Operational Procedures at Tokyo International Airport (Haneda)

1. Introduction

This material was prepared to notify foreign air carriers of the complicated operational procedures at Tokyo International Airport (hereinafter called Haneda Airport) and to supplement the explanation of constraints associated with operational procedures that were described in the capacity analysis of Haneda Airport. In order to better visualize the operational procedures at Haneda Airport, the runway configuration is shown in Figure 1. There are two main parallel runways, the A-Runway (16R/34L: 3,000 meters) and the C-Runway (16L/34R: 3,000 meters). In addition, there are two runways to be used mainly in a south wind operation; the B-Runway (04/22: 2,500 meters) and the D-Runways (05/23: 2,500 meters).

There are various complexities in formulating ATC procedures such as the operational constraints surrounding the aerodrome and also in terminal approach control airspace. In addition, careful consideration was given to assure the safety and punctuality of aircraft operations, since this is the first time the simultaneous operation of a 4 runway configuration is being used in Japan.

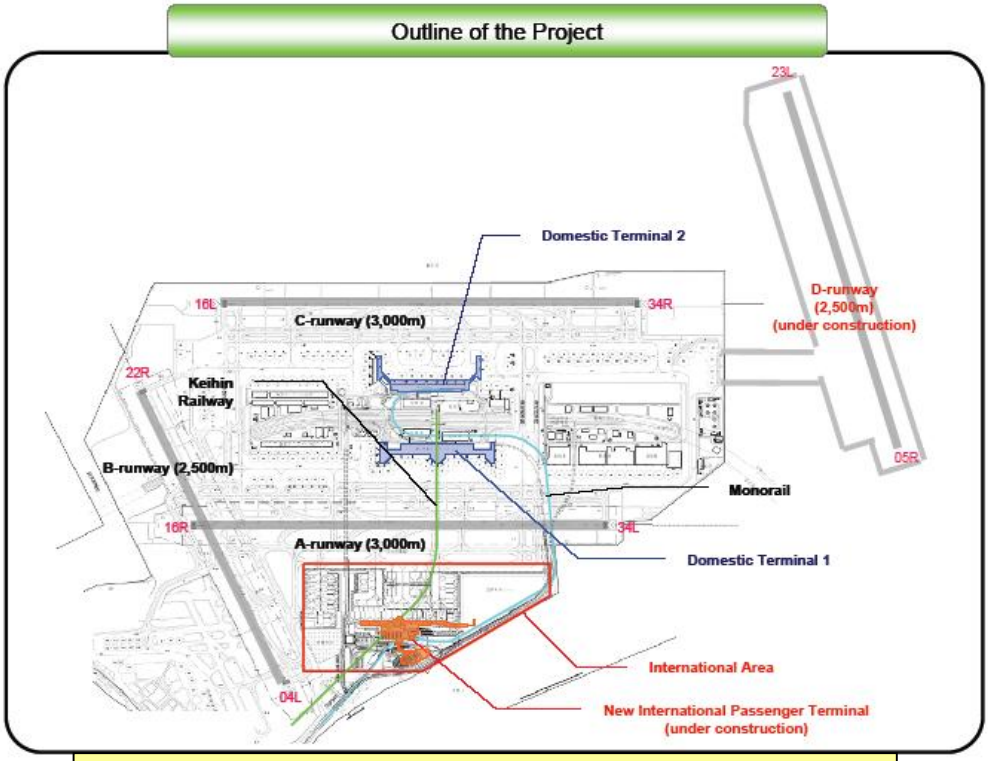


Figure 1: The runway configuration at Haneda Airport

(1) Environmental Constraints

In analyzing the capacity of the airport, it should be understood that there are many environmental

constraints at Haneda Airport. For example, all aircraft departing from and arriving at Haneda Airport may not fly over Metropolitan Tokyo, unless they fly at or above a prescribed altitude. In particular, aircraft may not fly over the residential area located on the north side of airport or the oil refinery area located on the west side of the airport. Aircraft may not fly over Chiba Prefecture, unless they fly at or above a prescribed altitude. Between the hours of 23:00 and 6:00, the departure and arrival routes are limited over the Tokyo Bay area, with over flight of land areas prohibited. Operational procedures during late night and early morning hours will be explained in more detail in section 7.

(2) Weather Conditions

It should also be understood that flight operations and ATC procedures are completely dependent on wind direction. At Haneda Airport, prevailing winds are northerly about 60 percent of the year, and the prevailing winds are southerly the remainder of the year. The parallel A- and C- Runways are used mainly for landing during north wind operations. The B- and D- Runways are used for landing during south wind operations.

(3) Unique Traffic Generation in Japan

As the Japanese archipelago stretches from north to south, air traffic volume naturally generates in the northern and southern parts of Japan. Since most of the major cities are located in the southern part of Japan, traffic volume from the north constitutes only about 30 percent and the volume from the south constitutes about 70 percent. In order to expedite the flow of traffic and increase airport capacity, the use of runways should be allocated according to the traffic direction.

