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PROCEDURES FOR AIR NAVIGATION SERVICES

Air Traffic Management

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Chapter 4

GENERAL PROVISIONS FOR AIR TRAFFIC SERVICES

4.1 RESPONSIBILITY FOR THE PROVISION OF AIR TRAFFIC CONTROL SERVICE

4.1.1 Area control service

Area control service shall be provided:

- a) by an area control centre (ACC); or
- b) by the unit providing approach control service in a control zone or in a control area of limited extent which is designated primarily for the provision of approach control service, when no ACC is established.

4.1.2 Approach control service

Approach control service shall be provided:

- a) by an aerodrome control tower or an ACC, when it is necessary or desirable to combine under the responsibility of one unit the functions of the approach control service and those of the aerodrome control service or the area control service; or
- b) by an approach control unit, when it is necessary or desirable to establish a separate unit.

Note.— Approach control service may be provided by a unit collocated with an ACC, or by a control sector within an ACC.

4.1.3 Aerodrome control service

Aerodrome control service shall be provided by an aerodrome control tower.

4.2 RESPONSIBILITY FOR THE PROVISION OF FLIGHT INFORMATION SERVICE AND ALERTING SERVICE

Flight information service and alerting service shall be provided as follows:

- a) *within a flight information region (FIR):* by a flight information centre, unless the responsibility for providing such services is assigned to an air traffic control unit having adequate facilities for the exercise of such responsibilities;
- b) *within controlled airspace and at controlled aerodromes:* by the relevant air traffic control units.

4.3 DIVISION OF RESPONSIBILITY FOR CONTROL BETWEEN AIR TRAFFIC CONTROL UNITS

4.3.1 General

The appropriate ATS authority shall designate the area of responsibility for each air traffic control (ATC) unit and, when applicable, for individual control sectors within an ATC unit. Where there is more than one ATC working position within a unit or sector, the duties and responsibilities of the individual working positions shall be defined.

4.3.2 Between a unit providing aerodrome control service and a unit providing approach control service

4.3.2.1 Except for flights which are provided aerodrome control service only, the control of arriving and departing controlled flights shall be divided between units providing aerodrome control service and units providing approach control service as follows:

4.3.2.1.1 *Arriving aircraft.* Control of an arriving aircraft shall be transferred from the unit providing approach control service to the unit providing aerodrome control service when the aircraft:

- a) is in the vicinity of the aerodrome, and
 - 1) it is considered that approach and landing will be completed in visual reference to the ground, or
 - 2) has reached uninterrupted visual meteorological conditions, or
- b) is at a prescribed point or level, or
- c) has landed,

as specified in letters of agreement or ATS unit instructions.

4.3.2.1.2 Transfer of communications to the aerodrome controller should be effected at such a point, level or time that clearance to land or alternative instructions, as well as information on essential local traffic, can be issued in a timely manner.

Note.— Even though there is an approach control unit, control of certain flights may be transferred directly from an ACC to an aerodrome control tower and vice versa, by prior arrangement between the units concerned for the relevant part of approach control service to be provided by the ACC or the aerodrome control tower, as applicable.

4.3.2.1.3 *Departing aircraft.* Control of a departing aircraft shall be transferred from the unit providing aerodrome control service to the unit providing approach control service:

- a) when visual meteorological conditions prevail in the vicinity of the aerodrome:
 - 1) prior to the time the aircraft leaves the vicinity of the aerodrome,
 - 2) prior to the aircraft entering instrument meteorological conditions, or
 - 3) when the aircraft is at a prescribed point or level,

as specified in letters of agreement or ATS unit instructions;

b) when instrument meteorological conditions prevail at the aerodrome:

- 1) immediately after the aircraft is airborne, or
- 2) when the aircraft is at a prescribed point or level,

as specified in letters of agreement or local instructions.

Note.— See Note following 4.3.2.1.2.

4.3.3 Between a unit providing approach control service and a unit providing area control service

4.3.3.1 When area control service and approach control service are not provided by the same air traffic control unit, responsibility for controlled flights shall rest with the unit providing area control service except that a unit providing approach control service shall be responsible for the control of:

- a) arriving aircraft that have been released to it by the ACC;
- b) departing aircraft until such aircraft are released to the ACC.

4.3.3.2 A unit providing approach control service shall assume control of arriving aircraft, provided such aircraft have been released to it, upon arrival of the aircraft at the point, level or time agreed for transfer of control, and shall maintain control during approach to the aerodrome.

4.3.4 Between two units providing area control service

The responsibility for the control of an aircraft shall be transferred from a unit providing area control service in a control area to the unit providing area control service in an adjacent control area at the time of crossing the common control area boundary as estimated by the ACC having control of the aircraft or at such other point, level or time as has been agreed between the two units.

4.3.5 Between control sectors/positions within the same air traffic control unit

The responsibility for the control of an aircraft shall be transferred from one control sector/position to another control sector/position within the same ATC unit at a point, level or time, as specified in local instructions.

4.4 FLIGHT PLAN

4.4.1 Flight plan form

Note.— Procedures for the use of repetitive flight plans are contained in Chapter 16, Section 16.4.

4.4.1.1 A flight plan form based on the model in Appendix 2 should be provided and should be used by operators and air traffic services units for the purpose of completing flight plans.

Note.— A different form may be provided for use in completing repetitive flight plan listings.

4.4.1.2 The flight plan form should be printed and should include an English text in addition to the language(s) of the State concerned.

Note.— The Model Flight Plan Form in Appendix 2 is printed in English and one other of the languages of the Organization for illustration purposes.

4.4.1.3 Operators and air traffic services units should comply with:

- a) the instructions for completion of the flight plan form and the repetitive flight plan listing form given in Appendix 2; and
- b) any constraints identified in relevant Aeronautical Information Publications (AIPs).

Note 1.— Failure to adhere to the provisions of Appendix 2 or any constraint identified in relevant AIPs may result in data being rejected, processed incorrectly or lost.

Note 2.— The instructions for completing the flight plan form given in Appendix 2 may be conveniently printed on the inside cover of flight plan form pads, or posted in briefing rooms.

4.4.1.4 An operator shall, prior to departure:

- a) ensure that, where the flight is intended to operate on a route or in an area where a navigation specification is prescribed, it has an appropriate RNP approval, and that all conditions applying to that approval will be satisfied;
- b) ensure that, where the flight is intended to operate in reduced vertical separation minimum (RVSM) airspace, it has the required RVSM approval;
- c) ensure that, where the flight is intended to operate where an RCP specification is prescribed, it has an appropriate approval, and that all conditions applying to that approval will be satisfied.
- d) ensure that, where the flight is intended to operate where an RSP specification is prescribed, it has an appropriate RSP approval, and that all conditions applying to that approval will be satisfied.

4.4.2 Submission of a flight plan

4.4.2.1 PRIOR TO DEPARTURE

4.4.2.1.1 Flight plans shall not be submitted more than 120 hours before the estimated off-block time of a flight.

4.4.2.1.2 Except when other arrangements have been made for submission of repetitive flight plans, a flight plan submitted prior to departure should be submitted to the air traffic services reporting office at the departure aerodrome. If no such unit exists at the departure aerodrome, the flight plan should be submitted to the unit serving or designated to serve the departure aerodrome.

4.4.2.1.3 In the event of a delay of 30 minutes in excess of the estimated off-block time for a controlled flight or a delay of one hour for an uncontrolled flight for which a flight plan has been submitted, the flight plan should be amended or a new flight plan submitted and the old flight plan cancelled, whichever is applicable.

4.4.2.2 DURING FLIGHT

4.4.2.2.1 A flight plan to be submitted during flight should normally be transmitted to the ATS unit in charge of the FIR, control area, advisory area or advisory route in or on which the aircraft is flying, or in or through which the aircraft

wishes to fly or to the aeronautical telecommunication station serving the air traffic services unit concerned. When this is not practicable, it should be transmitted to another ATS unit or aeronautical telecommunication station for retransmission as required to the appropriate air traffic services unit.

4.4.2.2.2 Where relevant, such as in respect of ATC units serving high- or medium-density airspace, the appropriate ATS authority should prescribe conditions and/or limitations with respect to the submission of flight plans during flight to ATC units.

Note.— If the flight plan is submitted for the purpose of obtaining air traffic control service, the aircraft is required to wait for an air traffic control clearance prior to proceeding under the conditions requiring compliance with air traffic control procedures. If the flight plan is submitted for the purpose of obtaining air traffic advisory service, the aircraft is required to wait for acknowledgment of receipt by the unit providing the service.

4.4.3 Acceptance of a flight plan

The first ATS unit receiving a flight plan, or change thereto, shall:

- a) check it for compliance with the format and data conventions;
- b) check it for completeness and, to the extent possible, for accuracy;
- c) take action, if necessary, to make it acceptable to the air traffic services; and
- d) indicate acceptance of the flight plan or change thereto, to the originator.

4.5 AIR TRAFFIC CONTROL CLEARANCES

4.5.1 Scope and purpose

4.5.1.1 Clearances are issued solely for expediting and separating air traffic and are based on known traffic conditions which affect safety in aircraft operation. Such traffic conditions include not only aircraft in the air and on the manoeuvring area over which control is being exercised, but also any vehicular traffic or other obstructions not permanently installed on the manoeuvring area in use.

4.5.1.2 If an air traffic control clearance is not suitable to the pilot-in-command of an aircraft, the flight crew may request and, if practicable, obtain an amended clearance.

4.5.1.3 The issuance of air traffic control clearances by air traffic control units constitutes authority for an aircraft to proceed only in so far as known air traffic is concerned. ATC clearances do not constitute authority to violate any applicable regulations for promoting the safety of flight operations or for any other purpose; neither do clearances relieve a pilot-in-command of any responsibility whatsoever in connection with a possible violation of applicable rules and regulations.

4.5.1.4 ATC units shall issue such ATC clearances as are necessary to prevent collisions and to expedite and maintain an orderly flow of air traffic.

4.5.1.5 ATC clearances must be issued early enough to ensure that they are transmitted to the aircraft in sufficient time for it to comply with them.

4.5.2 Aircraft subject to ATC for part of flight

4.5.2.1 When a flight plan specifies that the initial portion of a flight will be uncontrolled, and that the subsequent portion of the flight will be subject to ATC, the aircraft shall be advised to obtain its clearance from the ATC unit in whose area controlled flight will be commenced.

4.5.2.2 When a flight plan specifies that the first portion of a flight will be subject to ATC, and that the subsequent portion will be uncontrolled, the aircraft shall normally be cleared to the point at which the controlled flight terminates.

4.5.3 Flights through intermediate stops

4.5.3.1 When an aircraft files, at the departure aerodrome, flight plans for the various stages of flight through intermediate stops, the initial clearance limit will be the first destination aerodrome and new clearances shall be issued for each subsequent portion of flight.

4.5.3.2 The flight plan for the second stage, and each subsequent stage, of a flight through intermediate stops will become active for ATS and search and rescue (SAR) purposes only when the appropriate ATS unit has received notification that the aircraft has departed from the relevant departure aerodrome, except as provided for in 4.5.3.3.

4.5.3.3 By prior arrangement between ATC units and the operators, aircraft operating on an established schedule may, if the proposed route of flight is through more than one control area, be cleared through intermediate stops within other control areas but only after coordination between the ACCs concerned.

4.5.4 Contents of clearances

4.5.4.1 Clearances shall contain positive and concise data and shall, as far as practicable, be phrased in a standard manner.

4.5.4.2 Clearances shall, except as provided for in Chapter 6, Section 6.3.2, concerning standard departure clearances, contain the items specified in Chapter 11, 11.4.2.6.2.1.

4.5.5 Departing aircraft

ACCs shall, except where procedures providing for the use of standard departure clearances have been implemented, forward a clearance to approach control units or aerodrome control towers with the least possible delay after receipt of request made by these units, or prior to such request if practicable.

4.5.6 En-route aircraft

4.5.6.1 GENERAL

4.5.6.1.1 An ATC unit may request an adjacent ATC unit to clear aircraft to a specified point during a specified period.

4.5.6.1.2 After the initial clearance has been issued to an aircraft at the point of departure, it will be the responsibility of the appropriate ATC unit to issue an amended clearance whenever necessary and to issue traffic information, if required.

4.5.6.1.3 When so requested by the flight crew, an aircraft shall be cleared for cruise climb whenever traffic conditions and coordination procedures permit. Such clearance shall be for cruise climb either above a specified level or between specified levels.

4.5.6.2 CLEARANCES RELATING TO SUPERSONIC FLIGHT

4.5.6.2.1 Aircraft intending supersonic flight shall, whenever practicable, be cleared for the transonic acceleration phase prior to departure.

4.5.6.2.2 During the transonic and supersonic phases of a flight, amendments to the clearance should be kept to a minimum and must take due account of the operational limitations of the aircraft in these flight phases.

4.5.7 Description of air traffic control clearances

4.5.7.1 CLEARANCE LIMIT

4.5.7.1.1 A clearance limit shall be described by specifying the name of the appropriate significant point, or aerodrome, or controlled airspace boundary.

4.5.7.1.2 When prior coordination has been effected with units under whose control the aircraft will subsequently come, or if there is reasonable assurance that it can be effected a reasonable time prior to their assumption of control, the clearance limit shall be the destination aerodrome or, if not practicable, an appropriate intermediate point, and coordination shall be expedited so that a clearance to the destination aerodrome may be issued as soon as possible.

4.5.7.1.3 If an aircraft has been cleared to an intermediate point in adjacent controlled airspace, the appropriate ATC unit will then be responsible for issuing, as soon as practicable, an amended clearance to the destination aerodrome.

4.5.7.1.4 When the destination aerodrome is outside controlled airspace, the ATC unit responsible for the last controlled airspace through which an aircraft will pass shall issue the appropriate clearance for flight to the limit of that controlled airspace.

4.5.7.2 ROUTE OF FLIGHT

4.5.7.2.1 The route of flight shall be detailed in each clearance when deemed necessary. The phrase “cleared flight planned route” may be used to describe any route or portion thereof, provided the route or portion thereof is identical to that filed in the flight plan and sufficient routing details are given to definitely establish the aircraft on its route. The phrases “cleared (designation) departure” or “cleared (designation) arrival” may be used when standard departure or arrival routes have been established by the appropriate ATS authority and published in Aeronautical Information Publications (AIPs).

Note.— See 6.3.2.3 pertaining to standard clearances for departing aircraft and 6.5.2.3 pertaining to standard clearances for arriving aircraft.

4.5.7.2.2 The phrase “cleared flight planned route” shall not be used when granting a re-clearance.

4.5.7.2.3 Subject to airspace constraints, ATC workload and traffic density, and provided coordination can be effected in a timely manner, an aircraft should whenever possible be offered the most direct routing.

4.5.7.3 LEVELS

Except as provided for in Chapter 6, 6.3.2 and 6.5.1.5, use of standard departure and arrival clearances, instructions included in clearances relating to levels shall consist of the items specified in Chapter 11, 11.4.2.6.2.2.

4.5.7.4 CLEARANCE OF A REQUESTED CHANGE IN FLIGHT PLAN

4.5.7.4.1 When issuing a clearance covering a requested change in route or level, the exact nature of the change shall be included in the clearance.

4.5.7.4.2 When traffic conditions will not permit clearance of a requested change, the word “UNABLE” shall be used. When warranted by circumstances, an alternative route or level should be offered.

4.5.7.4.3 When an alternative route is offered and accepted by the flight crew under the procedures described in 4.5.7.4.2, the amended clearance issued shall describe the route to the point where it joins the previously cleared route, or, if the aircraft will not re-join the previous route, to the destination.

4.5.7.5 READBACK OF CLEARANCES

4.5.7.5.1 The flight crew shall read back to the air traffic controller safety-related parts of ATC clearances and instructions which are transmitted by voice. The following items shall always be read back:

- a) ATC route clearances;
- b) clearances and instructions to enter, land on, take off from, hold short of, cross, taxi and backtrack on any runway; and
- c) runway-in-use, altimeter settings, SSR codes, level instructions, heading and speed instructions and, whether issued by the controller or contained in automatic terminal information service (ATIS) broadcasts, transition levels.

Note.— If the level of an aircraft is reported in relation to standard pressure 1 013.2 hPa, the words “FLIGHT LEVEL” precede the level figures. If the level of the aircraft is reported in relation to QNH/QFE, the figures are followed by the word “METRES” or “FEET”, as appropriate.

4.5.7.5.1.1 Other clearances or instructions, including conditional clearances, shall be read back or acknowledged in a manner to clearly indicate that they have been understood and will be complied with.

4.5.7.5.2 The controller shall listen to the readback to ascertain that the clearance or instruction has been correctly acknowledged by the flight crew and shall take immediate action to correct any discrepancies revealed by the readback.

4.5.7.5.2.1 Unless specified by the appropriate ATS authority, voice readback of controller-pilot data link communications (CPDLC) messages shall not be required.

Note.— The procedures and provisions relating to the exchange and acknowledgement of CPDLC messages are contained in Annex 10, Volume II and the PANS-ATM, Chapter 14.

4.6 HORIZONTAL SPEED CONTROL INSTRUCTIONS

4.6.1 General

4.6.1.1 In order to facilitate a safe and orderly flow of traffic, aircraft may, subject to conditions specified by the appropriate authority, be instructed to adjust speed in a specified manner. Flight crews should be given adequate notice of planned speed control.

Note 1.— Application of speed control over a long period of time may affect aircraft fuel reserves.

Note 2.— Provisions concerning longitudinal separation using the Mach number technique are contained in Chapter 5, Separation Methods and Minima.

4.6.1.2 Speed control instructions shall remain in effect unless explicitly cancelled or amended by the controller.

Note.— Cancellation of any speed control instruction does not relieve the flight crew of compliance with speed limitations associated with airspace classifications as specified in Annex 11 — Air Traffic Services, Appendix 4.

4.6.1.3 Speed control shall not be applied to aircraft entering or established in a holding pattern.

4.6.1.4 Speed adjustments should be limited to those necessary to establish and/or maintain a desired separation minimum or spacing. Instructions involving frequent changes of speed, including alternate speed increases and decreases, should be avoided.

4.6.1.5 The flight crew shall inform the ATC unit concerned if at any time they are unable to comply with a speed instruction. In such cases, the controller shall apply an alternative method to achieve the desired spacing between the aircraft concerned.

4.6.1.6 At levels at or above 7 600 m (FL 250), speed adjustments should be expressed in multiples of 0.01 Mach; at levels below 7 600 m (FL 250), speed adjustments should be expressed in multiples of 20 km/h (10 kt) based on indicated airspeed (IAS).

Note 1.— Mach 0.01 equals approximately 11 km/h (6 kt) IAS at higher flight levels.

Note 2.— When an aircraft is heavily loaded and at a high level, its ability to change speed may, in cases, be very limited.

4.6.1.7 Aircraft shall be advised when a speed control restriction is no longer required.

4.6.2 Methods of application

4.6.2.1 In order to establish a desired spacing between two or more successive aircraft, the controller should first either reduce the speed of the last aircraft, or increase the speed of the lead aircraft, then adjust the speed(s) of the other aircraft in order.

4.6.2.2 In order to maintain a desired spacing using speed control techniques, specific speeds need to be assigned to all the aircraft concerned.

Note 1.— The true airspeed (TAS) of an aircraft will decrease during descent when maintaining a constant IAS. When two descending aircraft maintain the same IAS, and the leading aircraft is at the lower level, the TAS of the leading aircraft will be lower than that of the following aircraft. The distance between the two aircraft will thus be reduced, unless a sufficient speed differential is applied. For the purpose of calculating a desired speed differential between two succeeding aircraft, 11 km/h (6 kt) IAS per 300 m (1 000 ft) height difference may be used as a general rule. At levels below 2 450 m (FL 80) the difference between IAS and TAS is negligible for speed control purposes.

Note 2.— Time and distance required to achieve a desired spacing will increase with higher levels, higher speeds, and when the aircraft is in a clean configuration.

4.6.3 Descending and arriving aircraft

4.6.3.1 An aircraft should, when practicable, be authorized to absorb a period of notified terminal delay by cruising at a reduced speed for the latter portion of its flight.

4.6.3.2 An arriving aircraft may be instructed to maintain its “maximum speed”, “minimum clean speed”, “minimum speed”, or a specified speed.

Note.— “Minimum clean speed” signifies the minimum speed at which an aircraft can be flown in a clean configuration, i.e. without deployment of lift-augmentation devices, speed brakes or landing gear.

4.6.3.3 Speed reductions to less than 460 km/h (250 kt) IAS for turbojet aircraft during initial descent from cruising level should be applied only with the concurrence of the flight crew.

4.6.3.4 Instructions for an aircraft to simultaneously maintain a high rate of descent and reduce its speed should be avoided as such manoeuvres are normally not compatible. Any significant speed reduction during descent may require the aircraft to temporarily level off to reduce speed before continuing descent.

4.6.3.5 Arriving aircraft should be permitted to operate in a clean configuration for as long as possible. Below 4 550 m (FL 150), speed reductions for turbojet aircraft to not less than 410 km/h (220 kt) IAS, which will normally be very close to the minimum speed of turbojet aircraft in a clean configuration, may be used.

4.6.3.6 Only minor speed adjustments not exceeding plus/minus 40 km/h (20 kt) IAS should be used for aircraft on intermediate and final approach.

4.6.3.7 Speed control should not be applied to aircraft after passing a point 7 km (4 NM) from the threshold on final approach.

Note.— The flight crew has a requirement to fly a stabilized approach (airspeed and configuration) typically by 5 km (3 NM) from the threshold (Doc 8168, PANS-OPS, Volume I, Part III, Section 4, Chapter 3, 3.3 refers).

4.6.4 SID and STAR

The flight crew shall comply with published SID and STAR speed restrictions unless the restrictions are explicitly cancelled or amended by the controller.

Note. 1.— Some SID and STAR speed restrictions ensure containment within RNAV departure or arrival procedure (e.g. maximum speed associated with a constant radius arc to a fix (RF) leg).

Note 2.— See 6.3.2.4 pertaining to clearances on a SID and 6.5.2.4 pertaining to clearances on a STAR.

4.7 VERTICAL SPEED CONTROL INSTRUCTIONS

4.7.1 General

4.7.1.1 In order to facilitate a safe and orderly flow of traffic, aircraft may be instructed to adjust rate of climb or rate of descent. Vertical speed control may be applied between two climbing aircraft or two descending aircraft in order to establish or maintain a specific vertical separation minimum.

4.7.1.2 Vertical speed adjustments should be limited to those necessary to establish and/or maintain a desired separation minimum. Instructions involving frequent changes of climb/descent rates should be avoided.

4.7.1.3 The flight crew shall inform the ATC unit concerned if unable, at any time, to comply with a specified rate of climb or descent. In such cases, the controller shall apply an alternative method to achieve an appropriate separation minimum between aircraft, without delay.

4.7.1.4 Aircraft shall be advised when a rate of climb/descent restriction is no longer required.

4.7.2 Methods of application

4.7.2.1 An aircraft may be instructed to expedite climb or descent as appropriate to or through a specified level, or may be instructed to reduce its rate of climb or rate of descent.

4.7.2.2 Climbing aircraft may be instructed to maintain a specified rate of climb, a rate of climb equal to or greater than a specified value or a rate of climb equal to or less than a specified value.

4.7.2.3 Descending aircraft may be instructed to maintain a specified rate of descent, a rate of descent equal to or greater than a specified value or a rate of descent equal to or less than a specified value.

4.7.2.4 In applying vertical speed control, the controller should ascertain to which level(s) climbing aircraft can sustain a specified rate of climb or, in the case of descending aircraft, the specified rate of descent which can be sustained, and shall ensure that alternative methods of maintaining separation can be applied in a timely manner, if required.

Note.— Controllers need to be aware of aircraft performance characteristics and limitations in relation to a simultaneous application of horizontal and vertical speed limitations.

4.8 CHANGE FROM IFR TO VFR FLIGHT

4.8.1 Change from instrument flight rules (IFR) flight to visual flight rules (VFR) flight is only acceptable when a message initiated by the pilot-in-command containing the specific expression “CANCELLING MY IFR FLIGHT”, together with the changes, if any, to be made to the current flight plan, is received by an air traffic services unit. No invitation to change from IFR flight to VFR flight is to be made either directly or by inference.

4.8.2 No reply, other than the acknowledgment “IFR FLIGHT CANCELLED AT ... (time)”, should normally be made by an air traffic services unit.

4.8.3 When an ATS unit is in possession of information that instrument meteorological conditions are likely to be encountered along the route of flight, a pilot changing from IFR flight to VFR flight should, if practicable, be so advised.

Note.— See Chapter 11, 11.4.3.2.1.

4.8.4 An ATC unit receiving notification of an aircraft’s intention to change from IFR to VFR flight shall, as soon as practicable thereafter, so inform all other ATS units to whom the IFR flight plan was addressed, except those units through whose regions or areas the flight has already passed.

4.9 WAKE TURBULENCE CATEGORIES

Note.— The term “wake turbulence” is used in this context to describe the effect of the rotating air masses generated behind the wing tips of large jet aircraft, in preference to the term “wake vortex” which describes the nature of the air masses. Detailed characteristics of wake vortices and their effect on aircraft are contained in the Air Traffic Services Planning Manual (Doc 9426), Part II, Section 5.

4.9.1 Wake turbulence categories of aircraft

4.9.1.1 Wake turbulence separation minima shall be based on a grouping of aircraft types into three categories according to the maximum certificated take-off mass as follows:

- a) HEAVY (H) — all aircraft types of 136 000 kg or more;
- b) MEDIUM (M) — aircraft types less than 136 000 kg but more than 7 000 kg; and
- c) LIGHT (L) — aircraft types of 7 000 kg or less.

4.9.1.2 Helicopters should be kept well clear of light aircraft when hovering or while air taxiing.

Note 1.— Helicopters produce vortices when in flight and there is some evidence that, per kilogram of gross mass, their vortices are more intense than those of fixed-wing aircraft.

Note 2.— The provisions governing wake turbulence separation minima are set forth in Chapter 5, Section 5.8, and Chapter 8, Section 8.7.3.

4.9.2 Indication of heavy wake turbulence category

For aircraft in the heavy wake turbulence category the word “Heavy” shall be included immediately after the aircraft call sign in the initial radiotelephony contact between such aircraft and ATS units.

Note.— Wake turbulence categories are specified in the instructions for completing Item 9 of the flight plan in Appendix 2.

4.10 ALTIMETER SETTING PROCEDURES

4.10.1 Expression of vertical position of aircraft

4.10.1.1 For flights in the vicinity of aerodromes and within terminal control areas the vertical position of aircraft shall, except as provided for in 4.10.1.2, be expressed in terms of altitudes at or below the transition altitude and in terms of flight levels at or above the transition level. While passing through the transition layer, vertical position shall be expressed in terms of flight levels when climbing and in terms of altitudes when descending.

4.10.1.2 When an aircraft which has been given clearance to land is completing its approach using atmospheric pressure at aerodrome elevation (QFE), the vertical position of the aircraft shall be expressed in terms of height above aerodrome elevation during that portion of its flight for which QFE may be used, except that it shall be expressed in terms of height above runway threshold elevation:

- a) for instrument runways, if the threshold is 2 m (7 ft) or more below the aerodrome elevation; and
- b) for precision approach runways.

4.10.1.3 For flights en route, the vertical position of aircraft shall be expressed in terms of:

- a) flight levels at or above the lowest usable flight level; and
- b) altitudes below the lowest usable flight level;

except where, on the basis of regional air navigation agreements, a transition altitude has been established for a specified area, in which case the provisions of 4.10.1.1 shall apply.

4.10.2 Determination of the transition level

4.10.2.1 The appropriate ATS unit shall establish the transition level to be used in the vicinity of the aerodrome(s) concerned and, when relevant, the terminal control area (TMA) concerned, for the appropriate period of time on the basis of QNH (altimeter subscale setting to obtain elevation when on the ground) reports and forecast mean sea level pressure, if required.

4.10.2.2 The transition level shall be the lowest flight level available for use above the transition altitude established for the aerodrome(s) concerned. Where a common transition altitude has been established for two or more aerodromes which are so closely located as to require coordinated procedures, the appropriate ATS units shall establish a common transition level to be used at any given time in the vicinity of the aerodrome and, when relevant, in the TMA concerned.

Note.— See 4.10.3.2 regarding the determination of the lowest usable flight level(s) for control areas.

4.10.3 Minimum cruising level for IFR flights

4.10.3.1 Except when specifically authorized by the appropriate authority, cruising levels below the minimum flight altitudes established by the State shall not be assigned.

4.10.3.2 ATC units shall, when circumstances warrant it, determine the lowest usable flight level or levels for the whole or parts of the control area for which they are responsible, use it when assigning flight levels and pass it to pilots on request.

Note 1.— Unless otherwise prescribed by the State concerned, the lowest usable flight level is that flight level which corresponds to, or is immediately above, the established minimum flight altitude.

Note 2.— The portion of a control area for which a particular lowest usable flight level applies is determined in accordance with air traffic services requirements.

Note 3.— The objectives of the air traffic control service as prescribed in Annex 11 do not include prevention of collision with terrain. The procedures prescribed in this document do not relieve pilots of their responsibility to ensure that any clearances issued by air traffic control units are safe in this respect. When an IFR flight is vectored or is given a direct routing which takes the aircraft off an ATS route, the procedures in Chapter 8, 8.6.5.2 apply.

4.10.4 Provision of altimeter setting information

4.10.4.1 Appropriate ATS units shall at all times have available for transmission to aircraft in flight, on request, the information required to determine the lowest flight level which will ensure adequate terrain clearance on routes or segments of routes for which this information is required.

Note.— If so prescribed on the basis of regional air navigation agreements, this information may consist of climatological data.

4.10.4.2 Flight information centres and ACCs shall have available for transmission to aircraft, on request, an appropriate number of QNH reports or forecast pressures for the FIRs and control areas for which they are responsible, and for those adjacent.

4.10.4.3 The flight crew shall be provided with the transition level in due time prior to reaching it during descent. This may be accomplished by voice communications, ATIS broadcast or data link.

4.10.4.4 The transition level shall be included in approach clearances when so prescribed by the appropriate authority or requested by the pilot.

4.10.4.5 A QNH altimeter setting shall be included in the descent clearance when first cleared to an altitude below the transition level, in approach clearances or clearances to enter the traffic circuit, and in taxi clearances for departing aircraft, except when it is known that the aircraft has already received the information.

4.10.4.6 A QFE altimeter setting shall be provided to aircraft on request or on a regular basis in accordance with local arrangements; it shall be the QFE for the aerodrome elevation except for:

- a) non-precision approach runways, if the threshold is 2 m (7 ft) or more below the aerodrome elevation; and
- b) precision approach runways;

in which cases the QFE for the relevant runway threshold shall be provided.

4.10.4.7 Altimeter settings provided to aircraft shall be rounded down to the nearest lower whole hectopascal.

Note 1.— Unless otherwise prescribed by the State concerned, the lowest usable flight level is that flight level which corresponds to, or is immediately above, the established minimum flight altitude.

Note 2.— The portion of a control area for which a particular lowest usable flight level applies is determined in accordance with air traffic services requirements.

Note 3.— See Foreword, Note 2 to paragraph 2.1.

4.11 POSITION REPORTING

4.11.1 Transmission of position reports

4.11.1.1 On routes defined by designated significant points, position reports shall be made by the aircraft when over, or as soon as possible after passing, each designated compulsory reporting point, except as provided in 4.11.1.3 and 4.11.3. Additional reports over other points may be requested by the appropriate ATS unit.

4.11.1.2 On routes not defined by designated significant points, position reports shall be made by the aircraft as soon as possible after the first half hour of flight and at hourly intervals thereafter, except as provided in 4.11.1.3. Additional reports at shorter intervals of time may be requested by the appropriate ATS unit.

4.11.1.3 Under conditions specified by the appropriate ATS authority, flights may be exempted from the requirement to make position reports at each designated compulsory reporting point or interval. In applying this, account should be taken of the meteorological requirement for the making and reporting of routine aircraft observations.

Note.— This is intended to apply in cases where adequate flight progress data are available from other sources, e.g. radar or ADS-B (see Chapter 8, 8.6.4.4), or ADS-C (see Chapter 13) and in other circumstances where the omission of routine reports from selected flights is found to be acceptable.

4.11.1.4 The position reports required by 4.11.1.1 and 4.11.1.2 shall be made to the ATS unit serving the airspace in which the aircraft is operated. In addition, when so prescribed by the appropriate ATS authority in aeronautical information publications or requested by the appropriate ATS unit, the last position report before passing from one FIR or control area to an adjacent FIR or control area shall be made to the ATS unit serving the airspace about to be entered.

4.11.1.5 If a position report is not received at the expected time, subsequent control shall not be based on the assumption that the estimated time is accurate. Immediate action shall be taken to obtain the report if it is likely to have any bearing on the control of other aircraft.

4.11.2 Contents of voice position reports

4.11.2.1 The position reports required by 4.11.1.1 and 4.11.1.2 shall contain the following elements of information, except that elements d), e) and f) may be omitted from position reports transmitted by radiotelephony, when so prescribed on the basis of regional air navigation agreements:

- a) aircraft identification;
- b) position;
- c) time;
- d) flight level or altitude, including passing level and cleared level if not maintaining the cleared level;
- e) next position and time over; and
- f) ensuing significant point.

4.11.2.1.1 Element d), flight level or altitude, shall, however, be included in the initial call after a change of air-ground voice communication channel.

4.11.2.2 When assigned a speed to maintain, the flight crew shall include this speed in their position reports. The assigned speed shall also be included in the initial call after a change of air-ground voice communication channel, whether or not a full position report is required.

Note.— Omission of element d) may be possible when flight level or altitude, as appropriate, derived from pressure-altitude information can be made continuously available to controllers in labels associated with the position indication of aircraft and when adequate procedures have been developed to guarantee the safe and efficient use of this altitude information.

4.11.3 Radiotelephony procedures for air-ground voice communication channel changeover

When so prescribed by the appropriate ATS authority, the initial call to an ATC unit after a change of air-ground voice communication channel shall contain the following elements:

- a) designation of the station being called;
- b) call sign and, for aircraft in the heavy wake turbulence category, the word “Heavy”;
- c) level, including passing and cleared levels if not maintaining the cleared level;
- d) speed, if assigned by ATC; and
- e) additional elements, as required by the appropriate ATS authority.

4.11.4 Transmission of ADS-C reports

The position reports shall be made automatically to the ATS unit serving the airspace in which the aircraft is operating. The requirements for the transmission and contents of automatic dependent surveillance — contract (ADS-C) reports shall be established by the controlling ATC unit on the basis of current operational conditions and communicated to the aircraft and acknowledged through an ADS-C agreement.

4.11.5 Contents of ADS-C reports

4.11.5.1 ADS-C reports shall be composed of data blocks selected from the following:

- a) **Aircraft identification**
- b) **Basic ADS-C**
 - latitude
 - longitude
 - altitude
 - time
 - figure of merit

Note.— The basic ADS-C block is mandatory and is included in all ADS-C reports.

- c) **Ground vector**
 - track
 - ground speed
 - rate of climb or descent
- d) **Air vector**
 - heading
 - Mach or IAS
 - rate of climb or descent

- e) **Projected profile**
 - next waypoint
 - estimated altitude at next waypoint
 - estimated time at next waypoint
 - (next + 1) waypoint
 - estimated altitude at (next + 1) waypoint
 - estimated time at (next + 1) waypoint

- f) **Meteorological information**
 - wind speed
 - wind direction
 - wind quality flag (if available)
 - temperature
 - turbulence (if available)
 - humidity (if available)

Note.— The specifications for the elements in the meteorological information data block, including their ranges and resolutions, are shown in Appendix 3 to Annex 3.

- g) **Short-term intent**
 - latitude at projected intent point
 - longitude at projected intent point
 - altitude at projected intent point
 - time of projection

If an altitude, track or speed change is predicted to occur between the aircraft's current position and the projected intent point, additional information would be provided in an intermediate intent block as follows:

- distance from current point to change point
- track from current point to change point
- altitude at change point
- predicted time to change point

4.11.5.2 The basic ADS-C data block shall be required from all ADS-C-equipped aircraft. Remaining ADS-C data blocks shall be included as necessary. In addition to any requirements concerning its transmission for ATS purposes, data block f) (Meteorological information) shall be transmitted in accordance with Annex 3, 5.3.1. ADS-C emergency and/or urgency reports shall include the emergency and/or urgency status in addition to the relevant ADS-C report information.

4.11.6 Data format of ADS-B messages

Note.— Data formats of ADS-B messages can be found in Annex 10 — Aeronautical Telecommunications, Volume III — Communication Systems, Part I — Digital Data Communication Systems, and Volume IV — Surveillance and Collision Avoidance Systems.

4.12 REPORTING OF OPERATIONAL AND METEOROLOGICAL INFORMATION

4.12.1 General

4.12.1.1 When operational and/or routine meteorological information is to be reported, using data link, by an aircraft en route at times where position reports are required in accordance with 4.11.1.1 and 4.11.1.2, the position report shall be given in accordance with 4.11.5.2 (requirements concerning transmission of meteorological information from ADS-C equipped aircraft), or in the form of a routine air-report. Special aircraft observations shall be reported as special air-reports. All air-reports shall be reported as soon as is practicable.

4.12.2 Contents of routine air-reports

4.12.2.1 Routine air-reports transmitted by data link, when ADS-C is not being applied, shall give information relating to such of the following elements as are necessary for compliance with 4.12.2.2:

Section 1.— Position information:

- 1) aircraft identification
- 2) position
- 3) time
- 4) flight level or altitude
- 5) next position and time over
- 6) ensuing significant point

Section 2.— Operational information:

- 7) estimated time of arrival
- 8) endurance

Section 3.— Meteorological information:

- 9) wind direction
- 10) wind speed
- 11) wind quality flag
- 12) air temperature
- 13) turbulence (if available)
- 14) humidity (if available).

4.12.2.2 Section 1 of the air-report is obligatory, except that elements 5) and 6) thereof may be omitted when so prescribed on the basis of regional air navigation agreements. Section 2 of the air-report, or a portion thereof, shall only be transmitted when so requested by the operator or a designated representative, or when deemed necessary by the pilot-in-command. Section 3 of the air-report shall be transmitted in accordance with Annex 3, Chapter 5.

Note.— While element 4), flight level or altitude, may, in accordance with 4.11.2.1, be omitted from the contents of a position report transmitted by radiotelephony when so prescribed on the basis of regional air navigation agreements, that element may not be omitted from Section 1 of an air-report.

4.12.3 Contents of special air-reports

4.12.3.1 Special air-reports shall be made by all aircraft whenever the following conditions are encountered or observed:

- a) moderate or severe turbulence; or
- b) moderate or severe icing; or
- c) severe mountain wave; or
- d) thunderstorms, without hail that are obscured, embedded, widespread or in squall lines; or
- e) thunderstorms, with hail that are obscured, embedded, widespread or in squall lines; or
- f) heavy duststorm or heavy sandstorm; or
- g) volcanic ash cloud; or
- h) pre-eruption volcanic activity or a volcanic eruption.

Note.— *Pre-eruption volcanic activity in this context means unusual and/or increasing volcanic activity which could presage a volcanic eruption.*

In addition, in the case of transonic and supersonic flight:

- i) moderate turbulence; or
- j) hail; or
- k) cumulonimbus clouds.

4.12.3.2 When air-ground data link is used, special air-reports shall contain the following elements:

message type designator
aircraft identification

Data block 1:

latitude
longitude
pressure-altitude
time

Data block 2:

wind direction
wind speed
wind quality flag
air temperature
turbulence (if available)
humidity (if available)

Data block 3:

condition prompting the issuance of the special air-report; to be selected from the list a) to k) presented under 4.12.3.1.

4.12.3.3 When voice communications are used, special air-reports shall contain the following elements:

Message type designator

Section 1.— Position information

- 1) aircraft identification
- 2) position
- 3) time
- 4) flight level or altitude

Section 3.— Meteorological information

- 5) condition prompting the issuance of the special air-report; to be selected from the list a) to k) presented under 4.12.3.1.

4.12.4 Compilation and transmission of air-reports by voice communications

4.12.4.1 Forms based on the model AIREP SPECIAL form at Appendix 1 shall be provided for the use of flight crews in compiling the reports. The detailed instructions for reporting, as given at Appendix 1, shall be complied with.

4.12.4.2 The detailed instructions, including the formats of messages and the phraseologies given at Appendix 1, shall be used by flight crews when transmitting air-reports and by air traffic services units when retransmitting such reports.

Note.— Increasing use of air-reports in automated systems makes it essential that the elements of such reports be transmitted in the order and form prescribed.

4.12.5 Recording of special air-reports of volcanic activity

Special air-reports containing observations of volcanic activity shall be recorded on the special air-report of volcanic activity form. Forms based on the model form for special air-reports of volcanic activity at Appendix 1 shall be provided for flight crews operating on routes which could be affected by volcanic ash clouds.

Note.— The recording and reporting instructions may conveniently be printed on the back of the special air-report of volcanic activity form.

4.12.6 Forwarding of meteorological information

4.12.6.1 When receiving ADS-C reports which contain a meteorological information block, air traffic services units shall relay the basic ADS-C and meteorological information blocks and aircraft registration without delay to the world area forecast centres (WAFCs).

Note.— Specifications concerning the format to be used in the relay of meteorological information to the WAFCs are contained in the Manual on Aeronautical Meteorological Practice (Doc 8896).

4.12.6.2 When receiving special air-reports by data link communications, air traffic services units shall forward them without delay to their associated meteorological watch office, the WAFCs, and the centres designated by regional air navigation agreement for the operation of aeronautical fixed service Internet-based services.

4.12.6.3 When receiving special air-reports by voice communications, air traffic services units shall forward them without delay to their associated meteorological watch offices.

4.13 PRESENTATION AND UPDATING OF FLIGHT PLAN AND CONTROL DATA

4.13.1 General

The appropriate authority shall establish provisions and procedures for the presentation to controllers, and subsequent updating, of flight plan and control data for all flights being provided with a service by an ATS unit. Provision shall also be made for the presentation of any other information required or desirable for the provision of ATS.

4.13.2 Information and data to be presented

4.13.2.1 Sufficient information and data shall be presented in such a manner as to enable the controller to have a complete representation of the current air traffic situation within the controller's area of responsibility and, when relevant, movements on the manoeuvring area of aerodromes. The presentation shall be updated in accordance with the progress of aircraft, in order to facilitate the timely detection and resolution of conflicts as well as to facilitate and provide a record of coordination with adjacent ATS units and control sectors.

4.13.2.2 An appropriate representation of the airspace configuration, including significant points and information related to such points, shall be provided. Data to be presented shall include relevant information from flight plans and position reports as well as clearance and coordination data. The information display may be generated and updated automatically, or the data may be entered and updated by authorized personnel.

4.13.2.3 Requirements regarding other information to be displayed, or to be available for display, shall be specified by the appropriate authority.

4.13.3 Presentation of information and data

4.13.3.1 The required flight plan and control data may be presented through the use of paper flight progress strips or electronic flight progress strips, by other electronic presentation forms or by a combination of presentation methods.

4.13.3.2 The method(s) of presenting information and data shall be in accordance with Human Factors principles. All data, including data related to individual aircraft, shall be presented in a manner minimizing the potential for misinterpretation or misunderstanding.

4.13.3.3 Means and methods for manually entering data in ATC automation systems shall be in accordance with Human Factors principles.

4.13.3.4 When flight progress strips (FPS) are used, there should be at least one individual FPS for each flight. The number of FPS for individual flights shall be sufficient to meet the requirements of the ATS unit concerned. Procedures for annotating data and provisions specifying the types of data to be entered on FPS, including the use of symbols, shall be specified by the appropriate ATS authority.

Note.— Guidance material on the use of paper FPS is contained in the Air Traffic Services Planning Manual (Doc 9426).

4.13.3.5 Data generated automatically shall be presented to the controller in a timely manner. The presentation of information and data for individual flights shall continue until such time as the data is no longer required for the purpose of providing control, including conflict detection and the coordination of flights, or until terminated by the controller.

4.13.4 Recording and retention of data for investigative purposes

Paper FPS shall be retained for a period of at least 30 days. Electronic flight progress and coordination data shall be recorded and retained for at least the same period of time.

4.14 FAILURE OR IRREGULARITY OF SYSTEMS AND EQUIPMENT

ATC units shall immediately report in accordance with local instructions any failure or irregularity of communication, navigation and surveillance systems or any other safety-significant systems or equipment which could adversely affect the safety or efficiency of flight operations and/or the provision of air traffic control service.

4.15 DATA LINK COMMUNICATIONS INITIATION PROCEDURES

4.15.1 General

Note 1.— Provisions concerning the data link initiation capability (DLIC) are contained in Annex 10, Volume II, Chapter 8.

Note 2.— Guidance material relating to the implementation of DLIC can be found in the Global Operational Data Link (GOLD) Manual (Doc 10037).

4.15.1.1 Before entering an airspace where data link applications are used by the ATS unit, data link communications shall be initiated between the aircraft and the ATS unit in order to register the aircraft and, when necessary, allow the start of a data link application. This shall be initiated by the aircraft, either automatically or by the pilot, or by the ATS unit on address forwarding.

4.15.1.2 The logon address associated with an ATS unit shall be published in Aeronautical Information Publications in accordance with Annex 15.

Note.— A given FIR may have multiple logon addresses; and more than one FIR may share the same logon address.

4.15.2 Aircraft initiation

On receipt of a valid data link initiation request from an aircraft approaching or within a data link service area, the ATS unit shall accept the request and, if able to correlate it with a flight plan, shall establish a connection with the aircraft.

4.15.3 ATS unit forwarding

Where the ground system initially contacted by the aircraft is able to pass the necessary aircraft address information to another ATS unit, it shall pass the aircraft updated ground addressing information for data link applications previously coordinated in sufficient time to permit the establishment of data link communications.

4.15.4 Failure

4.15.4.1 In the case of a data link initiation failure, the data link system shall provide an indication of the failure to the appropriate ATS unit(s). The data link system shall also provide an indication of the failure to the flight crew when a data link initiation failure results from a logon initiated by the flight crew.

Note.— When the aircraft's logon request results from responding to a contact request by a transferring ATS unit, then both ATS units will receive the indication.

4.15.4.2 The ATS unit shall establish procedures to resolve, as soon as practicable, data link initiation failures. Procedures should include, as a minimum, verifying that the aircraft is initiating a data link request with the appropriate ATS unit (i.e. the aircraft is approaching or within the ATS unit's control area), and if so:

- a) when a flight plan is available, verify that the aircraft identification, aircraft registration, or aircraft address and other details contained in the data link initiation request correspond with details in the flight plan, and where differences are detected, verify which is the correct information and make the necessary changes; or
- b) when a flight plan is not available, create a flight plan with sufficient information in the flight data processing system to achieve a successful data link initiation; then
- c) arrange for the re-initiation of the data link.

4.15.4.3 The aircraft operator shall establish procedures to resolve, as soon as practicable, data link initiation failures. Procedures should include, as a minimum, that the pilot:

- a) verify the correctness and consistency of the flight plan information available in the FMS or equipment from which the data link is initiated, and where differences are detected, make the necessary changes;
- b) verify the correct address of the ATS unit; then
- c) re-initiate the data link.

Chapter 5

SEPARATION METHODS AND MINIMA

5.1 INTRODUCTION

Note 1.— With the exceptions stated below, Chapter 5 contains procedures and procedural separation minima for use in the separation of aircraft in the en-route phase as well as aircraft in the arrival and departure phases of flight.

Note 2.— Procedures and separation minima applicable to approaches to parallel runways are contained in Chapter 6. Procedures and separation minima applicable in the provision of aerodrome control service are contained in Chapter 7 and procedures and separation minima applicable to the use of ATS surveillance systems are contained in Chapter 8.

Note 3.— Attention is drawn to the use of strategic lateral offset procedures (SLOP) described in Chapter 16, 16.5.

Note 4.— Procedures applicable to data link initiation capability (DLIC) are contained in Chapter 4. Procedures applicable to automatic dependent surveillance — contract (ADS-C) are contained in Chapter 13. Procedures applicable to controller-pilot data link communications (CPDLC) are contained in Chapter 14.

5.2 PROVISIONS FOR THE SEPARATION OF CONTROLLED TRAFFIC

5.2.1 General

5.2.1.1 Vertical or horizontal separation shall be provided:

- 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, when so prescribed by the appropriate ATS authority;

except, for the cases under b) above in airspace Classes D and E, during the hours of daylight when flights have been cleared to climb or descend subject to maintaining own separation and remaining in visual meteorological conditions. Conditions applicable to the use of this procedure are contained in Section 5.9.

5.2.1.2 No clearance shall be given to execute any manoeuvre that would reduce the spacing between two aircraft to less than the separation minimum applicable in the circumstances.

5.2.1.3 Larger separations than the specified minima should be applied whenever exceptional circumstances such as unlawful interference or navigational difficulties call for extra precautions. This should be done with due regard to all relevant factors so as to avoid impeding the flow of air traffic by the application of excessive separations.

Note.— *Unlawful interference with an aircraft constitutes a case of exceptional circumstances which might require the application of separations larger than the specified minima, between the aircraft being subjected to unlawful interference and other aircraft.*

5.2.1.4 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.

5.2.2 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. 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.

5.3 VERTICAL SEPARATION

5.3.1 Vertical separation application

Vertical separation is obtained by requiring aircraft using prescribed altimeter setting procedures to operate at different levels expressed in terms of flight levels or altitudes in accordance with the provisions in Chapter 4, Section 4.10.

5.3.2 Vertical separation minimum

The vertical separation minimum (VSM) shall be:

- a) a nominal 300 m (1 000 ft) below FL 290 and a nominal 600 m (2 000 ft) at or above this level, except as provided for in b) below; and
- b) within designated airspace, subject to a regional air navigation agreement: a nominal 300 m (1 000 ft) below FL 410 or a higher level where so prescribed for use under specified conditions, and a nominal 600 m (2 000 ft) at or above this level.

Note.— *Guidance material relating to vertical separation is contained in the Manual on a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive (Doc 9574).*

5.3.3 Assignment of cruising levels for controlled flights

5.3.3.1 Except when traffic conditions and coordination procedures permit authorization of cruise climb, an ATC unit shall normally authorize only one level for an aircraft beyond its control area, i.e. that level at which the aircraft will enter the next control area whether contiguous or not. It is the responsibility of the accepting ATC unit to issue clearance for further climb as appropriate. When relevant, aircraft will be advised to request en route any cruising level changes desired.

5.3.3.2 Aircraft authorized to employ cruise climb techniques shall be cleared to operate between two levels or above a level.

5.3.3.3 If it is necessary to change the cruising level of an aircraft operating along an established ATS route extending partly within and partly outside controlled airspace and where the respective series of cruising levels are not identical, the change shall, whenever possible, be effected within controlled airspace.

5.3.3.4 When an aircraft has been cleared into a control area at a cruising level which is below the established minimum cruising level for a subsequent portion of the route, the ATC unit responsible for the area should issue a revised clearance to the aircraft even though the pilot has not requested the necessary cruising level change.

5.3.3.5 An aircraft may be cleared to change cruising level at a specified time, place or rate.

Note.— See 5.3.4.1.1 concerning procedures for vertical speed control.

5.3.3.6 In so far as practicable, 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.

5.3.3.7 An aircraft at a cruising level shall normally have priority over other aircraft requesting that cruising level. When two or more aircraft are at the same cruising level, the preceding aircraft shall normally have priority.

5.3.3.8 The cruising levels, or, in the case of cruise climb, the range of levels, to be assigned to controlled flights shall be selected from those allocated to IFR flights in:

- a) the tables of cruising levels in Appendix 3 of Annex 2; or
- b) a modified table of cruising levels, when so prescribed in accordance with Appendix 3 of Annex 2 for flights above FL 410;

except that the correlation of levels to track as prescribed therein shall not apply whenever otherwise indicated in air traffic control clearances or specified by the appropriate ATS authority in AIPs.

5.3.4 Vertical separation during climb or descent

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

- a) severe turbulence is known to exist;
- b) the higher aircraft is effecting a cruise climb; or
- c) the difference in aircraft performance is such that less than the applicable separation minimum may result;

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.

5.3.4.1.1 When the aircraft concerned are entering or established in the same holding pattern, consideration shall be given to aircraft descending at markedly different rates and, if necessary, additional measures such as specifying a maximum descent rate for the higher aircraft and a minimum descent rate for the lower aircraft should be applied to ensure that the required separation is maintained.

5.3.4.2 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.

5.4 HORIZONTAL SEPARATION

Note 1.— Nothing in the provisions detailed in Sections 5.4.1 and 5.4.2 hereunder precludes a State from establishing:

- a) other minima for use in circumstances not prescribed; or*
- b) additional conditions to those prescribed for the use of a given minimum;*

provided that the level of safety inherent in the provisions detailed in Sections 5.4.1 and 5.4.2 hereunder is at all times assured.

Note 2.— Details on track spacing between parallel routes are provided in Annex 11, Attachments A and B.

Note 3.— Attention is drawn to the following guidance material:

- a) Air Traffic Services Planning Manual (Doc 9426);*
- b) Manual on Airspace Planning Methodology for the Determination of Separation Minima (Doc 9689); and*
- c) Performance-based Navigation (PBN) Manual (Doc 9613).*

Note 4.— Provisions concerning reductions in separation minima are contained in Section 5.11 and in Chapter 2, ATS Safety Management.

5.4.1 Lateral separation

5.4.1.1 LATERAL SEPARATION APPLICATION

5.4.1.1.1 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. This buffer shall be determined by the appropriate authority and included in the lateral separation minima as an integral part thereof.

Note.— In the minima specified in 5.4.1.2 an appropriate buffer has already been included.

5.4.1.1.2 Lateral separation of aircraft is obtained by requiring operation on different routes or in different geographical locations as determined by visual observation, by the use of navigation aids or by the use of area navigation (RNAV) equipment.

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

5.4.1.1.4 When an aircraft turns onto an ATS route via a flyover waypoint, a separation other than the normally prescribed lateral separation shall be applied for that portion of the flight between the flyover waypoint where the turn is executed and the next waypoint (see Figures 5-1 and 5-2).

Note 1.— For flyover waypoints aircraft are required to first fly over the waypoint before executing the turn. After the turn the aircraft may either navigate to join the route immediately after the turn or navigate to the next defined waypoint before re-joining the route. This will require additional lateral separation on the overflown side of the turn.

Note 2.— This does not apply to ATS routes that have turns using fly-by waypoints.

Note 3.— An example of a prescribed lateral separation minima based on a specific navigation performance can be found in 5.4.1.2.1.6.

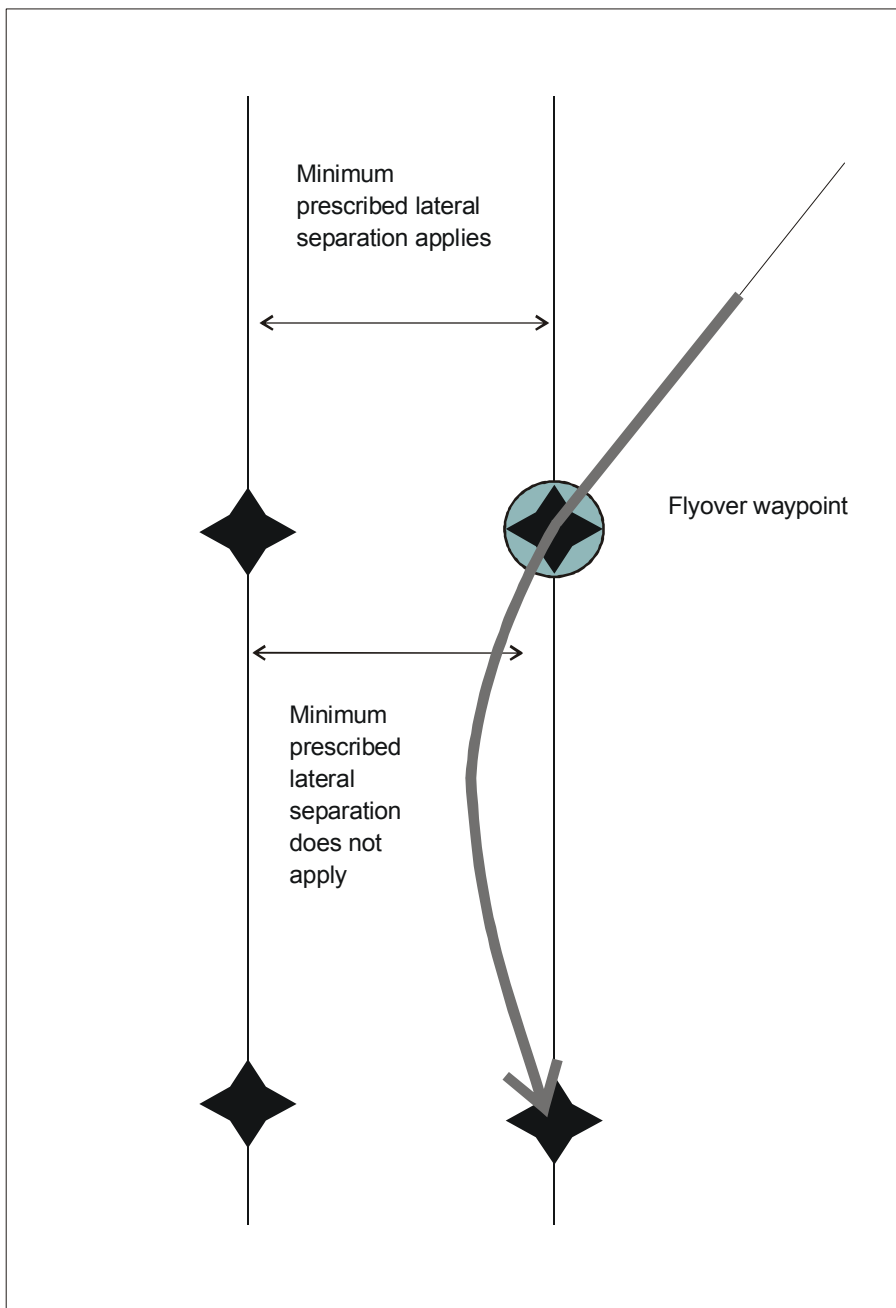


Figure 5-1. Turn over flyover waypoint (See 5.4.1.1.4)

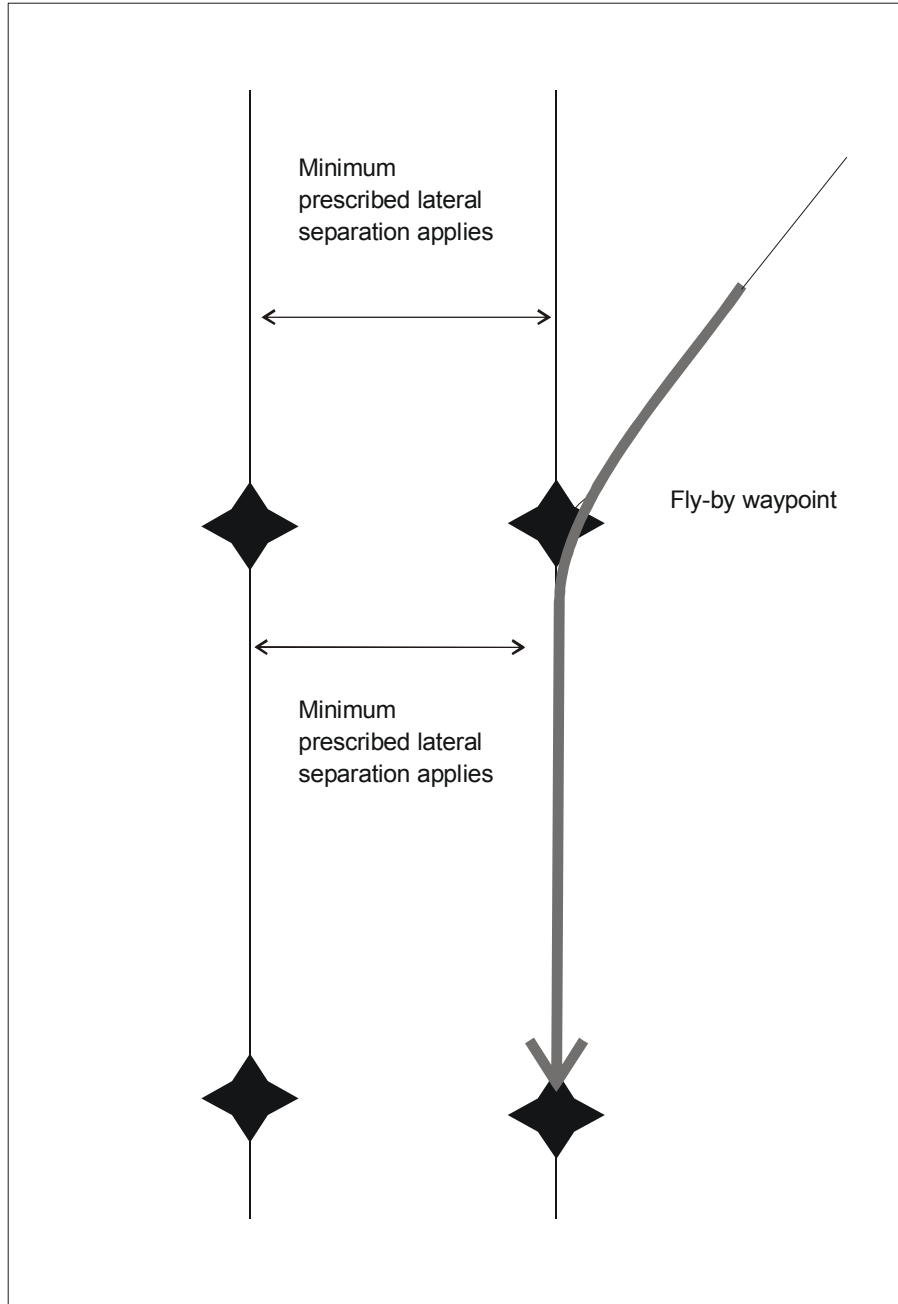


Figure 5-2. Turn at fly-by waypoint (See 5.4.1.1.4)

5.4.1.2 LATERAL SEPARATION CRITERIA AND MINIMA

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

5.4.1.2.1.1 *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 (see Figure 5-3).

5.4.1.2.1.2 *By use of NDB, VOR or GNSS on intersecting tracks or ATS routes.* By requiring aircraft to fly on specified tracks which are separated by a minimum amount appropriate to the navigation aid employed. 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 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 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 Table 5-1; or
- 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 Table 5-1.

