ENR 1.6 ATS SURVEILLANCE SERVICES AND PROCEDURES

1 USE OF RADAR SURVEILLANCE SYSTEM IN THE AREA CONTROL SERVICE AND APPROACH CONTROL SERVICE

1.1 GENERAL PROVISIONS

1.1.1 Radar Surveillance Service will be provided only for transponder equipped aircraft in radar covered airspace within Kathmandu Terminal Control Area (TMA), control zone (CTR) and in Airways.

1.1.2 Outside controlled airspace, only radar monitoring service will be provided to transponder equipped aircraft. Such 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.

1.1.3 The aerodrome controller should be 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.

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

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

1.1.6 When giving distance information, the controller will specify the point or navigation aid to which the information refers.

1.1.7 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

1.1.8 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 will enable the aircraft to be established in level flight on the final approach track prior to intercepting the specified path for radar approach is to be made, and should provide an intercept angle with the final approach track of 45 degrees or less.

1.1.9 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.

Description of Radar

S.N.	Particulars	Terminal – MSSR	Enroute - MSSR
a.	SSR Name	T-MSSR	E-MSSR
b.	Interrogator Ident. Code (three-four letters)	KTMT	KTME
c.	SSR Location (City, Country)	Kathmandu, Nepal	Mt. Bhattedanda, Nepal
d.	SSR latitude and Longitude	27°42'23.770" N 085°22'01.506" E	27°32'07.047" N 085°17'22.052" E
e.	SSR Elevation (AMSL)	1362 m	2322 m
f	Maximum detection range (Nautical miles)	200 NM	250 NM
g.	Number of channels available (typically one or two)	Two (CH-A / CH-B)	Two (CH-A / CH-B)

1.2 FUNCTIONS

The information provided by Radar 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 Radar 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;
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.

2. PROVISION OF RADAR SURVEILLANCE SERVICES

2.1 Information derived from Radar surveillance systems, including safety-related alerts and warnings such as Short Term Conflict Alert (STCA) and Minimum Safe Altitude Warning (MSAW), 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.

2.2 The number of aircraft simultaneously provided with Radar surveillance services will 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.

3 USE OF SSR TRANSPONDERS

3.1 GENERAL

To ensure the safe and efficient use of Radar surveillance services, pilots and controllers will strictly adhere to published operating procedures and standard radiotelephony phraseology will be used. The correct setting of transponder codes and/or aircraft identification will be ensured at all times.

3.2 SSR CODE MANAGEMENT

3.2.1 The selection of SSR Code should be made as instructed by ATC except in the following cases.

3.2.2 While flying under VFR

1) At or below 13,500 feet …… Code 1200
2) Above 13,500 feet …… ……Code 1400

VFR aircraft equipped with 4096 code transponder and squawking Code 1200 or 1400 may be instructed to change the Code to discrete beacon code for operational benefit.

3.2.3 IFR aircraft entering radar controlled airspace from non-radar controlled airspace without Code instruction by ATC

…….. Code 2000.

Note: It is preferable that Code 2000 be selected before the aircraft enters radar controlled airspace or before the aircraft establishes radio communication with the radar control facility.

3.2.4 IFR aircraft going out of radar controlled airspace to non-radar controlled airspace

…...Code 2000

3.2.5 When a pilot feels it necessary to show any of the following in flight conditions;

1) Unlawful interference ……..Code 7500
2) Communication failure …….. Code 7600

3) Emergency ……. Code 7700

Note: If the aircraft is in direct communication with ATC and under radar control, selection of Code 7700 is not necessarily required.

3.2.6 Assignment of SSR Code

3.2.6.1 One of discrete codes from within Code blocks allocated to Nepal in accordance with Table Radar - 3 of ICAO MID/ASIA Air Navigation Plan (Doc 8700) is assigned as below.
International flight 2501~2577
Domestic flight 0101~0177
Note: Code 2500 and 0100 are reserved for aircraft, which does not have discrete Code capability.

