TOWER AIR TRAFFIC CONTROL

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Chapter 1 – An Introduction to Local Control

1-1 Tower, better known as the Local Controller is responsible for the active runway surfaces. Local control clears aircraft for takeoff or landing and ensures the runway is clear for these aircraft. To accomplish this, local control controllers are normally given 2 to 5 nautical miles (4 to 9 km) of airspace around the airport, allowing them to give the clearances necessary for airport safety. If the local controller detects any unsafe condition, a landing aircraft will be told to "go around" and will be re-sequenced into the landing pattern by the terminal area controller.

1-2 A highly disciplined communications process between local and ground control is an absolute necessity. Ground control must request and gain approval from local control to cross any runway with any aircraft or vehicle. Likewise, local control must ensure ground control is aware of any operations that impact the taxiways and must work with the arrival radar controllers to ensure "separation" of arrival traffic is created and most importantly, maintained (where necessary) to allow taxiing traffic to cross runways and to allow departures aircraft to take off.

1-3 In real-life Tower controllers control aircraft based primarily on what they see out the windows. All separation standards depend on seeing the aircraft and other visible landmarks. Tower radar displays are only an aid. Here on VATSIM it's a bit different. You can't see out the windows so your radar display, supplemented by pilot reports, becomes your primary tool.

1-4 The tower controller should be using the “Tower” Radar mode. “Tower” radar mode simulates ASDE-X (ground) radar and allows us to see data tags of aircraft when squawking stand-by. Tower controllers in the Thailand Division shall not at anytime “TAG-UP” any aircraft. “TAGING-UP” an aircraft is a Radar function only. All aircraft are to be advised to squawk stand-by while on the ground.

Chapter 2 – Runway Selection

2-1 Normally Tower selects the runway in use. However, at some locations due to the close proximity of other airports or other factors, Approach Control will select the runway in use. You should remain flexible and consider the impact on other controllers when selecting and coordinating a runway in use.

2-2 When deciding runways in use, first refer to any “runway use,” runway selection programs, or calm wind designation that an airport has in effect. These may be located in Letters of Agreement, Facility Directives, or Standard Operating Procedures. If there is no selection program, then use the runway most aligned with the winds when speed is greater than 5 knots. If winds are less than 5 knots, use a designated “calm wind” runway, or a runway of your choice or pilot choice.

2-3 It should be noted that the "calm wind runway" does not mean that the winds are calm. As stated in the Basic Study Guide, when the winds are less than three knots, it is considered "calm." Therefore, "Calm Winds" and "Calm Wind Runway" are two separate terms. On the radio, you may state “Calm Winds” only when winds are less than 3 knots, from any direction.

2-4 Sometimes operational factors will make another runway less aligned with the wind more suitable. Reasons for selecting a different runway could be the availability of instrument approaches, length, noise abatement, or other locally unique reasons. You may use a runway other than the runway in use if it will be operationally advantageous or is requested by the pilot. Some examples would be: Assigning large aircraft to the runway in use and smaller aircraft to another runway, or a pilot requesting a straight-in approach to a different runway instead of flying a complete pattern to the runway in use, or requesting a runway that is closer to his parking area.
State the runway in use when using another runway e.g. "RUNWAY 19R IN USE, RUNWAY 19L CLEARED TO LAND."

Chapter 3 – Coordination

3-1 In addition to the general coordination concepts you learned in the Basic Study Guide, and built upon in the Ground Control Study Guide, Local Control has its own unique coordination requirements. For instance, when you authorize Ground Control to cross an active runway, you should use the word "*CROSS*" and the runway number, e.g. "*CROSS RUNWAY 36*." In real-life each individual crossing must be coordinated. On VATSIM, to reduce the amount of coordination, blanket approval is sometimes given to GND to cross active runways when he sees it is safe to do so. You should inform GND of the type of crossing coordination you wish to use. Before you use any runway not previously designated as active you must coordinate with GND to make sure he doesn't have any aircraft taxiing on it

3-2 You should also coordinate with the Approach Controller to determine what type instrument approach arrivals will be making, handoff points, unplanned missed approach instructions, Class C or D Airspace procedures, and any other locally unique requirements. Finally, you should coordinate with the controller doing the departure function (DEP, APP, or CTR) to determine the initial vector or routing for departures, IFR release procedures (individual or automatic), and initial separation for successive departures.

Chapter 4 – Initial Contact and Position Determination

4-1 When working Local Control, as when working Ground, you should provide airport traffic control service on the basis of known or observed conditions. This is more difficult on VATSIM than in real-life. You cannot simply look out the window. You must rely on your radar display, pilot reports, and your own common sense.

4-2 Before you begin controlling an aircraft, you must know where it is. Again, just as in Ground Control, issuing control instructions without being sure of an aircraft's position could easily create a conflict. While aircraft positions on radar are generally accurate enough, pilots may be unsure of their exact location. Use caution when relying on aircraft position reports alone.

4-3 Arriving VFR Aircraft are required to establish communications before entering the Class C & D airspace. You must tell them "Cleared into the class Charlie or Delta Airspace" to let them transition the airspace.

Chapter 5 – Advisories and Traffic Information

5-1 Issue information about the airport necessary for an aircraft's safe operation in time for it to be useful to the pilot. While not likely to be encountered on VATSIM, this would include information on construction, less than normal braking action, or other pertinent airport conditions. When describing any observed abnormal aircraft condition always use the term "APPEARS", e.g. "IT APPEARS YOU HAVE LANDED ON THE WRONG RUNWAY." This is especially useful on VATSIM because what the pilot sees on his computer may not exactly match what you see on yours.

