



CHAPTER 8

RADAR SERVICES AND PROCEDURES

8.1 GENERAL PROVISIONS:

8.1.1 Radar control procedures will be used by ATC in preference to non-radar control procedures whenever ATS or aircraft served will gain operational advantage.

8.1.2 The provision of radar services to aircraft is subject to:

- Communication system availability and reliability;
- Radar equipment limitations;
- Controller workloads,
- The capability of the controller to revert to non-radar separation in the event of radar failure.

8.1.3 The number of aircraft simultaneously provided with radar services shall not exceed that which can safely be handled under the prevailing circumstances, taking into account:

- the structural complexity of the control area or sector concerned;
- the radar functions to be performed within the control area or sector concerned;
- assessments of controller workloads and sector capacity;
- the degree of technical reliability and availability of the main radar and communication systems;
- the possibility of a radar equipment failure or other emergency that would eventually require reverting to back-up facilities and/or non-radar separation; and
- the degree of technical reliability and availability of the back-up radar and communication systems.

8.1.4 The following types of radar services may be provided to aircraft operating within reliable radar coverage:

Type of radar service	Class of airspace
Radar control service	D & E
Radar Advisory service	F
Radar Flight information service	G

8.1.5 Before providing radar service to an aircraft, radar identification shall be established and the pilot informed. Thereafter, radar identification shall be maintained until termination of the radar service.

8.1.6 If radar identification is subsequently lost, the pilot shall be informed accordingly and, when applicable, appropriate instructions issued.

8.1.7 The provision of radar services requires that aircraft remain in direct two way communication with the unit providing the service. However radar separation may be provided between two radar identified aircraft even when only one of the aircraft is in direct communication with the radar unit.

8.1.8 In the event of an aircraft in or appearing to be in, any form of emergency ATC will provide all possible assistance, including the provision of radar service to the extent possible.

8.2 USE OF RADAR IN AIR TRAFFIC CONTROL SERVICE:

8.2.1 The information presented on a radar display may be used to perform the following functions in the provision of Air Traffic Control service;



8.2.1.1 Provide radar service to

- a) Improve airspace utilization;
- b) Reduce delays;
- c) Facilitate direct routings and more optimum flight profiles;(DOC 4444#)
- d) Enhance safety

8.2.1.2 Provide radar vectoring to:-

- a) Departing aircraft for expeditious and efficient departure flow and expediting climb to cruising level
- b) Arriving aircraft for the purpose of expediting descent from cruising level and establishing an expeditious and efficient approach sequence.
- c) Aircraft for purpose of resolving potential conflict.
- d) Assist pilot in their navigation.

8.2.1.3 Provide separation and maintain normal traffic flow when an aircraft experiencing communication failure is within area of radar coverage.

8.2.1.4 Maintain radar monitoring of traffic

8.2.1.5 Monitor the progress of air traffic in order to:

- a) Obtain improved position information regarding aircraft under control.
- b) Obtain supplementary information regarding other traffic.
- c) Detect significant deviations by aircraft from their assigned routing or level.

NOTE: To be considered 'Significant' an aircraft's track deviation should be sufficient to take it beyond the boundary of the route being followed or be assessed by the radar controller as liable to take it beyond the edge of the protected airspace of the route being followed.

8.2.2 The information presented on a radar display may be used to perform the following additional functions in the provision of approach control service:

- a) provide radar vectoring of arriving traffic on to pilot-interpreted final approach aids;
- b) provide radar vectoring of arriving traffic to a point from which a visual approach can be completed;
- c) provide radar vectoring of arriving traffic to a point from which a surveillance radar approach can be made;
- d) provide radar monitoring of other pilot-interpreted approaches;
- e) in accordance with prescribed procedures, conduct: surveillance radar approaches;
- f) provide radar separation between:
 - i) succeeding departing aircraft;
 - ii) succeeding arriving aircraft; and
 - iii) a departing aircraft and a succeeding arriving aircraft.

8.3 USE OF SSR TRANSPONDERS

8.3.1 To ensure the safe and efficient use of Secondary surveillance Radar (SSR), pilots and controllers shall strictly adhere to published operating procedures. Standard radiotelephony phraseology shall be used and the correct setting of transponder codes shall be ensured at all times.

8.3.2 Use of SSR without Primary Radar:

8.3.2.1 SSR information may be used alone in the provision of separation between aircraft provided; aircraft identification is established and maintained by use of discrete SSR codes.

8.3.2.2 Non-radar separation will be applied between transponder-equipped aircraft and an aircraft without a SSR transponder or with a non-functioning SSR transponder.

8.3.2.3 In the event of an aircraft transponder failure or ATC determining that transponder does not meet serviceability requirements the aircraft (for whom carriage of Transponder is mandatory) will normally

be permitted to continue to operate to the next point of landing.

8.3.2.4 An aircraft (for whom carriage of transponder is mandatory) whose transponder failure is detected before departure may be specifically authorized by ATC to operate without serviceable transponder provided a request is included in the flight plan.

8.3.3 SSR Code management

8.3.3.1 Uniqueness and continuity criteria are used to provide permanent visibility and identification of individual flights with a minimum of errors and of interruptions.

- a) *Uniqueness*: Only one aircraft should respond on a given code in any particular area and at any given time. This measure provides an unambiguous code / call-sign association and consequently an easy identification of flights.
- b) *Continuity*: A code assigned to a flight will be retained as long as possible (preferably for the entire duration of the flight). This measure secures permanent display of individual flights, especially for control transfers between adjacent units.

8.3.3.2 The uniqueness and continuity criteria enhance safety by limiting the likelihood of identification errors due to the presence of several aircraft having the same code or to wrong settings. They assist traffic flow equally well since radar identification and all aspects connected with transfers are facilitated. This result in some reduction of controllers' workload (Radio-telephony, monitoring for identification, etc.).