(4) Unique Traffic Distribution Pattern

The majority of remain-over-night aircraft leave for local airports early in the morning, since Haneda Airport is used as a major domestic hub airport. Most aircraft come back late at night, and stay the night for the next day's operation. Thus, higher priority is placed on departure operations between the hours of 6:00 to 7:55, and on arrival operations during 21:00 to 22:55.

(5) Unique Location of International Passenger Terminal Building

There are two domestic passenger terminal buildings located between the A- and C-Runways. Whereas the international passenger terminal building is located on the west side of A-Runway, and not in between A - and C-Runways, its location makes ATC operations extremely difficult since international departure and arrival flights must cross the A-Runway. Therefore, to reduce the negative impact to capacity, quick aircraft responses to ATC instructions and expedited taxis are indispensable when crossing the runway.

2. Operational requirements

(1) Effective Runway Length

In principle, all aircraft must plan to take-off and land with a runway length of 2,500 meters. The 3,000 meter runway (C-Runway) is only available for northbound route aircraft during daytime hours.

(2) Aircraft Type Restrictions

Classic types of B747 (-100, -200, -300 and –SP) are not allowed to operate at Haneda. Airbus 380 cannot be accommodated during daytime hours.

(3) Navigation Performance Requirements

Because all departure routes and arrival routes are established by RNAV, RNAV1 and RNAV5 certifications are strongly recommended to operate in and out of Haneda. Between 23:00 to 5:55, RNAV1 and RNAV5 certification are required to operate on the routes described in Figure 10.

3. Ground and Aerodrome Control (Visual Contact at VFR Tower)

(1) North Wind Operations (60 percent)

Figure 2 shows the north wind operation's airborne and surface movement patterns.

There are three potential hazard areas shown in the figure.

- Ø No.1 illustrates a potential conflict between an airborne arrival and departure flight (on the ground).
- Ø No.2 illustrates a potential conflict between airborne departure flights.
- Ø No.3 illustrates a potential conflict between an arrival flight and a taxiing aircraft (both on the ground).

Although the C- and D-Runways are used as the main departure runways, simultaneous departure operations are not allowed because the flight paths conflict with each other. Only simultaneous arrival operations are allowed.

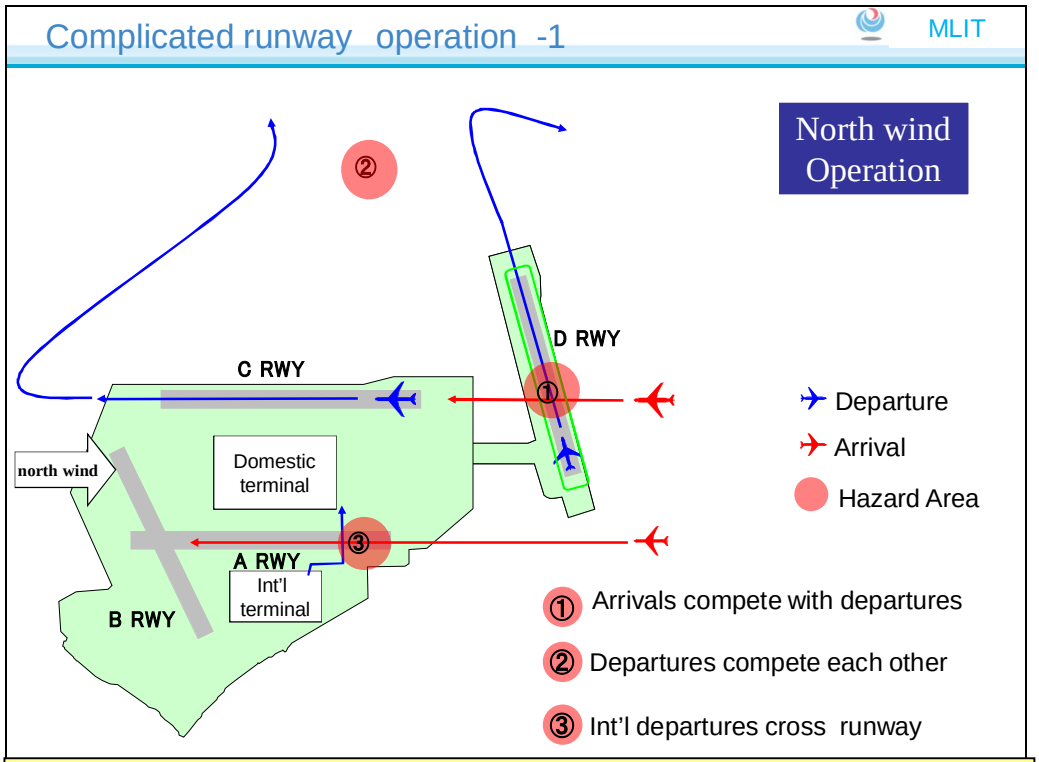


Figure 2: Aircraft movements in the air and on the ground (North Wind)

(2) South Wind Operations (40 percent)

Figure 3 shows the south wind operation's airborne and surface movement patterns. To increase capacity, departures from the A-Runway should commence take-off roll from the south side of the A- and B-Runway intersection. As a result, the effective runway length for departures is 2,500 meters. There are four potential hazard areas shown in the figure.