5-2 All vehicles, equipment, and personnel must be off the runway before a departing aircraft starts takeoff roll or a landing aircraft crosses the landing threshold. The only positive way to ensure this is by requiring these vehicles, etc to maintain radio contact with the control tower at all times. They may only enter the runway with permission from the tower and must exit and report off when instructed. When vehicles, equipment, or personnel are on the runway, aircraft may still make low approaches to that runway if they are restricted to at least 500 feet above the airport elevation, e.g. airport elevation 300MSL "CLEARED FOR LOW APPROACH AT OR ABOVE 800 VEHICLE ON THE RUNWAY."

5-3 Vehicles, equipment, and personnel in direct communications with the control tower may be authorized to operate up to the edge of the runway, but not actually on it, if you issue an advisory to the aircraft, eg "*MEN AND EQUIPMENT RIGHT SIDE OF RUNWAY*." Advise other aircraft of the runway braking action when reports are received from pilots. While reduced braking action is not currently modeled in Flight Simulator you should know how to handle any reports you may receive from pilots or observe in the REMARKS section of a METAR. Describe the quality of braking action using the terms "GOOD" "FAIR" "POOR" or "NIL" and include type of aircraft e.g. "*BRAKING ACTION POOR, REPORTED BY A 727*." If the pilot report uses different words, ask him to restate braking action in these terms.

5-4 Traffic alerts. You may also issue traffic in the standard radar traffic advisory format. This consists of:

1. 12-hour clock position or cardinal direction (N, S, E, W).
2. Distance in miles.
3. Direction of movement.
4. Type and altitude if known

"THA126, TRAFFIC, 11 O'CLOCK, 10 MILES, SOUTHBOUND, BOEING 737, at FL170."
“THA126, TRAFFIC 12 O”CLOCK, 3 MILES, TURNING RIGHT BASE, DASH-8 at 5000.”

5-5 When the traffic is no longer a factor or depicted on radar inform the pilot e.g. "TRAFFIC NO FACTOR/NO LONGER OBSERVED."

Chapter 6 – Wake Turbulence

6-1 Wake turbulence is generated by the passage of an aircraft through the atmosphere. Generally speaking the heavier the aircraft the more wake turbulence. The term also includes vortices, thrust stream turbulence, jet blast, jet wash, propeller wash, and rotor wash both on the ground and in the air. Wake turbulence may be encountered by aircraft on the ground as well as in flight. Because wake turbulence is unpredictable, controllers are not responsible for anticipating its existence or effects. Wake turbulence isn't modeled by Flight Sim so pilots won't experience its effects but as a controller you are still required to provide the appropriate wake turbulence separation. Thailand uses ICAO defined weight classes.

a. Heavy aircraft are capable of takeoff weights of 300,000 pounds or more whether or not they are operating at this weight during a particular phase of flight. Some examples are most 707/C-135, all 747, 767, DC-10, L-1011, A-300, C-5, C-141, C-17, and B-52.
b. Medium aircraft are aircraft of more than 15,500 pounds but less than 300,000 pounds maximum takeoff weight. Most military, Air Carrier, and other non-General Aviation aircraft are Medium. Some examples are most 757, 737, A-320, DC-9
c. Light aircraft are aircraft of 15,500 pounds or less maximum takeoff weight. Most General Aviation aircraft are Light and most weigh 15,500 lb or less.

6-2 Apply wake turbulence procedures to aircraft operating behind Heavy jets and, where indicated, to Light aircraft behind Medium or Heavy aircraft. Specific separations are listed in the appropriate sections.

6-3 Controllers shall not be required to apply wake turbulence separation:

a. For arriving VFR flights landing on the same runway proceeding landing heavy or medium
b. Between arriving IFR flights executing visual approaches when the aircraft has reported the proceeding aircraft in sight and has been instructed to follow and maintain own separation from that aircraft
c. Controllers should issue wake turbulence cautionary advisories when conditions a & b are encountered.

Chapter 7 – Time Based Wake Turbulence Separation

7-1 When dissimilar aircraft weight classes are involved, tower controller shall apply the appropriate time based wake turbulence separation to that situation. Weight class definitions are in Chapter 6-1, a, b, and c.

7-2 Arriving Aircraft

7-2-1 Except as provided in chapter 6-3, a, b and c the following separation minima shall be applied to ARRIVING aircraft:

a. MEDIUM aircraft behind HEAVY aircraft --- 2 minutes
b. LIGHT aircraft behind a HEAVY or MEDIUM aircraft --- 3 minutes

7-3 Departing Aircraft

7-3-1 A minimum separation of 2 minutes shall be applied between LIGHT or MEDIUM aircraft taking off behind HEAVY aircraft or a LIGHT aircraft taking off behind a MEDIUM aircraft when the aircraft are using:

a. The same runway
b. Parallel runways separated by less than 760m (2500 ft) (see figure 7.1)

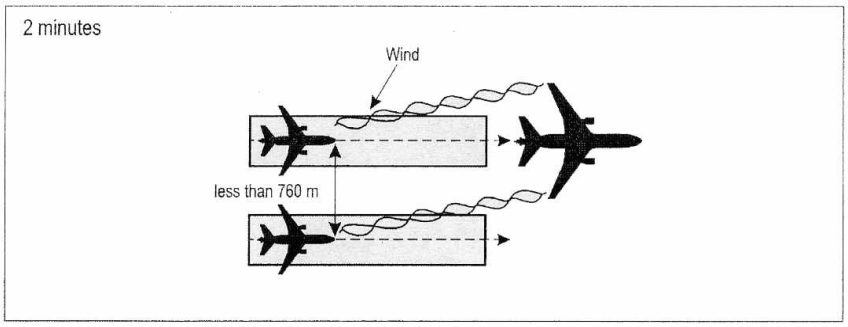


Figure 7.1

c. Crossing runways if the projected flight path of the second aircraft will cross the projected flight path of the first aircraft at the same altitude or less than 300 m (1000 ft) below. (see figure 7.2)