8.3.3.3 The detailed principles governing the use of SSR codes in the Asia/PAC Region are based on the following general principles:

- a) Mode A/3 codes should be used for ATS purposes only.
- b) Code assignment practices should be based on the temporary use of codes

and permit the most economic code recycling. The need for code changes during flight should be minimum and may be resorted to only when essential for the operations of the ATC system/unit having control responsibility.

- c) Codes are allotted on the basis of duly justified operational requirements, with the actual number derived from the number of aircraft to be handled simultaneously within a specified area and for a determined period of protection (uniqueness) during traffic peaks.
- d) Codes should be assigned to aircraft as close as possible to their actual departure time, and preferably at the time they receive their start-up clearance. In the case of having to change the code of an aircraft while in flight, the assignment should be made as close as possible to the time the flight is to transfer to the control of the assigning ATS unit/system
- e) Codes may be assigned according to the earliest time of release. However, in units assigning codes manually, the cyclical assignment of the codes released should be undertaken instead of an allocation.

8.3.3.4 Special Purpose Codes:

8.3.3.4.1 Specific codes in certain series are reserved for special purposes as follows:

SSR Codes	Purpose
0000	Available as a general-purpose code for domestic use by any State.
2000	Reserved for use on the initiative of pilots to provide recognition of aircraft which have not received ATC instructions regarding which code to squawk.
7500	Reserved for use in the event of unlawful interference.

7600	Reserved for use in the event of radiotelephony communication failure
7700	Reserved for use in the event of emergencies

8.3.3.5 International Codes:

8.3.3.5.1 International codes are allotted for assignment to aircraft engaged in international flights. They may also be assigned to international flights which overfly, or fly into the, FIR. However, in keeping with the principle of continuity, this action should always be seen as a exception to recommended practice.

8.3.3.5.2 International codes are assigned in accordance with the following principles.

8.3.3.5.3 Duplication of code assignments by different units in the same FIR is prevented.

8.3.3.5.4 Each flight will retain the original code assigned for the entire flight within the originating FIR at least.

8.3.3.5.5 Appropriate code protection criteria shall be applied in order to avoid duplication by too early re-assignment of the same code. For most FIRs within the ASIA/PAC Region, a protection period of two (2) hours should be sufficient. However, larger FIRs may need to apply longer protection periods, or protection by some other criteria (i.e. knowledge of the aircraft having reached its destination or having passed a predetermined point). For reasons of economy, every effort should be made to reduce the length of the protection periods whenever possible.

8.3.3.5.6 The protection period needs to be calculated with respect to preventing duplication in adjacent FIRs as well as within the FIR in which the flight originated.

8.3.3.5.7 Code changes at FIR boundaries should only be undertaken to meet the essential needs of ATC in the receiving FIR.

8.3.3.6 Domestic Codes:

8.3.3.6.1 Domestic codes are allotted for assignment to aircraft engaged in flights which will remain wholly within the State FIRs.

8.3.3.6.2 Domestic codes should be used so that the utmost economy in the number of codes required is achieved. All of the general principles described above and several of those ascribed to international code assignment (i.e prevention of duplication, code retention for flight leg, protection period etc.), are relevant with respect to domestic code use.

8.3.3.7 Except as provided in para 8.3.4, 8.3.5 and 8.3.6 below pilots shall operate transponders and select modes and codes in accordance with the following procedures.

- a) Aircraft departing from an aerodrome located in Delhi, Calcutta, Chennai, Mumbai and Guwahati FIR shall be assigned an appropriate SSR code on departure. This SSR code setting shall continue unless instructed otherwise.
- b) Aircraft engaged in International flight, entering Delhi, Calcutta, Chennai, Mumbai and Guwahati FIR shall continue to maintain the SSR code being squawked in the adjacent FIR. This SSR code setting shall be included in the first position report prior to entering the FIR.
- c) Aircraft engaged on domestic flight shall operate the transponder on the last assigned code.
- d) Aircraft not assigned a SSR code shall operate transponder on mode A3 code 2000 before entry into Delhi, Calcutta, Chennai, Mumbai and Guwahati FIR and maintain that code setting until otherwise instructed.
- e) In order to avoid interference on Radar display, the pilot shall not operate the transponder when the aircraft is on

ground except when entering the runway for take off or till vacating the runway after landing.

8.3.4 Emergency Procedure:

8.3.4.1 An aircraft encountering a state of emergency may continue to operate the transponder on the previously assigned code, until otherwise advised. Alternatively the transponder shall be set to mode A3 code 7700.

8.3.4.2 Notwithstanding the procedure in 8.3.4.1 above, a pilot may select mode A3 code 7700 whenever the nature of the emergency is such that this appears to be the most suitable course of action.

8.3.5 Radio Communication Failure

8.3.5.1 In the event of an aircraft radio receiver failure, a pilot shall select mode A3 code 7600 and follow established procedures; subsequent control of the aircraft will be based on those procedures.

8.3.6 Unlawful Interference

8.3.6.1 Should an aircraft in flight be subjected to unlawful interference, the pilot shall endeavor to set the transponder to mode A3 code 7500 to give indication of the situation unless circumstances warrant the use of mode A3 code 7700.

8.3.6.2 When a pilot has selected mode A3 code 7500 and is subsequently requested to confirm his code by ATC he shall, according to circumstances either confirm this or not reply at all.

NOTE: The absence of a reply from the pilot will be taken by ATC as an indication that the use of code 7500 is not due to an inadvertent false code selection.