- Ø No.1-a. illustrates a potential conflict between an airborne arrival to the D-Runway and an airborne departure from the C-Runway.
- Ø No.1-b. illustrates a potential conflict between the missed approach path of an arrival to the D-Runway and a departure flight from the A-Runway.
- Ø No.2 illustrates a potential conflict between a departure from the A-Runway and a taxiing aircraft (both on the ground).
- Ø No.3 illustrates the possible effect of an A-Runway departure's jet blast on a B-Runway arrival.

Simultaneous departure and arrival operations are allowed. However, while an aircraft is arriving to the D-Runway, departures from the A- and C-Runways are not allowed.

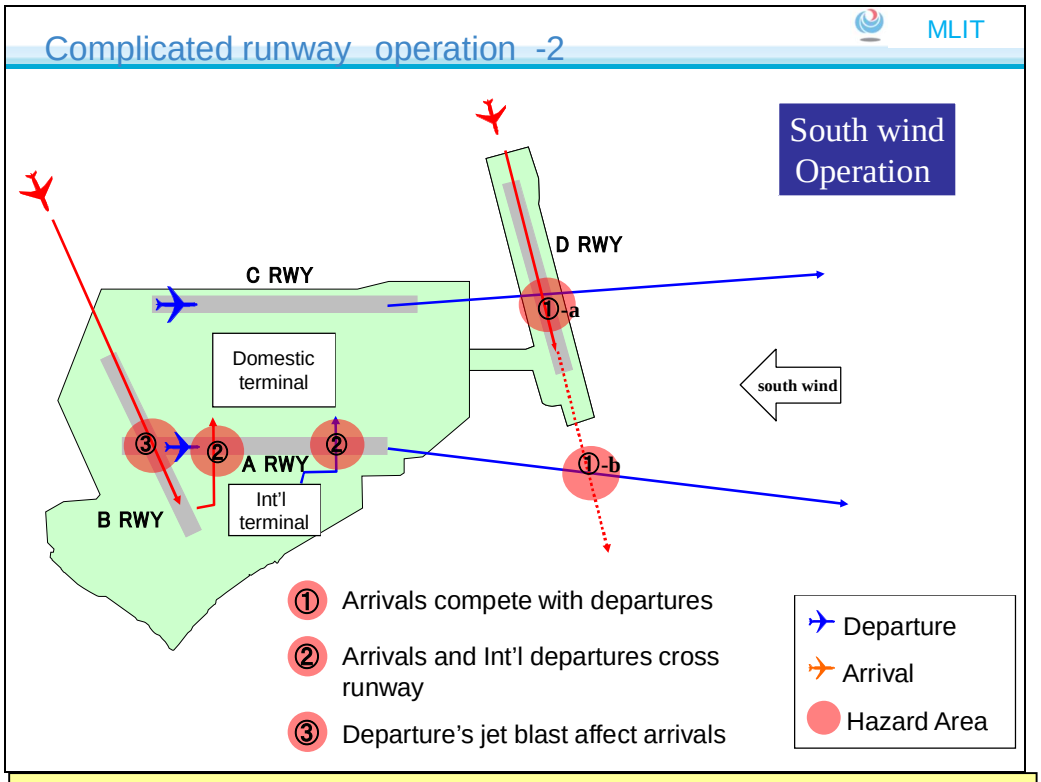


Figure 3: Aircraft movements in the air and on the ground (South Wind)

4. Terminal Approach Control (Radar Contact at IFR Room)

(1) North Wind Operations (60 percent)

The use of runways will be designated to aircraft depending on traffic direction in order to expedite traffic flow and increase airport capacity. The north wind operational traffic pattern plan is shown in Figure 4.

Domestic traffic arriving from the north (30 percent) will be assigned to the C-Runway, and domestic traffic from the south (70 percent) will be assigned to the A-Runway in order to prevent the traffic from crossing in the air. International flights coming from north like Trans-Siberia or NOPAC routes will be assigned to the C-Runway. International flights arriving from the south, e.g., flights from Southeast Asian countries, will be assigned to land on the A-Runway.

The traffic departing to the north (30 percent) will be assigned to the C-Runway, and south and west-bound traffic (70 percent) will be assigned to the D-Runway in order to prevent the traffic from crossing in the air. The separation of both departure paths will be maintained by the outbound ATC sector in this arrangement.