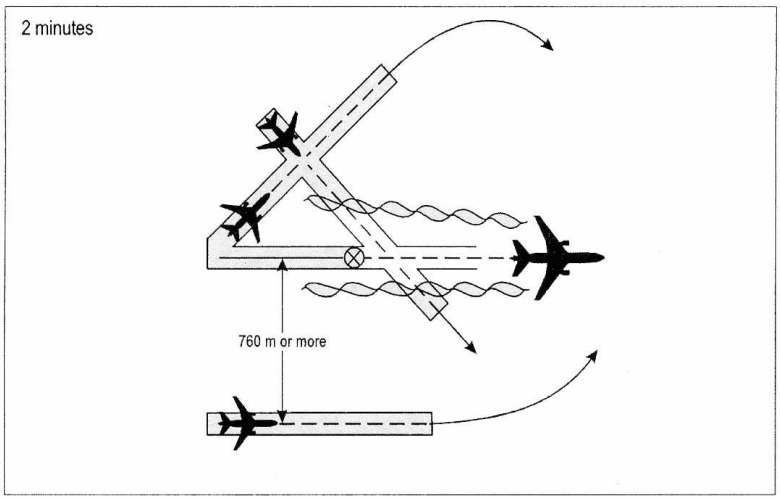


Figure 7.2

7-3-2 A separation of 3 minutes shall be applied between a LIGHT or MEDIUM aircraft when taking off behind a HEAVY aircraft or a LIGHT aircraft when taking off behind a MEDIUM aircraft from:

a. An intermediate part of the same runway; or
b. An intermediate part of a parallel runway separated by less than 760 m (2500 ft). (see figure 7.3)

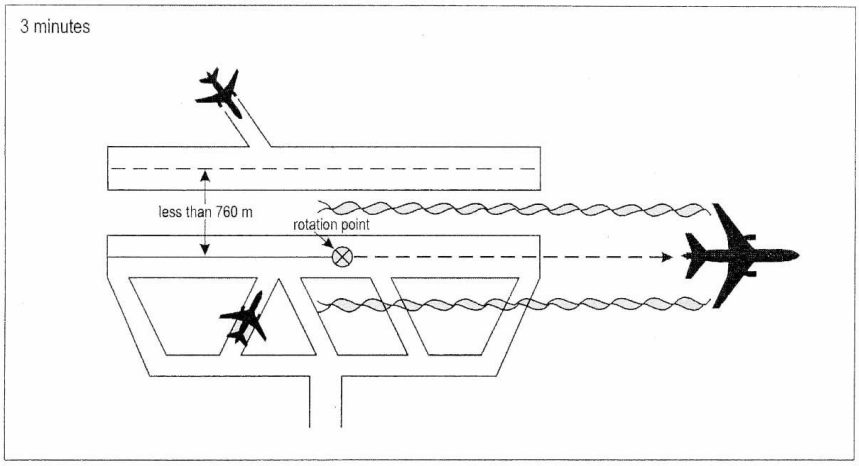


Figure 7.3

7-4 Displaced Landing Threshold

7-4-1 A separation minimum of 2 minutes shall be applied between a LIGHT or MEDIUM aircraft and a HEAVY aircraft and between a LIGHT aircraft and a MEDUIM aircraft when operating on a runway with displaced landing threshold when:

a. A departing LIGHT or MEDIUM aircraft follows a HEAVY aircraft arrival and a departing LIGHT aircraft follows a MEDIUM aircraft arrival; or
b. A arriving LIGHT or MEDIUM aircraft follows a HEAVY aircraft departure and a arriving LIGHT aircraft follows a MEDIUM aircraft departure if the projected paths are expected to cross.

7-5 Opposite direction

7-5-1 A separation minimum of 2 minutes shall be applied between a LIGHT or MEDIUM aircraft and a HEAVY aircraft and between a LIGHT aircraft and a MEDUIM aircraft when the heavier aircraft is making a low approach or missed approach and the lighter aircraft is:

a. Utilizing an opposite-direction runway for take-off; or (see figure 7.4)

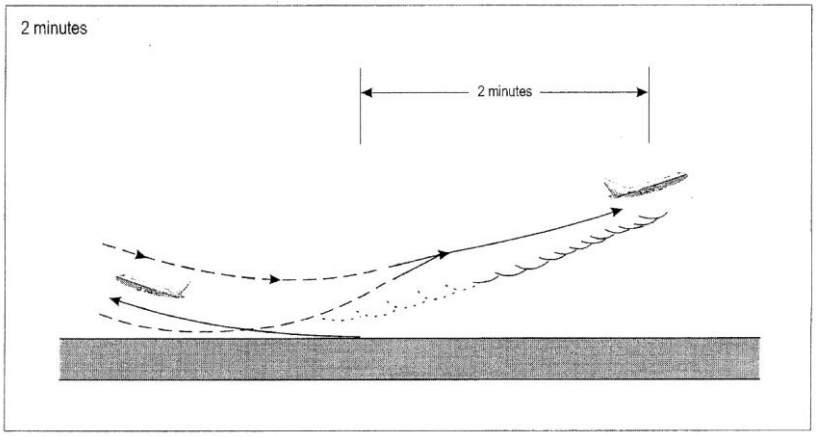


Figure 7.4

b. Landing on the same runway in the opposite direction, or on a parallel opposite-direction runway separated by less than 760 m (2500 ft). (see figure 7.5)

