



## EAC 172-2

# Separation Methods & Minima

# Chapter-1

## Separation methods and minima

### 1.1 Scope:

1- The separation minima for application within a given portion of airspace shall be selected from those prescribed by the provisions of the PANS-ATM (ICAO Doc 4444) and the Regional supplementary procedures as applicable under the prevailing circumstances.

2- Where types of aids used or prevailing circumstances are not covered by current ICAO provisions, other separation minima shall be established as necessary by:

a) The appropriate ATS authority, following consultation with operators, for routes or portions of routes contained within the sovereign airspace of a state.

b) Regional air navigation agreements for routes or portions of routes contained within airspace over the high seas or over areas of undetermined sovereignty.

3- Selection of separation minima shall be made in consultation between the appropriate ATS authorities responsible for the provision of air traffic services in neighboring airspace when:

a) Traffic will pass from / to neighboring airspace(s).

b) Routes are closer to the common boundary of the neighboring airspace(s) than the separation minima applicable in a given circumstance(s).

4- Controllers shall give the priority to and provide ATS service in accordance with the procedures and minima prescribed by the provisions of the PANS-ATM (ICAO Doc 4444) and the Regional supplementary procedures except when:

a) Other procedures and/or minima are prescribed in a letter of agreement between appropriate authorities.

b) A deviation is necessary to assist an aircraft in an emergency.

5- Controllers shall exercise their judgments, utilizing their experience if they encounter situations not prescribed by the provisions of the PANS-ATM (ICAO Doc 4444) and the Regional supplementary procedures or in this circular

## **1.2 Responsibility and provision of separation:**

1- Expedition is secondary to the absolute requirement for safety.

2- In the provision of separation, controllers shall place greater emphasis on traffic planning and conflict avoidance, the method of separation applied shall be based on operational advantage, separation assurance shall be achieved by:

a) Planning traffic to ensure separation.

b) Executing the plan to achieve separation.

c) Monitoring the situation to ensure effective execution.

d) Separation shall be applied so that the spacing between the positions of aircraft is never less the prescribed minima.

e) If the type of separation or minimum used cannot be maintained, the controller shall plan/ensure that another type of separation exists, or another minimum is established, before the previously used separation/minimum would be insufficient.

f) The controller shall use discretion and initiative in circumstances where current procedures/situation appears to be in conflict with standard requirements in order to promote safe conduct of flight.

3- Separation should be increased when significant factors may affect the application of separation standards/minima, the increase should be sufficient to maintain separation minima.

## **1.3 Degraded aircraft performance:**

Whenever, as a result of failure or degradation of navigation, communications, altimetry, flight control or other systems aircraft performance is degraded below the level required for the airspace in which it is operating, the flight crew shall advise the ATC unit concerned without delay.

Aircraft operating performance characteristics of similar type aircraft may also vary between operators; factors in the performance variation include the model /series of aircraft operational conditions and in-flight or operator requirements.

Separation dependent on the performance of aircraft may be compromised by aircraft operating at different speeds; where differing aircraft speeds may compromise a separation standard, controllers shall

obtain speed confirmation from the aircraft concerned and, if required, adjust speed to ensure separation is maintained.

Where the failure or degradation affects the separation minimum currently being employed, the controller shall take action to establish another appropriate type of separation or separation minimum.

#### **1.4 Provision of standard separation:**

1- Vertical or horizontal separation shall be provided as follows:

- a) Between all flights in Class A and B airspaces;
- b) Between IFR flights in Class C, D and E airspaces;
- c) Between IFR flights and VFR flights in Class C airspace;
- d) Between IFR flights and special VFR flights; and
- e) Between special VFR flights.

*Except, during the hours of daylight when flights have been cleared to climb or descend subject to maintaining own separation and remaining in VMC.*

<b>TRAFFIC SITUATION</b>	<b>AIRSPACE CLASS</b>
<b>Traffic at or above FL 150</b>	<b>A</b>
<b>Traffic in Cairo control zone</b>	<b>B</b>
<b>Traffic below FL 150</b>	<b>D</b>
<b>IFR flights within other aerodrome control zones</b>	<b>D</b>

2- A controller shall not give clearance to execute any maneuver that would reduce the spacing between two aircraft to less than the applicable separation minimum.

3- A controller should apply larger separations than the specified minima, whenever exceptional circumstances such as unlawful interference or navigational difficulties so require.

4- Another type of separation or another minimum shall be established prior to current separation is infringed.

5- Where the type of separation or minimum used to separate two aircraft cannot be maintained, another type of separation or another minimum shall be established prior to the time when the current separation minimum would be infringed.

## **1.5 Increased separation:**

- 1- Separation standards are minima and shall be increased when:
  - a) Requested by the pilot.
  - b) A controller considers it necessary in the interest of safety;
  - c) Unusual situations necessitate: emergency, hijack, equipment degradation, etc.
  - d) Directed by the AT S Authority.