3.2.7 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.

3.2.8 For individual aircraft identification, each aircraft will be assigned a discrete code which should, whenever possible, be retained throughout the flight.

3.3 OPERATION OF SSR TRANSPONDERS

3.3.1 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 will 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.

3.3.2 If the discrepancy between assigned and displayed Mode A codes still persists, the pilot maybe 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 Radar will be informed accordingly.

3.3.3 Aircraft equipped with Mode S having an aircraft identification feature will 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.

3.3.4 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 will be requested to confirm and, if necessary, re-enter the correct aircraft identification.

3.3.5 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 will 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.

4. LEVEL INFORMATION BASED ON THE USE OF PRESSURE-ALTITUDE INFORMATION

4.1 VERIFICATION OF LEVEL INFORMATION

4.1.1 The tolerance value used to determine that pressure-altitude-derived level information displayed to the controller is accurate will be ±200 ft in RVSM airspace. In other airspace, it will be ±300 ft

4.1.2 Verification of pressure-altitude-derived level information displayed to the controller will 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 will be effected by simultaneous comparison with altimeter-derived level information received from the same aircraft by radio telephony. The pilot of the aircraft whose pressure-altitude-derived level information is within the approved tolerance value need not be advised of such verification.

To request level check:

*CONFIRM (level)

4.1.3 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 will be advised accordingly and requested to check the pressure setting and confirm the aircraft's level.

*SQUAWK CHARLIE

*CHECK ALTIMETER SETTING AND CONFIRM (level)

4.1.4 If, following confirmation of the level and 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 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

*STOP SQUAWK CHARLIE WRONG INDICATON

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. Notify the next control position or ATC unit concerned with the aircraft of the action taken.

5 GENERAL PROCEDURES

5.1 IDENTIFICATION OF AIRCRAFT

5.1.1 ESTABLISHMENT OF IDENTIFICATION

5.1.1.1 Before providing an Radar surveillance service to an aircraft, identification will be established and the pilot informed. Thereafter, identification will be maintained until termination of the Radar surveillance service.

5.1.1.2 If identification is subsequently lost, the pilot will be informed accordingly and, when applicable, appropriate instructions issued.

5.1.1.3 Identification will be established by at least one of the methods specified in 5.1.2, and 5.1.3.

5.1.2 SSR IDENTIFICATION PROCEDURES

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

a) Recognition of an assigned discrete code, the setting of which has been verified, in an SSR label,

b) Direct recognition of the aircraft identification of a Mode S-equipped aircraft in an SSR 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.

c) By transfer of identification (see 5.3),

e) Observation of compliance with an instruction to set a specific code,

f) Observation of compliance with an instruction to squawk IDENT.

- ❖ SQUAWK IDENT
- ❖ SQUAWK (code) AND IDENT
- ❖ SQUAWK ALFA (code) AND IDENT

5.1.2.2 When a discrete code has been assigned to an aircraft, a check will 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 will the discrete code be used as a basis for identification.

5.1.2.3 Do not use the MSDPS data block as a radar identification method.

5.1.2.4 Use the MSDPS data block to maintain target identity unless it is a COAST status.

5.1.3 PSR IDENTIFICATION PROCEDURES

5.1.3.1 Identify a primary target by one of the following procedures:

a) By observing a target whose position with respect to VOR/DME corresponds with the direct position report received from an aircraft, and the observed track is consistent with the reported heading or route of flight.

Note: Use a primary target as means of radar identification only when it is displayed together with a beacon target of the same aircraft.

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.

5.2 TRANSFER OF IDENTIFICATION

5.2.1 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.

5.2.2 Transfer of identification will be affected 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;

c) Notification that the aircraft is SSR Mode S-equipped with aircraft identification feature when SSR Mode S coverage is available;

d) Direct designation (pointing with the finger) of the position indication, if the two situation displays are adjacent.

Note. — Attention must be given to any errors which might occur due to parallax effects.

e) Designation of the position indication by reference to, or in terms of bearing and distance from, a geographical position.