8.3.7 Operation of SSR transponders:

8.3.7.1 When, after a pilot has been directed to operate the aircraft's transponder on an assigned code, or to effect a code change, it is observed that the code shown

on the radar display is different from that assigned to the aircraft, the pilot shall be requested to reselect the assigned code.

8.3.7.2 Whenever it is observed that the code of an aircraft as shown on the radar display, or aircraft identification where code/call sign conversion is effected, is different from that assigned to the aircraft and the application of the procedure described in 8.3.7.1 has not resolved this discrepancy or is not warranted by circumstances (e.g. unlawful interference), the pilot shall be requested to confirm the correct code has been selected.

8.3.7.3 If the discrepancy 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 in the provision of ATS shall be informed accordingly.

8.3.7.4 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.(DOC4444)

8.3.8 Level Information based on the use of Mode C:

8.3.8.1 *Verification of accuracy of Mode-c derived level information:*

8.3.8.1.1 The tolerance value used to determine that Mode C-derived level information displayed to the controller is accurate shall be ± 300 ft.

8.3.8.1.2 Verification of the accuracy of Mode C-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 except. 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 Mode C-derived level information is within the approved tolerance value need not be advised of such verification.

Note 1: The accuracy of Mode C-derived level information displayed to the controller may be verified based on the level information report given by aircraft

Note 2: When the accuracy of Mode C-derived level information displayed to the controller has been verified by a radar controller and handoff is made to another radar controller at the same airport (intra facility), the accepting controller need not verify the Mode C-derived level information.

8.3.8.1.3 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.

8.3.8.1.4 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 transmission, provided this does not interrupt the operation of the transponder on Mode A and notify the next control positions or ATC unit concerned with the aircraft of the action taken;
- b) inform the pilot of the discrepancy and request that Mode C operation continue in order to prevent loss of position and identity information on the aircraft and notify the next control position or ATC unit concerned with the aircraft of the action taken.

8.3.8.2 Determination of level occupancy:

8.3.8.2.1 The criterion which shall be used to determine that a specific level is occupied by an aircraft shall be ± 300 ft.

8.3.8.2.2 *Aircraft maintaining a level.* An aircraft is considered to be maintaining its assigned level as long as the SSR Mode C-derived level information indicates that it is within ± 300 ft of the assigned level.

8.3.8.2.3 *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 SSR Mode C-derived level information indicates a change of more than ± 300 ft in the anticipated direction from its previously assigned level.

8.3.8.2.4 *Aircraft passing a level in climb or descent.* An aircraft in climb or descent is considered to have crossed a level when the SSR Mode C-derived level information indicates that it has passed this level in the required direction by more than ± 300 ft.

8.3.8.2.5 *Aircraft reaching a level.* An aircraft is considered to have reached the level to which it has been cleared when three consecutive renewals of Mode C-derived level information have indicated that it is within 300 ft of its assigned level.

Note.— In automated ATS systems, the cycles of renewals of Mode C data may not be evident to controllers. It may, therefore, be necessary to specify in instructions to controllers the number of display repetition cycles, or a time interval, corresponding to three consecutive renewals of Mode C data.

8.3.8.2.6 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.

8.4 PERFORMANCE CHECKS

8.4.1 The radar controller shall adjust the radar display(s) and carry out adequate checks on the accuracy thereof, in accordance with the technical instructions contained in Manual of Air Traffic Services Part-2.

8.4.2 The radar controller shall be satisfied that the available functional capabilities of the radar system as well as the information presented on the radar display(s) is adequate for the functions to be performed.

8.4.3 The radar controller shall report, in accordance with local procedures contained in Manual of Air Traffic Services Part-2, any fault in the equipment, or any incident requiring investigation, or any circumstances which make it difficult or impractical to provide radar services.

8.5 RADAR IDENTIFICATION

8.5.1 Before providing radar service to an aircraft, radar identification shall be established by at least one of the following methods:

8.5.1.1 SSR Identification Procedures

8.5.1.1.1 Where SSR is used, aircraft may be identified by one or more of the following procedures:

- a) recognition of the aircraft identification in a radar 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 a radar label;

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.

- c) direct recognition of the aircraft identification of a Mode S-equipped aircraft in a radar label;
- d) by transfer of radar identification;
- 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 radar position and associated data block.

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.

8.5.1.1.2 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.

8.5.1.2 PSR Identification Procedures:

8.5.1.2.1 Where SSR is not used or available, radar identification shall be established by at least one of the following methods:

8.5.1.2.1.1 Position Report Method:

- a) By correlating a particular radar position indication with an aircraft reporting its position
 - ✓ over an exact reporting point which is defined by reference to a radio navigational aid or aids and is displayed on the radar map; or,
 - ✓ at a particular distance on a particular radial from a collocated VOR and DME. The source facility (VOR/DME) must be displayed on the radar map.
- b) The identification must follow a period of track observation sufficient to ascertain the track of the particular radar position is consistent with the aircraft path or reported heading.

8.5.1.2.1.2 Departing Aircraft Method:

- a) By correlating an observed radar position indication with an aircraft which is known to have just departed, provided that the identification is

established within 1 NM from the end of the runway used.

- b) 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.

8.5.1.2.1.3 By Transfer of Radar Identification (Refer para 8.7)

8.5.1.2.1.4 The Turn Method:

- a) An aircraft may be identified 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.
- b) When using these methods, the radar 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 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, para 8.8.1 regarding radar vectoring of controlled aircraft should be referred.

8.6 DOUBTFUL IDENTIFICATION:

8.6.1 Controller should use more than one method of identification when proximity

of radar position indications, duplication of observed action, or any other circumstances cause doubt as to identification of radar position indication.

8.6.2 If identification is doubtful due to any reason, a controller shall take immediate action to re-identify the aircraft or terminate the radar service.