## **1.6 Loss of separation**

- 1- A controller may face a situation in which two or more aircraft are separated by less than the prescribed minima due to ATC errors, differences in pilot's estimated and actual times over reporting points...etc.
- 2- When facing such a situation, the controller shall:
  - a) Use all means to obtain the required minimum with the least possible delay; and
  - b) When practicable, pass traffic information, if a radar service is being provided, pass essential traffic information.

## Chapter-2

# VERTICAL SEPARATION

### 2.1 Vertical separation application:

1- Vertical separation shall be obtained by requiring aircraft using prescribed altimeter settings to operate at different levels expressed in terms of flight levels or altitudes.

2- Levels assigned to IFR aircraft shall provide a buffer of at least 500 FT with the base of control area (CTA).

3- A pilot shall commence level change as soon as possible, not later than 1 min after receipt of instructions, unless a later time or place is specified or approved.

4- A pilot shall report leaving a level which has been maintained for any period.

5- ATC shall request additional reports on leaving or reaching levels when needed.

### 2.2 Vertical separations minimum:

1- The vertical separation minimum (VSM) is a nominal 1 000 ft. below FL 290 and a nominal 2000 ft. at or above this level.

2- In Cairo FIR a reduced minima shall be used in designated RVSM airspace:

- a) A nominal of 1 000 ft. below FL 410; and
- b) A nominal 2 000 ft. at or above this level.

#### 2.2.1 Assignment of cruising levels for controlled flights:

1- An ATC unit shall normally authorize only one level for an aircraft beyond its control area, level at which the aircraft will enter the next control area.

2- Accepting unit is responsible for issuing clearance for further climb as appropriate, aircraft will be advised to request en-route any cruising level changes desired.

3- When an aircraft has been cleared into a control area at a cruising level, below the established minimum, the ATC unit responsible for the area shall issue a revised clearance, though the pilot has not requested the necessary cruising level change.

4- Aircraft may be cleared to change cruising level at a specified time, place or rate.

5- Cruising levels of aircraft flying to the same destination shall be assigned in a manner that will be correct for an approach sequence at destination.

6- An aircraft at a cruising level shall normally have priority over other aircraft requesting that cruising level.

7- When two or more aircraft are at the same cruising level, the preceding aircraft shall normally have priority.

8- The correlation of levels to track shall not apply whenever otherwise indicated in ATC clearances or specified in the A1P.

## **2.3 vertical separation during climb or descent:**

a) An aircraft may be cleared to a level previously occupied by another aircraft after the latter has reported vacating it, except when:

1) Severe turbulence is blown to exist;

2) The difference in aircraft performance is such that less than the applicable separation minimum may result;

b) In which case such clearance shall be withheld until the aircraft vacating the level has reported at or passing another level separated by the required minimum.

c) When aircraft, in the same holding pattern, are descending at markedly different rates, if necessary, specify a maximum descent rate for the higher and a minimum descent rate for the lower aircraft, to ensure the required separation is maintained.

d) Pilots in direct communication with each other may, with their concurrence, be cleared to maintain a specified vertical separation between their aircraft during ascent or descent.

### **2.3.1 Step climbs/descents**

a) The step climb procedures may be used to simultaneously climb aircraft to vertically separated levels provided that the lower aircraft is progressively assigned levels which provide vertical separation with the higher aircraft.

b) When applying step climb/descent procedures, pilots shall be advised that they are subject to a step climb/descent.

### **2.3.2 Specifying rates of climb/descent**

a) A rate of climb/descent shall be described in each level clearance when a specified rate is required to ensure the vertical separation is maintained;

b) A rate of climb/descent shall always be specified in feet per minutes.

### **2.3.3 Rate of descent for visual approach**

A rate of descent shall not be specified to aircraft instructed to make a visual approach.

### **2.3.4 VMC climb and descent**

a) When requested by pilots, controllers may authorize an aircraft to climb or descend subject to maintaining their own separation and remaining in VMC provided:

- 1) Essential traffic information is given;
- 2) The aircraft are in VMC;
- 3) It is during the hours of day light.

### **2.3.5 Assigning vacated levels**

a) A vacated level may be assigned immediately to a second aircraft provided that:

1) The required vertical separation has not been decreased because of the possibility of turbulence;

2) Both aircraft have been instructed to change level at a specified rate which will ensure that the applicable vertical separation standard is not infringed.

b) The lowest holding altitude may be assigned to a second aircraft when the first aircraft has reported. "ON FINAL"-LEFT (final approach altitude)".

## **2.4 Essential traffic information**

a) Essential traffic information is that controlled traffic to which the provision of separation by ATC is applicable, but which, in relation to a particular controlled flight is not, or will not be separated from other controlled traffic by the required separation minimum.

b) Essential traffic information shall include:

- 1) Direction of flight of aircraft concerned;
- 2) Type and wake turbulence category (if relevant) of aircraft concerned;
- 3) Cruising level of aircraft concerned; and

i) Estimated time over the reporting point nearest to where the level will be crossed; or

ii) relative bearing of the aircraft concerned in terms of the 12-hour clock as well as distance from the conflicting traffic; or

iii) Actual or estimated position of the aircraft concerned.

