



International Civil Aviation Organization

**The Third Meeting of the APANPIRG ATM Sub-Group
(ATM /SG/3)**

Bangkok, Thailand, 03-07 August 2015

Agenda Item 4: ATM Systems (Modernisation, Seamless ATM, CNS, ATFM)

ATC TOWER OPERATION IN CHINA

(Presented by China)

SUMMARY

This paper presents a brief introduction of the ‘Tower Operation Management System’ of middle south regional air traffic management bureau of China.

1. INTRODUCTION

1.1 Tower control is one of the most complex parts in ATC service. A typical tower control consists of many particular procedures and steps. However, from the technical view of the job, a flight is continuously changing its ‘state’ from one to next during the process. This means we can use a Finite State Machine (FSM) to modeling the whole process of tower control.

1.2 The Middle South Regional Air Traffic Management Bureau (ATMB) of China has developed the ‘Tower Operation Management System (TOMS)’ based on this concept. The TOMS system is an operation supporting system of tower including electronic flight strip, decision-making support toolkit, and data integration platform

1.3 TOMS is aiming at standardizing tower operation procedures, enhancing collaboration between different positions and reducing (but not replacing) the number of systems which needs controller handling in order to help them focus on flights and routes. To achieve this goal, TOMS must be able to connect to other tower systems such as DCL, D-ATIS and SMR, and play the role of data integration and exchange platform

1.4 We use the concept ‘state’ to describe different procedures of tower control in TOMS. A ‘state’ is a 3-character phase representing a certain milestone in the whole process. For example, ‘PRE’ for PRE-active, ‘RDY’ for Ready and ‘TAX’ for taxing. The whole set of states and convert rules covers all the milestones of tower control

1.5 The ATC controller is intended to change the state of a flight as long as the flight operation goes on. Every time before the controller change a flight’s state, the TOMS decision-making support function checks whether all the necessary requirements are fulfilled. If not, the state change will fail and visual alerts will be generated to prevent the controller from giving a wrong order

1.6 The states and convert rules at different airports could be similar if not same. With all these states and rules, tower control workflow at different airports can be standardized. Furthermore, the flight information exchange among different airports can be carried out under this standardization.

1.7 TOMS is not intended to replace any of the tower systems such as DCL (Datalink-based departure clearance) or SMR (Surface movement radar), but to cooperate with them as a data integration and exchange platform. With this function, TOMS is able to integrate several kinds of data and provide integrated flight information updates to these systems in order to reduce data redundancy, simplify connection complexity, and improve data quality.

1.8 Integration with D-ATIS. TOMS can retrieve ATIS information from D-ATIS system. This information is sent to DCL system together with flight updates.

1.9 Integration with DCL (Datalink-based departure clearance) system. TOMS sends ATIS sequence number, flight plan, and flight updates to DCL system; DCL system handles communication and departure clearance procedure between controller and pilot; DCL also sends results or errors back to TOMS. The DCL system still exists, but the controller runs it through a standard state change operation (PRE-REQ-CLD) in TOMS.

1.10 Integration with SMR. Surface movement radar system can improve its functionality by receiving flight plan/updates, push back times, departure sequence and planned taxi routes as long as the flight operation goes on. Some advanced warning/alert functions can be built upon this.

1.11 DMAN(Departure Management) subsystem works as a part of decision-making support toolkit of TOMS, which calculate departure sequence based on the integrated flight data from TOMS. Surface location data is also retrieved from the SMR system, and is added up to flight updates of TOMS and sent to DMAN if available.

1.12 With TOMS implementation at 7 major airports in the region, we have created a regional network which connects all these TOMS to an regional ATFM system. Tower flight information is sent to the regional ATFM continuously and the regional TMIs and CTOTs are sent back to tower when necessary. This work gave us a greater view of real-time traffic situation and greater ability of managing air & ground traffic flow, and what's more, phone calls between tower and TFM position fell sharply after this implementation.

2. DISCUSSION

2.1 State code and description.

CATEGORY	CODE	DESCRIPTION
Departure	FPL	Flight plan has been received by ATC.
Departure	PRE	Pre-Active, usually 30 minutes before EOBT.
Departure	REQ	The Pilot requested a departure clearance to ATC.
Departure	CLD	Departure clearance is approved.
Departure	RDY	The Pilot reported that the flight is ready to push back.
Departure	HLD	The flight is ready, but has to be held at the gate for some reason.
Departure	NPU	The flight is transferred to ground control and wait for push back.
Departure	PUS	The flight is approved to push back.

Departure	STR	The flight is approved to start its engine.
Departure/Arrival	TAX	The flight is approved to taxi out.
Departure/Arrival	STP	The ground control stopped the flight's taxing for some reason.
Departure/Arrival	CRS	The flight is approved to cross a runway during its taxing.
Departure	QUE	The flight has joined a departure queue out of a runway after taxing.
Departure/Arrival	CON	The pilot has made contact with tower control in order to take off or land.
Departure	LIN	The departure flight is approved to enter the runway and line up.
Departure	TAK	The flight is approved to take off.
Departure	ABT	The flight's taking off is aborted for some reason.
Arrival	APP	The flight is in approach control for arrival.
Arrival	LND	The flight is approved to land.
Arrival	TCH	The flight is touching the runway.
Arrival	VAC	The flight is vacating the runway after landing.
Arrival	MSA	The flight has missed its approach.
Arrival	TNG	The flight has touched the runway, but failed to land successfully and needs to pull up again.
Departure/Arrival	FIN	All works finished. The flight is out of tower's control.

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 matters as appropriate.

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