8.7 TRANSFER OF RADAR IDENTIFICATION:

8.7.1 Transfer of radar identification from one radar controller to another should only be attempted when it is considered that the aircraft is within the accepting controller's radar coverage.

8.7.2 Transfer of radar identification shall be effected by one of the following methods:

- a) designation of the radar position indication by automated means, provided that only one radar position indication is thereby indicated and there is no possible doubt of correct identification;
- b) notification of the discrete code of the aircraft;
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.
- c) notification that the aircraft is Mode S-equipped with an aircraft identification feature when Mode S coverage is available;
- d) direct designation (pointing with the finger) of the radar position indication, if the two radar displays are adjacent, or if a common "conference" type of radar display is used. If parallax is likely to cause an error, an alternative method is to be used;(DOC4444)
- e) designation of the radar position indication by reference to, or in terms of bearing and distance from, a geographical position or navigational facility accurately indicated on both radar displays, together with the track

of the observed radar position indication if the route of the aircraft is not known to both controllers. **The radar position indication, as seen by the accepting controller, must be within 3 miles of the position stated. The distance between the aircraft and the reference point must not exceed:**

i) 30 miles, if the aircraft is flying along a published ATS route or direction is given as a bearing in degrees;

ii) 15 miles in other circumstances.

Note.— Caution must be exercised before establishing radar identification using this method, particularly if other radar position indications are observed on similar headings and in close proximity to the aircraft under radar control. Inherent radar deficiencies, such as inaccuracies in bearing and distance of the radar position indications displayed on individual radars and parallax errors, may cause the indicated position of an aircraft in relation to the known point to differ between the two radar displays.

- f) instruction to the aircraft by the transferring controller to change code and the observation of the change by the accepting controller; or
- g) instruction to the aircraft by the transferring controller to squawk IDENT and observation of this response by the accepting controller;

Note.— Use of procedures f) and g) requires prior coordination between the controllers, since the indications to be observed by the accepting controller are of short duration.

8.8 POSITION INFORMATION

8.8.1 An aircraft provided with radar 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 observation is consistent with the aircraft's time of departure; or

- ii) by use of assigned discrete SSR codes or Mode S and the location of the observed radar position indication is consistent with the current flight plan of the aircraft; or
- iii) by transfer of radar identification;
- b) when the pilot requests this information;
- c) when a pilot's estimate differs significantly from the radar controller's estimate based on radar observation;
- d) when the pilot is instructed to resume own navigation after radar vectoring if the current instructions had diverted the aircraft from a previously assigned route,
- e) immediately before termination of radar service, if the aircraft is observed to deviate from its intended route.

8.8.2 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.

8.8.3 Whenever practicable, position information shall relate to positions or routes pertinent to the navigation of the aircraft concerned and displayed on the radar map.

8.8.4 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, including points at which air-reports are required for meteorological purposes. Pilots shall resume position reporting when so instructed and when

advised that radar service is terminated or that radar identification is lost.(DOC4444)

8.9 RADAR VECTORING

8.9.1 Radar 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 radar controller should comply with the following:

8.9.1.1 whenever practicable, the aircraft should be vectored along routes or tracks on which the pilot can monitor the aircraft position with reference to pilot-interpreted navigation aids (this will minimize the amount of radar navigational assistance required and alleviate the consequences resulting from a radar failure);

8.9.1.2 when an aircraft is given a vector diverting it from a previously assigned route, the pilot should be informed, unless it is self-evident, what the vector is to accomplish and, when possible, the limit of the vector should be specified (e.g. to ... position, for ... approach);

8.9.1.3 except when transfer of radar control is to be effected, aircraft shall not be vectored closer than 2.5 NM, or, where a radar separation minimum greater than 5 NM is prescribed, a distance equivalent to one half of the prescribed separation minimum, from the limit of the airspace for which the radar controller is responsible, unless local arrangements have been made to ensure that separation will exist with radar-controlled aircraft operating in adjoining areas;

8.9.1.4 controlled flights should not be vectored into uncontrolled airspace except in the case of emergency or in order to circumnavigate severe weather (in which case the pilot should be so informed), or at the specific request of the pilot; and

8.9.1.5 when an aircraft has reported unreliable directional instruments, the pilot should 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.

8.9.2 When vectoring an IFR flight, the radar controller shall insure adequate terrain clearance until the aircraft reaches the point when pilot resumes his own navigation;(AIP)

Note 1.— When an IFR flight is being vectored, the pilot is often unable to determine the aircraft's exact position and consequently the altitude which provides the required obstacle clearance. .

8.9.3 When ATC provides vectors to a VFR flight, the pilot retains responsibility for terrain clearance.

8.9.4 Report of incidents involving activations of aircraft ground proximity warning systems should be encouraged so that their locations can be identified and altitude, routing and/or aircraft operating procedures can be altered to prevent recurrences.

8.9.5 In terminating radar vectoring of an aircraft, the radar 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 8.7.2 b), if the current instructions had diverted the aircraft from a previously assigned route.

8.10 NAVIGATION ASSISTANCE

8.10.1 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.

8.10.2 The pilot of an aircraft requesting navigation assistance from an air traffic control unit providing radar 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.

8.11 INTERRUPTION OR TERMINATION OF RADAR SERVICE

8.11.1 An aircraft which has been informed that it is provided with radar service should be informed immediately when, for any reason, radar service is interrupted or terminated.