Note 1 — nothing in Section 5.10 is intended to prevent ATC from imparting to aircraft under its control any other information at its disposal with a view to enhancing air safety in accordance with the objectives of ATS as defined in Chapter 2 of Annex 11.

Note 2 — Wake turbulence category will only be essential traffic information if the aircraft concerned is of a heavier wake turbulence category than the aircraft to which the traffic information is directed.

# Chapter 3

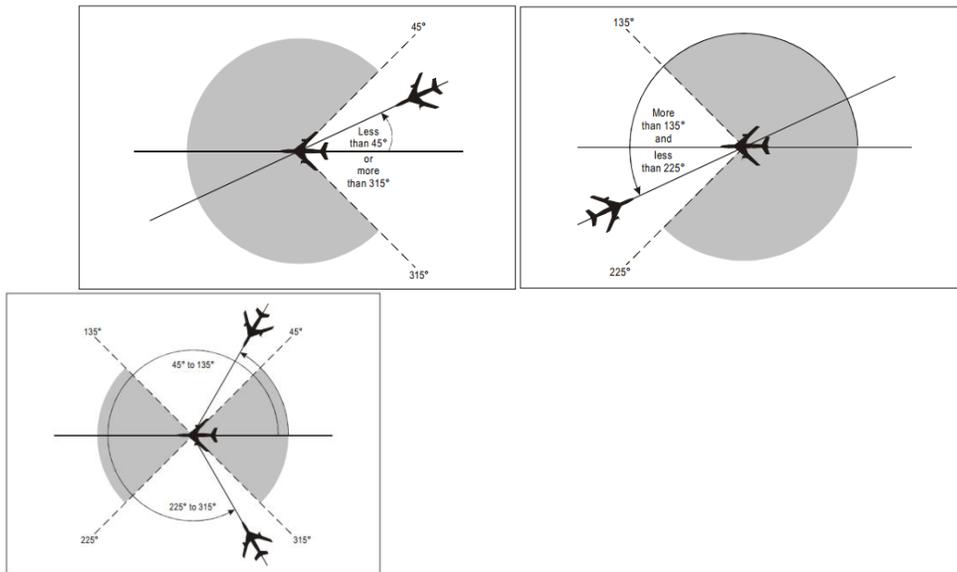
## HORIZONTAL SPARATTON

### 3.1 Types of horizontal separation

- 1- Lateral separation; and
- 2- Longitudinal separation.

### 3.2 Track definitions

1- The following definitions will be used in the application of separation minima:



a) Same track: Same direction tracks and intersecting tracks or portions thereof, the angular difference of which is less than  $45^\circ$  or more than  $315^\circ$ , and whose protected airspaces overlap; or when the track of one aircraft is separated from the track of the other by less than  $45^\circ$ .

b) Reciprocal tracks: Opposite tracks and intersecting tracks or portions thereof, the angular difference of whose is more than  $135^\circ$  but less than  $225^\circ$ , and whose protected airspaces overlap; or when the track of one aircraft is separated from the reciprocal of the other by less than  $45^\circ$ .

c) Crossing tracks: Intersecting tracks or portions thereof other than those specified in a) and b) above; or intersecting tracks which are not classified as "same" or "reciprocal".

2- Level change: is that portion of the climb or descent during which the vertical separation in relation to the level of another aircraft is less than the minima.

3- Exact reporting point: is a position established by:

- a) GNSS;
- b) VOR;
- c) NDB;
- d) Intersection of VOR radials;
- e) Intersection of VOR radial and a bearing from an NDB;
- f) A VOR radial and at a specified distance from associated DME station; or
- g) Geographic locations.

### **3.3 Lateral separation**

#### **3.3.1 Application**

1- Lateral separation shall be applied so that the distance between those portions of the intended routes for which the aircraft are to be laterally separated is never less than an established distance to account for navigational inaccuracies plus a specified buffer.

2- Lateral separation is obtained by requiring aircraft to operate on different routes or in different geographical locations as determined visually, by use of navigation aids or by use of area navigation (RNAV) equipment.

3- When information is received indicating navigation equipment failure or deterioration below the navigation performance requirements, ATC shall then apply alternative separation methods or minima.

4- Where a route flown by an aircraft involves a specified turn which will result in the minimum lateral separation being infringed, another type of separation or another minimum shall be established prior to the aircraft commencing the turn.

### **3.3.2 Lateral separation criteria and minima**

Means by which lateral separation may be applied include the following:

1- By reference to the same or different geographic locations. By position reports which positively indicate the aircraft are over different geographic locations as determined visually or by reference to a navigation aid

2- By use of the same navigation aid or method (Track separation). By requiring aircraft to fly on specified tracks which are separated by a minimum amount appropriate to the navigation aid or method employed.