Table 5-1. Lateral separation for aircraft flying VOR and GNSS

Angular difference between tracks measured at the common point (degrees)	Aircraft 1: VOR or GNSS Aircraft 2: GNSS	
	FL010 – FL190 Distance from a common point	FL200 – FL600 Distance from a common point
15 – 135	27.8 km (15 NM)	43 km (23 NM)
The distances in the table are ground distances. States must take into account the distance (slant range) from the source of a DME signal to the receiving antenna when DME is being utilized to provide range information.		

Note 1.— The values in Table 5-1 are from a larger table of values derived by collision risk analysis. The source table for separation of aircraft navigating by means of GNSS and VOR is contained in Circular 322, Guidelines for the Implementation of GNSS Lateral Separation Minima based on VOR Separation Minima. States may refer to Circular 322 for greater detail and other angular differences and separation distances.

Note 2.— The values in Table 5-1 have accounted for distances from the common point encompassed by the theoretical turn area for fly-by turns as specified in the Minimum Aviation System Performance Standard: Required Navigation Performance for Air Navigation (ED-75B/DO-236B), section 3.2.5.4, and fixed radius transition turns as defined in the Performance-based Navigation (PBN) Manual (Doc 9613).

Note 3.— Guidance material for the implementation of GNSS lateral separation is contained in Circular 322, Guidelines for the Implementation of GNSS Lateral Separation Minima Based on VOR Separation Minima.

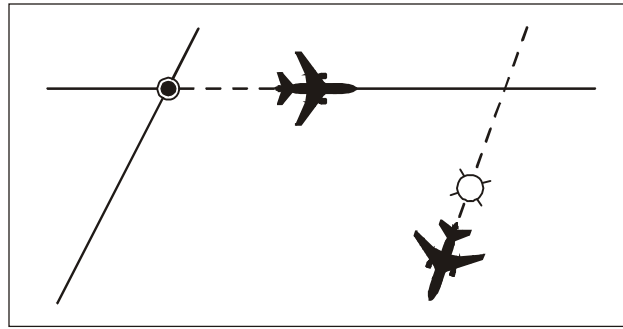


Figure 5-3. Using same or different geographic locations (see 5.4.1.2.1.1)

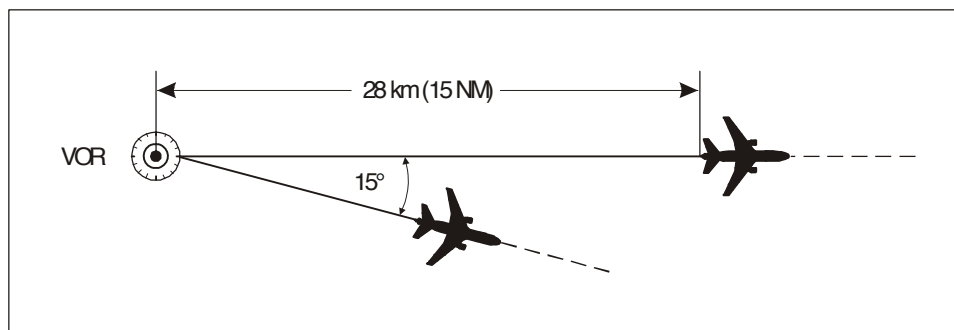


Figure 5-4. Separation using the same VOR (see 5.4.1.2.1.2 a))

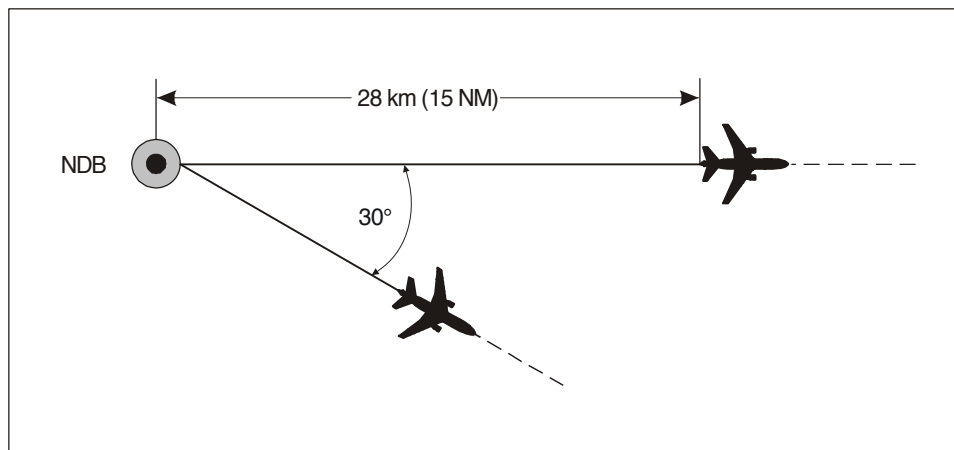


Figure 5-5. Separation using the same NDB (see 5.4.1.2.1.2 b))

5.4.1.2.1.2.1 When aircraft are operating on tracks which are separated by considerably more than the minimum in 5.4.1.2.1.2 a) and b), States may reduce the distance at which lateral separation is achieved.

5.4.1.2.1.2.2 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.

5.4.1.2.1.2.3 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.

5.4.1.2.1.2.4 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.

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

5.4.1.2.1.3 *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.

5.4.1.2.1.4 *Lateral separation of aircraft on published instrument flight procedures for arrivals and departures.*

5.4.1.2.1.4.1 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 (7 NM); or
- 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.

Note 1.— Distance values contained in a) and b) above were determined by collision risk analysis using multiple navigation specifications. Information on this analysis is contained in Circular 324, Guidelines for Lateral Separation of Arriving and Departing Aircraft on Published Adjacent Instrument Flight Procedures.

Note 2.— Circular 324 also contains information on separation of arrival and departure tracks using non-overlapping protected areas based on obstacle clearance criteria, as provided for in the Procedures for Air Navigation Services — Aircraft Operations, Volume II — Construction of Visual and Instrument Flight Procedures (PANS-OPS, Doc 8168).

Note 3.— Provisions concerning reductions in separation minima are contained in Chapter 2, ATS Safety Management, and Chapter 5, Separation Methods and Minima, Section 5.11.

Note 4.— Guidance concerning the navigation specifications is contained in the Performance-based Navigation (PBN) Manual (Doc 9613).

5.4.1.2.1.5 *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 centre 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 Annex 11, Attachment B.

5.4.1.2.1.6 *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 in accordance with the following:

- a) for a minimum spacing between tracks of 93 km (50 NM) a navigational performance of RNAV 10 (RNP 10), RNP 4 or RNP 2 shall be prescribed;
- b) for a minimum spacing between tracks of 42.6 km (23 NM) a navigational performance of RNP 4 or RNP 2 shall be prescribed. The communication system shall satisfy required communication performance 240 (RCP 240) and the surveillance system shall satisfy required surveillance performance 180 (RSP 180). Conformance monitoring shall be ensured by establishing an ADS-C event contract specifying a lateral deviation change event with a maximum of 5 NM threshold and a waypoint change event;
- c) for a minimum spacing between tracks of 27.8 km (15 NM) a navigational performance of RNP 2 or a GNSS equipage shall be prescribed. Direct controller-pilot VHF voice communication shall be maintained while such separation is applied;
- d) for a minimum spacing between tracks of 13 km (7 NM), applied while one aircraft climbs/descends through the level of another aircraft, a navigational performance of RNP 2 or a GNSS equipage shall be prescribed. Direct controller-pilot VHF voice communication shall be maintained while such separation is applied; and
- e) for a minimum spacing between tracks of 37 km (20 NM), applied while one aircraft climbs/descends through the level of another aircraft whilst using other types of communication than specified in d) above, a navigational performance of RNP 2 or a GNSS equipage shall be prescribed.

Note 1.— Guidance material for the implementation of the navigation capability supporting 93 km (50 NM), 42.6 km (23 NM), 37 km (20 NM), 27.8 km (15 NM) and 13 km (7 NM) lateral separation minima is contained in the Performance-based Navigation (PBN) Manual (Doc 9613). Guidance material for the implementation of the 93 km (50 NM), 42.6 km (23 NM), 37 km (20 NM), 27.8 km (15 NM) and 13 km (7 NM) lateral separation minima is contained in Circular 341, Guidelines for the Implementation of Lateral Separation Minima.

Note 2.— Guidance material for implementation of communication and surveillance capability supporting 93 km (50 NM) and 42.6 km (23 NM) lateral separation minima is contained in the Performance-based Communication and Surveillance (PBCS) Manual (Doc 9869) and the Global Operational Data Link (GOLD) Manual (Doc 10037).

Note 3.— See Appendix 2, ITEM 10: EQUIPMENT AND CAPABILITIES, in relation to the GNSS prescribed in c), d) and e) above.

5.4.1.2.1.7 *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 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 Figure 5-6).

This type of separation may be used for tracks that intersect at any angles using the values for lateral separation points specified below:

<i>Navigation</i>	<i>Separation</i>
RNAV 10 (RNP 10)	93 km (50 NM)
RNP 4	42.6 km (23 NM)
RNP 2	27.8 km (15 NM)

5.4.1.2.1.8 When applying the 27.8 km (15 NM) separation minima specified in the table above, a GNSS, as indicated in the flight plan by the letter G meets the specified navigation performance.

Note.— Guidance material for the implementation of the navigation capability supporting 93 km (50 NM), 42.6 km (23 NM), and 27.8 km (15 NM) lateral separation minima is contained in the Performance-based Navigation (PBN) Manual (Doc 9613). Supporting information for the implementation of the 93 km (50 NM), 42.6 km (23 NM) and 27.8 km (15 NM) lateral separation minima is contained in Circular 341, Guidelines for the Implementation of Lateral Separation Minima.

5.4.1.2.1.9 *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.

5.4.2 Longitudinal separation

5.4.2.1 LONGITUDINAL SEPARATION APPLICATION

5.4.2.1.1 Longitudinal separation shall be applied so that the spacing between the estimated positions of the aircraft being separated is never less than a prescribed minimum. Longitudinal separation between aircraft following the same or diverging tracks may be maintained by application of speed control, including the Mach number technique. When applicable, use of the Mach number technique shall be prescribed on the basis of a regional air navigation agreement.

Note 1.— Attention is drawn to the guidance material contained in the Air Traffic Services Planning Manual (Doc 9426) regarding the application of the Mach number technique to separation of subsonic aircraft.

Note 2.— The Mach number technique is applied using true Mach number.

5.4.2.1.2 In applying a time- or distance-based longitudinal separation minimum between aircraft following the same track, care shall be exercised to ensure that the separation minimum will not be infringed whenever the following aircraft is maintaining a higher airspeed than the preceding aircraft. When aircraft are expected to reach minimum separation, speed control shall be applied to ensure that the required separation minimum is maintained.

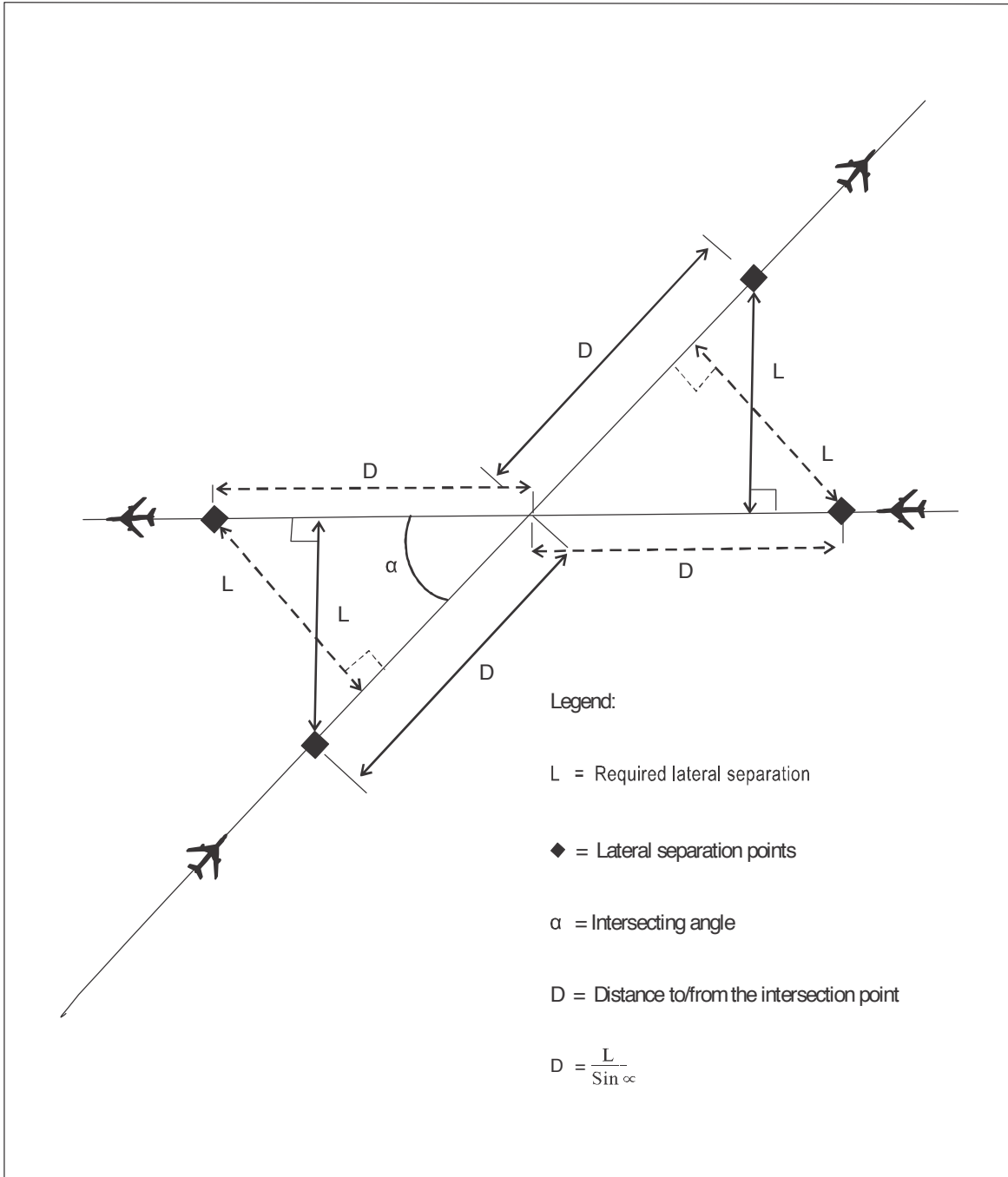


Figure 5-6. Lateral separation points (see 5.4.1.2.1.7)

5.4.2.1.3 Longitudinal separation may be established by requiring aircraft to depart at a specified time, to arrive over a geographical location at a specified time, or to hold over a geographical location until a specified time.

5.4.2.1.4 Longitudinal separation between supersonic aircraft during the transonic acceleration and supersonic phases of flight should normally be established by appropriate timing of the start of transonic acceleration rather than by the imposition of speed restrictions in supersonic flight.

5.4.2.1.5 For the purpose of application of longitudinal separation, the terms *same track*, *reciprocal tracks* and *crossing tracks* shall have the following meanings:

- a) Same track (see Figure 5-7):

same direction tracks and intersecting tracks or portions thereof, the angular difference of which is less than 45 degrees or more than 315 degrees, and whose protected airspaces overlap.

- b) Reciprocal tracks (see Figure 5-8):

opposite tracks and intersecting tracks or portions thereof, the angular difference of which is more than 135 degrees but less than 225 degrees, and whose protected airspaces overlap.

- c) Crossing tracks (see Figure 5-9):

intersecting tracks or portions thereof other than those specified in a) and b) above.

5.4.2.1.6 Time-based separation applied in accordance with 5.4.2.2 and 5.4.2.4 may be based on position information and estimates derived from voice reports, CPDLC or ADS-C.

5.4.2.2 LONGITUDINAL SEPARATION MINIMA BASED ON TIME

5.4.2.2.1 AIRCRAFT MAINTAINING THE SAME LEVEL

5.4.2.2.1.1 Aircraft flying on the same track:

- a) 15 minutes (see Figure 5-10); or
- b) 10 minutes, if navigation aids permit frequent determination of position and speed (see Figure 5-11); or
- c) 5 minutes in the following cases, provided that in each case the preceding aircraft is maintaining a true airspeed of 37 km/h (20 kt) or more faster than the succeeding aircraft (see Figure 5-12):
- 1) between aircraft that have departed from the same aerodrome;
 - 2) between en-route aircraft that have reported over the same exact significant point;
 - 3) between departing and en-route aircraft after the en-route aircraft has reported over a fix that is so located in relation to the departure point as to ensure that five-minute separation can be established at the point the departing aircraft will join the air route; or
- d) 3 minutes in the cases listed under c) provided that in each case the preceding aircraft is maintaining a true airspeed of 74 km/h (40 kt) or more faster than the succeeding aircraft (see Figure 5-13).

5.4.2.2.1.2 Aircraft flying on crossing tracks:

- a) 15 minutes at the point of intersection of the tracks (see Figure 5-14); or
- b) 10 minutes if navigation aids permit frequent determination of position and speed (see Figure 5-15).

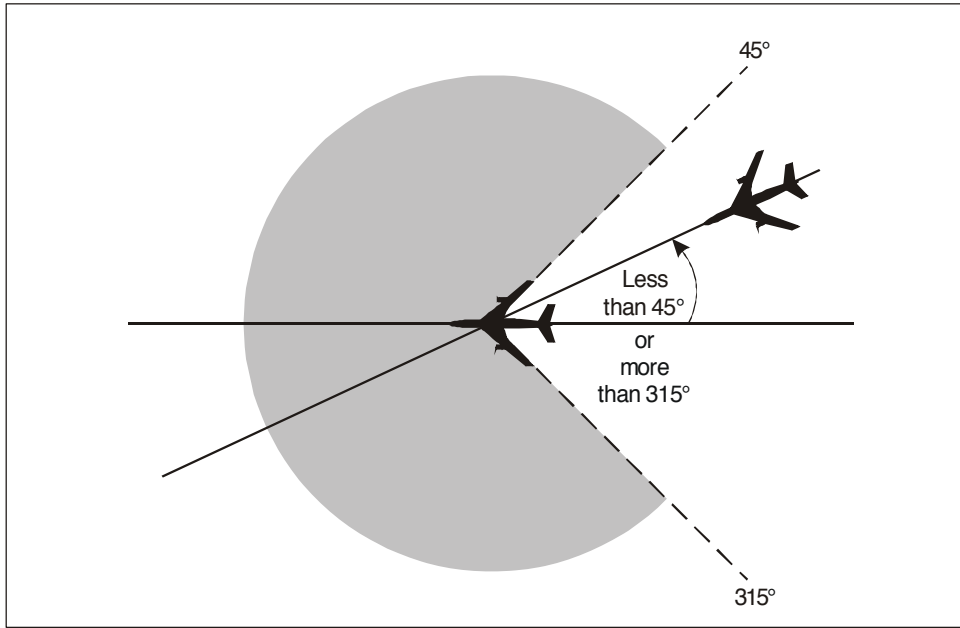


Figure 5-7. Aircraft on same track (see 5.4.2.1.5 a))

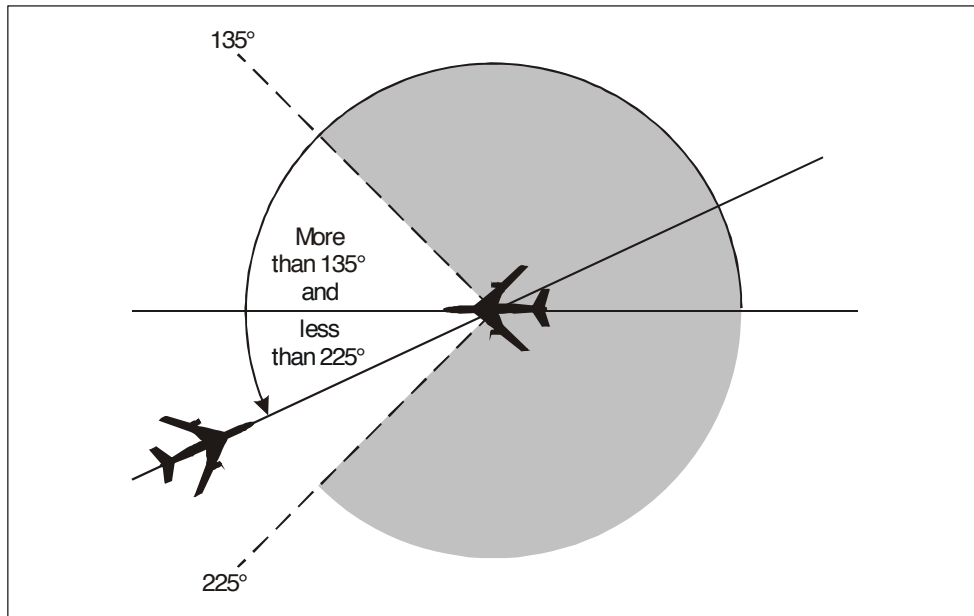


Figure 5-8. Aircraft on reciprocal tracks (see 5.4.2.1.5 b))

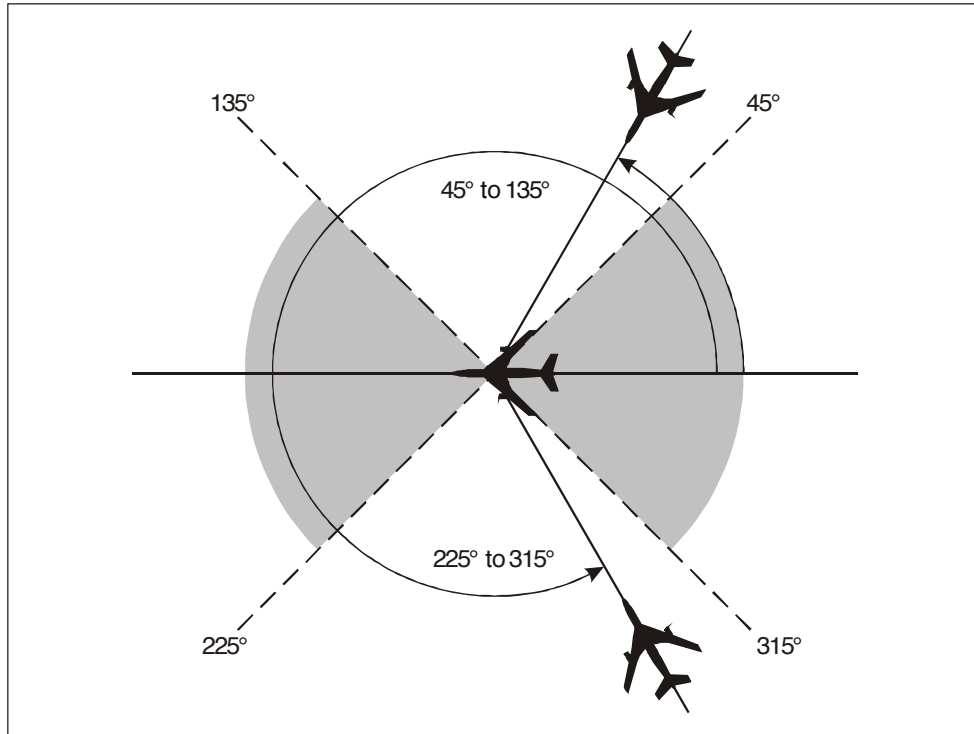


Figure 5-9. Aircraft on crossing tracks (see 5.4.2.1.5 c))

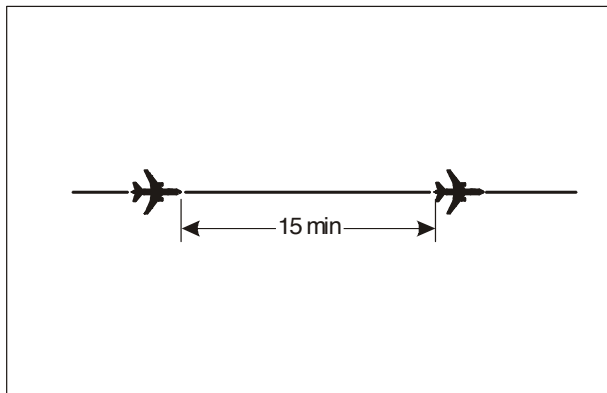


Figure 5-10. Fifteen-minute separation between aircraft on same track and same level (see 5.4.2.2.1.1 a))

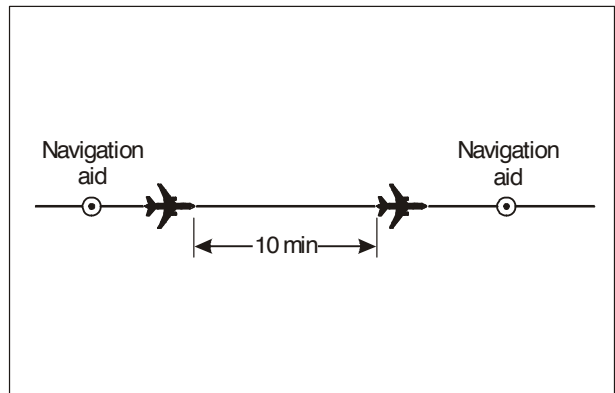


Figure 5-11. Ten-minute separation between aircraft on same track and same level (see 5.4.2.2.1.1 b))

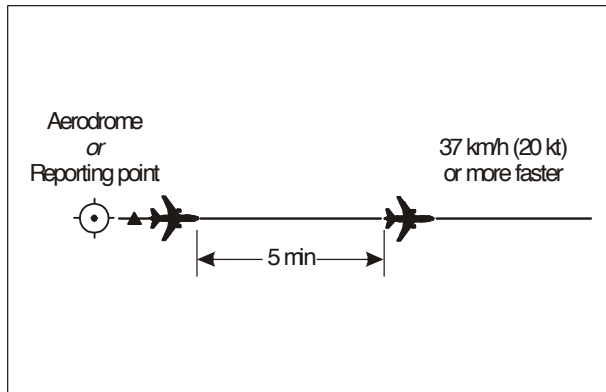


Figure 5-12. Five-minute separation between aircraft on same track and same level (see 5.4.2.2.1.1 c))

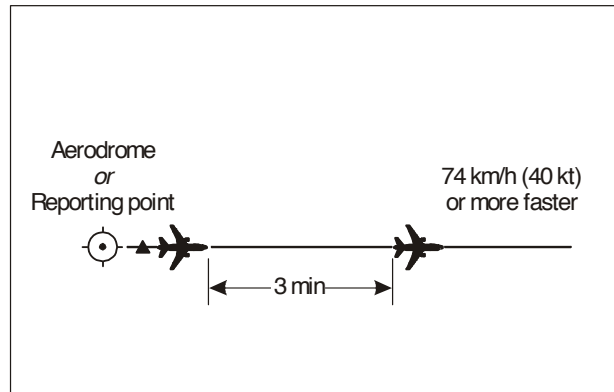


Figure 5-13. Three-minute separation between aircraft on same track and same level (see 5.4.2.2.1.1 d))

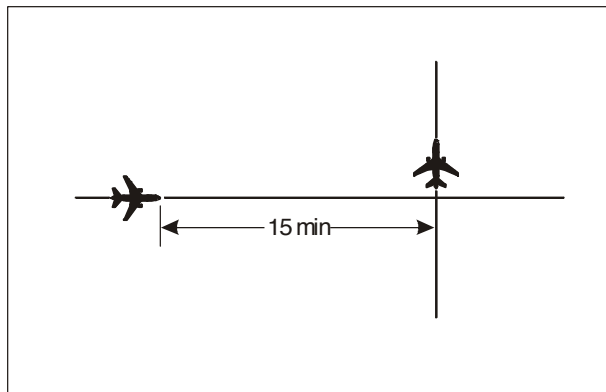


Figure 5-14. Fifteen-minute separation between aircraft on crossing tracks and same level (see 5.4.2.2.1.2 a))

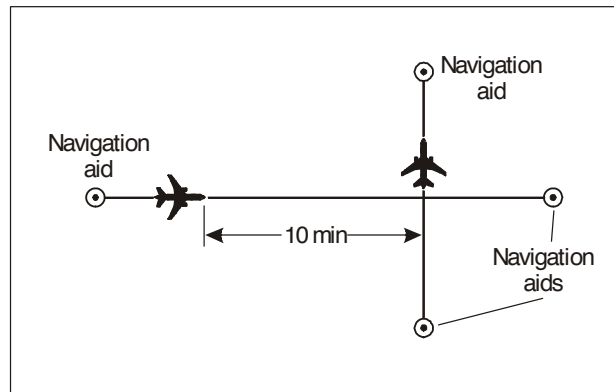


Figure 5-15. Ten-minute separation between aircraft on crossing tracks and same level (see 5.4.2.2.1.2 b))

5.4.2.2.2 AIRCRAFT CLIMBING OR DESCENDING

5.4.2.2.2.1 *Aircraft on the same track.* When an aircraft will pass through the level of another aircraft on the same track, the following minimum longitudinal separation shall be provided:

- a) 15 minutes while vertical separation does not exist (see Figures 5-16A and 5-16B); or
- b) 10 minutes while vertical separation does not exist, provided that such separation is authorized only where ground-based navigation aids or GNSS permit frequent determination of position and speed (see Figures 5-17A and 5-17B); or
- c) 5 minutes while vertical separation does not exist, provided that:
 - 1) the level change is commenced within 10 minutes of the time the second aircraft has reported over a common point which must be derived from ground-based navigation aids or by GNSS; and

- 2) when issuing the clearance through third party communication or CPDLC a restriction shall be added to the clearance to ensure that the 10-minute condition is satisfied (see Figures 5-18A and 5-18B).

Note.— To facilitate application of the procedure where a considerable change of level is involved, a descending aircraft may be cleared to some convenient level above the lower aircraft, or a climbing aircraft to some convenient level below the higher aircraft, to permit a further check on the separation that will be obtained while vertical separation does not exist.

5.4.2.2.2 Aircraft on crossing tracks:

- a) 15 minutes while vertical separation does not exist (see Figures 5-19A and 5-19B); or
- b) 10 minutes while vertical separation does not exist if navigation aids permit frequent determination of position and speed (see Figures 5-20A and 5-20B).

5.4.2.2.3 Aircraft on reciprocal tracks. Where lateral separation is not provided, vertical separation shall be provided for at least ten minutes prior to and after the time the aircraft are estimated to pass, or are estimated to have passed (see Figure 5-21). Provided it has been determined that the aircraft have passed each other, this minimum need not apply.

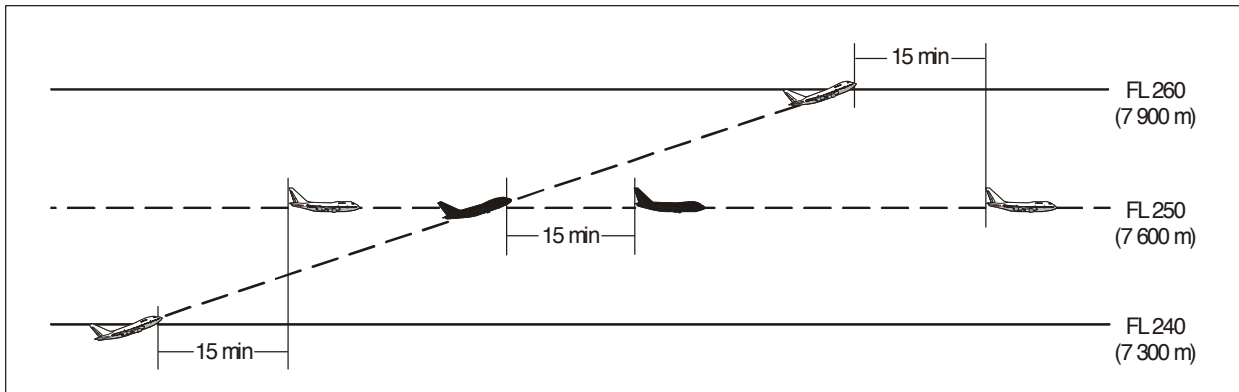


Figure 5-16A. Fifteen-minute separation between aircraft climbing and on same track (see 5.4.2.2.1 a))

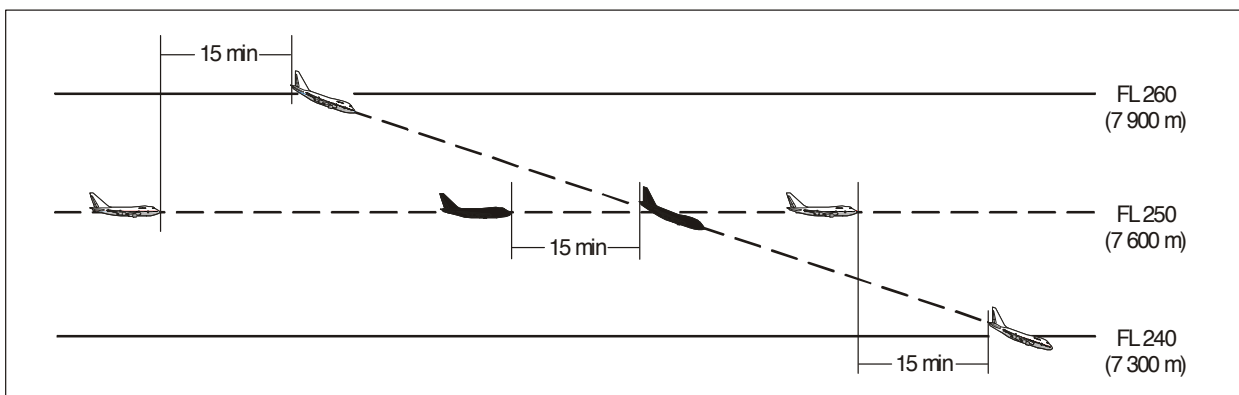


Figure 5-16B. Fifteen-minute separation between aircraft descending and on same track (see 5.4.2.2.1 a))

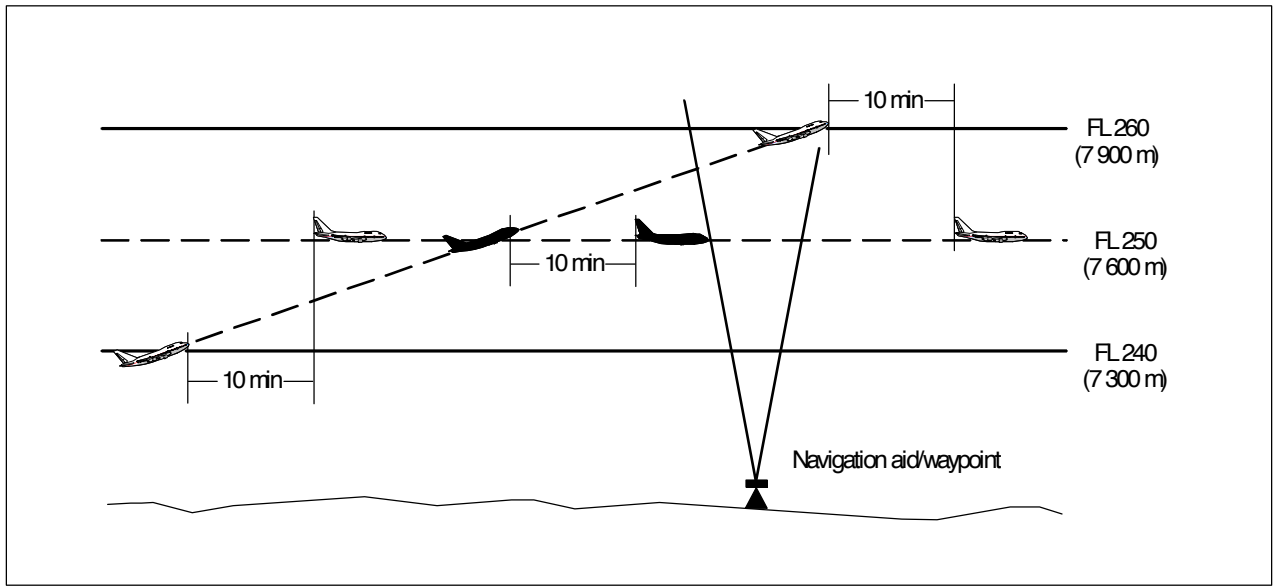


Figure 5-17A. Ten-minute separation between aircraft climbing and on same track (see 5.4.2.2.2.1 b))

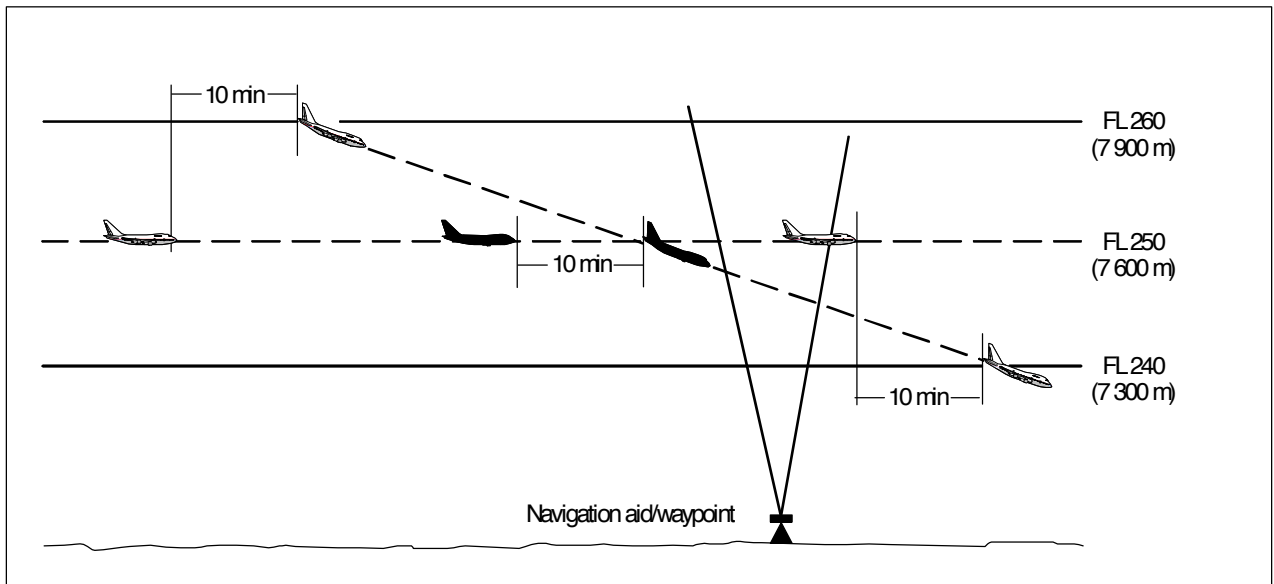


Figure 5-17B. Ten-minute separation between aircraft descending and on same track (see 5.4.2.2.2.1 b))

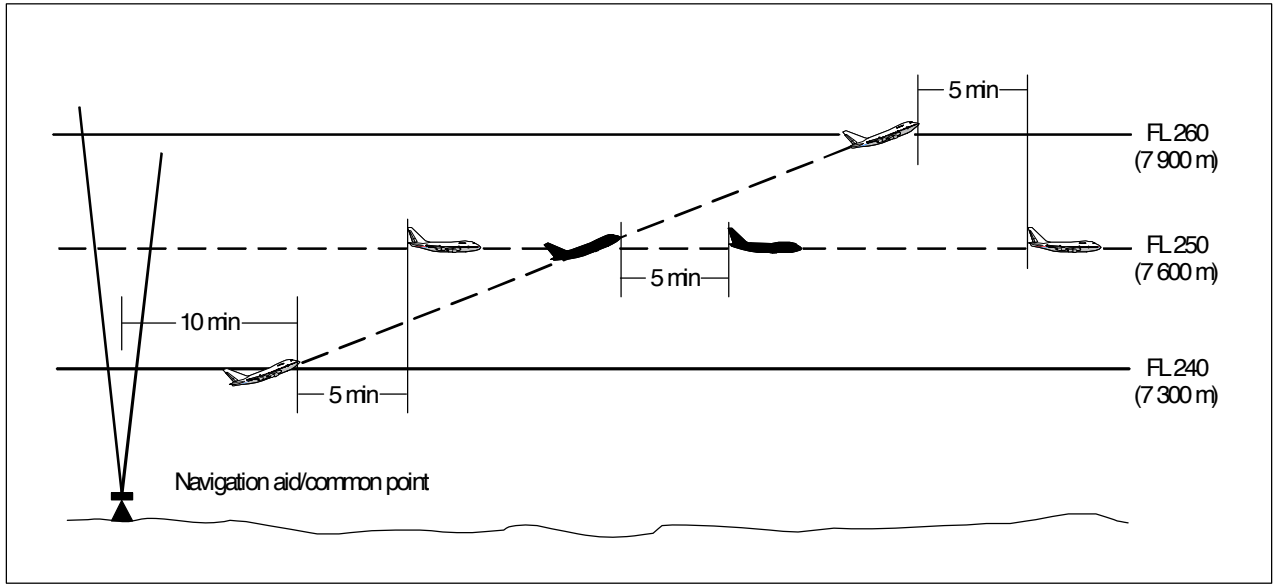


Figure 5-18A. Five-minute separation between aircraft climbing and on same track (see 5.4.2.2.1 c) 2))

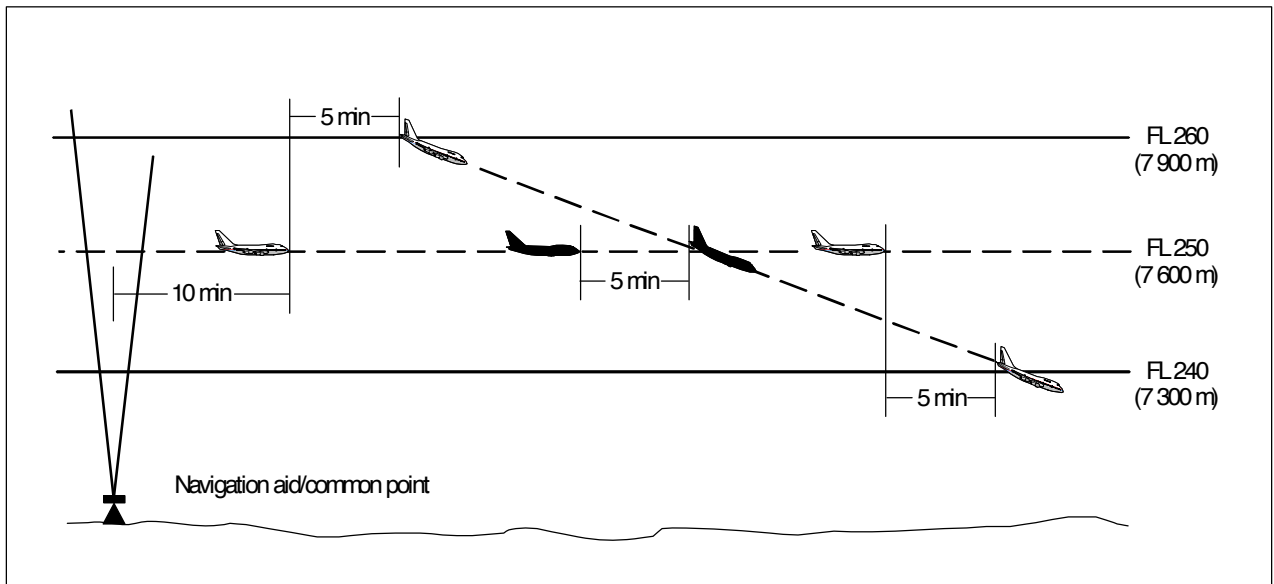


Figure 5-18B. Five-minute separation between aircraft descending and on same track (see 5.4.2.2.1 c) 2))

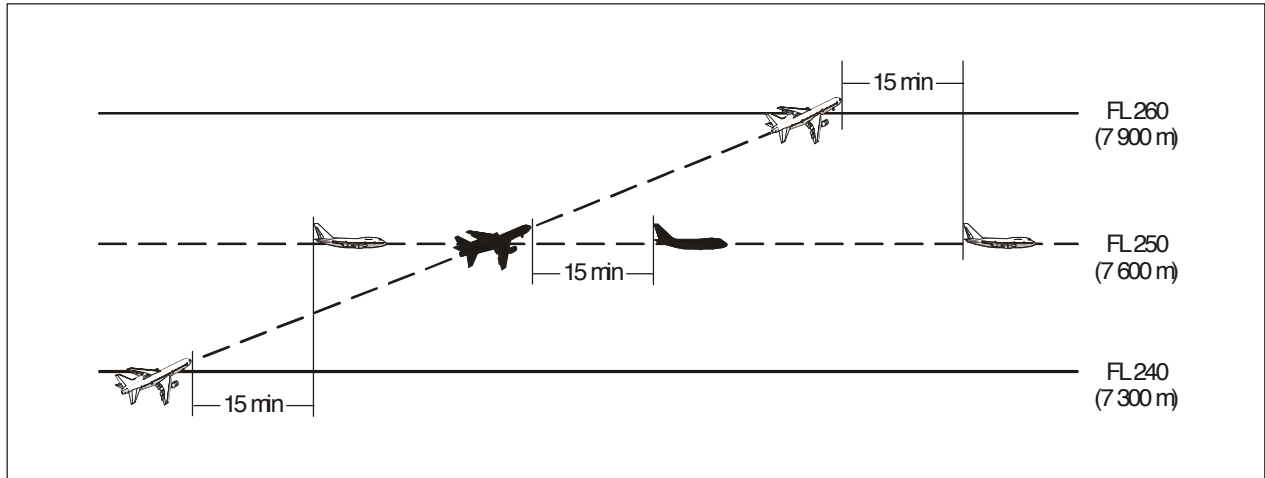


Figure 5-19A. Fifteen-minute separation between aircraft climbing and on crossing tracks (see 5.4.2.2.2 a)

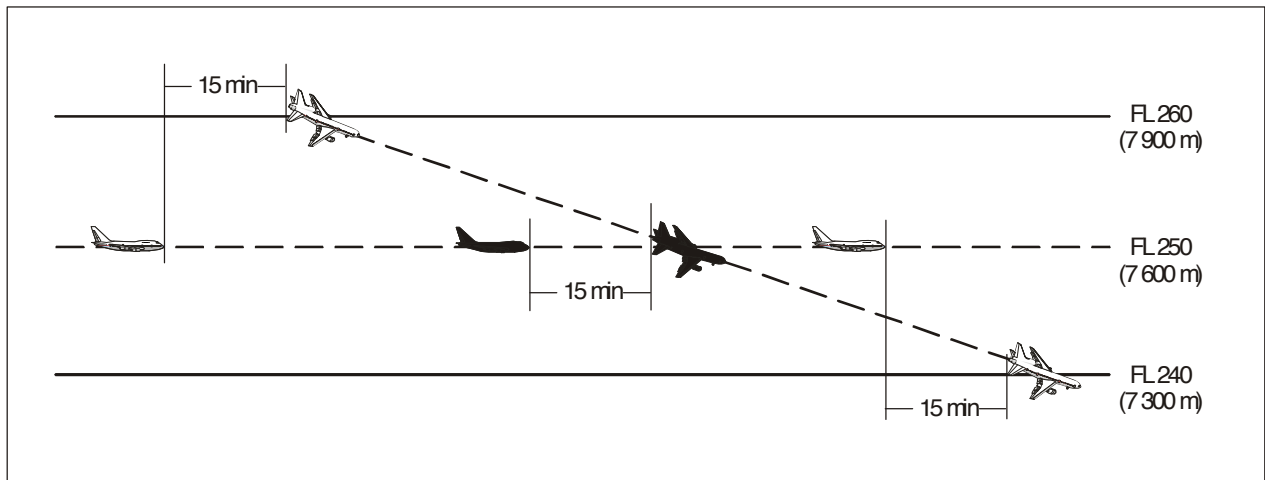


Figure 5-19B. Fifteen-minute separation between aircraft descending and on crossing tracks (see 5.4.2.2.2 a)

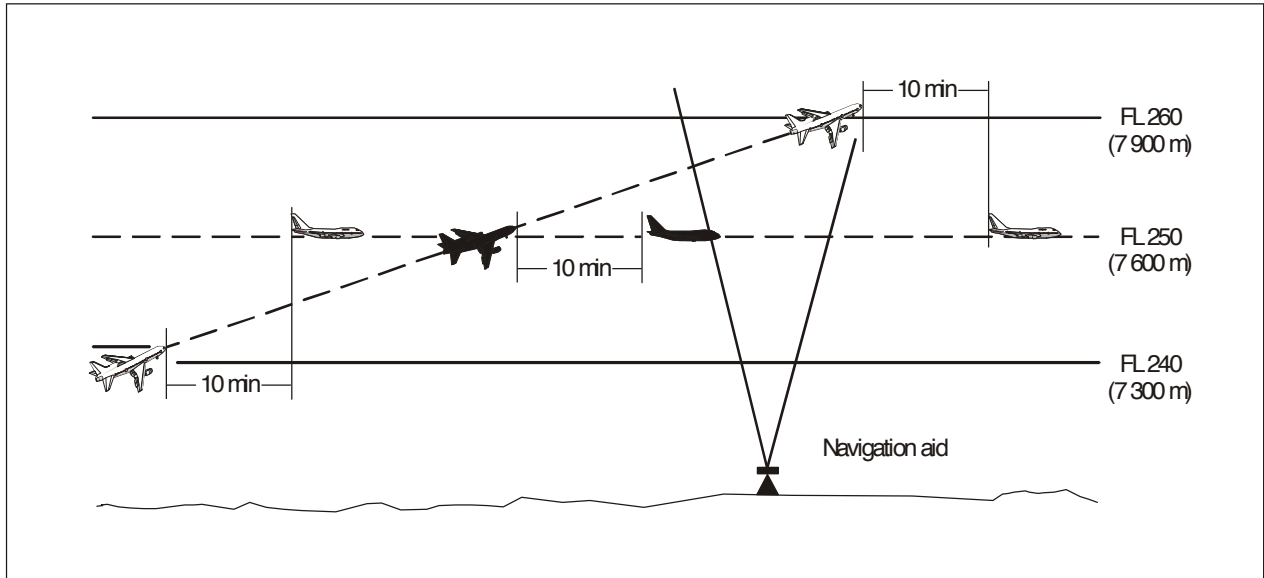


Figure 5-20A. Ten-minute separation between aircraft climbing and on crossing tracks (see 5.4.2.2.2 b))

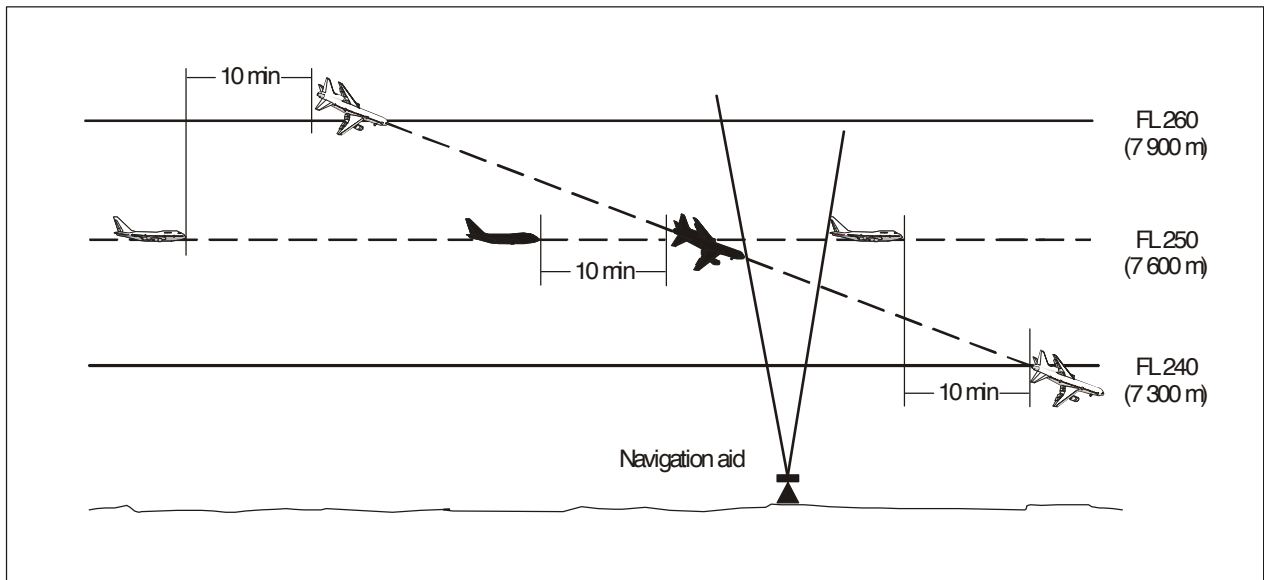


Figure 5-20B. Ten-minute separation between aircraft descending and on crossing tracks (see 5.4.2.2.2 b))

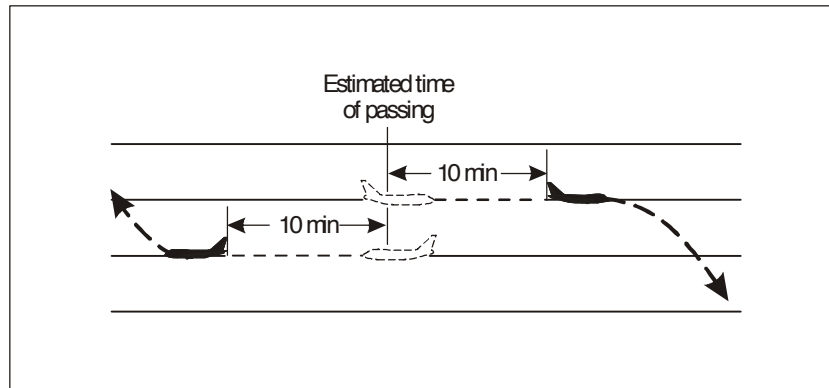


Figure 5-21. Ten-minute separation between aircraft on reciprocal tracks (see 5.4.2.2.3)

5.4.2.3 LONGITUDINAL SEPARATION MINIMA BASED ON DISTANCE USING DISTANCE MEASURING EQUIPMENT (DME) AND/OR GNSS

Note.— Where the term “on track” is used in the provisions relating to the application of longitudinal separation minima using DME and/or GNSS, it means that the aircraft is flying either directly inbound to or directly outbound from the station/waypoint.

5.4.2.3.1 Separation shall be established by maintaining not less than specified distance(s) between aircraft positions as reported by reference to DME in conjunction with other appropriate navigation aids and/or GNSS. This type of separation shall be applied between two aircraft using DME, or two aircraft using GNSS, or one aircraft using DME and one aircraft using GNSS. Direct controller-pilot VHF voice communication shall be maintained while such separation is used.

Note.— For the purpose of applying GNSS-based separation minimum, a distance derived from an integrated navigation system incorporating GNSS input is regarded as equivalent to GNSS distance.

5.4.2.3.2 When applying these separation minima between any aircraft with area navigation capability, controllers shall specifically request GNSS-derived distance.

Note.— Reasons making a pilot unable to provide GNSS distance information may include inadequate on-board equipment, no GNSS input into an integrated navigation system, or a loss of GNSS integrity.

5.4.2.3.3 AIRCRAFT AT THE SAME CRUISING LEVEL

5.4.2.3.3.1 Aircraft on the same track:

a) 37 km (20 NM), provided:

1) each aircraft utilizes:

i) the same “on-track” DME station when both aircraft are utilizing DME; or

ii) an “on-track” DME station and a collocated waypoint when one aircraft is utilizing DME and the other is utilizing GNSS; or

- iii) the same waypoint when both aircraft are utilizing GNSS; and
- 2) separation is checked by obtaining simultaneous DME and/or GNSS readings from the aircraft at frequent intervals to ensure that the minimum will not be infringed (see Figure 5-22);

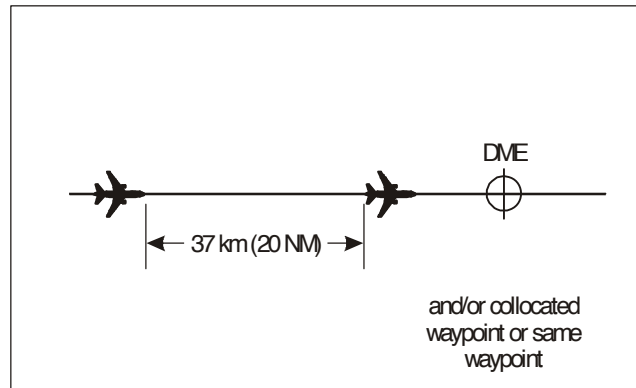


Figure 5-22. 37 km (20 NM) DME and/or GNSS-based separation between aircraft on same track and same level (see 5.4.2.3.3.1 a))

- b) 19 km (10 NM), provided:
 - 1) the leading aircraft maintains a true airspeed of 37 km/h (20 kt) or more faster than the succeeding aircraft;
 - 2) each aircraft utilizes:
 - i) the same “on-track” DME station when both aircraft are utilizing DME; or
 - ii) an “on-track” DME station and a collocated waypoint when one aircraft is utilizing DME and the other is utilizing GNSS; or
 - iii) the same waypoint when both aircraft are utilizing GNSS; and
 - 3) separation is checked by obtaining simultaneous DME and/or GNSS readings from the aircraft at such intervals as are necessary to ensure that the minimum is established and will not be infringed (see Figure 5-23).

5.4.2.3.3.2 *Aircraft on crossing tracks.* The longitudinal separation prescribed in 5.4.2.3.3.1 shall also apply provided each aircraft reports distance from the DME station and/or collocated waypoint or same waypoint located at the crossing point of the tracks and that the relative angle between the tracks is less than 90 degrees (see Figures 5-24A and 5-24B).

5.4.2.3.4 AIRCRAFT CLIMBING AND DESCENDING

5.4.2.3.4.1 *Aircraft on the same track:* 19 km (10 NM) while vertical separation does not exist, provided:

- a) each aircraft utilizes:

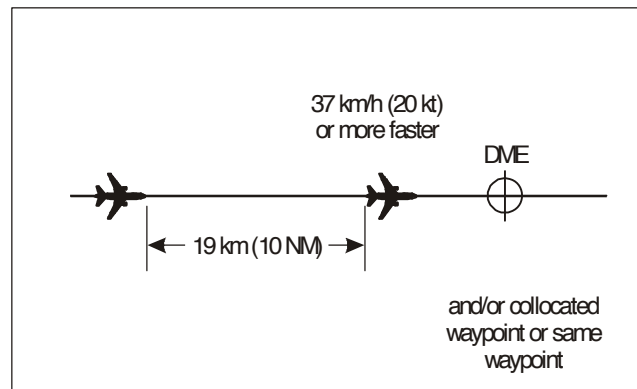


Figure 5-23. 19 km (10 NM) DME and/or GNSS-based separation between aircraft on same track and same level (see 5.4.2.3.3.1 b))

- i) the same “on-track” DME station when both aircraft are utilizing DME; or
 - ii) an “on-track” DME station and a collocated waypoint when one aircraft is utilizing DME and the other is utilizing GNSS; or
 - iii) the same waypoint when both aircraft are utilizing GNSS; and
- b) one aircraft maintains a level while vertical separation does not exist; and
 - c) separation is established by obtaining simultaneous DME and/or GNSS readings from the aircraft (see Figures 5-25A and 5-25B).

Note.— To facilitate application of the procedure where a considerable change of level is involved, a descending aircraft may be cleared to some convenient level above the lower aircraft, or a climbing aircraft to some convenient level below the higher aircraft, to permit a further check on the separation that will be obtained while vertical separation does not exist.

5.4.2.3.4.2 *Aircraft on reciprocal tracks.* Aircraft utilizing on-track DME and/or collocated waypoint or same waypoint may be cleared to climb or descend through the levels occupied by other aircraft utilizing on-track DME and/or collocated waypoint or same waypoint, provided that it has been positively established that the aircraft have passed each other and are at least 10 NM apart, or such other value as prescribed by the appropriate ATS authority.

5.4.2.4 LONGITUDINAL SEPARATION MINIMA WITH MACH NUMBER TECHNIQUE BASED ON TIME

5.4.2.4.1 Turbojet aircraft shall adhere to the true Mach number approved by ATC and shall request ATC approval before making any changes thereto. If it is essential to make an immediate temporary change in the Mach number (e.g. due to turbulence), ATC shall be notified as soon as possible that such a change has been made.

5.4.2.4.2 If it is not feasible, due to aircraft performance, to maintain the last assigned Mach number during en-route climbs and descents, pilots of aircraft concerned shall advise ATC at the time of the climb/descent request.