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. Following additional conditions are prescribed for the application of this method:

i) a maximum distance of 10 NM from the common reference point will be used by the two controllers; and

ii) a maximum distance of 3 NM between the position indication as observed by the accepting controller and the one stated by the transferring controller will be used.

f) 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

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

5.3 POSITION INFORMATION

5.3.1 An aircraft provided with Radar 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 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

e) Immediately before termination of Radar surveillance service, if the aircraft is observed to deviate from its intended route.

5.3.2 Position information will 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.

5.3.3 Whenever practicable, position information will relate to positions or routes pertinent to the navigation of the aircraft concerned and shown on the situation display map.\

5.3.4 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. Pilots will resume voice position reporting:

a) When so instructed;

b) When advised that the Radar surveillance service has been terminated; or

c) When advised that identification is lost.

5.4 VECTORING

5.4.1 APPLICATION

5.4.1 .1 Vector aircraft:

a. In controlled airspace for separation, safety and operational advantage.
b. At or above MVA
c. In airspace wherein you have control jurisdiction

5.4.1.2 Vector only transponder-equipped IFR aircraft. Regardless of flight rules, do not provide any radar service for an aircraft not equipped with a transponder. For a VFR aircraft equipped with a transponder, provide only radar monitoring and radar separation except radar assistance to VFR aircraft in weather difficulty and equipment outage.

5.4.1.3 When vectoring, ensure aircraft to establish on a non-radar route to be flown within the radar coverage.

5.4.1.4 Vector the aircraft in compliance with the "MVA Chart".

5.4.2 POSITION INFORMATION

If necessary, inform an aircraft of its position with respect to a fix or airway.

***OVER/PASSING (fix)**
*** (Number) MILES FROM (fix)**
***(Number) MILES (direction) OF (fix, airway, or location)**
***CROSSING/JONING/LEAVING (airway or route)**
***CROSING/INTRCEPTING (name of VOR) (specified) RADIAL**

5.4.3 METHODS

5.4.3.1 Vector aircraft by one of the following methods:

1. Specify direction of turn and magnetic heading to be flown

***TURN RIGHT/LEFT HEADING (number)**

NOTE: ASK the heading by the following phraseology.

***REPORT HEADING**

2. When the heading is unsure and you need imminent heading change,

*** TURN (number) DEGREES RIGHT/LEFT**

Ex. TURN THIRTY DEGREES RIGHT

3. Specify heading
   * **FLY HEADING (number)**
4. Instruct to maintain present heading.
   * **FLY PRESENT HEADING**
5. Specify departing heading from NAVAID/fix
   * **LEAVE (name of fix) HEADING (number)**

5.4.3.2 When initiating a vector, issue the following items to the pilots;

1. Vector purpose or vector target.
   * **VECTORING FOR (NAVAID/fix/airway)**
   * **VECTORING FOR INTERCEPT (name of VOR) (specified) RADIAL, AIRWAY**
   * **VECTORING FOR INTERCEPT (specified) BEARING FROM/COURSE TO (name of NDB)**
   * **VECTORING FOR FINAL APPROACH COURSE**
   * **VECTORING FOR (approach name) FINAL APPROACH COURSE**
   * **FOR TRAFFIC**
   * **FOR SPACING**
   * **FOR SEQUENCING**
   * **FOR DELAYING ACTION**

Note: Except when vectoring for the final approach course, the vector target should be on an approved non-radar route.

2. An altitude to maintain and all appropriate altitude restrictions when;

(i) The vector will take the aircraft off an assigned procedure which contains altitude restrictions, i.e., instrument approach, non-radar SID, etc.

(ii) The previously issued clearance includes crossing restrictions.

Note: When an aircraft is maintaining the final assigned altitude or is descending / climbing without restrictions to the final assigned altitude, this may be omitted.

(iii) Advance information when a vector will take the aircraft across a previously assigned non-radar route.