8.11.2 Radar service is automatically terminated when an arriving aircraft receiving radar service has been instructed to contact tower frequency. Position of aircraft to touch down should be given to the aircraft before changing over the aircraft to tower.(NOTAM)

8.11.3 When the control of an aircraft is to be transferred from a radar controller to a non-radar controller, the radar controller shall ensure that non-radar separation is established between that aircraft and any other controlled aircraft before the transfer is effected.(DOC 4444)

8.12 MINIMUM LEVELS

8.12.1 A radar 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
- c) established minimum altitudes applicable to procedures based on tactical radar vectoring.

8.13 INFORMATION REGARDING ADVERSE WEATHER

8.13.1 Modern ATC radar sensors and processors are normally designed to suppress weather clutter. Even the most active areas of adverse weather may not show on radar display. An aircraft's weather radar will normally provide better detection and definition of adverse weather than radar sensors in use by ATC.

8.13.2 If, however weather is observed that appears that appears likely to affect the

flight, the radar controller may pass the information to the pilot. (AIP)

8.13.3 If an aircraft is equipped with weather radar and the pilot intends to circumnavigate the adverse weather area observed on his radar display, he should intimate and obtain clearance from radar controller for his proposed action. This is necessary to ensure that separation which the radar controller may be providing to any other aircraft is not jeopardized.

8.13.4 In vectoring an aircraft for circumnavigating any area of adverse weather, the radar controller should ascertain that the aircraft can be returned to its intended or assigned flight path within the available radar coverage, 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 show on a radar display.

8.14 REPORTING OF SIGNIFICANT METEOROLOGICAL INFORMATION TO METEOROLOGICAL OFFICES

8.14.1 Although a radar controller is not required to keep a special watch for storm detection, etc., information on the position, intensity, extent and movement of significant weather (i.e. storms or well-defined frontal surfaces) as observed on radar displays, should, when practicable, be reported to the associated meteorological office.(DOC4444)

8.15 COORDINATION OF TRAFFIC UNDER RADAR AND NON-RADAR CONTROL

8.15.1 To ensure the coordination of traffic under radar control with traffic under non-radar control, and to ensure the provision of adequate separation between the radar-controlled aircraft and all other controlled aircraft a close liaison shall be

maintained at all times between radar controllers and non-radar controllers.

8.16 SEPARATION APPLICATION

Note.— Factors which the radar 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, radar technical limitations, controller workload and any difficulties caused by communication congestion.

8.16.1 Except as provided for in 8.15.5, 8.15.6 and 8.18.3.2, radar separation shall only be applied between identified aircraft when there is reasonable assurance that identification will be maintained.

8.16.2 Except when transfer of radar control is to be effected, non-radar separation shall be established by a radar controller before an aircraft under radar control reaches the limits of the controller's area of responsibility, or before the aircraft leaves the area of radar coverage.

8.16.3 Radar separation based on the use of RPS shall be applied so that the distance between the centres of the RPS's representing the positions of the aircraft concerned, is never less than a prescribed minimum.

8.16.4 In no circumstances shall the edges of the radar position indications touch or overlap unless vertical separation is applied between the aircraft concerned, irrespective of the type of radar position indication displayed and radar separation minimum applied.

8.16.5 In the event that the radar controller has been notified of a controlled flight entering or about to enter the airspace within which radar separation is applied, but has not radar identified the aircraft, the controller may continue to provide radar service to identified aircraft provided that:

- a) reasonable assurance exists that the unidentified controlled flight will be identified using SSR 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 radar separation is applied; and
- b) radar separation is maintained between the radar-controlled flights and any other observed radar position until either the unidentified controlled flight has been identified or non-radar separation has been established.

8.16.6 Radar separation may be applied between an aircraft taking off and a preceding departing aircraft or other radar-controlled traffic provided there is reasonable assurance that the departing aircraft will be identified within 1 NM from the end of the runway, and that, at the time, the required separation will exist.

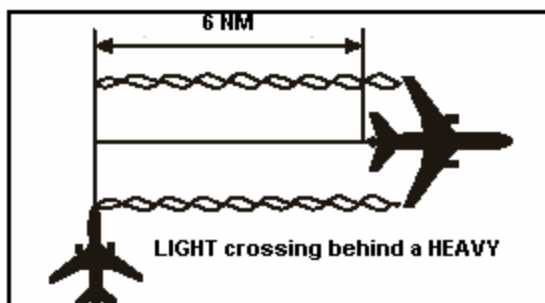
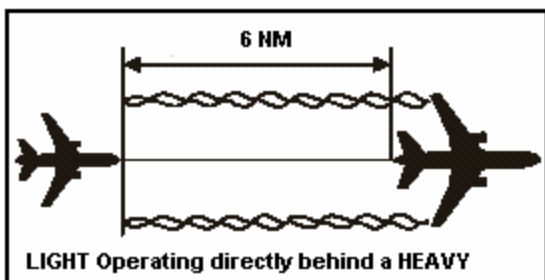
8.16.7 Radar separation shall not be applied between aircraft holding over the same holding point. When applying radar separation between holding aircraft and other flights, the controller shall maintain identity of holding aircraft for the provision of radar separation to other flights. No doubt shall exist about the identity of holding aircraft for any reason when such separation is applied. The controller shall also keep in mind the likely manoeuvres of the holding aircraft during application of such separation.

8.17 Radar separation minima

The following horizontal radar separation minima shall be applied:

- a) 5 NM horizontal radar separation upto 60 NM from radar head except 6 NM horizontal radar separation to aircraft in the approach and departure phases of flight shall be applied when
 - i) the LIGHT aircraft is operating directly behind the HEAVY aircraft at the same altitude or less than 1 000 ft below; or

- ii) The LIGHT aircraft following the HEAVY aircraft using the same runway, or parallel runways separated by less than 760 m or
- iii) The LIGHT aircraft is crossing behind the HEAVY aircraft, at the same altitude or less than 1 000 ft below.