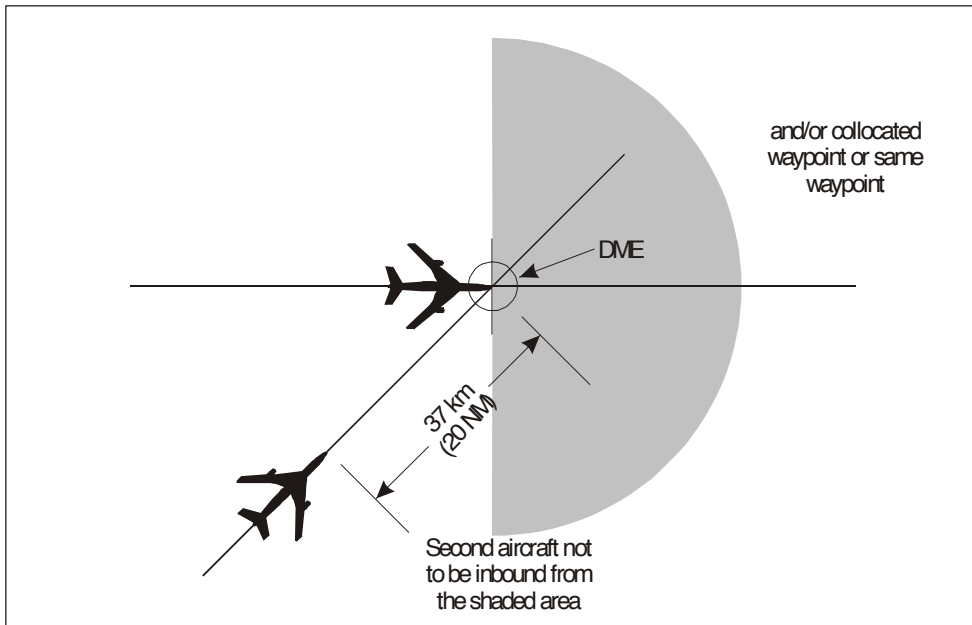


Figure 5-24A. 37 km (20 NM) DME and/or GNSS-based separation between aircraft on crossing tracks and same level (see 5.4.2.3.3.2)

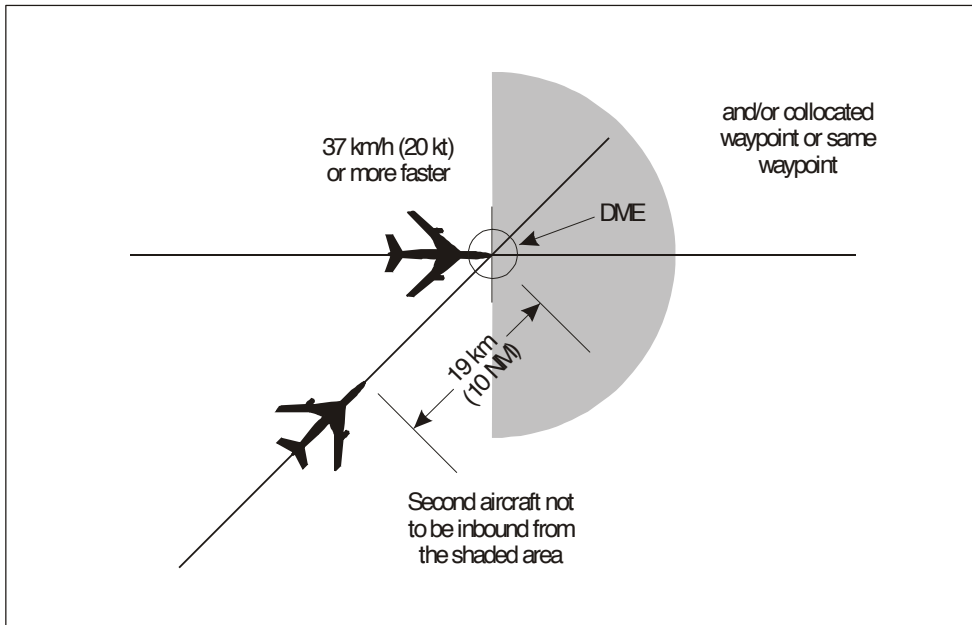


Figure 5-24B. 19 km (10 NM) DME and/or GNSS-based separation between aircraft on crossing tracks and same level (see 5.4.2.3.3.2)

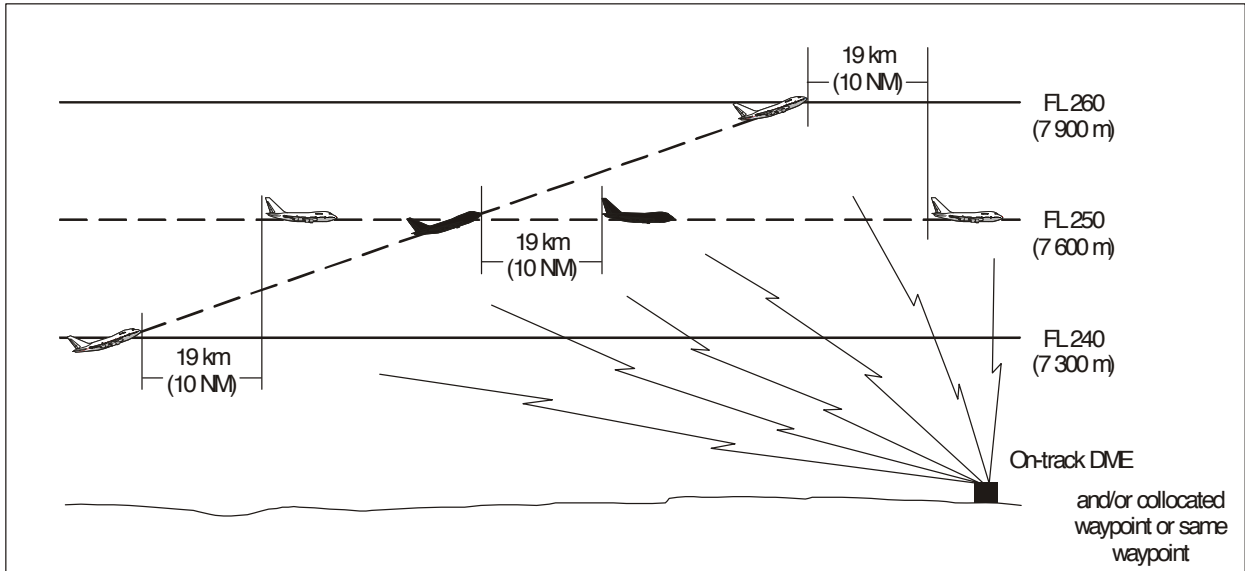


Figure 5-25A. 19 km (10 NM) DME and/or GNSS-based separation between aircraft climbing and on same track (see 5.4.2.3.4.1 c)

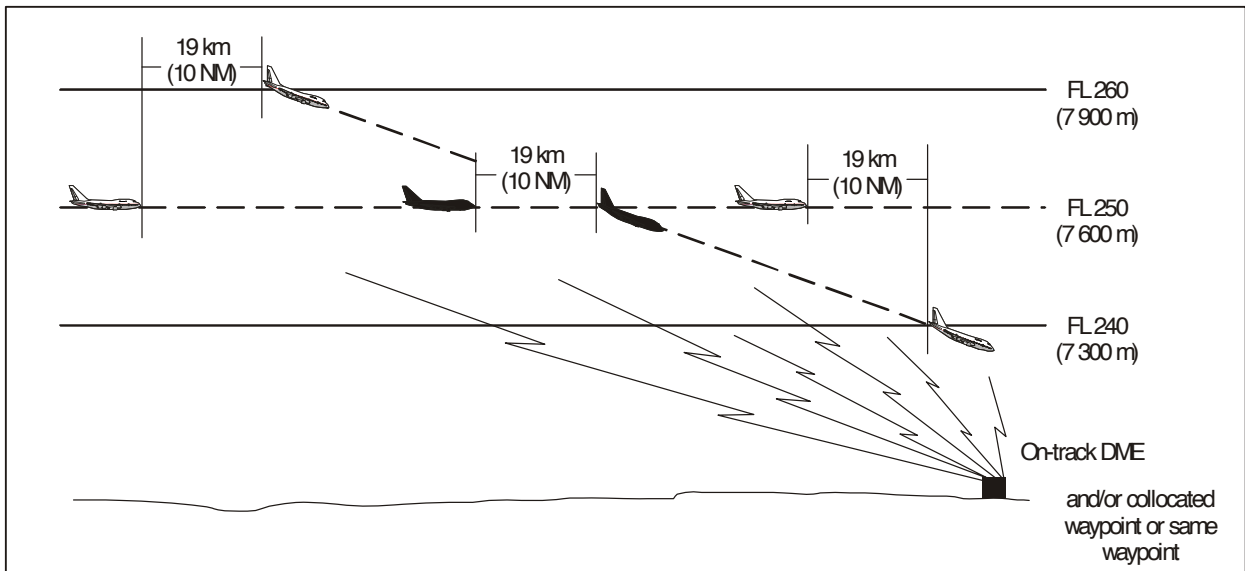


Figure 5-25B. 19 km (10 NM) DME and/or GNSS-based separation between aircraft descending and on same track (see 5.4.2.3.4.1 c)

5.4.2.4.3 When the Mach number technique is applied and provided that:

- a) the aircraft concerned have reported over the same common point and follow the same track or continuously diverging tracks until some other form of separation is provided; or
- b) if the aircraft have not reported over the same common point and it is possible to ensure, by radar, ADS-B or other means, that the appropriate time interval will exist at the common point from which they either follow the same track or continuously diverging tracks;

minimum longitudinal separation between turbojet aircraft on the same track, whether in level, climbing or descending flight shall be:

- 1) 10 minutes; or
- 2) between 9 and 5 minutes inclusive, provided that:

the preceding aircraft is maintaining a true Mach number greater than the following aircraft in accordance with the following:

- 9 minutes, if the preceding aircraft is Mach 0.02 faster than the following aircraft;
- 8 minutes, if the preceding aircraft is Mach 0.03 faster than the following aircraft;
- 7 minutes, if the preceding aircraft is Mach 0.04 faster than the following aircraft;
- 6 minutes, if the preceding aircraft is Mach 0.05 faster than the following aircraft;
- 5 minutes, if the preceding aircraft is Mach 0.06 faster than the following aircraft.

5.4.2.4.4 When the 10-minute longitudinal separation minimum with Mach number technique is applied, the preceding aircraft shall maintain a true Mach number equal to or greater than that maintained by the following aircraft.

5.4.2.5 LONGITUDINAL SEPARATION MINIMA WITH MACH NUMBER TECHNIQUE BASED ON DISTANCE USING RNAV

Note.— Guidance material on RNAV operations is contained in the Performance-based Navigation (PBN) Manual (Doc 9613).

5.4.2.5.1 Turbojet aircraft shall adhere to the true Mach number approved by ATC and shall request ATC approval before making any changes thereto. If it is essential to make an immediate temporary change in the Mach number (e.g. due to turbulence), ATC shall be notified as soon as possible that such a change has been made.

5.4.2.5.1.1 If it is not feasible, due to aircraft performance, to maintain the last assigned Mach number during en-route climbs and descents, pilots of aircraft concerned shall advise ATC at the time of the climb/descent request.

5.4.2.5.2 RNAV distance-based separation minima shall not be applied after ATC has received pilot advice indicating navigation equipment deterioration or failure.

5.4.2.5.3 Separation shall be established by maintaining not less than the specified distance between aircraft positions as reported by reference to RNAV equipment. Direct controller-pilot communications should be maintained, while such separation is used. Where high frequency or general purpose extended range very high frequency air-ground communication channels are used for area control service and are worked by air-ground communicators, suitable arrangements shall be made to permit direct controller-pilot communications, or monitoring by the controller of all air-ground communications.

5.4.2.5.3.1 To assist pilots to readily provide the required RNAV distance information, such position reports should, wherever possible, be referenced to a common waypoint ahead of both aircraft.

5.4.2.5.4 RNAV distance-based separation may be applied between RNAV-equipped aircraft when operating on designated RNAV routes or on ATS routes defined by VOR.

5.4.2.5.5 A 150 km (80 NM) RNAV distance-based separation minimum with Mach number technique may be used on same-direction tracks in lieu of a 10-minute longitudinal separation minimum with Mach number technique, provided:

- a) each aircraft reports its distance to or from the same “on-track” common point;
- b) separation between aircraft at the same level is checked by obtaining simultaneous RNAV distance readings from the aircraft at frequent intervals to ensure that the minimum will not be infringed (see Figure 5-26);
- c) separation between aircraft climbing or descending is established by obtaining simultaneous RNAV distance readings from the aircraft (see Figures 5-27A and 5-27B); and
- d) in the case of aircraft climbing or descending, one aircraft maintains a level while vertical separation does not exist.

5.4.2.5.6 When the 150 km (80 NM) longitudinal separation minimum with Mach number technique is applied, the preceding aircraft shall maintain a true Mach number equal to or greater than that maintained by the following aircraft.

Note.— To facilitate application of the procedure where a considerable change of level is involved, a descending aircraft may be cleared to some convenient level above the lower aircraft, or a climbing aircraft to some convenient level below the higher aircraft, to permit a further check on the separation that will be obtained while vertical separation does not exist.

5.4.2.5.7 *Aircraft on reciprocal tracks.* Aircraft utilizing RNAV may be cleared to climb or descend to or through the levels occupied by other aircraft utilizing RNAV provided it has been positively established by simultaneous RNAV distance readings to or from the same “on-track” common point that the aircraft have passed each other and are at least 150 km (80 NM) apart (see Figure 5-28).

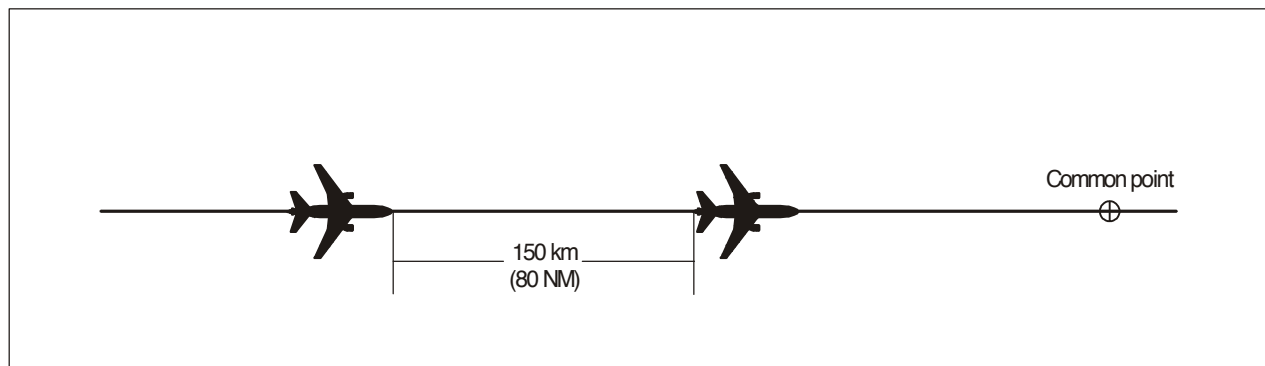


Figure 5-26. 150 km (80 NM) RNAV-based separation between aircraft at the same level (see 5.4.2.5.5 b))

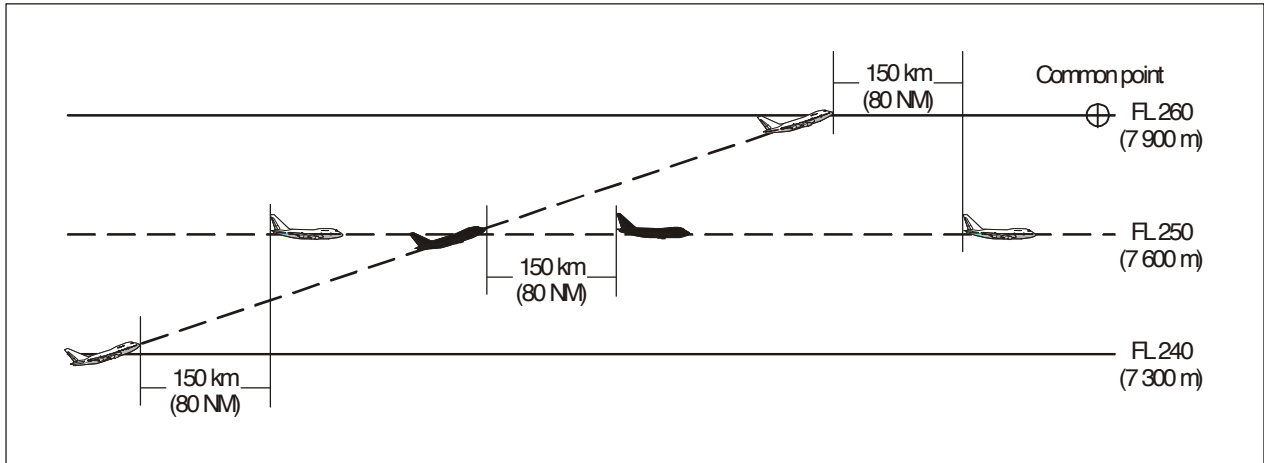


Figure 5-27A. 150 km (80 NM) RNAV-based separation between aircraft climbing and on same track (see 5.4.2.5.5 c)

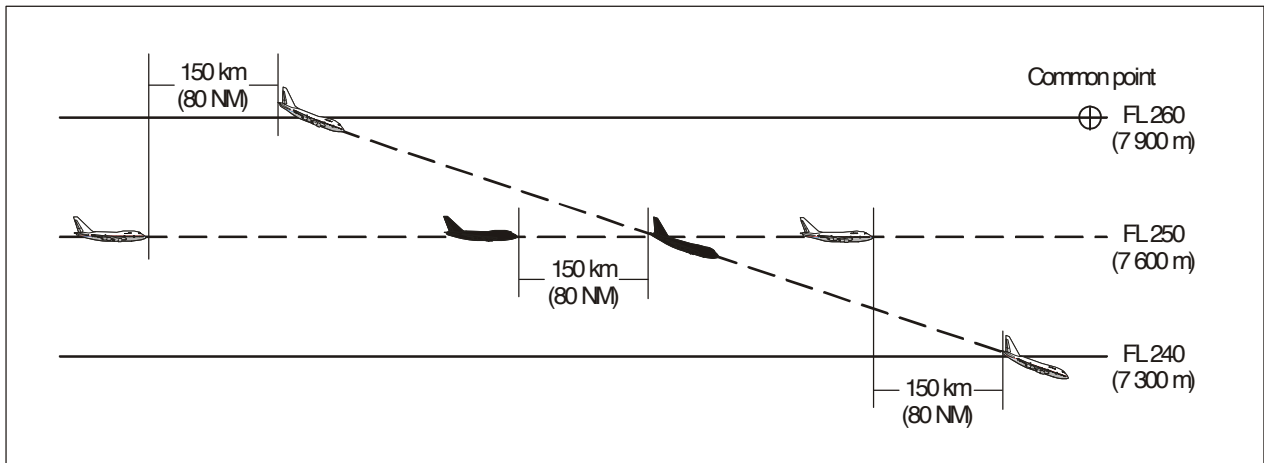


Figure 5-27B. 150 km (80 NM) RNAV-based separation between aircraft descending and on same track (see 5.4.2.5.5 c)

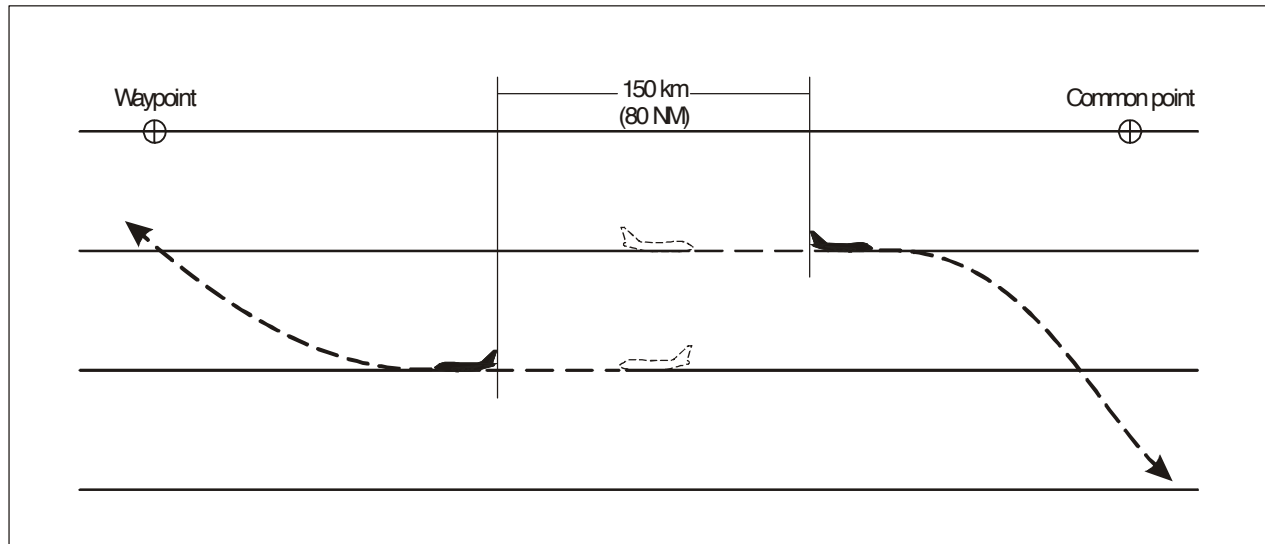


Figure 5-28. 150 km (80 NM) RNAV-based separation between aircraft on reciprocal tracks (see 5.4.2.5.7)

5.4.2.6 LONGITUDINAL SEPARATION MINIMA BASED ON DISTANCE USING RNAV WHERE RNP IS SPECIFIED

Note.— Guidance material is contained in Attachment B to Annex 11, the Performance-based Navigation (PBN) Manual (Doc 9613), the Air Traffic Services Planning Manual (Doc 9426) and the Manual on Airspace Planning Methodology for the Determination of Separation Minima (Doc 9689).

5.4.2.6.1 Within designated airspace, or on designated routes, separation minima in accordance with the provisions of this section (5.4.2.6) may be used, subject to regional air navigation agreements.

5.4.2.6.2 Separation shall be established by maintaining not less than the specified distance between aircraft positions as reported by reference to the same “on-track” common point, whenever possible ahead of both aircraft, or by means of an automated position reporting system.

Note.— The term “on track” means that the aircraft is flying either directly inbound to or directly outbound from the station or waypoint.

5.4.2.6.2.1 When information is received indicating navigation equipment failure or deterioration below the navigation performance requirements, ATC shall then, as required, apply alternative separation minima.

5.4.2.6.2.2 Direct controller-pilot communications shall be maintained while applying a distance-based separation minima. Direct controller-pilot communications shall be voice or CPDLC. The communication criteria necessary for CPDLC to satisfy the requirement for direct controller-pilot communications shall be established by an appropriate safety assessment.

Note.— The communication criteria which are used as a basis for the derivation of the separation minima in this section are set out in Appendix 5 of the Manual on Airspace Planning Methodology for the Determination of Separation Minima (Doc 9689). Guidance material for CPDLC is contained in the Manual of Air Traffic Services Data Link Applications (Doc 9694).

5.4.2.6.2.2.1 Prior to and during the application of a distance-based separation minimum, the controller should determine the adequacy of the available communication link, considering the time element required to receive replies from two or more aircraft, and the overall workload/traffic volume associated with the application of such minima.

5.4.2.6.2.3 When aircraft are at, or are expected to reduce to, the minimum separation applicable, speed control techniques, including assigning Mach number, shall be applied to ensure that the minimum distance exists throughout the period of application of the minima.

5.4.2.6.3 *LONGITUDINAL DISTANCE-BASED SEPARATION MINIMA
IN AN RNP RNAV ENVIRONMENT NOT USING ADS-C*

5.4.2.6.3.1 For aircraft cruising, climbing or descending on the same track, the following separation minimum may be used:

<i>Separation minimum</i>	<i>RNP type</i>	<i>Communication requirement</i>	<i>Surveillance requirement</i>	<i>Distance verification requirements</i>
93 km (50 NM)	10	Direct controller-pilot communications	Procedural position reports	At least every 24 minutes

Note 1.— Where a considerable change of level is involved using distance-based separation, a descending aircraft may be cleared to some convenient level above the lower aircraft, or a climbing aircraft to some convenient level below the higher aircraft (e.g. 1 200 m (4 000 ft) or less) to permit a further check on the separation that will be maintained while vertical separation does not exist.

Note 2.— It should be noted that the separation minimum depicted above is based on safety assessments performed specifically for a particular network of tracks or routes. As such, the assessments evaluated traffic characteristics which might be unique to the network being assessed.

Note 3.— The separation minimum above was developed in accordance with a collision risk analysis which dictates conditions under which this separation can be applied.

Note 4.— Detailed information on the analysis used to determine the separation minimum and on performing safety assessments is contained in the Manual on Airspace Planning Methodology for the Determination of Separation Minima (Doc 9689).

5.4.2.6.3.2 During the application of the 93 km (50 NM) separation, when an aircraft fails to report its position, the controller shall take action within 3 minutes to establish communication. If communication has not been established within 8 minutes of the time the report should have been received, the controller shall take action to apply an alternative form of separation.

5.4.2.6.3.3 Where automated position reporting applies, a common time reference shall be used.

5.4.2.6.3.4 *Aircraft on reciprocal tracks.* Aircraft may be cleared to climb or descend to or through the levels occupied by the other provided that it has been positively established that the aircraft have passed each other and the distance between them is equal to at least the applicable separation minimum.

5.4.2.7 LONGITUDINAL SEPARATION MINIMA BASED ON DISTANCE
USING ADS-B IN-TRAIL PROCEDURE (ITP)

Note 1.— Attention is drawn to Circular 325, In-Trail Procedure (ITP) Using Automatic Dependent Surveillance — Broadcast (ADS-B).

Note 2.— Guidance material on ITP equipment can be found in RTCA DO-312/EUROCAE ED-159 Safety Performance and Interoperability Requirements Document for the In-Trail Procedure in Oceanic Airspace (ATSA-ITP) Application and Supplement and RTCA DO-317A/EUROCAE ED-194, Minimum Operational Performance Standards (MOPS) for Aircraft Surveillance Application (ASA) System.

5.4.2.7.1 The routes or airspace where application of the in-trail procedure is authorized, and the procedures to be followed by pilots in accordance with the provisions of Section 5.4.2.7, shall be promulgated in aeronautical information publications (AIPs).

5.4.2.7.2 ITP requests and clearances shall be communicated via a CPDLC message exchange only and in accordance with the appropriate message elements in Appendix 5.

5.4.2.7.3 Longitudinal separation between a climbing or descending ITP aircraft and reference aircraft shall be applied in accordance with 5.4.2.7.3.1, 5.4.2.7.3.2 and 5.4.2.7.3.3. An ITP aircraft shall not be separated simultaneously from more than two reference aircraft using the ITP separation minimum (see Figure 5-29).

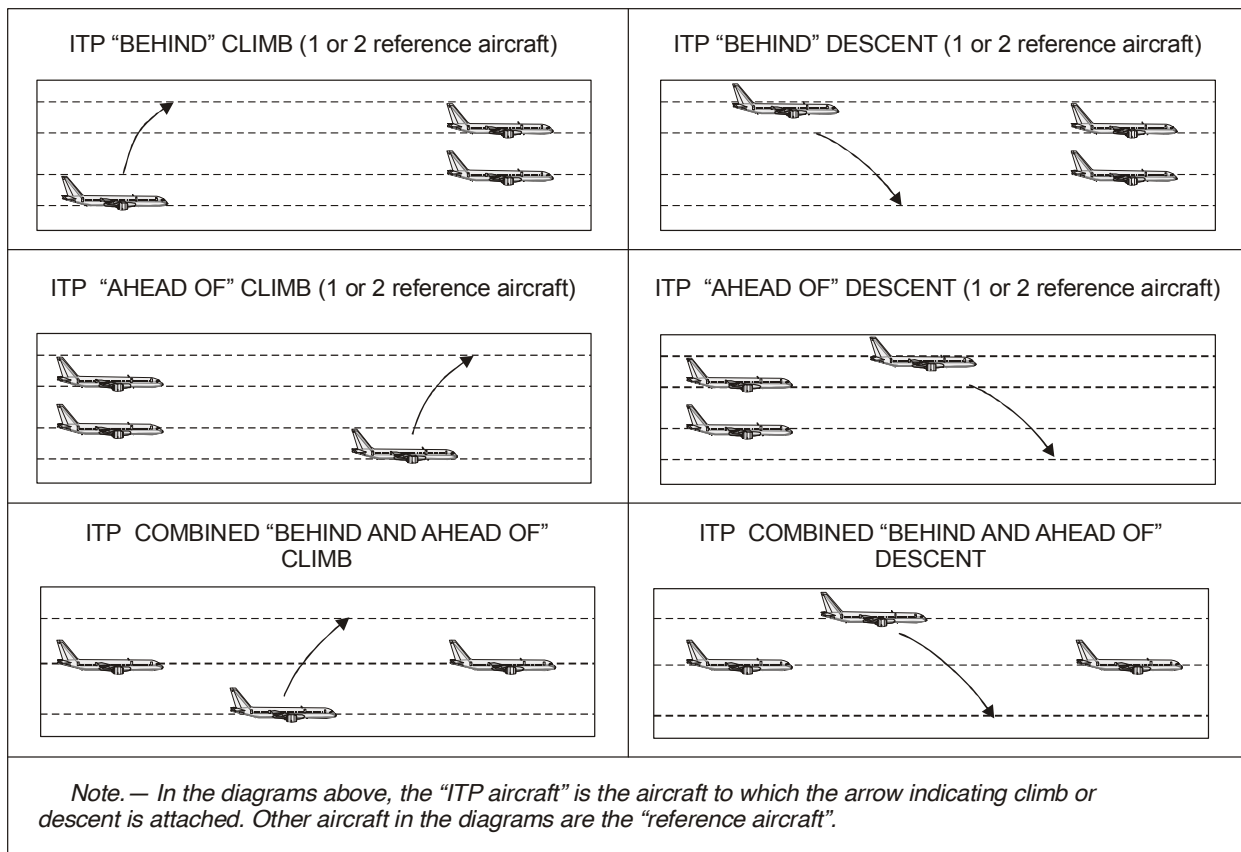


Figure 5-29. ITP flight level change scenarios (see 5.4.2.7.3)

5.4.2.7.3.1 An ITP climb or descent may be requested by the pilot provided the following ITP criteria are satisfied:

- a) the ITP distance between the ITP aircraft and the reference aircraft shall be:
 - 1) not less than 28 km (15 NM) with a maximum closing ground speed of 37 km/h (20 kt); or
 - 2) not less than 37 km (20 NM) with a maximum closing ground speed of 56 km/h (30 kt);
- b) the ITP on-board equipment shall indicate that the angle between the current tracks of the ITP aircraft and reference aircraft is less than 45 degrees;
- c) the altitude difference between the ITP aircraft and any reference aircraft shall be 600 m (2 000 ft) or less;
- d) the climb or descent shall be conducted at a rate of not less than 1.5 m/s (300 ft/min), or any higher rate when specified by the controller; and
- e) the climb or descent shall be performed at the assigned Mach number. If no Mach number has been assigned by ATC, the ITP aircraft shall maintain the current cruise Mach number throughout the ITP manoeuvre.

Note.— These criteria are designed to ensure a minimum separation of 19 km (10 NM) between the ITP aircraft and the reference aircraft during the climb or descent.

5.4.2.7.3.2 A controller may clear an aircraft for an ITP climb or descent provided the following conditions are satisfied:

- a) the ITP climb or descent has been requested by the pilot;
- b) the aircraft identification of each reference aircraft in the ITP request exactly matches the Item 7 — aircraft identification of the corresponding aircraft's filed flight plan;
- c) the reported ITP distance between the ITP aircraft and any reference aircraft is 28 km (15 NM) or more;
- d) both the ITP aircraft and reference aircraft are either on:
 - 1) same identical tracks and any turn at a waypoint shall be limited to less than 45 degrees; or
 - 2) parallel tracks or same tracks with no turns permitted during the manoeuvre.

Note.— Same identical tracks are a special case of same track defined in 5.4.2.1.5 a) where the angular difference is zero degrees.

- e) no speed or route change clearance shall be issued to the ITP aircraft until the ITP climb or descent is completed;
- f) the altitude difference between the ITP aircraft and any reference aircraft shall be 600 m (2 000 ft) or less;
- g) no instruction to amend speed, altitude or route shall be issued to any reference aircraft until the ITP climb or descent is completed;
- h) the maximum closing speed between the ITP aircraft and each reference aircraft shall be Mach 0.06; and
- i) the ITP aircraft shall not be a reference aircraft in another ITP clearance.

5.4.2.7.3.3 Following receipt of an ITP climb or descent clearance and before initiating the procedure, the pilot of the ITP aircraft shall determine that the ITP criteria referred to in 5.4.2.7.3.1 a) and b) are still being met with respect to the reference aircraft identified in the clearance and:

- a) if the ITP criteria are satisfied, the pilot shall accept the clearance and commence the climb or descent immediately; or
- b) if the ITP criteria are no longer satisfied, the pilot shall notify the controller and maintain the previously cleared level.

5.4.2.8 LONGITUDINAL SEPARATION MINIMA BASED ON DISTANCE USING ADS-C CLIMB AND DESCEND PROCEDURE (CDP)

5.4.2.8.1 When an aircraft on the same track is cleared to climb or descend through the level of another aircraft, the clearance should be issued provided the following requirements are met:

- a) the longitudinal distance between the aircraft is determined by the ground automation system from near-simultaneous demand ADS-C reports which contain position accuracy of 0.25 NM or better (Figure of Merit 6 or higher);

Note.— Refer to 5.4.2.9.5 for distance calculations.

- b) the longitudinal distance between the aircraft, as determined in a) above, is not less than:
 - 1) 27.8 km (15 NM) when the preceding aircraft is at the same speed or faster than the following aircraft; or
 - 2) 46.3 km (25 NM) when the following aircraft is not more than either 18.5 km/h (10 kt) or Mach 0.02 faster than the preceding aircraft;
- c) the altitude difference between aircraft is not greater than 600 m (2 000 ft);
- d) the clearance is issued with a restriction that ensures vertical separation is re-established within 15 minutes from the first demand report request; and
- e) direct controller-pilot voice communications or CPDLC is maintained.

5.4.2.8.2 The application of the ADS-C climb and descend procedure (CDP) should be supported by an ongoing monitoring process.

Note.— Supporting information on ongoing monitoring is provided in Circular 342, Automatic Dependent Surveillance — Contract (ADS-C) Climb and Descend Procedure (CDP).

5.4.2.9 PERFORMANCE-BASED LONGITUDINAL SEPARATION MINIMA

Note.— Guidance material for implementation and application of the separation minima in this section is contained in the Performance-based Communication and Surveillance (PBCS) Manual (Doc 9869), the Global Operational Data Link (GOLD) Manual (Doc 10037), the Satellite Voice Operations Manual (SVOM) (Doc 10038) and the Guidelines for the Implementation of Performance-based Longitudinal Separation Minima (Circular 343).

5.4.2.9.1 Within designated airspace, or on designated routes, separation minima in accordance with the provisions of this section may be used.

5.4.2.9.2 The following separation minima may be used for aircraft cruising, climbing or descending on:

- a) the same track; or
- b) crossing tracks provided that the relative angle between the tracks is less than 90 degrees.

<i>Separation minima</i>	<i>RNP</i>	<i>RCP</i>	<i>RSP</i>	<i>Maximum ADS-C periodic reporting interval</i>
93 km (50 NM)	10	240	180	27 minutes
	4	240	180	32 minutes
55.5 km (30 NM)	2 or 4	240	180	12 minutes
5 minutes	2 or 4 or 10	240	180	14 minutes

Note.— Detailed information on the analysis used to determine these separation minima and monitoring procedures is contained in the Guidelines for the Implementation of Performance-based Longitudinal Separation Minima (Circular 343).

5.4.2.9.3 Opposite-direction aircraft on reciprocal tracks may be cleared to climb or descend to or through the levels occupied by another aircraft provided that ADS-C reports show that the aircraft have passed each other by the applicable separation minimum in 5.4.2.9.2.

5.4.2.9.4 The five-minute separation shall be calculated to a resolution of one second without rounding.

5.4.2.9.5 Separation shall be applied so that the distance or time between the calculated positions of the aircraft is never less than the prescribed minimum. This distance or time shall be obtained by one of the following methods:

- a) when the aircraft are on the same identical track, the distance or time may be measured between the calculated positions of the aircraft or may be calculated by measuring the distances or times to a common point on the track (see Figures 5-30 and 5-31);

Note.— Same identical tracks are a special case of same track defined in 5.4.2.1.5 a) where the angular difference is zero degrees or reciprocal tracks defined in 5.4.2.1.5 b) where the angular difference is 180 degrees.

- b) when the aircraft are on the same or reciprocal non-parallel tracks other than in a) above, or on crossing tracks, the distance or time shall be calculated by measuring the distances or times to the common point of intersection of the tracks or projected track (see Figures 5-32 to 5-34); and
- c) when the aircraft are on parallel tracks whose protection areas overlap, the distance or time shall be measured along the track of one of the aircraft, as in a) above, using its calculated position and the point abeam the calculated position of the other aircraft (see Figure 5-35).

Note.— In all cases presented in Figures 5-30 to 5-35, “d” and “t” are calculated by subtracting the distance or time of the closer aircraft from the common point from the distance or time of the more distant aircraft from the common point, except in Figure 5-34 where the two distances or times are added and the order of the aircraft is not important in the calculation.

5.4.2.9.6 The communication system provided to enable the application of the separation minima in 5.4.2.9.2 shall allow a controller, within 4 minutes, to intervene and resolve a potential conflict by contacting an aircraft using the normal means of communication. An alternative means shall be available to allow the controller to intervene and resolve the conflict within a total time of 10.5 minutes, should the normal means of communication fail.

5.4.2.9.7 When an ADS-C periodic or waypoint change event report is not received within 3 minutes of the time it should have been sent, the report is considered overdue and the controller shall take action to obtain the report as quickly as possible, normally by ADS-C or CPDLC. If a report is not received within 6 minutes of the time the original report should have been sent, and there is a possibility of loss of separation with other aircraft, the controller shall take action to resolve any potential conflict(s) as soon as possible. The communication means provided shall be such that the conflict is resolved within a further 7.5 minutes.

5.4.2.9.8 When information is received indicating ground or aircraft equipment failure or deterioration below the communication, navigation and surveillance performance requirements, ATC shall then, as required, apply alternative separation minima.

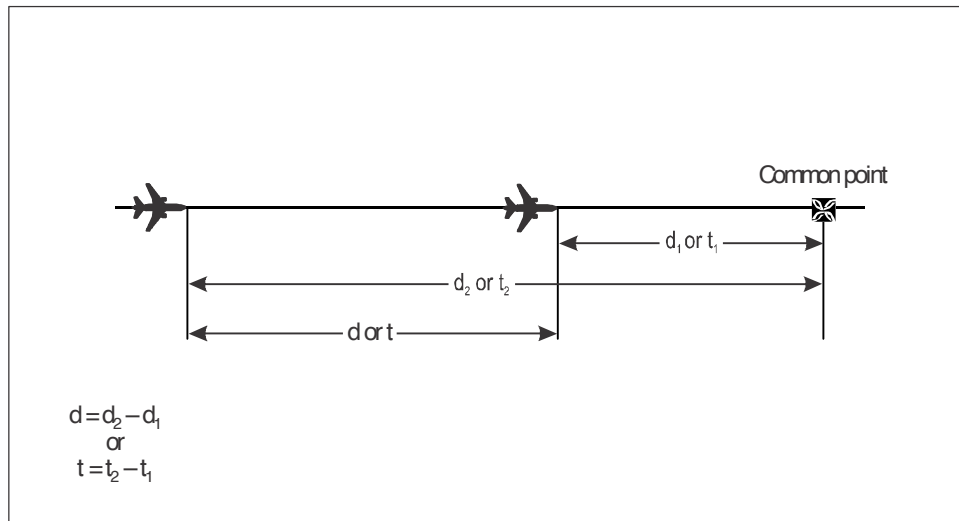


Figure 5-30. Calculation of longitudinal distance/time between aircraft — identical track, same direction (see 5.4.2.9.5 a))

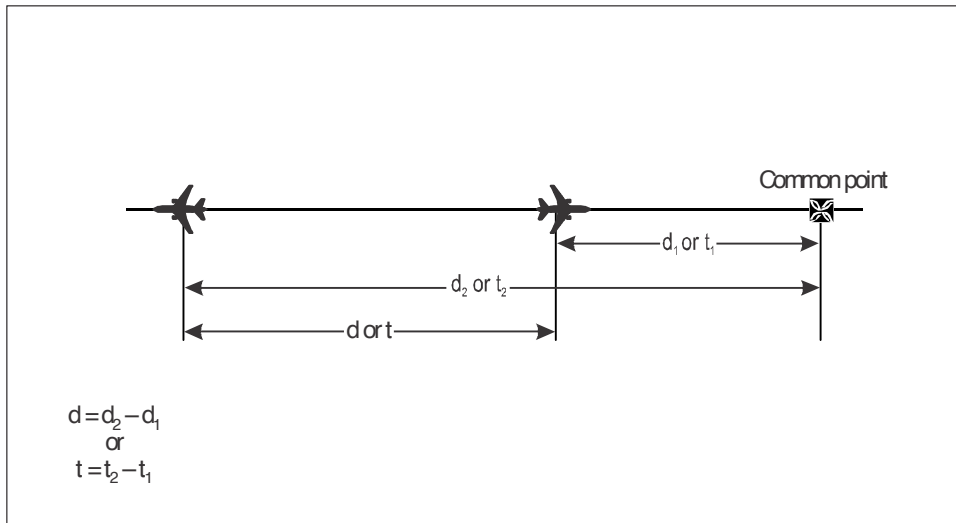


Figure 5-31. Calculation of longitudinal distance/time between aircraft — identical track, opposite direction (see 5.4.2.9.5 a))

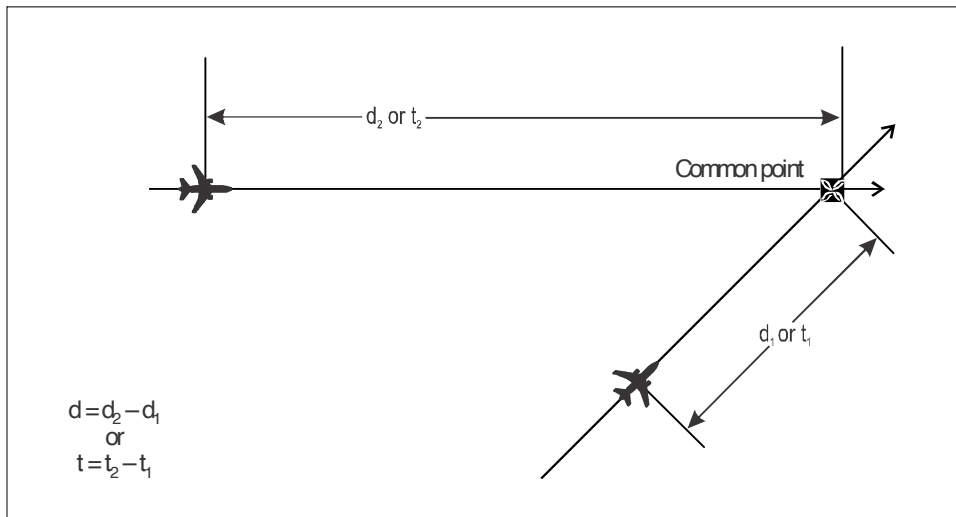


Figure 5-32. Calculation of longitudinal distance/time between aircraft — same track, but not identical (see 5.4.2.9.5 b))

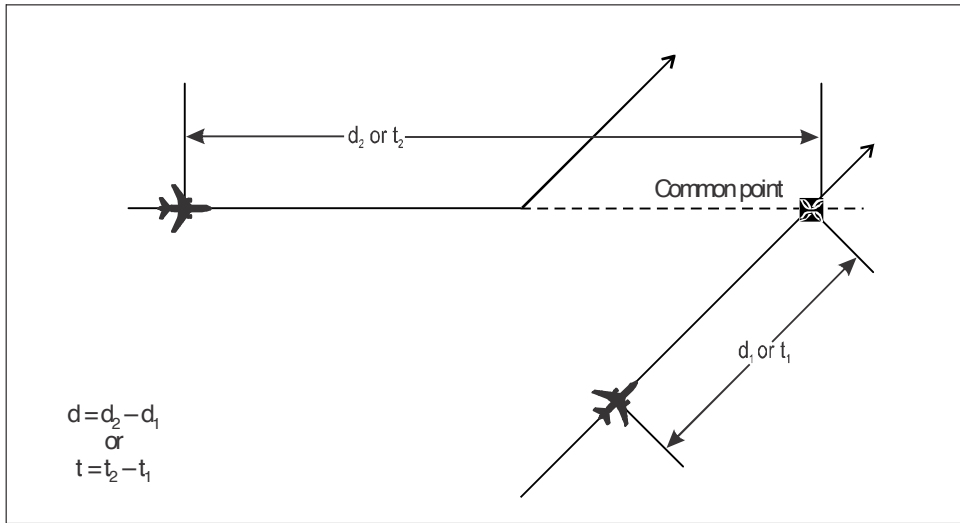


Figure 5-33. Calculation of longitudinal distance/time between aircraft — same track projected, but not identical (see 5.4.2.9.5 b))

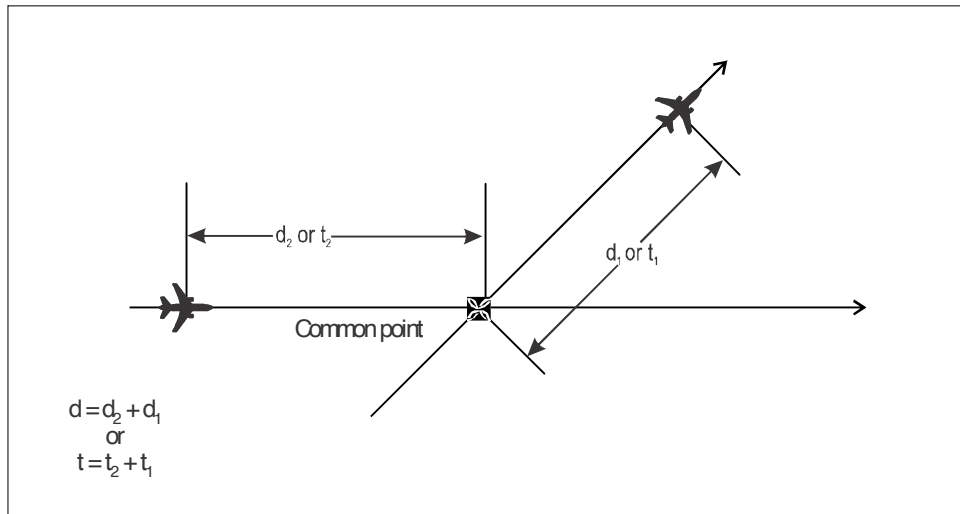


Figure 5-34. Calculation of longitudinal distance/time between aircraft — opposite sides of the common point (see 5.4.2.9.5 b))

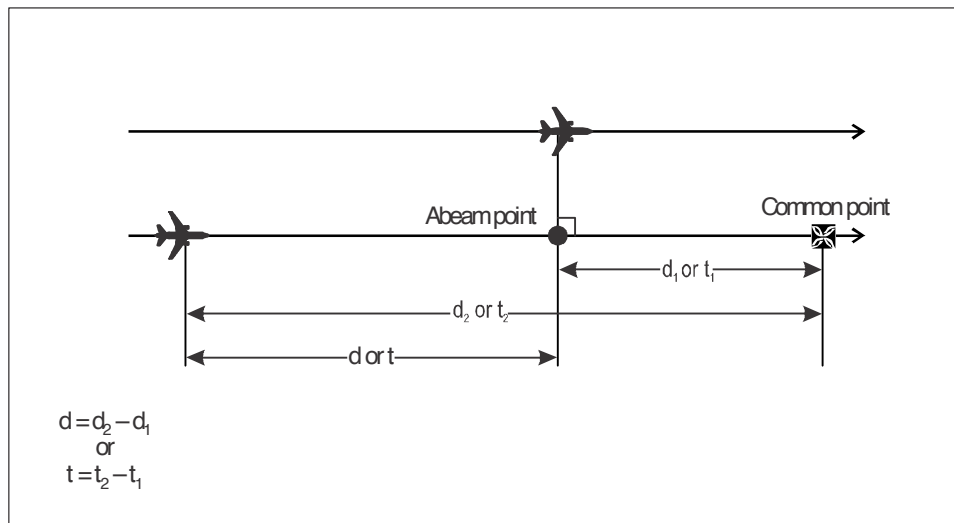


Figure 5-35. Calculation of longitudinal distance/time between aircraft — parallel tracks (see 5.4.2.9.5 c))

5.5 SEPARATION OF AIRCRAFT HOLDING IN FLIGHT

5.5.1 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.

5.5.2 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 (see Figure 5-36).

5.6 MINIMUM SEPARATION BETWEEN DEPARTING AIRCRAFT

Note.— The following provisions are complementary to the longitudinal separation minima specified in Section 5.4.2.

5.6.1 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 5-37). This minimum may be reduced when aircraft are using parallel runways or when the procedure in 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.

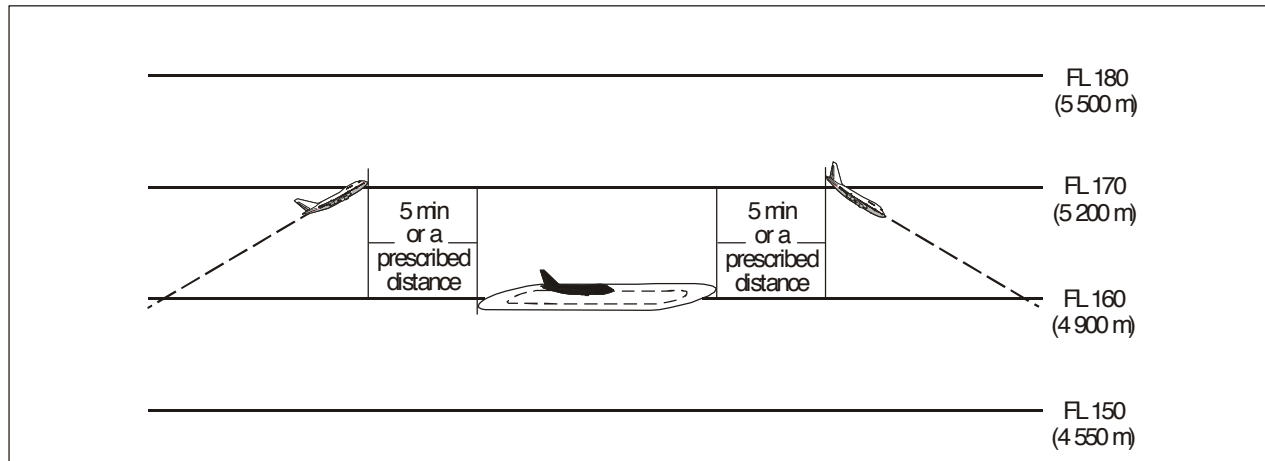


Figure 5-36. Separation between holding aircraft and en-route aircraft (see 5.5.2)

Note 1.— Wake turbulence categories of aircraft are contained in Chapter 4, Section 4.9.1 and longitudinal separation minima are contained in Section 5.8 and in Chapter 8, Section 8.7.

Note 2.— Detailed characteristics of wake vortices and their effect on aircraft are contained in the Air Traffic Services Planning Manual (Doc 9426), Part II, Section 5.

5.6.2 Two minutes are required between take-offs when the preceding aircraft is 74 km/h (40 kt) or more faster than the following aircraft and both aircraft will follow the same track (see Figure 5-38).

Note.— See Chapter 4, Section 4.6, concerning speed control instructions. Calculations, based on TAS, of speed differentials of aircraft during climb may not be sufficiently accurate in all circumstances for determining if the procedure in 5.6.2 can be applied, in which case calculations based on IAS may be more suitable.

5.6.3 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 (see Figure 5-39). Action must be taken to ensure that the five-minute separation will be maintained or increased while vertical separation does not exist.

5.7 SEPARATION OF DEPARTING AIRCRAFT FROM ARRIVING AIRCRAFT

5.7.1 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.

5.7.1.1 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 (see Figure 5-40).

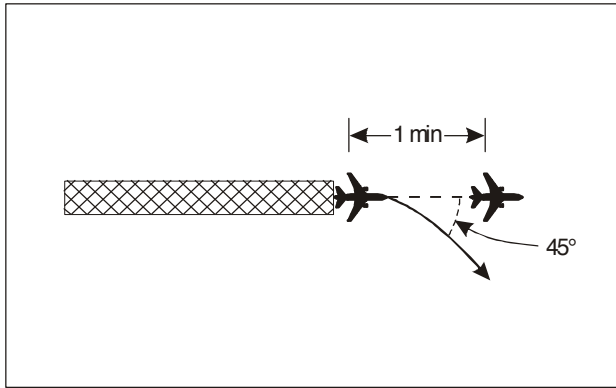


Figure 5-37. One-minute separation between departing aircraft following tracks diverging by at least 45 degrees (see 5.6.1)

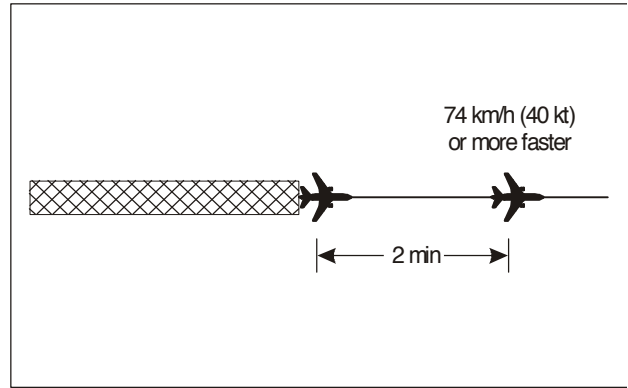


Figure 5-38. Two-minute separation between aircraft following same track (see 5.6.2)

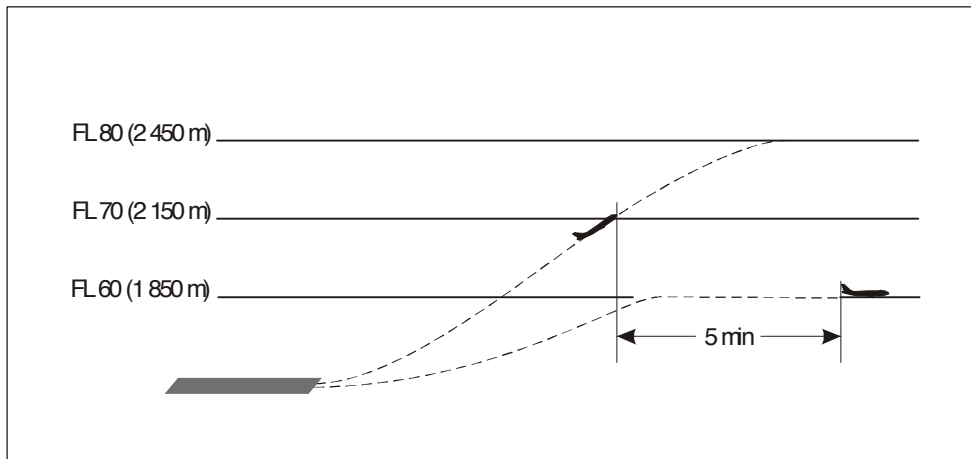


Figure 5-39. Five-minute separation of departing aircraft following same track (see 5.6.3)

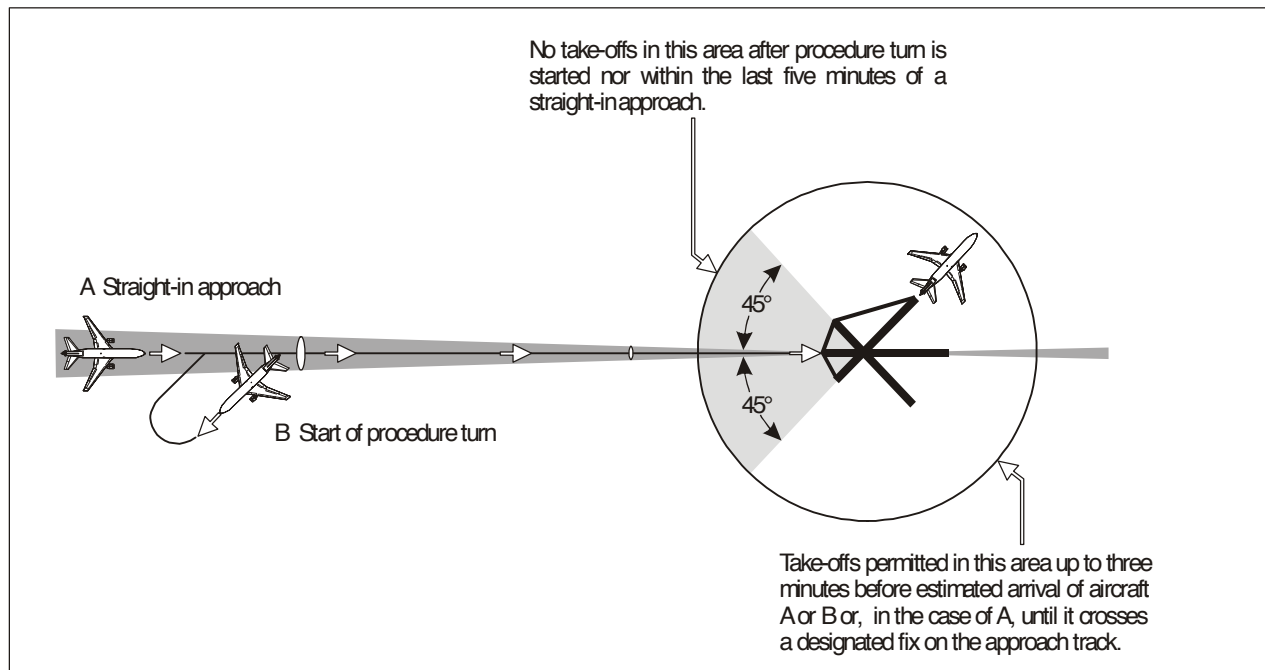


Figure 5-40. Separation of departing aircraft from arriving aircraft
(see 5.7.1.1 b) and 5.7.1.2 b))

5.7.1.2 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 (see Figure 5-40); 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.

5.7.1.3 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 (see Figure 5-41) 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.

Note.— The arrival protection area is defined as the shaded area extending from a line 45 degrees from an established compulsory reporting waypoint to a line 45 degrees from the outermost edge of the remainder of the arrival and/or approach procedure (see Figure 5-41).

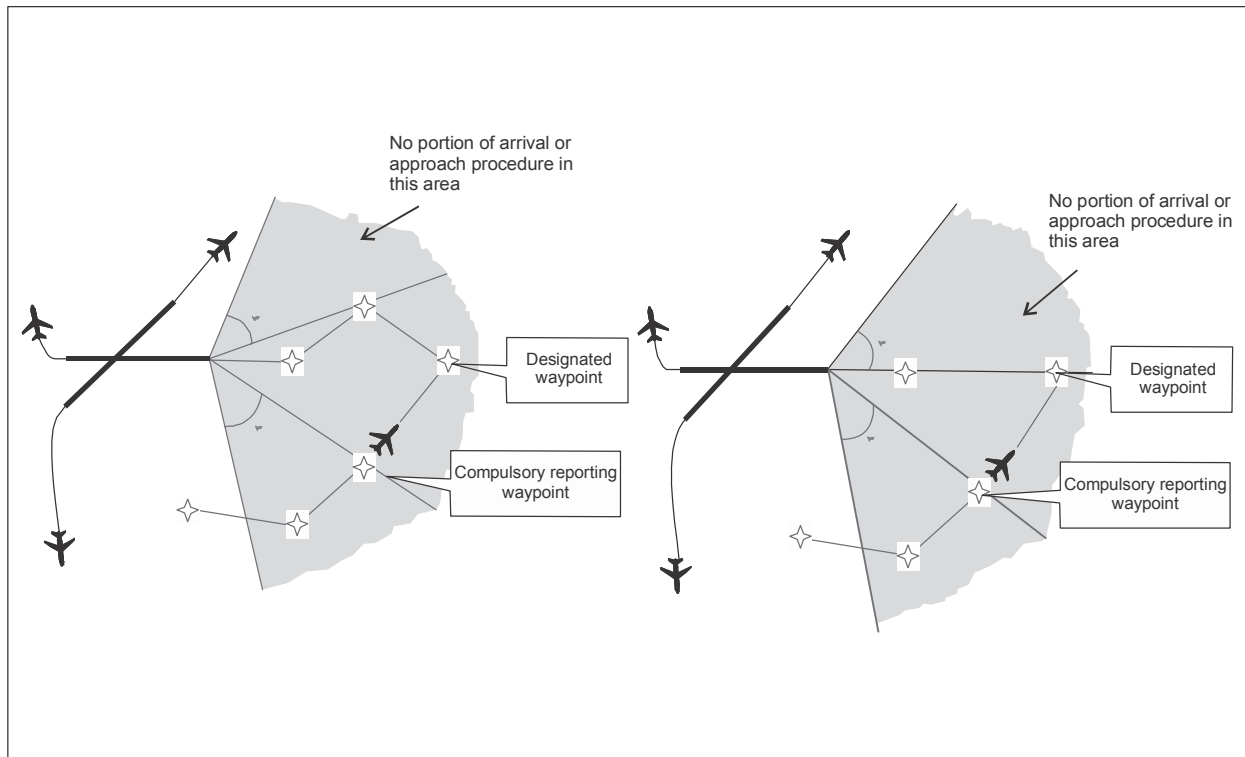


Figure 5-41. Examples of arrival protection area

5.8 TIME-BASED WAKE TURBULENCE LONGITUDINAL SEPARATION MINIMA

Note.— Distance-based wake turbulence separation minima are set forth in Chapter 8, 8.7.3.4.

5.8.1 Applicability

5.8.1.1 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 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.

5.8.1.2 The ATC unit shall, in respect of the flights specified in 5.8.1.1 a) and b), 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.

5.8.2 Arriving aircraft

5.8.2.1 Except as provided for in 5.8.1.1 a) and b), the following separation minima shall be applied.

5.8.2.1.1 The following minima shall be applied to aircraft landing behind a HEAVY or a MEDIUM aircraft:

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

5.8.3 Departing aircraft

5.8.3.1 A minimum separation of 2 minutes shall be applied between a LIGHT or MEDIUM aircraft taking off behind a 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 760 m (2 500 ft);
- 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 (2 500 ft) 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.

Note.— See Figures 5-42 and 5-43.

