



International Civil Aviation Organization

The Fourth Meeting of ICAO Asia/Pacific Air Traffic Flow Management Steering Group (ATFM/SG/4)

Bangkok, Thailand, 1 – 5 December 2014

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

Agenda Item 5: Development of Regional ATFM Framework

CAPACITY MANAGEMENT PROCEDURE AND PRACTICE IN CHINA

(Presented by CHINA)

SUMMARY

This paper presents current capacity management procedure and practice in the CDM/ATFM program in China.

1. INTRODUCTION

1.1 Significance. The objective of air traffic flow management (ATFM) service is to ensure an optimum flow of air traffic to or through areas during times when demand exceeds, or is expected to exceed available capacity of air traffic control (ATC) system. Capacity is one of the two elements of ATFM, and managing capacity is one of the foundations to manage air traffic flow well. ATMB of CAAC requires airspace management units and ATC service units to assess the capacity in a regular and scientific manner, and try their best to provide sufficient capacity and make best use of it.

1.2 Status of capacity management in China. CAAC has developed the administrative procedures for capacity management, and also regulated the methodology in 2006. ATMB of CAAC has completed the capacity assessment for a total of 373 sectors (including ACC sectors and APP sectors). Airports with traffic ranking the top 24 in China have finished the airport capacity management in terms of AAR and ADR. A website with capacity information has been established, but only domestic professional users can access now.

2. DISCUSSION

ATC Capacity

2.1 According to ICAO Doc 9426, the term **ATC capacity** reflects the ability of ATC system or any of its subsystems or operating positions to provide service to aircraft during normal activities, and is expressed in numbers of aircraft entering a specified portion of the airspace in a given period of time. The maximum peak capacity achieved for short periods may be appreciably higher than the sustainable capacity.

2.2 ATC capacity reflects the ATC service abilities in normal activities, and ATMB of CAAC tends to use this concept in the strategic ATFM phase.

2.3 Methods for capacity assessment of sectors and airports. The capacity assessment of CAAC refers to several methods that ICAO recommended and put into use by the factors of China. Basically, there are varies of methods for capacity assessment, in order to work scientifically, and they should be chosen in different situations. All of the methods should fit the real situations and be adjusted by veteran ATC controllers to produce the results as precise as possible.

2.4 The main capacity assessment methods used by CAAC:

a) Radar simulator assessment based on the workload of ATC controllers. The advantages of this approach are shown as an easy way to process, a strong operating function, and ATC controllers are actively involved. While the disadvantages aspects can be found as the accuracy of results are greatly affected by individual differences of ATC controllers and simulation environment.

b) Assessment based on analysis of historical data. The advantages include an easy way to operate and the accuracy of results. The disadvantages can be seen as a large amount of data resources, the quantity and quality of data affects the accuracy of results, and confidence needs be confirmed by veteran ATC controllers according to different situations.

c) Assessment based on analogue computer simulation. Advantages: great accuracy. Disadvantages: analogue models need great support by technology and investment with a long evaluation period. The ASMES of ATMB of CAAC is capable of such assessment.

d) Assessment method based on mathematical models. This method is fit for the assessment of combination with runway capacity in the final approach. The analysis on timing-spacing mathematical models is the major concern. Advantages: simple and quick with less investment, the accuracy of assessment results. Disadvantages: only one runway capacity assessment without human factors being concerned.

2.5 Factors concerned in capacity assessment:

a) Categories of ATS provided.

b) Complexity of ATC regions, sectors or airport structures.

c) Workloads of ATC controllers including the task of ATC and coordination.

d) The degree of types and technical reliability and availability of using the communication, navigation and surveillance (CNS) system and the availability of the standby system and/or procedure.

e) The availability of ATC system to provide support and alarm functions to ATC controllers.

f) Any other factors relating to the workload of ATC controllers.

2.6 Airspace capacity evaluation management procedure. Airspace capacity evaluation shall be carried out when the following situations occurs:

a) Structures of air routes are greatly changed.

b) Separation or operation mode has been changed.

c) The airspace, departure and arrival routes or flight procedures of high density airports are greatly changed.

d) Addition or adjustment of approach sectors.

e) Addition or adjustment of ATC sectors.

f) Others conditions considered necessary by ATMB of CAAC.

2.7 Airport capacity evaluation management procedures. The airport capacity evaluation shall be carried out when the following situations occurs:

- a) None time coordination airports changed to time coordination airports.
- b) At least every 5 years for coordination airports.
- c) Comprehensive support capabilities of coordination airports greatly changed.
- d) Others conditions considered necessary by ATMB of CAAC.
- e) ATC capacity shall be reviewed on a quarterly basis, required by ATMB of CAAC.

Declared Capacity

2.8 According to ICAO Annex 11, declared capacity measure of the abilities of ATC system or any of its subsystems or operating positions to provide service to aircraft during normal activities. It is expressed as the number of aircraft entering a specified portion of airspace in a given period of time, taking due account of weather, ATC unit configuration, available staff and equipment, and any other factors that may affect the workload of ATC controllers responsible for the airspace.

2.9 Compared with ATC capacity, declared capacity takes those factors such as weather, staff, and equipment into consideration, and therefore, ATMB of CAAC tends to use this concept in pre-tactical and tactical ATFM phase.

2.10 Usually, declared capacity is proposed by a specific ATC unit, and put out after consultation with a local ATFM unit.

2.11 Declared Capacity Prediction

a) Predicting the capacity of the system starts from the knowledge of capacity available under optimum operating conditions which refer to as ATC capacity. It is then necessary to make allowance for adverse weather conditions, runway configurations at destination and the effect of forecast wind shift, runway unserviceability, inoperative en-route navigation and/or landing aids or any other factors which could adversely affect flight regularity. This information is then assessed by ATC units, in close cooperation with ATFM, so as to arrive at a probable capacity figure for the system at any given time.

b) In order to regulate capacity prediction, and to avoid randomness, "declared capacity prediction guidance" could be created and used. Through the analysis of historical operating data, we can get an empirical value of the influence factors of capacity such as weather, runway operation mode, airspace limitation, etc. The guidance is a summary of the above-mentioned empirical value, listed in a form. When the operation is predicted to be affected by the related factors, the reference value of "Declared capacity" could be found out from the guidance. According to actual situations, operation and management personnel can do some fine-tuning based on the reference value and get the "Predicted Declared Capacity". The guidance should always be reviewed, analyzed, and improved.

2.12 Procedures.

a) ATC operation units shall complete each-hour airport capacity prediction for the next 24 hours based on the plan of use of airspace, the equipment downtime plan, the number of staff, and the weather forecast, at 17:30 PKT, the day before the day of operation. The flow management unit will rehearse the situation to find out the possible bottleneck and possible flow management methods.

b) On the day of operation, every ATC operation unit should confirm the

airport capacity in the next 3 hours according to the dynamic weather trend, the use of the airspace and human factors, either at the top of each hour or the moment received other information that affect the air traffic capacity.

2.13 Since the declared capacity is greatly influenced by the uncertain factors such as weather, China civil aviation is carrying out a series of studies to improve the predicted abilities of the "Declared capacity", which includes the dynamic weather affect to capacity, and quick simulation of airspace capacity, etc.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) note the information contained in this paper;
- b) Reference to capacity management in China, improve the ATFM framework;
- c) Build up APAC flow management information exchange platform and share information as capacity information is important;
- d) Discuss any relevant matters as appropriate.

.....