International Civil Aviation Organization

The First Meeting of Air Traffic Management Automation System Task Force of APANPIRG (ATMAS TF/1)

Web-conference, 28 – 30October2020

Agenda Item 5: Issues and Challenges in implementation
5.5 New ATM Technologies application (RECAT, TBO, PBN, Extended AMAN)

APPLICATION OF AMAN TECHNOLOGY IN BUSY TERMINAL AREA

(Presented by China)

SUMMARY

This paper first briefly introduces the AMAN concept and AMAN technical solution, then introduces the use of AMAN in Shanghai terminal area and problems in using it. Finally, the paper summarizes and put forward the prospect of AMAN system.

1. INTRODUCTION

1.1 AMAN Concept

The arrival sequencing assistant decision function (AMAN) usually refers to the arrival flight scheduling tool in the tactical phase. It is a traffic management tool used by controllers in the tactical phase. It can optimize the traffic flow entering the terminal area or runway by calculating the target landing time (TLDT) under the premise of considering various restrictions and preferences.

1.2 National Deployment

1.2.1 The Air Traffic Management Bureau of Civil Aviation Administration of China officially issued the minimum control functional requirements specification for the air traffic control arrival sequencing assistant decision function (AMAN) in April 2018. The specification specifies the basic control function requirements and performance requirements of the air traffic control arrival sequencing assistant decision function (AMAN), and is applicable to the civil aviation air traffic control units to carry out system preliminary demonstration, demand analysis and function design.

1.2.2 As one of the busiest terminal areas in China, Shanghai terminal area is preparing to construct the Shanghai terminal control center project in 2015, which includes AMAN function of Thales ATM automation system. The AMAN was officially installed and put into operation in December 2018. After several months of testing, commissioning and trial operation, in May 2019, Shanghai terminal control center officially opened the AMAN seat of Hongqiao Airport, which has been in stable operation till now.

1.2.3 With the completion of the construction of Beijing Daxing airport, it has become the second site to use AMAN. On March 15th, 2020, Beijing Daxing International Airport started the AMAN trial operation, and at present, it focuses on the experimental operation at the entry point of DUMAP、 AVBOX、 BELAX in Beijing terminal area.

2. AMAN TECHNICAL SOLUTION

2.1 At present, Beijing and Shanghai AMAN adopt integration mode AMAN is closely integrated with ATM automation system, and the integrated display of AMAN information and flight situation information is realized by ATM automation system. ATM automation system and AMAN background data should be considered as a whole. When the controller changes the specific elements of the aircraft type and flight in the AMAN / ATM automation system, they should be able to update or prompt them synchronously in the ATM automation system / AMAN. For example, when the controller modifies the runway on the ATM automation system / AMAN system, the AMAN / ATM automation system needs to be able to obtain the corresponding message, which can be obtained automatically or input externally.

2.2 The following will take Shanghai AMAN as an example to briefly introduce the application effect and problems of AMAN.

3. APPLICATION EFFECT OF SHANGHAI TERMINAL AREA

3.1 Introduction to the Use of AMAN in Shanghai Terminal Area

3.1.1 The AMAN in Shanghai terminal area is closely connected with the ATM automation system and manages landing flights of Shanghai Hongqiao and Shanghai Pudong respectively. The AMAN receives the flight data information from the ATM automation system, and reflects the sorting results of landing flights and the corresponding catch-up / delay time (TTL / TTG) on the man-machine interface of ATM automation system through runway capacity, wake interval restriction and other conditions. At the same time, the corresponding catch-up / delay time (TTL / TTG) is reflected on the label of the ATM automation system. The controller shall command the corresponding flight to carry out corresponding maneuver flight according to the time prompt.

3.1.2 At the present stage, Shanghai terminal area defines the control operation specification, defines the post functions, qualifications and working procedures of relevant seats, forms the operation guidance, and clarifies the handover principle between control sectors based on AMAN decision-making. The post responsibilities are defined as follows: head teacher position - monitoring the implementation; coordinating the operation of each sector; adjusting the operation strategy of AMAN under special circumstances. AMAN seat - Hongqiao landing flow monitoring; monitoring and adjusting flight sequence and system prompt time. Control operation position corresponding to specific control operation according to the system prompt time (the time value of "+" or "-" on the automatic label).