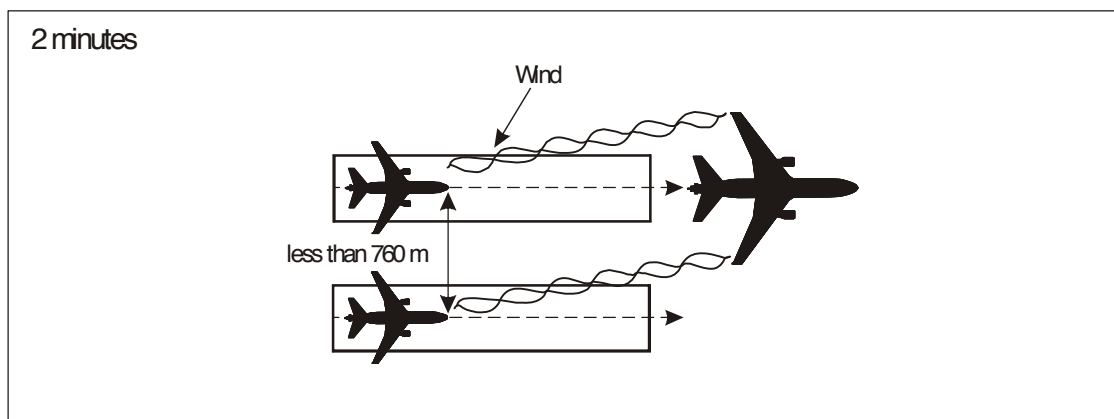


Figure 5-42. Two-minute separation for following aircraft
(see 5.8.3.1 a) and b))

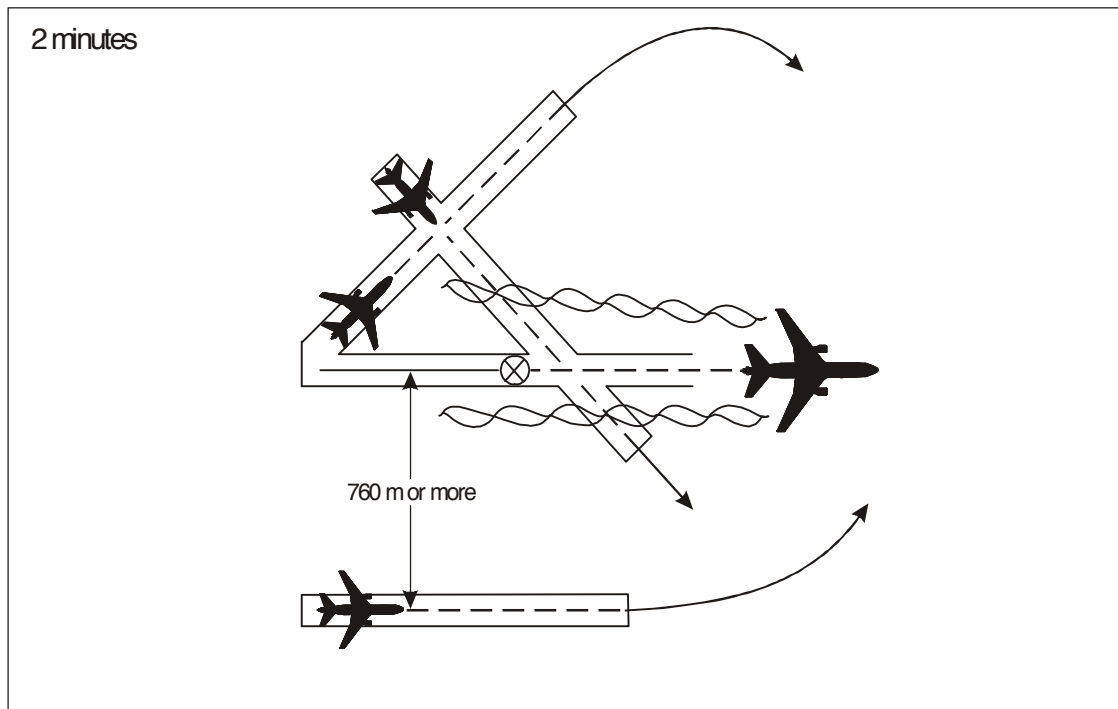


Figure 5-43. Two-minute wake turbulence separation for crossing aircraft (see 5.8.3.1 c) and d))

5.8.3.2 A separation minimum 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 (2 500 ft).

Note.— See Figure 5-44.

5.8.4 Displaced landing threshold

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 MEDIUM aircraft when operating on a runway with a 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) an arriving LIGHT or MEDIUM aircraft follows a HEAVY aircraft departure and an arriving LIGHT aircraft follows a MEDIUM aircraft departure if the projected flight paths are expected to cross.

5.8.5 Opposite direction

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 MEDIUM aircraft when the heavier aircraft is making a low or missed approach and the lighter aircraft is:

- a) utilizing an opposite-direction runway for take-off; or

Note.— See Figure 5-45.

- b) landing on the same runway in the opposite direction, or on a parallel opposite-direction runway separated by less than 760 m (2 500 ft).

Note.— See Figure 5-46.

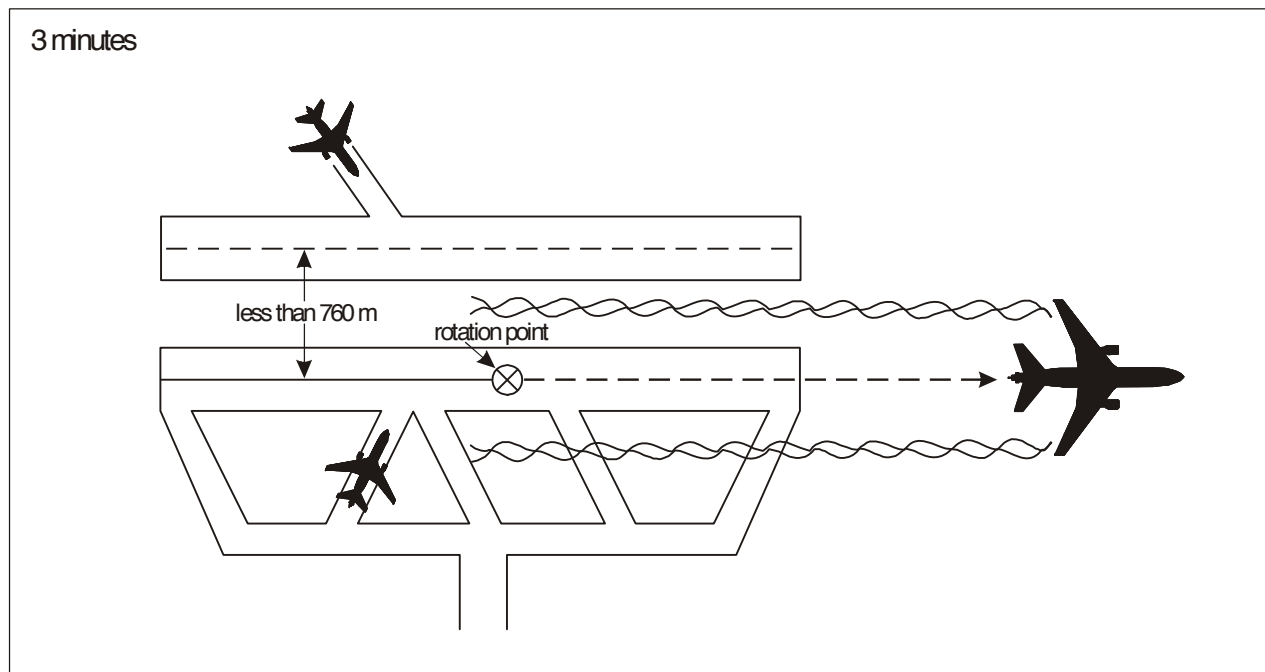


Figure 5-44. Three-minute wake turbulence separation for following aircraft (see 5.8.3.2)

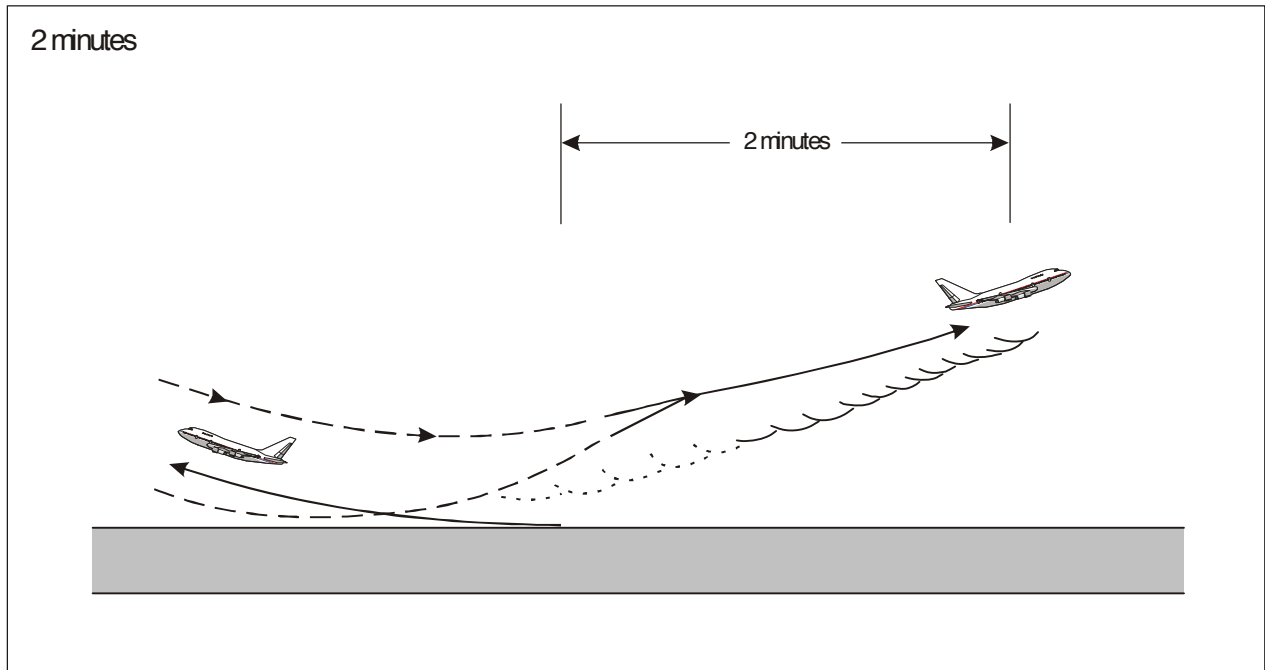


Figure 5-45. Two-minute wake turbulence separation for opposite-direction take-off (see 5.8.5 a))

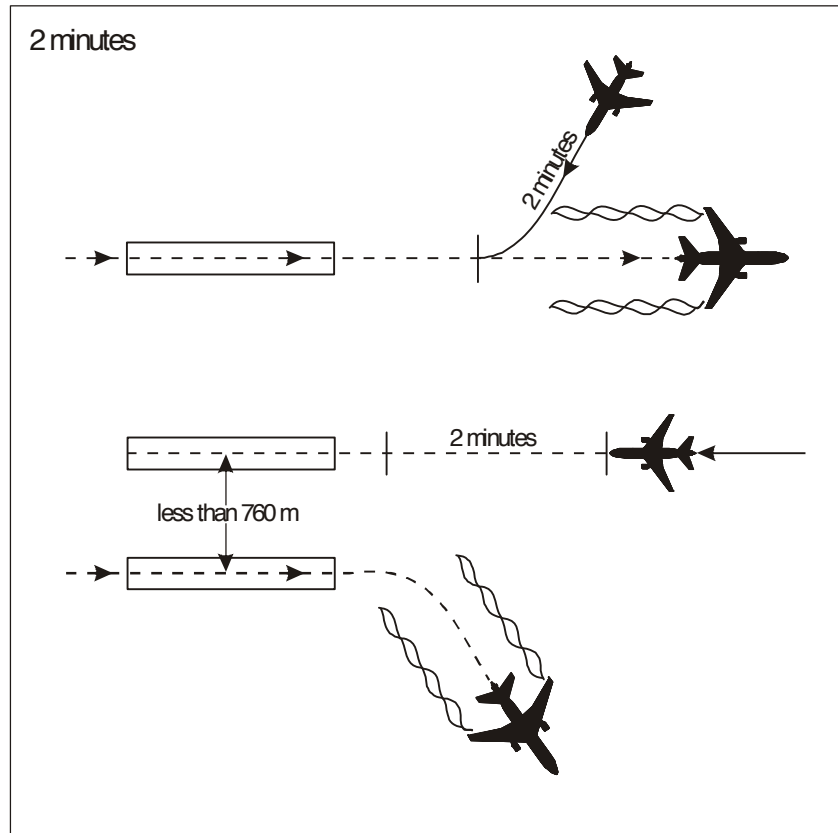


Figure 5-46. Two-minute wake turbulence separation for opposite-direction landing (see 5.8.5 b))

5.9 CLEARANCES TO FLY MAINTAINING OWN SEPARATION WHILE IN VISUAL METEOROLOGICAL CONDITIONS

Note 1.— As indicated in this Section, the provision of vertical or horizontal separation by an air traffic control unit is not applicable in respect of any specified portion of a flight cleared subject to maintaining own separation and remaining in visual meteorological conditions. It is for the flight so cleared to ensure, for the duration of the clearance, that it is not operated in such proximity to other flights as to create a collision hazard.

Note 2.— It is axiomatic that a VFR flight must remain in visual meteorological conditions at all times. Accordingly, the issuance of a clearance to a VFR flight to fly subject to maintaining own separation and remaining in visual meteorological conditions has no other object than to signify that, for the duration of the clearance, separation from other aircraft by air traffic control is not provided.

Note 3.— The objectives of the air traffic control service as prescribed in Annex 11 do not include prevention of collision with terrain. The procedures prescribed in this document do not relieve pilots of their responsibility to ensure that any clearances issued by air traffic control units are safe in this respect. When an IFR flight is vectored or is given a direct routing which takes the aircraft off an ATS route, the procedures in Chapter 8, 8.6.5.2 apply.

When so requested by an aircraft and provided it is agreed by the pilot of the other aircraft and so authorized by the appropriate ATS authority, an ATC unit may clear a controlled flight, including departing and arriving flights, operating in airspace Classes D and E in visual meteorological conditions during the hours of daylight to fly subject to maintaining own separation to one other aircraft and remaining in visual meteorological conditions. When a controlled flight is so cleared, the following shall apply:

- a) the clearance shall be for a specified portion of the flight at or below 3 050 m (10 000 ft), during climb or descent and subject to further restrictions as and when prescribed on the basis of regional air navigation agreements;
- b) if there is a possibility that flight under visual meteorological conditions may become impracticable, an IFR flight shall be provided with alternative instructions to be complied with in the event that flight in visual meteorological conditions (VMC) cannot be maintained for the term of the clearance;
- c) the pilot of an IFR flight, on observing that conditions are deteriorating and considering that operation in VMC will become impossible, shall inform ATC before entering instrument meteorological conditions (IMC) and shall proceed in accordance with the alternative instructions given.

Note.— See also 5.10.1.2.

5.10 ESSENTIAL TRAFFIC INFORMATION

5.10.1 General

5.10.1.1 Essential traffic 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 appropriate separation minimum.

Note.— Pursuant to Section 5.2, but subject to certain exceptions stated therein, ATC is required to provide separation between IFR flights in airspace Classes A to E, and between IFR and VFR flights in Classes B and C. ATC is not required to provide separation between VFR flights, except within airspace Class B. Therefore, IFR or VFR flights may constitute essential traffic to IFR traffic, and IFR flights may constitute essential traffic to VFR traffic. However, a VFR flight would not constitute essential traffic to other VFR flights except within Class B airspace.

5.10.1.2 Essential traffic information shall be given to controlled flights concerned whenever they constitute essential traffic to each other.

Note.— This information will inevitably relate to controlled flights cleared subject to maintaining own separation and remaining in visual meteorological conditions and also whenever the intended separation minimum has been infringed.

5.10.2 Information to be provided

Essential traffic information shall include:

- a) direction of flight of aircraft concerned;
- b) type and wake turbulence category (if relevant) of aircraft concerned;
- c) cruising level of aircraft concerned; and
 - 1) estimated time over the reporting point nearest to where the level will be crossed; or

- 2) relative bearing of the aircraft concerned in terms of the 12-hour clock as well as distance from the conflicting traffic; or
- 3) 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.

5.11 REDUCTION IN SEPARATION MINIMA

Note.— See also Chapter 2, ATS Safety Management.

5.11.1 Provided an appropriate safety assessment has shown that an acceptable level of safety will be maintained, and after prior consultation with users, the separation minima detailed in 5.4.1 and 5.4.2 may be reduced in the following circumstances:

5.11.1.1 As determined by the appropriate ATS authority as appropriate:

- a) when special electronic or other aids enable the pilot-in-command of an aircraft to determine accurately the aircraft's position and when adequate communication facilities exist for that position to be transmitted without delay to the appropriate air traffic control unit; or
- b) when, in association with rapid and reliable communication facilities, information of an aircraft's position, derived from an ATS surveillance system, is available to the appropriate air traffic control unit; or
- c) when special electronic or other aids enable the air traffic controller to predict rapidly and accurately the flight paths of aircraft, and adequate facilities exist to verify frequently the actual aircraft positions with the predicted positions; or
- d) when RNAV-equipped aircraft operate within the coverage of electronic aids that provide the necessary updates to maintain navigation accuracy.

5.11.1.2 In accordance with regional air navigation agreements when:

- a) special electronic, area navigation or other aids enable the aircraft to closely adhere to their current flight plans; and
- b) the air traffic situation is such that the conditions in 5.11.1.1 a) regarding communications between pilots and the appropriate ATC unit or units need not necessarily be met to the degree specified therein.

Note.— Attention is drawn to the guidance material contained in the Air Traffic Services Planning Manual (Doc 9426) regarding conditions governing the reduction of separation minima and to the Manual on Airspace Planning Methodology for the Determination of Separation Minima (Doc 9689).

Chapter 6

SEPARATION IN THE VICINITY OF AERODROMES

6.1 REDUCTION IN SEPARATION MINIMA IN THE VICINITY OF AERODROMES

In addition to the circumstances mentioned in Chapter 5, 5.11.1, the separation minima detailed in Chapter 5, 5.4.1 and 5.4.2, may be reduced in the vicinity of aerodromes if:

- a) adequate separation can be provided by the aerodrome controller when each aircraft is continuously visible to this controller; or
- b) each aircraft is continuously visible to flight crews of the other aircraft concerned and the pilots thereof report that they can maintain their own separation; or
- c) in the case of one aircraft following another, the flight crew of the succeeding aircraft reports that the other aircraft is in sight and separation can be maintained.

6.2 ESSENTIAL LOCAL TRAFFIC

6.2.1 Information on essential local traffic known to the controller shall be transmitted without delay to departing and arriving aircraft concerned.

Note 1.— Essential local traffic in this context consists of any aircraft, vehicle or personnel on or near the runway to be used, or traffic in the take-off and climb-out area or the final approach area, which may constitute a collision hazard to a departing or arriving aircraft.

Note 2.— See also Chapter 5, Section 5.10, Chapter 7, 7.4.1.3 and Chapter 8, 8.8.2.

6.2.1.1 Essential local traffic shall be described so as to be easily identified.

6.3 PROCEDURES FOR DEPARTING AIRCRAFT

6.3.1 General

6.3.1.1 Clearances for departing aircraft shall specify, when necessary for the separation of aircraft, direction of take-off and turn after take-off; heading or track to be made good before taking up the cleared departure track; level to maintain before continuing climb to assigned level; time, point and/or rate at which a level change shall be made; and any other necessary manoeuvre consistent with safe operation of the aircraft.

6.3.1.2 At aerodromes where standard instrument departures (SIDs) have been established, departing aircraft should normally be cleared to follow the appropriate SID.

6.3.2 Standard clearances for departing aircraft

6.3.2.1 GENERAL

The appropriate ATS authority should, wherever possible, establish standardized procedures for transfer of control between the ATC units concerned, and standard clearances for departing aircraft.

Note.— The provisions applying to standardized procedures for coordination and transfer of control are specified in Chapter 10, Section 10.1.1.

6.3.2.2 COORDINATION

6.3.2.2.1 Where standard clearances for departing aircraft have been agreed to between the units concerned, the aerodrome control tower will normally issue the appropriate standard clearance without prior coordination with or approval from the approach control unit or ACC.

6.3.2.2.2 Prior coordination of clearances should be required only in the event that a variation to the standard clearance or the standardized transfer of control procedures is necessary or desirable for operational reasons.

6.3.2.2.3 Provision shall be made to ensure that the approach control unit at all times is kept informed of the sequence in which aircraft will depart as well as the runway to be used.

6.3.2.2.4 Provision shall be made to display the designators of assigned SIDs to the aerodrome control tower, the approach control unit and/or the ACC as applicable.

6.3.2.3 CONTENTS

Standard clearances for departing aircraft shall contain the following items:

- a) aircraft identification;
- b) clearance limit, normally destination aerodrome;
- c) designator of the assigned SID, if applicable;
- d) cleared level;
- e) allocated SSR code;
- f) any other necessary instructions or information not contained in the SID description, e.g. instructions relating to change of frequency.

Note 1. — See 6.3.2.4.1 for clearances to aircraft on SID.

Note 2.— The use of a SID designator without a cleared level does not authorize the aircraft to climb on the SID vertical profile.

6.3.2.4 CLEARANCES ON A SID

6.3.2.4.1 Clearances to aircraft on a SID with remaining published level and/or speed restrictions shall indicate if such restrictions are to be followed or are cancelled. The following phraseologies shall be used with the following meanings:

- a) CLIMB VIA SID TO (*level*):
 - i) climb to the cleared level and comply with published level restrictions;
 - ii) follow the lateral profile of the SID; and
 - iii) comply with published speed restrictions or ATC-issued speed control instructions as applicable.
- b) CLIMB VIA SID TO (*level*), CANCEL LEVEL RESTRICTION(S):
 - i) climb to the cleared level; published level restrictions are cancelled;
 - ii) follow the lateral profile of the SID; and
 - iii) comply with published speed restrictions or ATC-issued speed control instructions as applicable.
- c) CLIMB VIA SID TO (*level*), CANCEL LEVEL RESTRICTION(S) AT (*point(s)*):
 - i) climb to the cleared level; published level restriction(s) at the specified point(s) are cancelled;
 - ii) follow the lateral profile of the SID; and
 - iii) comply with published speed restrictions or ATC-issued speed control instructions as applicable.
- d) CLIMB VIA SID TO (*level*), CANCEL SPEED RESTRICTION(S):
 - i) climb to the cleared level and comply with published level restrictions;
 - ii) follow the lateral profile of the SID; and
 - iii) published speed restrictions and ATC-issued speed control instructions are cancelled.
- e) CLIMB VIA SID TO (*level*), CANCEL SPEED RESTRICTION(S) AT (*point(s)*):
 - i) climb to the cleared level and comply with published level restrictions;
 - ii) follow the lateral profile of the SID; and
 - iii) published speed restrictions are cancelled at the specified point(s).
- f) CLIMB UNRESTRICTED TO (*level*) or CLIMB TO (*level*), CANCEL LEVEL AND SPEED RESTRICTION(S):
 - i) climb to the cleared level; published level restrictions are cancelled;
 - ii) follow the lateral profile of the SID; and
 - iii) published speed restrictions and ATC-issued speed control instructions are cancelled.

6.3.2.4.2 If there are no remaining published level or speed restrictions on the SID, the phrase CLIMB TO (*level*) should be used.

6.3.2.4.3 When subsequent speed restriction instructions are issued, and if the cleared level is unchanged, the phrase CLIMB VIA SID TO (*level*) should be omitted.

6.3.2.4.4 When a departing aircraft is cleared to proceed direct to a published waypoint on the SID, the speed and level restrictions associated with the bypassed waypoints are cancelled. All remaining published speed and level restrictions shall remain applicable.

6.3.2.4.5 When a departing aircraft is vectored or cleared to proceed to a point that is not on the SID, all the published speed and level restrictions of the SID are cancelled and the controller shall:

- a) reiterate the cleared level;
- b) provide speed and level restrictions as necessary; and
- c) notify the pilot if it is expected that the aircraft will be instructed to subsequently rejoin the SID.

Note.— See also 8.6.5.2 regarding prescribed obstacle clearance.

6.3.2.4.6 ATC instructions to an aircraft to rejoin a SID shall include:

- a) the designator of the SID to be rejoin, unless advance notification of rejoin has been provided in accordance with 6.3.2.4.5;
- b) the cleared level in accordance with 6.3.2.4.1; and
- c) the position at which it is expected to rejoin the SID.

Note.— See 12.3.3.1 for phraseology on rejoin instructions.

6.3.2.5 COMMUNICATION FAILURE

6.3.2.5.1 Clearances for departing aircraft may specify a cleared level other than that indicated in the filed flight plan for the en-route phase of flight, without a time or geographical limit for the cleared level. Such clearances will normally be used to facilitate the application of tactical control methods by ATC, normally through the use of an ATS surveillance system.

6.3.2.5.2 Where clearances for departing aircraft contain no time or geographical limit for a cleared level, action to be taken by an aircraft experiencing air-ground communication failure in the event the aircraft has been radar vectored away from the route specified in its current flight plan should be prescribed on the basis of a regional air navigation agreement and included in the SID description or published in AIPs.

6.3.3 Departure sequence

6.3.3.1 Departing aircraft may be expedited by suggesting a take-off direction which is not into the wind. It is the responsibility of the pilot-in-command of an aircraft to decide between making such a take-off or waiting for take-off in a preferred direction.

6.3.3.2 If departures are delayed, the delayed flights shall normally be cleared in an order based on their estimated time of departure, except that deviation from this order may be made to:

- a) facilitate the maximum number of departures with the least average delay;
- b) accommodate requests by an operator in respect of that operator's flights to the extent practicable.

6.3.3.3 Air traffic control units should, when practicable, advise aircraft operators or their designated representatives when anticipated delays are expected to exceed 30 minutes.

6.4 INFORMATION FOR DEPARTING AIRCRAFT

Note.— See Chapter 11, 11.4.3, regarding flight information messages.

6.4.1 Meteorological conditions

Information regarding significant changes in the meteorological conditions in the take-off or climb-out area, obtained by the unit providing approach control service after a departing aircraft has established communication with such unit, shall be transmitted to the aircraft without delay, except when it is known that the aircraft already has received the information.

Note.— Significant changes in this context include those relating to surface wind direction or speed, visibility, runway visual range or air temperature (for turbine-engined aircraft), and the occurrence of thunderstorm or cumulonimbus, moderate or severe turbulence, wind shear, hail, moderate or severe icing, severe squall line, freezing precipitation, severe mountain waves, sandstorm, duststorm, blowing snow, tornado or waterspout.

6.4.2 Operational status of visual or non-visual aids

Information regarding changes in the operational status of visual or non-visual aids essential for take-off and climb shall be transmitted without delay to a departing aircraft, except when it is known that the aircraft already has received the information.

6.5 PROCEDURES FOR ARRIVING AIRCRAFT

6.5.1 General

6.5.1.1 When it becomes evident that delays will be encountered by arriving aircraft, operators or designated representatives shall, to the extent practicable, be notified and kept currently informed of any changes in such expected delays.

6.5.1.2 Arriving aircraft may be required to report when leaving or passing a significant point or navigation aid, or when starting procedure turn or base turn, or to provide other information required by the controller, to expedite departing and arriving aircraft.

6.5.1.3 An IFR flight shall not be cleared for an initial approach below the appropriate minimum altitude as specified by the State concerned nor to descend below that altitude unless:

- a) the pilot has reported passing an appropriate point defined by a navigation aid or as a waypoint; or
- b) the pilot reports that the aerodrome is and can be maintained in sight; or
- c) the aircraft is conducting a visual approach; or
- d) the controller has determined the aircraft's position by the use of an ATS surveillance system, and a lower minimum altitude has been specified for use when providing ATS surveillance services.

6.5.1.4 At aerodromes where standard instrument arrivals (STARs) have been established, arriving aircraft should normally be cleared to follow the appropriate STAR. The aircraft shall be informed of the type of approach to expect and runway-in-use as early as possible.

Note.— See Section 6.5.2 concerning Standard arrival clearances.

6.5.1.5 After coordination with the approach control unit, the ACC may clear the first arriving aircraft for approach rather than to a holding fix.

6.5.2 Standard clearances for arriving aircraft

6.5.2.1 GENERAL

The appropriate ATS authority should, wherever possible, establish standardized procedures for transfer of control between the ATC units concerned, and standard clearances for arriving aircraft.

Note.— The provisions applying to standardized procedures for coordination and transfer of control are specified in Chapter 10, Section 10.1.1.

6.5.2.2 COORDINATION

6.5.2.2.1 Where standard clearances for arriving aircraft are in use and, provided no terminal delay is expected, clearance to follow the appropriate STAR will normally be issued by the ACC without prior coordination with or approval from the approach control unit or the aerodrome control tower as applicable.

6.5.2.2.2 Prior coordination of clearances should be required only in the event that a variation to the standard clearance or the standardized transfer of control procedures is necessary or desirable for operational reasons.

6.5.2.2.3 Provision shall be made to ensure that the approach control unit is at all times kept informed of the sequence of aircraft following the same STAR.

6.5.2.2.4 Provision shall be made to display the designators of assigned STARs to the ACC, the approach control unit and/or the aerodrome control tower, as applicable.

6.5.2.3 CONTENTS

Standard clearances for arriving aircraft shall contain the following items:

- a) aircraft identification;
- b) designator of the assigned STAR if applicable;
- c) runway-in-use, except when part of the STAR description;
- d) cleared level; and
- e) any other necessary instructions or information not contained in the STAR description, e.g. change of communications.

Note 1.— See 6.5.2.4.1 for clearances on a STAR.

Note 2.— The use of a STAR designator without a cleared level does not authorize the aircraft to descend on the STAR vertical profile.

6.5.2.4 CLEARANCES ON A STAR

6.5.2.4.1 Clearances to aircraft on a STAR with remaining published level and/or speed restrictions shall indicate if such restrictions are to be followed or are cancelled. The following phraseologies shall be used with the following meaning:

- a) DESCEND VIA STAR TO (*level*):
 - i) descend to the cleared level and comply with published level restrictions;
 - ii) follow the lateral profile of the STAR; and
 - iii) comply with published speed restrictions or ATC-issued speed control instructions as applicable.
- b) DESCEND VIA STAR TO (*level*), CANCEL LEVEL RESTRICTION(S):
 - i) descend to the cleared level; published level restrictions are cancelled;
 - ii) follow the lateral profile of the STAR; and
 - iii) comply with published speed restrictions or ATC-issued speed control instructions as applicable.
- c) DESCEND VIA STAR TO (*level*), CANCEL LEVEL RESTRICTION(S) AT (*point(s)*):
 - i) descend to the cleared level; published level restriction(s) at the specified point(s) are cancelled;
 - ii) follow the lateral profile of the STAR; and
 - iii) comply with published speed restrictions or ATC-issued speed control instructions as applicable.
- d) DESCEND VIA STAR TO (*level*), CANCEL SPEED RESTRICTION(S):
 - i) descend to the cleared level and comply with published level restrictions;
 - ii) follow the lateral profile of the STAR; and
 - iii) published speed restrictions and ATC-issued speed control instructions are cancelled.
- e) DESCEND VIA STAR TO (*level*), CANCEL SPEED RESTRICTION(S) AT (*point(s)*):
 - i) descend to the cleared level and comply with published level restrictions;
 - ii) follow the lateral profile of the STAR; and
 - iii) published speed restrictions are cancelled at the specified point(s).
- f) DESCEND UNRESTRICTED TO (*level*) or DESCEND TO (*level*), CANCEL LEVEL AND SPEED RESTRICTION(S):
 - i) descend to the cleared level; published level restrictions are cancelled;
 - ii) follow the lateral profile of the STAR; and
 - iii) published speed restrictions and ATC-issued speed control instructions are cancelled.

6.5.2.4.2 If there are no remaining published level or speed restrictions on the STAR, the phrase DESCEND TO (*level*) should be used.

6.5.2.4.3 When subsequent speed restriction instructions are issued and if the cleared level is unchanged, the phrase DESCEND VIA STAR TO (*level*) should be omitted.

6.5.2.4.4 When an arriving aircraft is cleared to proceed direct to a published waypoint on the STAR, the speed and level restrictions associated with the bypassed waypoints are cancelled. All remaining published speed and level restrictions shall remain applicable.

6.5.2.4.5 When an arriving aircraft is vectored or cleared to proceed to a point that is not on the STAR, all the published speed and level restrictions of the STAR are cancelled and the controller shall:

- a) reiterate the cleared level;
- b) provide speed and level restrictions as necessary; and
- c) notify the pilot if it is expected that the aircraft will be instructed to subsequently rejoin the STAR.

Note.— See 8.6.5.2 regarding prescribed obstacle clearance.

6.5.2.4.6 ATC instructions to an aircraft to rejoin a STAR shall include:

- a) the designator of the STAR to be rejoined, unless advance notification of rejoin has been provided in accordance with 6.5.2.4.5;
- b) the cleared level on rejoining the STAR in accordance with 6.5.2.4.1; and
- c) the position at which it is expected to rejoin the STAR.

Note.— See 12.3.3.2 for phraseology on rejoin instructions.

6.5.3 Visual approach

6.5.3.1 Subject to the conditions in 6.5.3.3, clearance for an IFR flight to execute a visual approach may be requested by a flight crew or initiated by the controller. In the latter case, the concurrence of the flight crew shall be required.

6.5.3.2 Controllers shall exercise caution in initiating a visual approach when there is reason to believe that the flight crew concerned is not familiar with the aerodrome and its surrounding terrain. Controllers should also take into consideration the prevailing traffic and meteorological conditions when initiating visual approaches.

6.5.3.3 An IFR flight may be cleared to execute a visual approach provided the pilot can maintain visual reference to the terrain and:

- a) the reported ceiling is at or above the level of the beginning of the initial approach segment for the aircraft so cleared; or
- b) the pilot reports at the level of the beginning of the initial approach segment or at any time during the instrument approach procedure that the meteorological conditions are such that with reasonable assurance a visual approach and landing can be completed.

6.5.3.4 Separation shall be provided between an aircraft cleared to execute a visual approach and other arriving and departing aircraft.

6.5.3.5 For successive visual approaches, separation shall be maintained by the controller until the pilot of a succeeding aircraft reports having the preceding aircraft in sight. The aircraft shall then be instructed to follow and maintain own separation from the preceding aircraft. When both aircraft are of a heavy wake turbulence category, or the preceding aircraft is of a heavier wake turbulence category than the following, and the distance between the aircraft is less than the appropriate wake turbulence minimum, the controller shall 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.

6.5.3.6 Transfer of communications to the aerodrome controller should be effected at such a point or time that information on essential local traffic, if applicable, and clearance to land or alternative instructions can be issued to the aircraft in a timely manner.

6.5.4 Instrument approach

6.5.4.1 The approach control unit shall specify the instrument approach procedure to be used by arriving aircraft. A flight crew may request an alternative procedure and, if circumstances permit, should be cleared accordingly.

6.5.4.2 If a pilot reports or it is clearly apparent to the ATC unit that the pilot is not familiar with an instrument approach procedure, the initial approach level, the point (in minutes from the appropriate reporting point) at which base turn or procedure turn will be started, the level at which the procedure turn shall be carried out and the final approach track shall be specified, except that only the last-mentioned need be specified if the aircraft is to be cleared for a straight-in approach. The frequency(ies) of the navigation aid(s) to be used as well as the missed approach procedure shall also be specified when deemed necessary.

6.5.4.3 If visual reference to terrain is established before completion of the approach procedure, the entire procedure must nevertheless be executed unless the aircraft requests and is cleared for a visual approach.

6.5.5 Holding

6.5.5.1 In the event of extended delays, aircraft should be advised of the anticipated delay as early as possible and, when practicable, be instructed or given the option to reduce speed en route in order to absorb delay.

6.5.5.2 When delay is expected, the ACC shall normally be responsible for clearing aircraft to the holding fix, and for including holding instructions, and expected approach time or onward clearance time, as applicable, in such clearances. (See Section 6.5.8.)

6.5.5.3 After coordination with the approach control unit, the ACC may clear an arriving aircraft to a visual holding location to hold until further advised by the approach control unit.

6.5.5.4 After coordination with the aerodrome control tower, the approach control unit may clear an arriving aircraft to a visual holding location to hold until further advised by the aerodrome control tower.

6.5.5.5 Holding and holding pattern entry shall be accomplished in accordance with procedures established by the appropriate ATS authority and published in AIPs. If entry and holding procedures have not been published or if the procedures are not known to a flight crew, the appropriate air traffic control unit shall specify the designator of the location or aid to be used, the inbound track, radial or bearing, direction of turn in the holding pattern as well as the time of the outbound leg or the distances between which to hold.

6.5.5.6 Aircraft should normally be held at a designated holding fix. The required minimum vertical, lateral or longitudinal separation from other aircraft shall be provided. Criteria and procedures for the simultaneous use of adjacent holding patterns shall be prescribed in local instructions.

Note.— See Chapter 5, Section 5.5, concerning separation of aircraft holding in flight.

6.5.5.7 Levels at a holding fix or visual holding location shall as far as practicable be assigned in a manner that will facilitate clearing each aircraft to approach in its proper priority. Normally, the first aircraft to arrive over a holding fix or visual holding location should be at the lowest level, with following aircraft at successively higher levels.

6.5.5.8 When extended holding is anticipated, turbojet aircraft should, when practicable, be permitted to hold at higher levels in order to conserve fuel, while retaining their order in the approach sequence.

6.5.5.9 If an aircraft is unable to comply with the published or cleared holding procedure, alternative instructions shall be issued.

6.5.5.10 For the purpose of maintaining a safe and orderly flow of traffic, an aircraft may be instructed to orbit at its present or at any other position, provided the required obstacle clearance is ensured.

6.5.6 Approach sequence

6.5.6.1 GENERAL

The following procedures shall be applied whenever approaches are in progress.

6.5.6.1.1 The approach sequence shall be established in a manner which will facilitate arrival of the maximum number of aircraft with the least average delay. Priority shall be given to:

- a) an aircraft which anticipates being compelled to land because of factors affecting the safe operation of the aircraft (engine failure, shortage of fuel, etc.);
- b) hospital aircraft or aircraft carrying any sick or seriously injured person requiring urgent medical attention;
- c) aircraft engaged in search and rescue operations; and
- d) other aircraft as may be determined by the appropriate authority.

Note.— An aircraft which has encountered an emergency is handled as outlined in Chapter 15, Section 15.1.

6.5.6.1.2 Succeeding aircraft shall be cleared for approach:

- a) when the preceding aircraft has reported that it is able to complete its approach without encountering instrument meteorological conditions; or
- b) when the preceding aircraft is in communication with and sighted by the aerodrome control tower, and reasonable assurance exists that a normal landing can be accomplished; or
- c) when timed approaches are used, the preceding aircraft has passed the defined point inbound, and reasonable assurance exists that a normal landing can be accomplished;

Note.— See 6.5.6.2.1 concerning timed approach procedures.

- d) when the use of an ATS surveillance system confirms that the required longitudinal spacing between succeeding aircraft has been established.

6.5.6.1.3 In establishing the approach sequence, the need for increased longitudinal spacing between arriving aircraft due to wake turbulence shall be taken into account.

6.5.6.1.4 If the pilot of an aircraft in an approach sequence has indicated an intention to hold for weather improvement, or for other reasons, such action shall be approved. However, when other holding aircraft indicate intention to continue their approach to land, the pilot desiring to hold will be cleared to an adjacent fix for holding awaiting weather change or re-routing. Alternatively, the aircraft should be given a clearance to place it at the top of the approach sequence so that other holding aircraft may be permitted to land. Coordination shall be effected with any adjacent ATC unit or control sector, when required, to avoid conflict with the traffic under the jurisdiction of that unit or sector.

6.5.6.1.5 When establishing the approach sequence, an aircraft which has been authorized to absorb a specified period of notified terminal delay by cruising at a reduced speed en route, should, in so far as practicable, be credited with the time absorbed en route.

6.5.6.2 SEQUENCING AND SPACING OF INSTRUMENT APPROACHES

6.5.6.2.1 TIMED APPROACH PROCEDURES

6.5.6.2.1.1 Subject to approval by the appropriate ATS authority, the following procedure should be utilized as necessary to expedite the approaches of a number of arriving aircraft:

- a) a suitable point on the approach path, which shall be capable of being accurately determined by the pilot, shall be specified, to serve as a checkpoint in timing successive approaches;
- b) aircraft shall be given a time at which to pass the specified point inbound, which time shall be determined with the aim of achieving the desired interval between successive landings on the runway while respecting the applicable separation minima at all times, including the period of runway occupancy.

6.5.6.2.1.2 The time at which aircraft should pass the specified point shall be determined by the unit providing approach control service and notified to the aircraft sufficiently in advance to permit the pilot to arrange the flight path accordingly.

6.5.6.2.1.3 Each aircraft in the approach sequence shall be cleared to pass the specified point inbound at the previously notified time, or any revision thereof, after the preceding aircraft has reported passing the point inbound.

6.5.6.2.2 INTERVAL BETWEEN SUCCESSIVE APPROACHES

In determining the time interval or longitudinal distance to be applied between successive approaching aircraft, the relative speeds between succeeding aircraft, the distance from the specified point to the runway, the need to apply wake turbulence separation, runway occupancy times, the prevailing meteorological conditions as well as any condition which may affect runway occupancy times shall be considered. When an ATS surveillance system is used to establish an approach sequence, the minimum distance to be established between succeeding aircraft shall be specified in local instructions. Local instructions shall additionally specify the circumstances under which any increased longitudinal distance between approaches may be required as well as the minima to be used under such circumstances.

6.5.6.2.3 INFORMATION ON APPROACH SEQUENCE

Provision shall be made to ensure that the aerodrome control tower is kept informed of the sequence in which aircraft will be established on final approach for landing.

Note 1.— Guidance material on factors to be taken into account when determining separation for timed approaches is contained in the Air Traffic Services Planning Manual (Doc 9426).

Note 2.— Wake turbulence categories and wake turbulence separation minima are contained in Chapter 4, Section 4.9, Chapter 5, Section 5.8 and Chapter 8, Section 8.7.

Note 3.— Detailed characteristics of wake vortices and their effect on aircraft are contained in the Air Traffic Services Planning Manual (Doc 9426), Part II, Section 5.

6.5.7 Expected approach time

6.5.7.1 An expected approach time shall be determined for an arriving aircraft that will be subjected to a delay of 10 minutes or more or such other period as has been determined by the appropriate authority. The expected approach time shall be transmitted to the aircraft as soon as practicable and preferably not later than at the commencement of its initial descent from cruising level. A revised expected approach time shall be transmitted to the aircraft without delay whenever it differs from that previously transmitted by 5 minutes or more, or such lesser period of time as has been established by the appropriate ATS authority or agreed between the ATS units concerned.

6.5.7.2 An expected approach time shall be transmitted to the aircraft by the most expeditious means whenever it is anticipated that the aircraft will be required to hold for 30 minutes or more.

6.5.7.3 The holding fix to which an expected approach time relates shall be identified together with the expected approach time whenever circumstances are such that this would not otherwise be evident to the pilot.

6.5.8 Onward clearance time

In the event an aircraft is held en route or at a location or aid other than the initial approach fix, the aircraft concerned shall, as soon as practicable, be given an expected onward clearance time from the holding fix. The aircraft shall also be advised if further holding at a subsequent holding fix is expected.

Note.— “Onward clearance time” is the time at which an aircraft can expect to leave the fix at which it is being held.

6.6 INFORMATION FOR ARRIVING AIRCRAFT

Note.— See Chapter 11, 11.4.3, regarding flight information messages.

6.6.1 As early as practicable after an aircraft has established communication with the unit providing approach control service, the following elements of information, in the order listed, shall be transmitted to the aircraft, with the exception of such elements which it is known the aircraft has already received:

- a) type of approach and runway-in-use;
- b) meteorological information, as follows:
 - 1) surface wind direction and speed, including significant variations;
 - 2) visibility and, when applicable, runway visual range (RVR);
 - 3) present weather;

- 4) cloud below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater; cumulonimbus; if the sky is obscured, vertical visibility when available;
- 5) air temperature;
- 6) dew point temperature, inclusion determined on the basis of a regional air navigation agreement;
- 7) altimeter setting(s);
- 8) any available information on significant meteorological phenomena in the approach area; and
- 9) trend-type landing forecast, when available.

Note.— The meteorological information listed above is identical to that required in ATIS broadcasts for arriving aircraft as specified in Annex 11, 4.3.7 l) to t), and is to be extracted from local meteorological routine and special reports, in accordance with Chapter 11, 11.4.3.2.2 to 11.4.3.2.3.

- c) current runway surface conditions, in case of precipitants or other temporary hazards;
- d) changes in the operational status of visual and non-visual aids essential for approach and landing.

6.6.2 In applying the provisions in 6.7.3.1.1, it should be recognized that information published by NOTAM or disseminated by other means may not have been received by the aircraft prior to departure or during en-route flight.

6.6.3 If it becomes necessary or operationally desirable that an arriving aircraft follow an instrument approach procedure or use a runway other than that initially stated, the flight crew shall be advised without delay.

6.6.4 At the commencement of final approach, the following information shall be transmitted to aircraft:

- a) significant changes in the mean surface wind direction and speed;

Note.— Significant changes are specified in Annex 3, Chapter 4. However, if the controller possesses wind information in the form of components, the significant changes are:

- Mean headwind component: 19 km/h (10 kt)
- Mean tailwind component: 4 km/h (2 kt)
- Mean crosswind component: 9 km/h (5 kt)

- b) the latest information, if any, on wind shear and/or turbulence in the final approach area;
- c) the current visibility representative of the direction of approach and landing or, when provided, the current runway visual range value(s) and the trend.

6.6.5 During final approach, the following information shall be transmitted without delay:

- a) the sudden occurrence of hazards (e.g. unauthorized traffic on the runway);
- b) significant variations in the current surface wind, expressed in terms of minimum and maximum values;
- c) significant changes in runway surface conditions;
- d) changes in the operational status of required visual or non-visual aids;

- e) changes in observed RVR value(s), in accordance with the reported scale in use, or changes in the visibility representative of the direction of approach and landing.

6.7 OPERATIONS ON PARALLEL OR NEAR-PARALLEL RUNWAYS

6.7.1 General

Where parallel or near-parallel runways are used for simultaneous operations, the requirements and procedures below shall apply.

Note.— Guidance material is contained in the Manual on Simultaneous Operations on Parallel or Near-Parallel Instrument Runways (SOIR) (Doc 9643).

6.7.2 Departing aircraft

6.7.2.1 TYPES OF OPERATION

Parallel runways may be used for independent instrument departures as follows:

- a) both runways are used exclusively for departures (independent departures);
- b) one runway is used exclusively for departures while the other runway is used for a mixture of arrivals and departures (semi-mixed operation); and
- c) both runways are used for mixed arrivals and departures (mixed operation).

6.7.2.2 REQUIREMENTS AND PROCEDURES FOR INDEPENDENT PARALLEL DEPARTURES

Independent IFR departures may be conducted from parallel runways provided:

- a) the runway centre lines are spaced by the distance specified in Annex 14, Volume I;
- b) the departure tracks diverge by at least 15 degrees immediately after take-off;
- c) suitable surveillance radar capable of identification of the aircraft within 2 km (1.0 NM) from the end of the runway is available; and
- d) ATS operational procedures ensure that the required track divergence is achieved.

6.7.3 Arriving aircraft

6.7.3.1 TYPES OF OPERATIONS

- 6.7.3.1.1 Parallel runways may be used for simultaneous instrument operations for:

- a) independent parallel approaches; or
- b) dependent parallel approaches; or
- c) segregated parallel operations.

6.7.3.1.2 Whenever parallel approaches are carried out, separate controllers should be responsible for the sequencing and spacing of arriving aircraft to each runway.

6.7.3.2 REQUIREMENTS AND PROCEDURES FOR INDEPENDENT PARALLEL APPROACHES

6.7.3.2.1 Independent parallel approaches may be conducted to parallel runways provided that:

- a) the runway centre lines are spaced by the distance specified in Annex 14, Volume I:
 - 1) where runway centre lines are spaced by less than 1 310 m but not less than 1 035 m, suitable secondary surveillance radar (SSR) equipment, with a minimum azimuth accuracy of 0.06 degrees (one sigma), an update period of 2.5 seconds or less and a high resolution display providing position prediction and deviation alert is available; or
 - 2) where runway centre lines are spaced by less than 1 525 m but not less than 1 310 m, SSR equipment with performance specifications other than the foregoing may be applied, provided they are equal to or better than those stated under 3) below, and when it is determined that the safety of aircraft operation would not be adversely affected; or
 - 3) where runway centre lines are spaced by 1 525 m or more, suitable surveillance radar with a minimum azimuth accuracy of 0.3 degrees (one sigma) or better and update period of 5 seconds or less is available;

For the above cases, other equivalent ATS surveillance systems (e.g. ADS-B or MLAT) may be used to provide the services detailed above provided that a performance capability equal to or better than that required for the above can be demonstrated.

Note.— Guidance material pertaining to use of ADS-B and multilateration (MLAT) systems and their system performance is contained in the Assessment of ADS-B and Multilateration Surveillance to Support Air Traffic Services and Guidelines for Implementation (Cir 326).

- b) instrument landing system (ILS) and/or microwave landing system (MLS) approaches are being conducted on both runways;
- c) the missed approach track for one approach diverges by at least 30 degrees from the missed approach track of the adjacent approach;
- d) an obstacle survey and evaluation is completed, as appropriate, for the areas adjacent to the final approach segments;
- e) aircraft are advised of the runway identification and ILS localizer or MLS frequency as early as possible;
- f) vectoring is used to intercept the ILS localizer course or the MLS final approach track;
- g) a no transgression zone (NTZ) at least 610 m (2 000 ft) wide is established equidistant between extended runway centre lines and is depicted on the situation display;
- h) separate controllers monitor the approaches to each runway and ensure that when the 300 m (1 000 ft) vertical separation is reduced:
 - 1) aircraft do not penetrate the depicted NTZ; and

- 2) the applicable minimum longitudinal separation between aircraft on the same ILS localizer course or MLS final approach track is maintained; and
- i) if no dedicated radio channels are available for the controllers to control the aircraft until landing:
 - 1) transfer of communication of aircraft to the respective aerodrome controller's channel is effected before the higher of two aircraft on adjacent final approach tracks intercepts the ILS glide path or the specified MLS elevation angle; and
 - 2) the controllers monitoring the approaches to each runway are provided with the capability to override transmissions of aerodrome control on the respective radio channels for each arrival flow.

6.7.3.2.2 As early as practicable after an aircraft has established communication with approach control, the aircraft shall be advised that independent parallel approaches are in force. This information may be provided through the ATIS broadcasts.

6.7.3.2.3 When vectoring to intercept the ILS localizer course or MLS final approach track, the final vector shall enable the aircraft to intercept the ILS localizer course or MLS final approach track at an angle not greater than 30 degrees and to provide at least 2 km (1.0 NM) straight and level flight prior to ILS localizer course or MLS final approach track intercept. The vector shall also enable the aircraft to be established on the ILS localizer course or MLS final approach track in level flight for at least 3.7 km (2.0 NM) prior to intercepting the ILS glide path or specified MLS elevation angle.

6.7.3.2.4 A minimum of 300 m (1 000 ft) vertical separation or, subject to radar system and situation display capabilities, a minimum of 5.6 km (3.0 NM) radar separation shall be provided until aircraft are established:

- a) inbound on the ILS localizer course and/or MLS final approach track; and
- b) within the normal operating zone (NOZ).

6.7.3.2.5 Subject to radar system and situation display capabilities, a minimum of 5.6 km (3.0 NM) radar separation shall be provided between aircraft on the same ILS localizer course or MLS final approach track unless increased longitudinal separation is required due to wake turbulence or for other reasons.

Note 1.— See Chapter 8, 8.7.3.4.

Note 2.— An aircraft established on an ILS localizer course or MLS final approach track is separated from another aircraft established on an adjacent parallel ILS localizer course or MLS final approach track provided neither aircraft penetrates the NTZ as depicted on the situation display.

6.7.3.2.6 When assigning the final heading to intercept the ILS localizer course or MLS final approach track, the runway shall be confirmed, and the aircraft shall be advised of:

- a) its position relative to a fix on the ILS localizer course or MLS final approach track;
- b) the altitude to be maintained until established on the ILS localizer course or MLS final approach track to the ILS glide path or specified MLS elevation angle intercept point; and
- c) if required, clearance for the appropriate ILS or MLS approach.

6.7.3.2.7 All approaches regardless of meteorological conditions shall be provided with flight path monitoring using radar. Control instructions and information necessary to ensure separation between aircraft and to ensure aircraft do not enter the NTZ shall be issued.

Note 1.— The primary responsibility for navigation on the ILS localizer course and/or MLS final approach track rests with the pilot. Control instructions and information are therefore issued only to ensure separation between aircraft and to ensure that aircraft do not penetrate the NTZ.

Note 2.— For the purpose of ensuring an aircraft does not penetrate the NTZ, the aircraft is considered to be the centre of its position symbol. However, the edges of the position symbols representing aircraft executing parallel approaches are not allowed to touch (see Chapter 8, 8.7.2).

6.7.3.2.8 When an aircraft is observed to overshoot the turn-on or to continue on a track which will penetrate the NTZ, the aircraft shall be instructed to return immediately to the correct track.

6.7.3.2.9 When an aircraft is observed penetrating the NTZ, the aircraft on the adjacent ILS localizer course or MLS final approach track shall be instructed to immediately climb and turn to the assigned altitude/height and heading in order to avoid the deviating aircraft. Where parallel approach obstacle assessment surfaces (PAOAS) criteria are applied for the obstacle assessment, the air traffic controller shall not issue the heading instruction to the aircraft below 120 m (400 ft) above the runway threshold elevation, and the heading instruction shall not exceed 45 degrees track difference with the ILS localizer course or MLS final approach track.

6.7.3.2.10 Flight path monitoring using radar shall not be terminated until:

- a) visual separation is applied, provided procedures ensure that both controllers are advised whenever visual separation is applied;
- b) the aircraft has landed, or in case of a missed approach, is at least 2 km (1.0 NM) beyond the departure end of the runway and adequate separation with any other traffic is established.

Note.— There is no requirement to advise the aircraft that flight path monitoring using radar is terminated.

6.7.3.3 SUSPENSION OF INDEPENDENT PARALLEL APPROACHES TO CLOSELY-SPACED PARALLEL RUNWAYS

Independent parallel approaches to parallel runways spaced by less than 1 525 m between their centre lines shall be suspended under certain meteorological conditions, as prescribed by the appropriate ATS authority, including wind shear, turbulence, downdrafts, crosswind and significant meteorological conditions such as thunderstorms, which might otherwise increase ILS localizer course and/ or MLS final approach track deviations to the extent that safety may be impaired.

Note 1.— The increase in final approach track deviations would additionally result in an unacceptable level of deviation alerts being generated.

Note 2.— Guidance material relating to meteorological conditions is contained in the Manual on Simultaneous Operations on Parallel or Near-Parallel Instrument Runways (SOIR) (Doc 9643).

6.7.3.4 REQUIREMENTS AND PROCEDURES FOR DEPENDENT PARALLEL APPROACHES

6.7.3.4.1 Dependent parallel approaches may be conducted to parallel runways provided:

- a) the runway centre lines are spaced by the distance specified in Annex 14, Volume I;
- b) the aircraft are vectored to intercept the final approach track;
- c) suitable surveillance radar with a minimum azimuth accuracy of 0.3 degrees (one sigma) and update period of 5 seconds or less is available;
- d) ILS and/or MLS approaches are being conducted on both runways;

- e) aircraft are advised that approaches are in use to both runways (this information may be provided through the ATIS);
- f) the missed approach track for one approach diverges by at least 30 degrees from the missed approach track of the adjacent approach; and
- g) approach control has a frequency override capability to aerodrome control.

6.7.3.4.2 A minimum of 300 m (1 000 ft) vertical separation or a minimum of 5.6 km (3.0 NM) radar separation shall be provided between aircraft during turn-on to parallel ILS localizer courses and/or MLS final approach tracks.

6.7.3.4.3 The minimum radar separation to be provided between aircraft established on the ILS localizer course and/or MLS final approach track shall be:

- a) 5.6 km (3.0 NM) between aircraft on the same ILS localizer course or MLS final approach track unless increased longitudinal separation is required due to wake turbulence; and
- b) 3.7 km (2.0 NM) between successive aircraft on adjacent ILS localizer courses or MLS final approach tracks.

6.7.3.5 REQUIREMENTS AND PROCEDURES FOR SEGREGATED PARALLEL OPERATIONS

6.7.3.5.1 Segregated parallel operations may be conducted on parallel runways provided:

- a) the runway centre lines are spaced by the distance specified in Annex 14, Volume I; and
- b) the nominal departure track diverges immediately after take-off by at least 30 degrees from the missed approach track of the adjacent approach (see Figure 6-1).

6.7.3.5.2 The minimum distance between parallel runway centre 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 (see Figure 6-2) and should be increased by 30 m for each 150 m that the arrival runway is staggered away from the arriving aircraft (see Figure 6-3).

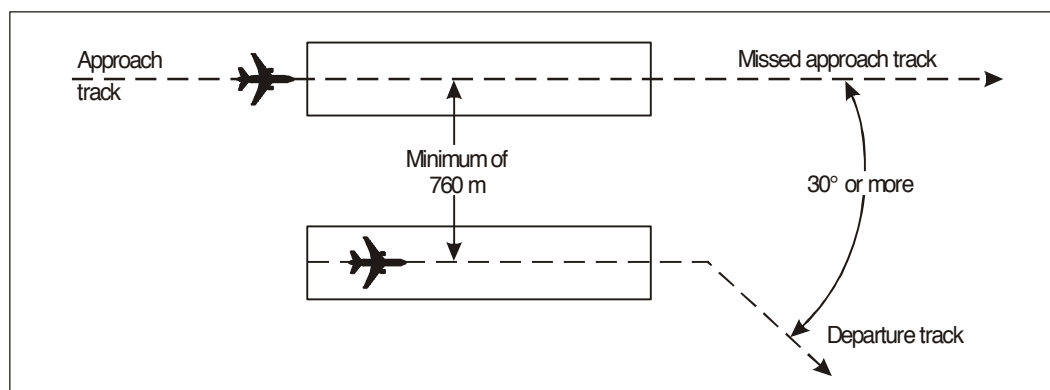


Figure 6-1. Segregated parallel operations (see 6.7.3.5.1 b))

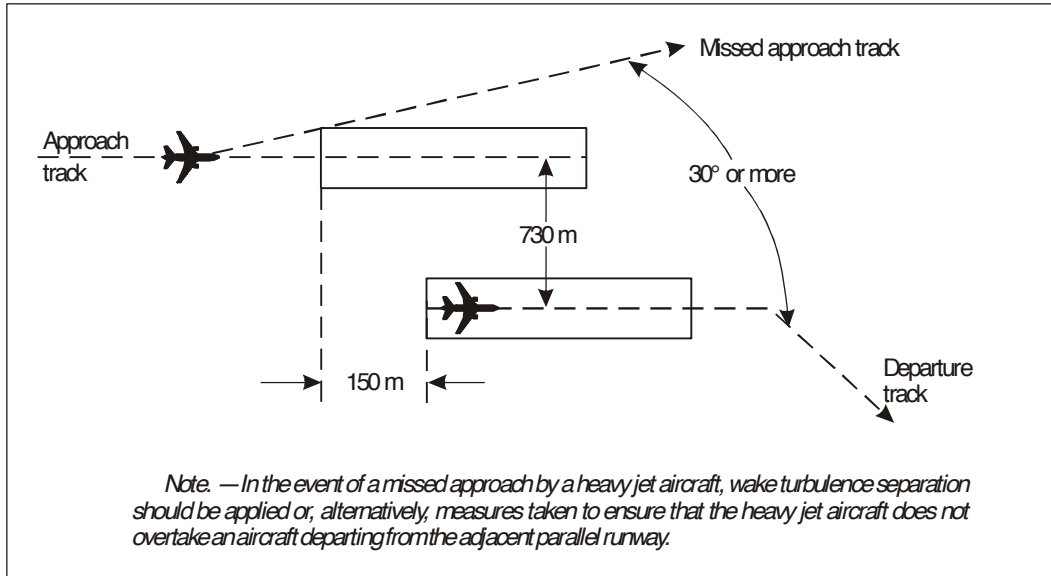


Figure 6-2. Segregated parallel operations where runways are staggered
(see 6.7.3.5.2)

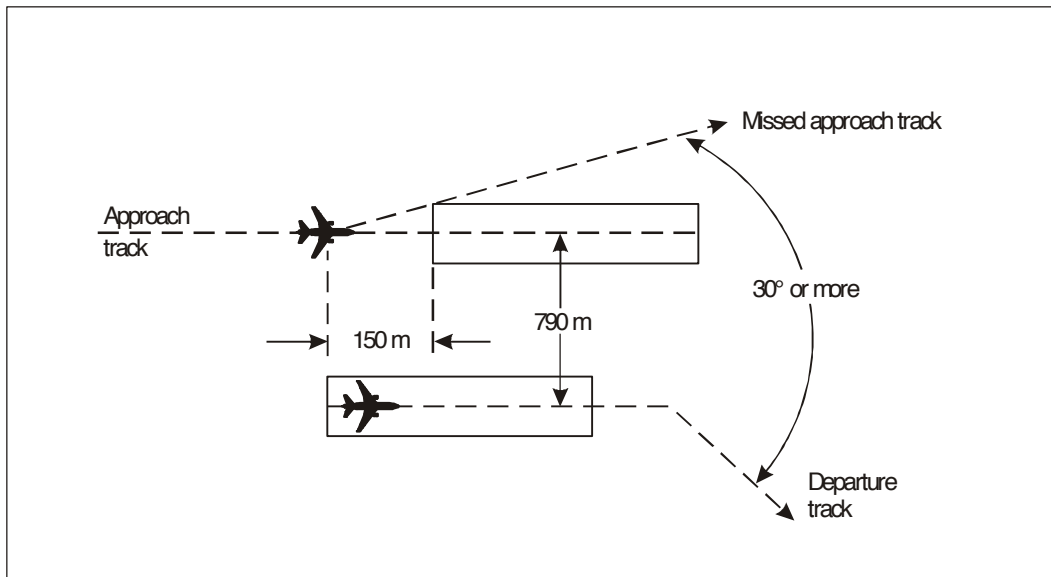


Figure 6-3. Segregated parallel operations where runways are staggered
(see 6.7.3.5.2)

6.7.3.5.3 The following types of approaches may be conducted in segregated parallel operations provided suitable surveillance radar and the appropriate ground facilities conform to the standard necessary for the specific type of approach:

- a) ILS and/or MLS precision approach;
- b) surveillance radar approach (SRA) or precision approach radar (PAR) approach; and
- c) visual approach.

Note.— Guidance material is contained in the Manual on Simultaneous Operations on Parallel or Near-Parallel Instrument Runways (SOIR) (Doc 9643).

Chapter 7

PROCEDURES FOR AERODROME CONTROL SERVICE

Note.— This Chapter also includes procedures for the operation of aeronautical ground lights, see Section 7.15.

7.1 FUNCTIONS OF AERODROME CONTROL TOWERS

7.1.1 General

7.1.1.1 Aerodrome control towers shall issue information and clearances to aircraft under their control to achieve a safe, orderly and expeditious flow of air traffic on and in the vicinity of an aerodrome with the object of preventing collision(s) between:

- a) aircraft flying within the designated area of responsibility of the control tower, including the aerodrome traffic circuits;
- b) aircraft operating on the manoeuvring area;
- c) aircraft landing and taking off;
- d) aircraft and vehicles operating on the manoeuvring area;
- e) aircraft on the manoeuvring area and obstructions on that area.

7.1.1.2 Aerodrome controllers shall maintain a continuous watch on all flight operations on and in the vicinity of an aerodrome as well as vehicles and personnel on the manoeuvring area. Watch shall be maintained by visual observation, augmented in low visibility conditions by an ATS surveillance system when available. Traffic shall be controlled in accordance with the procedures set forth herein and all applicable traffic rules specified by the appropriate ATS authority. If there are other aerodromes within a control zone, traffic at all aerodromes within such a zone shall be coordinated so that traffic circuits do not conflict.