- b) 10 NM horizontal radar separation beyond 60 NM from radar head.

8.18 TRANSFER OF RADAR CONTROL

8.18.1 Transfer of radar control should be effected whenever practicable so as to enable the uninterrupted provision of radar service.

8.18.2 Where SSR is used and the radar system provides for the display of radar position indications with associated radar labels, transfer of radar 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, is provided to the accepting controller prior to transfer;

- b) radar coverage provided to the accepting controller is such that the aircraft concerned is presented on the radar 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 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 radar control may be terminated at any time by the accepting controller, normally with an agreed advance notice;
- f) the accepting controller is kept currently 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.

8.18.3 The minimum agreed separation between aircraft about to be transferred (8.18.2 d refers) and the advance notice (8.18.2 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 8.18.4 until the situation is resolved.

8.18.4 Where primary radar is being used, and where SSR is employed but the provisions of 8.16.2 are not applied, the transfer of radar control of aircraft between adjacent control positions or between two adjacent ATS units may be effected, provided that:

- a) radar identification has been transferred to or has been established directly by the accepting radar controller;
- b) when the radar 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) radar separation from other radar-controlled flights conforms to the minima authorized for use during transfer of radar control between the radar sectors or units concerned;
- d) the accepting radar controller is informed of any level, speed or vectoring instructions applicable to the aircraft at the point of transfer;
- e) radio-communication with the aircraft is retained by the transferring radar controller until the accepting radar controller has agreed to assume responsibility for providing radar service to the aircraft. Thereafter, the aircraft should be instructed to change over to the appropriate frequency and from that point is the responsibility of the accepting radar controller.

8.19 SPEED CONTROL

8.19.1 In order to facilitate radar control or to reduce the need for radar vectoring, a radar controller, subject to consideration of the aircraft performance limitation, may request aircraft under radar control to adjust their speed in a specified manner.

8.19.2 Unless a pilot concurs in the use of lower speed, the controller should use the

following minima for arriving aircraft operating below 10,000 ft:

An IAS not less than 210 knots, except when the aircraft is within 20 flying miles of the runway threshold of the airport of intended landing, an IAS not less than

- i) 90 knots for aircraft category A,
- ii) 120 knots for aircraft category B,
- iii) 160 knots for aircraft category C,
- iv) 185 knots for aircraft category D/E

Note.— Procedures for speed control instructions are contained in Chapter 4.

8.20 EMERGENCIES, HAZARDS AND EQUIPMENT FAILURES

8.20.1 Emergencies

8.20.1.1 In the event of an aircraft in, or appearing to be in, any form of emergency, every assistance shall be provided by the radar controller, and the procedures prescribed herein may be varied according to the situation.

8.20.1.2 The progress of an aircraft in emergency shall be monitored and (whenever possible) plotted on the radar display until the aircraft passes out of radar coverage, and position information shall be provided to all air traffic services units which may be able to give assistance to the aircraft. Radar transfer to adjacent radar sectors shall also be effected when appropriate.

8.20 Collision hazard information

8.20.2.1 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 radar controller the situation warrants, a course of avoiding action should be suggested; and

- b) be notified when the conflict no longer exists.

8.20.2.2 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 radar controller, the situation warrants, a course of avoiding action should be suggested; and
- b) be notified when the conflict no longer exists. (DOC 4444)

8.20.2.3 In both cases mentioned in 8.18.2.1 and 8.18.2.2 the decision whether to comply with ATC suggestion or not, rests with the pilot.

8.20.2.4 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 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,

8.20.2.5 SSR Mode C-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.

8.20.2.5.1 When the Mode C-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.

8.20.3 Failure of equipment

8.20.3.1 Aircraft Radio Transmitter Failure

8.20.3.1.1 If two-way communication is lost with an aircraft, the radar controller should determine whether or not the aircraft's receiver is functioning by instructing the aircraft on the frequency 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 code changes.

Note.— Transponder-equipped aircraft experiencing radio-communication failure will operate the transponder on Mode A Code 7600.

8.20.3.1.2 If the action prescribed in 8.18.3.1.1 is unsuccessful, it shall be repeated on any other available frequency on which it is believed that the aircraft might be listening.

8.20.3.1.3 In both the cases covered by 8.18.3.1.1 and 8.18.3.1.2, any manoeuvring instructions shall be such that the aircraft would regain its current cleared track after having complied with the instructions received.

8.20.3.1.4 Where it has been established by the action in 8.18.3.1.1 that the aircraft's radio receiver is functioning, continued control of transponder-equipped aircraft where SSR is available can be effected using code changes or IDENT transmissions to obtain acknowledgement of clearances issued to the aircraft.

8.20.3.2 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 radar separation is applied, such separation may continue to be used. However, if the aircraft experiencing the communication failure is not identified, radar separation shall be applied between

aircraft under radar control 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 radio failure has passed through the airspace concerned, has landed, or has proceeded elsewhere.

8.20.3.3 Aircraft Transponder Failure in areas where the carriage of a functioning transponder is mandatory:

8.20.3.3.1 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.

8.20.3.3.2 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 in-tended flight. Subsequent adjustments may become necessary during the course of the flight.

8.20.4 Radar equipment failure

8.20.4.1 In the event of complete failure of the radar equipment except for air-ground communications, the radar controller shall:

- a) plot the positions of all aircraft already identified and, in conjunction with the non-radar controller when applicable, take the necessary action to establish non-radar separation between the aircraft; and when relevant:
- b) request the appropriate non-radar controller to assume control of the traffic affected;
- c) instruct aircraft to communicate with the appropriate non-radar controller for further instructions.

8.20.4.2 As an emergency measure, use of flight levels spaced by half the applicable vertical separation minimum may be resorted to temporarily if standard non-radar separation cannot be provided immediately.

