International Civil Aviation Organization

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

Web-conference, 28 – 30 October 2020

Agenda Item 5: Issues and Challenges in implementation

5.8 Ground based safety net

APPLICATION OF MTCD FUNCTION IN ATM AUTOMATION SYSTEM

(Presented by China)

SUMMARY

This paper presents the introduction of Medium Term Conflict Detection (MTCD) function which are well commended by controllers, and the application in China's Large-scale ATM automation system.

1. INTRODUCTION

1.1 In order to adapt to the rapidly increasing growth of civil aviation traffic, ATM automation system in China has continuously encouraged to develop new functions to enhance safety and improve efficiency as much as possible. In recent years, there are a good supply of new functions springing up immensely in China, such as multiple surveillance data tracking, main/backup system synchronization, screen handover through MH/T 4029.3, arrival management (AMAN), RECAT and especially Medium Term Conflict Detection, abbreviated MTCD, which are overwhelmingly high praised to push forward an enormously significant effect on much further flight security reinforcement, flow management rationalization and disaster recovery consolidation. This paper primarily puts emphasis on statement of MTCD function applied in the ATM automation system and merits of it.

1.2 Medium Term Conflict Detection (MTCD) function has been put into operation in Beijing and Shanghai. It is widely commended by controllers, mainly being ascribable to call their attention to keeping aircrafts separation in a certain time advance rather than in a closely short time, as well as helpful for airspace safety especially in heavy traffic.

2. DISCUSSION

2.1 MTCD concept

2.1.1 The purpose of the MTCD function is to provide controllers information on present and future loss of separation between two aircrafts, in a tactical time ahead (typically 4 to 5 minutes).

2.1.2 The MTCD function determines all the surveillance track pairs, which are needed to be separated by less than the minimum air traffic separation requirements. The system computes this by combining with four-dimensional profile calculation of flights. When these predicted trajectories, at both vertical and horizontal perspective, infringe a minimum separation, a MTCD alert is raised.

2.2 Difference between MTCD and STCA

2.2.1 Different data input

STCA mainly uses surveillance information including position, speed, altitude, ROC/ROD to predict the aircraft position at a look-ahead time. Compared with STCA, MTCD combines the track information with the flight plane information to make a medium-term prediction of the aircraft's future position.

The input information required for MTCD alert is mainly:

a) Surveillance information, including position, speed, heading, altitude, ROC/ROD, etc.;
b) Flight data information, including CFL, flight plan, 4-D trajectory, etc.;
c) System parameters, including areas, separations, prediction time, etc.

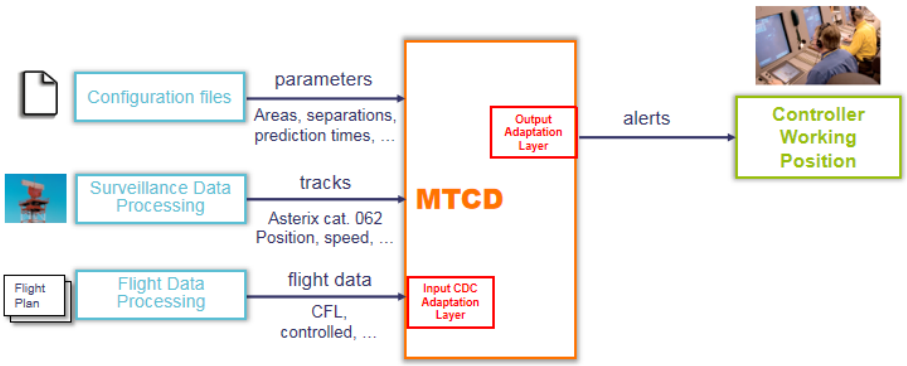

Figure 1 input information required for MTCD

2.2.2 Different perdition time

The looking ahead time of STCA is about 90 seconds. In a disadvantage, STCA only can provide the controller with a short time to handle the conflict while the alert is generated. Compared with STCA, MTCD can provide controller with 8 minutes in a looking ahead time at best. It allows the controller have enough time to confirm the aircraft situation and deal with the conflict calmly and timely.