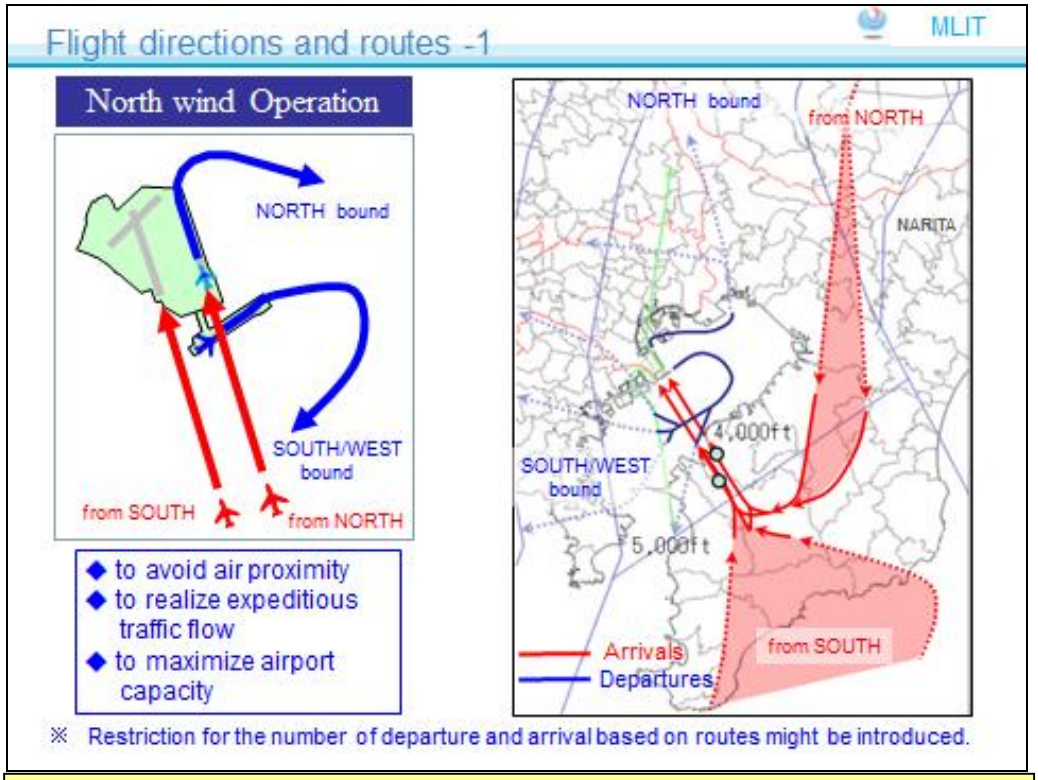


Figure 4: North wind operational traffic pattern plan

(2) South Wind Operations (40 percent)

The south wind operational traffic pattern plan is shown in Figure 5. Domestic traffic arriving from the north (30 percent) will be assigned to the D-Runway. Domestic traffic arriving from the south (70 percent) will be assigned to the B-Runway. In this arrangement, the arrival flight paths cross each other using at least 1,000 feet separation. An operational advantage is gained because the use of the B-Runway by the higher volume (70 percent) domestic traffic coming from south and west will minimize the interference with the departing traffic from the A-and C-Runways. International flights coming from the north, such as Trans-Siberia or NOPAC route traffic, will be assigned to the D-Runway. International flights coming from south, i.e., flights from South East Asian countries, will be assigned to the B-Runway.

Simultaneous B- and D- arrival operations are conducted. One of these simultaneous approach operations, generally used under good weather conditions, is the LDA approach (Localizer Type Directional Aid

Approach), which is explained in more detail in the following section. Under bad weather conditions, ILS approaches to the B- and D-Runways will be used.

The traffic departing to the north (30percent) will be assigned to the C-Runway. The traffic departing to the south and west (70 percent) will be assigned to the A-Runway. In this arrangement, departing traffic flight paths do not cross.

