
ENR 1.6 – RADAR SERVICE AND PROCEDURES

1. Introduction

- 1.1. Radar control procedures will be used by ATC in preference to non-radar control procedures whenever ATS or the aircraft served will gain operational advantage
- 1.2. The provision of radar service to aircraft is subject to
 - i) Communication system availability and reliability
 - ii) Radar equipment limitations, and
 - iii) The capability of the controller to revert to non-radar separation in the event of radar failure.
- 1.3. The following types of radar services may be provided to aircraft operating within reliable radar coverage-
 - i) Radar control service - for aircraft operating within Class D and E airspace
 - ii) Radar advisory service - for aircraft operating within Class F airspace
 - iii) Radar flight information service - for identified aircraft operating in any part of FIR
- 1.4. The provision of any of the above types of radar service 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.
- 1.5. In the event of an aircraft in or appearing to be in, any form of emergency ATC will provide all possible assistance, including the provisions of radar service to the extent possible.

2. Use of radar in air traffic control service

- 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.
 - 2.1.1. Provide of radar service to-
 - i) Improve airspace utilization
 - ii) Reduce delays
 - iii) Enhance safety
 - 2.1.2. Provide radar vectoring to-
 - i) Departing aircraft for expeditious and efficient departure flow and expediting climb to cruising level
 - ii) Arriving aircraft for the purpose of expediting descent from cruising level and establishing an expeditious and efficient approach sequence
 - iii) Aircraft for the purpose of resolving potential conflict
 - iv) Assist pilot in their navigation
 - 2.1.3. Provide separation and maintain normal flow when an aircraft is experiencing communication failure is within area of radar coverage
 - 2.1.4. Maintain radar monitoring of traffic
 - 2.1.5. Monitor the progress of air traffic in order to
 - i) Obtain improved position information regarding aircraft under control
 - ii) Obtain supplementary information regarding other traffic
 - iii) Detect significant deviations by aircraft from their assigned routings or level.
Note – To be considered ‘significant’ an aircraft’s track deviations 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 flown.

3. Use of SSR without primary radar

- 3.1. Secondary Surveillance Radar (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.
- 3.2. Non-radar separation will be applied between transponder equipped aircraft and an aircraft without SSR transponder or with a non-functioning SSR transponder.

3.3. 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.

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

4. Radar identification

4.1. Before providing radar service to an aircraft, radar identification shall be established by one of the method in Doc 4444-PANS-ATM, Chapter 4 and the pilot so informed. If radar identification is subsequently lost, the pilot shall be informed accordingly and instructions will be issued so as to restore non-radar separation.

5. Terrain clearance

5.1. When vectoring IFR flights, the radar controller shall ensure adequate terrain clearance until the aircraft reaches the point when the pilot resumes his own navigation.

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

6. Information regarding adverse weather

6.1. 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 the radar sensors in se by ATC.

6.2. If, however, weather is observed that appears likely to affect the flight, the radar controller may pass this information to the pilot.

6.3. 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.

7. Radar separation minima

7.1. Radar separation based on the use of radar position symbol (RPS) shall be applied so that the distance between the centers of the RPS representing the positions of aircraft concerned, is never less than prescribed minima.

7.2. Traffic separation will be based to a large degree on radar separation within the airspace under radar coverage.

7.3. 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-

7.3.1. 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

7.3.2. Radar separation is maintained between the radar controlled flights and any other observed radar position until either the controlled flight has been identified or non-radar separation has been established.

7.4. Procedural separation minima will be applied-

i) In the event of radar failure

ii) In the area outside the radar coverage

iii) To aircraft leaving radar coverage or entering adjacent FIR except where radar transfer is effected.

7.5. The following radar separation minima in addition to those given in Doc 4444 - PANS-ATM, Chapter 7 shall be applied.

7.5.1. 5NM radar separation upto 60NM from the radar head

7.5.2. 10NM radar separation beyond 60NM from radar head

7.6. Wake turbulence radar separation minima shall be applied to aircraft in the approach and departure phases of flight as prescribed in Doc 4444-PANS-ATM, Chapter 8.

7.7. Radar separation shall not be applied between aircraft holding over the same holding points. When applying radar separation between holding aircrafts and other flights, the controller shall maintain identity of the holding aircraft for the provision of the 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 maneuvers of the holding aircraft during application of such separation.

8. Speed control procedures

8.1. All aircraft (including arrivals and departures), operating below 10000 Ft will fly at IAS not greater than 250 Kt.

8.2. All arriving aircraft, operating below 10000 Ft within 15NM radius of VOR/DME serving the aerodrome will fly at IAS not greater than 220 Kt.

8.3. Additional speed control restrictions may be imposed for arriving and en-route aircraft by ATC whenever traffic conditions so require.

8.4. ATC may suspend speed control by using the phrase 'No Speed restriction' when traffic conditions permit.

9. Termination of radar service

9.1. 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.

9.2. Radar service is automatically terminated when an arriving aircraft receiving radar service has been instructed to contact tower frequency. Position of aircraft from touchdown should be given to the aircraft before changing over the aircraft to tower.

10. Collision hazard

10.1. Identified controlled flight in controlled airspace-

10.1.1. Traffic information will be given when an identified controlled flight is observed to be on conflicting path with an aircraft which ATC has no specific information but deemed to constitute a collision hazard; a course of avoiding action will be suggested, if so requested by the pilot or if in the opinion of the radar controller the situation warrants.

