International Civil Aviation Organization

Thirteenth Meeting of the Asia/Pacific Air Traffic Flow Management Steering Group (ATFM/SG/13)

Bangkok, Thailand, 03 – 07 April 2023

Agenda Item 7: Any Other Business

CAPACITY ASSESSMENT

(Presented by Secretariat)

SUMMARY

This paper presents a brief review of requirement of capacity assessment by States for long term planning and establishing Air Traffic Flow Management along with available guidance material on the process. The paper proposes a capacity assessment workshop to share experiences of States for knowledge sharing.

1. INTRODUCTION

1.1 System capacity is a crucial concept in Air Traffic Flow Management (ATFM). Striving to improve system capacity is an integral part of ATFM. While airport capacity or airport throughput is a well-established concept, airspace capacity or sector capacity is still not universally implemented.

1.2 Knowledge of the capacity of air traffic control sectors or ATC operating positions is necessary for two reasons. Firstly, for long-term planning, adequate warning is required of any future shortfall in capacity, as indicated by traffic forecasts. Secondly, if there is already a shortage of capacity requiring the application of flow control, it is necessary to know what the capacity is, to limit air traffic to a level which does not overload the system or penalize the operators excessively.

1.3 The Regional Framework for Collaborative ATFM in the "Capacity Planning, Assessment and Declaration" section has brought out the critical importance of capacity studies for ATFM. In the following sections a brief overview of Capacity Assessment requirements and methods is presented.

2. DISCUSSION

ICAO Provisions and Regional Requirements

Annex 11

2.1 ATFM (Annex 11) definition - A service established with the objective of contributing to a safe, orderly and expeditious flow of air traffic by ensuring that ATC capacity is utilized to the maximum extent possible, and that the traffic volume is compatible with the capacities declared by the appropriate ATS authority.

2.2 Para 3.7.5.1- Air traffic flow management (ATFM) shall be implemented for airspace where air traffic demand at times exceeds, or is expected to exceed, the declared capacity of the air traffic control services concerned.

Note. — The capacity of the air traffic control services concerned will normally be declared by the appropriate ATS authority.

PANS ATM Doc 4444-ATFM Service

2.3 Para 3.2.1.1- An Air Traffic flow management (ATFM) service shall be implemented for airspace where traffic demand at times exceeds the defined ATC Capacity.

2.4 Para 3.1.1.2- The number of aircraft provided with an ATC service shall not exceed that which can be safely handled by the ATC unit concerned under the prevailing circumstances. To define the maximum number of flights which can be safely accommodated, the appropriate ATS authority should assess and declare the ATC capacity for control areas, for control sectors within a control area and for aerodromes.

2.5 Para 3.1.3.2- In case of particular events which have a negative impact on the declared capacity of an airspace or aerodrome, the capacity of the airspace or aerodrome concerned shall be reduced accordingly for the required time period. Whenever possible, the capacity pertaining to such events should be predetermined.

ICAO Doc 9426 (ATS Planning Manual)

2.6 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.

2.7 ATFM PQs (USOAP CMA 2020 Protocol Questions -ANS)

− 7.081 – Does the State ensure that the ATS provider assesses and declares the ATS capacity?

− 7.082 – Does the State ensure that air traffic flow management (ATFM) is implemented when air traffic demand at times exceeds, or is expected to exceed the declared ATC capacity?

2.8 APSAP v 3.0 requirements

PARS Phase II

− Para 7.1 c)- regular airport capacity analysis, which included a detailed assessment of passenger, airport gate, apron, taxiway and runway capacity

− Para 7.37 - All ATC Sectors should have a nominal aircraft capacity figure based on a scientific capacity study and safety assessment, to ensure safe and efficient aircraft operations.

− Appendix D provides some guidance on Airport and Airspace capacity assessment and provides capacity data of some States.