Note.— Provisions for the use of an ATS surveillance system in the aerodrome control service are contained in Chapter 8, Section 8.10.

7.1.1.3 The functions of an aerodrome control tower may be performed by different control or working positions, such as:

- a) aerodrome controller, normally responsible for operations on the runway and aircraft flying within the area of responsibility of the aerodrome control tower;
- b) ground controller, normally responsible for traffic on the manoeuvring area with the exception of runways;
- c) clearance delivery position, normally responsible for delivery of start-up and ATC clearances to departing IFR flights.

7.1.1.4 Where parallel or near-parallel runways are used for simultaneous operations, individual aerodrome controllers should be responsible for operations on each of the runways.

7.1.2 Alerting service provided by aerodrome control towers

7.1.2.1 Aerodrome control towers are responsible for alerting the rescue and fire fighting services whenever:

- a) an aircraft accident has occurred on or in the vicinity of the aerodrome; or
- b) information is received that the safety of an aircraft which is or will come under the jurisdiction of the aerodrome control tower may have or has been impaired; or
- c) requested by the flight crew; or
- d) when otherwise deemed necessary or desirable.

7.1.2.2 Procedures concerning the alerting of the rescue and fire fighting services shall be contained in local instructions. Such instructions shall specify the type of information to be provided to the rescue and fire fighting services, including type of aircraft and type of emergency and, when available, number of persons on board, and any dangerous goods carried on the aircraft.

7.1.2.3 Aircraft which fail to report after having been transferred to an aerodrome control tower, or, having once reported, cease radio contact and in either case fail to land five minutes after the expected landing time, shall be reported to the approach control unit, ACC or flight information centre, or to the rescue coordination centre or rescue sub-centre, in accordance with local instructions.

7.1.3 Failure or irregularity of aids and equipment

Aerodrome control towers shall immediately report in accordance with local instructions any failure or irregularity of operation in any equipment, light or other device established at an aerodrome for the guidance of aerodrome traffic and flight crews or required for the provision of air traffic control service.

7.2 SELECTION OF RUNWAY-IN-USE

7.2.1 The term “runway-in-use” shall be used to indicate the runway or runways that, at a particular time, are considered by the aerodrome control tower to be the most suitable for use by the types of aircraft expected to land or take off at the aerodrome.

Note.— Separate or multiple runways may be designated runway-in-use for arriving aircraft and departing aircraft.

7.2.2 Normally, an aircraft will land and take off into wind unless safety, the runway configuration, meteorological conditions and available instrument approach procedures or air traffic conditions determine that a different direction is preferable. In selecting the runway-in-use, however, the unit providing aerodrome control service shall take into consideration, besides surface wind speed and direction, other relevant factors such as the aerodrome traffic circuits, the length of runways, and the approach and landing aids available.

7.2.3 A runway for take-off or landing, appropriate to the operation, may be nominated for noise abatement purposes, the objective being to utilize whenever possible those runways that permit aeroplanes to avoid noise-sensitive areas during the initial departure and final approach phases of flight.

7.2.4 Runways should not be selected for noise abatement purposes for landing operations unless they are equipped with suitable glide path guidance, e.g. ILS, or a visual approach slope indicator system for operations in visual meteorological conditions.

7.2.5 A pilot-in-command, prompted by safety concerns, can refuse a runway offered for noise-preferential reasons.

7.2.6 Noise abatement shall not be a determining factor in runway nomination under the following circumstances:

- a) if the runway surface conditions are adversely affected (e.g. by snow, slush, ice, water, mud, rubber, oil or other substances);
- b) for landing in conditions:
 - 1) when the ceiling is lower than 150 m (500 ft) above aerodrome elevation, or the visibility is less than 1 900 m; or
 - 2) when the approach requires use to be made of vertical minima greater than 100 m (300 ft) above aerodrome elevation and:
 - i) the ceiling is lower than 240 m (800 ft) above aerodrome elevation; or
 - ii) the visibility is less than 3 000 m;
- c) for take-off when the visibility is less than 1 900 m;
- d) when wind shear has been reported or forecast or when thunderstorms are expected to affect the approach or departure; and
- e) when the crosswind component, including gusts, exceeds 28 km/h (15 kt), or the tailwind component, including gusts, exceeds 9 km/h (5 kt).

7.3 INITIAL CALL TO AERODROME CONTROL TOWER

For aircraft being provided with aerodrome control service, the initial call shall contain:

- a) designation of the station being called;
- b) call sign and, for aircraft in the heavy wake turbulence category, the word “Heavy”;
- c) position; and
- d) additional elements, as required by the appropriate ATS authority.

Note.— See also Chapter 4, 4.11.3.1, for aircraft in the air, making the first call to the aerodrome tower.

7.4 INFORMATION TO AIRCRAFT BY AERODROME CONTROL TOWERS

7.4.1 Information related to the operation of aircraft

Note.— See Chapter 11, 11.4.3, regarding flight information messages.

7.4.1.1 START-UP TIME PROCEDURES

7.4.1.1.1 When so requested by the pilot prior to engine start, an expected take-off time should be given, unless engine start-up time procedures are employed.

7.4.1.1.2 Start-up time procedures should be implemented where necessary to avoid congestion and excessive delays on the manoeuvring area or when warranted by ATFM regulations. Start-up time procedures should be contained in local instructions, and should specify the criteria and conditions for determining when and how start-up times shall be calculated and issued to departing flights.

7.4.1.1.3 When an aircraft is subject to ATFM regulations, it should be advised to start up in accordance with its allocated slot time.

7.4.1.1.4 When the delay for a departing aircraft is anticipated to be less than a time period specified by the appropriate ATS authority, an aircraft should be cleared to start up at its own discretion.

7.4.1.1.5 When the delay for a departing aircraft is anticipated to exceed a time period specified by the appropriate ATS authority, the aerodrome control tower should issue an expected start-up time to an aircraft requesting start-up.

7.4.1.1.6 A start-up clearance shall only be withheld under circumstances or conditions specified by the appropriate ATS authority.

7.4.1.1.7 If a start-up clearance is withheld, the flight crew shall be advised of the reason.

7.4.1.2 AERODROME AND METEOROLOGICAL INFORMATION

7.4.1.2.1 Prior to taxiing for take-off, aircraft shall be advised of the following elements of information, in the order listed, with the exception of such elements which it is known the aircraft has already received:

- a) the runway to be used;
- b) the surface wind direction and speed, including significant variations therefrom;
- c) the QNH altimeter setting and, either on a regular basis in accordance with local arrangements or if so requested by the aircraft, the QFE altimeter setting;
- d) the air temperature for the runway to be used, in the case of turbine-engined aircraft;
- e) the visibility representative of the direction of take-off and initial climb, if less than 10 km, or, when applicable, the RVR value(s) for the runway to be used;
- f) the correct time.

Note.— The meteorological information listed above is to follow the criteria used for meteorological local routine and special reports, in accordance with Chapter 11, 11.4.3.2.2 to 11.4.3.2.3.

7.4.1.2.2 Prior to take-off aircraft shall be advised of:

- a) any significant changes in the surface wind direction and speed, the air temperature, and the visibility or RVR value(s) given in accordance with 7.4.1.2.1;
- b) significant meteorological conditions in the take-off and climb-out area, except when it is known that the information has already been received by the aircraft.

Note.— Significant meteorological conditions in this context include the occurrence or expected occurrence of cumulonimbus or thunderstorm, moderate or severe turbulence, wind shear, hail, moderate or severe icing, severe squall line, freezing precipitation, severe mountain waves, sandstorm, duststorm, blowing snow, tornado or waterspout in the take-off and climb-out area.

7.4.1.2.3 Prior to entering the traffic circuit or commencing its approach to land, an aircraft shall be provided with the following elements of information, in the order listed, with the exception of such elements which it is known the aircraft has already received:

- a) the runway to be used;
- b) the surface wind direction and speed, including significant variations therefrom;
- c) the QNH altimeter setting and, either on a regular basis in accordance with local arrangements or if so requested by the aircraft, the QFE altimeter setting.

Note.— The meteorological information listed above is to follow the criteria used for meteorological local routine and special reports, in accordance with Chapter 11, 11.4.3.2.2 to 11.4.3.2.3.

7.4.1.3 ESSENTIAL LOCAL TRAFFIC INFORMATION

7.4.1.3.1 Information on essential local traffic shall be issued in a timely manner, either directly or through the unit providing approach control service when, in the judgement of the aerodrome controller, such information is necessary in the interests of safety, or when requested by aircraft.

7.4.1.3.2 Essential local traffic shall be considered to consist of any aircraft, vehicle or personnel on or near the manoeuvring area, or traffic operating in the vicinity of the aerodrome, which may constitute a hazard to the aircraft concerned.

7.4.1.3.3 Essential local traffic shall be described so as to be easily identified.

7.4.1.4 RUNWAY INCURSION OR OBSTRUCTED RUNWAY

7.4.1.4.1 In the event the aerodrome controller, after a take-off clearance or a landing clearance has been issued, becomes aware of a runway incursion or the imminent occurrence thereof, or the existence of any obstruction on or in close proximity to the runway likely to impair the safety of an aircraft taking off or landing, appropriate action shall be taken as follows:

- a) cancel the take-off clearance for a departing aircraft;
- b) instruct a landing aircraft to execute a go-around or missed approach;
- c) in all cases inform the aircraft of the runway incursion or obstruction and its location in relation to the runway.

Note.— Animals and flocks of birds may constitute an obstruction with regard to runway operations. In addition, an aborted take-off or a go-around executed after touchdown may expose the aeroplane to the risk of overrunning the runway. Moreover, a low altitude missed approach may expose the aeroplane to the risk of a tail strike. Pilots may, therefore, have to exercise their judgement in accordance with Annex 2, 2.4, concerning the authority of the pilot-in-command of an aircraft.

7.4.1.4.2 Pilots and air traffic controllers shall report any occurrence involving an obstruction on the runway or a runway incursion.

Note 1.— Information regarding runway incursions' reporting forms together with instructions for their completion are contained in the Manual on the Prevention of Runway Incursions (Doc 9870). Attention is drawn to the guidance for analysis, data collection and sharing of data related to runway incursions/incidents (see Chapter 5 of Doc 9870).

Note 2.— The provisions in 7.4.1.4.2 have the objective of supporting the State's safety programme and safety management system (SMS).

7.4.1.5 UNCERTAINTY OF POSITION ON THE MANOEUVRING AREA

7.4.1.5.1 Except as provided for in 7.4.1.5.2, a pilot in doubt as to the position of the aircraft with respect to the manoeuvring area shall immediately:

- a) stop the aircraft; and
- b) simultaneously notify the appropriate ATS unit of the circumstances (including the last known position).

7.4.1.5.2 In those situations where a pilot is in doubt as to the position of the aircraft with respect to the manoeuvring area, but recognizes that the aircraft is on a runway, the pilot shall immediately:

- a) notify the appropriate ATS unit of the circumstances (including the last known position);
- b) if able to locate a nearby suitable taxiway, vacate the runway as expeditiously as possible, unless otherwise instructed by the ATS unit; and then,
- c) stop the aircraft.

7.4.1.5.3 A vehicle driver in doubt as to the position of the vehicle with respect to the manoeuvring area shall immediately:

- a) notify the appropriate ATS unit of the circumstances (including the last known position);
- b) simultaneously, unless otherwise instructed by the ATS unit, vacate the landing area, taxiway, or other part of the manoeuvring area, to a safe distance as expeditiously as possible; and then,
- c) stop the vehicle.

7.4.1.5.4 In the event the aerodrome controller becomes aware of an aircraft or vehicle that is lost or uncertain of its position on the manoeuvring area, appropriate action shall be taken immediately to safeguard operations and assist the aircraft or vehicle concerned to determine its position.

7.4.1.6 WAKE TURBULENCE AND JET BLAST HAZARDS

7.4.1.6.1 Aerodrome controllers shall, when applicable, apply the wake turbulence separation minima specified in Chapter 5, Section 5.8. Whenever the responsibility for wake turbulence avoidance rests with the pilot-in-command, aerodrome controllers shall, to the extent practicable, advise aircraft of the expected occurrence of hazards caused by turbulent wake.

Note.— Occurrence of turbulent wake hazards cannot be accurately predicted and aerodrome controllers cannot assume responsibility for the issuance of advice on such hazards at all times, nor for its accuracy. Information on hazards due to wake vortices is contained in the Air Traffic Services Planning Manual (Doc 9426), Part II, Section 5. Wake turbulence categories of aircraft are specified in Chapter 4, 4.9.1.

7.4.1.6.2 In issuing clearances or instructions, air traffic controllers should take into account the hazards caused by jet blast and propeller slipstream to taxiing aircraft, to aircraft taking off or landing, particularly when intersecting runways are being used, and to vehicles and personnel operating on the aerodrome.

Note.— Jet blast and propeller slipstream can produce localized wind velocities of sufficient strength to cause damage to other aircraft, vehicles and personnel operating within the affected area.

7.4.1.7 ABNORMAL AIRCRAFT CONFIGURATION AND CONDITION

7.4.1.7.1 Whenever an abnormal configuration or condition of an aircraft, including conditions such as landing gear not extended or only partly extended, or unusual smoke emissions from any part of the aircraft, is observed by or reported to the aerodrome controller, the aircraft concerned shall be advised without delay.

7.4.1.7.2 When requested by the flight crew of a departing aircraft suspecting damage to the aircraft, the departure runway used shall be inspected without delay and the flight crew advised in the most expeditious manner as to whether any aircraft debris or bird or animal remains have been found or not.

7.5 ESSENTIAL INFORMATION ON AERODROME CONDITIONS

Note.— See Chapter 11, 11.4.3.4, regarding messages containing information on aerodrome conditions.

7.5.1 Essential information on aerodrome conditions is information necessary to safety in the operation of aircraft, which pertains to the movement area or any facilities usually associated therewith. For example, construction work on a taxi strip not connected to the runway-in-use would not be essential information to any aircraft except one that might be taxied in the vicinity of the construction work. As another example, if all traffic must be confined to runways, that fact should be considered as essential aerodrome information to any aircraft not familiar with the aerodrome.

7.5.2 Essential information on aerodrome conditions shall include information relating to the following:

- a) construction or maintenance work on, or immediately adjacent to the movement area;
- b) rough or broken surfaces on a runway, a taxiway or an apron, whether marked or not;
- c) snow, slush or ice on a runway, a taxiway or an apron;
- d) water on a runway, a taxiway or an apron;
- e) snow banks or drifts adjacent to a runway, a taxiway or an apron;
- f) other temporary hazards, including parked aircraft and birds on the ground or in the air;
- g) failure or irregular operation of part or all of the aerodrome lighting system;
- h) any other pertinent information.

Note.— Up-to-date information on the conditions on aprons may not always be available to the aerodrome control tower. The responsibility of the aerodrome control tower in relation to aprons is, with respect to the provisions of 7.5.1 and 7.5.2, limited to the transmission to aircraft of the information which is provided to it by the authority responsible for the aprons.

7.5.3 Essential information on aerodrome conditions shall be given to every aircraft, except when it is known that the aircraft already has received all or part of the information from other sources. The information shall be given in sufficient time for the aircraft to make proper use of it, and the hazards shall be identified as distinctly as possible.

Note.— “Other sources” include NOTAM, ATIS broadcasts, and the display of suitable signals.

7.5.4 When a not previously notified condition pertaining to the safe use by aircraft of the manoeuvring area is reported to or observed by the controller, the appropriate aerodrome authority shall be informed and operations on that part of the manoeuvring area terminated until otherwise advised by the appropriate aerodrome authority.

7.6 CONTROL OF AERODROME TRAFFIC

7.6.1 General

As the view from the flight deck of an aircraft is normally restricted, the controller shall ensure that instructions and information which require the flight crew to employ visual detection, recognition and observation are phrased in a clear, concise and complete manner.

7.6.2 Designated positions of aircraft in the aerodrome traffic and taxi circuits

The following positions of aircraft in the traffic and taxi circuits are the positions where aircraft normally receive aerodrome control tower clearances. Aircraft should be watched closely as they approach these positions so that proper clearances may be issued without delay. Where practicable, all clearances should be issued without waiting for aircraft to initiate the call.

Position 1. Aircraft initiates call to taxi for departing flight. Runway-in-use information and taxi clearances given.

Position 2. If there is conflicting traffic, the departing aircraft will be held at this position. Engine run-up will, when required, normally be performed here.

Position 3. Take-off clearance is issued here, if not practicable at position 2.

Position 4. Clearance to land is issued here as practicable.

Position 5. Clearance to taxi to apron is issued here.

Position 6. Parking information issued here, if necessary.

Note 1.— Arriving aircraft executing an instrument approach procedure will normally enter the traffic circuit on final except when visual manoeuvring to the landing runway is required.

Note 2.— See Figure 7-1.

7.6.3 Traffic on the manoeuvring area

7.6.3.1 CONTROL OF TAXIING AIRCRAFT

7.6.3.1.1 TAXI CLEARANCE

7.6.3.1.1.1 Prior to issuing a taxi clearance, the controller shall determine where the aircraft concerned is parked. Taxi clearances shall contain concise instructions and adequate information so as to assist the flight crew to follow the correct taxi routes, to avoid collision with other aircraft or objects and to minimize the potential for the aircraft inadvertently entering an active runway.

7.6.3.1.1.2 When a taxi clearance contains a taxi limit beyond a runway, it shall contain an explicit clearance to cross or an instruction to hold short of that runway.

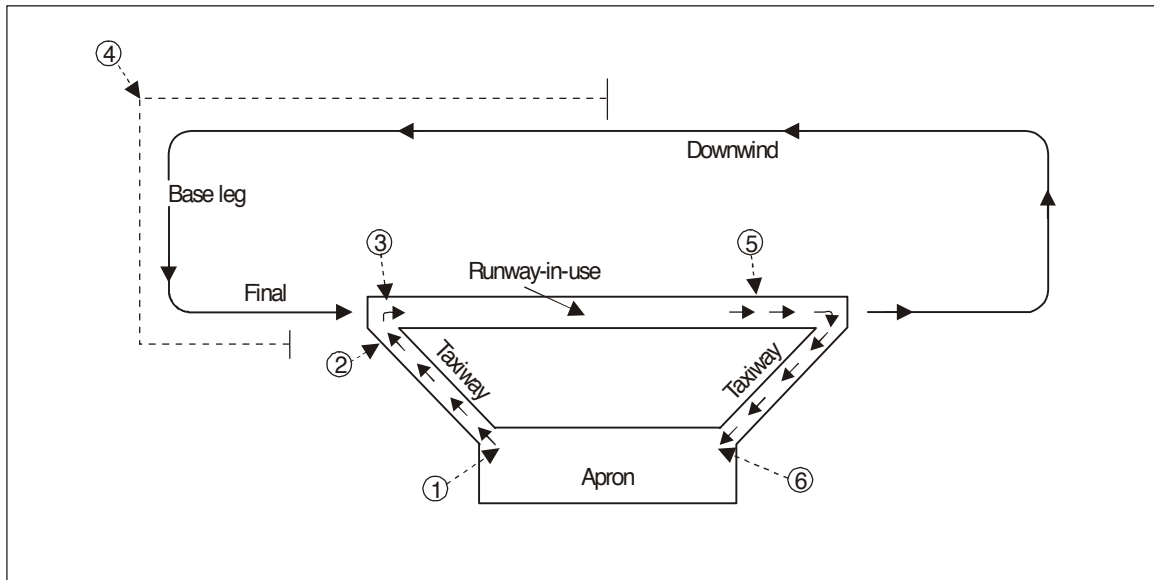


Figure 7-1. Designated positions of aircraft from an aerodrome control tower viewpoint (see 7.6.2)

7.6.3.1.1.3 The appropriate ATS authority should whenever practicable publish in the national AIP standard taxi routes to be used at an aerodrome. Standard taxi routes should be identified by appropriate designators and should be used in taxi clearances.

7.6.3.1.1.4 Where standard taxi routes have not been published, a taxi route should, whenever possible, be described by use of taxiway and runway designators. Other relevant information, such as an aircraft to follow or give way to, shall also be provided to a taxiing aircraft.

7.6.3.1.2 TAXIING ON A RUNWAY-IN-USE

7.6.3.1.2.1 For the purpose of expediting air traffic, aircraft may be permitted to taxi on the runway-in-use, provided no delay or risk to other aircraft will result. Where control of taxiing aircraft is provided by a ground controller and the control of runway operations by an aerodrome controller, the use of a runway by taxiing aircraft shall be coordinated with and approved by the aerodrome controller. Communication with the aircraft concerned should be transferred from the ground controller to the aerodrome controller prior to the aircraft entering the runway.

7.6.3.1.2.2 If the control tower is unable to determine, either visually or via an ATS surveillance system that a vacating or crossing aircraft has cleared the runway, the aircraft shall be requested to report when it has vacated the runway. The report shall be made when the entire aircraft is beyond the relevant runway-holding position.

7.6.3.1.3 USE OF RUNWAY-HOLDING POSITIONS

7.6.3.1.3.1 Except as provided in 7.6.3.1.3.2 or as prescribed by the appropriate ATS authority, aircraft shall not be held closer to a runway-in-use than at a runway-holding position.

Note.— Runway-holding position locations in relation to runways are specified in Annex 14, Volume I, Chapter 5.

7.6.3.1.3.2 Aircraft shall not be permitted to line up and hold on the approach end of a runway-in-use whenever another aircraft is effecting a landing, until the landing aircraft has passed the point of intended holding.

Note.— See Figure 7-2.

7.6.3.1.4 HELICOPTER TAXIING OPERATIONS

7.6.3.1.4.1 When necessary for a wheeled helicopter or vertical take-off and landing (VTOL) aircraft to taxi on the surface, the following provisions are applicable.

Note.— Ground taxiing uses less fuel than air-taxiing and minimizes air turbulence. However, under certain conditions, such as rough, soft or uneven terrain, it may become necessary to air-taxi for safety considerations. Helicopters with articulating rotors (usually designs with three or more main rotor blades) are subject to “ground resonance” and may, on rare occasions, suddenly lift off the ground to avoid severe damage or destruction.

7.6.3.1.4.2 When it is requested or necessary for a helicopter to proceed at a slow speed above the surface, normally below 37 km/h (20 kt) and in ground effect, air-taxiing may be authorized.

Note.— Air-taxiing consumes fuel at a high burn rate, and helicopter downwash turbulence (produced in ground effect) increases significantly with larger and heavier helicopters.

7.6.3.1.4.3 Instructions which require small aircraft or helicopters to taxi in close proximity to taxiing helicopters should be avoided and consideration should be given to the effect of turbulence from taxiing helicopters on arriving and departing light aircraft.

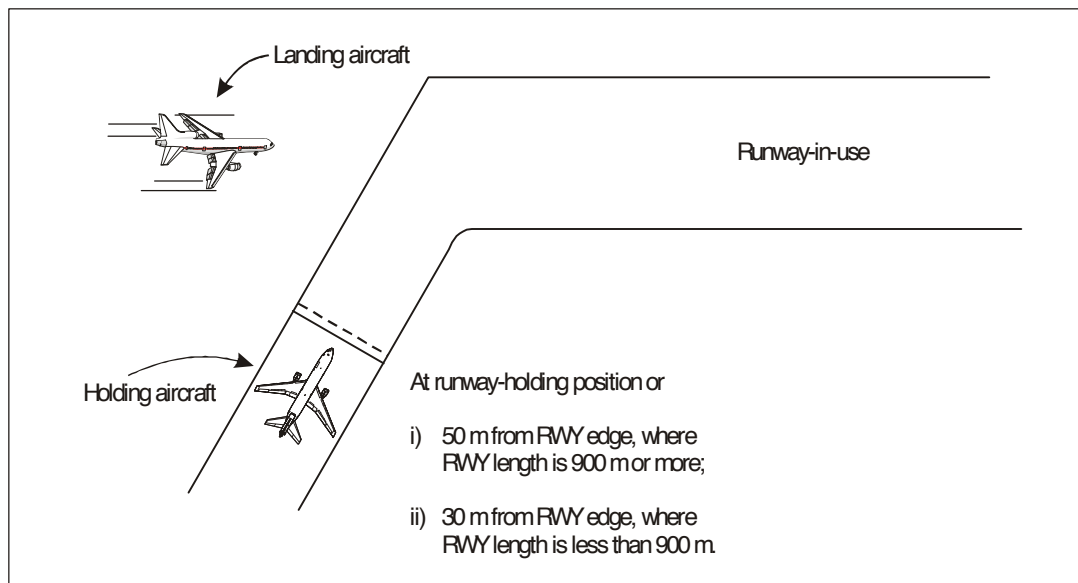


Figure 7-2. Method of holding aircraft (see 7.6.3.1.3.2)

7.6.3.1.4.4 A frequency change should not be issued to single-pilot helicopters hovering or air-taxiing. Whenever possible, control instructions from the next ATS unit should be relayed as necessary until the pilot is able to change frequency.

Note.— Most light helicopters are flown by one pilot and require the constant use of both hands and feet to maintain control during low-altitude/low-level flight. Although flight control friction devices assist the pilot, changing frequency near the ground could result in inadvertent ground contact and consequent loss of control.

7.6.3.2 CONTROL OF OTHER THAN AIRCRAFT TRAFFIC

7.6.3.2.1 ENTRY TO THE MANOEUVRING AREA

The movement of pedestrians or vehicles on the manoeuvring area shall be subject to authorization by the aerodrome control tower. Persons, including drivers of all vehicles, shall be required to obtain authorization from the aerodrome control tower before entry to the manoeuvring area. Notwithstanding such an authorization, entry to a runway or runway strip or change in the operation authorized shall be subject to a further specific authorization by the aerodrome control tower.

7.6.3.2.2 PRIORITY ON THE MANOEUVRING AREA

7.6.3.2.2.1 All vehicles and pedestrians shall give way to aircraft which are landing, taxiing or taking off, except that emergency vehicles proceeding to the assistance of an aircraft in distress shall be afforded priority over all other surface movement traffic. In the latter case, all movement of surface traffic should, to the extent practicable, be halted until it is determined that the progress of the emergency vehicles will not be impeded.

7.6.3.2.2.2 When an aircraft is landing or taking off, vehicles shall not be permitted to hold closer to the runway-in-use than:

- a) at a taxiway/runway intersection — at a runway-holding position; and
- b) at a location other than a taxiway/runway intersection — at a distance equal to the separation distance of the runway-holding position.

7.6.3.2.3 COMMUNICATION REQUIREMENTS AND VISUAL SIGNALS

7.6.3.2.3.1 At controlled aerodromes all vehicles employed on the manoeuvring area shall be capable of maintaining two-way radiocommunication with the aerodrome control tower, except when the vehicle is only occasionally used on the manoeuvring area and is:

- a) accompanied by a vehicle with the required communications capability; or
- b) employed in accordance with a pre-arranged plan established with the aerodrome control tower.

7.6.3.2.3.2 When communications by a system of visual signals is deemed to be adequate, or in the case of radiocommunication failure, the signals given hereunder shall have the meaning indicated therein:

<i>Light signal from aerodrome control</i>	<i>Meaning</i>
Green flashes	Permission to cross landing area or to move onto taxiway
Steady red	Stop
Red flashes	Move off the landing area or taxiway and watch out for aircraft
White flashes	Vacate manoeuvring area in accordance with local instructions

7.6.3.2.3.3 In emergency conditions or if the signals in 7.6.3.2.3.2 are not observed, the signal given hereunder shall be used for runways or taxiways equipped with a lighting system and shall have the meaning indicated therein.

<i>Light signal</i>	<i>Meaning</i>
Flashing runway or taxiway lights	Vacate the runway and observe the tower for light signal

7.6.3.2.3.4 When employed in accordance with a plan prearranged with the aerodrome control tower, constructional and maintenance personnel should not normally be required to be capable of maintaining two-way radiocommunication with the aerodrome control tower.

7.7 CONTROL OF TRAFFIC IN THE TRAFFIC CIRCUIT

7.7.1 General

7.7.1.1 Aircraft in the traffic circuit shall be controlled to provide the separation minima outlined in 7.9.2, 7.10.1 and 7.11 and Chapter 5, Section 5.8, except that:

- a) aircraft in formation are exempted from the separation minima with respect to separation from other aircraft of the same flight;
- b) aircraft operating in different areas or different runways on aerodromes suitable for simultaneous landings or take-offs are exempted from the separation minima;
- c) separation minima shall not apply to aircraft operating under military necessity in accordance with Chapter 16, Section 16.1.

7.7.1.2 Sufficient separation shall be effected between aircraft in flight in the traffic circuit to allow the spacing of arriving and departing aircraft as outlined in 7.9.2, 7.10.1 and 7.11 and Chapter 5, Section 5.8.

7.7.2 Entry of traffic circuit

7.7.2.1 The clearance to enter the traffic circuit should be issued to an aircraft whenever it is desired that the aircraft approach the landing area in accordance with current traffic circuits but traffic conditions do not yet allow a landing clearance to be issued. Depending on the circumstances and traffic conditions, an aircraft may be cleared to join at any position in the traffic circuit.

7.7.2.2 An arriving aircraft executing an instrument approach shall normally be cleared to land straight in unless visual manoeuvring to the landing runway is required.

7.7.3 Priority for landing

7.7.3.1 If an aircraft enters an aerodrome traffic circuit without proper authorization, it shall be permitted to land if its actions indicate that it so desires. If circumstances warrant, aircraft which are in contact with the controller may be instructed by the controller to give way so as to remove as soon as possible the hazard introduced by such unauthorized operation. In no case shall permission to land be withheld indefinitely.

7.7.3.2 In cases of emergency it may be necessary, in the interests of safety, for an aircraft to enter a traffic circuit and effect a landing without proper authorization. Controllers should recognize the possibilities of emergency action and render all assistance possible.

7.7.3.3 Priority shall be given to:

- a) an aircraft which anticipates being compelled to land because of factors affecting the safe operation of the aircraft (engine failure, shortage of fuel, etc.);
- b) hospital aircraft or aircraft carrying any sick or seriously injured persons requiring urgent medical attention;
- c) aircraft engaged in search and rescue operations; and
- d) other aircraft as may be determined by the appropriate authority.

Note.— An aircraft which has encountered an emergency is handled as outlined in Chapter 15, Section 15.1.

7.8 ORDER OF PRIORITY FOR ARRIVING AND DEPARTING AIRCRAFT

An aircraft landing or in the final stages of an approach to land shall normally have priority over an aircraft intending to depart from the same or an intersecting runway.

7.9 CONTROL OF DEPARTING AIRCRAFT

7.9.1 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 which should be considered in relation to the departure sequence include, *inter alia*:

- a) types of aircraft and their relative performance;
- b) routes to be followed after take-off;
- c) any specified minimum departure interval between take-offs;

- d) need to apply wake turbulence separation minima;
- e) aircraft which should be afforded priority; and
- f) aircraft subject to ATFM requirements.

Note 1.— See also Chapter 6, 6.3.3.

Note 2.— For aircraft subject to ATFM requirements, it is the responsibility of the pilot and the operator to ensure that the aircraft is ready to taxi in time to meet any required departure time, bearing in mind that once a departure sequence is established on the taxiway system, it can be difficult, and sometimes impossible, to change the order.

7.9.2 Separation of departing aircraft

Except as provided in 7.11 and Chapter 5, Section 5.8, a 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.

Note 1.— See Figure 7-3.

Note 2.— Wake turbulence categories and time-based wake turbulence longitudinal separation minima are contained in Chapter 4, Section 4.9 and Chapter 5, Section 5.8, respectively. Distance-based wake turbulence separation minima are contained in Chapter 8, Section 8.7.

Note 3.— See 7.6.3.1.2.2.

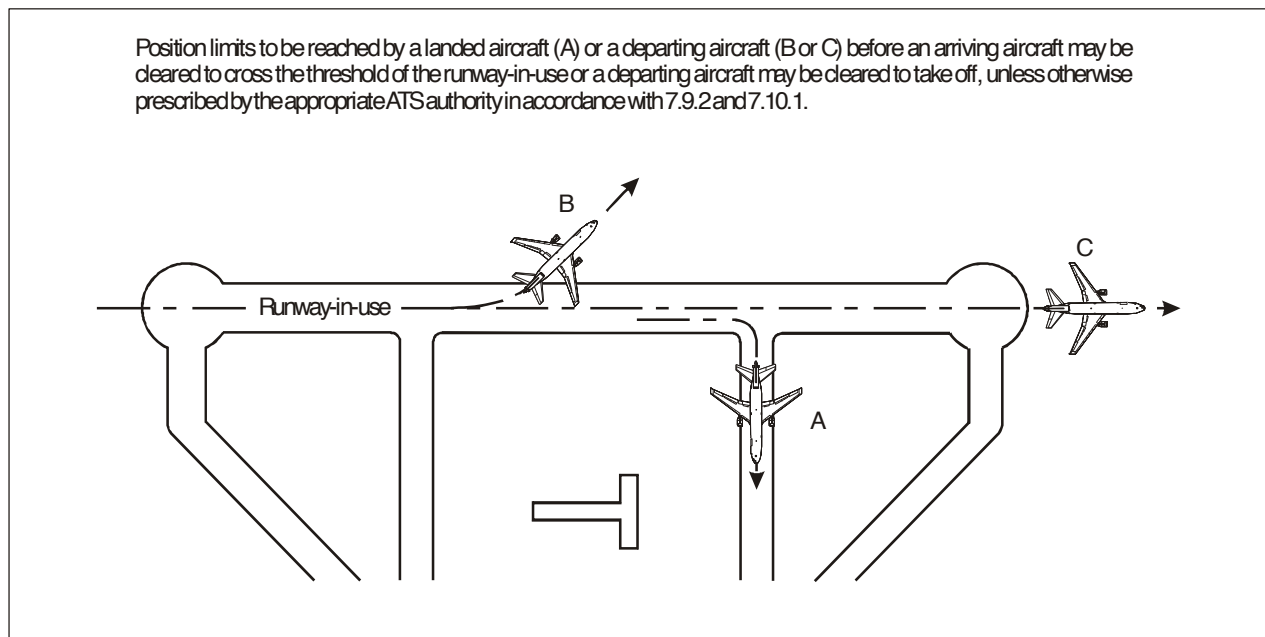


Figure 7-3. Separation between departing and arriving aircraft (see 7.9.2 and 7.10.1)

7.9.3 Take-off clearance

7.9.3.1 Take-off clearance may be issued to an aircraft when there is reasonable assurance that the separation in 7.9.2, or prescribed in accordance with 7.11, will exist when the aircraft commences take-off.

7.9.3.2 When an ATC clearance is required prior to take-off, the take-off clearance shall not be issued until the ATC clearance has been transmitted to and acknowledged by the aircraft concerned. The ATC clearance shall be forwarded to the aerodrome control tower with the least possible delay after receipt of a request made by the tower or prior to such request if practicable.

7.9.3.3 The expression TAKE-OFF shall only be used in radiotelephony when an aircraft is cleared for take-off or when cancelling a take-off clearance.

Note.— The expression TORA, pronounced TOR-AH, may be used to indicate take-off run available.

7.9.3.4 Subject to 7.9.3.2, 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 shall include the designator of the departure runway.

7.9.3.5 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.

7.10 CONTROL OF ARRIVING AIRCRAFT

7.10.1 Separation of landing aircraft and preceding landing and departing aircraft using the same runway

Except as provided in 7.11 and Chapter 5, Section 5.8, a landing aircraft will not normally be permitted to cross the runway threshold on its final approach 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.

Note 1.— See Figure 7-3.

Note 2.— Wake turbulence categories of aircraft and longitudinal separation minima are contained in Chapter 4, Section 4.9 and Chapter 5, Section 5.8, respectively.

Note 3.— See 7.6.3.1.2.2.

7.10.2 Clearance to land

An aircraft may be cleared to land when there is reasonable assurance that the separation in 7.10.1, or prescribed in accordance with 7.11 will exist when the aircraft crosses the runway threshold, provided that a clearance to land shall not be issued until a preceding landing aircraft has crossed the runway threshold. To reduce the potential for misunderstanding, the landing clearance shall include the designator of the landing runway.

7.10.3 Landing and roll-out manoeuvres

7.10.3.1 When necessary or desirable in order to expedite traffic, a landing aircraft may be requested to:

- a) hold short of an intersecting runway after landing;
- b) land beyond the touchdown zone of the runway;
- c) vacate the runway at a specified exit taxiway;
- d) expedite vacating the runway.

7.10.3.2 In requesting a landing aircraft to perform a specific landing and/or roll-out manoeuvre, the type of aircraft, runway length, location of exit taxiways, reported braking action on runway and taxiway, and prevailing meteorological conditions shall be considered. A HEAVY aircraft shall not be requested to land beyond the touchdown zone of a runway.

7.10.3.3 If the pilot-in-command considers that he or she is unable to comply with the requested operation, the controller shall be advised without delay.

7.10.3.4 When necessary or desirable, e.g. due to low visibility conditions, a landing or a taxiing aircraft may be instructed to report when a runway has been vacated. The report shall be made when the entire aircraft is beyond the relevant runway-holding position.

7.11 REDUCED RUNWAY SEPARATION MINIMA BETWEEN AIRCRAFT USING THE SAME RUNWAY

7.11.1 Provided that an appropriate, documented safety assessment has shown that an acceptable level of safety can be met, lower minima than those in 7.9.2 and 7.10.1 may be prescribed by the appropriate ATS authority, after consultation with the operators. The safety assessment shall be carried out for each runway for which the reduced minima are intended, taking into account factors such as:

- a) runway length;
- b) aerodrome layout; and
- c) types/categories of aircraft involved.

7.11.2 All applicable procedures related to the application of reduced runway separation minima shall be published in the Aeronautical Information Publication as well as in local air traffic control instructions. Controllers shall be provided with appropriate and adequate training in the use of the procedures.

7.11.3 Reduced runway separation minima shall only be applied during the hours of daylight from 30 minutes after local sunrise to 30 minutes before local sunset.

7.11.4 For the purpose of reduced runway separation, aircraft shall be classified as follows:

- a) *Category 1 aircraft*: single-engine propeller aircraft with a maximum certificated take-off mass of 2 000 kg or less;

- b) *Category 2 aircraft*: single-engine propeller aircraft with a maximum certificated take-off mass of more than 2 000 kg but less than 7 000 kg; and twin-engine propeller aircraft with a maximum certificated take-off mass of less than 7 000 kg;
- c) *Category 3 aircraft*: all other aircraft.

7.11.5 Reduced runway separation minima shall not apply between a departing aircraft and a preceding landing aircraft.

7.11.6 Reduced runway separation minima shall be subject to the following conditions:

- a) wake turbulence separation minima shall be applied;
- b) visibility shall be at least 5 km and ceiling shall not be lower than 300 m (1 000 ft);
- c) tailwind component shall not exceed 5 kt;
- d) there shall be available means, such as suitable landmarks, to assist the controller in assessing the distances between aircraft. A surface surveillance system that provides the air traffic controller with position information on aircraft may be utilized, provided that approval for operational use of such equipment includes a safety assessment to ensure that all requisite operational and performance requirements are met;
- e) minimum separation continues to exist between two departing aircraft immediately after take-off of the second aircraft;
- f) traffic information shall be provided to the flight crew of the succeeding aircraft concerned; and
- g) the braking action shall not be adversely affected by runway contaminants such as ice, slush, snow and water.

7.11.7 Reduced runway separation minima which may be applied at an aerodrome shall be determined for each separate runway. The separation to be applied shall in no case be less than the following minima:

- a) landing aircraft:
 - 1) a succeeding landing Category 1 aircraft may cross the runway threshold when the preceding aircraft is a Category 1 or 2 aircraft which either:
 - i) has landed and has passed a point at least 600 m from the threshold of the runway, is in motion and will vacate the runway without backtracking; or
 - ii) is airborne and has passed a point at least 600 m from the threshold of the runway;
 - 2) a succeeding landing Category 2 aircraft may cross the runway threshold when the preceding aircraft is a Category 1 or 2 aircraft which either:
 - i) has landed and has passed a point at least 1 500 m from the threshold of the runway, is in motion and will vacate the runway without backtracking; or
 - ii) is airborne and has passed a point at least 1 500 m from the threshold of the runway;
 - 3) a succeeding landing aircraft may cross the runway threshold when a preceding Category 3 aircraft:

- i) has landed and has passed a point at least 2 400 m from the threshold of the runway, is in motion and will vacate the runway without backtracking; or
 - ii) is airborne and has passed a point at least 2 400 m from the threshold of the runway;
- b) departing aircraft:
- 1) a Category 1 aircraft may be cleared for take-off when the preceding departing aircraft is a Category 1 or 2 aircraft which is airborne and has passed a point at least 600 m from the position of the succeeding aircraft;
 - 2) a Category 2 aircraft may be cleared for take-off when the preceding departing aircraft is a Category 1 or 2 aircraft which is airborne and has passed a point at least 1 500 m from the position of the succeeding aircraft; and
 - 3) an aircraft may be cleared for take-off when a preceding departing Category 3 aircraft is airborne and has passed a point at least 2 400 m from the position of the succeeding aircraft.

7.11.7.1 Consideration should be given to increased separation between high performance single-engine aircraft and preceding Category 1 or 2 aircraft.

7.12 PROCEDURES FOR LOW VISIBILITY OPERATIONS

7.12.1 Control of aerodrome surface traffic in conditions of low visibility

Note.— These procedures apply whenever conditions are such that all or part of the manoeuvring area cannot be visually monitored from the control tower. Additional requirements which apply when category II/III approaches are being conducted are specified in Section 7.12.2.

7.12.1.1 When there is a requirement for traffic to operate on the manoeuvring area in conditions of visibility which prevent the aerodrome control tower from applying visual separation between aircraft, and between aircraft and vehicles, the following shall apply:

7.12.1.1.1 At the intersection of taxiways, an aircraft or vehicle on a taxiway shall not be permitted to hold closer to the other taxiway than the holding position limit defined by a clearance bar, stop bar or taxiway intersection marking according to the specifications in Annex 14, Volume I, Chapter 5.

7.12.1.1.2 The longitudinal separation on taxiways shall be as specified for each particular aerodrome by the appropriate ATS authority. This separation shall take into account the characteristics of the aids available for surveillance and control of ground traffic, the complexity of the aerodrome layout and the characteristics of the aircraft using the aerodrome.

Note.— The Manual of Surface Movement Guidance and Control Systems (SMGCS) (Doc 9476) provides guidance on surface movement guidance and control components and procedures for low visibility operations.

7.12.2 Procedures for control of aerodrome traffic when category II/III approaches are in use

7.12.2.1 The appropriate ATS authority shall establish provisions applicable to the start and continuation of precision approach category II/III operations as well as departure operations in RVR conditions less than a value of 550 m.

7.12.3 Low visibility operations shall be initiated by or through the aerodrome control tower.

7.12.4 The aerodrome control tower shall inform the approach control unit concerned when procedures for precision approach category II/III and low visibility operations will be applied and also when such procedures are no longer in force.

7.12.5 Provisions regarding low visibility operations should specify:

- a) the RVR value(s) at which the low visibility operations procedures shall be implemented;
- b) the minimum ILS/MLS equipment requirements for category II/III operations;
- c) other facilities and aids required for category II/III operations, including aeronautical ground lights, which shall be monitored for normal operation;
- d) the criteria for and the circumstances under which downgrading of the ILS/MLS equipment from category II/III operations capability shall be made;
- e) the requirement to report any relevant equipment failure and degradation, without delay, to the flight crews concerned, the approach control unit, and any other appropriate organization;
- f) special procedures for the control of traffic on the manoeuvring area, including:
 - 1) the runway-holding positions to be used;
 - 2) the minimum distance between an arriving and a departing aircraft to ensure protection of the sensitive and critical areas;
 - 3) procedures to verify that aircraft and vehicles have vacated the runway;
 - 4) procedures applicable to the separation of aircraft and vehicles;
- g) applicable spacing between successive approaching aircraft;
- h) action(s) to be taken in the event low visibility operations need to be discontinued, e.g. due to equipment failures; and
- i) any other relevant procedures or requirements.

Note.— Further information regarding the requirements for low visibility operations can be found in the Air Traffic Services Planning Manual (Doc 9426) and the All-Weather Operations Manual (Doc 9365).

7.12.6 The aerodrome control tower shall, prior to a period of application of low visibility procedures, establish a record of vehicles and persons currently on the manoeuvring area and maintain this record during the period of application of these procedures to assist in assuring the safety of operations on that area.

Note.— See also 7.6.3.2.

7.13 SUSPENSION OF VISUAL FLIGHT RULES OPERATIONS

7.13.1 Any or all VFR operations on and in the vicinity of an aerodrome may be suspended by any of the following units, persons or authorities whenever safety requires such action:

- a) the approach control unit or the appropriate ACC;
- b) the aerodrome control tower;
- c) the appropriate ATS authority.

7.13.2 All such suspensions of VFR operations shall be accomplished through or notified to the aerodrome control tower.

7.13.3 The following procedures shall be observed by the aerodrome control tower whenever VFR operations are suspended:

- a) hold all VFR departures;
- b) recall all local flights operating under VFR or obtain approval for special VFR operations;
- c) notify the approach control unit or ACC as appropriate of the action taken;
- d) notify all operators, or their designated representatives, of the reason for taking such action, if necessary or requested.

7.14 AUTHORIZATION OF SPECIAL VFR FLIGHTS

7.14.1 When traffic conditions permit, special VFR flights may be authorized subject to the approval of the unit providing approach control service and the provisions of 7.14.1.3.

7.14.1.1 Requests for such authorization shall be handled individually.

7.14.1.2 Separation shall be effected between all IFR flights and special VFR flights in accordance with separation minima in Chapters 5 and 6 and, when so prescribed by the appropriate ATS authority, between all special VFR flights in accordance with separation minima prescribed by that authority.

7.14.1.3 When the ground visibility is not less than 1 500 m, special VFR flights may be authorized to: enter a control zone for the purpose of landing, take off and depart from a control zone, cross a control zone or operate locally within a control zone.

Note.— Requirements for two-way communications between controlled flights and the appropriate air traffic control unit are contained in Annex 2, 3.6.5.

7.15 AERONAUTICAL GROUND LIGHTS

7.15.1 Operation

Note.— The procedures in this Section apply to all aerodromes, whether or not aerodrome control service is provided. In addition, the procedures in 7.15.2.1 apply to all aeronautical ground lights, whether or not they are on or in the vicinity of an aerodrome.

7.15.2 General

7.15.2.1 All aeronautical ground lights shall be operated, except as provided in 7.15.2.2 and 7.15.3:

- a) continuously during the hours of darkness or during the time the centre of the sun's disc is more than 6 degrees below the horizon, whichever requires the longer period of operation, unless otherwise provided hereafter or otherwise required for the control of air traffic;
- b) at any other time when their use, based on meteorological conditions, is considered desirable for the safety of air traffic.

7.15.2.2 Lights on and in the vicinity of aerodromes that are not intended for en-route navigation purposes may be turned off, subject to further provisions hereafter, if no likelihood of either regular or emergency operation exists, provided that they can be again brought into operation at least one hour before the expected arrival of an aircraft.

7.15.2.3 At aerodromes equipped with lights of variable intensity a table of intensity settings, based on conditions of visibility and ambient light, should be provided for the guidance of air traffic controllers in effecting adjustment of these lights to suit the prevailing conditions. When so requested by an aircraft, further adjustment of the intensity shall be made whenever possible.

7.15.3 Approach lighting

Note.— Approach lighting includes such lights as simple approach lighting systems, precision approach lighting systems, visual approach slope indicator systems, circling guidance lights, approach light beacons and runway alignment indicators.

7.15.3.1 In addition to 7.15.2.1 approach lighting shall also be operated:

- a) by day when requested by an approaching aircraft;
- b) when the associated runway lighting is operated.

7.15.3.2 The lights of a visual approach slope indicator system shall be operated during the hours of daylight as well as of darkness and irrespective of the visibility conditions when the associated runway is being used.

7.15.4 Runway lighting

Note.— Runway lighting includes such lights as edge, threshold, centre line, end, touchdown zone and wing bar lights.

7.15.4.1 Runway lighting shall not be operated if that runway is not in use for landing, take-off or taxiing purposes, unless required for runway inspections or maintenance.

7.15.4.2 If runway lighting is not operated continuously, lighting following a take-off shall be provided as specified below:

- a) at aerodromes where air traffic control service is provided and where lights are centrally controlled, the lights of one runway shall remain lighted after take-off as long as is considered necessary for the return of the aircraft due to an emergency occurring during or immediately after take-off;

- b) at aerodromes without air traffic control service or without centrally controlled lights, the lights of one runway shall remain lighted until such time as would normally be required to reactivate the lights in the likelihood of the departing aircraft returning for an emergency landing, and in any case not less than fifteen minutes after take-off.

Note.— Where obstacle lighting is operated simultaneously with runway lighting as provided in 7.15.8.1, particular care should be taken to ensure that it is not turned off until no longer required by the aircraft.

7.15.5 Stopway lighting

Stopway lights shall be operated whenever the associated runway lights are operated.

7.15.6 Taxiway lighting

Note.— Taxiway lighting includes such lights as edge lights, centre line lights, stop bars and clearance bars.

Where required to provide taxi guidance, taxiway lighting shall be turned on in such order that a continuous indication of the taxi path is presented to taxiing aircraft. Taxiway lighting or any portion thereof may be turned off when no longer needed.

7.15.7 Stop bars

Stop bars shall be switched on to indicate that all traffic shall stop and switched off to indicate that traffic may proceed.

Note.— Stop bars are located across taxiways at the point where it is desired that traffic stop, and consist of lights, showing red, spaced across the taxiway.

7.15.8 Obstacle lighting

Note.— Obstacle lighting includes such lights as obstacle and unserviceability lights and hazard beacons.

7.15.8.1 Obstacle lighting associated with the approach to or departure from a runway or channel, where the obstacle does not project through the inner horizontal surface, as described in Annex 14, Volume I, Chapter 6, may be turned off and on simultaneously with the runway or channel lights.

7.15.8.2 Unserviceability lights may not be turned off as permitted under 7.15.2.2 while the aerodrome is open.

7.15.9 Monitoring of visual aids

7.15.9.1 Aerodrome controllers shall make use of automatic monitoring facilities, when provided, to ascertain whether the lighting is in good order and functioning according to selection.

7.15.9.2 In the absence of an automatic monitoring system or to supplement such a system, the aerodrome controller shall visually observe such lighting as can be seen from the aerodrome control tower and use information from other sources such as visual inspections or reports from aircraft to maintain awareness of the operational status of the visual aids.

7.15.9.3 On receipt of information indicating a lighting fault, the aerodrome controller shall take such action as is warranted to safeguard any affected aircraft or vehicles, and initiate action to have the fault rectified.

7.16 DESIGNATION OF HOT SPOT(S)

The aerodrome operator shall designate, whenever necessary, a location or several locations on the movement area of the aerodrome as hot spot(s). The hot spot(s) shall be charted in accordance with Annex 4, 13.6, 14.6, 15.6 and Appendix 2.

Note.— Guidance material related to hot spots is contained in the Manual on the Prevention of Runway Incursions (Doc 9870).

Chapter 8

ATS SURVEILLANCE SERVICES

Note.— *ADS-contract (ADS-C), at this time used wholly to provide procedural separation, is covered in Chapter 13.*

8.1 ATS SURVEILLANCE SYSTEMS CAPABILITIES

8.1.1 ATS surveillance systems used in the provision of air traffic services shall have a very high level of reliability, availability and integrity. The possibility of system failures or significant system degradations which may cause complete or partial interruptions of service shall be very remote. Backup facilities shall be provided.

Note 1.— *An ATS surveillance system will normally consist of a number of integrated elements, including sensor(s), data transmission links, data-processing systems and situation displays.*

Note 2.— *Guidance material pertaining to use of radar and to system performance is contained in the Manual on Testing of Radio Navigation Aids (Doc 8071), the Manual on the Secondary Surveillance Radar (SSR) Systems (Doc 9684) and the Air Traffic Services Planning Manual (Doc 9426).*

Note 3.— *Guidance material pertaining to use of ADS-B and MLAT systems and their system performance is contained in Cir 326.*

Note 4.— *Functional and performance requirements pertaining to ATS surveillance systems are contained in Annex 10 — Aeronautical Telecommunications, Volume IV — Surveillance and Collision Avoidance Systems.*

8.1.2 ATS surveillance systems should have the capability to receive, process and display, in an integrated manner, data from all the connected sources.

8.1.3 ATS surveillance systems should be capable of integration with other automated systems used in the provision of ATS, and should provide for an appropriate level of automation with the objectives of improving the accuracy and timeliness of data displayed to the controller and reducing controller workload and the need for verbal coordination between adjacent control positions and ATC units.

8.1.4 ATS surveillance systems should provide for the display of safety-related alerts and warnings, including conflict alert, minimum safe altitude warning, conflict prediction and unintentionally duplicated SSR codes and aircraft identification.

8.1.5 States should, to the extent possible, facilitate the sharing of information derived from ATS surveillance systems in order to extend and improve surveillance coverage in adjacent control areas.

8.1.6 States should, on the basis of regional air navigation agreements, provide for the automated exchange of coordination data relevant to aircraft being provided with ATS surveillance services, and establish automated coordination procedures.

8.1.7 ATS surveillance systems, such as primary surveillance radar (PSR), secondary surveillance radar (SSR), ADS-B and MLAT systems may be used either alone or in combination in the provision of air traffic services, including in the provision of separation between aircraft, provided:

- a) reliable coverage exists in the area;
- b) the probability of detection, the accuracy and the integrity of the ATS surveillance system(s) are satisfactory; and
- c) in the case of ADS-B, the availability of data from participating aircraft is adequate.

8.1.8 PSR systems should be used in circumstances where other ATS surveillance systems alone would not meet the air traffic services requirements.

8.1.9 SSR systems, especially those utilizing monopulse techniques or having Mode S capability or MLAT, may be used alone, including in the provision of separation between aircraft, provided:

- a) the carriage of SSR transponders is mandatory within the area; and
- b) identification is established and maintained.

8.1.10 ADS-B shall only be used for the provision of air traffic control service provided the quality of the information contained in the ADS-B message exceeds the values specified by the appropriate ATS authority.

8.1.11 ADS-B may be used alone, including in the provision of separation between aircraft, provided:

- a) identification of ADS-B-equipped aircraft is established and maintained;
- b) the data integrity measure in the ADS-B message is adequate to support the separation minimum;
- c) there is no requirement for detection of aircraft not transmitting ADS-B; and
- d) there is no requirement for determination of aircraft position independent of the position-determining elements of the aircraft navigation system.

8.1.12 The provision of ATS surveillance services shall be limited to specified areas of coverage and shall be subject to such other limitations as have been specified by the appropriate ATS authority. Adequate information on the operating methods used shall be published in aeronautical information publications, as well as operating practices and/or equipment limitations having direct effects on the operation of the air traffic services.

Note.— States will provide information on the area or areas where PSR, SSR, ADS-B and MLAT systems are in use as well as ATS surveillance services and procedures in accordance with Annex 15, 4.1.1 and Appendix 1.

8.1.12.1 The provision of ATS surveillance services shall be limited when position data quality degrades below a level specified by the appropriate ATS authority.

8.1.13 Where PSR and SSR are required to be used in combination, SSR alone may be used in the event of PSR failure to provide separation between identified transponder-equipped aircraft, provided the accuracy of the SSR position indications has been verified by monitor equipment or other means.

8.2 SITUATION DISPLAY

8.2.1 A situation display providing surveillance information to the controller shall, as a minimum, include position indications, map information required to provide ATS surveillance services and, where available, information concerning the identity of the aircraft and the aircraft level.

8.2.2 The ATS surveillance system shall provide for a continuously updated presentation of surveillance information, including position indications.

8.2.3 Position indications may be displayed as:

- a) individual position symbols, e.g. PSR, SSR, ADS-B or MLAT symbols, or combined symbols;
- b) PSR blips; and
- c) SSR responses.

8.2.4 When applicable, distinct symbols should be used for presentation of:

- a) unintentionally duplicated SSR codes and/or aircraft identification that are unintentionally duplicated;
- b) predicted positions for a non-updated track; and
- c) plot and track data.

8.2.5 Where surveillance data quality degrades such that services need to be limited, symbology or other means shall be used to provide the controller with an indication of the condition.

8.2.6 Reserved SSR codes, including 7500, 7600 and 7700, operation of IDENT, ADS-B emergency and/or urgency modes, safety-related alerts and warnings as well as information related to automated coordination shall be presented in a clear and distinct manner, providing for ease of recognition.

8.2.7 Labels associated with displayed targets should be used to provide, in alphanumeric form, relevant information derived from the means of surveillance and, where necessary, the flight data processing system.

8.2.8 Labels shall, as a minimum, include information relating to the identity of the aircraft, e.g. SSR code or aircraft identification and, if available, pressure-altitude-derived level information. This information may be obtained from SSR Mode A, SSR Mode C, SSR Mode S and/or ADS-B.

8.2.9 Labels shall be associated with their position indications in a manner precluding erroneous identification by or confusion on the part of the controller. All label information shall be presented in a clear and concise manner.

8.3 COMMUNICATIONS

8.3.1 The level of reliability and availability of communications systems shall be such that the possibility of system failures or significant degradations is very remote. Adequate backup facilities shall be provided.

Note.— Guidance material and information pertaining to system reliability and availability are contained in Annex 10, Volume I, and the Air Traffic Services Planning Manual (Doc 9426).

8.3.2 Direct pilot-controller communications shall be established prior to the provision of ATS surveillance services, unless special circumstances, such as emergencies, dictate otherwise.

8.4 PROVISION OF ATS SURVEILLANCE SERVICES

8.4.1 Information derived from ATS surveillance systems, including safety-related alerts and warnings such as conflict alert and minimum safe altitude warning, should be used to the extent possible in the provision of air traffic control service in order to improve capacity and efficiency as well as to enhance safety.

8.4.2 The number of aircraft simultaneously provided with ATS surveillance services shall not exceed that which can safely be handled under the prevailing circumstances, taking into account:

- a) the structural complexity of the control area or sector concerned;
- b) the functions to be performed within the control area or sector concerned;
- c) assessments of controller workloads, taking into account different aircraft capabilities, and sector capacity; and
- d) the degree of technical reliability and availability of the primary and backup communications, navigation and surveillance systems, both in the aircraft and on the ground.

8.5 USE OF SSR TRANSPONDERS AND ADS-B TRANSMITTERS

8.5.1 General

To ensure the safe and efficient use of ATS surveillance services, pilots and controllers shall strictly adhere to published operating procedures and standard radiotelephony phraseology shall be used. The correct setting of transponder codes and/or aircraft identification shall be ensured at all times.

8.5.2 SSR code management

8.5.2.1 Codes 7700, 7600 and 7500 shall be reserved internationally for use by pilots encountering a state of emergency, radiocommunication failure or unlawful interference, respectively.

8.5.2.2 SSR codes are to be allocated and assigned in accordance with the following principles.

8.5.2.2.1 Codes should be allocated to States or areas in accordance with regional air navigation agreements, taking into account overlapping radar coverage over adjacent airspaces.

8.5.2.2.2 The appropriate ATS authority shall establish a plan and procedures for the allocation of codes to ATS units.

8.5.2.2.3 The plan and procedures should be compatible with those practised in adjacent States.

8.5.2.2.4 The allocation of a code should preclude the use of this code for any other function within the area of coverage of the same SSR for a prescribed time period.

8.5.2.2.5 To reduce pilot and controller workload and the need for controller/pilot communications, the number of code changes required of the pilot should be kept to the minimum.

8.5.2.2.6 Codes shall be assigned to aircraft in accordance with the plan and procedures laid down by the appropriate ATS authority.

8.5.2.2.7 Where there is a need for individual aircraft identification, each aircraft shall be assigned a discrete code which should, whenever possible, be retained throughout the flight.

8.5.2.2.8 Except for aircraft in a state of emergency, or during communication failure or unlawful interference situations, and unless otherwise agreed by regional air navigation agreement or between a transferring and an accepting ATC unit, the transferring unit shall assign Code A2000 to a controlled flight prior to transfer of communications.

8.5.2.3 SSR codes shall be reserved, as necessary, for exclusive use by medical aircraft operating in areas of international armed conflict. SSR codes shall be allocated by ICAO through its Regional Offices in coordination with States concerned and should be assigned to aircraft for use within the area of conflict.

Note.— The term “medical aircraft” refers to aircraft protected under the Geneva Conventions of 1949 and under the Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the protection of victims of international armed conflicts (Protocol I).

8.5.3 Operation of SSR transponders

Note.— SSR transponder operating procedures are contained in Procedures for Air Navigation Services — Aircraft Operations (PANS-OPS, Doc 8168), Volume I, Part III, Section 3.

8.5.3.1 When it is observed that the Mode A code shown on the situation display is different to what has been assigned to the aircraft, the pilot shall be requested to confirm the code selected and, if the situation warrants (e.g. not being a case of unlawful interference), to reselect the correct code.

8.5.3.2 If the discrepancy between assigned and displayed Mode A codes still persists, the pilot may be requested to stop the operation of the aircraft’s transponder. The next control position and any other affected unit using SSR and/or MLAT in the provision of ATS shall be informed accordingly.

8.5.3.3 Aircraft equipped with Mode S having an aircraft identification feature shall transmit the aircraft identification as specified in Item 7 of the ICAO flight plan or, when no flight plan has been filed, the aircraft registration.

Note.— All Mode S-equipped aircraft engaged in international civil aviation are required to have an aircraft identification feature (Annex 10, Volume IV, Chapter 2, 2.1.5.2, refers).

8.5.3.4 Whenever it is observed on the situation display that the aircraft identification transmitted by a Mode S-equipped aircraft is different from that expected from the aircraft, the pilot shall be requested to confirm and, if necessary, re-enter the correct aircraft identification.

8.5.3.5 If, following confirmation by the pilot that the correct aircraft identification has been set on the Mode S identification feature, the discrepancy continues to exist, the following actions shall be taken by the controller:

- a) inform the pilot of the persistent discrepancy;
- b) where possible, correct the label showing the aircraft identification on the situation display; and

- c) notify the erroneous aircraft identification transmitted by the aircraft to the next control position and any other interested unit using Mode S for identification purposes.

8.5.4 Operation of ADS-B transmitters

Note 1.— To indicate that it is in a state of emergency or to transmit other urgent information, an aircraft equipped with ADS-B might operate the emergency and/or urgency mode as follows:

- a) *emergency;*
- b) *communication failure;*
- c) *unlawful interference;*
- d) *minimum fuel; and/or*
- e) *medical.*

Note 2.— Some aircraft equipped with first generation ADS-B avionics do not have the capability described in Note 1 above and only have the capability to transmit a general emergency alert regardless of the code selected by the pilot.