***EXPECT VECTOR ACROSS (NAVAID radial/ course, airway, route)**

5.4.3.3 TERMINATION OF VECTOR

5.4.3.3.1 Provide radar navigational guidance until the aircraft is:

1) Established within the airspace to be protected for the non-radar route to be flown and will intercept the non-radar route within a reasonable distance.
2) Able to proceed to NAVAID on its own navigation.

5.4.3.3.2 When terminating vector, ensure that;

1) The pilot is able to intercept non-radar route achieving the MEA, an altitude restriction over fix, MCA, MRA, etc.
2) The aircraft satisfies MVA until intercepting the previously assigned non-radar route.

5.4.3.3.3 When terminating vector, inform the aircraft of its position and instruct the aircraft to resume its own navigation. When 5.6.1 applies, instruct the aircraft to proceed direct to NAVAID. Omit position information if the aircraft is DME equipped and proceeds to VORDME.

***RESUME OWN NAVIGATION (position with respect to route or fix along route)**
***RESUME OWN NAVIGATION, DIRECT (name of VORDME)**
***RESUME OWN NAVIGATION, DIRECT (name of NAVAID), TRACK (three digits) DISTANCE (number)**
***FLY/TURN LEFT (or RIGHT) HEADING (number) TO INTERCEPT (specified) BEARING FROM/COURSETO (name of NDB), THEN RESUME OWN NAVIGATION, (position with respect to route or fix alongroute)**

5.4.3.3.4 Aircraft instructed to resume a procedure which contains restrictions will be advised to comply with those restrictions.

***COMPLY WITH RESTRICTIONS**

5.4.4 GENERAL

5.4.4.1 Vectoring will 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 will comply with the following: a) whenever practicable, the aircraft will 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 Radar surveillance system failure);

b) When an aircraft is given its initial vector diverting it from a previously assigned route, the pilot will be informed what the vector is to accomplish, and the limit of the vector will be specified;

***VECTOR TO RATAN FOR VOR/DME APPROACH**

c) except when transfer of control is to be effected, aircraft will not be vectored closer than 3 NM or, where the minimum permissible separation is 5NM from the limit of the airspace for which the controller is responsible.

d) controlled flights will 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

5.4.4.2 When vectoring an IFR flight and when giving an IFR flight a direct routing which takes the aircraft off an ATS route, the controller will 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.

5.4.4.3 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.

5.4.4.4 Controller will request the pilot 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.

5.4.4.5 In terminating vectoring of an aircraft, the controller will instruct the pilot to resume own navigation, giving the pilot the aircraft's position and appropriate instructions, as necessary, in the form prescribed in 1.5.4.2 b), if the current instructions had diverted the aircraft from a previously assigned route.

Note: Avoidance with terrain/obstruction will be controller's responsibility.

5.5 NAVIGATION ASSISTANCE

5.5.1 An identified aircraft observed to deviate significantly from its intended route or designated holding pattern will be advised accordingly. Appropriate action will also be taken if, in the opinion of the controller, such deviation is likely to affect the service being provided.

5.5.2 The pilot of an aircraft requesting navigation assistance from an air traffic control unit providing Radar surveillance services will state the reason (e.g. to avoid areas of adverse weather or unreliable navigational instruments) and will give as much information as possible in the circumstances.

5.5.3 RADAR ASSISTANCE TO VFR AIRCRAFT IN WEATHER DIFFICULTY.

5.5.4 If a VFR aircraft requests radar assistance when it encounters or is to encounter IFR weather conditions, advice the aircraft in the following order.