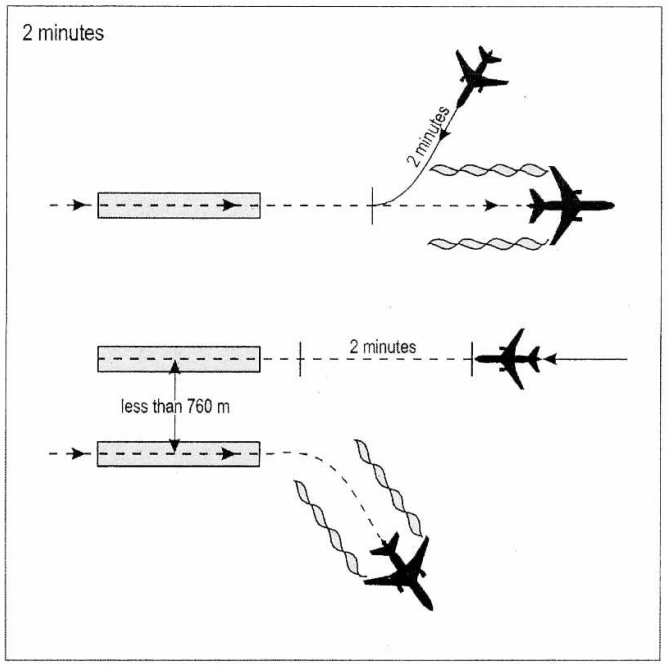


Figure 7.5

Chapter 8 – Tower Departure and Arrival Separation

8-1 Control of Departing Aircraft

8-1-1 Departure Sequence, Departures shall normally be cleared in the order in which they are ready for take-off, except that deviations may be made from this order of priority to facilitate the maximum number of departures with the least average delay. Factors that should be considered in relation to the departure sequence include:

a. Types of aircraft and their relative performance;
b. Routes to be followed after take-off;
c. Any specific minimum departure interval between take-offs;
d. Need to apply wake turbulence minima;

e. Aircraft which should be afforded priority;

8-1-2 Except when wake turbulence minima is required, departing aircraft will NOT normally be permitted to commence take-off until the preceding departing aircraft has crossed the end of the runway-in-use or has started a turn or until all preceding landing aircraft are clear of the runway-in-use. (refer to figure 8.1)

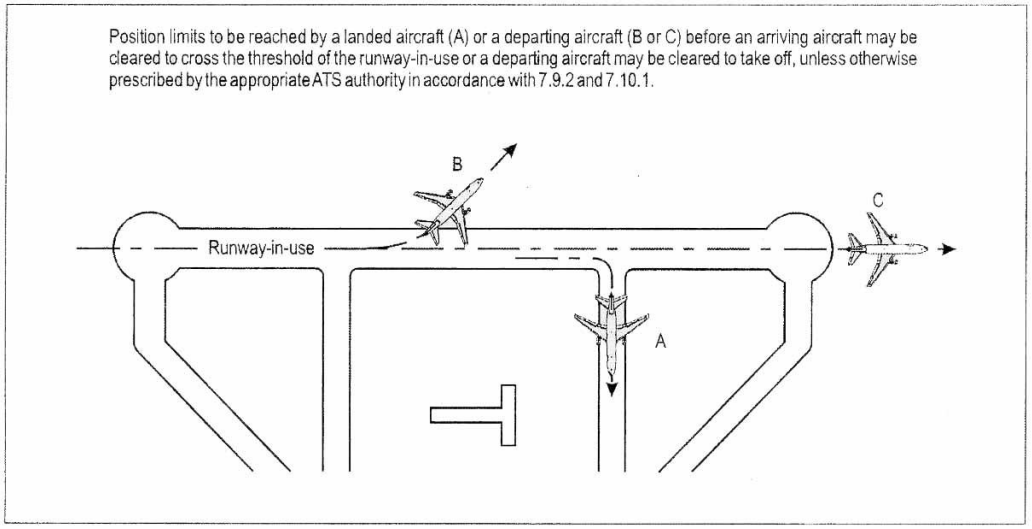


Figure 8.1

8-1-3 Take-off clearance may be issued to an aircraft when there is reasonable assurance that the separation in 8-1-2 will exist when the aircraft commences take-off.

8-1-4 The take-off clearance shall be issued when the aircraft is ready for take-off and at or approaching the departure runway, and the traffic situation permits. To reduce the potential for misunderstanding, the take-off clearance controllers shall include the designator of the departure runway.

8-1-5 In the interest of expediting traffic, a clearance for immediate take-off may be issued to an aircraft before it enters the runway. On acceptance of such clearance the aircraft shall taxi out to the runway and take-off in one continuous movement.

8-1-6 In the interest of expediting traffic, Aircraft may be taxied into a holding position behind a departing or arriving aircraft. This shall be referred as “line up”

8-1-7 To issue a take-off clearance the controller shall use one of the following phrases:

a. (callsign), Wind (xxx) degrees at (xx) knots, Runway (xx) cleared for take-off.
b. (callsign), (traffic information) Wind (xxx) degrees at (xx) knots, runway (xx) cleared for take-off.
c. (callsign) when airborne contact approach on (frequency). Wind (xxx) degrees at (xxx) knots, Runway (xxx) cleared for take-off.

8-0 Control of Arriving Aircraft

8-1 Except when wake turbulence minima is required, the following rules shall apply:

8-2-1 An aircraft may be cleared to land when there is a reasonable assurance that proper separation exists when that aircraft crosses the runway-in-use threshold:

a. The proceeding arrival has landed and taxied clear of the runway-in-use.
b. The proceeding departure is airborne and past the runway end of the runway-in-use.
c. Crossing runways, that the preceding departing or arriving aircraft has passed the intersection point prior to the arrival crossing the threshold.

