*International Civil Aviation Organization*

**Fifteenth Meeting of the Asia/Pacific Air Traffic Flow Management Steering Group (ATFM/SG/15)**

Bangkok, Thailand, 28 April – 02 May 2025

**Agenda Item 4: Review of Current ATFM Operations and Problem Areas**

# CASE STUDIES ON APPLYING FLOW RATE TO ATFM MEASURES

(Presented by Republic of Korea)

**SUMMARY**

This paper analyzes Flow Rate's application for air traffic flow management, suggesting improvements from Republic of Korea (ROK)'s case studies. It emphasizes post-analysis methods and balancing safety with efficiency, highlighting ATFMU's role.

## 1. INTRODUCTION

1.1 Although the CTOT exchange method enables efficient flow management with high predictability, traditional methods are inevitable in the absence of a flow management system or international consensus. ROK is considering Flow Rate application along with MIT. While MIT focuses on ensuring safety through increased separation between aircraft, it can increase the workload of neighboring country controllers. Flow Rate, on the other hand, aims to manage the amount of air traffic. This helps reduce the workload for nearby countries and makes the whole system more efficient.

1.2 ROK has applied Flow Rate to neighboring countries when airport demand control was necessary, such as during the College Scholastic Ability Test(CSAT) and snowfall at Incheon Airport. This alleviated the burden on neighboring countries and met the purpose of demand control. Based on its experience in applying Flow Rate at airports, the Republic of Korea plans to gradually expand its application to airspace.

1.3 This paper shares ROK's experience in applying Flow Rate and its post-analysis methods, emphasizing the pursuit of a balance between safety and efficiency, and the role of ATFMU.

## 2. DISCUSSION

Establishing Post-Analysis Criteria for Flow Rate Application

2.1 When ROK initiating Flow Rate, facilitators can control the flow in various ways, such as CTOT, MIT, and others. While there is a Post-Ops standards called CTOT compliance rate when the facilitator chooses CTOT, the initiator cannot know the correlation between the CTOT compliance rate and the actual Flow Rate throughput.

2.2 In other words, it's necessary to verify the Flow Rate's effectiveness by the initiator. Unlike MIT, Flow Rate requires post-analysis because it's hard for controllers to track real-time traffic. However, there are no clear standards to check if the issued Flow Rate matches the actual flow or the target hourly traffic.

2.3 Therefore, ROK performed post-analysis based on the following criteria:

a) Reference Index: ATO(Actual Time Over)

b) Hourly Throughput Calculation Method: Calculate hourly throughput based on the restriction start time to minimize compliance rate variation according to the observation time. For example, as you can see in Figure 1, if the restriction is 3 aircraft per 30 minutes starting from 0000Z, we count from the restriction start time, 0000Z. Specifically, we check the number of aircraft in the 0000~0029 and 0030~0100 intervals.