1) Ask the pilot if he/she is qualified for and capable of conducting IFR flight.
2) If the pilot states he/she is qualified for and capable of IFR flight, request him/her to file an IFR flight plan and then issue clearance to destination airport, as appropriate.
3) If the pilot states he/she is not qualified for or not capable of conducting IFR flight, or if he/she refuses to file an IFR flight plan, take whichever of the following actions is appropriate.
   a) Ask pilot if he will elect to conduct VFR flight to another airport where VMC exist. If required, inform the pilot of aircraft where VMC are reported.
   b) If the aircraft is equipped with a transponder, identify the aircraft and:

1. If the pilot declines to conduct VFR flight to another airport, provide radar monitoring and radar separation.

2. If the aircraft has already encountered IMC, inform the pilot of the appropriate minimum altitude such as MEA, MVA, MSA, etc., and if available, terrain/obstacle clearance minimum altitude.
3. If the pilot desires radar vectoring, advise him/her to climb to MVA for initiation of radar vectoring to destination airport. In case of MSDPS outage, provide only radar monitoring service.

Note: Avoidance with terrain/obstruction will be pilot's responsibility.

5.5.5 Use the following techniques to the extent possible while providing radar assistance to a pilot not qualified to operate in IFR conditions.

a) Avoid radio frequency changes
b) Make turn while the aircraft is in VFR conditions so that it will be in a position to fly a straight course while in IFR condition.
c) Have a pilot lower gear and slow aircraft to approach speed while in VFR conditions.
d) Avoid requiring a climb or descend while in a turn if in IFR conditions.
e) Avoid abrupt maneuvers.
f) Vector aircraft to VMC.

5.6 INTERRUPTION OR TERMINATION OF RADAR SURVEILLANCE SERVICE

5.6.1 An aircraft which has been informed that it is provided with Radar 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 coverage will not normally constitute an interruption or termination of the Radar surveillance service.

5.6.2 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 will ensure that appropriate procedural separation is established between that aircraft and any other controlled aircraft before the transfer is affected.

5.7 INFORMATION REGARDING ADVERSE WEATHER

5.7.1 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 Radar 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.

5.7.2 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 Radar 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.

5.7.3 Provide radar navigational guidance and/or approve deviations around weather areas when requested by the pilot. Do not use word "turbulence" in describing radar-derived weather.

***DEVIATION APPROVED ADVISE WHEN ABLE TO RESUME NORMALNAVIGATION**

6 SEPARATION APPLICATION

6.1 Except as provided for in 6.6, 6.7 and 9.2.2, the separation minima specified in 5.3 will only be applied between identified aircraft when there is reasonable assurance that identification will be maintained.

6.2 When control of an identified aircraft is to be transferred to a control sector that will provide the aircraft with procedural separation, such separation will 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.

6.3 Separation based on the use of PSR target symbol and SSR target symbol will be applied so that the distance between the centre of the PSR target symbol and the nearest edge of the SSR target symbol is never less than a prescribed minimum.

6.4 Separation based on the use of SSR target symbol will be applied so that the distance between the closest edges of the SSR target symbol is never less than a prescribed minimum.

6.5 In no circumstances will 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.

6.6 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 5.3 is applied, but has not identified the aircraft, the controller may continue to provide an Radar surveillance service to identified aircraft provided that the separation is maintained between identified flights and any other observed Radar surveillance system position indications until either the unidentified controlled flight has been identified or procedural separation has been established.

6.7 The separation minima specified in 5.3 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 1 NM from the end of the runway, and that, at the time, the required separation will exist.

6.8 The separation minima specified in 6.2 will not be applied between aircraft holding over the same holding fix.

Note: Apply Radar separation to a primary target only when it is displayed together with a beacon target of the same aircraft.

6.9 SEPARATION MINIMA BASED ON RADAR SURVEILLANCE SYSTEMS

6.9.1 The horizontal separation minima will be 5.0 NM except on the final approach track the separation minima will be 10.0 NM provided 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;

6.9.2 The following distance-based wake turbulence separation minima will be applied to aircraft being provided with an Radar surveillance service in the approach and departure phases of flight.

Aircraft Category		Distance based wake turbulence separation minima
Preceding Aircraft	**Succeeding Aircraft**	
HEAVY	HEAVY	4 NM
	MEDIUM	5 NM
	LIGHT	6 NM
MEDIUM	LIGHT	5 NM

6.9.2.1 The minima set out in 6.9.2 will be applied when:

a) an aircraft is operating directly behind another aircraft at the same altitude or less than 1000 ft below; or

b) both aircraft are using the same runway,

c) an aircraft is crossing behind another aircraft, at the same altitude or less than 300 m (1000 ft) below.