8.20.4.3 Except when there is assurance that the complete radar equipment failure will be of a very limited duration, steps should be taken to limit the number of aircraft permitted to enter the area to that which can be safely handled without the use of radar.

8.20.5 Ground radio failure

8.20.5.1 In the event of complete failure of the ground radio equipment used for radar control, the radar controller shall, unless able to continue to provide the radar service by means of other available communication channels, proceed as set forth in 8.18.4.1 a) and b).

8.20.5.2 Where the provisions in 8.18.4.1 are not applicable, the controller shall:

- a) without delay inform all adjacent control positions or ATC units, as applicable, of the failure;
- b) appraise 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 radar or non-radar separation between and maintaining control of such aircraft; and

- d) instruct adjacent control positions or ATC units to hold or reroute 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.

8.21 USE OF RADAR IN THE APPROACH CONTROL SERVICE

8.21.1 General provision:

8.21.1.1 Radar systems used in the provision of approach control service shall be appropriate to the functions and level of service to be provided.(DOC4444)

8.21.2 General Approach Radar Procedures:

8.21.2.1 The aerodrome controller shall be kept informed of the sequence of arriving aircraft by the approach radar controller, 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.

8.21.2.2 Prior to, or upon commencement of, radar vectoring for approach, the pilot shall be advised of the type of approach as well as the runway to be used.

8.21.2.3 The radar controller shall advise an aircraft being radar vectored for an instrument approach of its position at least once prior to commencement of final approach.

8.21.2.4 When giving distance information, the radar controller shall specify the point or navigation aid to which the information refers.

8.21.2.5 The initial and intermediate approach phases of an approach executed under the direction of a radar controller comprise those parts of the approach from the time radar 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;

8.21.2.6 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 in level flight on the final approach track prior to intercepting the specified or nominal glide path if an ILS or radar approach is to be made, and should provide an intercept angle with the final approach track of 45 degrees or less.

8.21.2.7 Whenever an aircraft is assigned a radar vector which will take it through the final approach track, it should be advised accordingly, stating the reason for the vector.

8.21.3 Vectoring to pilot-interpreted final approach aid

8.21.3.1 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. Radar vectoring will normally terminate at the time the aircraft leaves the last assigned heading to intercept the final approach track.

8.21.3.2 The radar controller shall be responsible for maintaining radar separation between succeeding aircraft on the same final approach, except that the responsibility may be transferred to the aerodrome controller in accordance with procedures prescribed in MATS Part 2 and provided radar information is available to the aerodrome controller.

8.21.3.3 Transfer of control of succeeding aircraft on final approach from the radar controller to the aerodrome controller shall be effected in accordance with procedures prescribed in MATS Part 2.

8.21.3.4 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.

8.21.4 Surveillance Radar approaches

8.21.4.1 General Provisions

8.21.4.1.1 During the period that a radar controller is engaged in giving surveillance radar, he or she should not be responsible for any duties other than those directly connected with such approaches.

8.21.4.1.2 Radar controllers conducting surveillance radar approaches shall be in possession of information regarding the obstacle clearance altitudes/heights established for such approaches.

8.21.4.1.3 Prior to commencement of a surveillance 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
- d) the procedure to be followed in the event of radio-communication failure.

8.21.4.1.4 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.

8.21.4.1.5 Aircraft making a radar approach should be reminded, when on final approach,

to check that the wheels are down and locked.

8.21.4.1.6 The radar controller should notify the aerodrome controller or, when applicable, the non-radar controller when an aircraft making a radar approach is approximately 8 NM from touchdown. If landing clearance is not received at this time, a subsequent notification should be made at approximately 4 NM from touchdown and landing clearance requested.

8.21.4.1.7 Clearance to land or any alternative clearance received from the aerodrome controller or, when applicable, the non-radar controller should normally be passed to the aircraft before it reaches a distance of 2 NM from touchdown.

8.21.5.1.8 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 non-radar controller by the time the aircraft reaches a distance of 2 NM from touch-down 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 radar display for any significant interval during the last 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.

8.21.4.1.9 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.

8.21.5 Final approach procedures

8.21.5.1 Surveillance Radar Approach

8.19.5.1.1 A surveillance radar approach shall only be performed with equipment suitably sited and a radar 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 where surveillance radar approaches are promulgated.

8.21.5.1.2 When conducting a surveillance radar approach, the radar 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) 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.

- d) Distance from touch-down shall normally be passed at every each NM;
- e) pre-computed levels through which the aircraft should be passing to maintain the glide path shall also be transmitted at each NM at the same time as the distance;
- f) the surveillance radar approach shall be terminated:
 - i) at a distance of 2 NM from touchdown, 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.
- c) the radar controller should not be responsible for any duties other than those directly connected with a particular approach.

8.21.5.1.3 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 radar controller.

8.22 USE OF RADAR IN THE AERODROME CONTROL SERVICE

8.22.1 Approach Monitor Aid in Control Tower

8.22.1.1 Display unit of the TAR (ASR/MSSR) when provided in the control tower at the Aerodrome Control Work Station will give view of the final approaches of the runways at the airport.

8.22.1.2 In order to achieve maximum runway utilization and aerodrome capacity, the ATCO on Aerodrome Control duty may use the information derived from the monitor for –

- (a) Tactical decision regarding landing and departing aircraft to determine their sequence and spacing.

- (b) Tactical decision regarding position of aircraft on take off vis-à-vis the position of proceeding aircraft.
- (c) Strategical decision regarding sequencing of departing aircraft to achieve smooth traffic flow;
- (d) Monitoring pilot's position reports and confirming compliance with the assigned track to departing aircraft;
- (e) Providing information to an aircraft on the position of another arriving/departing aircraft.