8.5.4.1 Aircraft equipped with ADS-B having an aircraft identification feature shall transmit the aircraft identification as specified in Item 7 of the ICAO flight plan or, when no flight plan has been filed, the aircraft registration.

8.5.4.2 Whenever it is observed on the situation display that the aircraft identification transmitted by an ADS-B-equipped aircraft is different from that expected from the aircraft, the pilot shall be requested to confirm and, if necessary, re-enter the correct aircraft identification.

8.5.4.3 If, following confirmation by the pilot that the correct aircraft identification has been set on the ADS-B identification feature, the discrepancy continues to exist, the following actions shall be taken by the controller:

- a) inform the pilot of the persistent discrepancy;
- b) where possible, correct the label showing the aircraft identification on the situation display; and
- c) notify the next control position and any other unit concerned of the erroneous aircraft identification transmitted by the aircraft.

8.5.5 Level information based on the use of pressure-altitude information

8.5.5.1 VERIFICATION OF LEVEL INFORMATION

8.5.5.1.1 The tolerance value used to determine that pressure-altitude-derived level information displayed to the controller is accurate shall be ± 60 m (± 200 ft) in RVSM airspace. In other airspace, it shall be ± 90 m (± 300 ft), except that the appropriate ATS authority may specify a smaller criterion, but not less than ± 60 m (± 200 ft), if this is found to be more practical. Geometric height information shall not be used for separation.

8.5.5.1.2 Verification of pressure-altitude-derived level information displayed to the controller shall be effected at least once by each suitably equipped ATC unit on initial contact with the aircraft concerned or, if this is not feasible, as soon as possible thereafter. The verification shall be effected by simultaneous comparison with altimeter-derived level information received from the same aircraft by radiotelephony. The pilot of the aircraft whose pressure-altitude-derived level information is within the approved tolerance value need not be advised of such verification. Geometric height information shall not be used to determine if altitude differences exist.

8.5.5.1.3 If the displayed level information is not within the approved tolerance value or when a discrepancy in excess of the approved tolerance value is detected subsequent to verification, the pilot shall be advised accordingly and requested to check the pressure setting and confirm the aircraft's level.

8.5.5.1.4 If, following confirmation of the correct pressure setting the discrepancy continues to exist, the following action should be taken according to circumstances:

- a) request the pilot to stop Mode C or ADS-B altitude data transmission, provided this does not cause the loss of position and identity information, and notify the next control positions or ATC unit concerned with the aircraft of the action taken; or
- b) inform the pilot of the discrepancy and request that the relevant operation continue in order to prevent loss of position and identity information of the aircraft and, when authorized by the appropriate ATS authority, override the label-displayed level information with the reported level. Notify the next control position or ATC unit concerned with the aircraft of the action taken.

8.5.5.2 DETERMINATION OF LEVEL OCCUPANCY

8.5.5.2.1 The criterion which shall be used to determine that a specific level is occupied by an aircraft shall be ± 60 m (± 200 ft) in RVSM airspace. In other airspace, it shall be ± 90 m (± 300 ft), except that the appropriate ATS authority may specify a smaller criterion, but not less than ± 60 m (± 200 ft), if this is found to be more practical.

Note.— For a brief explanation of the considerations underlying this value, see the Air Traffic Services Planning Manual (Doc 9426).

8.5.5.2.2 *Aircraft maintaining a level.* An aircraft is considered to be maintaining its assigned level as long as the pressure-altitude-derived level information indicates that it is within the appropriate tolerances of the assigned level, as specified in 8.5.5.2.1.

8.5.5.2.3 *Aircraft vacating a level.* An aircraft cleared to leave a level is considered to have commenced its manoeuvre and vacated the previously occupied level when the pressure-altitude-derived level information indicates a change of more than 90 m (300 ft) in the anticipated direction from its previously assigned level.

8.5.5.2.4 *Aircraft passing a level in climb or descent.* An aircraft in climb or descent is considered to have crossed a level when the pressure-altitude-derived level information indicates that it has passed this level in the required direction by more than 90 m (300 ft).

8.5.5.2.5 *Aircraft reaching a level.* An aircraft is considered to have reached the level to which it has been cleared when the elapsed time of three display updates, three sensor updates or 15 seconds, whichever is the greater, has passed since the pressure-altitude-derived level information has indicated that it is within the appropriate tolerances of the assigned level, as specified in 8.5.5.2.1.

8.5.5.2.6 Intervention by a controller shall only be required if differences in level information between that displayed to the controller and that used for control purposes are in excess of the values stated above.

8.6 GENERAL PROCEDURES

8.6.1 Performance checks

8.6.1.1 The controller shall adjust the situation display(s) and carry out adequate checks on the accuracy thereof, in accordance with the technical instructions prescribed by the appropriate authority for the equipment concerned.

8.6.1.2 The controller shall be satisfied that the available functional capabilities of the ATS surveillance system as well as the information presented on the situation display(s) is adequate for the functions to be performed.

8.6.1.3 The controller shall report, in accordance with local procedures, any fault in the equipment, or any incident requiring investigation, or any circumstances which make it difficult or impractical to provide ATS surveillance services.

8.6.2 Identification of aircraft

8.6.2.1 ESTABLISHMENT OF IDENTIFICATION

8.6.2.1.1 Before providing an ATS surveillance service to an aircraft, identification shall be established and the pilot informed. Thereafter, identification shall be maintained until termination of the ATS surveillance service.

8.6.2.1.2 If identification is subsequently lost, the pilot shall be informed accordingly and, when applicable, appropriate instructions issued.

8.6.2.1.3 Identification shall be established by at least one of the methods specified in 8.6.2.2, 8.6.2.3, 8.6.2.4 and 8.6.2.5.

8.6.2.2 ADS-B IDENTIFICATION PROCEDURES

Where ADS-B is used for identification, aircraft may be identified by one or more of the following procedures:

- a) direct recognition of the aircraft identification in an ADS-B label;
- b) transfer of ADS-B identification (see 8.6.3); and
- c) observation of compliance with an instruction to TRANSMIT ADS-B IDENT.

Note 1.— Some aircraft equipped with first generation ADS-B avionics do not have the capability of squawking IDENT while the emergency and/or urgency mode is selected.

Note 2.— In automated systems, the “IDENT” feature may be presented in different ways, e.g. as a flashing of all or part of the position indication and associated label.

8.6.2.3 SSR and/or MLAT IDENTIFICATION PROCEDURES

8.6.2.3.1 Where SSR and/or MLAT is used for identification, aircraft may be identified by one or more of the following procedures:

- a) recognition of the aircraft identification in an SSR and/or MLAT label;

Note.— The use of this procedure requires that the code/call sign correlation is achieved successfully, taking into account the Note following b) below.

- b) recognition of an assigned discrete code, the setting of which has been verified, in an SSR and/or MLAT label; and

Note.— The use of this procedure requires a system of code assignment which ensures that each aircraft in a given portion of airspace is assigned a discrete code (see 8.5.2.2.7).

- c) direct recognition of the aircraft identification of a Mode S-equipped aircraft in an SSR and/or MLAT label;

Note.— The aircraft identification feature available in Mode S transponders provides the means to identify directly individual aircraft on situation displays and thus offers the potential to eliminate ultimately the recourse to Mode A discrete codes for individual identification. This elimination will only be achieved in a progressive manner depending on the state of deployment of suitable ground and airborne installations.

- d) by transfer of identification (see 8.6.3);
- e) observation of compliance with an instruction to set a specific code;
- f) observation of compliance with an instruction to squawk IDENT.

Note 1.— In automated radar systems, the “IDENT” feature may be presented in different ways, e.g. as a flashing of all or part of the position indication and associated label.

Note 2.— Garbling of transponder replies may produce “IDENT”-type of indications. Nearly simultaneous “IDENT” transmissions within the same area may give rise to errors in identification.

8.6.2.3.2 When a discrete code has been assigned to an aircraft, a check shall be made at the earliest opportunity to ensure that the code set by the pilot is identical to that assigned for the flight. Only after this check has been made shall the discrete code be used as a basis for identification.

8.6.2.4 PSR IDENTIFICATION PROCEDURES

8.6.2.4.1 Where PSR is used for identification, aircraft may be identified by one or more of the following procedures:

- a) by correlating a particular radar position indication with an aircraft reporting its position over, or as bearing and distance from, a point shown on the situation display, and by ascertaining that the track of the particular radar position is consistent with the aircraft path or reported heading;

Note 1.— Caution must be exercised when employing this method since a position reported in relation to a point may not coincide precisely with the radar position indication of the aircraft on the situation display. The appropriate ATS authority may, therefore, prescribe additional conditions for the application of this method, e.g.:

- i) a level or levels above which this method may not be applied in respect of specified navigation aids; or
- ii) a distance from the radar site beyond which this method may not be applied.

Note 2.— The term “a point” refers to a geographical point suitable for the purposes of identification. It is normally a reporting point defined by reference to a radio navigation aid or aids.

- b) by correlating an observed radar position indication with an aircraft which is known to have just departed, provided that the identification is established within 2 km (1 NM) from the end of the runway used. Particular care should be taken to avoid confusion with aircraft holding over or overflying the aerodrome, or with aircraft departing from or making a missed approach over adjacent runways;
- c) by transfer of identification (see 8.6.3);
- d) by ascertaining the aircraft heading, if circumstances require, and following a period of track observation:
 - instructing the pilot to execute one or more changes of heading of 30 degrees or more and correlating the movements of one particular radar position indication with the aircraft's acknowledged execution of the instructions given; or
 - correlating the movements of a particular radar position indication with manoeuvres currently executed by an aircraft having so reported.

When using these methods, the controller shall:

- i) verify that the movements of not more than one radar position indication correspond with those of the aircraft; and
- ii) ensure that the manoeuvre(s) will not carry the aircraft outside the coverage of the radar or the situation display.

Note 1.— Caution must be exercised when employing these methods in areas where route changes normally take place.

Note 2.— With reference to ii) above, see also 8.6.5.1 regarding vectoring of controlled aircraft.

8.6.2.4.2 Use may be made of direction-finding bearings to assist in identification of an aircraft. This method, however, shall not be used as the sole means of establishing identification, unless so prescribed by the appropriate ATS authority for particular cases under specified conditions.

8.6.2.5 ADDITIONAL IDENTIFICATION METHOD

When two or more position indications are observed in close proximity, or are observed to be making similar movements at the same time, or when doubt exists as to the identity of a position indication for any other reason, changes of heading should be prescribed or repeated as many times as necessary, or additional methods of identification should be employed, until all risk of error in identification is eliminated.

8.6.3 Transfer of identification

8.6.3.1 Transfer of identification from one controller to another should only be attempted when it is considered that the aircraft is within the accepting controller's surveillance coverage.

8.6.3.2 Transfer of identification shall be effected by one of the following methods:

- a) designation of the position indication by automated means, provided that only one position indication is thereby indicated and there is no possible doubt of correct identification;
- b) notification of the aircraft's discrete SSR code or aircraft address;

Note 1.— The use of a discrete SSR code requires a system of code assignment which ensures that each aircraft in a given portion of airspace is assigned a discrete code (see 8.5.2.2.7).

Note 2.— Aircraft address would be expressed in the form of the alphanumeric code of six hexadecimal characters.

- c) notification that the aircraft is SSR Mode S-equipped with an aircraft identification feature when SSR Mode S coverage is available;
- d) notification that the aircraft is ADS-B-equipped with an aircraft identification feature when compatible ADS-B coverage is available;
- e) direct designation (pointing with the finger) of the position indication, if the two situation displays are adjacent, or if a common “conference” type of situation display is used;

Note.— Attention must be given to any errors which might occur due to parallax effects.

- f) designation of the position indication by reference to, or in terms of bearing and distance from, a geographical position or navigational facility accurately indicated on both situation displays, together with the track of the observed position indication if the route of the aircraft is not known to both controllers;

Note.— Caution must be exercised before transferring identification using this method, particularly if other position indications are observed on similar headings and in close proximity to the aircraft under control. Inherent radar deficiencies, such as inaccuracies in bearing and distance of the radar position indications displayed on individual situation displays and parallax errors, may cause the indicated position of an aircraft in relation to the known point to differ between the two situation displays. The appropriate ATS authority may, therefore, prescribe additional conditions for the application of this method, e.g.:

- i) a maximum distance from the common reference point used by the two controllers; and
 - ii) a maximum distance between the position indication as observed by the accepting controller and the one stated by the transferring controller.
- g) where applicable, issuance of an instruction to the aircraft by the transferring controller to change SSR code and the observation of the change by the accepting controller; or
 - h) issuance of an instruction to the aircraft by the transferring controller to squawk/transmit IDENT and observation of this response by the accepting controller.

Note.— Use of procedures g) and h) requires prior coordination between the controllers, since the indications to be observed by the accepting controller are of short duration.

8.6.4 Position information

8.6.4.1 An aircraft provided with ATS surveillance service should be informed of its position in the following circumstances:

- a) upon identification, except when the identification is established:
 - i) based on the pilot’s report of the aircraft position or within one nautical mile of the runway upon departure and the observed position on the situation display is consistent with the aircraft’s time of departure; or

- ii) by use of ADS-B aircraft identification, Mode S aircraft identification or assigned discrete SSR codes and the location of the observed position indication is consistent with the current flight plan of the aircraft; or
- iii) by transfer of identification;
- b) when the pilot requests this information;
- c) when a pilot's estimate differs significantly from the controller's estimate based on the observed position;
- d) when the pilot is instructed to resume own navigation after vectoring if the current instructions had diverted the aircraft from a previously assigned route (see 8.6.5.5);
- e) immediately before termination of ATS surveillance service, if the aircraft is observed to deviate from its intended route.

8.6.4.2 Position information shall be passed to aircraft in one of the following forms:

- a) as a well-known geographical position;
- b) magnetic track and distance to a significant point, an en-route navigation aid, or an approach aid;
- c) direction (using points of the compass) and distance from a known position;
- d) distance to touchdown, if the aircraft is on final approach; or
- e) distance and direction from the centre line of an ATS route.

8.6.4.3 Whenever practicable, position information shall relate to positions or routes pertinent to the navigation of the aircraft concerned and shown on the situation display map.

8.6.4.4 When so informed, the pilot may omit position reports at compulsory reporting points or report only over those reporting points specified by the air traffic services unit concerned. Unless automated position reporting is in effect (e.g. ADS-C), pilots shall resume voice or CPDLC position reporting:

- a) when so instructed;
- b) when advised that the ATS surveillance service has been terminated; or
- c) when advised that identification is lost.

8.6.5 Vectoring

8.6.5.1 Vectoring shall be achieved by issuing to the pilot specific headings which will enable the aircraft to maintain the desired track. When vectoring an aircraft, a controller shall comply with the following:

- a) whenever practicable, the aircraft shall be vectored along tracks on which the pilot can monitor the aircraft position with reference to pilot-interpreted navigation aids (this will minimize the amount of navigational assistance required and alleviate the consequences resulting from an ATS surveillance system failure);
- b) when an aircraft is given its initial vector diverting it from a previously assigned route, the pilot shall be informed what the vector is to accomplish, and the limit of the vector shall be specified (e.g. to ... position, for ... approach);

- c) except when transfer of control is to be effected, aircraft shall not be vectored closer than 4.6 km (2.5 NM) or, where the minimum permissible separation is greater than 9.3 km (5 NM), a distance equivalent to one-half of the prescribed separation minimum, from the limit of the airspace for which the controller is responsible, unless local arrangements have been made to ensure that separation will exist with aircraft operating in adjoining areas;
- d) controlled flights shall not be vectored into uncontrolled airspace except in the case of emergency or in order to circumnavigate adverse meteorological conditions (in which case the pilot should be so informed), or at the specific request of the pilot; and
- e) when an aircraft has reported unreliable directional instruments, the pilot shall be requested, prior to the issuance of manoeuvring instructions, to make all turns at an agreed rate and to carry out the instructions immediately upon receipt.

8.6.5.2 When vectoring an IFR flight and when giving an IFR flight a direct routing which takes the aircraft off an ATS route, the controller shall issue clearances such that the prescribed obstacle clearance will exist at all times until the aircraft reaches the point where the pilot will resume own navigation. When necessary, the relevant minimum vectoring altitude shall include a correction for low temperature effect.

Note 1.— When an IFR flight is being vectored, the pilot may be unable to determine the aircraft's exact position in respect to obstacles in this area and consequently the altitude which provides the required obstacle clearance. Detailed obstacle clearance criteria are contained in PANS-OPS (Doc 8168), Volumes I and II. See also 8.6.8.2.

Note 2.— It is the responsibility of the ATS authority to provide the controller with minimum altitudes corrected for temperature effect.

8.6.5.3 Whenever possible, minimum vectoring altitudes should be sufficiently high to minimize activation of aircraft ground proximity warning systems.

Note.— Activation of such systems will induce aircraft to pull up immediately and climb steeply to avoid hazardous terrain, possibly compromising separation between aircraft.

8.6.5.4 States shall encourage operators to report incidents involving activations of aircraft ground proximity warning systems so that their locations can be identified and altitude, routing and/or aircraft operating procedures can be altered to prevent recurrences.

8.6.5.5 In terminating vectoring of an aircraft, the controller shall instruct the pilot to resume own navigation, giving the pilot the aircraft's position and appropriate instructions, as necessary, in the form prescribed in 8.6.4.2 b), if the current instructions had diverted the aircraft from a previously assigned route.

8.6.6 Navigation assistance

8.6.6.1 An identified aircraft observed to deviate significantly from its intended route or designated holding pattern shall be advised accordingly. Appropriate action shall also be taken if, in the opinion of the controller, such deviation is likely to affect the service being provided.

8.6.6.2 The pilot of an aircraft requesting navigation assistance from an air traffic control unit providing ATS surveillance services shall state the reason (e.g. to avoid areas of adverse weather or unreliable navigational instruments) and shall give as much information as possible in the circumstances.

8.6.7 Interruption or termination of ATS surveillance service

8.6.7.1 An aircraft which has been informed that it is provided with ATS surveillance service should be informed immediately when, for any reason, the service is interrupted or terminated.

Note.— The transition of an aircraft across adjoining areas of radar and/or ADS-B and/or MLAT systems coverage will not normally constitute an interruption or termination of the ATS surveillance service.

8.6.7.2 When the control of an identified aircraft is to be transferred to a control sector that will provide the aircraft with procedural separation, the transferring controller shall ensure that appropriate procedural separation is established between that aircraft and any other controlled aircraft before the transfer is effected.

8.6.8 Minimum levels

8.6.8.1 The controller shall at all times be in possession of full and up-to-date information regarding:

- a) established minimum flight altitudes within the area of responsibility;
- b) the lowest usable flight level or levels determined in accordance with Chapters 4 and 5; and
- c) established minimum altitudes applicable to procedures based on tactical vectoring.

8.6.8.2 Unless otherwise specified by the appropriate ATS authority, minimum altitudes for procedures based on tactical vectoring with any ATS surveillance system shall be determined using the criteria applicable to tactical radar vectoring.

Note.— Criteria for the determination of minimum altitudes applicable to procedures based on tactical radar vectoring are contained in Procedures for Air Navigation Services — Aircraft Operations (PANS-OPS, Doc 8168), Volume II.

8.6.9 Information regarding adverse weather

8.6.9.1 Information that an aircraft appears likely to penetrate an area of adverse weather should be issued in sufficient time to permit the pilot to decide on an appropriate course of action, including that of requesting advice on how best to circumnavigate the adverse weather area, if so desired.

Note.— Depending on the capabilities of the ATS surveillance system, areas of adverse weather may not be presented on the situation display. An aircraft's weather radar will normally provide better detection and definition of adverse weather than radar sensors in use by ATS.

8.6.9.2 In vectoring an aircraft for circumnavigating any area of adverse weather, the controller should ascertain that the aircraft can be returned to its intended or assigned flight path within the coverage of the ATS surveillance system and, if this does not appear possible, inform the pilot of the circumstances.

Note.— Attention must be given to the fact that under certain circumstances the most active area of adverse weather may not be displayed.

8.6.10 Reporting of significant meteorological information to meteorological offices

Although a controller is not required to keep a special watch for heavy precipitation, etc., information on the position, intensity, extent and movement of significant meteorological conditions (i.e. heavy showers or well-defined frontal surfaces) as observed on situation displays should, when practicable, be reported to the associated meteorological office.

8.7 USE OF ATS SURVEILLANCE SYSTEMS IN THE AIR TRAFFIC CONTROL SERVICE

Note.— The procedures in this Section are general procedures applicable when an ATS surveillance system is used in the provision of area control service or approach control service. Additional procedures applicable in the provision of approach control service are detailed in Section 8.9.

8.7.1 Functions

The information provided by ATS surveillance systems and presented on a situation display may be used to perform the following functions in the provision of air traffic control service:

- a) provide ATS surveillance services as necessary in order to improve airspace utilization, reduce delays, provide for direct routings and more optimum flight profiles, as well as to enhance safety;
- b) provide vectoring to departing aircraft for the purpose of facilitating an expeditious and efficient departure flow and expediting climb to cruising level;
- c) provide vectoring to aircraft for the purpose of resolving potential conflicts;
- d) provide vectoring to arriving aircraft for the purpose of establishing an expeditious and efficient approach sequence;
- e) provide vectoring to assist pilots in their navigation, e.g. to or from a radio navigation aid, away from or around areas of adverse weather;
- f) provide separation and maintain normal traffic flow when an aircraft experiences communication failure within the area of coverage;
- g) maintain flight path monitoring of air traffic;

Note.— Where tolerances regarding such matters as adherence to track, speed or time have been prescribed by the appropriate ATS authority, deviations are not considered significant until such tolerances are exceeded.

- h) when applicable, maintain a watch on the progress of air traffic, in order to provide a procedural controller with:
 - i) improved position information regarding aircraft under control;
 - ii) supplementary information regarding other traffic; and
 - iii) information regarding any significant deviations by aircraft from the terms of their respective air traffic control clearances, including their cleared routes as well as levels, when appropriate.

8.7.2 Separation application

Note.— Factors which the controller using an ATS surveillance system must take into account in determining the spacing to be applied in particular circumstances in order to ensure that the separation minimum is not infringed include aircraft relative headings and speeds, ATS surveillance system technical limitations, controller workload and any difficulties caused by communication congestion. Guidance material on this subject is contained in the Air Traffic Services Planning Manual (Doc 9426).

8.7.2.1 Except as provided for in 8.7.2.8, 8.7.2.9 and 8.8.2.2, the separation minima specified in 8.7.3 shall only be applied between identified aircraft when there is reasonable assurance that identification will be maintained.

8.7.2.2 When control of an identified aircraft is to be transferred to a control sector that will provide the aircraft with procedural separation, such separation shall be established by the transferring controller before the aircraft reaches the limits of the transferring controller's area of responsibility, or before the aircraft leaves the relevant area of surveillance coverage.

8.7.2.3 When authorized by the appropriate ATS authority, separation based on the use of ADS-B, SSR and/or MLAT, and/or PSR position symbols and/or PSR blips shall be applied so that the distance between the centres of the position symbols and/or PSR blips, representing the positions of the aircraft concerned, is never less than a prescribed minimum.

8.7.2.4 Separation based on the use of PSR blips and SSR responses shall be applied so that the distance between the centre of the PSR blip and the nearest edge of the SSR response (or centre, when authorized by the appropriate ATS authority) is never less than a prescribed minimum.

8.7.2.5 Separation based on the use of ADS-B position symbols and SSR responses shall be applied so that the distance between the centre of the ADS-B position symbol and the nearest edge of the SSR response (or the centre, when authorized by the appropriate ATS authority) is never less than a prescribed minimum.

8.7.2.6 Separation based on the use of SSR responses shall be applied so that the distance between the closest edges of the SSR responses (of the centres, when authorized by the appropriate ATS authority) is never less than a prescribed minimum.

8.7.2.7 In no circumstances shall the edges of the position indications touch or overlap unless vertical separation is applied between the aircraft concerned, irrespective of the type of position indication displayed and separation minimum applied.

8.7.2.8 In the event that the controller has been notified of a controlled flight entering or about to enter the airspace within which the separation minima specified in 8.7.3 is applied, but has not identified the aircraft, the controller may, if so prescribed by the appropriate ATS authority, continue to provide an ATS surveillance service to identified aircraft provided that:

- a) reasonable assurance exists that the unidentified controlled flight will be identified using SSR and/or ADS-B and/or MLAT or the flight is being operated by an aircraft of a type which may be expected to give an adequate return on primary radar in the airspace within which the separation is applied; and
- b) the separation is maintained between identified flights and any other observed ATS surveillance system position indications until either the unidentified controlled flight has been identified or procedural separation has been established.

8.7.2.9 The separation minima specified in 8.7.3 may be applied between an aircraft taking off and a preceding departing aircraft or other identified traffic provided there is reasonable assurance that the departing aircraft will be identified within 2 km (1 NM) from the end of the runway, and that, at the time, the required separation will exist.

8.7.2.10 The separation minima specified in 8.7.3 shall not be applied between aircraft holding over the same holding fix. Application of ATS surveillance system separation minima based on radar and/or ADS-B and/or MLAT systems between holding aircraft and other flights shall be subject to requirements and procedures prescribed by the appropriate ATS authority.

8.7.3 Separation minima based on ATS surveillance systems

8.7.3.1 Unless otherwise prescribed in accordance with 8.7.3.2, 8.7.3.3 or 8.7.3.4, or Chapter 6 (with respect to independent and dependent parallel approaches), the horizontal separation minimum based on radar and/or ADS-B and/or MLAT systems shall be 9.3 km (5.0 NM).

8.7.3.2 The separation minimum in 8.7.3.1 may, if so prescribed by the appropriate ATS authority, be reduced, but not below:

- a) 5.6 km (3.0 NM) when radar and/or ADS-B and/or MLAT systems' capabilities at a given location so permit; and
- b) 4.6 km (2.5 NM) between succeeding aircraft which are established on the same final approach track within 18.5 km (10 NM) of the runway threshold. A reduced separation minimum of 4.6 km (2.5 NM) may be applied, provided:
 - i) the average runway occupancy time of landing aircraft is proven, by means such as data collection and statistical analysis and methods based on a theoretical model, not to exceed 50 seconds;
 - ii) braking action is reported as good and runway occupancy times are not adversely affected by runway contaminants such as slush, snow or ice;
 - iii) an ATS surveillance system with appropriate azimuth and range resolution and an update rate of 5 seconds or less is used in combination with suitable displays;
 - iv) the aerodrome controller is able to observe, visually or by means of surface movement radar (SMR), MLAT system or a surface movement guidance and control system (SMGCS), the runway-in-use and associated exit and entry taxiways;
 - v) distance-based wake turbulence separation minima in 8.7.3.4, or as may be prescribed by the appropriate ATS authority (e.g. for specific aircraft types), do not apply;
 - vi) aircraft approach speeds are closely monitored by the controller and when necessary adjusted so as to ensure that separation is not reduced below the minimum;
 - vii) aircraft operators and pilots have been made fully aware of the need to exit the runway in an expeditious manner whenever the reduced separation minimum on final approach is applied; and
 - viii) procedures concerning the application of the reduced minimum are published in AIPs.

8.7.3.3 The separation minimum or minima based on radar and/or ADS-B and/or MLAT systems to be applied shall be prescribed by the appropriate ATS authority according to the capability of the particular ATS surveillance system or sensor to accurately identify the aircraft position in relation to the centre of a position symbol, PSR blip, SSR response and taking into account factors which may affect the accuracy of the ATS surveillance system-derived information, such as aircraft range from the radar site and the range scale of the situation display in use.

8.7.3.4 The following distance-based wake turbulence separation minima shall be applied to aircraft being provided with an ATS surveillance service in the approach and departure phases of flight in the circumstances given in 8.7.3.4.1.

<i>Aircraft category</i>		<i>Distance-based wake turbulence separation minima</i>
<i>Preceding aircraft</i>	<i>Succeeding aircraft</i>	
HEAVY	HEAVY	7.4 km (4.0 NM)
	MEDIUM	9.3 km (5.0 NM)
	LIGHT	11.1 km (6.0 NM)
MEDIUM	LIGHT	9.3 km (5.0 NM)

Note.— *The provisions governing wake turbulence aircraft categorization are set forth in Chapter 4, Section 4.9.*

8.7.3.4.1 The minima set out in 8.7.3.4 shall be applied when:

- a) an aircraft is operating directly behind another aircraft at the same altitude or less than 300 m (1 000 ft) below; or
- b) both aircraft are using the same runway, or parallel runways separated by less than 760 m (2 500 ft); or
- c) an aircraft is crossing behind another aircraft, at the same altitude or less than 300 m (1 000 ft) below.

Note.— *See Figures 8-1A and 8-1B.*

8.7.4 Transfer of control

8.7.4.1 Where an ATS surveillance service is being provided, transfer of control should be effected, whenever practicable, so as to enable the uninterrupted provision of the ATS surveillance service.

8.7.4.2 Where SSR and/or ADS-B and/or MLAT is used and the display of position indications with associated labels is provided for, transfer of control of aircraft between adjacent control positions or between adjacent ATC units may be effected without prior coordination, provided that:

- a) updated flight plan information on the aircraft about to be transferred, including the discrete assigned SSR code or, with respect to Mode S and ADS-B, the aircraft identification, is provided to the accepting controller prior to transfer;
- b) the ATS surveillance system coverage provided to the accepting controller is such that the aircraft concerned is presented on the situation display before the transfer is effected and is identified on, but preferably before, receipt of the initial call;
- c) when the controllers are not physically adjacent, two-way direct speech facilities, which permit communications to be established instantaneously, are available between them at all times;

Note.— *“Instantaneous” refers to communications which effectively provide for immediate access between controllers.*

- d) the transfer point or points and all other conditions of application, such as direction of flight, specified levels, transfer of communication points, and especially an agreed minimum separation between aircraft, including that applicable to succeeding aircraft on the same route, about to be transferred as observed on the situation display, have been made the subject of specific instructions (for intra-unit transfer) or of a specific letter of agreement between two adjacent ATC units;
- e) the instructions or letter of agreement specify explicitly that the application of this type of transfer of control may be terminated at any time by the accepting controller, normally with an agreed advance notice;
- f) the accepting controller is informed of any level, speed or vectoring instructions given to the aircraft prior to its transfer and which modify its anticipated flight progress at the point of transfer.

8.7.4.3 The minimum agreed separation between aircraft about to be transferred (8.7.4.2 d) refers) and the advance notice (8.7.4.2 e) refers) shall be determined taking into account all relevant technical, operational and other circumstances. If circumstances arise in which these agreed conditions can no longer be satisfied, controllers shall revert to the procedure in 8.7.4.4 until the situation is resolved.

8.7.4.4 Where primary radar is being used, and where another type of ATS surveillance system is employed but the provisions of 8.7.4.2 are not applied, the transfer of control of aircraft between adjacent control positions or between two adjacent ATS units may be effected, provided that:

- a) identification has been transferred to or has been established directly by the accepting controller;
- b) when the controllers are not physically adjacent, two-way direct-speech facilities between them are at all times available which permit communications to be established instantaneously;
- c) separation from other controlled flights conforms to the minima authorized for use during transfer of control between the sectors or units concerned;
- d) the accepting controller is informed of any level, speed or vectoring instructions applicable to the aircraft at the point of transfer;
- e) radiocommunication with the aircraft is retained by the transferring controller until the accepting controller has agreed to assume responsibility for providing the ATS surveillance service to the aircraft. Thereafter, the aircraft should be instructed to change over to the appropriate channel and from that point is the responsibility of the accepting controller.

8.7.5 Speed control

Subject to conditions specified by the appropriate ATS authority, including consideration of aircraft performance limitations, a controller may, in order to facilitate sequencing or to reduce the need for vectoring, request aircraft to adjust their speed in a specified manner.

Note.— Procedures for speed control instructions are contained in Chapter 4, Section 4.6.

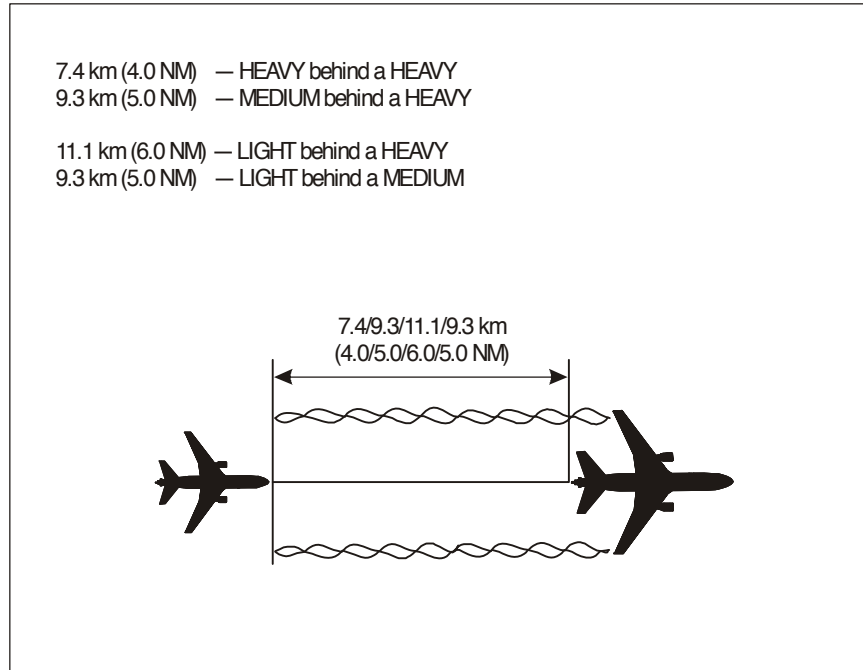


Figure 8-1A. Operating directly behind (see 8.7.3.4 and 8.7.3.4.1)

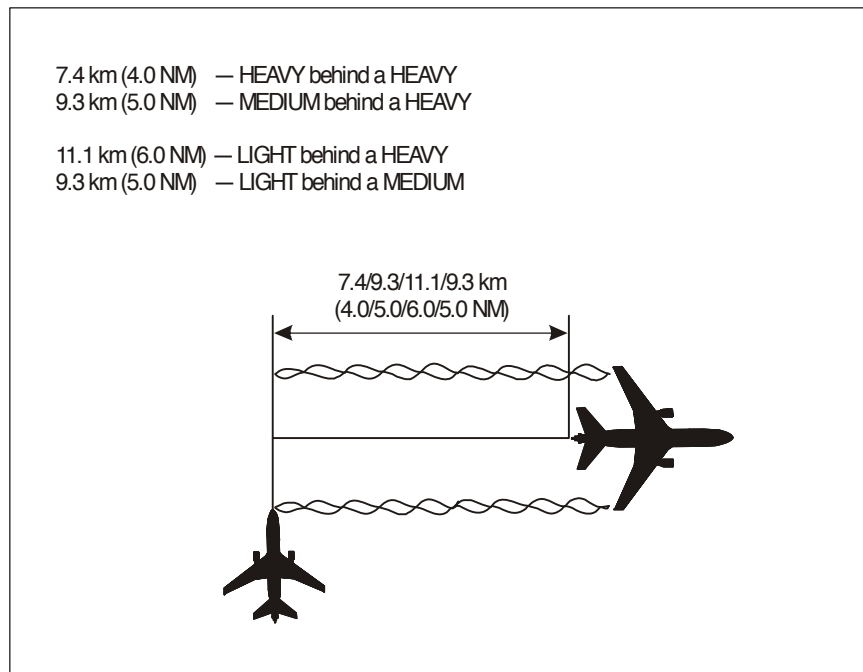


Figure 8-1B. Crossing behind (see 8.7.3.4 and 8.7.3.4.1)

8.8 EMERGENCIES, HAZARDS AND EQUIPMENT FAILURES

Note.— See also Chapter 15.

8.8.1 Emergencies

8.8.1.1 In the event of an aircraft in, or appearing to be in, any form of emergency, every assistance shall be provided by the controller, and the procedures prescribed herein may be varied according to the situation.

8.8.1.2 The progress of an aircraft in emergency shall be monitored and (whenever possible) plotted on the situation display until the aircraft passes out of coverage of the ATS surveillance system, and position information shall be provided to all air traffic services units which may be able to give assistance to the aircraft. Transfer to adjacent sectors shall also be effected when appropriate.

Note.— If the pilot of an aircraft encountering a state of emergency has previously been directed by ATC to select a specific transponder code and/or an ADS-B emergency mode, that code/mode will normally be maintained unless, in special circumstances, the pilot has decided or has been advised otherwise. Where ATC has not requested a code or emergency mode to be set, the pilot will set the transponder to Mode A Code 7700 and/or the appropriate ADS-B emergency mode.

8.8.1.3 Whenever a general ADS-B emergency alert is observed on the situation display and there is no other indication of the particular nature of the emergency, the controller shall take the following action:

- a) attempt to establish communication with the aircraft to verify the nature of the emergency; or
- b) if no response is received from the aircraft, the controller shall attempt to ascertain if the aircraft is able to receive transmissions from the air traffic control unit by requesting it to execute a specified manoeuvre which can be observed on the situation display.

Note 1.— Some aircraft equipped with first generation ADS-B avionics have the capability to transmit a general emergency alert only, regardless of the code selected by the pilot.

Note 2.— Some aircraft equipped with first generation ADS-B avionics do not have the capability of squawking IDENT while the emergency and/or urgency mode is selected.

8.8.2 Collision hazard information

8.8.2.1 When an identified controlled flight is observed to be on a conflicting path with an unknown aircraft deemed to constitute a collision hazard, the pilot of the controlled flight shall, whenever practicable:

- a) be informed of the unknown aircraft, and if so requested by the controlled flight or if, in the opinion of the controller, the situation warrants, a course of avoiding action should be suggested; and
- b) be notified when the conflict no longer exists.

8.8.2.2 When an identified IFR flight operating outside controlled airspace is observed to be on a conflicting path with another aircraft, the pilot should:

- a) be informed as to the need for collision avoidance action to be initiated, and if so requested by the pilot or if, in the opinion of the controller, the situation warrants, a course of avoiding action should be suggested; and
- b) be notified when the conflict no longer exists.

8.8.2.3 Information regarding traffic on a conflicting path should be given, whenever practicable, in the following form:

- a) relative bearing of the conflicting traffic in terms of the 12-hour clock;
- b) distance from the conflicting traffic in kilometres (nautical miles);
- c) direction in which the conflicting traffic appears to be proceeding;
- d) level and type of aircraft or, if unknown, relative speed of the conflicting traffic, e.g. slow or fast.

8.8.2.4 Pressure-altitude-derived level information, even when unverified, should be used in the provision of collision hazard information because such information, particularly if available from an otherwise unknown aircraft (e.g. a VFR flight) and given to the pilot of a known aircraft, could facilitate the location of a collision hazard.

8.8.2.4.1 When the pressure-altitude-derived level information has been verified, the information shall be passed to pilots in a clear and unambiguous manner. If the level information has not been verified, the accuracy of the information should be considered uncertain and the pilot shall be informed accordingly.

8.8.3 Failure of equipment

8.8.3.1 AIRCRAFT RADIO TRANSMITTER FAILURE

8.8.3.1.1 If two-way communication is lost with an aircraft, the controller should determine whether or not the aircraft's receiver is functioning by instructing the aircraft on the channel so far used to acknowledge by making a specified manoeuvre and by observing the aircraft's track, or by instructing the aircraft to operate IDENT or to make SSR code and/or ADS-B transmission changes.

Note 1.— Transponder-equipped aircraft experiencing radiocommunication failure will operate the transponder on Mode A Code 7600.

Note 2.— ADS-B-equipped aircraft experiencing radiocommunication failure may transmit the appropriate ADS-B emergency and/or urgency mode.

8.8.3.1.2 If the action prescribed in 8.8.3.1.1 is unsuccessful, it shall be repeated on any other available channel on which it is believed that the aircraft might be listening.

8.8.3.1.3 In both the cases covered by 8.8.3.1.1 and 8.8.3.1.2, any manoeuvring instructions shall be such that the aircraft would regain its current cleared track after having complied with the instructions received.

8.8.3.1.4 Where it has been established by the action in 8.8.3.1.1 that the aircraft's radio receiver is functioning, continued control can be effected using SSR code/ADS-B transmission changes or IDENT transmissions to obtain acknowledgement of clearances issued to the aircraft.

8.8.3.2 COMPLETE AIRCRAFT COMMUNICATION FAILURE

When a controlled aircraft experiencing complete communication failure is operating or expected to operate in an area and at flight levels where an ATS surveillance service is applied, separation specified in 8.7.3 may continue to be used. However, if the aircraft experiencing the communication failure is not identified, separation shall be applied between identified aircraft and all unidentified aircraft observed along the expected route of the aircraft with the communication failure, until such time as it is known, or can safely be assumed, that the aircraft with radiocommunication failure has passed through the airspace concerned, has landed, or has proceeded elsewhere.

8.8.3.3 AIRCRAFT TRANSPONDER FAILURE IN AREAS WHERE THE CARRIAGE OF A FUNCTIONING TRANSPONDER IS MANDATORY

8.8.3.3.1 When an aircraft experiencing transponder failure after departure is operating or expected to operate in an area where the carriage of a functioning transponder with specified capabilities is mandatory, the ATC units concerned should endeavour to provide for continuation of the flight to the aerodrome of first intended landing in accordance with the flight plan. However, in certain traffic situations, either in terminal areas or en-route, continuation of the flight may not be possible, particularly when failure is detected shortly after take-off. The aircraft may then be required to return to the departure aerodrome or to land at the nearest suitable aerodrome acceptable to the operator concerned and to ATC.

8.8.3.3.2 In case of a transponder failure which is detected before departure from an aerodrome where it is not practicable to effect a repair, the aircraft concerned should be permitted to proceed, as directly as possible, to the nearest suitable aerodrome where repair can be made. When granting clearance to such aircraft, ATC should take into consideration the existing or anticipated traffic situation and may have to modify the time of departure, flight level or route of the intended flight. Subsequent adjustments may become necessary during the course of the flight.

8.8.4 ATS surveillance system failure

8.8.4.1 In the event of complete failure of the ATS surveillance system where air-ground communications remain, the controller shall plot the positions of all aircraft already identified, take the necessary action to establish procedural separation between the aircraft and, if necessary, limit the number of aircraft permitted to enter the area.

8.8.4.2 As an emergency measure, use of flight levels spaced by half the applicable vertical separation minimum may be resorted to temporarily if standard procedural separation cannot be provided immediately.

8.8.5 Degradation of aircraft position source data

In order to reduce the impact of a degradation of aircraft position source data, for example, a receiver autonomous integrity monitoring (RAIM) outage for GNSS, the appropriate ATS authority shall establish contingency procedures to be followed by control positions and ATC units in the event of data degradation.

8.8.6 Ground radio failure

8.8.6.1 In the event of complete failure of the ground radio equipment used for control, the controller shall, unless able to continue to provide the ATS surveillance service by means of other available communication channels, proceed as follows:

- a) without delay inform all adjacent control positions or ATC units, as applicable, of the failure;

- b) apprise such positions or units of the current traffic situation;
- c) request their assistance, in respect of aircraft which may establish communications with those positions or units, in establishing and maintaining separation between such aircraft; and
- d) instruct adjacent control positions or ATC units to hold or re-route all controlled flights outside the area of responsibility of the position or ATC unit that has experienced the failure until such time that the provision of normal services can be resumed.

8.8.6.2 In order to reduce the impact of complete ground radio equipment failure on the safety of air traffic, the appropriate ATS authority should establish contingency procedures to be followed by control positions and ATC units in the event of such failures. Where feasible and practicable, such contingency procedures should provide for the delegation of control to an adjacent control position or ATC unit in order to permit a minimum level of services to be provided as soon as possible, following the ground radio failure and until normal operations can be resumed.

8.9 USE OF ATS SURVEILLANCE SYSTEMS IN THE APPROACH CONTROL SERVICE

8.9.1 General provisions

8.9.1.1 ATS surveillance systems used in the provision of approach control service shall be appropriate to the functions and level of service to be provided.

8.9.1.2 ATS surveillance systems used to monitor parallel ILS approaches shall meet the requirements for such operations specified in Chapter 6.

8.9.2 Functions

The position indications presented on a situation display may be used to perform the following additional functions in the provision of approach control service:

- a) provide vectoring of arriving traffic on to pilot-interpreted final approach aids;
- b) provide flight path monitoring of parallel ILS approaches and instruct aircraft to take appropriate action in the event of possible or actual penetrations of the no transgression zone (NTZ);

Note.— See Chapter 6, Section 6.7.

- c) provide vectoring of arriving traffic to a point from which a visual approach can be completed;
- d) provide vectoring of arriving traffic to a point from which a precision radar approach or a surveillance radar approach can be made;
- e) provide flight path monitoring of other pilot-interpreted approaches;

- f) in accordance with prescribed procedures, conduct:
 - i) surveillance radar approaches;
 - ii) precision radar (PAR) approaches; and
- g) provide separation between:
 - i) succeeding departing aircraft;
 - ii) succeeding arriving aircraft; and
 - iii) a departing aircraft and a succeeding arriving aircraft.

8.9.3 General approach control procedures using ATS surveillance systems

8.9.3.1 The appropriate ATS authority shall establish procedures to ensure that the aerodrome controller is kept informed of the sequence of arriving aircraft, as well as any instructions and restrictions which have been issued to such aircraft in order to maintain separation after transfer of control to the aerodrome controller.

8.9.3.2 Prior to, or upon commencement of, vectoring for approach, the pilot shall be advised of the type of approach as well as the runway to be used.

8.9.3.3 The controller shall advise an aircraft being vectored for an instrument approach of its position at least once prior to commencement of final approach.

8.9.3.4 When giving distance information, the controller shall specify the point or navigation aid to which the information refers.

8.9.3.5 The initial and intermediate approach phases of an approach executed under the direction of a controller comprise those parts of the approach from the time vectoring is initiated for the purpose of positioning the aircraft for a final approach, until the aircraft is on final approach and:

- a) established on the final approach path of a pilot-interpreted aid; or
- b) reports that it is able to complete a visual approach; or
- c) ready to commence a surveillance radar approach; or
- d) transferred to the precision radar approach controller.

8.9.3.6 Aircraft vectored for final approach should be given a heading or a series of headings calculated to close with the final approach track. The final vector shall enable the aircraft to be established on the final approach track prior to intercepting the specified or nominal glide path of the approach procedure from below, and should provide an intercept angle with the final approach track of 45 degrees or less.

Note.— See Chapter 6, Section 6.7.3.2, and Section 6.7.3.2.3 concerning vectoring and level flight requirements of independent parallel approaches, respectively.

8.9.3.7 Whenever an aircraft is assigned a vector which will take it through the final approach track, it should be advised accordingly, stating the reason for the vector.

8.9.4 Vectoring to pilot-interpreted final approach aid

8.9.4.1 An aircraft vectored to intercept a pilot-interpreted final approach aid shall be instructed to report when established on the final approach track. Clearance for the approach should be issued prior to when the aircraft reports established, unless circumstances preclude the issuance of the clearance at such time. Vectoring will normally terminate at the time the aircraft leaves the last assigned heading to intercept the final approach track.

8.9.4.2 When clearance for the approach is issued, aircraft shall maintain the last assigned level until intercepting the specified or nominal glide path of the approach procedure. If ATC requires an aircraft to intercept the glide path at a level other than a level flight segment depicted on the instrument approach chart, ATC shall instruct the pilot to maintain the particular level until established on the glide path.

8.9.4.3 The controller shall be responsible for maintaining separation specified in 8.7.3 between succeeding aircraft on the same final approach, except that the responsibility may be transferred to the aerodrome controller in accordance with procedures prescribed by the appropriate ATS authority and provided an ATS surveillance system is available to the aerodrome controller.

8.9.4.4 Transfer of control of succeeding aircraft on final approach to the aerodrome controller shall be effected in accordance with procedures prescribed by the appropriate ATS authority.

8.9.4.5 Transfer of communications to the aerodrome controller should be effected at such a point or time that clearance to land or alternative instructions can be issued to the aircraft in a timely manner.

8.9.5 Vectoring for visual approach

Note.— See also Chapter 6, Section 6.5.3.

8.9.5.1 The controller may initiate vectoring of an aircraft for visual approach provided the reported ceiling is above the minimum altitude applicable to vectoring and meteorological conditions are such that, with reasonable assurance, a visual approach and landing can be completed.

8.9.5.2 Clearance for visual approach shall be issued only after the pilot has reported the aerodrome or the preceding aircraft in sight, at which time vectoring would normally be terminated.

8.9.6 Radar approaches

8.9.6.1 GENERAL PROVISIONS

8.9.6.1.1 During the period that a controller is engaged in giving surveillance radar or precision radar approaches, he or she should not be responsible for any duties other than those directly connected with such approaches.

8.9.6.1.2 Controllers conducting radar approaches shall be in possession of information regarding the obstacle clearance altitudes/heights established for the types of approach to be conducted.

8.9.6.1.3 Prior to commencement of a radar approach, the aircraft shall be informed of:

- a) the runway to be used;
- b) the applicable obstacle clearance altitude/height;

- c) the angle of the nominal glide path and, if so prescribed by the appropriate ATS authority or requested by the aircraft, the approximate rate of descent to be maintained;

Note.— See the Air Traffic Services Planning Manual (Doc 9426) regarding calculation of approximate rates of descent.

- d) the procedure to be followed in the event of radiocommunication failure, unless the procedure has been published in AIPs.

8.9.6.1.4 When a radar approach cannot be continued due to any circumstance, the aircraft should be immediately informed that a radar approach or continuation thereof is not possible. The approach should be continued if this is possible using non-radar facilities or if the pilot reports that the approach can be completed visually; otherwise an alternative clearance should be given.

8.9.6.1.5 Aircraft making a radar approach should be reminded, when on final approach, to check that the wheels are down and locked.

8.9.6.1.6 Unless otherwise prescribed by the appropriate ATS authority, the controller conducting the approach should notify the aerodrome controller or, when applicable, the procedural controller when an aircraft making a radar approach is approximately 15 km (8 NM) from touchdown. If landing clearance is not received at this time, a subsequent notification should be made at approximately 8 km (4 NM) from touchdown and landing clearance requested.

8.9.6.1.7 Clearance to land or any alternative clearance received from the aerodrome controller or, when applicable, the procedural controller should normally be passed to the aircraft before it reaches a distance of 4 km (2 NM) from touchdown.

8.9.6.1.8 An aircraft making a radar approach should:

- a) be directed to execute a missed approach in the following circumstances:
 - i) when the aircraft appears to be dangerously positioned on final approach; or
 - ii) for reasons involving traffic conflicts; or
 - iii) if no clearance to land has been received from the procedural controller by the time the aircraft reaches a distance of 4 km (2 NM) from touchdown or such other distance as has been agreed with the aerodrome control tower; or
 - iv) on instructions by the aerodrome controller; or
- b) be advised to consider executing a missed approach in the following circumstances:
 - i) when the aircraft reaches a position from which it appears that a successful approach cannot be completed; or
 - ii) if the aircraft is not visible on the situation display for any significant interval during the last 4 km (2 NM) of the approach; or
 - iii) if the position or identification of the aircraft is in doubt during any portion of the final approach.

In all such cases, the reason for the instruction or the advice should be given to the pilot.

8.9.6.1.9 Unless otherwise required by exceptional circumstances, radar instructions concerning a missed approach should be in accordance with the prescribed missed approach procedure and should include the level to which the aircraft is to climb and heading instructions to keep the aircraft within the missed approach area during the missed approach procedure.

8.9.7 Final approach procedures

8.9.7.1 SURVEILLANCE RADAR APPROACH

8.9.7.1.1 A final approach using solely surveillance radar should not be carried out if precision approach radar is available, unless meteorological conditions are such as to indicate with reasonable certainty that a surveillance radar approach can be completed successfully.

8.9.7.1.2 A surveillance radar approach shall only be performed with equipment suitably sited and a situation display specifically marked to provide information on position relative to the extended centre line of the runway to be used and distance from touchdown, and which is specifically approved for the purpose by the appropriate ATS authority.

8.9.7.1.3 When conducting a surveillance radar approach, the controller shall comply with the following:

- a) at or before the commencement of the final approach, the aircraft shall be informed of the point at which the surveillance radar approach will be terminated;
- b) the aircraft shall be informed when it is approaching the point at which it is computed that descent should begin, and just before reaching that point it shall be informed of the obstacle clearance altitude/height and instructed to descend and check the applicable minima;
- c) azimuth instructions shall be given in accordance with the precision approach technique (see 8.9.7.2.4);
- d) except as provided in 8.9.7.1.4, distance from touchdown shall normally be passed at every 2 km (each NM);
- e) pre-computed levels through which the aircraft should be passing to maintain the glide path shall also be transmitted at every 2 km (each NM) at the same time as the distance;
- f) the surveillance radar approach shall be terminated:
 - i) at a distance of 4 km (2 NM) from touchdown, except as provided in 8.9.7.1.4; or
 - ii) before the aircraft enters an area of continuous radar clutter; or
 - iii) when the pilot reports that a visual approach can be effected;

whichever is the earliest.

8.9.7.1.4 When, as determined by the appropriate ATS authority, the accuracy of the radar equipment permits, surveillance radar approaches may be continued to the threshold of the runway, or to a prescribed point less than 4 km (2 NM) from touchdown, in which case:

- a) distance and level information shall be given at each km (each half NM);
- b) transmission should not be interrupted for intervals of more than five seconds while the aircraft is within a distance of 8 km (4 NM) from touchdown;

- c) the controller should not be responsible for any duties other than those directly connected with a particular approach.

8.9.7.1.5 Levels through which the aircraft should pass to maintain the required glide path, and the associated distances from touchdown, shall be pre-computed and displayed in such a manner as to be readily available to the controller concerned.

Note.— See the Air Traffic Services Planning Manual (Doc 9426) regarding pre-computation of levels.

8.9.7.2 PRECISION RADAR APPROACH

8.9.7.2.1 *DUTIES OF PRECISION APPROACH CONTROLLER*

During the period the controller is engaged in giving a precision approach, the controller should not be responsible for any duties other than those directly connected with that particular approach.

8.9.7.2.2 *TRANSFER OF CONTROL*

Aircraft to be provided with a precision radar approach shall have been transferred to the controller in charge of the precision approach at a distance of not less than 2 km (1 NM) from the point of interception of the glide path, unless otherwise provided by the appropriate ATS authority.

8.9.7.2.3 *COMMUNICATIONS*

When control of the aircraft is assumed by the controller in charge of the precision approach, a communications check shall be made on the channel to be used during the precision approach and the pilot shall be advised that no further acknowledgement of transmission is required. Thereafter, transmission should not be interrupted for intervals of more than five seconds while the aircraft is on final approach.

8.9.7.2.4 *AZIMUTH INFORMATION AND CORRECTIONS*

8.9.7.2.4.1 The pilot shall be informed at regular intervals of the aircraft's position in relation to the extended centre line of the runway. Heading corrections shall be given as necessary to bring the aircraft back on to the extended centre line.

8.9.7.2.4.2 In the case of azimuth deviations, the pilot should not take corrective action unless specifically instructed to do so.

8.9.7.2.5 *ELEVATION INFORMATION AND ADJUSTMENTS*

8.9.7.2.5.1 The aircraft shall be informed when it is approaching the point of interception of the glide path and, just before intercepting the glide path, it shall be instructed to begin its descent and to check the applicable decision altitude/height. Thereafter, the aircraft shall be informed at regular intervals of its position in relation to the glide path. When no corrections are required, the aircraft should be informed at regular intervals that it is on the glide path. Deviations from the glide path shall be given to the aircraft, together with instructions to adjust the rate of descent if the corrective action taken by the aircraft does not appear to be sufficient. The aircraft shall be informed when it starts to regain the glide path, and immediately before it reaches the glide path.

8.9.7.2.5.2 In the case of deviations from the glide path, the pilot should take corrective action on the basis of the information given by the controller, even though not specifically instructed to do so.

8.9.7.2.5.3 Prior to the aircraft reaching a point 4 km (2 NM) from touchdown, or a greater distance as necessary for faster aircraft, a certain degree of tolerance should be allowed with regard to deviations from the glide path, and elevation information need not specify the actual number of metres (or feet) above or below the glide path unless it is required to emphasize the rate of change or the extent of the displacement. Thereafter, any deviations from the glide path should be given to the aircraft, preferably in terms of specific distances (metres or feet) above or below the glide path. The use of emphasis in the manner in which the information is transmitted should normally be sufficient to expedite action by the pilot when necessary (e.g. “*STILL* 20 metres (60 feet) too low”).

8.9.7.2.5.4 Should the elevation element fail during a precision radar approach, the controller shall inform the aircraft immediately. If possible, the controller shall change to a surveillance radar approach, informing the aircraft of the revised obstacle clearance altitude/height. Alternatively, instructions should be given for a missed approach.

8.9.7.2.6 *DISTANCE INFORMATION*

The distance from touchdown should be transmitted at intervals of 2 km (1 NM) until the aircraft reaches a distance of 8 km (4 NM) from touchdown. Thereafter distance information should be transmitted at more frequent intervals, priority being given, however, to the provision of azimuth and elevation information and guidance.

8.9.7.2.7 *TERMINATION OF A PRECISION RADAR APPROACH*

A precision radar approach is terminated when the aircraft reaches the point at which the glide path intercepts the obstacle clearance altitude/height. Nevertheless, information shall continue to be given until the aircraft is over the threshold, or at such distance therefrom as may be specified by the appropriate ATS authority, taking into account the capability of the equipment concerned. The approach may be monitored to touchdown and information may continue to be provided as necessary at the discretion of the controller in charge of the precision approach in which case the aircraft shall be informed when it is over the threshold.

8.9.7.2.8 *MISSED APPROACHES*

When information provided by the elevation element indicates that the aircraft may be initiating a missed approach, the controller shall take the following action:

- a) when there is sufficient time to obtain a reply from the pilot (e.g. when the aircraft is more than 4 km (2 NM) from touchdown), the controller shall transmit the aircraft's height above the glide path and ask if the pilot intends to make a missed approach. If this is confirmed by the pilot, the controller shall pass missed approach instructions (see 8.9.6.1.8);
- b) when there is not sufficient time to obtain a reply from the pilot (e.g. when the aircraft is at 4 km (2 NM) or less from touchdown), the precision approach should be continued, emphasizing the aircraft's displacement, and terminated at the normal termination point. If it is apparent from elevation information that the aircraft is making a missed approach, either before or after the normal termination point, the controller shall pass missed approach instructions (see 8.9.6.1.8).

8.10 USE OF ATS SURVEILLANCE SYSTEMS IN THE AERODROME CONTROL SERVICE

8.10.1 Functions

8.10.1.1 When authorized by and subject to conditions prescribed by the appropriate ATS authority, ATS surveillance systems may be used in the provision of aerodrome control service to perform the following functions:

- a) flight path monitoring of aircraft on final approach;
- b) flight path monitoring of other aircraft in the vicinity of the aerodrome;
- c) establishing separation specified in 8.7.3 between succeeding departing aircraft; and
- d) providing navigation assistance to VFR flights.

8.10.1.2 Special VFR flights shall not be vectored unless special circumstances, such as emergencies, dictate otherwise.

8.10.1.3 Caution shall be exercised when vectoring VFR flights so as to ensure that the aircraft concerned does not inadvertently enter instrument meteorological conditions.

8.10.1.4 In prescribing conditions and procedures for the use of ATS surveillance systems in the provision of aerodrome control service, the appropriate ATS authority shall ensure that the availability and use of an ATS surveillance system will not be detrimental to visual observation of aerodrome traffic.

Note.— Control of aerodrome traffic is in the main based on visual observation of the manoeuvring area and the vicinity of the aerodrome by the aerodrome controller.

8.10.2 Use of ATS surveillance systems for surface movement control

Note.— Requirements concerning surface movement guidance and control systems (SMGCS) are contained in Annex 14, Volume I, Chapter 9. Guidance on the use of surface movement radar (SMR) and other advanced functions is contained in the Manual of Surface Movement Guidance and Control Systems (SMGCS) (Doc 9476) and in the Advanced Surface Movement Guidance and Control Systems (A-SMGCS) Manual (Doc 9830).

8.10.2.1 GENERAL PROVISIONS

8.10.2.1.1 The use of SMR should be related to the operational conditions and requirements of the particular aerodrome (i.e. visibility conditions, traffic density and aerodrome layout).

8.10.2.1.2 SMR systems shall to the extent possible enable the detection and display of the movement of all aircraft and vehicles on the manoeuvring area in a clear and unambiguous manner.

8.10.2.1.3 Aircraft and vehicle position indications may be displayed in symbolic or non-symbolic form. Where labels are available for display, the capability should be provided for inclusion of aircraft and vehicle identification by manual or automated means.

8.10.2.2 FUNCTIONS

8.10.2.2.1 SMR should be used to augment visual observation of traffic on the manoeuvring area and to provide surveillance of traffic on those parts of the manoeuvring area which cannot be observed visually.

8.10.2.2.2 The information displayed on an SMR display may be used to assist in:

- a) monitoring of aircraft and vehicles on the manoeuvring area for compliance with clearances and instructions;
- b) determining that a runway is clear of traffic prior to a landing or take-off;
- c) providing information on essential local traffic on or near the manoeuvring area;
- d) determining the location of aircraft and vehicles on the manoeuvring area;
- e) providing directional taxi information to aircraft when requested by the pilot or deemed necessary by the controller. Except under special circumstances, e.g. emergencies, such information should not be issued in the form of specific heading instructions; and
- f) providing assistance and advice to emergency vehicles.

8.10.2.3 IDENTIFICATION OF AIRCRAFT

Where an ATS surveillance system is used, aircraft may be identified by one or more of the following procedures:

- a) by correlating a particular position indication with:
 - i) an aircraft position visually observed by the controller;
 - ii) an aircraft position reported by the pilot; or
 - iii) an identified position indication displayed on a situation display;
- b) by transfer of identification when authorized by the appropriate ATS authority; and
- c) by automated identification procedures when authorized by the appropriate ATS authority.

8.11 USE OF ATS SURVEILLANCE SYSTEMS IN THE FLIGHT INFORMATION SERVICE

Note.— The use of an ATS surveillance system in the provision of flight information service does not relieve the pilot-in-command of an aircraft of any responsibilities, including the final decision regarding any suggested alteration of the flight plan.

