

**58th CONFERENCE OF
DIRECTORS GENERAL OF CIVIL AVIATION
ASIA AND PACIFIC REGIONS**

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AGENDA ITEM 3: AVIATION SAFETY

**PROPOSAL FOR SHARING ATC PERSONNEL
MANAGEMENT CONSIDERING FATIGUE MANAGEMENT
AND IMPROVEMENT OF WORKLOAD ASSESSMENT
METHODS**

(Presented by the Republic of Korea)

SUMMARY

In light of the recent rapid increase in air traffic volume, the global aviation industry recognizes the importance of systematic aviation personnel management. Specifically, air traffic controllers are essential frontline personnel responsible for the safety and efficiency of air traffic. With the Amendment 50-B to Annex 11 of the Chicago Convention in 2020, fatigue management for these workers became mandatory. Furthermore, the staffing and workload of air traffic controllers have a significant impact on airspace and airport capacity. Efficient personnel and workload management are essential conditions for aviation safety at the national and regional levels. Through this paper, Republic of Korea aims to introduce current air traffic controller fatigue management system, support tools and future enhancement plans. Additionally, ROK hopes to use this opportunity to share fatigue management practices implemented by various countries and benchmark best practices. Moreover, ROK encourages the development and improvement of relevant guidelines to support scientific workload measurement.

PROPOSAL FOR SHARING ATC PERSONNEL MANAGEMENT CONSIDERING FATIGUE MANAGEMENT AND IMPROVEMENT OF WORKLOAD ASSESSMENT METHODS

1. INTRODUCTION

1.1 During the past two years of reduced air traffic, a significant number of aviation industry professionals voluntarily or involuntarily left the aviation field, and the competence of these professionals declined in most areas. Subsequently, as air traffic has started to recover, there have been active return of aviation professionals to their roles and new hiring. However, a substantial amount of time and effort is required to regain the same level of job skills and proficiency as before.

1.2 In particular, air traffic controllers serve a vital role on the forefront of aviation safety and efficiency, and the development of a single professional requires a significant investment of time and resources. Managing this workforce also necessitates special efforts. Additionally, their staffing and workload significantly impact airport and airspace capacity. ICAO Doc. 9426 (ATS Planning Manual) provides two prominent methodologies that countries can reference when calculating ATC Sector/Position Workload and Capacity, ensuring efficient management in this regard. However, the most recent amendment of ICAO Doc. 9426 is from 1992.

1.3 In the context of workforce management, ICAO, through the amendment of Annex 11, has mandated that as of November 2020, countries are obligated to manage the fatigue of air traffic controllers based on scientific principles, knowledge and operational experience with the aim of ensuring that air traffic controllers perform at an adequate level of alertness. Each country is required to implement various fatigue management systems for air traffic controllers in accordance with ICAO SARPs, taking into account their specific work environment, air traffic characteristics, and organizational structure and culture.

2. DISCUSSION

2.1 Air traffic controllers are essential personnel in aviation operations alongside pilots, and their work is closely related to aviation safety. Given the nature of their duties, which require a high level of concentration and judgment, maintaining these job competencies continuously is crucial. To achieve this, strict workforce management for air traffic controllers is necessary. Recently, ICAO has enforced amendment of Annex 11 to extend the obligation of fatigue management regulations, previously applied to pilots, to air traffic controller as well.

Current Status of Fatigue Management in ROK

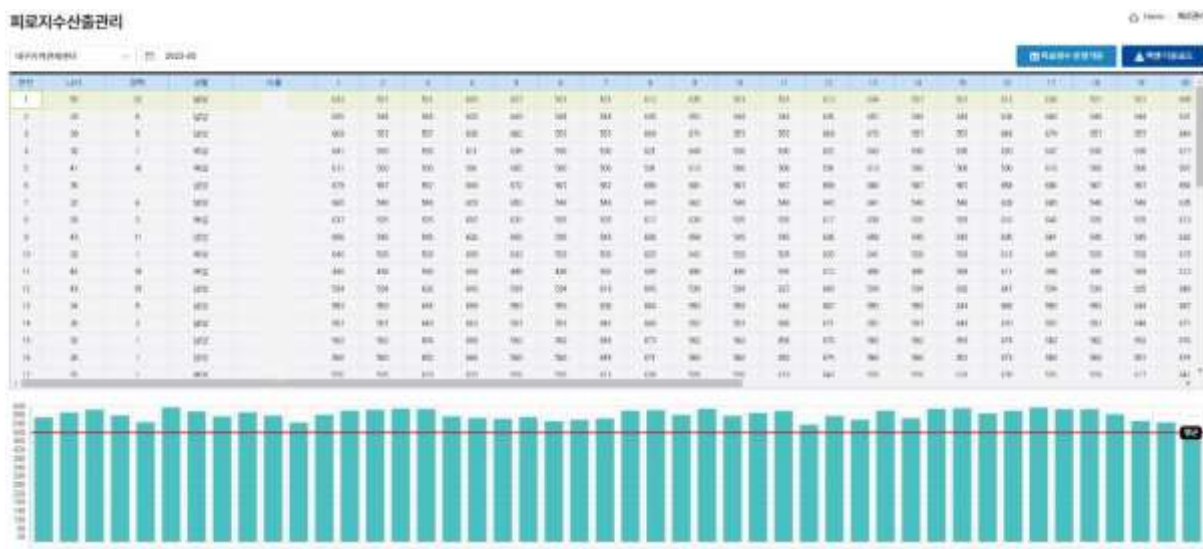
2.2 In the case of the Republic of Korea, even before the enforcement of amendment annex 11, basic workforce management principles were established to prevent safety incidents resulting from fatigue accumulation of air traffic controllers. However, implementing strict workforce management based on fatigue was challenging. Since the introduction of amendment of Annex 11, ROK has put in efforts to enhance fatigue management policies for air traffic controllers, taking a comprehensive approach to address this issue.