2.9 Regional Framework for Collaborative ATFM v4.0 requirements

Phase IA

− Para 7.12 - A regular program of bi-annual strategic airport and airspace capacity and demand analysis should be implemented for all international airports and associated terminal area airspace, and for all en-route ATC sectors supporting the homogeneous ATM areas and major traffic flows identified in the Asia and Pacific Regions.

− Para 7.14 - Daily pre-tactical airport and airspace capacity and demand analysis should be conducted for all ATFM Program Airports and associated terminal area airspace, and for all en-route ATC sectors supporting the busiest Asia/Pacific city pairs,

Capacity

2.10 Capacity- The maximum number of aircraft that can be accommodated in a given time period by the system or one of its components (throughput). - ICAO Doc 9882 Manual on Air Traffic Management System Requirements.

Declared Capacity- Annex 11

2.11 A measure of the ability of the ATC system or any of its subsystems or operating positions to provide service to aircraft during normal activities.

2.12 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, staff and equipment available, and any other factors that may affect the workload of the controller responsible for the airspace.

Doc 9971 (Manual on Collaborative ATFM)

2.13 Para 3.1.2 - The number of aircraft provided with ATC service should not exceed that which can be safely handled by the ATS unit concerned. In order to define the maximum number of flights that can be safely managed, the appropriate ATS authority should assess and declare the capacity for control sectors (en-route and terminal control area) and for airports. This capacity is the "declared capacity" for the airspace or airport.

2.14 Para 3.1.5.3 - Strategic airport slot allocations should be consistent with declared airport ATM capacities, i.e., the number of allocated strategic airport slots should not exceed the declared capacity of the airport.

2.15 Para 3.1.6 - operational capacity - Operational capacity is the expected capacity associated with the tactical situation at the airport or airspace. ATFM solutions are based on the expected dynamic operational capacity.

Capacity determining methods

2.16 It would be extremely complex to establish a universal rule to calculate capacity. Capacity can be affected by so many variables and external considerations that standardization is simply not possible. It is therefore up to each ANSP to decide how to determine its capacity by choosing from either basic method based on observation or highly sophisticated mathematical models. Each State is responsible for determining capacity, while using the methodology of its choice.

2.17 Guidance material

− ICAO Doc 9971 – Manual on Collaborative ATFM provides the following guidance on capacity planning and assessment:

  - Part II Chapter 3 and 4 – Capacity Determination and ATFM Phases and Solutions.

  - Appendix II-B – Determining the Airport Arrival Rate – An example of a simplified methodology for determining the acceptance rate at an airport, based on scientific process developed by the Federal Aviation Administration (FAA).

  - Appendix II-C – Determining Sector Capacity – An example of a simplified methodology for determining sector capacity at an area control centre (ACC), based on the process developed by the Federal Aviation Administration for establishing sector capacity.

  - Appendix II-D – Capacity Planning and Assessment Process – Provides information developed by the European Organization for the Safety of Air Navigation (EUROCONTROL) related to the ATFM capacity and planning assessment process

− Airport Capacity Assessment Methodology (ACAM) Manual | EUROCONTROL

2.18 Methodologies

− Controller Workload assessment
− Mathematical models
− Fast-time simulations for analysis of effect on capacity for any proposed ATS changes
− Real time simulations involving active ATCO

Proposal

2.19 Capacity assessment is an essential part of ANS resources planning and improvements. It is also the first step in ATFM implementation.

2.20 ICAO has previously (2019) conducted a capacity assessment and improvement workshop where states had shared their experiences.

2.21 During the last three years of pandemic, international air traffic has been greatly affected. Despite this, many States in APAC Region have augmented airport infrastructure such as operationalization of new airports, additional runways, and new airport terminals into the national airspace system. The experiences of States' in planning such resource augmentation along with capacity impact studies will be greatly beneficial to other States looking for guidance in capacity assessment.

2.22 It is proposed to conduct a capacity assessment workshop wherein States will be invited to share their experiences in conducting capacity assessment of airports and airspace sectors.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) Agree to the proposal in Para 2.22; and

c) discuss any relevant matters as appropriate.

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