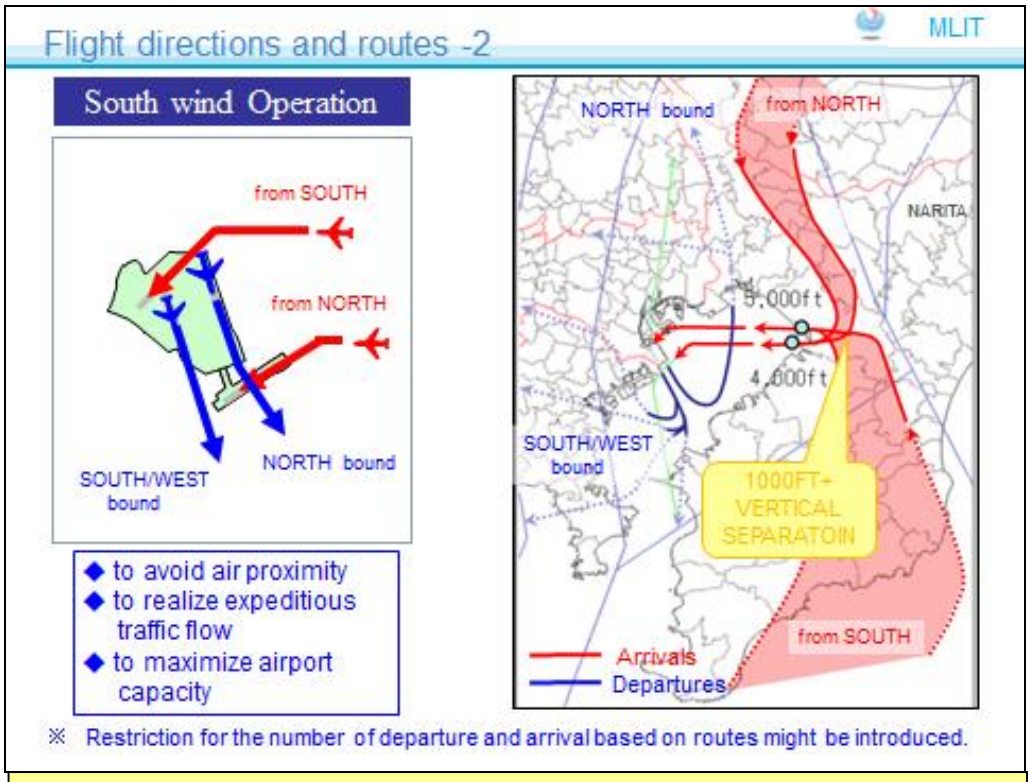


Figure 5: South wind operational traffic pattern plan

5. Localizer Type Directional Aid Approach (LDA)

In developing the LDA, two sets of Localizers (LOC) were installed to provide lateral guidance, one near the C-Runway at the airport, and the other on the man-made waste dump island located northeast of the airport. These two sets of LOC transmit the lateral guidance signal toward Chiba City in Chiba Prefecture, where arriving aircraft will fly over the final approach fixes (FAF). After capturing the LOC, arriving aircraft descend at a

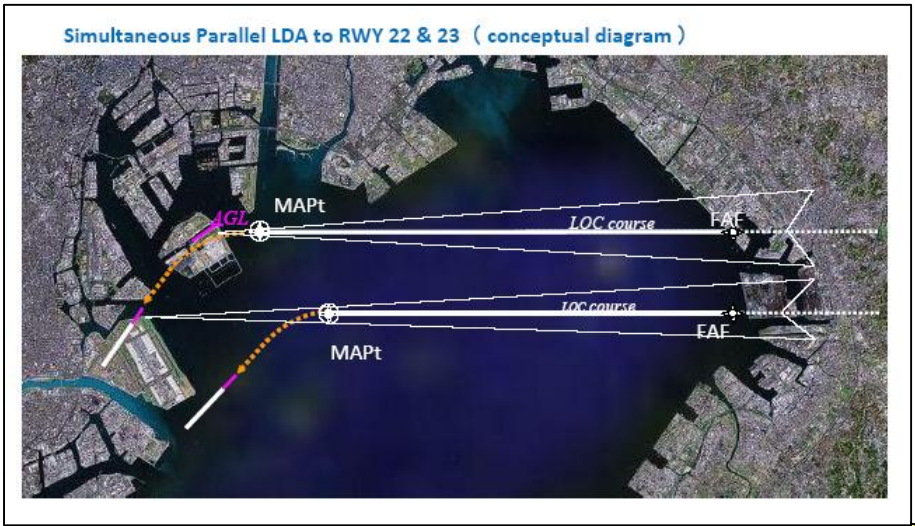


Figure 6: Localizer Type Directional Aid Approach (LDA)

constant rate along the LOC signal over missed approach points (MAPt), which are located 3.4 and 3.8 miles from the runway threshold. Arriving aircraft then make a left turn after passing the MAPt to make a final approach as a visual maneuver to the B- and D-Runways. Airlines should ensure aircrews are able to conduct these LDA approaches.

6. Charted Visual Approach (CVA)

For the first time in Japan, a Charted Visual Approach (CVA) will be implemented to the A- and C-Runways to minimize public annoyance by aircraft noise. The CVA will be conducted during good weather conditions on a north wind operation.

Approach courses and altitudes will be prescribed on charts and pilots are required to fly in accordance with them. At the same time, pilots are responsible for preventing collision with obstacles on the surface, maintaining visual separation with other aircraft, and avoiding wake turbulence.