8-2-2 IFR Arrivals will be separated, sequenced, and cleared for approach by the Approach Control. Tower need only issue landing clearance. VFR arrivals in Class C and D Airspace are handled the same as IFR arrivals. You must issue current landing information to VFR arrivals NOT handed off to you by APP.

a. Runway in use.
b. Wind.
c. Altimeter setting in QNH format.
d. Ceiling and visibility if below VFR.
e. Low level windshear advisories when available.
f. Braking action reports when available and the braking action is reported as "POOR" or "NIL."

8-2-3 Landing information contained in the ATIS broadcast may be omitted if the pilot states the appropriate ATIS code.

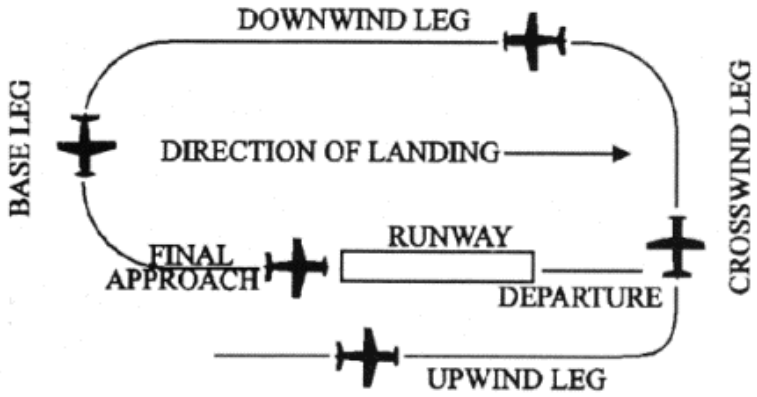
8-2-4 Issuing landing clearance controllers shall use one of the following phrases:

a. (callsign), wind (xxx) degrees at (xx) knots, runway (xx) cleared to land.
b. (callsign), Continue approach runway (xxx). You're number (x).
c. (callsign), Continue approach runway (xxx). Expect late landing clearance.

Chapter 9 – The Traffic Pattern

9-1 Aerodrome Traffic Circuit is defined as left-hand or right-hand, according to which way the turns in the pattern lie. They are usually left-hand because most small airplanes are piloted from the left seat (or the senior pilot or pilot in command sits in the left seat), and so the pilot has better visibility out the left window. Right-hand patterns will be set up for parallel runways for noise abatement or because of ground features (such as terrain, towers, etc.). Helicopters are encouraged, but not required, to use an opposite pattern from fixed wing traffic due to their slower speed and greater maneuverability. Because the active runway is chosen to meet the wind at the nearest angle (upwind), the circuit orientation also depends on wind direction.

9-2 Traffic Pattern



9-2-1 Patterns are typically rectangular in basic shape, and include the runway along one long side of the rectangle. Each leg of the pattern has a particular name:

a. **Upwind Leg** - A flight path parallel to the landing runway in the direction of landing.
b. **Crosswind Leg** - A flight path at right angles to the landing runway off its takeoff end.
c. **Downwind Leg** - A flight path parallel to the landing runway in the opposite direction of landing.
d. **Base Leg** - A flight path at right angles to the landing runway off its approach end and extending from the downwind leg to the intersection of the extended runway centerline.
e. **Final Leg** - A flight path in the direction of landing along the extended runway centerline from the base leg to the runway.
f. **Departure Leg** - The flight path which begins after takeoff and continues straight ahead along the runway centerline. The departure climb continues until reaching a point at least 1/2 mile beyond the departure end of the runway and within 300feet of the traffic pattern altitude.

9-2-1 Pattern Altitude:

9-2-2 A facility will define a pattern altitude, that is, a nominal altitude above the field at which pilots are required to fly while in the pattern. Thailand uses the following:

a. Jet and Prop-jet…… 1500 feet AGL
b. Conventional ……..1000 feet AGL
c. Light Aircraft……..600 feet AGL
d. Helicopters……..500 feet AGL

** If true airspeed is less than 130 kts, aircraft is considered a light aircraft.**

9-2-3 Here are several example of phraseology used for communicating with traffic entering, exiting or in the traffic pattern:

a. JOIN [(direction of circuit)] (position in circuit) (runway number) WIND (direction and speed) QNH (number) [TRAFFIC (detail)]
b. MAKE STRAIGHT-IN APPROACH, RUNWAY (number), WIND (direction and speed) QNH (number) [TRAFFIC (detail)].
c. (Reporting with ATIS) JOIN [(direction of circuit)] (position in circuit) (runway number), QNH (number) [TRAFFIC (detail)].
d. (traffic information) RUNWAY (number) CLEARED TO LAND.
e. CLEARED TOUCH AND GO.
f. CLEARED LOW APPROACH [RUNWAY (number)].

g. GO AROUND.
h. CIRCLE THE AERODROME.
i. MAKE ANOTHER CIRCUIT.
j. MAKE SHORT APPROACH.
k. EXTEND (leg of pattern) I'LL CALL (next leg of pattern).
l. CAUTION WAKE TURBULENCE (departing/arriving and type aircraft).
m. WIND(numbers) MAKE (left/right) CLOSED TRAFFIC, REPORT (turning on leg or position on leg) RUNWAY (number) CLEARED FOR TAK OFF.

Chapter 10 – Tower Control with Procedural Control

10-1 When Approach or Center control positions are controlling by means of Procedural control, the rules of separating aircraft at the tower level also change. Procedural Controlling means that the Approach and/or Center positions are not controlling aircraft with radar. The controller is separating aircraft by means of time and pilot position reports. This makes the tower job a whole lot more difficult. The tower controller cannot just clear aircraft for take-off and let the Approach controller separate them. When procedural controlling is in effect the times between successive departures and between departures arrivals increases greatly. In Thailand the Approach and Center controllers have the option of controlling by means of Radar or Procedural control. When you log on you must check with the controller to find out the method of controlling.