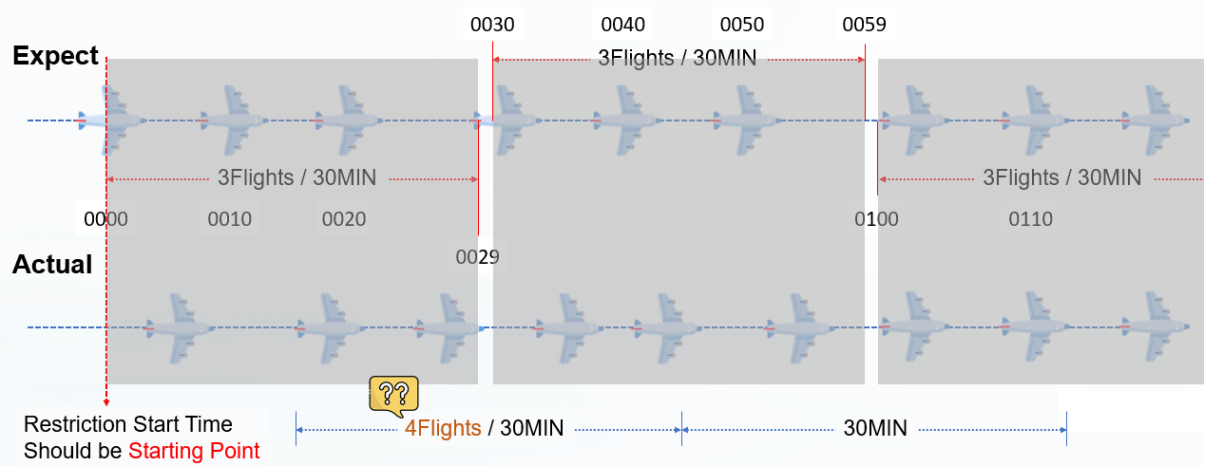


**Figure 1**: Hourly Throughput Calculation Method

c) Comparison of Planned vs. Actual Traffic Volume: Just as CTOT has a window range, Flow Rate also need a buffer. This considers situations where the hourly throughput does not match the target due to various variables such as air traffic control instructions and speed control. Time-based air traffic flow is interconnected. For example, as you can see in Figure 2, aircraft from a previous time sector (-1 flight) can affect the next time sector (+1 flight)." Therefore, we need to assess two key aspects:

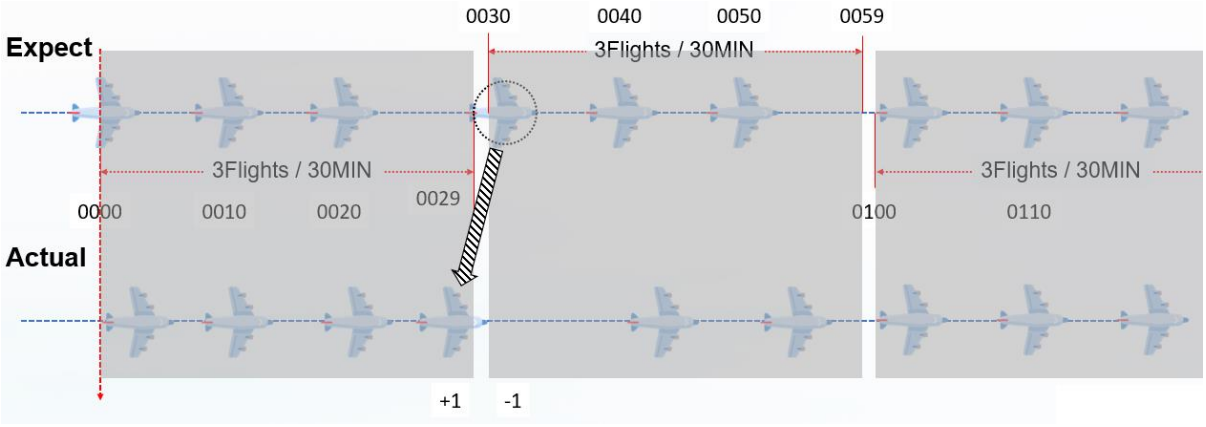


**Figure 2**: Comparison of Planned vs. Actual Traffic Volume

(i) Overall Traffic Check: We examine if the total aircraft volume during the restriction period was satisfactory.

(ii) Hourly Traffic Check: We measure if traffic is evenly spread out over time, not concentrated in certain hours. This is a key factor in determining Flow Rate's success.

(iii) When measuring hourly traffic volume, apply a buffer. At this time, the buffer range is set based on the CTOT Window (±5 minutes) applied to the airspace, and an actual traffic volume error of about 15% per hour (Window/unit time, 10 minutes/60 minutes = 15%) is set as the allowable range. In the case of the figure, it is calculated that up to 3.9 aircraft with a buffer (10 minutes/30 minutes) of 33% added to 3 aircraft per 30 minutes are compliant. At this time, decimal points were rounded.

Considerations for Flow Rate Setting: Balance of Safety and Efficiency

2.4 Flow Rate refers to the number of aircraft that can pass a specific point per unit time. Controllers tend to prioritize safety and set the Flow Rate conservatively, but if it's excessively low, it becomes similar to MIT/MINIT. Since 1 aircraft per 30 minutes is analogous to 30 minutes MINIT, it is advisable to suggest at least 2 aircraft per unit time.

2.5 Setting a short unit time is advantageous for preventing instantaneous traffic congestion and responding to variables. Although 6 aircraft per hour and 3 aircraft per 30 minutes have the same total volume, the latter provides room for preventing overload and responding quickly through time distribution.

2.6 ICAO Doc 9971 emphasizes the balance of safety and efficiency, and ATFMU should present an appropriate Flow Rate range through analysis of past data, weather, and airspace conditions to support reasonable decisions by controllers. In addition, active flow management that continuously monitors and analyzes the setting effect and adjusts it when necessary is required.

## 3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper; and

b) discuss any relevant matters as appropriate.

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