As the CVA to A- and C-Runways will be conducted independently, two aircraft may fly side-by-side within 1 nautical mile. During this operation, safe separation must be maintained visually by the pilots.

Airlines are encouraged to ensure aircrews are familiar with these rare simultaneous Charted Visual Approaches.

Figure 7: Charted Visual Approach (CVA)

7. Operational Procedures During Late Night and Early Morning Hours

The C- and D-Runways, which are farthest from residential areas, will be used as the principle operational runways both in north and south wind operations from 23:00 to 5:55. The A- or B-Runways may be used as an alternative when C-, D-, or both runways are closed for maintenance overnight. While typical operational patterns are shown below, they may not be applied in the case of an emergency, a typhoon, or other unforeseen situations. It is required that all aircraft have the capability to take-off and land on a runway length of 2,500 meters.

(1) North Wind Operations (60 percent)

Figure 8 shows the runway use and aircraft movement patterns for the north wind operation. Generally, the aircraft land on the C-Runway (34R) and take off from the D-Runway (05). When the C-Runway is closed for

maintenance, aircraft land on the A-Runway (34L). When the D-Runway is closed for maintenance, aircraft take-off from and land on the C-Runway (34R).

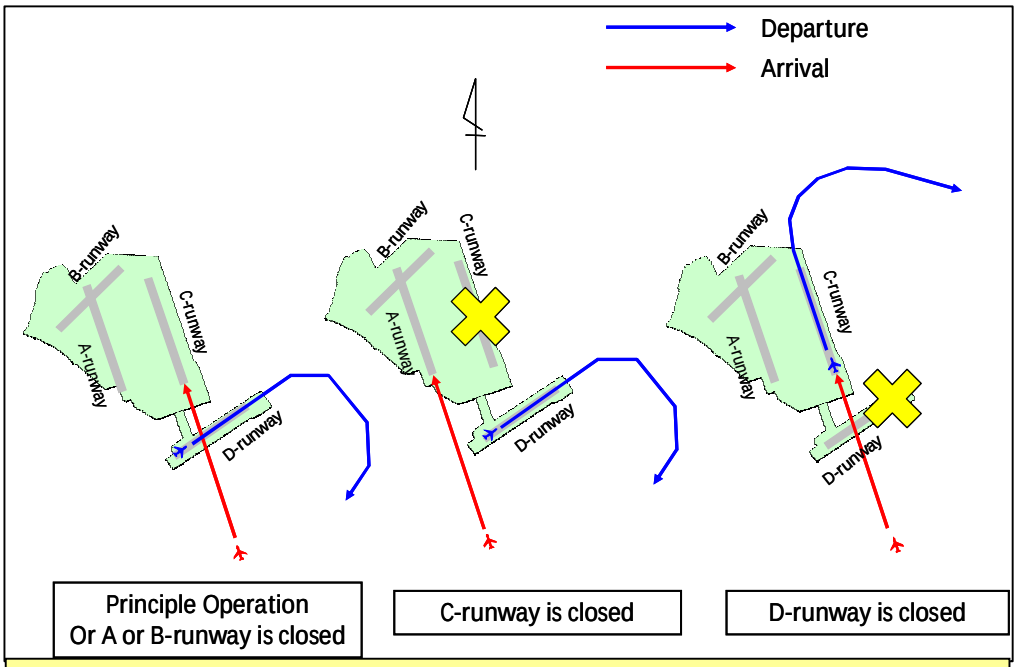


Figure 8: The use of runway and Aircraft movements (North Wind)

(2) South Wind Operations (40 percent)

Figure 9 shows the runway use and aircraft movement patterns for the south wind operation. Generally, aircraft land on the D-Runway (23) and take-off from the C-Runway (16L). When the C-Runway is closed for maintenance, aircraft take-off from the A-Runway (16R). When the D-Runway is closed for maintenance, aircraft take-off from and land on the C-Runway (16L). If an aircraft cannot land on the C-Runway due to a strong south-west wind, the aircraft will land on the B-Runway (22) without the use of the ILS in order to avoid creating noise pollution.