10-2 Departure from Departure Separation rules when procedural controlling is in use.

10-2-1 One –minute separation is required if aircraft are to fly on tracks diverging by at least 45 degrees immediately after take-off so that lateral separation is provided (see figure 10.1) When weight classes differ, time-based wake turbulence longitudinal separation minim shall be applied and supersede the 1 minute rule. You must still coordinate with Approach/Center on each departure.

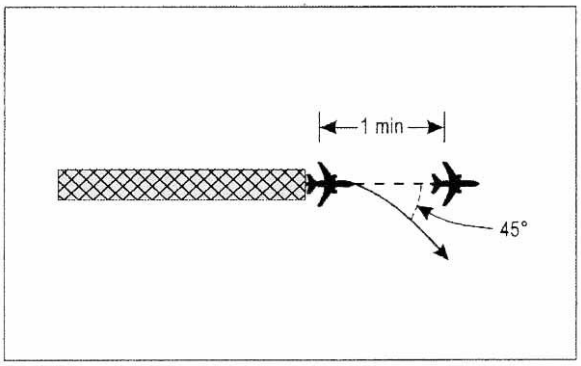


Figure 10.1

10-2-2 Two minutes are required between take-offs when the proceeding aircraft is 40 kts or more faster than the following aircraft and both aircraft will be following the same track (see figure 10.2) When weight classes differ, time-based wake turbulence longitudinal separation minim shall be applied and supersede the 2 minute rule. You must still coordinate with Approach/Center on each departure.

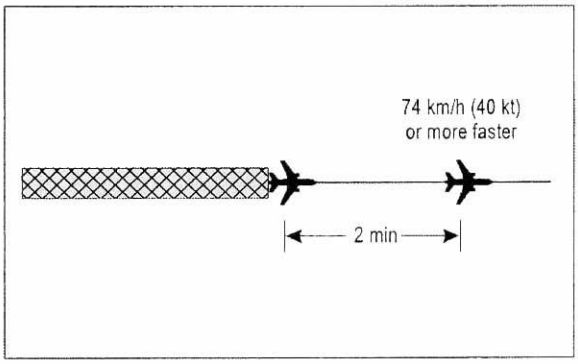


Figure 10.2

10-2-3 Five minute separation is required while vertical separation does not exist if a departing aircraft will be flown through the level of a proceeding departing aircraft and both aircraft propose to follow the same track (see figure 10.3). Action must be taken to ensure that the five-minute separation will be maintained or increased while vertical separation does not exist. This rule includes aircraft the will be flying the same Standard Instrument Departure (SID) or the same airway (routing). You must still coordinate with Approach/Center on each departure.

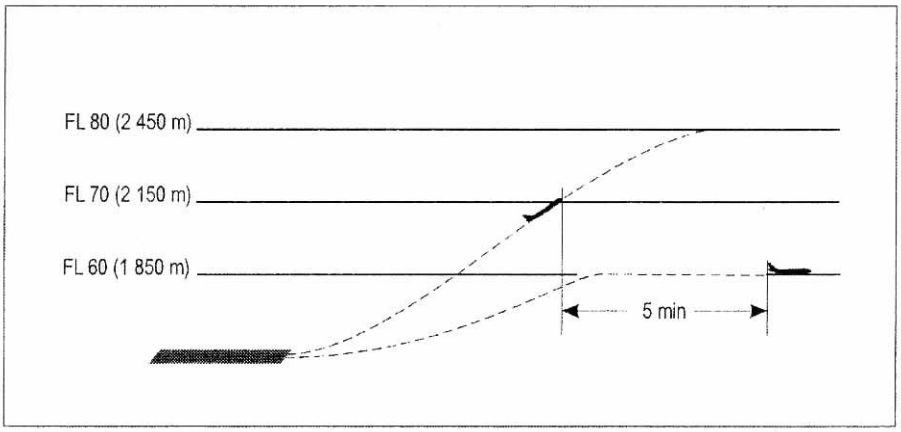


Figure 10.3

10-3 Separation of departing aircraft from arriving aircraft rules when procedural controlling is in use.

10-3-1 No Take-offs are permitted in the direction of an arriving aircraft or less than 45 degree of the final approach course for that procedure being flown when the arriving aircraft has started the procedure turn nor within the last 5 minutes of a straight-in approach. Refer to Figure 10.4

10-3-2 No Take-offs permitted between 315 degrees clock wise to 135 degrees from the final approach course of an approach up to 3 minutes before the estimated arrival of a aircraft performing straight-in approach, crosses a designated fix (usually the Outer marker or final approach fix) on the approach track. No Take-offs permitted between 315 degrees clock wise to 135 degrees from the final approach course of an approach up to 3 minutes before the estimated arrival of an aircraft performing a full procedure approach. Refer to figure 10.4