#### **3.3.2.1 Geographical separation**



*Using same or different geographic locations*

Geographical separation shall be:

1- Positively indicated by position reports over different geographic locations as determined visually or by reference to a navigational aid.

2- Constant or increasing.

#### **3.3.2.2 Track separation**

1- Track separation shall be established by requiring aircraft to fly on specified tracks, separated by a minimum amount appropriate to the NAVAID \ method used;

2- Lateral separation between two aircraft exists when:

a) VOR: both aircraft are established on radials diverging by at least 15 degrees and at least one aircraft is at a distance of 28 km (15 NM) or more from the facility (see DOC 4444 Figure 5-4);

b) NDB: both aircraft are established on tracks to or from the NDB which are diverging by at least 30 degrees and at least one aircraft is at a distance of 28 km (15 NM) or more from the facility (see DOC 4444 Figure 5-5);

c) GNSS/GNSS: each aircraft is confirmed to be established on a track with zero offset between two waypoints and at least one aircraft is at a

minimum distance from a common point as specified in DOC 4444 Table 5-1;

d) VOR/GNSS: the aircraft using VOR is established on a radial to or from the VOR and the other aircraft using GNSS is confirmed to be established on a track with zero offset between two waypoints and at least one aircraft is at a minimum distance from a common point as specified in DOC 4444 Table 5-1.

i) When aircraft are operating on tracks which are separated by considerably more than the minimum in a) and b), States may reduce the distance at which lateral separation is achieved.

ii) Before applying GNSS-based track separation, the controller shall confirm the following:

a) Ensure that the aircraft is navigating using GNSS; and

b) In airspace where strategic lateral offsets are authorized, that a lateral offset is not being applied.

iii) In order to minimize the possibility of operational errors, waypoints contained in the navigation database or uplinked to the aircraft flight management system should be used in lieu of manually entered waypoints, when applying GNSS-based track separation. In the event that it is operationally restrictive to use waypoints contained in the navigation database, the use of waypoints that require manual entry by pilots should be limited to a half or whole degree of latitude and longitude.

iv) GNSS-based track separation shall not be applied in cases of pilot-reported receiver autonomous integrity monitoring (RAIM) outages.

Note. — For the purpose of applying GNSS-based lateral separation minima, distance and track information derived from an integrated navigation system incorporating GNSS input is regarded as equivalent to GNSS distance and track.

v) GNSS receivers used for applying separation shall meet the requirements in Annex 10, Volume I, and be indicated in the flight plan.

e) DEAD RECKONING (DR): Both aircraft are established on tracks diverging by at least 45° and at least one aircraft is at a distance of 15NM or more from the point of intersection of the tracks.

f) AREA NAVIGATION OPERATIONS (RNAV):

(i) Both aircraft are established on tracks, which diverge, by at least 15°;

(ii) The protected airspace associated with the track of one aircraft does not overlap with the protected airspace associated with the track of the other;

(iii) This is determined by applying the angular difference between two tracks and the protected airspace value. The value is expressed as a distance from the intersection of the two tracks where lateral separation exists.

3- By use of different navigation aids or methods. Lateral separation between aircraft using different navigation aids, or when one aircraft is using RNAV equipment, shall be established by ensuring that the derived protected airspaces for the navigation aid(s) or RNP do not overlap.

4- Lateral separation of aircraft on published instrument flight procedures for arrivals and departures; Lateral separation of departing and/or arriving aircraft, using instrument flight procedures, will exist:

a) Where the distance between any combination of RNAV 1 with RNAV 1, or RNP 1, RNP APCH or RNP AR APCH tracks is not less than 13 km (7NM);

b) where the distance between any combination of RNP 1, RNP APCH or RNP AR APCH tracks is not less than 9.3 km (5 NM); or

c) where the protected areas of tracks designed using obstacle clearance criteria do not overlap and provided operational error is considered.

5- RNAV operations where RNP is specified on parallel tracks or ATS routes. Within designated airspace or on designated routes, where RNP is specified, lateral separation between RNAV-equipped aircraft may be obtained by requiring aircraft to be established on the centre lines of parallel tracks or ATS routes spaced at a distance which ensures that the protected airspace of the tracks or ATS routes does not overlap.

*NOTE.* The spacing between parallel tracks or between parallel ATS route center lines for which an RNP type is required will be dependent upon the relevant RNP type specified. Guidance material related to the spacing between tracks or ATS routes based on RNP type is contained in ICAO Annex 11, Attachment B.

6- Lateral separation of aircraft on parallel or non-intersecting tracks or ATS routes. Within designated airspace or on designated routes, lateral separation between aircraft operating on parallel or non-intersecting tracks or ATS routes shall be established as specified in DOC 4444 Table 5-2.