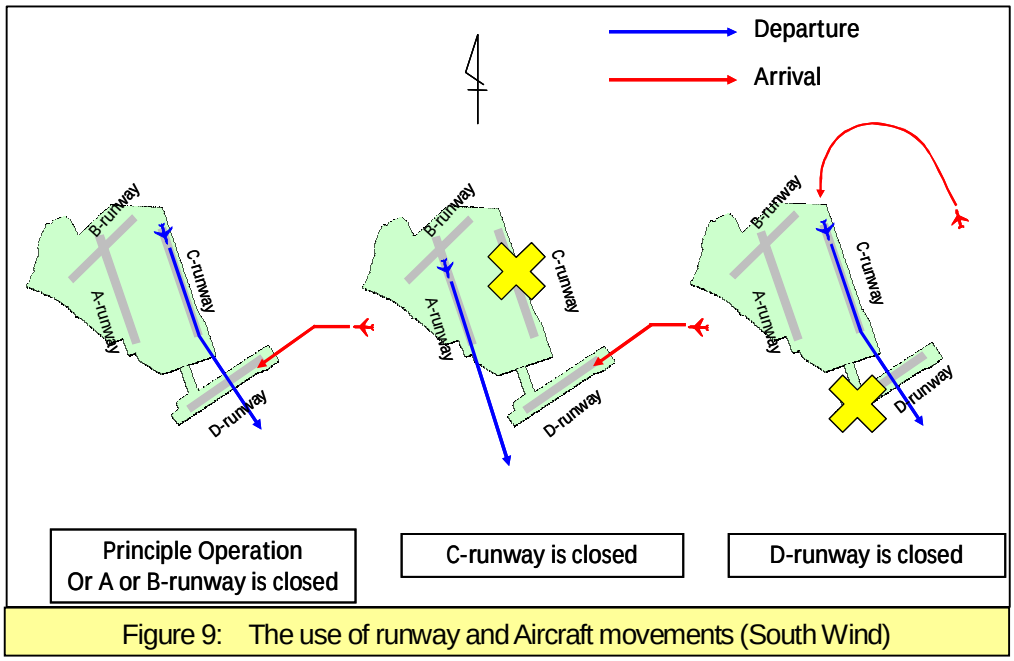
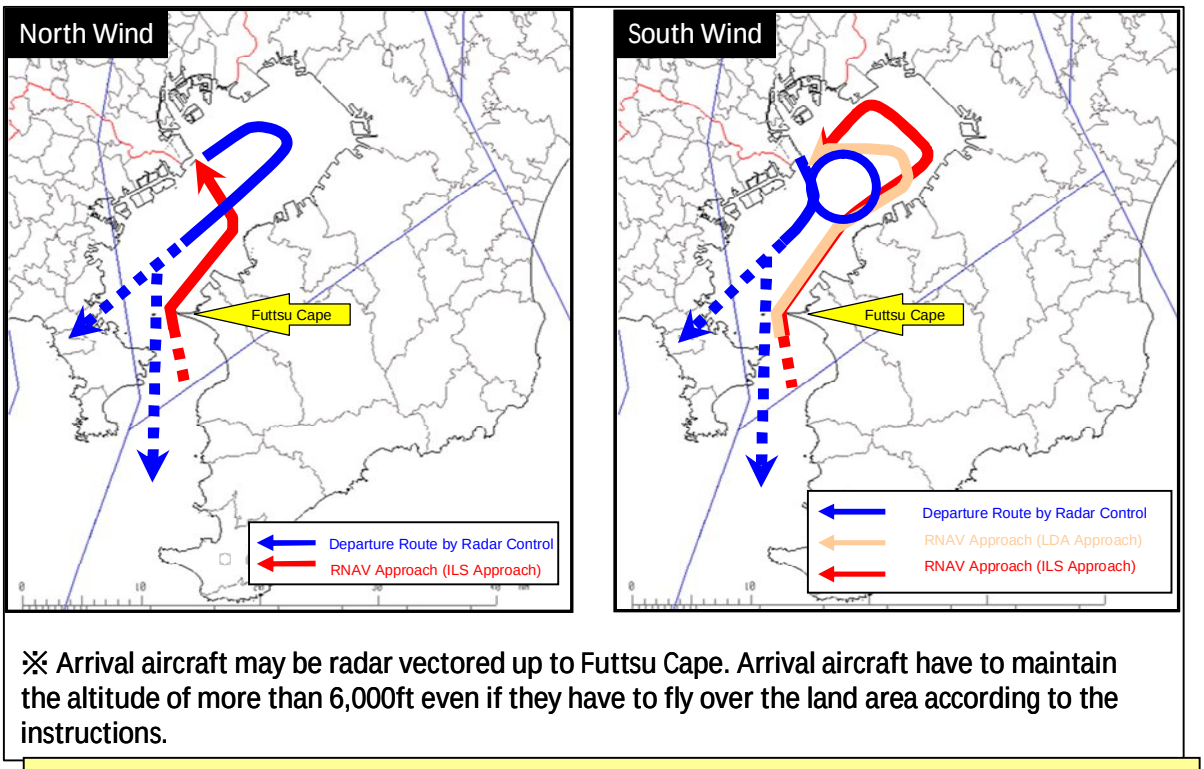


Figure 9: The use of runway and Aircraft movements (South Wind)

(3) Standard Departure and Arrival Routes (Radar Contact at IFR Room)

During 23:00 to 5:55, the departure and arrival routes will be limited to the over-water areas of Tokyo Bay. Standard departure and arrival routes for north wind and south wind operations are shown in Figure 10. During north wind operations, the ILS approach will be used. During south wind operations, the LDA approach will be used primarily, and the ILS approach for D-Runway will be available only in bad weather conditions due to noise abatement procedures. Almost identical departure and arrival routes will be used in the case of alternative runway use. In order to meet operational requirements during night hours, aircraft must be certified for RNAV1 and RNAV5 operations.