8.11.1 Functions

The information presented on a situation display may be used to provide identified aircraft with:

- a) information regarding any aircraft observed to be on a conflicting path with the identified aircraft and suggestions or advice regarding avoiding action;
 - b) information on the position of significant weather and, as practicable, advice to the aircraft on how best to circumnavigate any such areas of adverse weather (see 8.6.9.2, Note);
 - c) information to assist the aircraft in its navigation.
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Chapter 9

FLIGHT INFORMATION SERVICE AND ALERTING SERVICE

9.1. FLIGHT INFORMATION SERVICE

9.1.1 Recording and transmission of information on the progress of flights

Information on the actual progress of flights, including those of heavy or medium unmanned free balloons, under neither air traffic control service nor air traffic advisory service shall be:

- a) recorded by the air traffic services unit serving the FIR within which the aircraft is flying in such a manner that it is available for reference and in case it is requested for search and rescue action;
- b) transmitted by the air traffic services unit receiving the information to other air traffic services units concerned, when so required in accordance with Chapter 10, 10.2.2.

9.1.2 Transfer of responsibility for the provision of flight information service

The responsibility for the provision of flight information service to a flight normally passes from the appropriate ATS unit in an FIR to the appropriate ATS unit in the adjacent FIR at the time of crossing the common FIR boundary. However, when coordination is required in accordance with Chapter 10, 10.2, but communication facilities are inadequate, the former ATS unit shall, as far as practicable, continue to provide flight information service to the flight until it has established two-way communication with the appropriate ATS unit in the FIR it is entering.

9.1.3 Transmission of information

9.1.3.1 MEANS OF TRANSMISSION

9.1.3.1.1 Except as provided in 9.1.3.2.1, information shall be disseminated to aircraft by one or more of the following means as determined by the appropriate ATS authority:

- a) the preferred method of directed transmission on the initiative of the appropriate ATS unit to an aircraft, ensuring that receipt is acknowledged; or
- b) a general call, unacknowledged transmission to all aircraft concerned; or
- c) broadcast; or
- d) data link.

Note.— It should be recognized that in certain circumstances, e.g. during the last stages of a final approach, it may be impracticable for aircraft to acknowledge directed transmissions.

9.1.3.1.2 The use of general calls shall be limited to cases where it is necessary to disseminate essential information to several aircraft without delay, e.g. the sudden occurrence of hazards, a change of the runway-in-use, or the failure of a key approach and landing aid.

9.1.3.2 TRANSMISSION OF SPECIAL AIR-REPORTS,
SIGMET AND AIRMET INFORMATION

9.1.3.2.1 Appropriate SIGMET and AIRMET information, as well as special air-reports which have not been used for the preparation of a SIGMET, shall be disseminated to aircraft by one or more of the means specified in 9.1.3.1.1 as determined on the basis of regional air navigation agreements. Special air-reports shall be disseminated to aircraft for a period of 60 minutes after their issuance.

9.1.3.2.2 The special air-report, SIGMET and AIRMET information to be passed to aircraft on ground initiative should cover a portion of the route up to one hour's flying time ahead of the aircraft except when another period has been determined on the basis of regional air navigation agreements.

9.1.3.3 TRANSMISSION OF INFORMATION CONCERNING
VOLCANIC ACTIVITY

Information concerning pre-eruption volcanic activity, volcanic eruptions and volcanic ash clouds (position of clouds and flight levels affected) shall be disseminated to aircraft by one or more of the means specified in 9.1.3.1.1 as determined on the basis of regional air navigation agreements.

9.1.3.4 TRANSMISSION OF INFORMATION CONCERNING
RADIOACTIVE MATERIALS AND TOXIC CHEMICAL CLOUDS

Information on the release into the atmosphere of radioactive materials or toxic chemicals which could affect airspace within the area of responsibility of the ATS unit shall be transmitted to aircraft by one or more of the means specified in 9.1.3.1.1.

9.1.3.5 TRANSMISSION OF SPECI AND AMENDED TAF

9.1.3.5.1 Special reports in the SPECI code form and amended TAF shall be transmitted on request and supplemented by:

- a) directed transmission from the appropriate air traffic services unit of selected special reports and amended TAF for the departure, destination and its alternate aerodromes, as listed in the flight plan; or
- b) a general call on appropriate frequencies for the unacknowledged transmission to affected aircraft of selected special reports and amended TAF; or
- c) continuous or frequent broadcast or the use of data link to make available current METAR and TAF in areas determined on the basis of regional air navigation agreements where traffic congestion dictates. VOLMET broadcasts and/or D-VOLMET should be used to serve this purpose (see Annex 11, 4.4).

9.1.3.5.2 The passing of amended aerodrome forecasts to aircraft on the initiative of the appropriate air traffic services unit should be limited to that portion of the flight where the aircraft is within a specified time from the aerodrome of destination, such time being established on the basis of regional air navigation agreements.

9.1.3.6 TRANSMISSION OF INFORMATION ON HEAVY OR MEDIUM UNMANNED FREE BALLOONS

Appropriate information on heavy or medium unmanned free balloons shall be disseminated to aircraft by one or more of the means specified in 9.1.3.1.1.

9.1.3.7 TRANSMISSION OF INFORMATION TO SUPERSONIC AIRCRAFT

The following information shall be available at appropriate ACCs or flight information centres for aerodromes determined on the basis of regional air navigation agreements and shall be transmitted on request to supersonic aircraft prior to commencement of deceleration/descent from supersonic cruise:

- a) current meteorological reports and forecasts, except that where communications difficulties are encountered under conditions of poor propagation, the elements transmitted may be limited to:
 - i) mean surface wind, direction and speed (including gusts);
 - ii) visibility or runway visual range;
 - iii) amount and height of base of low clouds;
 - iv) other significant information;
 - v) if appropriate, information regarding expected changes;
- b) operationally significant information on the status of facilities relating to the runway-in-use, including the precision approach category in the event that the lowest approach category promulgated for the runway is not available;
- c) sufficient information on the runway surface conditions to permit assessment of the runway braking action.

9.1.4 Air traffic advisory service

9.1.4.1 OBJECTIVE AND BASIC PRINCIPLES

9.1.4.1.1 The objective of the air traffic advisory service is to make information on collision hazards more effective than it would be in the mere provision of flight information service. It may be provided to aircraft conducting IFR flights in advisory airspace or on advisory routes (Class F airspace). Such areas or routes will be specified by the State concerned.

9.1.4.1.2 Taking into account the considerations detailed in 2.4 of Annex 11, air traffic advisory service should only be implemented where the air traffic services are inadequate for the provision of air traffic control, and the limited advice on collision hazards otherwise provided by flight information service will not meet the requirement. Where air traffic advisory service is implemented, this should be considered normally as a temporary measure only until such time as it can be replaced by air traffic control service.

9.1.4.1.3 Air traffic advisory service does not afford the degree of safety and cannot assume the same responsibilities as air traffic control service in respect of the avoidance of collisions, since information regarding the disposition of traffic in the area concerned available to the unit providing air traffic advisory service may be incomplete.

To make this quite clear, air traffic advisory service does not deliver “clearances” but only “advisory information” and it uses the word “advise” or “suggest” when a course of action is proposed to an aircraft.

Note.— See 9.1.4.2.2.

9.1.4.2 AIRCRAFT

9.1.4.2.1 AIRCRAFT USING THE AIR TRAFFIC ADVISORY SERVICE

IFR flights electing to use or required by the appropriate ATS authority on the basis of regional air navigation agreements to use the air traffic advisory service when operating within Class F airspace are expected to comply with the same procedures as those applying to controlled flights except that:

- a) the flight plan and changes thereto are not subjected to a clearance, since the unit furnishing air traffic advisory service will only provide advice on the presence of essential traffic or suggestions as to a possible course of action;

Note 1.— It is assumed that a pilot will not effect a change in the current flight plan until he or she has notified the intended change to the appropriate ATS unit and, if practicable, has received acknowledgement or relevant advice.

Note 2.— When a flight is operating or about to operate in a control area to continue eventually into an advisory area or along an advisory route, a clearance may be issued for the whole route, but the clearance as such, or revisions thereto, applies only to those portions of the flight conducted within control areas and control zones (3.7.4.4 of Annex 11). Advice or suggestions would be provided as necessary for the remaining portion of the route.

- b) it is for the aircraft to decide whether or not it will comply with the advice or suggestion received and to inform the unit providing air traffic advisory service, without delay, of its decision;
- c) air-ground contacts shall be made with the air traffic services unit designated to provide air traffic advisory service within the advisory airspace or portion thereof.

Note.— See Chapter 4, 4.4.2, for procedures governing submission of a flight plan.

9.1.4.2.2 AIRCRAFT NOT USING THE AIR TRAFFIC ADVISORY SERVICE

9.1.4.2.2.1 Aircraft wishing to conduct IFR flights within advisory airspace, but not electing to use the air traffic advisory service, shall nevertheless submit a flight plan, and notify changes made thereto to the unit providing that service.

Note.— See Chapter 4, 4.4.2, for procedures governing submission of a flight plan.

9.1.4.2.2.2 IFR flights intending to cross an advisory route should do so as nearly as possible at an angle of 90 degrees to the direction of the route and at a level, appropriate to its track, selected from the tables of cruising levels prescribed for use by IFR flights operating outside controlled airspace.

9.1.4.3 AIR TRAFFIC SERVICES UNITS

Note.— The efficiency of air traffic advisory service will depend largely on the procedures and practices in use. Its establishment in line with the organization, procedures and equipment of area control service, taking into account the basic differences of the two services, as indicated in 9.1.4.2.1, will help to ensure a high degree of efficiency and promote

uniformity in the various provisions of air traffic advisory service. For example, exchange of information by the units concerned on the progress of an aircraft from one advisory area into an adjacent control area or terminal control area, and vice versa, will help to relieve pilots from repeating details of their flight plans already filed; also, use of standard air traffic control phraseology, preceded by the word “suggest” or “advise”, will facilitate the pilot’s understanding of air traffic advisory service intelligence.

9.1.4.3.1 An air traffic services unit providing air traffic advisory service shall:

- a) *advise* the aircraft to depart at the time specified and to cruise at the levels indicated in the flight plan if it does not foresee any conflict with other known traffic;
- b) *suggest* to aircraft a course of action by which a potential hazard may be avoided, giving priority to an aircraft already in advisory airspace over other aircraft desiring to enter such advisory airspace; and
- c) *pass* to aircraft traffic information comprising the same information as that prescribed for area control service.

9.1.4.3.2 The criteria used as a basis for action under b) and c) above should be at least those laid down for aircraft operating in controlled airspace and should take into account the limitations inherent in the provision of air traffic advisory service, navigation facilities and air-ground communications prevailing in the region.

9.2 ALERTING SERVICE

9.2.1 Aircraft

Note.— Whenever applied, the procedures for the provision of air traffic control service or air traffic advisory service take the place of the following procedures, except when relevant procedures do not call for more than hourly position reports, in which case the Operations normal procedure applies.

9.2.1.1 When so required by the appropriate ATS authority to facilitate the provision of alerting and search and rescue services, an aircraft, prior to and when operating within or into designated areas or along designated routes, shall comply with the provisions detailed in Annex 2, Chapter 3, concerning the submission, completion, changing and closing of a flight plan.

9.2.1.2 In addition to the above, aircraft equipped with suitable two-way radiocommunications shall report during the period twenty to forty minutes following the time of last contact, whatever the purpose of such contact, merely to indicate that the flight is progressing according to plan, such report to comprise identification of the aircraft and the words “Operations normal” or the signal QRU.

9.2.1.3 The “Operations normal” message shall be transmitted air-ground to an appropriate air traffic services unit (e.g. normally to the aeronautical telecommunication station serving the air traffic services unit in charge of the FIR in which the aircraft is flying, otherwise to another aeronautical telecommunication station to be retransmitted as required to the air traffic services unit in charge of the FIR).

9.2.1.4 It may be advisable, in case of a SAR operation of a substantial duration, to promulgate by NOTAM the lateral and vertical limits of the area of SAR action, and to warn aircraft not engaged in actual SAR operations and not controlled by air traffic control to avoid such areas unless otherwise authorized by the appropriate ATS unit.

9.2.2 Air traffic services units

9.2.2.1 When no report from an aircraft has been received within a reasonable period of time (which may be a specified interval prescribed on the basis of regional air navigation agreements) after a scheduled or expected reporting

time, the ATS unit shall, within the stipulated period of thirty minutes, endeavour to obtain such report in order to be in a position to apply the provisions relevant to the “Uncertainty Phase” (Annex 11, 5.2.1 refers) should circumstances warrant such application.

9.2.2.2 When alerting service is required in respect of a flight operated through more than one FIR or control area, and when the position of the aircraft is in doubt, responsibility for coordinating such service shall rest with the ATS unit of the FIR or control area:

- a) within which the aircraft was flying at the time of last air-ground radio contact;
- b) that the aircraft was about to enter when last air-ground contact was established at or close to the boundary of two FIRs or control areas;
- c) within which the aircraft’s intermediate stop or final destination point is located:
 - 1) if the aircraft was not equipped with suitable two-way radiocommunication equipment; or
 - 2) was not under obligation to transmit position reports.

9.2.2.3 The unit responsible for alerting service, in accordance with 9.2.2.2, shall:

- a) notify units providing alerting service in other affected FIRs or control areas of the emergency phase or phases, in addition to notifying the rescue coordination centre associated with it;
- b) request those units to assist in the search for any useful information pertaining to the aircraft presumed to be in an emergency, by all appropriate means and especially those indicated in 5.3 of Annex 11 (Use of communication facilities);
- c) collect the information gathered during each phase of the emergency and, after verifying it as necessary, transmit it to the rescue coordination centre;
- d) announce the termination of the state of emergency as circumstances dictate.

9.2.2.4 In obtaining the necessary information as required under 5.2.2.1 of Annex 11, attention shall particularly be given to informing the relevant rescue coordination centre of the distress frequencies available to survivors, as listed in Item 19 of the flight plan but not normally transmitted.

Chapter 12

PHRASEOLOGIES

12.1 COMMUNICATIONS PROCEDURES

The communications procedures shall be in accordance with Volume II of Annex 10 — *Aeronautical Telecommunications*, and pilots, ATS personnel and other ground personnel shall be thoroughly familiar with the radiotelephony procedures contained therein.

12.2 GENERAL

Note.— *Requirements for readback of clearances and safety-related information are provided in Chapter 4, 4.5.7.5.*

12.2.1 Most phraseologies contained in Section 12.3 of this Chapter show the text of a complete message without call signs. They are not intended to be exhaustive, and when circumstances differ, pilots, ATS personnel and other ground personnel will be expected to use plain language, which should be as clear and concise as possible, to the level specified in the ICAO language proficiency requirements contained in Annex 1 — *Personnel Licensing*, in order to avoid possible confusion by those persons using a language other than one of their national languages.

12.2.2 The phraseologies are grouped according to types of air traffic service for convenience of reference. However, users shall be familiar with, and use as necessary, phraseologies from groups other than those referring specifically to the type of air traffic service being provided. All phraseologies shall be used in conjunction with call signs (aircraft, ground vehicle, ATC or other) as appropriate. In order that the phraseologies listed should be readily discernible in Section 12.3, call signs have been omitted. Provisions for the compilation of RTF messages, call signs and procedures are contained in Annex 10, Volume II, Chapter 5.

12.2.3 Section 12.3 includes phrases for use by pilots, ATS personnel and other ground personnel.

12.2.4 During operations in or vertical transit through reduced vertical separation minimum (RVSM) airspace with aircraft not approved for RVSM operations, pilots shall report non-approved status in accordance with 12.3.1.12 c) as follows:

- a) at initial call on any channel within RVSM airspace;
- b) in all requests for level changes; and
- c) in all readbacks of level clearances.

12.2.5 Air traffic controllers shall explicitly acknowledge receipt of messages from aircraft reporting RVSM non-approved status.

12.2.6 Phraseologies for the movement of vehicles, other than tow-tractors, on the manoeuvring area shall be the same as those used for the movement of aircraft, with the exception of taxi instructions, in which case the word “PROCEED” shall be substituted for the word “TAXI” when communicating with vehicles.

12.2.7 Conditional phrases, such as “behind landing aircraft” or “after departing aircraft”, shall not be used for movements affecting the active runway(s), except when the aircraft or vehicles concerned are seen by the appropriate controller and pilot. The aircraft or vehicle causing the condition in the clearance issued shall be the first aircraft/vehicle to pass in front of the other aircraft concerned. In all cases a conditional clearance shall be given in the following order and consist of:

- a) identification;
- b) the condition;
- c) the clearance; and
- d) brief reiteration of the condition,

for example:

“SAS 941, BEHIND DC9 ON SHORT FINAL, LINE UP BEHIND”.

Note.— This implies the need for the aircraft receiving the conditional clearance to identify the aircraft or vehicle causing the conditional clearance.

12.2.8 The phraseology in Section 12.3 does not include phrases and regular radiotelephony procedure words contained in Annex 10, Volume II.

12.2.9 Words in parentheses indicate that specific information, such as a level, a place or a time, etc., must be inserted to complete the phrase, or alternatively that optional phrases may be used. Words in square parentheses indicate optional additional words or information that may be necessary in specific instances.

12.2.10 Examples of the application of the phraseologies may be found in the *Manual of Radiotelephony* (Doc 9432).

12.3 ATC PHRASEOLOGIES

12.3.1 General

<i>Circumstances</i>	<i>Phraseologies</i>
12.3.1.1 DESCRIPTION OF LEVELS (SUBSEQUENTLY REFERRED TO AS “(LEVEL)”)	a) FLIGHT LEVEL (<i>number</i>); <i>or</i> b) (<i>number</i>) METRES; <i>or</i> c) (<i>number</i>) FEET.
12.3.1.2 LEVEL CHANGES, REPORTS AND RATES	a) CLIMB (<i>or</i> DESCEND); <i>followed as necessary by:</i> 1) TO (<i>level</i>);

<i>Circumstances</i>	<i>Phraseologies</i>
... instruction that a climb (or descent) to a level within the vertical range defined is to commence	2) TO AND MAINTAIN BLOCK (<i>level</i>) TO (<i>level</i>); 3) TO REACH (<i>level</i>) AT (<i>or BY</i>) (<i>time or significant point</i>); 4) REPORT LEAVING (<i>or REACHING, or PASSING</i>) (<i>level</i>); 5) AT (<i>number</i>) METRES PER SECOND (<i>or FEET PER MINUTE</i>) [OR GREATER (<i>or OR LESS</i>)];
... for SST aircraft only	6) REPORT STARTING ACCELERATION (<i>or DECELERATION</i>). b) MAINTAIN AT LEAST (<i>number</i>) METRES (<i>or FEET</i>) ABOVE (<i>or BELOW</i>) (<i>aircraft call sign</i>); c) REQUEST LEVEL (<i>or FLIGHT LEVEL or ALTITUDE</i>) CHANGE FROM (<i>name of unit</i>) [AT (<i>time or significant point</i>)]; d) STOP CLIMB (<i>or DESCENT</i>) AT (<i>level</i>); e) CONTINUE CLIMB (<i>or DESCENT</i>) TO (<i>level</i>); f) EXPEDITE CLIMB (<i>or DESCENT</i>) [UNTIL PASSING (<i>level</i>)]; g) WHEN READY CLIMB (<i>or DESCEND</i>) TO (<i>level</i>); h) EXPECT CLIMB (<i>or DESCENT</i>) AT (<i>time or significant point</i>); *i) REQUEST DESCENT AT (<i>time</i>);
... to require action at a specific time or place	j) IMMEDIATELY; k) AFTER PASSING (<i>significant point</i>); l) AT (<i>time or significant point</i>);
... to require action when convenient	m) WHEN READY (<i>instruction</i>);

<i>Circumstances</i>	<i>Phraseologies</i>
... to require an aircraft to climb or descend maintaining own separation and VMC	n) MAINTAIN OWN SEPARATION AND VMC [FROM (<i>level</i>)] [TO (<i>level</i>)];
	o) MAINTAIN OWN SEPARATION AND VMC ABOVE (<i>or</i> BELOW, <i>or</i> TO) (<i>level</i>);
... when there is doubt that an aircraft can comply with a clearance or instruction	p) IF UNABLE (<i>alternative instructions</i>) AND ADVISE;
... when a pilot is unable to comply with a clearance or instruction	*q) UNABLE;
... after a flight crew starts to deviate from any ATC clearance or instruction to comply with an ACAS resolution advisory (RA) (Pilot and controller interchange)	*r) TCAS RA; s) ROGER;
... after the response to an ACAS RA is completed and a return to the ATC clearance or instruction is initiated (Pilot and controller interchange)	*t) CLEAR OF CONFLICT, RETURNING TO (<i>assigned clearance</i>); u) ROGER (<i>or alternative instructions</i>);
... after the response to an ACAS RA is completed and the assigned ATC clearance or instruction has been resumed (Pilot and controller interchange)	*v) CLEAR OF CONFLICT (<i>assigned clearance</i>) RESUMED; w) ROGER (<i>or alternative instructions</i>);
... after an ATC clearance or instruction contradictory to the ACAS RA is received, the flight crew will follow the RA and inform ATC directly (Pilot and controller interchange)	*x) UNABLE, TCAS RA; y) ROGER;

<i>Circumstances</i>	<i>Phraseologies</i>
... clearance to climb on a SID which has published level and/or speed restrictions, where the pilot is to climb to the cleared level and comply with published level restrictions, follow the lateral profile of the SID and comply with published speed restrictions or ATC issued speed control instructions as applicable.	z) CLIMB VIA SID TO <i>(level)</i> .
... clearance to cancel level restriction(s) of the vertical profile of a SID during climb	aa) [CLIMB VIA SID TO <i>(level)</i>], CANCEL LEVEL RESTRICTION(S);
... clearance to cancel specific level restriction(s) of the vertical profile of a SID during climb	bb) [CLIMB VIA SID TO <i>(level)</i>], CANCEL LEVEL RESTRICTION(S) AT <i>(point(s))</i> ;
... clearance to cancel speed restrictions of a SID during climb	cc) [CLIMB VIA SID TO <i>(level)</i>], CANCEL SPEED RESTRICTION(S);
... clearance to cancel specific speed restrictions of a SID during climb	dd) [CLIMB VIA SID TO <i>(level)</i>], CANCEL SPEED RESTRICTION(S) AT <i>(point(s))</i> ;
...clearance to climb and to cancel speed and level restrictions of a SID	ee) CLIMB UNRESTRICTED TO <i>(level)</i> (or) CLIMB TO <i>(level)</i> , CANCEL LEVEL AND SPEED RESTRICTIONS;
... clearance to descend on a STAR which has published level and/or speed restrictions, where the pilot is to descend to the cleared level and comply with published level restrictions, follow the lateral profile of the STAR and comply with published speed restrictions or ATC issued speed control instructions.	ff) DESCEND VIA STAR TO <i>(level)</i> ;

<i>Circumstances</i>	<i>Phraseologies</i>
... clearance to cancel level restrictions of a STAR during descent	gg) [DESCEND VIA STAR TO <i>(level)</i>], CANCEL LEVEL RESTRICTION(S);
... clearance to cancel specific level restrictions of a STAR during descent	hh) [DESCEND VIA STAR TO <i>(level)</i>], CANCEL LEVEL RESTRICTION(S) AT <i>(point(s))</i> ;
... clearance to cancel speed restrictions of a STAR during descent	ii) [DESCEND VIA STAR TO <i>(level)</i>], CANCEL SPEED RESTRICTION(S);
... clearance to cancel specific speed restrictions of a STAR during descent	jj) [DESCEND VIA STAR TO <i>(level)</i>], CANCEL SPEED RESTRICTION(S) AT <i>(point(s))</i> ;
... clearance to descend and to cancel speed and level restrictions of a STAR	kk) DESCEND UNRESTRICTED TO <i>(level)</i> or DESCEND TO <i>(level)</i> , CANCEL LEVEL AND SPEED RESTRICTIONS.
	* Denotes pilot transmission.
12.3.1.3 MINIMUM FUEL	
... indication of minimum fuel	*a) MINIMUM FUEL; b) ROGER [NO DELAY EXPECTED or EXPECT <i>(delay information)</i>].
	* Denotes pilot transmission.
12.3.1.4 TRANSFER OF CONTROL AND/OR FREQUENCY CHANGE	
	a) CONTACT <i>(unit call sign) (frequency)</i> [NOW];
	b) AT <i>(or OVER) (time or place)</i> [or WHEN] [PASSING/LEAVING/REACHING <i>(level)</i>] CONTACT <i>(unit call sign) (frequency)</i> ;
	c) IF NO CONTACT <i>(instructions)</i> ;
<i>Note.— An aircraft may be</i>	d) STAND BY FOR <i>(unit call sign) (frequency)</i> ;

Circumstances	Phraseologies
<p>requested to “STAND BY” on a frequency when it is intended that the ATS unit will initiate communications soon and to “MONITOR” a frequency when information is being broadcast thereon.</p>	<p>*e) REQUEST CHANGE TO (frequency); f) FREQUENCY CHANGE APPROVED; g) MONITOR (unit call sign) (frequency); *h) MONITORING (frequency); i) WHEN READY CONTACT (unit call sign) (frequency); j) REMAIN THIS FREQUENCY. * Denotes pilot transmission.</p>
<p>12.3.1.5 8.33 kHz CHANNEL SPACING</p> <p><i>Note.— In this paragraph, the term “point” is used only in the context of naming the 8.33 kHz channel spacing concept and does not constitute any change to existing ICAO provisions or phraseology regarding the use of the term “decimal”.</i></p>	<p>a) CONFIRM EIGHT POINT THREE THREE; *b) AFFIRM EIGHT POINT THREE THREE; *c) NEGATIVE EIGHT POINT THREE THREE; d) CONFIRM UHF; *e) AFFIRM UHF; *f) NEGATIVE UHF; g) CONFIRM EIGHT POINT THREE THREE EXEMPTED; *h) AFFIRM EIGHT POINT THREE THREE EXEMPTED; *i) NEGATIVE EIGHT POINT THREE THREE EXEMPTED;</p>
<p>... to request confirmation of 8.33 kHz capability</p>	<p>a) CONFIRM EIGHT POINT THREE THREE;</p>
<p>... to indicate 8.33 kHz capability</p>	<p>*b) AFFIRM EIGHT POINT THREE THREE;</p>
<p>... to indicate lack of 8.33 kHz capability</p>	<p>*c) NEGATIVE EIGHT POINT THREE THREE;</p>
<p>... to request UHF capability</p>	<p>d) CONFIRM UHF;</p>
<p>... to indicate UHF capability</p>	<p>*e) AFFIRM UHF;</p>
<p>... to indicate lack of UHF capability</p>	<p>*f) NEGATIVE UHF;</p>
<p>... to request status in respect of 8.33 kHz exemption</p>	<p>g) CONFIRM EIGHT POINT THREE THREE EXEMPTED;</p>
<p>... to indicate 8.33 kHz exempted status</p>	<p>*h) AFFIRM EIGHT POINT THREE THREE EXEMPTED;</p>
<p>... to indicate 8.33 kHz non-exempted status</p>	<p>*i) NEGATIVE EIGHT POINT THREE THREE EXEMPTED;</p>

<i>Circumstances</i>	<i>Phraseologies</i>
<p>... to indicate that a certain clearance is given because otherwise a non-equipped and/or non-exempted aircraft would enter airspace of mandatory carriage</p>	<p>j) DUE EIGHT POINT THREE THREE REQUIREMENT.</p> <p>* Denotes pilot transmission.</p>
<p>12.3.1.6 CHANGE OF CALL SIGN</p> <p>... to instruct an aircraft to change its type of call sign</p> <p>... to advise an aircraft to revert to the call sign indicated in the flight plan</p>	<p>a) CHANGE YOUR CALL SIGN TO (<i>new call sign</i>) [UNTIL FURTHER ADVISED];</p> <p>b) REVERT TO FLIGHT PLAN CALL SIGN (<i>call sign</i>) [AT (<i>significant point</i>)].</p>
<p>12.3.1.7 TRAFFIC INFORMATION</p> <p>... to pass traffic information</p> <p>... to acknowledge traffic information</p>	<p>a) TRAFFIC (<i>information</i>);</p> <p>b) NO REPORTED TRAFFIC;</p> <p>*c) LOOKING OUT;</p> <p>*d) TRAFFIC IN SIGHT;</p> <p>*e) NEGATIVE CONTACT [<i>reasons</i>];</p> <p>f) [ADDITIONAL] TRAFFIC (<i>direction</i>) BOUND (<i>type of aircraft</i>) (<i>level</i>) ESTIMATED (<i>or OVER</i>) (<i>significant point</i>) AT (<i>time</i>);</p> <p>g) TRAFFIC IS (<i>classification</i>) UNMANNED FREE BALLOON(S) WAS [<i>or ESTIMATED</i>] OVER (<i>place</i>) AT (<i>time</i>) REPORTED (<i>level(s)</i>) [<i>or LEVEL UNKNOWN</i>] MOVING (<i>direction</i>) (<i>other pertinent information, if any</i>).</p> <p>* Denotes pilot transmission.</p>
<p>12.3.1.8 METEOROLOGICAL CONDITIONS</p>	<p>a) [SURFACE] WIND (<i>number</i>) DEGREES (<i>speed</i>) (<i>units</i>);</p> <p>b) WIND AT (<i>level</i>) (<i>number</i>) DEGREES (<i>number</i>) KILOMETRES PER HOUR (<i>or KNOTS</i>);</p> <p style="text-align: center;"><i>Note.— Wind is always expressed by giving the mean direction and speed and any significant variations thereof.</i></p> <p>c) VISIBILITY (<i>distance</i>) (<i>units</i>) [<i>direction</i>];</p> <p>d) RUNWAY VISUAL RANGE (<i>or RVR</i>) [RUNWAY (<i>number</i>)] (<i>distance</i>) (<i>units</i>);</p>

Circumstances	Phraseologies
... for multiple RVR observations	<p>e) RUNWAY VISUAL RANGE (or RVR) RUNWAY (number) NOT AVAILABLE (or NOT REPORTED);</p> <p>f) RUNWAY VISUAL RANGE (or RVR) [RUNWAY (number)] (first position) (distance) (units), (second position) (distance) (units), (third position) (distance) (units);</p> <p><i>Note 1.— Multiple RVR observations are always representative of the touchdown zone, midpoint zone and the roll-out/stop end zone, respectively.</i></p> <p><i>Note 2.— Where reports for three locations are given, the indication of these locations may be omitted, provided that the reports are passed in the order of touchdown zone, followed by the midpoint zone and ending with the roll-out/stop end zone report.</i></p>
... in the event that RVR information on any one position is not available this information will be included in the appropriate sequence	<p>g) RUNWAY VISUAL RANGE (or RVR) [RUNWAY (number)] (first position) (distance) (units), (second position) NOT AVAILABLE, (third position) (distance) (units);</p> <p>h) PRESENT WEATHER (details);</p> <p>i) CLOUD (amount, [(type)] and height of base) (units) (or SKY CLEAR);</p> <p><i>Note.— Details of the means to describe the amount and type of cloud are in Chapter 11, 11.4.3.2.3.</i></p> <p>j) CAVOK;</p> <p><i>Note.— CAVOK pronounced CAV-O-KAY.</i></p> <p>k) TEMPERATURE [MINUS] (number) (and/or DEWPOINT [MINUS] (number));</p> <p>l) QNH (number) [(units)];</p> <p>m) QFE (number) [(units)];</p> <p>n) (aircraft type) REPORTED (description) ICING (or TURBULENCE) [IN CLOUD] (area) (time);</p> <p>o) REPORT FLIGHT CONDITIONS.</p>
12.3.1.9 POSITION REPORTING	a) NEXT REPORT AT (significant point);

<i>Circumstances</i>	<i>Phraseologies</i>
... to omit position reports until a specified position	b) OMIT POSITION REPORTS [UNTIL (<i>specify</i>)]; c) RESUME POSITION REPORTING.
12.3.1.10 ADDITIONAL REPORTS	a) REPORT PASSING (<i>significant point</i>);
... to request a report at a specified place or distance	b) REPORT (<i>distance</i>) MILES (GNSS or DME) FROM (<i>name of DME station</i>) (or <i>significant point</i>);
... to report at a specified place or distance	*c) (<i>distance</i>) MILES (GNSS or DME) FROM (<i>name of DME station</i>) (or <i>significant point</i>);
... to request a report of present position	d) REPORT PASSING (<i>three digits</i>) RADIAL (<i>name of VOR</i>) VOR;
... to report present position	e) REPORT (GNSS or DME) DISTANCE FROM (<i>significant point</i>) or (<i>name of DME station</i>); *f) (<i>distance</i>) MILES (GNSS or DME) FROM (<i>name of DME station</i>) (or <i>significant point</i>). * Denotes pilot transmission.
12.3.1.11 AERODROME INFORMATION	a) [(<i>location</i>)] RUNWAY SURFACE CONDITION RUNWAY (<i>number</i>) (<i>condition</i>);
	b) [(<i>location</i>)] RUNWAY SURFACE CONDITION RUNWAY (<i>number</i>) NOT CURRENT;
	c) LANDING SURFACE (<i>condition</i>);
	d) CAUTION CONSTRUCTION WORK (<i>location</i>);
	e) CAUTION (<i>specify reasons</i>) RIGHT (or LEFT), (or BOTH SIDES) OF RUNWAY [<i>number</i>];
	f) CAUTION WORK IN PROGRESS (or OBSTRUCTION) (<i>position and any necessary advice</i>);
	g) RUNWAY REPORT AT (<i>observation time</i>) RUNWAY (<i>number</i>) (<i>type of precipitant</i>) UP TO (<i>depth of deposit</i>) MILLIMETRES. ESTIMATED SURFACE FRICTION GOOD (or MEDIUM TO GOOD, or MEDIUM, or MEDIUM TO POOR, or POOR);
	h) BRAKING ACTION REPORTED BY (<i>aircraft type</i>) AT (<i>time</i>) GOOD (or MEDIUM to GOOD, or MEDIUM, or MEDIUM to POOR, or POOR);

<i>Circumstances</i>	<i>Phraseologies</i>
12.3.1.12 OPERATIONAL STATUS OF VISUAL AND NON-VISUAL AIDS	<p>i) RUNWAY (or TAXIWAY) (number) WET [or STANDING WATER, or SNOW REMOVED (length and width as applicable), or TREATED, or COVERED WITH PATCHES OF DRY SNOW (or WET SNOW, or COMPACTED SNOW, or SLUSH, or FROZEN SLUSH, or ICE, or WET ICE, or ICE UNDERNEATH, or ICE AND SNOW, or SNOWDRIFTS, or FROZEN RUTS AND RIDGES)];</p> <p>j) TOWER OBSERVES (weather information);</p> <p>k) PILOT REPORTS (weather information).</p> <hr/> <p>a) (specify visual or non-visual aid) RUNWAY (number) (description of deficiency);</p> <p>b) (type) LIGHTING (unservicability);</p> <p>c) GBAS/SBAS/MLS/ILS CATEGORY (category) (servicability state);</p> <p>d) TAXIWAY LIGHTING (description of deficiency);</p> <p>e) (type of visual approach slope indicator) RUNWAY (number) (description of deficiency).</p>

<i>Circumstances</i>	<i>Phraseologies</i>
12.3.1.13 REDUCED VERTICAL SEPARATION MINIMUM (RVSM) OPERATIONS	
... to ascertain RVSM approval status of an aircraft	a) CONFIRM RVSM APPROVED;
... to report RVSM approved status	*b) AFFIRM RVSM;
... to report RVSM non-approved status followed by supplementary information	*c) NEGATIVE RVSM [(supplementary information, e.g. State aircraft)];
<i>Note.— See 12.2.4 and 12.2.5 for procedures relating to operations in RVSM airspace by aircraft with non-approved status.</i>	
... to deny ATC clearance into RVSM airspace	d) UNABLE ISSUE CLEARANCE INTO RVSM AIRSPACE, MAINTAIN [or DESCEND TO, or CLIMB TO] (level);
... to report when severe turbulence affects the capability of an aircraft to maintain height-keeping requirements for RVSM	*e) UNABLE RVSM DUE TURBULENCE;
... to report that the equipment of an aircraft has degraded below minimum aviation system performance standards	*f) UNABLE RVSM DUE EQUIPMENT;
...to request an aircraft to provide information as soon as RVSM-approved status has been regained or the pilot is ready to resume RVSM operations	g) REPORT WHEN ABLE TO RESUME RVSM;
... to request confirmation that an aircraft has regained RVSM-approved status or a pilot is ready to resume RVSM operations	h) CONFIRM ABLE TO RESUME RVSM;
... to report ability to resume RVSM operations after an equipment or weather-related contingency	*i) READY TO RESUME RVSM.
	* Denotes pilot transmission.

<i>Circumstances</i>	<i>Phraseologies</i>
12.3.1.14 GNSS SERVICE STATUS	<p>a) GNSS REPORTED UNRELIABLE (or GNSS MAY NOT BE AVAILABLE [DUE TO INTERFERENCE]);</p> <p>1) IN THE VICINITY OF (<i>location</i>) (<i>radius</i>) [BETWEEN (<i>levels</i>)]; or</p> <p>2) IN THE AREA OF (<i>description</i>) (or IN (<i>name</i>) FIR) [BETWEEN (<i>levels</i>)];</p> <p>b) BASIC GNSS (or SBAS, or GBAS) UNAVAILABLE FOR (<i>specify operation</i>) [FROM (<i>time</i>) TO (<i>time</i>) (or UNTIL FURTHER NOTICE)];</p> <p>*c) BASIC GNSS UNAVAILABLE [DUE TO (<i>reason, e.g. LOSS OF RAIM or RAIM ALERT</i>)];</p> <p>*d) GBAS (or SBAS) UNAVAILABLE;</p> <p>e) CONFIRM GNSS NAVIGATION; and</p> <p>*f) AFFIRM GNSS NAVIGATION.</p> <p>* Denotes pilot transmission.</p>
12.3.1.15 DEGRADATION OF AIRCRAFT NAVIGATION PERFORMANCE	UNABLE RNP (<i>specify type</i>) (or RNAV) [DUE TO (<i>reason, e.g. LOSS OF RAIM or RAIM ALERT</i>)].

12.3.2 Area control services

<i>Circumstances</i>	<i>Phraseologies</i>
12.3.2.1 ISSUANCE OF A CLEARANCE	<p>a) (<i>name of unit</i>) CLEARS (<i>aircraft call sign</i>);</p> <p>b) (<i>aircraft call sign</i>) CLEARED TO;</p> <p>c) RECLEARED (<i>amended clearance details</i>) [REST OF CLEARANCE UNCHANGED];</p> <p>d) RECLEARED (<i>amended route portion</i>) TO (<i>significant point of original route</i>) [REST OF CLEARANCE UNCHANGED];</p> <p>e) ENTER CONTROLLED AIRSPACE (or CONTROL ZONE) [VIA (<i>significant point or route</i>)] AT (<i>level</i>) [AT (<i>time</i>)];</p> <p>f) LEAVE CONTROLLED AIRSPACE (or CONTROL ZONE) [VIA (<i>significant point or route</i>)] AT (<i>level</i>) (or CLIMBING, or DESCENDING);</p> <p>g) JOIN (<i>specify</i>) AT (<i>significant point</i>) AT (<i>level</i>) [AT (<i>time</i>)].</p>

<i>Circumstances</i>	<i>Phraseologies</i>
12.3.2.2 INDICATION OF ROUTE AND CLEARANCE LIMIT	<p>a) FROM (<i>location</i>) TO (<i>location</i>);</p> <p>b) TO (<i>location</i>), <i>followed as necessary by:</i></p> <p>1) DIRECT;</p> <p>2) VIA (<i>route and/or significant points</i>);</p> <p>3) FLIGHT PLANNED ROUTE;</p> <p style="text-align: center;"><i>Note.— Conditions associated with the use of this phrase are in Chapter 4, 4.5.7.2.</i></p> <p>4) VIA (<i>distance</i>) DME ARC (<i>direction</i>) OF (<i>name of DME station</i>);</p> <p>c) (<i>route</i>) NOT AVAILABLE DUE (<i>reason</i>) ALTERNATIVE[S] IS/ARE (<i>routes</i>) ADVISE.</p>
12.3.2.3 MAINTENANCE OF SPECIFIED LEVELS	<p>a) MAINTAIN (<i>level</i>) [TO (<i>significant point</i>)];</p> <p>b) MAINTAIN (<i>level</i>) UNTIL PASSING (<i>significant point</i>);</p> <p>c) MAINTAIN (<i>level</i>) UNTIL (<i>minutes</i>) AFTER PASSING (<i>significant point</i>);</p> <p>d) MAINTAIN (<i>level</i>) UNTIL (<i>time</i>);</p> <p>e) MAINTAIN (<i>level</i>) UNTIL ADVISED BY (<i>name of unit</i>);</p> <p>f) MAINTAIN (<i>level</i>) UNTIL FURTHER ADVISED;</p> <p>g) MAINTAIN (<i>level</i>) WHILE IN CONTROLLED AIRSPACE;</p> <p>h) MAINTAIN BLOCK (<i>level</i>) TO (<i>level</i>).</p> <p style="text-align: center;"><i>Note.— The term “MAINTAIN” is not to be used in lieu of “DESCEND” or “CLIMB” when instructing an aircraft to change level.</i></p>
12.3.2.4 SPECIFICATION OF CRUISING LEVELS	<p>a) CROSS (<i>significant point</i>) AT (<i>or ABOVE, or BELOW</i>) (<i>level</i>);</p> <p>b) CROSS (<i>significant point</i>) AT (<i>time</i>) OR LATER (<i>or BEFORE</i>) AT (<i>level</i>);</p> <p>c) CRUISE CLIMB BETWEEN (<i>levels</i>) (<i>or ABOVE (level)</i>);</p> <p>d) CROSS (<i>distance</i>) MILES, (GNSS or DME) [(<i>direction</i>)] OF (<i>name of DME station</i>) OR (<i>distance</i>) [(<i>direction</i>)] OF (<i>significant point</i>) AT (<i>or ABOVE or BELOW</i>) (<i>level</i>).</p>

<i>Circumstances</i>	<i>Phraseologies</i>
12.3.2.5 EMERGENCY DESCENT	<p>*a) EMERGENCY DESCENT (<i>intentions</i>);</p> <p>b) ATTENTION ALL AIRCRAFT IN THE VICINITY OF [<i>or AT</i>] (<i>significant point or location</i>) EMERGENCY DESCENT IN PROGRESS FROM (<i>level</i>) (followed as necessary by specific instructions, clearances, traffic information, etc.).</p> <p>* Denotes pilot transmission.</p>
12.3.2.6 IF CLEARANCE CANNOT BE ISSUED IMMEDIATELY UPON REQUEST	EXPECT CLEARANCE (<i>or type of clearance</i>) AT (<i>time</i>).
12.3.2.7 WHEN CLEARANCE FOR DEVIATION CANNOT BE ISSUED	UNABLE, TRAFFIC (<i>direction</i>) BOUND (<i>type of aircraft</i>) (<i>level</i>) ESTIMATED (<i>or OVER</i>) (<i>significant point</i>) AT (<i>time</i>) CALL SIGN (<i>call sign</i>) ADVISE INTENTIONS.
12.3.2.8 SEPARATION INSTRUCTIONS	<p>a) CROSS (<i>significant point</i>) AT (<i>time</i>) [OR LATER (<i>or OR BEFORE</i>)];</p> <p>b) ADVISE IF ABLE TO CROSS (<i>significant point</i>) AT (<i>time or level</i>);</p> <p>c) MAINTAIN MACH (<i>number</i>) [OR GREATER (<i>or OR LESS</i>)] [UNTIL (<i>significant point</i>)];</p> <p>d) DO NOT EXCEED MACH (<i>number</i>).</p> <p>e) CONFIRM ESTABLISHED ON THE TRACK BETWEEN (<i>significant point</i>) AND (<i>significant point</i>) [WITH ZERO OFFSET];</p> <p>*f) ESTABLISHED ON THE TRACK BETWEEN (<i>significant point</i>) AND (<i>significant point</i>) [WITH ZERO OFFSET];</p> <p>g) MAINTAIN TRACK BETWEEN (<i>significant point</i>) AND (<i>significant point</i>). REPORT ESTABLISHED ON THE TRACK;</p> <p>*h) ESTABLISHED ON THE TRACK;</p> <p>i) CONFIRM ZERO OFFSET;</p> <p>*j) AFFIRM ZERO OFFSET.</p> <p>* Denotes pilot transmission.</p>
<p><i>Note.— When used to apply a lateral VOR/GNSS separation confirmation of zero offset is required (see 5.4.1.2).</i></p>	
12.3.2.9 INSTRUCTIONS ASSOCIATED WITH FLYING A TRACK (OFFSET), PARALLEL TO THE CLEARED ROUTE	<p>a) ADVISE IF ABLE TO PROCEED PARALLEL OFFSET;</p> <p>b) PROCEED OFFSET (<i>distance</i>) RIGHT/LEFT OF (<i>route</i>) (<i>track</i>) [CENTRE LINE] [AT (<i>significant point or time</i>)] [UNTIL (<i>significant point or time</i>)];</p> <p>c) CANCEL OFFSET (<i>instructions to rejoin cleared flight route or other information</i>).</p>

12.3.3 Approach control services

<i>Circumstances</i>	<i>Phraseologies</i>
12.3.3.1 DEPARTURE INSTRUCTIONS	<p>a) [AFTER DEPARTURE] TURN RIGHT (or LEFT) HEADING (three digits) (or CONTINUE RUNWAY HEADING) (or TRACK EXTENDED CENTRE LINE) TO (level or significant point) [(other instructions as required)];</p> <p>b) AFTER REACHING (or PASSING) (level or significant point) (instructions);</p> <p>c) TURN RIGHT (or LEFT) HEADING (three digits) TO (level) [TO INTERCEPT (track, route, airway, etc.)];</p> <p>d) (standard departure name and number) DEPARTURE;</p> <p>e) TRACK (three digits) DEGREES [MAGNETIC (or TRUE)] TO (or FROM) (significant point) UNTIL (time, or REACHING (fix or significant point or level)) [BEFORE PROCEEDING ON COURSE];</p> <p>f) CLEARED (designation) DEPARTURE;</p> <p style="text-align: center;"><i>Note.— Conditions associated with the use of this phrase are in Chapter 4, 4.5.7.2.</i></p> <p>g) CLEARED DIRECT (waypoint), CLIMB TO (level), EXPECT TO REJOIN SID [(SID designator)] [AT (waypoint)], <i>then</i> REJOIN SID [(SID designator)] [AT (waypoint)];</p> <p>h) CLEARED DIRECT (waypoint), CLIMB TO (level), <i>then</i> REJOIN SID (SID designator) AT (waypoint).</p>
...clearance to proceed direct with advance notice of a future instruction to rejoin the SID	
12.3.3.2 APPROACH INSTRUCTIONS	<p>a) CLEARED (designation) ARRIVAL;</p> <p>b) CLEARED TO (clearance limit) (designation);</p> <p>c) CLEARED (or PROCEED) (details of route to be followed);</p>

Circumstances	Phraseologies
...clearance to proceed direct with advance notice of a future instruction to rejoin the STAR	<p>d) CLEARED DIRECT (<i>waypoint</i>), DESCEND TO (<i>level</i>), EXPECT TO REJOIN STAR [(<i>STAR designator</i>)] AT (<i>waypoint</i>),</p> <p><i>then</i></p> <p>REJOIN STAR [(<i>STAR designator</i>)] [AT (<i>waypoint</i>)];</p> <p>e) CLEARED DIRECT (<i>waypoint</i>), DESCEND TO (<i>level</i>),</p> <p><i>then</i></p> <p>REJOIN STAR (<i>STAR designator</i>) AT (<i>waypoint</i>);</p> <p>f) CLEARED (<i>type of approach</i>) APPROACH [RUNWAY (<i>number</i>)];</p> <p>g) CLEARED (<i>type of approach</i>) RUNWAY (<i>number</i>) FOLLOWED BY CIRCLING TO RUNWAY (<i>number</i>);</p> <p>h) CLEARED APPROACH [RUNWAY (<i>number</i>)];</p> <p>i) COMMENCE APPROACH AT (<i>time</i>);</p> <p>*j) REQUEST STRAIGHT-IN [(<i>type of approach</i>)] APPROACH [RUNWAY (<i>number</i>)];</p> <p>k) CLEARED STRAIGHT-IN [(<i>type of approach</i>)] APPROACH [RUNWAY (<i>number</i>)];</p> <p>l) REPORT VISUAL;</p> <p>m) REPORT RUNWAY [LIGHTS] IN SIGHT;</p>
... when a pilot requests a visual approach	<p>*n) REQUEST VISUAL APPROACH;</p> <p>o) CLEARED VISUAL APPROACH RUNWAY (<i>number</i>);</p>
... to request if a pilot is able to accept a visual approach	<p>p) ADVISE ABLE TO ACCEPT VISUAL APPROACH RUNWAY (<i>number</i>);</p>
<p><i>Note.—See 6.5.3 for provisions relating to visual approach procedures.</i></p>	

Circumstances	Phraseologies
... in case of successive visual approaches when the pilot of a succeeding aircraft has reported having the preceding aircraft in sight	<p>q) CLEARED VISUAL APPROACH RUNWAY (<i>number</i>), MAINTAIN OWN SEPARATION FROM PRECEDING (<i>aircraft type and wake turbulence category as appropriate</i>) [CAUTION WAKE TURBULENCE];</p> <p>r) REPORT (<i>significant point</i>); [OUTBOUND, <i>or</i> INBOUND];</p> <p>s) REPORT COMMENCING PROCEDURE TURN;</p> <p>*t) REQUEST VMC DESCENT;</p> <p>u) MAINTAIN OWN SEPARATION;</p> <p>v) MAINTAIN VMC;</p> <p>w) ARE YOU FAMILIAR WITH (<i>name</i>) APPROACH PROCEDURE;</p> <p>*x) REQUEST (<i>type of approach</i>) APPROACH [RUNWAY (<i>number</i>)];</p> <p>*y) REQUEST (MLS/RNAV plain-language designator);</p> <p>z) CLEARED (<i>MLS/RNAV plain-language designator</i>).</p> <p>* Denotes pilot transmission.</p>
12.3.3.3 HOLDING CLEARANCES	<p>a) HOLD VISUAL [OVER] (<i>position</i>), (<i>or</i> BETWEEN (<i>two prominent landmarks</i>));</p> <p>b) CLEARED (<i>or</i> PROCEED) TO (<i>significant point, name of facility or fix</i>) [MAINTAIN (<i>or</i> CLIMB <i>or</i> DESCEND TO (<i>level</i>)] HOLD [(<i>direction</i>)] AS PUBLISHED EXPECT APPROACH CLEARANCE (<i>or</i> FURTHER CLEARANCE) AT (<i>time</i>);</p> <p>*c) REQUEST HOLDING INSTRUCTIONS;</p> <p>d) CLEARED (<i>or</i> PROCEED) TO (<i>significant point, name of facility or fix</i>) [MAINTAIN (<i>or</i> CLIMB <i>or</i> DESCEND TO (<i>level</i>)] HOLD [(<i>direction</i>)] [(<i>specified</i>) RADIAL, COURSE, INBOUND TRACK (<i>three digits</i>) DEGREES] [RIGHT (<i>or</i> LEFT) HAND PATTERN] [OUTBOUND TIME (<i>number</i>) MINUTES] EXPECT APPROACH CLEARANCE (<i>or</i> FURTHER CLEARANCE) AT (<i>time</i>) (<i>additional instructions, if necessary</i>);</p>
... visual	
... published holding procedure over a facility or fix	
... when a detailed holding clearance is required	

Circumstances

Phraseologies

- e) CLEARED TO THE *(three digits)* RADIAL OF THE *(name)* VOR AT *(distance)* DME FIX [MAINTAIN *(or CLIMB or DESCEND TO)* *(level)*] HOLD [*(direction)*] [RIGHT *(or LEFT)* HAND PATTERN] [OUTBOUND TIME *(number)* MINUTES] EXPECT APPROACH CLEARANCE *(or FURTHER CLEARANCE)* AT *(time)* *(additional instructions, if necessary)*;
- f) CLEARED TO THE *(three digits)* RADIAL OF THE *(name)* VOR AT *(distance)* DME FIX [MAINTAIN *(or CLIMB or DESCEND TO)* *(level)*] HOLD BETWEEN *(distance)* AND *(distance)* DME [RIGHT *(or LEFT)* HAND PATTERN] EXPECT APPROACH CLEARANCE *(or FURTHER CLEARANCE)* AT *(time)* *(additional instructions, if necessary)*.

* Denotes pilot transmission.

12.3.3.4 EXPECTED APPROACH TIME

- a) NO DELAY EXPECTED;
- b) EXPECTED APPROACH TIME *(time)*;
- c) REVISED EXPECTED APPROACH TIME *(time)*;
- d) DELAY NOT DETERMINED *(reasons)*.

12.3.4 Phraseologies for use on and in the vicinity of the aerodrome

<i>Circumstances</i>	<i>Phraseologies</i>
12.3.4.1 IDENTIFICATION OF AIRCRAFT	SHOW LANDING LIGHTS.
12.3.4.2 ACKNOWLEDGEMENT BY VISUAL MEANS	a) ACKNOWLEDGE BY MOVING AILERONS (<i>or</i> RUDDER); b) ACKNOWLEDGE BY ROCKING WINGS; c) ACKNOWLEDGE BY FLASHING LANDING LIGHTS.
12.3.4.3 STARTING PROCEDURES	
... to request permission to start engines	*a) [<i>aircraft location</i>] REQUEST START UP; *b) [<i>aircraft location</i>] REQUEST START UP, INFORMATION (<i>ATIS identification</i>);
... ATC replies	c) START UP APPROVED; d) START UP AT (<i>time</i>); e) EXPECT START UP AT (<i>time</i>); f) START UP AT OWN DISCRETION; g) EXPECT DEPARTURE (<i>time</i>) START UP AT OWN DISCRETION. * Denotes pilot transmission.
12.3.4.4 PUSHBACK PROCEDURES	
<i>Note.— When local procedures so prescribe, authorization for pushback should be obtained from the control tower.</i>	
... aircraft/ATC	*a) [<i>aircraft location</i>] REQUEST PUSHBACK; b) PUSHBACK APPROVED; c) STAND BY; d) PUSHBACK AT OWN DISCRETION; e) EXPECT (<i>number</i>) MINUTES DELAY DUE (<i>reason</i>). * Denotes pilot transmission.

<i>Circumstances</i>	<i>Phraseologies</i>
12.3.4.5 TOWING PROCEDURES ... ATC response	†a) REQUEST TOW [company name] (aircraft type) FROM (location) TO (location); b) TOW APPROVED VIA (<i>specific routing to be followed</i>); c) HOLD POSITION; d) STAND BY. † Denotes transmission from aircraft/tow vehicle combination.
12.3.4.6 TO REQUEST TIME CHECK AND/OR AERODROME DATA FOR DEPARTURE ... when no ATIS broadcast is available	*a) REQUEST TIME CHECK; b) TIME (<i>time</i>); *c) REQUEST DEPARTURE INFORMATION; d) RUNWAY (<i>number</i>), WIND (<i>direction and speed</i>) (<i>units</i>) QNH (<i>or</i> QFE) (<i>number</i>) [(<i>units</i>)] TEMPERATURE [MINUS] (<i>number</i>), [VISIBILITY (<i>distance</i>) (<i>units</i>) (<i>or</i> RUNWAY VISUAL RANGE (<i>or</i> RVR) (<i>distance</i>) (<i>units</i>))] [TIME (<i>time</i>)]. <i>Note.— If multiple visibility and RVR observations are available, those that represent the roll-out/stop end zone should be used for take-off.</i> * Denotes pilot transmission.
12.3.4.7 TAXI PROCEDURES ... for departure ... where detailed taxi instructions are required	*a) [<i>aircraft type</i>] [<i>wake turbulence category if “heavy”</i>] [<i>aircraft location</i>] REQUEST TAXI [<i>intentions</i>]; *b) [<i>aircraft type</i>] [<i>wake turbulence category if “heavy”</i>] [<i>aircraft location</i>] (<i>flight rules</i>) TO (<i>aerodrome of destination</i>) REQUEST TAXI [<i>intentions</i>]; c) TAXI TO HOLDING POINT [<i>number</i>] [RUNWAY (<i>number</i>)] [HOLD SHORT OF RUNWAY (<i>number</i>) (<i>or</i> CROSS RUNWAY (<i>number</i>))] [TIME (<i>time</i>)]; *d) [<i>aircraft type</i>] [<i>wake turbulence category if “heavy”</i>] REQUEST DETAILED TAXI INSTRUCTIONS;

Circumstances	Phraseologies
... where aerodrome information is not available from an alternative source such as ATIS	<p>e) TAXI TO HOLDING POINT <i>[number]</i> [RUNWAY <i>(number)</i>] VIA <i>(specific route to be followed)</i> [TIME <i>(time)</i>] [HOLD SHORT OF RUNWAY <i>(number)</i> (or CROSS RUNWAY <i>(number)</i>)];</p> <p>f) TAXI TO HOLDING POINT <i>[number]</i> <i>(followed by aerodrome information as applicable)</i> [TIME <i>(time)</i>];</p> <p>g) TAKE (or TURN) FIRST (or SECOND) LEFT (or RIGHT);</p> <p>h) TAXI VIA <i>(identification of taxiway)</i>;</p> <p>i) TAXI VIA RUNWAY <i>(number)</i>;</p> <p>j) TAXI TO TERMINAL (or other location, e.g. GENERAL AVIATION AREA) [STAND <i>(number)</i>];</p>
... for helicopter operations	<p>*k) REQUEST AIR-TAXIING FROM (or VIA) TO <i>(location or routing as appropriate)</i>;</p> <p>l) AIR-TAXI TO (or VIA) <i>(location or routing as appropriate)</i> [CAUTION <i>(dust, blowing snow, loose debris, taxiing light aircraft, personnel, etc.)</i>];</p> <p>m) AIR TAXI VIA <i>(direct, as requested, or specified route)</i> TO <i>(location, heliport, operating or movement area, active or inactive runway)</i>. AVOID <i>(aircraft or vehicles or personnel)</i>;</p>
... after landing	<p>*n) REQUEST BACKTRACK;</p> <p>o) BACKTRACK APPROVED;</p> <p>p) BACKTRACK RUNWAY <i>(number)</i>;</p>
... general	<p>*q) <i>[(aircraft location)]</i> REQUEST TAXI TO <i>(destination on aerodrome)</i>;</p> <p>r) TAXI STRAIGHT AHEAD;</p> <p>s) TAXI WITH CAUTION;</p> <p>t) GIVE WAY TO <i>(description and position of other aircraft)</i>;</p> <p>*u) GIVING WAY TO <i>(traffic)</i>;</p> <p>*v) TRAFFIC (or type of aircraft) IN SIGHT;</p> <p>w) TAXI INTO HOLDING BAY;</p> <p>x) FOLLOW <i>(description of other aircraft or vehicle)</i>;</p>

Circumstances	Phraseologies
	<p>y) VACATE RUNWAY;</p> <p>*z) RUNWAY VACATED;</p> <p>aa) EXPEDITE TAXI [<i>reason</i>];</p> <p>*bb) EXPEDITING;</p> <p>cc) [CAUTION] TAXI SLOWER [<i>reason</i>];</p> <p>*dd) SLOWING DOWN.</p> <p>* Denotes pilot transmission.</p>
<p>12.3.4.8 HOLDING</p> <p>... to hold not closer to a runway than specified in Chapter 7, 7.6.3.1.3.1</p>	<p>‡a) HOLD (<i>direction</i>) OF (<i>position, runway number, etc.</i>);</p> <p>‡b) HOLD POSITION;</p> <p>‡c) HOLD (<i>distance</i>) FROM (<i>position</i>);</p> <p>‡d) HOLD SHORT OF (<i>position</i>);</p> <p>*e) HOLDING;</p> <p>*f) HOLDING SHORT.</p> <p>‡ Requires specific acknowledgement from the pilot.</p> <p>* Denotes pilot transmission. The procedure words ROGER and WILCO are insufficient acknowledgement of the instructions HOLD, HOLD POSITION and HOLD SHORT OF (<i>position</i>). In each case the acknowledgement shall be by the phraseology HOLDING or HOLDING SHORT, as appropriate.</p>
<p>12.3.4.9 TO CROSS A RUNWAY</p>	<p>*a) REQUEST CROSS RUNWAY (<i>number</i>);</p> <p><i>Note.— If the control tower is unable to see the crossing aircraft (e.g. night, low visibility), the instruction should always be accompanied by a request to report when the aircraft has vacated the runway.</i></p> <p>b) CROSS RUNWAY (<i>number</i>) [REPORT VACATED];</p> <p>c) EXPEDITE CROSSING RUNWAY (<i>number</i>) TRAFFIC (<i>aircraft type</i>) (<i>distance</i>) KILOMETRES (<i>or</i>) MILES FINAL;</p> <p>d) TAXI TO HOLDING POINT [<i>number</i>] [RUNWAY (<i>number</i>)] VIA (<i>specific route to be followed</i>), [HOLD SHORT OF RUNWAY (<i>number</i>)] or [CROSS RUNWAY (<i>number</i>)];</p>

<i>Circumstances</i>	<i>Phraseologies</i>
<p style="text-align: center;"><i>Note.— The pilot will, when requested, report “RUNWAY VACATED” when the entire aircraft is beyond the relevant runway-holding position.</i></p>	<p>*e) RUNWAY VACATED.</p> <p>* Denotes pilot transmission.</p>
<p>12.3.4.10 PREPARATION FOR TAKE-OFF</p>	<p>a) UNABLE TO ISSUE (<i>designator</i>) DEPARTURE (<i>reasons</i>);</p> <p>b) REPORT WHEN READY [FOR DEPARTURE];</p> <p>c) ARE YOU READY [FOR DEPARTURE]?;</p> <p>d) ARE YOU READY FOR IMMEDIATE DEPARTURE?;</p> <p>*e) READY;</p>
<p>... clearance to enter runway and await take-off clearance</p>	<p>f) LINE UP [AND WAIT];</p> <p>†g) LINE UP RUNWAY (<i>number</i>);</p> <p>h) LINE UP. BE READY FOR IMMEDIATE DEPARTURE;</p>
<p>... conditional clearances</p>	<p>‡i) (<i>condition</i>) LINE UP (<i>brief reiteration of the condition</i>);</p>
<p>... acknowledgement of a conditional clearance</p>	<p>*j) (<i>condition</i>) LINING UP (<i>brief reiteration of the condition</i>);</p>
<p>... confirmation or otherwise of the readback of conditional clearance</p>	<p>k) [THAT IS] CORRECT (<i>or</i> NEGATIVE) [I SAY AGAIN] ... (<i>as appropriate</i>).</p> <p>* Denotes pilot transmission.</p> <p>† When there is the possibility of confusion during multiple runway operations.</p> <p>‡ Provisions concerning the use of conditional clearances are contained in 12.2.7.</p>
<p>12.3.4.11 TAKE-OFF CLEARANCE</p>	<p>a) RUNWAY (<i>number</i>) CLEARED FOR TAKE-OFF [REPORT AIRBORNE];</p>
<p>... when reduced runway separation is used</p>	<p>b) (<i>traffic information</i>) RUNWAY (<i>number</i>) CLEARED FOR TAKE-OFF;</p>

<i>Circumstances</i>	<i>Phraseologies</i>
... when take-off clearance has not been complied with	c) TAKE OFF IMMEDIATELY OR VACATE RUNWAY [(instructions)];
	d) TAKE OFF IMMEDIATELY OR HOLD SHORT OF RUNWAY;
... to cancel a take-off clearance	e) HOLD POSITION, CANCEL TAKE-OFF I SAY AGAIN CANCEL TAKE-OFF (reasons);
	*f) HOLDING;
... to stop a take-off after an aircraft has commenced take-off roll	g) STOP IMMEDIATELY [(repeat aircraft call sign) STOP IMMEDIATELY];
	*h) STOPPING;
... for helicopter operations	i) CLEARED FOR TAKE-OFF [FROM (location)] (present position, taxiway, final approach and take-off area, runway and number);
	*j) REQUEST DEPARTURE INSTRUCTIONS;
	k) AFTER DEPARTURE TURN RIGHT (or LEFT, or CLIMB) (instructions as appropriate).
	* Denotes pilot transmission. HOLDING and STOPPING are the procedural responses to e) and g) respectively.
12.3.4.12 TURN OR CLIMB INSTRUCTIONS AFTER TAKE-OFF	*a) REQUEST RIGHT (or LEFT) TURN;
	b) RIGHT (or LEFT) TURN APPROVED;
	c) WILL ADVISE LATER FOR RIGHT (or LEFT) TURN;
... to request airborne time	d) REPORT AIRBORNE;
	e) AIRBORNE (time);
	f) AFTER PASSING (level) (instructions);
... heading to be followed	g) CONTINUE RUNWAY HEADING (instructions);
... when a specific track is to be followed	h) TRACK EXTENDED CENTRE LINE (instructions);
	i) CLIMB STRAIGHT AHEAD (instructions).
	* Denotes pilot transmission.