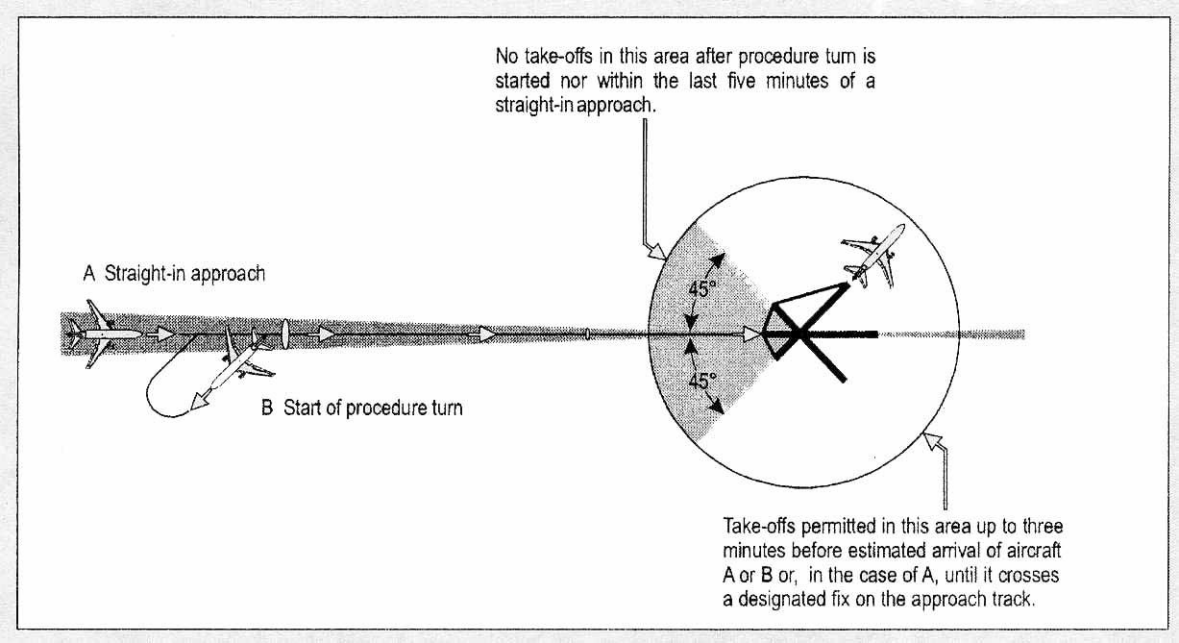


Figure 10.4

Chapter 11 – Missed Approaches

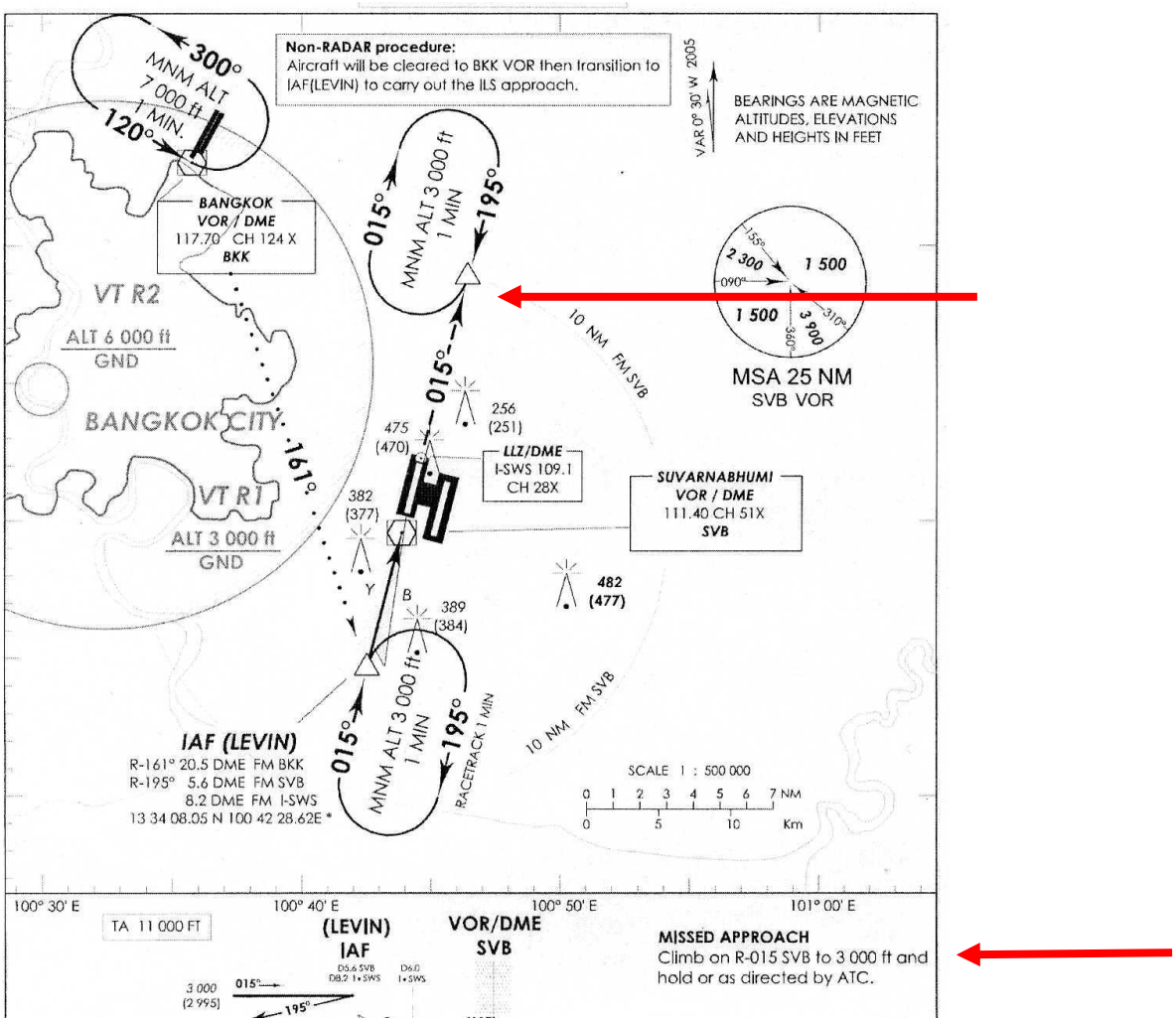
1. A missed approach is a segment of an instrument approach. The pilot will fly the missed approach segment while on an instrument approach when he is unable to land for various reasons. The number one reason is usually due to weather. All instrument approaches have a text and graphic instruction on what to do if the pilot go's missed approach. Missed approached usually include a turn, climb and a hold.