※ Arrival aircraft may be radar vectored up to Futtsu Cape. Arrival aircraft have to maintain the altitude of more than 6,000ft even if they have to fly over the land area according to the instructions.

Figure 10: Standard departure and arrival routes during late night and early morning hours

8. Constraints Setting and Collaboration between ATC and Flight Crews

Airport capacity may be easily calculated by runway configurations and runway occupancy time only if limits such as environmental issues, airspace and aerodrome constraints do not exist. However, Haneda Airport has many constraints as explained in the introduction. Considering the challenging environmental constraints, weather conditions, Japan's unique traffic generation, complex traffic patterns and location of the international passenger terminal building, JCAB has striven to utilize the airport capacity of Haneda to the maximum extent possible.

Based on JCAB's analysis, the number of departures and arrivals per hour referred in Figure 11 is the maximum number possible while maintaining safety and regularity of flights. However, this number may be increased incrementally while ensuring that the safety and punctuality of aircraft operations are maintained. The number of departure and arrival flights will be increased as ATC personnel and flight crews'

familiarization with these new procedures increases in the future. The collaboration between ATC personnel and flight crews is very important and essential in order to maintain the safety of flight operations and the expeditious flow of flights at Haneda Airport.

To guarantee the delivery of both punctuality and capacity, the airlines' efforts are required. In particular, quick responses to ATC instructions and minimizing runway occupancy times will lead to a smooth operation. In addition, airlines are strongly encouraged to become familiar with these operational procedures at Haneda Airport.

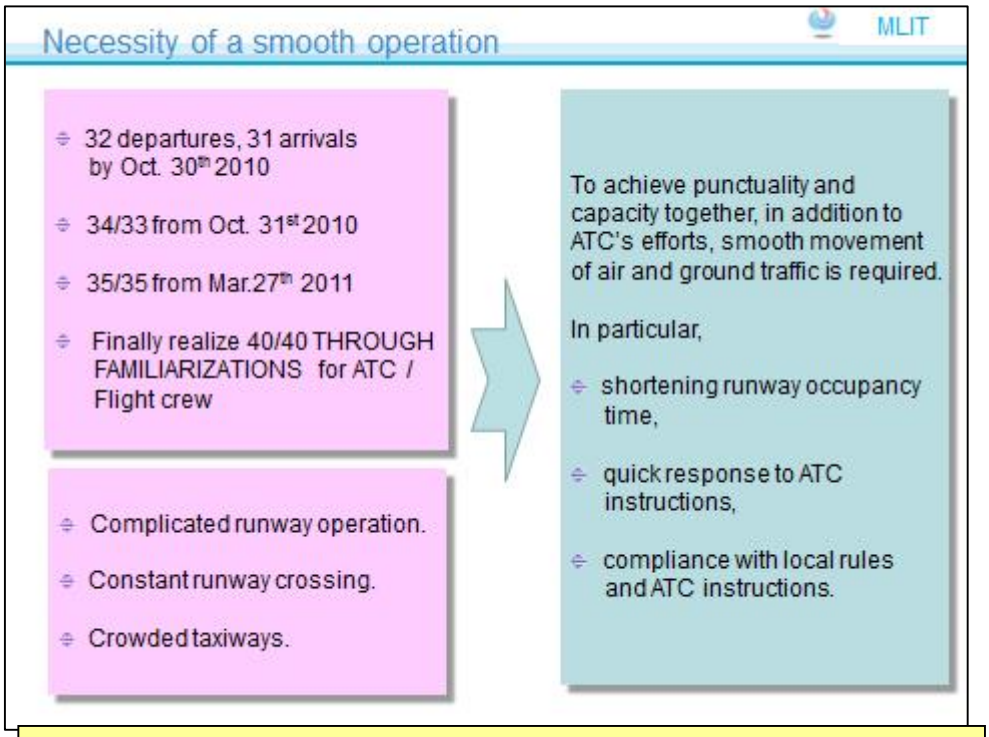


Figure 11: Constraints Setting and ATC Instructions

9. In-flight Traffic Flow Management (under consideration)

To maintain an orderly and efficient flow of traffic, a Ground Delay Program has been implemented on domestic flights. However, to cope with capacity enhancements at Haneda and Narita Airports, JCAB believes it will be necessary to implement in-flight Traffic Flow Management Initiatives for both domestic and international flights. At present, new measures are under consideration.

(Note 1) Some of the figures used in this material are subject to change.
(Note 2) Some of the constraints shown in Figure11 are subject to change.