Note.— See Figures 8-C and 8-D.

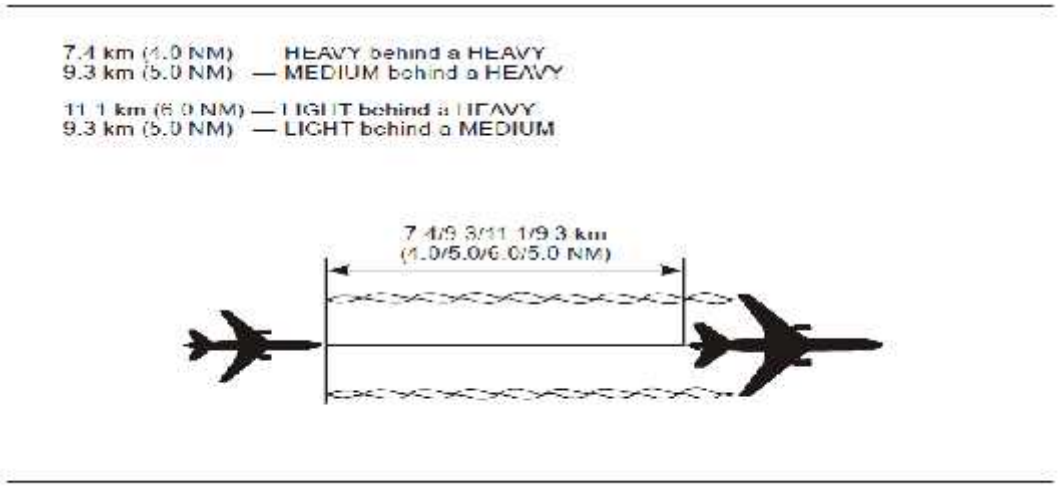


Figure 8-C. Operating directly behind

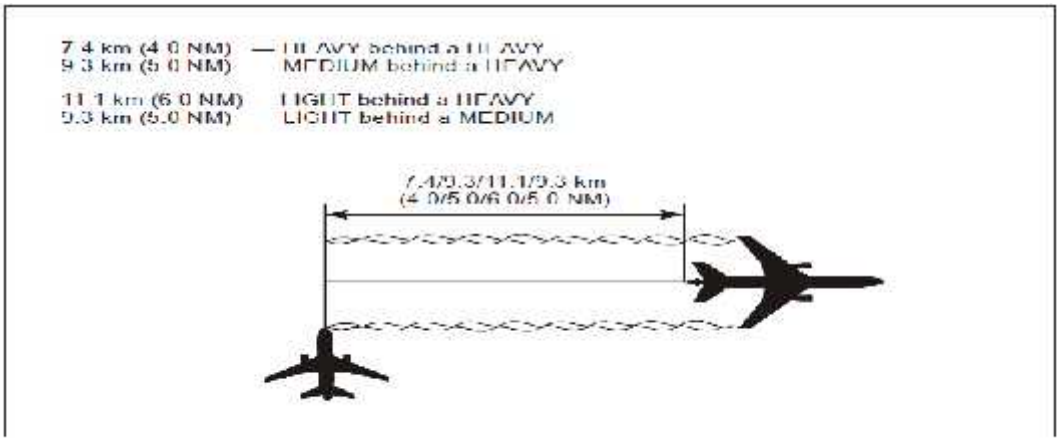


Figure 8-D. Crossing behind

7 TRANSFER OF CONTROL

7.1 Transfer of control should be effected, whenever practicable, so as to enable the uninterrupted provision of the Radar surveillance service.

7.2 Where SSR 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, the aircraft identification, is provided to the accepting controller prior to transfer;

b) the Radar 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.