2. A Go-Around is similar to a missed approach but is usually performed by aircraft flying in VFR condition and are able to maintain visual contact with the runway.

3. If a pilot reports to you "Missed Approach" you will have two options.

a. Option one; You can issue the pilot instructions that mirror the instructions on the approach plate. Or you can issue instructions that you and the approach controller have agreed upon.
b. Option two; advise the pilot to fly the missed approach procedure as filed.

Below are two images of two different ILS approaches to VTBS.



In this example if the pilot goes's missed approach he will climb to 3000 on the SVB 015 radial to 10 DME and hold. The red arrows point to the graphic and the text missed approach information.

Here are some phraseology examples for the previous graphic.

Pilot

Suvarnabhumi Tower, THA124, missed approach.

Controller

THA124, climb to 3000. track the SVB 015 radial to 10 DME

Then

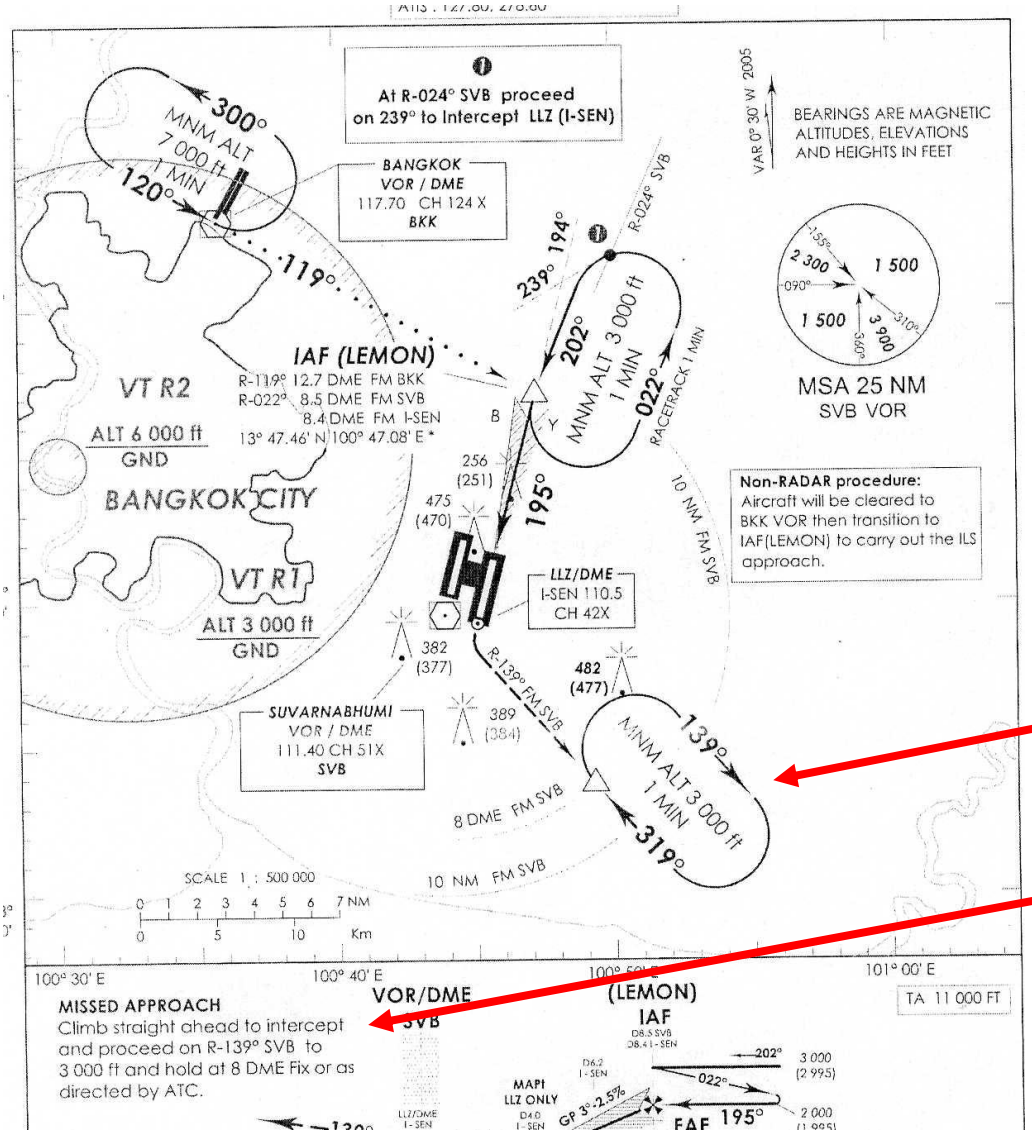
THA124 contact Approach on (xxx.xx)

Or

THA124 Execute/fly missed approach procedure as published

Then

THA124 contact Approach on (xxx.xx) The approach controller will issue hold instructions and a EFC time.



In this example if the pilot goes' missed approach he will climb to straight ahead, intercept the SVB 139 radial to 8 DME and hold as published. The red arrows point to the graphic and the text missed approach information.

Here are some examples of phraseology from the previous graphic.

Pilot

Suvarnabhumi Tower, THA124, missed approach.

Controller

THA124, Climb to 3000, maintain runway heading and intercept the SVB 139 radial.

Then

THA124 contact Approach on (xxx.xx)

Or

THA124 Execute/fly missed approach procedure as published.

Then

THA124 contact Approach on (xxx.xx). The approach controller will issue hold instructions and a EFC time.

Written by John Holt
Training updated by John Holt 1-25-11