10.1.2. The pilot shall be notified when the conflict no longer exists.

10.2. Identified IFR flight outside controlled airspace-

10.2.1. When an identified IFR flight operating outside controlled airspace is observed to be on a conflicting path with another aircraft, the identified aircraft will be advised of the need for collision avoidance. If so requested by the pilot or if in the opinion of the radar controller the situation warrants, a course of avoiding action will be suggested.

10.2.2. The pilot shall be notified when the conflict no longer exists.

10.3. In both the cases mentioned in para 10.1.1 and 10.2.1 above, the decision whether to comply with ATC suggestion or not rests solely with the pilot.

11. Radar failure

11.1. In the event of radar failure, instructions will be issued to restore non-radar separation.

11.2. If non-radar separation cannot be provided immediately, an emergency separation of half the applicable vertical separation minimum may be used, i.e. 500 Ft between aircraft in airspace where a vertical separation of 1000 Ft is applied and 1000 Ft between aircraft in airspace where a 2000 Ft vertical separation minimum is applied.

12. Communication failure procedure

12.1. If two-way communication is lost with an aircraft, the radar controller will try to determine whether or not the aircraft's receiver is functioning by-

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- i) Instructing the aircraft to acknowledge by making specific maneuver(s)
 - ii) Instructing the aircraft to operate SPI feature (i.e. Squawk Ident) or to make SSR mode A3 code changes
- Note - A transponder equipped aircraft experiencing radio communication failure should operate its transponder on mode A3 code 7600.

12.2. If it is established that the aircraft's radio receiver is functioning, the controller shall continue to provide radar service to the aircraft.

12.3. In the event of complete radio communication failure, radar separation shall continue to be applied between other aircraft under radar control and RCF aircraft.

13. Procedures for operation of SSR transponder codes

13.1. All aircraft carrying serviceable transponder shall operate the transponder at all times during flight within Chennai, Delhi, Guwahati, Kolkata and Mumbai FIR regardless of whether the aircraft is within or outside airspace where SSR is used for ATS.

13.2. Operating procedures

13.2.1. Except as provided in para 12.3, 12.4 and 12.5 below, pilots shall operate transponders and select modes and codes in accordance with the following procedures-

- i) Aircraft departing from an aerodrome located in Chennai, Delhi, Guwahati, Kolkata and Mumbai FIR shall be assigned an appropriate SSR code on departure. This SSR code setting shall continue unless instructed otherwise.
- ii) Aircraft engaged in international flight, entering Chennai, Delhi, Guwahati, Kolkata and Mumbai FIR shall continue to maintain 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.
- iii) Aircraft engaged in domestic flight shall operate the transponder on the last assigned code.
- iv) Aircraft not assigned a SSR code shall operate transponder on mode A3 code 2000 before entry into Chennai, Delhi, Guwahati, Kolkata and Mumbai FIR and maintain that code setting until otherwise instructed.
- v) 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.

13.3. Emergency procedure

13.3.1. 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.

13.3.2. Notwithstanding the procedure in 12.3.1 above, a pilot may select mode A3 code 7700 whenever the emergency is such that this appears to be the most suitable course of action.

13.4. Radio communication failure

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

13.5. Unlawful interference

13.5.1. 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.

13.5.2. When a pilot has selected mode A3 code 7500 and 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.

13.6. Verification of accuracy of mode C derived level information

13.6.1. All aircraft must report the level/altitude maintaining/passing on first contact with a radar unit to facilitate verification of Mode C altitude information.

13.6.2. Verification of the accuracy of SSR derived altitude 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. This verification shall be effected

by simultaneous comparison with altimeter derived level information received from the specific aircraft by radio telephony. The pilot if the aircraft whose Mode C derived information is within the approved tolerance value will not be advised of such verification.

13.6.3. If the displayed 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 and requested to check his pressure setting and confirm his level.

13.6.4. If, following confirmation of level and correct pressure setting, the discrepancy continues to exist the controller may request the pilot to stop his Mode C transmission. The phraseology used will be ‘Stop SWUAWK CHARLIE. WRONG INDICATION’

13.7. Code Assignment

13.7.1. Aircraft operating in Indian airspace will be assigned codes as follows-

Code	VAAH	VECC	VOMM	VIDP	VEGT	VOHY	VABB	VANP	VOTV
0200 - 0237			D						
0238 - 0277							D		
2600 - 2620					D				
2621 - 2670		D							
2671 - 2677								D	
2715 - 2736						D			
2737 - 2777									
0300 - 0360							I		
0361 - 0377	I								
3300 - 3310							D		
3311 - 3377				D					
0400 - 0472		I							
0473 - 0477								I	
0500 - 0577				I					
0600 - 0663			I						
0664 - 0673									I
0674 - 0677						I			
6300 - 6326	D								
6327 - 6351							D		
6352 - 6377				D					

I – For International flights

D – For Domestic flights

14. Radar coverage

14.1. Terminal Area Radar (PSR) and co-located Monopulse secondary surveillance radar (MSSR) with a range of 60NM are operational at the following airports

- i) Ahmedabad
- ii) Chennai
- iii) Calicut

- iv) Delhi
- v) Guwahati
- vi) Hyderabad
- vii) Kolkata
- viii) Mumbai
- ix) Thiruvananthapuram
- x) Varanasi

14.2. Route Surveillance Radar (PSR) with a range of 220NM are operational at the following airports-

- i) Delhi
- ii) Mumbai

14.3. MSSR with a range of 250NM are operational at the following airports-

- i) Ahmedabad
 - ii) Chennai
 - iii) Delhi
 - iv) Guwahati
 - v) Hyderabad
 - vi) Kolkata
 - vii) Mumbai
 - viii) Nagpur
 - ix) Thiruvananthapuram
 - x) Varanasi
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