7- When the minima in 6) are applied by requiring one or both aircraft to establish a specified lateral offset, vertical separation shall be maintained by the controller until the maneuvering aircraft is established on the applicable lateral offset.

8- Lateral separation of aircraft on intersecting tracks or ATS routes. Lateral separation between aircraft operating on intersecting tracks or ATS routes shall be established in accordance with the following:

a) An aircraft converging with the track of another aircraft is laterally separated until it reaches a lateral separation point that is located a specified distance measured perpendicularly from the track of the other aircraft (see Doc 4444 Figure 5-6); and

b) An aircraft diverging from the track of another aircraft is laterally separated after passing a lateral separation point that is located a specified distance measured perpendicularly from the track of the other aircraft (see Doc 4444 Figure 5-6).

9- Transitioning into airspace where a greater lateral separation minimum applies. Lateral separation will exist when aircraft are established on specified tracks which:

a) Are separated by an appropriate minimum; and

b) Diverge by at least 15 degrees until the applicable lateral separation minimum is established; providing that it is possible to ensure, by means approved by the appropriate ATS authority, that aircraft have the navigation capability necessary to ensure accurate track guidance.

## Chapter 4

### Longitudinal separation

#### 4.1 Application

a) This separation shall be applied between aircraft on the same or reciprocal tracks;

b) It is based on time or distance and shall be applied so that the spacing between the estimated positions of the aircraft is never less than a prescribed minimum;

c) It will be maintained between aircraft following same/diverging tracks, by applying speed control, including the Mach number technique based on true Mach number.

d) In applying time/distance-based longitudinal separation between aircraft following the same track, whenever the following aircraft is faster than the preceding aircraft, ensure that the separation minimum will not be infringed.

e) When aircraft are expected to reach minimum separation, speed control shall be applied to ensure that the required separation minimum is maintained;

f) Longitudinal separation is established by requiring aircraft to:

- 1) Depart at a specified time.
- 2) Arrive over a geographical location at a specified time.
- 3) Hold over a geographical location until a specified time

#### 4.1.1 Longitudinal separation minima based on time

*As mentioned in ICAO doc 4444 item 5.4.2.2...*

#### 4.1.2 Longitudinal separation minima based on distance using distance measuring equipment (DME) and/or GNSS

*As mentioned in ICAO doc 4444 item 5.4.2.3...*

#### 4.1.3 Longitudinal separation minima with Mach number technique based on time

*As mentioned in ICAO doc 4444 item 5.4.2.4...*

#### **4.1.4 Longitudinal separation minima with Mach number technique based on distance using RNAV**

*As mentioned in ICAO doc 4444 item 5.4.2.5...*

#### **4.1.5 Longitudinal separation minima based on distance using RNAV where RNP is specified**

*As mentioned in ICAO doc 4444 item 5.4.2.6...*

#### **4.1.4 Time-based wake turbulence longitudinal separation minima**

*Note. For distance-based wake turbulence separation minima see ICAO doc 4444 Chapter 8, 8.7.3.*

##### **4.1.4.1 Applicability**

1- The ATC unit concerned shall not be required to apply wake turbulence separation :

a) For arriving VFR flights landing on the same runway as a preceding landing SUPER, HEAVY or MEDIUM aircraft; and

b) Between arriving IFR flights executing visual approach when the aircraft has reported the preceding aircraft in sight and has been instructed to follow and maintain own separation from that aircraft .

2-The ATC unit shall, in respect of the flights specified in item (1) a) and b) above , as well as when otherwise deemed necessary, issue a caution of possible wake turbulence. The pilot-in-command of the aircraft concerned shall be responsible for ensuring that the spacing from a preceding aircraft of a heavier wake turbulence category is acceptable. If it is determined that additional spacing is required, the flight crew shall inform the ATC unit accordingly, stating their requirements .

##### **4.1.4.2 Arriving aircraft**

1- Except as provided for in 4.1.4.1 item (1), a) and b), the following minima shall be applied to aircraft landing behind a SUPER, a HEAVY or a MEDIUM aircraft:

a) HEAVY aircraft landing behind SUPER aircraft — 2 minutes;

b) MEDIUM aircraft landing behind SUPER aircraft — 3 minutes;

- c) MEDIUM aircraft landing behind HEAVY aircraft — 2 minutes;
- d) LIGHT aircraft landing behind SUPER aircraft — 4 minutes;
- e) LIGHT aircraft landing behind a HEAVY or MEDIUM aircraft — 3 minutes.

#### **4.1.4.3 Departing aircraft**

1- When using wake turbulence categories contained in ICAO doc 4444 Chapter 4, 4.9.1.1 and when the aircraft are using:

- a) The same runway.
  - b) Parallel runways separated by less than 760 m (2 500ft).
  - 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 (1 000 ft.) below ;
  - d) Parallel runways separated by 760 m (2 500ft) or more, 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 (1 000 ft.) below.
- the following minimum separations shall be applied:
- i) HEAVY aircraft taking off behind a SUPER aircraft — 2 minutes;
  - ii) LIGHT or MEDIUM aircraft taking off behind a SUPER aircraft — 3 minutes;
  - iii) LIGHT or MEDIUM aircraft taking off behind a HEAVY aircraft — 2 minutes;
  - iv) LIGHT aircraft taking off behind a MEDIUM aircraft — 2 minutes.