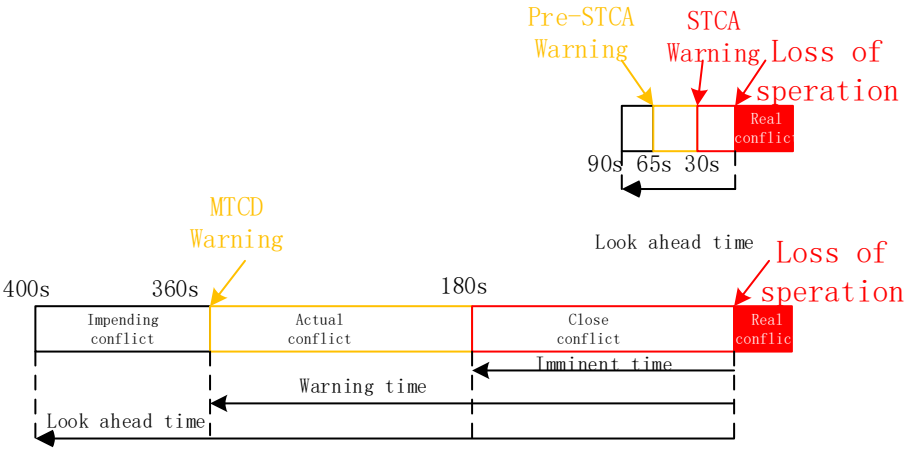

Figure 2 Perdition time for both STCA and MTCD

2.2.3 Different users

The longer prediction time than before determines that the user of the MTCD function is ACC controller instead of APP controllers apparently. Nevertheless, STCA function is both for ACC and APP controllers.

2.3 Application in ATM automation system

2.3.1 Tuning experience

During the trial and technical understanding of MTCD function, it comes gradually to realize that parameter tuning is the key point to MTCD application. It requires to exert a great effort to define overall MTCD functionality behavior through offline parameters, in order to raise practical and tactical alerts in a sufficient time scope rather than a nuisance of false alerts. If false alert rate becomes very high, the number of practical alerts will end up with impact of being disregarded.

In order to make the best use of the MTCD function, it is of crucial importance for tuning that users need to form several cases or scenarios, by means of extracting flight data recordings from operational system or simulated site. By research and analysis of the alert behavior on these recordings with a default set of offline parameters, it needs to adjust the parameters accordingly and constantly. One thing bear in mind, users need a large number of experiments to verify them before bringing into operation.

In Beijing ATM automation system, we have an entire MTCD processing area, excluding APP area, by the way of defining 3 sets of MTCD parameters for different airspaces. The looking ahead time is set to 260-400 seconds according to the various airspaces.

2.3.2 Operational use

The MTCD function uses a completely independent software module and is deployed on the dual-machine redundant servers in Area Control Center. At present, the MTCD function has been deployed on-site in Beijing and Shanghai, and achieves good operational results.
When the alert raises, the controller will check the situation of aircraft, and make corresponding action.

a) If it is judged that the MTCD alert displayed as MT for short is false alarm, use the ACK key to confirm it.

b) If it is judged that the MT alert occurs between the aircrafts using the visual interval, use the ACK key to confirm after the relevant activity has been notified.

c) If it is judged that the MT alert is caused by the wrong route, the controller needs change it to the correct route.

d) If it is judged that the MT alert indicates real conflict, the controller shall quickly identify the flight conflict, and immediately issue the conflict resolution instruction. During this period, the ACK key shall not be used to confirm it until disappears automatically after the flight conflict is resolved.

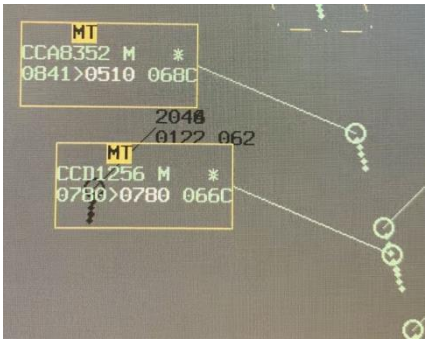

Figure 3 MTCD warning shown in HMI

2.4 Benefit and suggestion

2.4.1 MTCD function provides new, safe and efficient method for the controller to detect potential flight conflict in advance. It allows the controller have enough time to check the aircraft situation and solve the conflict calmly and timely.

2.4.2 It can help controller to address flight conflict effectively, and improve airspace safety to a certain extent. Especially in the case of heavy flight traffic and flight diversion during thunderstorm, it is very helpful for the controllers to review their instructions.

2.4.3 With the complexity of the current airspaces and the diversity of airspace situations, the same set of parameters should not be applied for all. Therefore, we are supposed to make efficient use of the different parameter groups, assigning each of these to different areas.

2.4.4 Setting the parameter values too high does create undesired effects (such as alerts raised too early). It is better to reduce the constraints around a high density of traffic areas.

2.4.5 In order to keep correct alerts, users need always adjust the system parameters constantly corresponding to the operation environment.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper; and

b) discuss any relevant matter as appropriate

– – – – – – – – – – – – –