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Agenda Item 5: Development of Regional ATFM Framework

ATC SECTOR CAPACITY ASSESSMENT WORKSHOP

(Presented by EU-AATIP)

SUMMARY

This paper provides an update on the proceedings at the EU-AATIP workshop on ATC Sector Capacity Assessment, taking place in Bangkok on 26-27 November, 2014.

It recognises that a correct understanding of the capacity of the sectors/airports involved is a vital input for any decision on the application of ATFM measures.

The paper describes how the workshop was prepared and how the EUROCONTROL ATC Capacity Analyser methodology was used to describe the various steps in a capacity assessment process. It also contains a simplified description of the steps required to carry out a standard ATC sector capacity assessment study.

1. INTRODUCTION

1.1 A vital input for any decision on the application of ATFM measures or the initiation of any ATM improvement projects is a correct understanding of the capacity of the sectors/airports to be analysed.

1.2 One way to measure ATC sector capacity is the use of the EUROCONTROL ATC Capacity Analyser (CAPAN) capacity assessment methodology.

1.3 On 26-27 November the EU - ASEAN Air Transport Integration Project (AATIP) conducted a workshop on ATC Sector Capacity Assessment, using the CAPAN methodology. The meeting was attended by 37 participants, having direct responsibilities for the development, implementation and management of ATC sector capacity assessments in their ASEAN States.

1.4 The objectives of the meeting were to:

- conduct a standard Data Preparation Meeting of a capacity assessment study, allowing ASEAN member states to gain full understanding of the different issues related to the data preparation stages of a CAPAN study.

- Show the experts from the ASEAN member States how to work with the data so that they would gain a basic understanding on how to process the information.

1.5 Since AEROTHAI, Thailand, has a current license for the use of the fast time simulation model underlying this process (Re-organized ATC Mathematical Simulator - RAMS), it was agreed to use the sectors of the Bangkok Area Control Centre and their fast-time simulation tool to do the capacity assessment.

2. DISCUSSION

Preparation of the Workshop

2.1 In preparation for the workshop, the European experts together with experts from AEROTHAI had collected and documented the necessary airspace and traffic data. A sector capacity assessment methodology requires different types of input data, including but not limited to:

- Static infrastructure data, such as navigation aids, airspace structure and route network;
- Traffic data representing the intent of aircraft operating in the subject sectors;
- ATC logic and procedures;
- Controller task definitions; and
- Aircraft performance data.

2.2 The preparation of the data is extremely important since the accuracy of the data that is put into the simulation tool will determine the correctness of the output. Without correct data, the result cannot be used.

CAPAN methodology

2.3 At the outset of the workshop, the simulation experts discussed controller workload issues with the BKK area controllers by going through each of the main traffic flows in BKK FIR on a flow-by-flow basis. All actions to be taken by the controllers were identified and verified.

2.4 The involvement of controllers with valid ratings in the sectors concerned during the discussions is of fundamental importance for the validation of the simulation scenarios. The controllers are needed to provide support to define actual flight routings, procedures, tasks, conflict detection and resolution logic and other simulation parameters.

2.5 The next step was to discuss how to associate the actions discussed in the previous step with a certain task. In this phase controller tasks, reproducing controller actions, has to be defined. Tasks are triggered by discrete ATC events, e.g. entry into a sector, entry into controller window, start of descent, etc. Tasks can be associated to specific conditions e.g. airport, route, flight level, fight attitude, and tasks can be grouped/chained to represent a set of connected actions.

2.6 The CAPAN methodology contains a sample task list which covers all ATC tasks in a general way, classified according to their nature and objective. The tasks are applicable to both ACC and TMA environment and are totally customisable depending on issues such as ATM system capabilities, specific procedures, separation minima, etc. During the process of translating actions into tasks, this sample task list automatically becomes specific to the procedures used by the ACC that is assessed.

2.7 The five main categories of tasks are:

- Flight Data Management – handling of data concerning the flights (flight progress strips, flight data system inputs, etc.)
- Standard Conflict Search – includes the actions the controller normally does in assessing potential conflicts at sector entry, transit and exit.
- Coordination – includes all actions required for coordination and exchange of required flight details within the ATC Unit (Internal Coordination) and outside the ATC Unit (External Coordination)
- Standard Radio Telephony (R/T) – includes all routine radio telephony tasks (e.g. issuance of clearance, transfer to next frequency)
- Radar Tasks – includes all the work related to solve conflicts using radar vectors, level changes or similar techniques, including coordination and radio telephony.

2.8 Once the actions have been associated with a task and the time it takes to perform this task has been agreed, this can now be translated into simulation parameters.

2.9 The fast time simulation tool contain logic for conflict detection/resolution mechanisms. When the tool detects a conflict it assumes that an action will have to be taken. This action will depend on how controller conflict resolution is defined, i.e. type of conflict, conflict evolution and system capabilities.

2.10 There is a minimum of 9 different conflict categories, and separation minima have to be decided for all the 9 categories. A conflict can be solved in many different ways, for example through a level change, application of speed control, by vectoring or a direct-to clearance. A workload assessment needs to be able to take this into account either by simulating it realistically or by reproducing the proper load for the controller resolution strategy. A set of rules has to be defined to choose the right resolution according to actual conflict evolution, local procedures and modus operandi.

Next Steps

2.11 Following the workshop, the local simulation experts will now correct, refine and insert the required information into the model. When this has been done, an initial test-run of the model can be done. It is foreseen that there will be a requirement for a follow-up event, in order to verify flight profiles, adapt aircraft performance to local conditions, and define and verify sector specific controller tasks together with simulation parameters including conflict detection and resolution mechanisms.

2.12 The results of the simulation will give outputs indicating traffic and controller workload levels for the simulated airspace. These results enable capacity baseline figures to be established.

STEPS IN A CAPACITY ASSESSMENT METHODOLOGY

2.13 A simplified description of the steps required to carry out a standard capacity assessment methodology include the following:

1. Collect the necessary airspace and traffic data;
2. Verify (with the support of local controllers) the traffic sample routes and the procedures used on a flow-by-flow basis;
3. Correct, refine and insert the information into the model (done by the simulation experts). This includes the ATC procedures used in the sector, standard controller tasks, simulation parameters and aircraft performance parameters;
4. Run an initial test-run of the model;
5. Verify flight profiles. The knowledge of local controllers is used to adapt aircraft performance to local conditions, to define and verify sector specific controller tasks together with simulation parameters including conflict detection and resolution mechanisms;
6. Consolidate a final model which is used to calculate results for all simulation scenarios, e.g. different sector configurations, different traffic samples, etc.;
7. Verify the simulation scenarios and the initial results, and if so required, do a fine-tuning of parameters.

2.14 A capacity assessment methodology should use a simulation engine which allows reproducing the ATC environment and it should follow a reiterative process of validation involving active ATC staff.

3. ACTION BY THE MEETING

3.1 The meeting is invited to note the information contained in this paper.