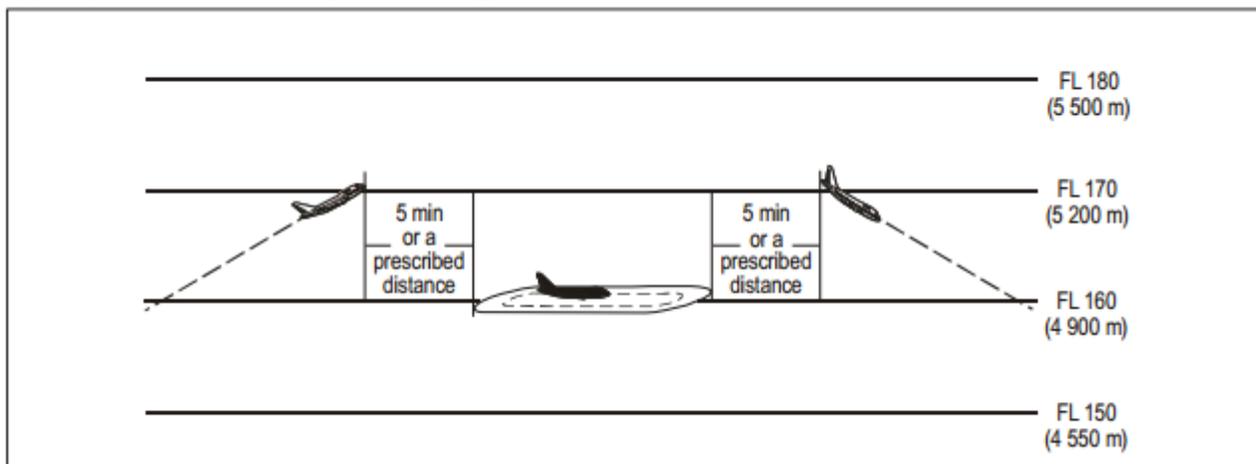
## Chapter 5

### Arrival, departure and holding separation

#### 5.1 Separation of aircraft holding in flight

1- Aircraft established in adjacent holding patterns shall, except when lateral separation between the holding areas exists as determined by the appropriate ATS authority, be separated by the applicable vertical separation minimum.

2- Except when lateral separation exists, vertical separation shall be applied between aircraft holding in flight and other aircraft, whether arriving, departing or en route, whenever the other aircraft concerned are within five minutes flying time of the holding area or within a distance prescribed by the appropriate authority as in figure below.



#### 5.2 Minimum separation between departing aircraft

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. This minimum may be reduced when aircraft are using parallel runways or when the procedure in doc 4444 Chapter 6, 6.3.3.1, is adopted for operations on diverging runways which do not cross, provided instructions covering the procedure have been approved by the appropriate ATS authority and lateral separation is effected immediately after take-off.

2- Five-minute separation is required while vertical separation does not exist if a departing aircraft will be flown through the level of a preceding

departing aircraft and both aircraft propose to follow the same track. Action must be taken to ensure that the five-minute separation will be maintained or increased while vertical separation does not exist.

### **5.3 Separation of departing aircraft from arriving aircraft**

1- Except as otherwise prescribed by the appropriate ATS authority, the following separation shall be applied when take-off clearance is based on the position of an arriving aircraft.

2- If an arriving aircraft is making a complete instrument approach, a departing aircraft may take off:

a) In any direction until an arriving aircraft has started its procedure turn or base turn leading to final approach;

b) In a direction which is different by at least 45 degrees from the reciprocal of the direction of approach after the arriving aircraft has started procedure turn or base turn leading to final approach, provided that the take-off will be made at least 3 minutes before the arriving aircraft is estimated to be over the beginning of the instrument runway.

3- If an arriving aircraft is making a straight-in approach, a departing aircraft may take off:

a) In any direction until 5 minutes before the arriving aircraft is estimated to be over the instrument runway;

b) In a direction which is different by at least 45 degrees from the reciprocal of the direction of approach of the arriving aircraft:

1) Until 3 minutes before the arriving aircraft is estimated to be over the beginning of the instrument runway; or

2) Before the arriving aircraft crosses a designated fix on the approach track; the location of such fix to be determined by the appropriate ATS authority after consultation with the operators.

4- If an arriving aircraft is following an RNAV or RNP instrument flight procedure, a departing aircraft may take off on a departure path that is clear of the arrival protection area for the arriving aircraft provided:

a) vertical separation is applied until the arriving aircraft has reported passing the compulsory reporting waypoint on the instrument flight procedure, the location of such waypoint to be determined by the appropriate ATS authority;

- b) the take-off takes place before the arriving aircraft crosses a designated waypoint on the instrument flight procedure, the location of such waypoint to be determined by the appropriate ATS authority; and
- c) The departing aircraft remains clear of the arrival protection area until another form of separation is established.