2.3 As a part of these efforts, ROK reevaluated its fatigue management system based on its specific air traffic environment, organizational structure, culture and scientific research findings. To achieve this, we studied approximately 290 air traffic controllers in Korea with tools such as heart rate monitoring devices and attention self-assessment techniques to determine how specific time intervals during their work schedules affect individual's fatigue levels. Simultaneously, surveys were conducted to gather information on the fatigue levels perceived by air traffic controllers and the factors influencing these levels. Based on the findings from these studies, the Republic of Korea established a systematic set of prescriptive time limits that align with the ROK's air traffic control operational realities, in accordance with both the maximum criteria of 4 factors and minimum criteria of 3 factors proposed by ICAO.

2.4 Furthermore, ROK has implemented tailored workforce management policies for female air traffic controllers to reduce fatigue related to personal life. These policies include maternity leave, maternal protection, family care leave, and pregnancy checkup leave, among others. These measures are aimed at managing fatigue stemming from personal life at a national level and fostering stable workforce operation and working environment. As a result of these efforts, most air traffic control organizations in ROK maintain a gender balance close to 50%, with some facilities even exceeding this level in terms of the proportion of female air traffic controllers.

2.5 Moreover, the Republic of Korea has developed a Korean-specific Fatigue Risk Index for air traffic controllers, based on scientific data, to predict fatigue levels of individual controllers in advance. This index incorporates key variables such as historical air traffic statistics, demographic statistics, cumulative working hours and fatigue variations across different air traffic control facilities. In the future, this index will be validated by comparing it with subjectively reported fatigue levels, and it will be utilized in the management of fatigue and scheduling for air traffic controllers.

2.6 Furthermore, the Republic of Korea is preparing to implement a Fatigue Risk Management System (FRMS) tailored to the size and conditions of each air traffic control facility in the future. As a first step towards this goal, Korea has established a “Fatigue Management Program” that can digitize scheduling and sector assignments for air traffic controllers, as well as individual fatigue indices. This program has been in operation since 2021. Currently, it is in its initial operational phase, using accumulated data to manage scheduling based on historical data and enabling fatigue self-reporting using features like QR codes. ROK plans to further develop the foundation for FRMS implementation through additional research based on accumulated data.



[Figure 1. Example of Fatigue Index Management in ROK]

2.7 However, concerns regarding the need for improving above-mentioned policies have been raised, particularly among fatigue management experts and air traffic controllers. Major concerns include the “appropriateness of mitigation measures for unavoidable cases of non-compliance with time limits” and the “suitability of nighttime maximum working hour restrictions.” Similar issues are anticipated to be experienced by many states and air traffic control authorities, and member states can benchmark best practices through the sharing of policies in place.

Sector/Position Workload Assessment

2.8 In the management of air traffic control personnel, calculating the workload for each position or sector is of utmost importance. Workload typically impacts both safety and efficiency, and it plays a significant role, particularly when determining airport and airspace capacity. As widely recognized, excessive workload is directly associated with human errors, and in some cases, too low workload levels can increase individual fatigue and lead to inefficiencies in personnel management.

2.9 However, measuring the workload of sectors and positions is not a straightforward task due to complex interaction of diverse factors. While ICAO documents such as Doc. 9426, which is revised lastly in 1992 and Doc. 9971 provide general methodologies and principles for measuring the workload of air traffic controllers, sectors and positions, they may have limitations in serving as a sufficiently comprehensive guidance material for member states. This is because they may not fully encompass the advancements in air traffic technology and changes in the environment that have occurred over time.

2.10 The Republic of Korea is also considering the workload of sectors and positions for air traffic controller personnel management and appropriate staffing calculations. However, issues such as the underestimation or overestimation of workload and the overlook of operational efficiency have frequently arisen. Based on these challenges and lessons learned, ROK is planning additional research to establish criteria for appropriate staffing that take into account fatigue management for air traffic controllers, and enhance operational efficiency and stability in personnel operations.

Conclusion

2.11 Many countries, including ROK, are implementing fatigue management and personnel operation policies to provide a sustainable working environment for air traffic controllers. It is believed that by sharing and benchmarking such cases among nations, the best policies can be derived. Additionally, there is a need to develop or refine appropriate workload calculation methodologies to ensure stable performance by air traffic controllers and the accurate determination of required staffing levels. As a result of these two discussions, it is possible to enhance the efficiency and safety of the entire air traffic management system.

3. ACTION BY THE CONFERENCE

3.1 The Conference is invited to:

- a) Note the information in this paper
- b) Share fatigue management strategies for air traffic controller management in each states/administrations
- c) Improve and develop guidelines for measuring air traffic controller workload, etc.

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