3.1.3 According to the requirements of the head teacher and the actual situation, the AMAN seat determines the interval allocation, and issues the deployment time requirements for landing flights. According to the time prompt on the flight signs of the system, the front-line control posts set up specific deployment plans and issue control instructions.

3.1.4 With the addition of AMAN posts in Hongqiao, the Shanghai terminal area has constructed an overall management link for the allocation of inbound flights in Hongqiao. By making more efficient use of the resources of the control sector, it has changed the dilemma that it is difficult

to coordinate closely between the operation departments and landing sectors, making the seat the first gateway for the stable and orderly operation of Shanghai terminal.

3.2 Application Effect of AMAN in Shanghai Terminal Area

3.2.1 According to the time prompt given by the AMAN， the control post shall formulate the plan to facilitate the fine deployment of landing flights. Through different delay time allocation strategies, the multi sector landing coordination can be realized, the workload can be reasonably shared, and the continuous accumulation of control pressure in a single sector can be avoided. Through the unified deployment scheme of AMAN and reducing the intervention of human factors, the objective and efficient management of the class flow of incoming shipping can be realized. Through continuous iteration and matching service design, the control sector reconfiguration and efficiency improvement can be achieved. It is an important technical means to realize the modernization of Shanghai terminal and improve the operation efficiency and service quality of the Yangtze River Delta core region.

3.2.2 Through the actual operation, the AMAN has played an important role in three aspects: first, through the operation mode of "system operation + manual control", the seat realized the fine allocation of landing time slot, improved the landing command efficiency, and synchronously reduced the control load; second, the refined allocation of landing time slot by AMAN proposed further refinement for the deployment of controller's five side interval Thirdly, the establishment of AMAN seat has realized the separation of the functions of the shift leader in the aspect of "constant supervision of inbound flight sequence", which is conducive to the head teacher to focus on the on-site operation management.