## **Chapter 6**

# **Operations on parallel runways**

### **6.1. Definitions:**

***ATS surveillance system.*** A generic term meaning variously, ADS-B, PSR, SSR or any comparable ground-based system that enables the identification of aircraft.

*Note.— A comparable ground-based system is one that has been demonstrated, by comparative assessment or other methodology, to have a level of safety and performance equal to or better than monopulse SSR.*

***Break-out procedure(s).*** Immediate evasive maneuvers, which are performed on instruction by air traffic control.

***Closely spaced runways.*** Runways that are parallel or near parallel and spaced less than 1 525 m (5 000 ft.) but not less than 1 035 m (3 400 ft.) apart.

***Correction zone.*** Additional airspace provided for the purpose of resolving conflicts.

***Delay time.*** The time allowed for an air traffic controller to react, coordinate and communicate the appropriate command to the pilot, for the pilot to understand and react, and for the aircraft to respond.

***Dependent parallel approaches.*** Simultaneous approaches to parallel or near-parallel instrument runways where ATS surveillance system separation minima between aircraft on adjacent extended runway center lines are prescribed.

***Deviation alert.*** An aural and visual alarm indicating situations where an aircraft deviates into the no transgression zone (NTZ) established between parallel runway approaches.

***Glide path.*** A descent profile determined for vertical guidance during a final approach.

***Independent parallel approaches.*** Simultaneous approaches to parallel or near-parallel instrument runways where ATS surveillance system separation minima between aircraft on adjacent extended runway center lines are not prescribed.

***Independent parallel departures.*** Simultaneous departures from parallel or near-parallel instrument runways.

***Miss distance.*** The minimum lateral spacing achieved when the tracks of both aircraft are parallel after the threatened aircraft has executed the evading maneuver in the deviation analysis.

***Mixed parallel operations.*** Simultaneous approaches and departures on parallel or near-parallel instrument runways.

***No transgression zone (NTZ).*** In the context of independent parallel approaches, a corridor of airspace of defined dimensions located centrally between the two extended runway center lines, where a penetration by an aircraft requires a controller intervention to maneuver any threatened aircraft on the adjacent approach.

***Precision approach (PA) procedure.*** An instrument approach procedure based on navigation systems (ILS, MLS, GLS and SBAS CAT I) designed for 3D instrument approach operations Type A or B.

***Segregated parallel operations.*** Simultaneous operations on parallel or near-parallel instrument runways in which one runway is used exclusively for approaches and the other runway is used exclusively for departures.

***Semi-mixed parallel operations.*** Simultaneous operations on parallel or near-parallel instrument runways in which one runway is used exclusively for departures while the other runway is used for a mixture of approaches and departures, or one runway is used exclusively for approaches while the other runway is used for a mixture of approaches and departures.

## **6.2. Abbreviations:**

<b>APCH</b>	approach
<b>ATIS</b>	automatic terminal information service
<b>IAF</b>	initial approach fix
<b>IF</b>	intermediate fix
<b>ILS</b>	instrument landing system
<b>NAVAID</b>	navigation aid
<b>NTZ</b>	no transgression zone
<b>PA</b>	precision approach
<b>PRM</b>	precision runway monitor
<b>RTF</b>	radiotelephone
<b>SOIR</b>	simultaneous operations on parallel or near-parallel instrument runways

### **6.3.1 Departing aircraft**

Parallel runways may be used for instrument independent departures, when both runways are used exclusively for departures independently, semi-mixed, and mixed operation.

6.3.1.1 Independent IFR departures may be conducted from parallel runways when:

- a) The runway center lines are spaced by a minimum distance of 760 m, and the nominal departure tracks diverge by at least 15 degrees immediately after take-off;
- b) A suitable ATS surveillance system capable of identification of the aircraft within (1.0 NM) from the end of the runway is available;
- c) ATS operational procedures ensure that the required track divergence is achieved;

### **6.3.2 Arriving aircraft:**

Parallel runways may be used for simultaneous instrument operations for independent, or dependent parallel approaches, or segregated parallel operations, provided that separate controller should be responsible for the sequencing and spacing of arriving aircraft:

