International Civil Aviation Organization

ICAO ASIA/PAC METEOROLOGY/
AIR TRAFFIC MANAGEMENT (MET/ATM) SEMINAR

26 – 28 November 2013, Bangkok, Thailand

Discussion Topic 2(1)(a): Requirements for MET support to ATM

PRACTICAL USE OF WEATHER INFORMATION TO AIR TRAFFIC MANAGEMENT

(Presented by Japan)

SUMMARY

This paper presents a case study in which cumulonimbus clouds (CBs) and convective clouds occurred in an approach control area that affected air traffic, as a material to examine the weather information in support of ATM.

1. Introduction

1.1 The Air Traffic Meteorology Center (ATMetC) puts emphasis in the briefing to ATM officers on the weather regarding major components of air traffic network, that is, the airports with many takeoffs and landings and the airways with high density air traffic flows. ATMetC, through its experience, has realized the importance of the effect of the weather on the airspace including approach control area around main airports with numerous takeoffs and landings.

1.2 This paper provides a material to examine the weather information in support of ATM by showing a case study in which cumulonimbus clouds (CBs) and convective clouds occurred in an approach control area affected air traffic.

2. Case study

2.1 This is an example of CBs and convective clouds affected air traffic in Tokyo approach control area on September 3, 2012.

2.2 The situation of CBs around Tokyo approach control area on the day is shown in Figure 1. The outline of an example is as follows.

a) CBs occurred over the Boso Peninsula at 03UTC, and moved northeastward until 05UTC.

b) “TSRA” was not observed around Tokyo International Airport (RJTT).

c) Influence on air traffic caused by CBs increased to force a large number of aircraft to keep holding above the sea south of the Boso Peninsula and southwest of the Izu Peninsula.

d) ATM officers started air traffic flow control by suspending the departures of aircraft bound for RJTT at 04:22UTC.

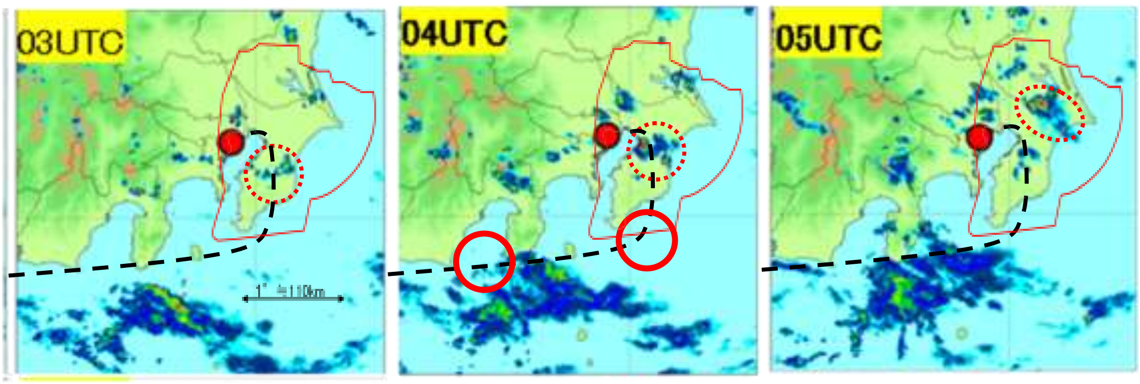

Figure 1 Rader echo (precipitation intensity) at 03UTC, 04UTC, and 05UTC on September 3,2012. A red filled circle indicates the location of RJTT.

- A black dashed line shows one of the typical courses bound for Tokyo International Airport (RJTT) from west (in case of south wind operation).

- A red thin solid line shows the Tokyo approach control area.

- A red dotted line shows the cloud zone which affected air traffic flow.

- (Only regarding the figure of middle) A red bold circle shows the airspace where the flights bound for Tokyo International Airport (RJTT) kept holding at around 04:20UTC.

3. Air traffic flow control taken in the region

3.1 The feature of the airspace considering flight operation

In the approach control area, the arrival course is set up corresponding to the approach system to landing-runway (an example is shown in Figure 2). It is necessary for ANSP to arrange a lot of aircraft arriving from various directions and to make them fly maintaining safety interval along the standard course.

3.2 Case of CBs and convective clouds existing on flight path within approach control area

ANSP usually guides aircraft coming in for landing, to avoid CBs and convective clouds. However, since the number of aircraft which a controller can deal with is limited, it is necessary to execute air traffic flow control, such as expansion of spatial intervals to enter the approach control area, slowdown, or suspension to enter the approach control area by holding.

Also, ANSP does not usually make an aircraft deviate from standard course in the final approach from the initial approach fix (BACON in Figure 2) to a landing point, so the influence of CBs and convective clouds occurring on the said course on air traffic is significant.

In such a case, controller will keep aircraft holding at the specified points until the time to permit them to enter approach control area comes. A controller will keep a number of following aircraft holding at two or more points, due to the limitation of the number of aircraft available to keep holding at one point.