7.3 The minimum agreed separation between aircraft about to be transferred and the advance notice will 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 will revert to the procedure in 5.4.4 until the situation is resolved.

8 SPEED CONTROL

8.1 GENERAL

8.1.1 Subject to 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. 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.

8.1.2 Speed control will not be applied to aircraft entering or established in a holding pattern.

8.1.3 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.

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

8.1.5 Speed adjustments should be expressed in multiples of 10 kt based on indicated airspeed (IAS). At or above F240, speed adjustments may be expressed in terms of Mach numbers in 0.01 increments for turbojet aircraft with Mach meters. Do not assign speed adjustment to aircraft at or above F390 without pilot consent.

Note 1.— When an aircraft is heavily loaded and at a high level, its ability to change speed may, in cases, be very limited.

8.1.6 Aircraft will be advised when a speed control restriction is no longer required.

8.2 METHODS OF APPLICATION

8.2.1 In order to establish a desired spacing between two or more successive aircraft, the controller should first 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.

8.2.2 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, 6 kt IAS per 1 000 ft height difference may be used as a general rule. At levels below 8000 ft 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.

8.2.3 DESCENDING AND ARRIVING AIRCRAFT

8.2.3.1 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.

8.2.3.2 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.

8.2.3.3 Speed reductions to less than 250 kt IAS for turbojet aircraft during initial descent from cruising level should be applied only with the concurrence of the flight crew.

8.2.3.4 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.

8.2.3.5 Arriving aircraft should be permitted to operate in a clean configuration for as long as possible. Below FL 150, speed reductions for turbojet aircraft to not less than 220 kt IAS, which will normally be very close to the minimum speed of turbojet aircraft in a clean configuration, may be used.

8.2.3.6 Only minor speed adjustments not exceeding plus/minus 20 kt IAS should be used for aircraft on intermediate and final approach.

8.2.3.7 Speed control should not be applied to aircraft after passing a point 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 3 NM from the threshold .

9 EMERGENCIES, HAZARDS AND EQUIPMENT FAILURES

9.1 EMERGENCIES

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

9.1.2 The progress of an aircraft in emergency will be monitored and (whenever possible) plotted on the situation display until the aircraft passes out of coverage of the Radar surveillance system, and position information will be provided to all air traffic services units which may be able to give assistance to the aircraft. Transfer to adjacent sectors will 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, that code will normally be maintained unless, in special circumstances, the pilot has decided or has been advised otherwise. Where ATC has not requested a code to be set, the pilot will set the transponder to Mode A Code 7700.

9.2 COLLISION HAZARD INFORMATION

9.2.1 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 will, 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.

9.2.2 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.

9.2.3 Information regarding traffic on a conflicting path should be given, whenever practicable, in the following form: 1. To radar identified aircraft of identified aircraft:

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, e.g. slow or fast.

Example:
***TRAFFIC ONE O'CLOCK FIVE MILES WEST-BOUND ATR72 8,500**
***TRAFFIC NUMEROUS.**

Note: For altitude information which has not been verified by ATC, the word "altitude readout" will be added.

***TRAFFIC ELEVEN O'CLOCK 6 MILES EAST-BOUND TYPE UNKNOWN ALTITUDE READOUT 4,500.**

2. To radar identified aircraft of un-identified aircraft:
   a) Distance and direction with respect to a fix or an airport
   b) Direction in which the target is proceeding
   c) Type of aircraft and altitude, if known:

Example:

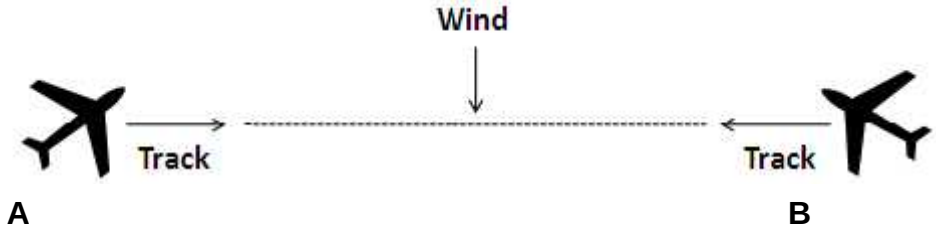
***TRAFFIC EIGHT MILES EAST OF THE AIRPORT NORTHEAST-BOUND.**
***TRAFFIC NUMEROUS TARGETS VICINITY SIMRA.**

9.2.4 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 another unknown aircraft (e.g. a VFR flight) and given to the pilot of a known aircraft, could facilitate the location of a collision hazard.