<i>Circumstances</i>	<i>Phraseologies</i>
12.3.4.13 ENTERING AN AERODROME TRAFFIC CIRCUIT	<p>*a) <i>[aircraft type] (position) (level)</i> FOR LANDING;</p> <p>b) JOIN <i>[(direction of circuit)] (position in circuit) (runway number)</i> [SURFACE] WIND <i>(direction and speed) (units)</i> [TEMPERATURE [MINUS] <i>(number)</i>] QNH (or QFE) <i>(number) [(units)]</i> [TRAFFIC <i>(detail)</i>];</p> <p>c) MAKE STRAIGHT-IN APPROACH, RUNWAY <i>(number)</i> [SURFACE] WIND <i>(direction and speed) (units)</i> [TEMPERATURE [MINUS] <i>(number)</i>] QNH (or QFE) <i>(number) [(units)]</i> [TRAFFIC <i>(detail)</i>];</p>
... when ATIS information is available	<p>*d) <i>(aircraft type) (position) (level)</i> INFORMATION <i>(ATIS identification)</i> FOR LANDING;</p> <p>e) JOIN <i>(position in circuit)</i> [RUNWAY <i>(number)</i>] QNH (or QFE) <i>(number) [(units)]</i> [TRAFFIC <i>(detail)</i>].</p> <p>* Denotes pilot transmission.</p>
12.3.4.14 IN THE CIRCUIT	<p>*a) <i>(position in circuit, e.g. DOWNWIND/FINAL)</i>;</p> <p>b) NUMBER ... FOLLOW <i>(aircraft type and position) [additional instructions if required]</i>.</p> <p>* Denotes pilot transmission.</p>
12.3.4.15 APPROACH INSTRUCTIONS	<p>a) MAKE SHORT APPROACH;</p> <p>b) MAKE LONG APPROACH (or EXTEND DOWNWIND);</p> <p>c) REPORT BASE (or FINAL, or LONG FINAL);</p> <p>d) CONTINUE APPROACH [PREPARE FOR POSSIBLE GO AROUND].</p>
12.3.4.16 LANDING CLEARANCE	<p>a) RUNWAY <i>(number)</i> CLEARED TO LAND;</p>
... when reduced runway separation is used	<p>b) <i>(traffic information)</i> RUNWAY <i>(number)</i> CLEARED TO LAND;</p>
... special operations	<p>c) CLEARED TOUCH AND GO;</p> <p>d) MAKE FULL STOP;</p>

<i>Circumstances</i>	<i>Phraseologies</i>
<p>... to make an approach along, or parallel to a runway, descending to an agreed minimum level</p> <p>... to fly past the control tower or other observation point for the purpose of visual inspection by persons on the ground</p> <p>... for helicopter operations</p>	<p>*e) REQUEST LOW APPROACH (<i>reasons</i>);</p> <p>f) CLEARED LOW APPROACH [RUNWAY (<i>number</i>)] [<i>(altitude restriction if required) (go around instructions)</i>];</p> <p>*g) REQUEST LOW PASS (<i>reasons</i>);</p> <p>h) CLEARED LOW PASS [<i>as in f)</i>];</p> <p>*i) REQUEST STRAIGHT-IN (<i>or</i> CIRCLING APPROACH, LEFT (<i>or</i> RIGHT) TURN TO (<i>location</i>));</p> <p>j) MAKE STRAIGHT-IN (<i>or</i> CIRCLING APPROACH, LEFT (<i>or</i> RIGHT) TURN TO (<i>location, runway, taxiway, final approach and take-off area</i>)) [ARRIVAL (<i>or</i> ARRIVAL ROUTE) (<i>number, name, or code</i>)]. [HOLD SHORT OF (<i>active runway, extended runway centre line, other</i>)]. [REMAIN (<i>direction or distance</i>) FROM (<i>runway, runway centre line, other helicopter or aircraft</i>)]. [CAUTION (<i>power lines, unlighted obstructions, wake turbulence, etc.</i>)]. CLEARED TO LAND.</p> <p>* Denotes pilot transmission.</p>
12.3.4.17 DELAYING AIRCRAFT	<p>a) CIRCLE THE AERODROME;</p> <p>b) ORBIT (RIGHT, <i>or</i> LEFT) [FROM PRESENT POSITION];</p> <p>c) MAKE ANOTHER CIRCUIT.</p>
12.3.4.18 MISSED APPROACH	<p>a) GO AROUND;</p> <p>*b) GOING AROUND.</p> <p>* Denotes pilot transmission.</p>
12.3.4.19 INFORMATION TO AIRCRAFT	
<p>... when pilot requested visual inspection of landing gear</p>	<p>a) LANDING GEAR APPEARS DOWN;</p> <p>b) RIGHT (<i>or</i> LEFT, <i>or</i> NOSE) WHEEL APPEARS UP (<i>or</i> DOWN);</p> <p>c) WHEELS APPEAR UP;</p> <p>d) RIGHT (<i>or</i> LEFT, <i>or</i> NOSE) WHEEL DOES NOT APPEAR UP (<i>or</i> DOWN);</p>

<i>Circumstances</i>	<i>Phraseologies</i>
... wake turbulence	e) CAUTION WAKE TURBULENCE [FROM ARRIVING (or DEPARTING) (type of aircraft)] [additional information as required];
... jet blast on apron or taxiway	f) CAUTION JET BLAST;
... propeller-driven aircraft slipstream	g) CAUTION SLIPSTREAM.
12.3.4.20 RUNWAY VACATING AND COMMUNICATIONS AFTER LANDING	a) CONTACT GROUND (frequency);
	b) WHEN VACATED CONTACT GROUND (frequency);
	c) EXPEDITE VACATING;
	d) YOUR STAND (or GATE) (designation);
	e) TAKE (or TURN) FIRST (or SECOND, or CONVENIENT) LEFT (or RIGHT) AND CONTACT GROUND (frequency);
... for helicopter operations	f) AIR-TAXI TO HELICOPTER STAND (or) HELICOPTER PARKING POSITION (area);
	g) AIR-TAXI TO (or VIA) (location or routing as appropriate) [CAUTION (dust, blowing snow, loose debris, taxiing light aircraft, personnel, etc.)];
	h) AIR-TAXI VIA (direct, as requested, or specified route) TO (location, heliport, operating or movement area, active or inactive runway). AVOID (aircraft or vehicles or personnel).

12.3.5 Coordination between ATS units

<i>Circumstances</i>	<i>Phraseologies</i>
12.3.5.1 ESTIMATES AND REVISIONS	a) ESTIMATE [direction of flight] (aircraft call sign) [SQUAWKING (SSR code)] (type) ESTIMATED (significant point) (time) (level) (or DESCENDING FROM (level) TO (level)) [SPEED (filed TAS)] (route) [REMARKS];
... sending unit	b) ESTIMATE (significant point) ON (aircraft call sign);
... receiving unit reply (if flight plan details are not available)	c) NO DETAILS;

<i>Circumstances</i>	<i>Phraseologies</i>
<p>... receiving unit reply (if flight plan details are available)</p> <p>... sending unit reply</p>	<p>(aircraft type) (destination);</p> <p>[SQUAWKING (SSR code)] [ESTIMATED] (significant point) (time) AT (level);</p> <p><i>Note.— In the event that flight plan details are not available the receiving station shall reply to b) NO DETAILS and transmitting station shall pass full estimate as in a).</i></p> <p>d) ESTIMATE UNMANNED FREE BALLOON(S) (identification and classification) ESTIMATED OVER (place) AT (time) REPORTED FLIGHT LEVEL(S) (figure or figures) [or FLIGHT LEVEL UNKNOWN] MOVING (direction) ESTIMATED GROUND SPEED (figure) (other pertinent information, if any);</p> <p>e) REVISION (aircraft call sign) (details as necessary).</p>
12.3.5.2 TRANSFER OF CONTROL	<p>a) REQUEST RELEASE OF (aircraft call sign);</p> <p>b) (aircraft call sign) RELEASED [AT (time)] [conditions/restrictions];</p> <p>c) IS (aircraft call sign) RELEASED [FOR CLIMB (or DESCENT)];</p> <p>d) (aircraft call sign) NOT RELEASED [UNTIL (time or significant point)];</p> <p>e) UNABLE (aircraft call sign) [TRAFFIC IS (details)].</p>
12.3.5.3 CHANGE OF CLEARANCE	<p>a) MAY WE CHANGE CLEARANCE OF (aircraft call sign) TO (details of alteration proposed);</p> <p>b) AGREED TO (alteration of clearance) OF (aircraft call sign);</p> <p>c) UNABLE (aircraft call sign);</p> <p>d) UNABLE (desired route, level, etc.) [FOR (aircraft call sign)] [DUE (reason)] (alternative clearance proposed).</p>
12.3.5.4 APPROVAL REQUEST	<p>a) APPROVAL REQUEST (aircraft call sign) ESTIMATED DEPARTURE FROM (significant point) AT (time);</p> <p>b) (aircraft call sign) REQUEST APPROVED [(restriction if any)];</p> <p>c) (aircraft call sign) UNABLE (alternative instructions).</p>

<i>Circumstances</i>	<i>Phraseologies</i>
12.3.5.5 INBOUND RELEASE	[INBOUND RELEASE] (<i>aircraft call sign</i>) [SQUAWKING (<i>SSR code</i>)] (<i>type</i>) FROM (<i>departure point</i>) RELEASED AT (<i>significant point, or time, or level</i>) CLEARED TO AND ESTIMATING (<i>clearance limit</i>) (<i>time</i>) AT (<i>level</i>) [EXPECTED APPROACH TIME or NO DELAY EXPECTED] CONTACT AT (<i>time</i>).
12.3.5.6 HANDOVER	HANDOVER (<i>aircraft call sign</i>) [SQUAWKING (<i>SSR code</i>)] POSITION (<i>aircraft position</i>) (<i>level</i>).
12.3.5.7 EXPEDITION OF CLEARANCE	a) EXPEDITE CLEARANCE (<i>aircraft call sign</i>) EXPECTED DEPARTURE FROM (<i>place</i>) AT (<i>time</i>); b) EXPEDITE CLEARANCE (<i>aircraft call sign</i>) [ESTIMATED] OVER (<i>place</i>) AT (<i>time</i>) REQUESTS (<i>level or route, etc.</i>).
12.3.5.8 REDUCED VERTICAL SEPARATION MINIMUM (RVSM) OPERATIONS ... to verbally supplement estimate messages of aircraft non-approved for RVSM or to verbally supplement an automated estimate message exchange that does not automatically transfer information from Item 18 of the flight plan followed by supplementary information, as appropriate ... to communicate the cause of a contingency relating to an aircraft that is unable to conduct RVSM operations due to severe turbulence or other severe meteorological phenomena or equipment failure, as applicable	a) NEGATIVE RVSM [(<i>supplementary information, e.g. State aircraft</i>)]; b) UNABLE RVSM DUE TURBULENCE (<i>or EQUIPMENT, as applicable</i>).

12.3.6 Phraseologies to be used related to CPDLC

<i>Circumstances</i>	<i>Phraseologies</i>
12.3.6.1 OPERATIONAL STATUS ... failure of CPDLC ... failure of a single CPDLC message	a) [ALL STATIONS] CPDLC FAILURE (<i>instructions</i>); b) CPDLC MESSAGE FAILURE (<i>appropriate clearance, instruction, information or request</i>);

<i>Circumstances</i>	<i>Phraseologies</i>
... to correct CPDLC clearances, instructions, information or requests	c) DISREGARD CPDLC (<i>message type</i>) MESSAGE, BREAK (<i>correct clearance, instruction, information or request</i>);
... to instruct all stations or a specific flight to avoid sending CPDLC requests for a limited period of time	d) [ALL STATIONS] STOP SENDING CPDLC REQUESTS [UNTIL ADVISED] [<i>reason</i>];
... to resume normal use of CPDLC	e) [ALL STATIONS] RESUME NORMAL CPDLC OPERATIONS.

12.4 ATS SURVEILLANCE SERVICE PHRASEOLOGIES

Note.— The following comprise phraseologies specifically applicable when an ATS surveillance system is used in the provision of air traffic services. The phraseologies detailed in the sections above for use in the provision of air traffic services are also applicable, as appropriate, when an ATS surveillance system is used.

12.4.1 General ATS surveillance service phraseologies

<i>Circumstances</i>	<i>Phraseologies</i>
12.4.1.1 IDENTIFICATION OF AIRCRAFT	a) REPORT HEADING [AND FLIGHT LEVEL (<i>or</i> ALTITUDE)]; b) FOR IDENTIFICATION TURN LEFT (<i>or</i> RIGHT) HEADING (<i>three digits</i>); c) TRANSMIT FOR IDENTIFICATION AND REPORT HEADING; d) RADAR CONTACT [<i>position</i>]; e) IDENTIFIED [<i>position</i>]; f) NOT IDENTIFIED [<i>reason</i>], [RESUME (<i>or</i> CONTINUE) OWN NAVIGATION].
12.4.1.2 POSITION INFORMATION	POSITION (<i>distance</i>) (<i>direction</i>) OF (<i>significant point</i>) (<i>or</i> OVER <i>or</i> ABEAM (<i>significant point</i>)).
12.4.1.3 VECTORING INSTRUCTIONS	a) LEAVE (<i>significant point</i>) HEADING (<i>three digits</i>); b) CONTINUE HEADING (<i>three digits</i>); c) CONTINUE PRESENT HEADING;

Circumstances	Phraseologies
12.4.1.4 TERMINATION OF VECTORING	d) FLY HEADING (<i>three digits</i>); e) TURN LEFT (<i>or RIGHT</i>) HEADING (<i>three digits</i>) [<i>reason</i>]; f) TURN LEFT (<i>or RIGHT</i>) (<i>number of degrees</i>) DEGREES [<i>reason</i>]; g) STOP TURN HEADING (<i>three digits</i>); h) FLY HEADING (<i>three digits</i>), WHEN ABLE PROCEED DIRECT (<i>name</i>) (<i>significant point</i>); i) HEADING IS GOOD.
12.4.1.5 MANOEUVRES	a) RESUME OWN NAVIGATION (<i>position of aircraft</i>) (<i>specific instructions</i>); b) RESUME OWN NAVIGATION [DIRECT] (<i>significant point</i>) [MAGNETIC TRACK (<i>three digits</i>) DISTANCE (<i>number</i>) KILOMETRES (<i>or MILES</i>)].
... (in case of unreliable directional instruments on board aircraft)	a) MAKE A THREE SIXTY TURN LEFT (<i>or RIGHT</i>) [<i>reason</i>]; b) ORBIT LEFT (<i>or RIGHT</i>) [<i>reason</i>]; c) MAKE ALL TURNS RATE ONE (<i>or RATE HALF, or (number) DEGREES PER SECOND</i>) START AND STOP ALL TURNS ON THE COMMAND “NOW”; d) TURN LEFT (<i>or RIGHT</i>) NOW; e) STOP TURN NOW.
<p><i>Note.— When it is necessary to specify a reason for vectoring or for the above manoeuvres, the following phraseologies should be used:</i></p>	a) DUE TRAFFIC; b) FOR SPACING; c) FOR DELAY; d) FOR DOWNWIND (<i>or BASE, or FINAL</i>).
12.4.1.6 SPEED CONTROL	a) REPORT SPEED; *b) SPEED (<i>number</i>) KILOMETRES PER HOUR (<i>or KNOTS</i>); c) MAINTAIN (<i>number</i>) KILOMETRES PER HOUR (<i>or KNOTS</i>) [OR GREATER (<i>or OR LESS</i>)] [UNTIL (<i>significant point</i>)]; d) DO NOT EXCEED (<i>number</i>) KILOMETRES PER HOUR (<i>or KNOTS</i>);

Circumstances	Phraseologies
... to request avoiding action	9) (level); 10) CLIMBING (or DESCENDING); *b) REQUEST VECTORS; c) DO YOU WANT VECTORS?;
... when passing unknown traffic	d) CLEAR OF TRAFFIC [<i>appropriate instructions</i>];
... for avoiding action	e) TURN LEFT (or RIGHT) IMMEDIATELY HEADING (<i>three digits</i>) TO AVOID [UNIDENTIFIED] TRAFFIC (<i>bearing by clock-reference and distance</i>); f) TURN LEFT (or RIGHT) (<i>number of degrees</i>) DEGREES IMMEDIATELY TO AVOID [UNIDENTIFIED] TRAFFIC AT (<i>bearing by clock-reference and distance</i>).
* Denotes pilot transmission.	
12.4.1.9 COMMUNICATIONS AND LOSS OF COMMUNICATIONS	a) [IF] RADIO CONTACT LOST (<i>instructions</i>); b) IF NO TRANSMISSIONS RECEIVED FOR (<i>number</i>) MINUTES (or SECONDS) (<i>instructions</i>); c) REPLY NOT RECEIVED (<i>instructions</i>); d) IF YOU READ [<i>manoeuvre instructions or SQUAWK (code or IDENT)</i>]; e) (<i>manoeuvre, SQUAWK or IDENT</i>) OBSERVED. POSITION (<i>position of aircraft</i>). [<i>instructions</i>].
... if loss of communications suspected	
12.4.1.10 TERMINATION OF RADAR AND/OR ADS-B SERVICE	a) RADAR SERVICE (or IDENTIFICATION) TERMINATED [DUE (<i>reason</i>)] (<i>instructions</i>); b) WILL SHORTLY LOSE IDENTIFICATION (<i>appropriate instructions or information</i>); c) IDENTIFICATION LOST [<i>reasons</i>] (<i>instructions</i>).
12.4.1.11 RADAR AND/OR ADS-B EQUIPMENT DEGRADATION	a) SECONDARY RADAR OUT OF SERVICE (<i>appropriate information as necessary</i>); b) PRIMARY RADAR OUT OF SERVICE (<i>appropriate information as necessary</i>);

*Circumstances**Phraseologies*

- | | |
|--|--|
| | c) ADS-B OUT OF SERVICE (<i>appropriate information as necessary</i>). |
|--|--|

12.4.2 Radar in approach control service*Circumstances**Phraseologies*

12.4.2.1 VECTORIZING FOR APPROACH

- | | |
|-----------------------------------|---|
| 12.4.2.1 VECTORIZING FOR APPROACH | <ul style="list-style-type: none"> a) VECTORIZING FOR (<i>type of pilot-interpreted aid</i>) APPROACH RUNWAY (<i>number</i>); b) VECTORIZING FOR VISUAL APPROACH RUNWAY (<i>number</i>) REPORT FIELD (<i>or</i> RUNWAY) IN SIGHT; c) VECTORIZING FOR (<i>positioning in the circuit</i>); d) VECTORIZING FOR SURVEILLANCE RADAR APPROACH RUNWAY (<i>number</i>); e) VECTORIZING FOR PRECISION APPROACH RUNWAY (<i>number</i>); f) (<i>type</i>) APPROACH NOT AVAILABLE DUE (<i>reason</i>) (<i>alternative instructions</i>). |
|-----------------------------------|---|

12.4.2.2 VECTORIZING FOR ILS AND OTHER PILOT-INTERPRETED AIDS

... when a pilot wishes to be positioned a specific distance from touchdown

... instructions and information

- | | |
|---|--|
| 12.4.2.2 VECTORIZING FOR ILS AND OTHER PILOT-INTERPRETED AIDS | <ul style="list-style-type: none"> a) POSITION (<i>number</i>) KILOMETRES (<i>or</i> MILES) from (<i>fix</i>). TURN LEFT (<i>or</i> RIGHT) HEADING (<i>three digits</i>); b) YOU WILL INTERCEPT (<i>radio aid or track</i>) (<i>distance</i>) FROM (<i>significant point or TOUCHDOWN</i>); *c) REQUEST (<i>distance</i>) FINAL; d) CLEARED FOR (<i>type of approach</i>) APPROACH RUNWAY (<i>number</i>); e) REPORT ESTABLISHED ON [ILS] LOCALIZER (<i>or</i> ON GBAS/SBAS/MLS APPROACH COURSE); f) CLOSING FROM LEFT (<i>or</i> RIGHT) [REPORT ESTABLISHED]; g) TURN LEFT (<i>or</i> RIGHT) HEADING (<i>three digits</i>) [TO INTERCEPT] <i>or</i> [REPORT ESTABLISHED]; h) EXPECT VECTOR ACROSS (<i>localizer course or radio aid</i>) (<i>reason</i>); |
|---|--|

Circumstances	Phraseologies
	<p>i) THIS TURN WILL TAKE YOU THROUGH (<i>localizer course or radio aid</i>) [<i>reason</i>];</p> <p>j) TAKING YOU THROUGH (<i>localizer course or radio aid</i>) [<i>reason</i>];</p> <p>k) MAINTAIN (<i>altitude</i>) UNTIL GLIDE PATH INTERCEPTION;</p> <p>l) REPORT ESTABLISHED ON GLIDE PATH;</p> <p>m) INTERCEPT (<i>localizer course or radio aid</i>) [REPORT ESTABLISHED].</p> <p>* Denotes pilot transmission.</p>
<p>12.4.2.3 MANOEUVRE DURING INDEPENDENT AND DEPENDENT PARALLEL APPROACHES</p> <p>... for avoidance action when an aircraft is observed penetrating the NTZ</p> <p>... for avoidance action below 120 m (400 ft) above the runway threshold elevation where parallel approach obstacle assessment surfaces (PAOAS) criteria are being applied</p>	<p>a) CLEARED FOR (<i>type of approach</i>) APPROACH RUNWAY (<i>number</i>) LEFT (<i>or</i>) RIGHT);</p> <p>b) YOU HAVE CROSSED THE LOCALIZER (<i>or</i>) GBAS/SBAS/MLS FINAL APPROACH COURSE). TURN LEFT (<i>or</i>) RIGHT) IMMEDIATELY AND RETURN TO THE LOCALIZER (<i>or</i>) GBAS/SBAS/MLS FINAL APPROACH COURSE);</p> <p>c) ILS (<i>or</i>) MLS) RUNWAY (<i>number</i>) LEFT (<i>or</i>) RIGHT) LOCALIZER (<i>or</i>) MLS) FREQUENCY IS (<i>frequency</i>);</p> <p>d) TURN LEFT (<i>or</i>) RIGHT) (<i>number</i>) DEGREES (<i>or</i>) HEADING) (<i>three digits</i>) IMMEDIATELY TO AVOID TRAFFIC [DEVIATING FROM ADJACENT APPROACH], CLIMB TO (<i>altitude</i>);</p> <p>e) CLIMB TO (<i>altitude</i>) IMMEDIATELY TO AVOID TRAFFIC [DEVIATING FROM ADJACENT APPROACH] (<i>further instructions</i>).</p>
<p>12.4.2.4 SURVEILLANCE RADAR APPROACH</p> <p>12.4.2.4.1 PROVISION OF SERVICE</p>	<p>a) THIS WILL BE A SURVEILLANCE RADAR APPROACH RUNWAY (<i>number</i>) TERMINATING AT (<i>distance</i>) FROM TOUCHDOWN, OBSTACLE CLEARANCE ALTITUDE (<i>or</i>) HEIGHT) (<i>number</i>) METRES (<i>or</i>) FEET) CHECK YOUR MINIMA [IN CASE OF GO AROUND (<i>instructions</i>)];</p>

<i>Circumstances</i>	<i>Phraseologies</i>
	b) APPROACH INSTRUCTIONS WILL BE TERMINATED AT <i>(distance)</i> FROM TOUCHDOWN.
12.4.2.4.2 ELEVATION	a) COMMENCE DESCENT NOW [TO MAINTAIN A <i>(number)</i> DEGREE GLIDE PATH]; b) <i>(distance)</i> FROM TOUCHDOWN ALTITUDE <i>(or)</i> HEIGHT SHOULD BE <i>(numbers and units)</i> .
12.4.2.4.3 POSITION	<i>(distance)</i> FROM TOUCHDOWN.
12.4.2.4.4 CHECKS	a) CHECK GEAR DOWN [AND LOCKED]; b) OVER THRESHOLD.
12.4.2.4.5 COMPLETION OF APPROACH	a) REPORT VISUAL; b) REPORT RUNWAY [LIGHTS] IN SIGHT; c) APPROACH COMPLETED [CONTACT <i>(unit)</i>].
12.4.2.5 PAR APPROACH	
12.4.2.5.1 PROVISION OF SERVICE	a) THIS WILL BE A PRECISION RADAR APPROACH RUNWAY <i>(number)</i> ; b) PRECISION APPROACH NOT AVAILABLE DUE <i>(reason)</i> <i>(alternative instructions)</i> ; c) IN CASE OF GO AROUND <i>(instructions)</i> .
12.4.2.5.2 COMMUNICATIONS	a) DO NOT ACKNOWLEDGE FURTHER TRANSMISSIONS; b) REPLY NOT RECEIVED. WILL CONTINUE INSTRUCTIONS.
12.4.2.5.3 AZIMUTH	a) CLOSING [SLOWLY <i>(or)</i> QUICKLY] [FROM THE LEFT <i>(or)</i> FROM THE RIGHT)]; b) HEADING IS GOOD; c) ON TRACK; d) SLIGHTLY <i>(or)</i> WELL, <i>or</i> GOING) LEFT <i>(or)</i> RIGHT) OF TRACK; e) <i>(number)</i> METRES LEFT <i>(or)</i> RIGHT) OF TRACK.
12.4.2.5.4 ELEVATION	a) APPROACHING GLIDE PATH;

Circumstances	Phraseologies
	<ul style="list-style-type: none"> b) COMMENCE DESCENT NOW [AT <i>(number)</i> METRES PER SECOND OR <i>(number)</i> FEET PER MINUTE (or ESTABLISH A <i>(number)</i> DEGREE GLIDE PATH)]; c) RATE OF DESCENT IS GOOD; d) ON GLIDE PATH; e) SLIGHTLY (or WELL, or GOING) ABOVE (or BELOW) GLIDE PATH; f) [STILL] <i>(number)</i> METRES (or FEET) TOO HIGH (or TOO LOW); g) ADJUST RATE OF DESCENT; h) COMING BACK [SLOWLY (or QUICKLY)] TO THE GLIDE PATH; i) RESUME NORMAL RATE OF DESCENT; j) ELEVATION ELEMENT UNSERVICEABLE (<i>to be followed by appropriate instructions</i>); k) <i>(distance)</i> FROM TOUCHDOWN. ALTITUDE (or HEIGHT) SHOULD BE <i>(numbers and units)</i>.
12.4.2.5.5 POSITION	<ul style="list-style-type: none"> a) <i>(distance)</i> FROM TOUCHDOWN; b) OVER APPROACH LIGHTS; c) OVER THRESHOLD.
12.4.2.5.6 CHECKS	<ul style="list-style-type: none"> a) CHECK GEAR DOWN AND LOCKED; b) CHECK DECISION ALTITUDE (or HEIGHT).
12.4.2.5.7 COMPLETION OF APPROACH	<ul style="list-style-type: none"> a) REPORT VISUAL; b) REPORT RUNWAY [LIGHTS] IN SIGHT; c) APPROACH COMPLETED [CONTACT <i>(unit)</i>].

<i>Circumstances</i>	<i>Phraseologies</i>
12.4.2.5.8 MISSED APPROACH	a) CONTINUE VISUALLY OR GO AROUND [<i>missed approach instructions</i>]; b) GO AROUND IMMEDIATELY [<i>missed approach instructions</i>] (<i>reason</i>); c) ARE YOU GOING AROUND?; d) IF GOING AROUND (<i>appropriate instructions</i>); *e) GOING AROUND.
	* Denotes pilot transmission.

12.4.3 Secondary surveillance radar (SSR) and ADS-B phraseologies

<i>Circumstances</i>	<i>Phraseologies</i>
12.4.3.1 TO REQUEST THE CAPABILITY OF THE SSR EQUIPMENT	a) ADVISE TRANSPONDER CAPABILITY; *b) TRANSPONDER (<i>as shown in the flight plan</i>); *c) NEGATIVE TRANSPONDER. * Denotes pilot transmission.
12.4.3.2 TO REQUEST THE CAPABILITY OF THE ADS-B EQUIPMENT	a) ADVISE ADS-B CAPABILITY; *b) ADS-B TRANSMITTER (<i>data link</i>); *c) ADS-B RECEIVER (<i>data link</i>); *d) NEGATIVE ADS-B. * Denotes pilot transmission.
12.4.3.3 TO INSTRUCT SETTING OF TRANSPONDER	a) FOR DEPARTURE SQUAWK (<i>code</i>); b) SQUAWK (<i>code</i>).
12.4.3.4 TO REQUEST THE PILOT TO RESELECT THE ASSIGNED MODE AND CODE	a) RESET SQUAWK [(<i>mode</i>)] (<i>code</i>); *b) RESETTING (<i>mode</i>) (<i>code</i>). * Denotes pilot transmission.

<i>Circumstances</i>	<i>Phraseologies</i>
12.4.3.5 TO REQUEST RESELECTION OF AIRCRAFT IDENTIFICATION	RE-ENTER [ADS-B <i>or</i> MODE S] AIRCRAFT IDENTIFICATION.
12.4.3.6 TO REQUEST THE PILOT TO CONFIRM THE CODE SELECTED ON THE AIRCRAFT'S TRANSPONDER	a) CONFIRM SQUAWK (<i>code</i>); *b) SQUAWKING (<i>code</i>). * Denotes pilot transmission.
12.4.3.7 TO REQUEST THE OPERATION OF THE IDENT FEATURE	a) SQUAWK [(<i>code</i>)] [AND] IDENT; b) SQUAWK LOW; c) SQUAWK NORMAL; d) TRANSMIT ADS-B IDENT.
12.4.3.8 TO REQUEST TEMPORARY SUSPENSION OF TRANSPONDER OPERATION	SQUAWK STANDBY.
12.4.3.9 TO REQUEST EMERGENCY CODE	SQUAWK MAYDAY [CODE SEVEN-SEVEN-ZERO-ZERO].
12.4.3.10 TO REQUEST TERMINATION OF TRANSPONDER AND/OR ADS-B TRANSMITTER OPERATION <i>Note.— Independent operations of Mode S transponder and ADS-B may not be possible in all aircraft (e.g. where ADS-B is solely provided by 1 090 MHz extended squitter emitted from the transponder). In such cases, aircraft may not be able to comply with ATC instructions related to ADS-B operation.</i>	a) STOP SQUAWK [TRANSMIT ADS-B ONLY]; b) STOP ADS-B TRANSMISSION [SQUAWK (<i>code</i>) ONLY].
12.4.3.11 TO REQUEST TRANSMISSION OF PRESSURE-ALTITUDE	a) SQUAWK CHARLIE; b) TRANSMIT ADS-B ALTITUDE.
12.4.3.12 TO REQUEST PRESSURE SETTING CHECK AND CONFIRMATION OF LEVEL	CHECK ALTIMETER SETTING AND CONFIRM (<i>level</i>).
12.4.3.13 TO REQUEST TERMINATION OF PRESSURE-ALTITUDE TRANSMISSION BECAUSE OF FAULTY OPERATION <i>Note.— See Note to paragraph 12.4.3.10.</i>	a) STOP SQUAWK CHARLIE WRONG INDICATION; b) STOP ADS-B ALTITUDE TRANSMISSION [(WRONG INDICATION, <i>or reason</i>)].

<i>Circumstances</i>	<i>Phraseologies</i>
12.4.3.14 TO REQUEST LEVEL CHECK	CONFIRM <i>(level)</i> .

12.5 AUTOMATIC DEPENDENT SURVEILLANCE – CONTRACT (ADS-C) PHRASEOLOGIES

12.5.1 General ADS-C phraseologies

<i>Circumstances</i>	<i>Phraseologies</i>
12.5.1.1 ADS-C DEGRADATION	ADS-C <i>(or ADS-CONTRACT)</i> OUT OF SERVICE <i>(appropriate information as necessary)</i> .

12.6 ALERTING PHRASEOLOGIES

12.6.1 Alerting phraseologies

<i>Circumstances</i>	<i>Phraseologies</i>
12.6.1.1 LOW ALTITUDE WARNING	<i>(aircraft call sign)</i> LOW ALTITUDE WARNING, CHECK YOUR ALTITUDE IMMEDIATELY, QNH IS <i>(number)</i> [<i>(units)</i>]. [THE MINIMUM FLIGHT ALTITUDE IS <i>(altitude)</i>].
12.6.1.2 TERRAIN ALERT	<i>(aircraft call sign)</i> TERRAIN ALERT, <i>(suggested pilot action, if possible)</i> .

12.7 GROUND CREW/FLIGHT CREW PHRASEOLOGIES

12.7.1 Ground crew/flight crew phraseologies

<i>Circumstances</i>	<i>Phraseologies</i>
12.7.1.1 STARTING PROCEDURES (GROUND CREW/COCKPIT)	a) [ARE YOU] READY TO START UP?;

Circumstances

Phraseologies

12.7.1.2 PUSHBACK PROCEDURES

... (ground crew/cockpit)

*b) STARTING NUMBER (*engine number(s)*).

Note 1.— The ground crew should follow this exchange by either a reply on the intercom or a distinct visual signal to indicate that all is clear and that the start-up as indicated may proceed.

Note 2.— Unambiguous identification of the parties concerned is essential in any communications between ground crew and pilots.

* Denotes pilot transmission.

a) ARE YOU READY FOR PUSHBACK?;

*b) READY FOR PUSHBACK;

c) CONFIRM BRAKES RELEASED;

*d) BRAKES RELEASED;

e) COMMENCING PUSHBACK;

f) PUSHBACK COMPLETED;

*g) STOP PUSHBACK;

h) CONFIRM BRAKES SET;

*i) BRAKES SET;

*j) DISCONNECT;

k) DISCONNECTING STAND BY FOR VISUAL AT YOUR LEFT (*or* RIGHT).

Note.— This exchange is followed by a visual signal to the pilot to indicate that disconnect is completed and all is clear for taxiing.

* Denotes pilot transmission.

12.7.2 De/anti-icing operations

<i>Circumstances</i>	<i>Phraseologies</i>
12.7.2.1 PRIOR TO DE-ICING/ANTI-ICING (GROUND CREW (ICEMAN) / FLIGHT CREW) ...aircraft configuration confirmation	<p>a) STANDING BY TO DE-ICE. CONFIRM BRAKES SET AND TREATMENT REQUIRED;</p> <p>*b) [AFFIRM] BRAKES SET, REQUEST (<i>type of de/anti-icing treatment and areas to be treated</i>);</p> <p>c) HOLD POSITION AND CONFIRM AIRCRAFT CONFIGURED;</p> <p>*d) [AFFIRM] AIRCRAFT CONFIGURED, READY FOR DE-ICING;</p> <p>e) DE-ICING STARTS NOW.</p> <p>* Denotes pilot transmission.</p>
12.7.2.2 UPON CONCLUDING DE-ICING/ANTI-ICING PROCEDURE ...for de-icing operation	<p>a) DE-ICING ON (<i>areas treated</i>) COMPLETE. ADVISE WHEN READY FOR INFORMATION;</p> <p>b) TYPE OF FLUID (<i>Type I or II or III or IV</i>);</p> <p>c) HOLDOVER TIME STARTED AT (<i>time</i>);</p> <p>d) ANTI-ICING CODE (<i>appropriate anti-icing code</i>)</p> <p><i>Note.— Anti-icing code example:</i></p> <p><i>A de-icing/anti-icing procedure whose last step is the use of a mixture of 75% of a Type II fluid and 25% water, commencing at 13:35 local time, is recorded as follows:</i></p> <p style="padding-left: 40px;"><i>TYPE II/75 13:35 (followed by complete name of anti-icing fluid)</i></p>
...for a two-step de-icing/anti-icing operation	<p>e) FINAL STEP STARTED AT (<i>time</i>);</p>
... De-icing/anti-icing complete	<p>f) POST DE-ICING CHECK COMPLETED;</p> <p>g) PERSONNEL AND EQUIPMENT CLEAR OF AIRCRAFT;</p>

12.7.2.3 ABNORMAL OPERATIONS

... for spray nozzle proximity sensor activation

a) BE ADVISED NOZZLE PROXIMITY ACTIVATION ON *(significant point on aircraft)* [NO VISUAL DAMAGE *or* DAMAGE *(description of damage)* OBSERVED] [SAY INTENTIONS];

... for other aircraft having an emergency on the de-icing bay

b) EMERGENCY IN DE-ICING BAY *(de-icing bay number)* [SHUT DOWN ENGINES *or* STANDBY FOR FURTHER INSTRUCTIONS].

Chapter 13

AUTOMATIC DEPENDENT SURVEILLANCE — CONTRACT (ADS-C) SERVICES

13.1 GENERAL

Note.— *Guidance material concerning the implementation of ADS-C is contained in the Global Operational Data Link (GOLD) Manual (Doc 10037).*

The provision of air traffic services to aircraft, based on information received from aircraft via ADS-C, is generally referred to as the provision of ADS-C services.

13.2 ADS-C GROUND SYSTEM CAPABILITIES

13.2.1 ADS-C ground systems used in the provision of air traffic services shall have a very high level of reliability, availability and integrity. The possibility of system failures or significant system degradations that may cause complete or partial interruptions of service shall be very remote. Backup facilities shall be provided.

Note 1.— *An ADS-C ground system will normally consist of a number of integrated elements, including communication interfaces, a data-processing system and one or more controller interfaces.*

Note 2.— *Information pertaining to use of ADS-C and to system reliability, availability and integrity is contained in the Performance-based Communication and Surveillance (PBCS) Manual (Doc 9869).*

13.2.2 ADS-C ground systems should be capable of integration with other automated systems used in the provision of ATS and should provide for an appropriate level of automation with the objectives of improving the accuracy and timeliness of data displayed to the controller and reducing controller workload and the need for verbal coordination between adjacent control positions and ATC units.

13.2.3 Several significant functional requirements are necessary to permit the effective implementation of an ADS-C service in a CNS/ATM environment. Ground systems shall provide for:

- a) the transmitting, receiving, processing and displaying of ADS-C messages related to flights equipped for and operating within environments where ADS-C services are being provided;
- b) the display of safety-related alerts and warnings;
- c) position monitoring (the aircraft's current position as derived from ADS-C reports is displayed to the controller for air traffic situation monitoring);
- d) conformance monitoring (the ADS-C reported current position or projected profile is compared to the expected aircraft position, which is based on the current flight plan. Along track, lateral and vertical deviations that exceed a pre-defined tolerance limit will permit an out-of-conformance alert to be issued to the controller);

- e) flight plan update (e.g. longitudinal variations that exceed pre-defined tolerance limits will be used to adjust expected arrival times at subsequent fixes);
- f) intent validation (intent data contained in ADS-C reports, such as extended projected profile, are compared with the current clearance and discrepancies are identified);
- g) conflict detection (the ADS-C data can be used by the ADS-C ground system automation to identify violations of separation minima);
- h) conflict prediction (the ADS-C position data can be used by the ADS-C ground system automation to identify potential violations of separation minima);
- i) tracking (the tracking function is intended to extrapolate the current position of the aircraft based on ADS-C reports);
- j) wind estimation (ADS-C reports containing wind data may be used to update wind forecasts and hence expected arrival times at waypoints); and
- k) flight management (ADS-C reports may assist automation in generating optimum conflict-free clearances to support possible fuel-saving techniques, such as cruise climbs, requested by the operators).

Note.— The use of ADS-C does not relieve the controller of the obligation to continuously monitor the traffic situation.

13.2.4 The sharing of ADS-C information should be facilitated to the extent possible, in order to extend and improve surveillance in adjacent control areas, thereby reducing the need for additional ADS contracts to be supported by a given aircraft.

13.2.5 Automated exchange of coordination data relevant to aircraft being provided with an ADS-C service, and the establishment of automated coordination procedures shall be provided for on the basis of regional air navigation agreements.

13.2.6 Air traffic control facilities providing an ADS-C service shall be capable of storing and disseminating specific flight information relating to flights equipped for and operating within environments where an ADS-C service is provided.

13.2.7 Effective human-machine interfaces shall exist for the controller to permit appropriate utilization of the ADS-C-derived information and associated automated features.

13.3 ADS-C-RELATED AERONAUTICAL INFORMATION

Adequate information on the operating practices having a direct effect on the operations of air traffic services shall be published in aeronautical information publications. This shall include a brief description concerning the area of responsibility, requirements and conditions under which the ADS-C service is available, equipment limitations, ADS-C failure procedures, if required, and the initial address(es) for each ATC unit.

13.4 USE OF ADS-C IN THE PROVISION OF AIR TRAFFIC CONTROL SERVICE

13.4.1 General

13.4.1.1 ADS-C may be used in the provision of an air traffic control service, provided identification of the aircraft is unambiguously established.

13.4.1.2 Flight data processing of ADS-C data may be used in the provision of an air traffic control service, provided the correlation between the ADS-C data downlinked by that aircraft and the flight plan details held for the aircraft has been accomplished.

Note.— A combination of information received from the aircraft may be necessary to ensure unambiguous correlation, e.g. departure aerodrome, estimated off-block time (EOBT), and destination aerodrome might be used.

13.4.1.3 Human Factors principles shall be observed. In particular, the controller shall be provided with enough information to:

- a) maintain situational awareness; and
- b) be capable of assuming, in the event of system malfunction, the minimum tasks for the provision of an air traffic control service, normally performed by automation.

Note 1.— Automated systems, while designed to provide high operational integrity, remain susceptible to error and failure. Human participation is integral to the safety of the air traffic system.

Note 2.— Guidance material on Human Factors principles can be found in the Human Factors Training Manual (Doc 9683), Human Factors Digest No. 8 — Human Factors in Air Traffic Control (Circular 241), and Human Factors Digest No. 11 — Human Factors in CNS/ATM Systems (Circular 249).

13.4.1.4 Information provided by the ground system may be used by the controller to perform the following functions in the provision of air traffic control services:

- a) enhance safety;
- b) maintain an accurate awareness of the air traffic situation;
- c) apply separation minima;
- d) take appropriate action regarding any significant deviation by aircraft from the terms of their respective air traffic control clearances, including their cleared routes, levels and speed when appropriate;

Note.— Where tolerances regarding such matters as adherence to 3-D position, speed or time have been prescribed by the appropriate ATS authority, deviations are not considered significant until such tolerances are exceeded.

- e) provide updated position information regarding aircraft to other controllers when required; and
- f) improve airspace utilization, reduce delays, as well as provide for direct routings and more optimum flight profiles.

13.4.2 Presentation of ADS-C data

13.4.2.1 Appropriate ADS-C data shall be presented to the controller in a manner suitable to achieve the control functions in 13.4.1.4. Display systems shall incorporate a situation display, textual information display, aural and visual alerts in such combinations as deemed appropriate.

13.4.2.2 Display systems may display actual ADS-C report information only or a combination of actual ADS-C report information and data derived from ADS-C reports. Additionally, display systems may incorporate surveillance information from a number of other sources, including data derived from radar, ADS-B, the flight data processing system (FDPS) and/or CPDLC or voice position reports.

13.4.2.2.1 Where surveillance information is derived from different sources, the type of surveillance shall be readily apparent to the controller.

13.4.2.3 ADS information available to the controller on a situation display shall, as a minimum, include ADS position indications and map information.

13.4.2.3.1 When applicable, distinct symbols should be used to differentiate presentation of position indications which are derived from:

- a) ADS-C position reports; or
- b) combinations of ADS-C with information derived from other surveillance sources, e.g. PSR, SSR, ADS-B; or
- c) ADS-C extrapolations.

13.4.2.3.2 Labels used to provide ADS-C-derived information and any other information that may be available shall, as a minimum, be displayed in alphanumeric form.

13.4.2.3.3 Label information shall, as a minimum, include aircraft identification and level information. All label information shall be presented in a clear and concise manner. Labels shall be associated with their ADS-C position indications in a manner precluding erroneous identification.

13.4.2.4 When ADS-C reports are queued, the controller shall be given an indication that more urgent reports are available based on the following order of priority:

- a) emergency and/or urgency mode ADS-C reports;
- b) event or demand ADS-C reports; and then
- c) periodic ADS-C reports.

13.4.2.4.1 If more than one ADS-C report is queued in any one of a), b) or c) above, they shall be handled in the order received.

13.4.2.5 Safety-related alerts and warnings, including emergency/urgent reports, shall be presented in a clear and distinct manner. Provisions shall be made for alerting the controller when expected ADS-C reports are not received within an appropriate time.

Note.— Non-receipt of ADS-C event contract reports may be undetectable.

13.4.3 Provision of ADS-C services

13.4.3.1 GENERAL

The number of aircraft simultaneously provided with ADS-C services shall not exceed that which can safely be handled under the prevailing circumstances, taking into account:

- a) the complexity of the traffic situation and associated workload within the sector or area of responsibility of the controller;
- b) the level of automation of the ADS-C ground system;
- c) the overall technical performance of the ADS-C systems and communications systems, including possible degradations that would require use of backup facilities;
- d) the overall performance of the backup surveillance and communications systems; and
- e) the effect of loss of controller-pilot communications.

13.4.3.2 COORDINATION AND TRANSFER OF CONTROL OF ADS-C AIRCRAFT

13.4.3.2.1 Appropriate arrangements shall be made in and between any ATC units using ADS-C to ensure the coordination of ADS-C and non-ADS-C traffic and to ensure the provision of adequate separation between the ADS-C aircraft and all other aircraft.

13.4.3.2.2 Transfer of control shall be effected so as to facilitate uninterrupted provision of ADS-C services where ADS-C is available in adjacent ATC units.

13.4.3.2.3 The accepting ATC unit shall establish a contract with the affected aircraft prior to reaching the transfer of control point. Should the accepting ATC unit be unable to establish a contract, the transferring ATC unit shall be notified in order to provide ground forwarding of ADS-C data to permit an uninterrupted ADS-C service.

13.4.3.2.4 When an aircraft is in an emergency/urgency mode or is the subject of safety alerts or warnings, this information shall be provided to the accepting ATC unit, and the ADS contract shall not be terminated by the transferring ATC unit until appropriate coordination has been effected.

13.4.3.2.5 Transfer of control of aircraft between adjacent control positions or between adjacent ATC units may be effected as follows:

- a) appropriate ADS-C transfer protocols are observed by:
 - 1) designation of the ADS-C position indication by automated means; or
 - 2) direct designation of the ADS-C position indication if two display systems are adjacent or if a common (conference) type of display is used; or
 - 3) designation of the ADS-C position indication by reference to a position accurately indicated on both display systems;
- b) updated flight plan information on the aircraft about to be transferred is provided to the accepting controller prior to transfer;

- c) when controllers are not physically adjacent, direct communications facilities are available between them at all times;

Note.— This requirement may be met by two-way direct speech facilities or ATS interfacility data communications (AIDC).

- d) the transfer point or points and all other conditions of application have been made the subject of specific instructions or a specific letter of agreement; and
- e) the accepting controller is kept current of all control instructions (e.g. level or speed instructions) given to the aircraft prior to its transfer and which modify its anticipated flight progress.

Note.— This requirement may be met by two-way direct speech facilities or ATS interfacility data communications (AIDC).

13.4.3.2.6 The minimum agreed separation between aircraft about to be transferred shall be as specified in letters of agreement or local instructions, as appropriate.

13.4.3.3 COMMUNICATIONS

Controller-pilot communications shall be such that the possibility of communications failure or significant degradations is very remote. Adequate backup facilities shall be provided.

13.4.3.4 GENERAL ADS-C PROCEDURES

13.4.3.4.1 ADS CONTRACT MANAGEMENT

13.4.3.4.1.1 Only appropriate ATC units shall initiate ADS contracts with a given aircraft. Procedures shall ensure that non-current contracts are terminated in a timely manner.

13.4.3.4.1.2 The ADS-C ground system shall be able to identify the ADS-C capability of the aircraft and establish appropriate ADS contracts with ADS-C-equipped aircraft.

13.4.3.4.1.3 ADS contracts necessary for the control of the aircraft will be established with each aircraft by the relevant ADS-C ground system, at least for the portions of the aircraft flight over which that ATC unit provides air traffic services.

13.4.3.4.1.4 The contract may include the provision of basic ADS-C reports at a periodic interval defined by the ADS-C ground system with, optionally, additional data containing specific information, which may or may not be sent with each periodic report. The agreement may also provide for ADS-C reports at geographically defined points such as waypoints, in addition to other specific event-driven reports.

13.4.3.4.1.5 The aircraft must be capable of supporting ADS-C agreements with at least four ATC unit ADS-C ground systems simultaneously.

13.4.3.4.1.5.1 When an ADS-C ground system attempts to establish an ADS-C agreement with an aircraft and is unable to do so due to the aircraft's inability to support an additional ADS contract, the aircraft should reply with the

ICAO location indicators or eight-letter facility indicators of the ground systems with which it currently has contracts, in order for the ATC unit to negotiate a contract release. In the event that this information cannot be provided to the ground system, the ground system shall nevertheless alert the controller that an ADS agreement cannot be established. Coordination between the appropriate ATC units shall then be effected for the purpose of establishing priority for ADS-C connections with the aircraft.

13.4.3.4.1.6 An ATC unit shall be capable of replacing or terminating its own ADS contract(s) as required. An existing contract shall remain in place until any new contract of the same type is accepted by the aircraft or until the contract type is terminated.

13.4.3.4.2 ADS-C TERMINATION

13.4.3.4.2.1 ADS contracts may be terminated manually, or automatically by the ADS-C ground system, based on agreements between ATS authorities for aircraft crossing FIR boundaries.

13.4.3.4.2.2 ATS authorities shall establish procedures to ensure that ADS contracts are re-established as required when unplanned ADS-C termination occurs.

13.4.3.4.3 ADS-C AGREEMENTS

13.4.3.4.3.1 Except as provided for in 13.4.3.4.3.2, initial ADS-C agreements shall be determined by the ATS authority. Subsequent modifications to individual contracts may be made at the discretion of the ATS unit.

13.4.3.4.3.2 In airspace where procedural separation is being applied, ADS-C agreements shall, as a minimum, contain the following ADS contracts:

- a) a periodic contract at an interval appropriate to the airspace requirements;
- b) an event contract, specifying the following:
 - 1) a waypoint change event;
 - 2) a lateral deviation event; and
 - 3) a level range deviation event.

Note.— A vertical rate change event specified at, for example, a negative vertical rate (i.e. a descent) exceeding 27 m/s (5 000 ft/min), may provide an additional indication of an abnormal situation.

13.4.3.4.3.3 Upon receipt of an event report indicating a deviation from the clearance, the ATC unit shall establish a periodic contract at a reduced reporting interval, as deemed appropriate, requesting the ground vector data block in addition to basic ADS-C data block. The ATC unit shall advise the flight crew of the observed deviation and ascertain its intention using CPDLC or voice, as appropriate.

13.4.3.4.3.4 The reduced ADS-C periodic reporting interval shall be retained until the aircraft has resumed its clearance, at which time the event contract shall be re-established and the normal periodic contract restored. Action should be taken by the ATC unit to notify proximate aircraft if appropriate.

13.4.3.4.3.5 When the application of specified separation minima is dependent on the reporting interval of periodic position reports, the ATC unit shall not establish periodic contracts with a reporting interval greater than the required reporting interval.

13.4.3.4.3.6 Where an expected position report is not received within a prescribed time parameter, action shall be taken, as appropriate, to ascertain the position of the aircraft.

Note 1.— This may be achieved by the use of an ADS demand contract, CPDLC or voice communications, or receipt of a subsequent periodic report.

Note 2.— Requirements concerning the provision of an alerting service are contained in Chapter 9.

13.4.3.4.4 PERFORMANCE CHECKS

13.4.3.4.4.1 An ATC unit providing an ADS-C service to an aircraft shall check the ADS-C three-dimensional position information received from that aircraft through pilot reports and/or flight plan conformance.

13.4.3.4.4.2 The pilot of the aircraft whose ADS-C-derived position information is within the approved tolerance value need not be advised of such verification.

13.4.3.4.4.3 If the displayed position information is not within the approved tolerance value, or when a discrepancy in excess of the approved tolerance value is detected subsequent to verification, the pilot shall be advised accordingly and requested to check the aircraft's navigation system.

13.4.3.4.4.4 The controller shall adjust the display(s) and carry out adequate checks on the accuracy thereof, in accordance with instructions prescribed by the appropriate authority responsible for the ADS-C display or integrated display system concerned.

13.4.3.4.4.5 The controller shall be satisfied that the functional capabilities of the ADS-C display system or integrated display system, as well as the information displayed, is adequate for the functions to be performed.

13.4.3.4.4.6 The controller shall report, in accordance with local procedures, any fault in the equipment or any incident requiring investigation or any circumstances which make it difficult or impractical to provide services on the basis of displayed ADS-C positions.

13.4.3.4.5 EMERGENCY REPORTS

Note.— To indicate that it is in a state of emergency or the state of emergency is terminated, an aircraft equipped with ADS-C might operate the emergency mode as follows:

- a) *emergency; and*
- b) *emergency cancelled.*

13.4.3.4.5.1 When an ADS-C report is received with an emergency status indication, the controller with responsibility for the flight must acknowledge receipt of the information by the most appropriate means of communication.

13.4.3.4.5.2 Both the aircraft and the ADS-C ground system shall be capable of supporting an emergency mode of ADS-C operation to assist ATC alerting procedures and to assist search and rescue operations. In the event of an aircraft in, or appearing to be in, any form of emergency, all possible assistance shall be provided by the controller.

Note.— The ADS-C airborne system will provide for a pilot-initiated emergency mode. It may also permit the aircraft to automatically establish the emergency mode.

13.4.3.4.5.3 The ADS-C ground system shall recognize the initiation, modification and termination of an emergency mode and alert the controller. The ADS-C ground system shall be able to modify the emergency reporting rate if necessary. The ADS-C ground system shall be able to suppress an emergency indication.

13.4.3.4.6 FAILURE OF EQUIPMENT

Note.— It is not expected that the pilot will be made aware of any failure of ADS-C by means of on-board monitoring equipment.

13.4.3.4.6.1 ADS-C airborne system failure

13.4.3.4.6.1.1 On receipt of an airborne failure notification, the controller will:

- a) advise the pilot of the failure;
- b) advise the pilot of the requirement for position reports via voice or CPDLC; and
- c) take necessary action to establish alternative separation, if required.

13.4.3.4.6.1.2 When an aircraft experiencing ADS-C failure after departure is operating or expected to operate in an area where the carriage of functional ADS-C with specified capabilities is mandatory, the ATC units concerned should endeavour to provide for continuation of the flight to the aerodrome of first intended landing in accordance with the flight plan. However, under some circumstances, continuation of the flight may not be possible due to traffic or airspace configuration. The aircraft may then be required to return to the departure aerodrome or to land at the nearest suitable aerodrome acceptable to the operator concerned.

13.4.3.4.6.1.3 In the case of an ADS-C failure that is detected before departure from an aerodrome where it is not practicable to effect a repair, the aircraft concerned should be permitted to proceed, as directly as possible, to the nearest suitable aerodrome where repair can be made. When granting clearance to such aircraft, the air traffic control unit should take into consideration the existing or anticipated traffic situation and may have to modify the time of departure, flight level or route of the intended flight. Subsequent adjustments may become necessary during the course of the flight.

13.4.3.4.6.2 ADS-C ground system shutdown

13.4.3.4.6.2.1 When a planned shutdown of the ADS-C ground system occurs:

- a) a NOTAM shall be published to inform all affected parties of the shutdown period;
- b) position reports via voice or CPDLC shall be stipulated; and
- c) alternative separation shall be established, if required.

13.4.3.4.6.2.2 In the event of an unplanned ADS-C ground system shutdown, the relevant ATS provider shall:

- a) inform all affected aircraft and advise them of the requirement for position reports via voice or CPDLC;
- b) take necessary action to establish alternative separation, if required;
- c) inform the adjacent ATS unit(s) by direct coordination; and
- d) inform all other relevant parties via the publication of a NOTAM, if appropriate.

13.5 USE OF ADS-C IN THE APPLICATION OF SEPARATION MINIMA

13.5.1 General

Note.— In an ADS-C-based air traffic control (ATC) system, the accuracy of the positional information displayed to the controller is dependent upon the aircraft's on-board navigation or positioning system. Therefore, any aircraft system degradation that affects the aircraft's navigational capabilities will also affect the accuracy of the positional data displayed to the controller.

13.5.1.1 The procedures and minima in this section are applicable when ADS-C is used in the provision of air traffic control services.

13.5.1.1.1 The use of ADS-C position reports to ensure separation shall only be applied when there is a reasonable assurance that the provision of ADS-C reports will not be interrupted.

13.5.2 Determination of level occupancy

13.5.2.1 The tolerance value which shall be used to determine that the ADS-C level information displayed to the controller is accurate shall be ± 60 m (± 200 ft) in RVSM airspace. In other airspace, it shall be ± 90 m (± 300 ft), except that appropriate ATS authorities may specify a smaller criterion, but not less than ± 60 m (± 200 ft), if this is found to be more practical.

13.5.2.2 If the ADS-C level information is not within the approved tolerance value, the information must be validated by voice or CPDLC. Where it has been established that the ADS-C level information is incorrect, the appropriate ATS authority shall determine the action to be taken regarding the display and use of this information.

13.5.2.3 An aircraft cleared to leave a level is considered to have commenced its manoeuvre and vacated the previously occupied level when the ADS level information indicates a change of more than 90 m (300 ft) in the anticipated direction from its previously assigned level, or verification has been made by receipt of a CPDLC or voice report from the pilot.

13.5.2.4 An aircraft that is climbing or descending is considered to have crossed a level when the ADS-C level information indicates that it has passed this level in the required direction by more than 90 m (300 ft) or that verification has been made by receipt of a CPDLC or voice report from the pilot.

13.5.2.5 An aircraft that is climbing or descending is considered to have reached the level to which it has been cleared when verification has been made by receipt of the assigned level by CPDLC or a voice report from the pilot. The aircraft may then be considered to be maintaining this level for as long as the ADS-C level information remains within the appropriate tolerance values as specified in 13.5.2.1.

Note.— A level range deviation event contract may be used to monitor the continued compliance of the aircraft with the appropriate level tolerance values.

13.5.2.5.1 When CPDLC is to be used to verify that the aircraft has reached the level to which it has been cleared, the uplink message No. 129, REPORT MAINTAINING (*level*), or uplink message No. 200, REPORT REACHING, should be used.

*Note.— Uplink message No. 175, REPORT REACHING (*level*), does not provide the same assurance that the aircraft has maintained the assigned level. On those occasions where the flight management system has been loaded by*

the pilot to reply automatically to this message, the reply may be sent when the aircraft reaches the assigned level, irrespective of whether the aircraft maintains the assigned level.

13.5.2.6 Where it is intended to provide vertical separation below a transition level using ADS-C level information, the appropriate authority shall ensure that such information is corrected to the appropriate barometric altitude.

13.5.3 Application of horizontal separation using ADS-C position information

Note 1.— Factors that the controller must take into account in determining the spacing to be applied in particular circumstances in order to ensure that the separation minimum is not infringed include aircraft relative headings and speeds, ADS-C technical limitations, controller workload and any difficulties caused by communications congestion.

Note 2.— Information on the determination and application of separation minima is contained in the Manual on Airspace Planning Methodology for the Determination of Separation Minima (Doc 9689).

13.5.3.1 ADS-C-based longitudinal distance separation minima are detailed at 5.4.2.9 of Chapter 5.

13.5.3.2 ATS authorities shall ensure that contingency procedures are available to be followed in the event of degradation of ADS-C information due to a loss of the required navigation performance accuracy.

13.5.3.3 Distance-based separation minima for use with ADS-C may be applied between ADS-C-derived aircraft positions, or between ADS-C-derived positions and radar or ADS-B-derived positions. The positions of the aircraft shall be extrapolated or interpolated, as necessary, to ensure that they represent the positions of the aircraft at a common time.

13.5.3.3.1 Displayed ADS-C position symbols should enable the controller to distinguish between reported, extrapolated or interpolated positions. When there is any doubt regarding the integrity of the information displayed as an extrapolated or interpolated position symbol, it shall be updated by a demand contract request.

13.5.3.3.2 ADS-C-based separation shall not be applied between aircraft holding over the same holding fix. Application of horizontal separation between holding aircraft and other flights shall be subject to requirements and procedures prescribed by the appropriate ATS authority.

13.5.3.4 Information derived from the display of ADS-C information shall not be used to vector an aircraft.

Note.— Vectoring using ADS-C may be possible in the future in cases where the surveillance and communications performance are comparable to the performance of radar systems and direct voice communications using VHF.