3.3 Case of September 3 was the case even small-scale CBs occurred near the final approach starting point could impede aircraft to make landing

Moreover, since there were a large number of aircraft in flight bound for RJTT, controllers kept them holding and ATM officers suspended the departure of aircraft bound for RJTT.

4. Lessons learned

4.1 This case suggests the existence of specific weather conditions which affect cruise in approach control area, other than those affecting takeoff or landing around runway.

4.2 Even small-scale CBs and convective clouds, depending on their positions, might affect air traffic. Specifically, CBs and convective clouds existing especially on flight path in approach control area might directly link to the drop of control processing capacity.

Therefore, it is important to monitor and forecast CBs and convective clouds in approach control area in consideration of flight path.

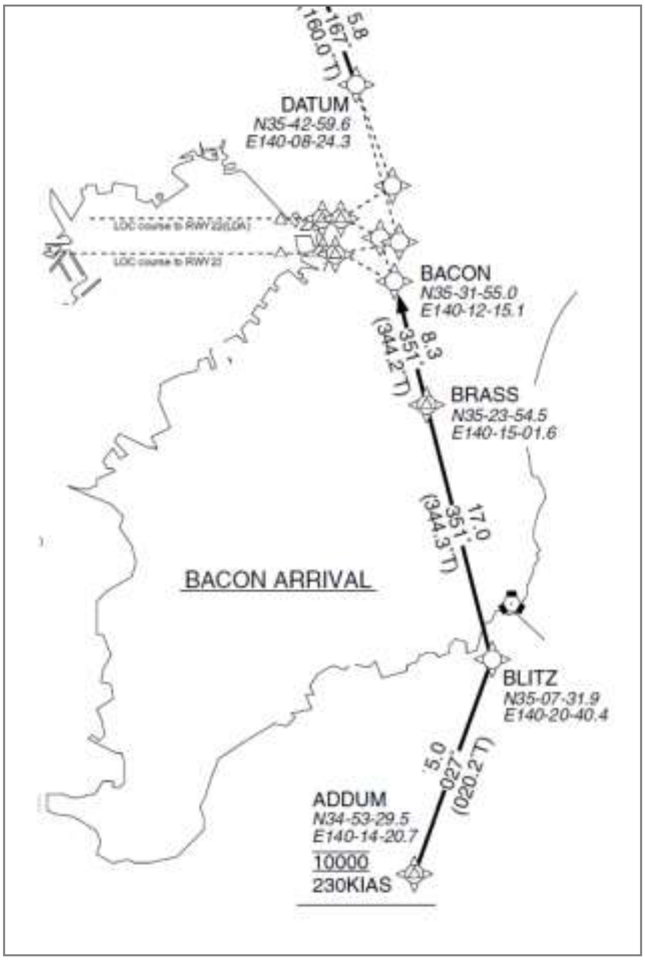

Figure 2 Example of the standard arrival course of Tokyo International Airport (RJTT) (RNAV STAR RWY22/23 BACON ARRIVAL) extracted from AIP-JAPAN

4.3 In the case of large-scale CBs accompanied by synoptic scale disturbance, various kind of weather elements, such as TS and CB, broadly affect air traffic including airports. In such a case, monitoring and forecasting weather conditions in consideration of distinction between influence on airport and that on approach control area would make the meteorological support for ATM appropriate.

5. Procedures taken at present

5.1 ATMetC recognizes the importance of the information on CBs and convective clouds in approach control area. However, under the present circumstances, it is difficult to forecast up to several hours CBs and convective clouds with the area of 100km-scale corresponding to the scale of an approach control area. Also, in many cases, degree of influence by weather phenomena on air traffic varies according to degree of growth, distribution, positions of CBs and convective clouds.

5.2 Therefore, the following procedures are taken under the present circumstances.

1) ATMetC may get information on air traffic flow situations via the ATMC systems. Also, ATMetC receives information on whether occurring CBs and convective clouds actually affect air traffic flow or not from ATM officers.

2) ATMetC will watch the actual weather condition regarding CBs and convective clouds which may affect air traffic flow, and predict it in the near future by extrapolation methods and utilization of numerical weather prediction to provide frequent briefings to ATM officers.

3) Corresponding to this, ATM officers will secure the smooth air traffic flow by lowering control processing capacity of involved airports and controlled airspace (sector) including the airways bound for the target airport.

4) ATMetC understands in advance the approach system to each landing-runway of aerodrome and the standard arrival course concerned as the basic knowledge, to use effectively in monitoring of weather conditions and briefings to ATM officers.

6. Future challenge

6.1 For further enhancement of the information to support ATM related to CBs and convective clouds, it is necessary to improve forecast accuracy and accumulate knowledge regarding the relation between various weather elements, such as intensity, cloud top height, distribution and movement of CBs and convective clouds, and air traffic.

7. Action by the Meeting

7.1 The meeting is invited to:

a) note the information contained in this paper; and

b) discuss any relevant matters as appropriate.

– – – – – – – – – – – – –