9.2.5 When the pressure-altitude-derived level information has been verified, the information will 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 will be informed accordingly.

Note1: Traffic information is issued to the extent possible the workload of ATC permits. The issuance of the traffic information is, in the job priority, next to the provision of the required separation. Therefore the radar traffic information will not be issued always on all the relevant targets.

Note2: Target's azimuth is expressed to the pilot with his/her proceeding direction on the radarscope as 12 o'clock. While an aircraft is flying applying drift correction to maintain his/her track, or is making a turn, informed azimuth of the target may be different from the real azimuth as seen from the cockpit. Traffic information will be "TRAFFIC 12 O'CLOCK" respectively to both aircraft, although the actual position of the traffic, as seen by (A), would be "ONE O'CLOCK" or by (B), "ELEVEN O'CLOCK" respectively.



9.2.6 Reply to the Traffic Information

1. The pilot should notify to ATC when he/she had the advised traffic in sight, or not in sight, or looking out.

***TRAFFIC IN SIGHT or**
***NEGATIVE CONTACT or**
***LOOKING OUT**

Note: when the pilot notifies "LOOKING OUT" to ATC, he/she should report "TRAFFIC IN SIGHT" or "NEGATIVE CONTACT" as soon as possible.

2. When the pilot could not have the advised traffic in sight, and the traffic moved to a new position where the target was not a factor any more, he may be informed by ATC with phraseology of "CLEAR OF TRAFFIC or "CLEAR OF [number] O'CLOCK TRAFFIC".

9.3 FAILURE OF EQUIPMENT

9.3.1 AIRCRAFT RADIO TRANSMITTER FAILURE

9.3.1.1 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 changes.

*** REPLY NOT RECEIVED. IF YOU READ ME (appropriate instructions)**

Note 1.— Transponder-equipped aircraft experiencing radio communication failure will operate the transponder on Mode A Code 7600.

9.3.1.2 If the action prescribed in 9.3.1.1 is unsuccessful, it will be repeated on any other available channel on which it is believed that the aircraft might be listening.

9.3.1.3 In both the cases covered by 9.3.1.1 and 9.3.1.2, any manoeuvring instructions will be such that the aircraft would regain its current cleared track after having complied with the instructions received.

9.3.1.4 Where it has been established by the action in 9.3.1.1 that the aircraft's radio receiver is functioning, continued control can be effected using SSR code or IDENT transmissions to obtain acknowledgement of clearances issued to the aircraft.

***(action) OBSERVED, WILL CONTINUE RADAR CONTROL SERVICE.**

9.3.2 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 Radar surveillance service is applied, separation specified in 6.9 may continue to be used. However, if the aircraft experiencing the communication failure is not identified, separation will 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 radio communication failure has passed through the airspace concerned, has landed, or has proceeded elsewhere.

9.3.3 AIRCRAFT TRANSPONDER FAILURE IN AREAS WHERE THE CARRIAGE OF A FUNCTIONING TRANSPONDER IS MANDATORY

9.3.3.1 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 endeavor 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.

9.3.3.2 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.

9.4 GROUND RADIO FAILURE

9.4.1 In the event of complete failure of the ground radio equipment used for control, the controller will, unless able to continue to provide the Radar 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.

9.4.2 In order to reduce the impact of complete ground radio equipment failure on the safety of air traffic, the control positions and ATC units should follow the contingency procedure.