2.8 In future applications of the methodology or of this project, additional layers of complexity can be added, including considering forecast growth on different routes, as well as the practical feasibility of changing flight schedules based on reduced flight times considering operating and capacity constraints at airports.

2.9 IATA plans to continue the discussion and collaboration with the States/ANSPs in Asia/Pacific Region and keep the industry stakeholders updated of the progress at upcoming meetings/workshops, etc.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) consider supporting further coordination among concerned States and ANSPs; and

c) discuss any relevant matters as appropriate.

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