8.22.1.3 The Aerodrome Controller shall not assume radar control of any aircraft of the Approach Monitor Aid.

8.22.1.4 The Approach Monitor Aid shall not be used to issue radar/heading instructions.

8.22.1.5 The equipment shall not be used to provide approach radar services.

8.22.1.6 The Aerodrome Controller shall issue ATC (Procedural) instructions to aircraft required to go around, delay, and orbit.

8.22.1.7 The monitor will be set for 20 NM range at all times. The ATCO in the Aerodrome Control is not required to make any selections, adjustments, off-centering etc.

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.

8.23 USE OF SURFACE MOVEMENT RADAR (SMR)

8.23.1 Operating Procedures for Aerodrome Surface Detection Equipment (ASDE).

8.23.1.1 ASDE is useful in assisting the Controller to keep continuous check of runway occupancy and taxiway usage during period of low visibility and at night. It also allows rapid appreciation of lighting control

requirements and facilitates clearances for aircraft and vehicles.

Note 1: ASDE is an adjunct and not an alternative to the visual aids and procedures used for the control of aircraft and vehicles on the manoeuvring area.

Note 2: Control for aircraft on the apron is not the responsibility of ATS Unit.

8.23.1.2 ASDE may 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.

8.23.1.3 The following technical limitations may affect the operational efficiency and use of ASDE.

- a) Aircraft/vehicle size – detectability diminishes with reduction in size.
- b) Line-of-sight limitations.
- c) Heavy rain causing clutter and resolution difficulties.
- d) Shielding – a portion of an aircraft/vehicle may be shielded from the radar by another object or part of the same object, e.g. an offside wing is often not visible when shielded by the fuselage.
- e) Reflection – other aircraft/vehicle (s) and large structures such as hangers may reflect some energy away from the radar antenna, e.g. a smooth aircraft fuselage at angles other than a right angle to the radar.
- f) Rough surfaces or long grass-vehicle detectability is reduced on rough ground, wet or long grass.
- g) Radar position elongation – occurs in both range and azimuth, due to radar equipment resolution limitations associated with stronger returns.
- h) Lack of radar position labels and symbols.
- i) Shadow area.

8.23.1.4 Before providing guidance to an aircraft/vehicle based on ASDE

derived information, positive identity of the object should be established by use of at least one of the methods specified below :

- a) Correlating the position of a visually observed aircraft/vehicle to that displayed on ASDE.
- b) Correlating an ASDE position – complying with an ATC instruction for a specific manoeuvre.
- c) Correlating a displayed ASDE position of an aircraft or vehicle as reported by radio.
- d) Correlating a displayed ASDE position to an aircraft or vehicle :
 - j) entering a runway or taxiway intersection
 - ii) abeam a building or airfield feature which either shows as a permanent echo on the display or is marked on the video or grid map
 - iii) on a taxiway or runway, provided that there are no other unidentified vehicles or aircraft on that runway or taxiway segment.

8.23.1.5 Position information of ASDE – derived aircraft/vehicles position may be relayed by use of the following methods

- (a) direct designation
- (b) specifying the location of ASDE derived position by reference to identifiable features displayed on the video or grid map.

8.23.1.6 The ASDE will be deployed for the surface movement guidance and control when visibility is 2000M or less or RVR is 1500M or less. However, it may be used for the above purposes at night irrespective of the visibility/RVR conditions or at the discretion of the Controller.

8.23.1.7 In the even of equipment failure when visibility is below 2000M or RVR is below 1500M, the information will be disseminated on ATIS.

8.23.1.8 The ASDE provided at the workstation of Surface Movement Controller within the limitation of the coverage, may be used for the following purposes:

- a) To monitor and assist departing and arriving traffic.
- b) To monitor the position of traffic in order to facilitate switching-on of associated taxiway lights.
- c) To monitor and assist emergency service vehicles to attend a scene of an incident as necessary.
- d) To monitor movement of ground vehicles on the movement area to detect unauthorized entry into maneuvering area.
- e) To monitor pilot compliance with the issued instructions.
- f) To provide taxi guidance.
- g) To provide guidance information to an aircraft uncertain of its position.
- h) To monitor push-back for avoiding conflict with traffic in the area.

Note :ASDE should not be used by ATC to provide heading instructions for taxi-guidance. Taxi guidance instructions using ASDE should be the same as those applicable for visual control.

8.23.1.9 The use of ASDE for the above listed purposes will not in any way relieve pilots of taxing aircraft or drivers of vehicles or any of their responsibilities in respect of avoiding collision with other objects or structure on the ground.

8.23.1.9 The ASDE monitor provided at Aerodrome Control workstation may be used for the following purposes:

- a) To ascertain that departing aircraft are lined up on the correct runway.
- b) To ascertain that arriving aircraft has vacated the runway.
- c) To ascertain that aircraft has commenced the take-off run.
- d) To ascertain that runway is clear of aircraft, vehicles or obstructions prior to a departure or landing.

8.24 USE OF RADAR IN THE FLIGHT INFORMATION SERVICE

Note.— The use of radar 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.

8.24.1 The information presented on a radar display may be used to provide identified aircraft with:

- a) information regarding any aircraft observed to be on a conflicting path with the radar-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

Note.— Attention must be given to the fact that under certain circumstances the most active area of adverse weather may not show on a radar display.

- c) information to assist the aircraft in its navigation.

8.25 RADAR AIR TRAFFIC ADVISORY SERVICE.

When radar is used in the provision of air traffic advisory service, the procedures in Section 8.2.1 for the use of radar in the air traffic control service shall be applied subject to the conditions and limitations governing the provision of air traffic advisory service.