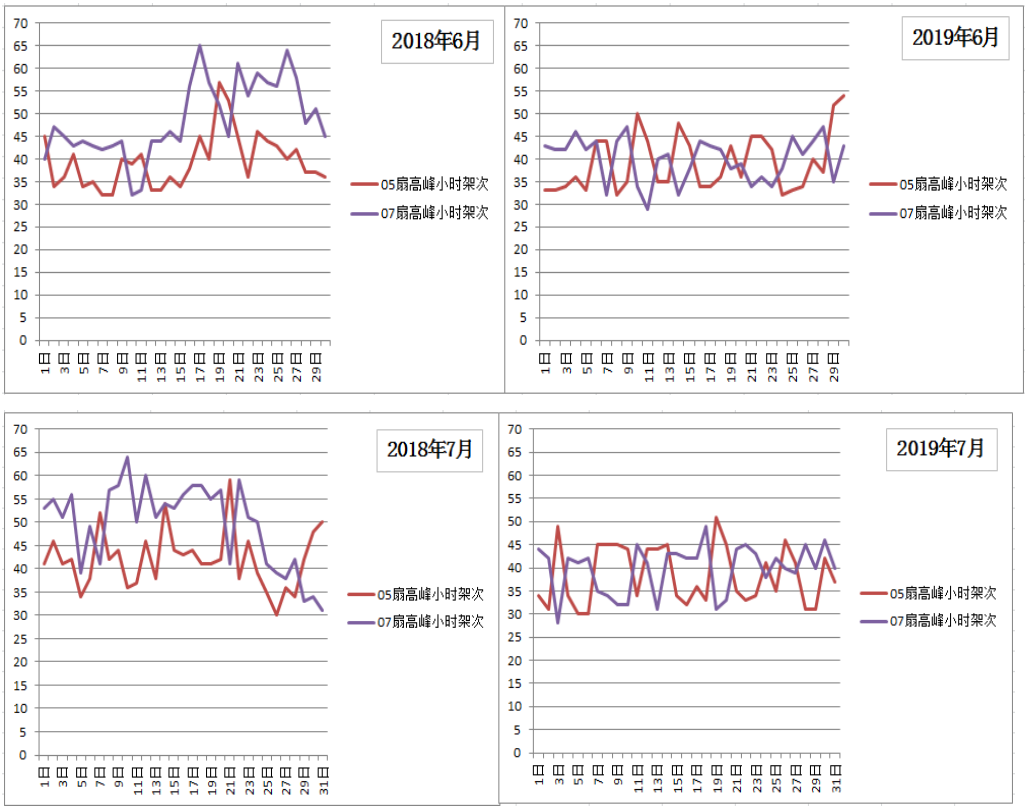

Figure 1： The change of daily peak hour sorties of 05 / 07 fan in approach room 1 in 2018 / 19

3.2.3 The above figure compares the changes of "daily peak hour sorties" between 2018 and June and July 2019. Through the chart, it can be seen that after the application of AMAN in Shanghai terminal area, the amplitude of hourly high peak curve of landing sector has been significantly narrowed, which reflects that the occurrence of daily "extreme" peak has been significantly reduced. This trend change also reflects one of the main functions of AMAN seats: auxiliary reduction and balance of "extreme" peak traffic during peak hours of landing sector. Based on the close combination of AMAN seat function and actual control operation, the formulation of supporting rules and regulations such as "post management, seat responsibility, personnel qualification" has been completed, so as to give full play to the supporting effect of AMAN and management regulations for actual business from "both hard and soft".

3.2.4 After collecting and classifying the relevant data, the paper starts from the two dimensions of "efficiency improvement" and "load reduction", and reflects the operation effect of AMAN before and after using through differential comparison. According to the preliminary analysis of the main indicators, the "average transit time" of inbound flights in the landing sector decreased by more than 12% and 5% respectively when Hongqiao landed northward and southward, and the average call volume of controller unit flights also decreased by about 3%.

3.3 Problems in Using AMAN in Shanghai Terminal Area

3.3.1 There are software problems between the AMAN and the ATM automation system. For example, the AMAN will not reallocate a new runway after the ATM automatic system controller performs CDP (cancel takeoff) operation. Sometimes the AMAN does not normally send the information of runway assignment to the ATM automation system.

3.3.2 The controller's satisfaction with the sorting results of AMAN needs to be improved. By further adjusting the rationality of offline data by the ATC department and CNS department, the frequency of manual intervention on flight scheduling and system time prompt can be reduced.

3.3.3 The AMAN should be coordinated by the controllers of the area and approach to realize the aircraft landing according to the sequence given by the AMAN. However, due to the first use of AMAN in Shanghai, the current landing sequence and catch-up / delay time (TTL / TTG) cannot meet the satisfaction of regional control. Therefore, the catch-up / delay time of Shanghai scene is realized by the approach controller. However, due to the limited approach airspace, the space that can be adjusted is small and the control faces great pressure. It is hoped that with the use of AMAN, the accuracy of sorting and catch-up / delay time (TTL / TTG) can be improved, so that regional control can participate together.

4. CONCLUSIONS AND SUGGESTIONS

4.1 After two years of hard work, the AMAN seat of Hongqiao airport has been running well since its official operation. At present, the control and equipment department is working hard to prepare for the AMAN seat in Pudong. Of course, the preparation period is longer because there are more runways in Pudong Airport and the allocation principle is more complicated. With the more in-depth understanding of the AMAN system, I believe that in the near future, it can give full play to the functions of the AMAN system, provide more reliable sequencing for the control, and optimize the traffic flow into the terminal area or runway.

4.2 In the next stage, China will continue to promote the application of AMAN system in busy airports and explore the application of DMAN system and cross regional expansion of AMAN technology.

4.3 At the same time, it further studies the information sharing and interface standards between AMAN system and other systems, and clarifies the operation mode and technical standards of AMAN.

5. ACTION BY THE MEETING

5.1 The meeting is invited to:

a) note the information contained in this paper; and
b) discuss any relevant matter as appropriate

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