#### **6.3.2.1 Instrument parallel approaches**

6.3.2.1.1 Independent parallel approaches may be conducted to parallel runways when:

- a) Runway centerlines spacing is 1310 m at least;
- b) ATS surveillance Radar system is suitable for independent parallel approach operation with an update period of 5 seconds or less (see doc 4444 6.7.3.2);
- c) Instrument Landing System (ILS) approaches are being conducted to both runways;
- d) The missed approach tracks diverge by at least 30 degrees;
- e) An obstacle survey and evaluation are completed, as appropriate, for the areas adjacent to the final approach segments;
- f) Aircraft shall be advised of the assigned runway, instrument approach procedure and any additional information considered necessary to confirm correct selection by radio communication or through ATIS broadcast as early as possible;
- g) The final approach localizer course is intercepted by use of vectoring;
- h) A no transgression zone (NTZ) at least 610 m wide and is depicted on the ATS surveillance radar system situation display;
- i) A single monitoring controller assigned for no more than two runways, if determined by a safety risk assessment and approved by ECAA;
- j) 1 000 ft. vertical separation is maintained until both aircraft are established on final approach localizer course and monitoring ensures that aircraft do not penetrate the depicted NTZ; and the applicable minimum longitudinal separation between aircraft on the same final approach course is maintained;
- k) Transfer of communication of aircraft to the respective aerodrome controller's channel is established before either of the two aircraft on adjacent final approach tracks intercepts the glide path; and the controller monitoring the approaches to each runway are provided with the capability to override transmissions of aerodrome control;
- l) Aircraft shall be notified that independent parallel approaches are in force by radio communication or through ATIS broadcast as early as practicable;
- m) When vectoring an aircraft to intercept the ILS localizer course, the final vector shall enable the aircraft to intercept the ILS localizer course at an angle not greater than 30 degrees and provide at least 1 NM straight flight prior to ILS localizer course intercept; and at least 2 NM prior to intercepting the glide path;

n) A minimum of 1000 ft. vertical or 3 NM horizontal radar separation is provided until aircraft are established on the ILS localizer course;

o) The applicable minimum longitudinal separation between aircraft on the same final approach course which is determined for each runway by a safety risk assessment and approved by ECAA shall be maintained and in all cases is not less than 3 NM, taking into account wake turbulence and any other reasons;

p) Runway shall be confirmed with the issuance of the final heading to intercept the final approach course, and approach clearance shall be issued with relative information such as: aircraft position, altitude to be maintained until established on final approach course;

q) When an aircraft observed on radar that it will penetrate the NTZ, ATC corrective instruction shall be issued to the deviated aircraft;

r) When an aircraft is observed on radar that it is penetrating the NTZ, the aircraft on the adjacent final approach course shall be instructed to immediately climb and turn to the assigned altitude and appropriate heading shall be issued provided that aircraft is not below 400ft above threshold elevation and heading does not exceed 45 degrees track difference with the final approach course (break-out procedures);

s) All approaches, regardless of meteorological conditions shall be radar monitored until visual separation is applied, the aircraft has landed, or in case of a missed approach, is at least 1 NM beyond the departure end of the runway and adequate separation with any other traffic is established;

#### 6.3.2.1.2 Suspension of independent parallel approaches:

Independent parallel approaches shall not be conducted when meteorological conditions are below VMC minima and in significant meteorological conditions such as: thunderstorms, wind shear, turbulence, downdrafts, crosswind that may affect the safety of operation. (See ICAO annex 2 for VMC).

#### 6.3.2.1.3 Requirements and procedures for dependent parallel approaches:

Dependent parallel approaches may be conducted to parallel runways when:

a) Runway centerlines spacing is 915 m at least;

b) The final approach localizer course is intercepted by use of vectoring;

c) ATS surveillance Radar system is suitable for dependent parallel approach operation with an update period of 5 seconds or less (see doc 4444 6.7.3.2);

d) Instrument Landing System (ILS) approaches are being conducted to both runways;

e) Aircraft shall be notified that approaches are in use to both runways by radio communication or through ATIS broadcast as early as practicable;

f) The missed approach tracks diverge by at least 30 degrees;

g) Approach control has a frequency override capability to aerodrome control;

h) A minimum of 1000 ft vertical or 3 NM horizontal radar separation is provided until aircraft are established on the ILS localizer course;

i) The applicable minimum longitudinal separation between aircraft on the same final approach course which is determined for each runway by a safety risk assessment and approved by ECAA shall be maintained and in all cases is not less than 3 NM;

j) Diagonal horizontal radar separation between successive aircraft on adjacent final approach courses is at least 2 NM;

#### **6.3.3 Requirements and procedures for segregated parallel operations:**

Segregated parallel operations may be conducted on parallel runways when:

a) Runway centerlines spacing is 760 m at least;

b) Suitable ATS surveillance Radar system with an update period of 5 seconds or less (see doc 4444 6.7.3.2);

c) The missed approach tracks diverge by at least 30 degrees:

6.3.3.1 The minimum distance between parallel runway center lines for segregated parallel operations may be decreased by 30 m for each 150 m that the arrival runway is staggered toward the arriving aircraft, to a minimum of 300 m and should be increased by 30 m for each 150 m that the arrival runway is staggered away from the arriving aircraft.

6.3.3.2 Segregated parallel operations may be utilized with the following approach types:

a) Precision approaches.

b) Visual approach.