

DGCA CPL / ATPL GROUND SCHOOL

Use of Air Traffic Services Surveillance System

Doc 4444 (PANS-ATM) & AIP India — Complete Study Notes

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SUBJECT

Air Regulations

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CHAPTER

9 — Pages 215–226

Air Regulations › Chapter 9 › ATS Surveillance System

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Introduction — ATS Surveillance Systems

WHAT IS AN ATS SURVEILLANCE SYSTEM?

ATS Surveillance System is a *generic term* covering any ground-based system that enables the identification of aircraft to provide Air Traffic Services. It encompasses:

- **ADS-B** — Automatic Dependent Surveillance – Broadcast
- **PSR** — Primary Surveillance Radar
- **SSR** — Secondary Surveillance Radar
- **MLAT** — Multilateration
- Any comparable **ground-based** system enabling aircraft identification

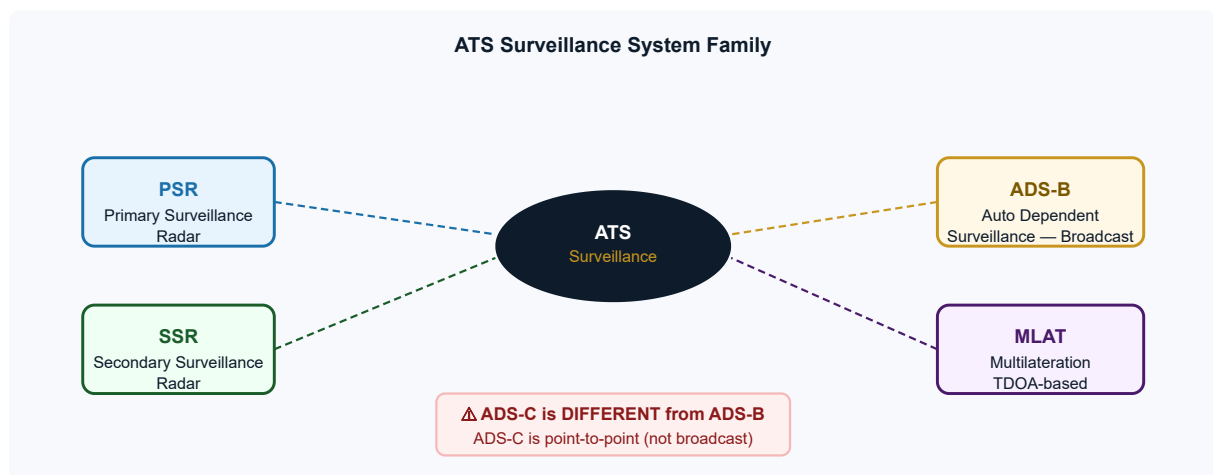


Fig 1.1 — The ATS Surveillance System family and their key distinctions

When is PSR Used?

PSR USAGE RULE

PSR systems should be used in circumstances where *other* ATS surveillance systems **alone** would **not meet** the air traffic services requirements.

PSR is the supplementary backstop — not the primary tool in modern ATC.

When Can SSR Be Used Alone?

✅ SSR ALONE — CONDITIONS FOR SEPARATION

SSR systems (especially those with **monopulse techniques** or **Mode S capability**), or **MLAT**, may be used alone — including for **separation between aircraft** — provided *both* conditions are met:

- ✓ The carriage of SSR transponders is **mandatory** within the area
- ✓ Identification is **established and maintained**

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§ 02

ADS-B — Automatic Dependent Surveillance – Broadcast

DEFINITION — ADS-B

ADS-B, like PSR and SSR, is an **ATS surveillance system**. It allows ATC to **automatically and repeatedly access data** from all suitably equipped aircraft and both *use* and *re-broadcast* it to suitably equipped other aircraft within range.

KEY POINTS — ADS-B

- **Dependent:** Relies on the aircraft's own navigation systems (GPS/GNSS)
- **Automatic:** No pilot input required — broadcasts continuously
- **Surveillance:** Provides traffic picture to ATC and other aircraft
- **Broadcast:** Signal goes to ALL receivers in range (unlike ADS-C which is point-to-point)
- Moves from **ground radar** and navigational aids to **precise satellite-based tracking**
- Forms the **foundation for NextGen** (Next Generation Air Transportation System)

ADS-C — Automatic Dependent Surveillance – Contract

DEFINITION — ADS-C

ADS-C uses the **same on-board systems** as ADS-B to transmit similar information (position, altitude, speed, navigational intent, meteorological data) — but *only* to **one or more specific** Air Traffic Services Units (ATSU) or Aeronautical Operational Control (AOC) facilities — for **surveillance and/or route conformance monitoring**.

ADS-B (Broadcast)

- Signal goes to **ALL** receivers within range
- Used by ATC *and* other aircraft (TCAS/traffic display)
- No specific "contract" required
- Suitable for busy, high-density airspace
- Ground stations re-broadcast to other aircraft

ADS-C (Contract)

- Signal goes to **specific** ATSU's / AOC only
- Based on an **ADS contract** between aircraft & ground
- Contract defines *type of data* and *reporting conditions*
- Used for oceanic / remote area surveillance
- Aircraft can also send *unsolicited* emergency reports

CRITICAL EXAM DISTINCTION

Although the names are similar, **ADS-C and ADS-B are two different applications.**

Data provision under ADS-C is *only* generated in response to a **request within the terms of an ADS contract** held by the ground system. The contract identifies the types of information and the conditions under which reports are sent.

Some information types are included in *every* report; others are provided *only if specified* in the contract.

Advantages of ADS-B

✅ ADVANTAGES — ADS-B (THE FULL LIST)

- 🌿 **Environmentally friendly technology** — enhances safety and efficiency
- 👤 **Pilots see what controllers see:** displays showing other aircraft in the sky (first time in aviation history)
- ☁️ **Cockpit displays** also pinpoint **hazardous weather and terrain**, and give important flight information such as temporary flight restrictions
- 🚗 **Reduces runway incursions:** cockpit and controller displays show the location of aircraft *and equipped ground vehicles* on airport surfaces — even at night or in heavy rainfall
- 🚨 **Collision alerts:** ADS-B applications give pilots indications or alerts of potential collisions
- 📖 **Greater coverage:** ground stations are much easier to place than radar — remote areas without radar coverage now have surveillance with ADS-B
- 📡 **Satellite-based routing:** aircraft fly more directly from Point A to Point B, saving time, money, and reducing fuel burn and emissions
- 📶 **Reduces separation minima:** improved accuracy of satellite signals over radar allows controllers to eventually reduce minimum separation and increase airspace capacity
- 🏠 **Foundation for NextGen:** moves from ground radar and navigational aids to precise tracking using satellite signals

MLAT — Multilateration Applications

DEFINITION — MLAT

Multilateration (MLAT) is a technology to accurately locate aircraft using **Time Difference of Arrival (TDOA)**. It employs a number of **ground stations** placed in strategic locations around an airport.

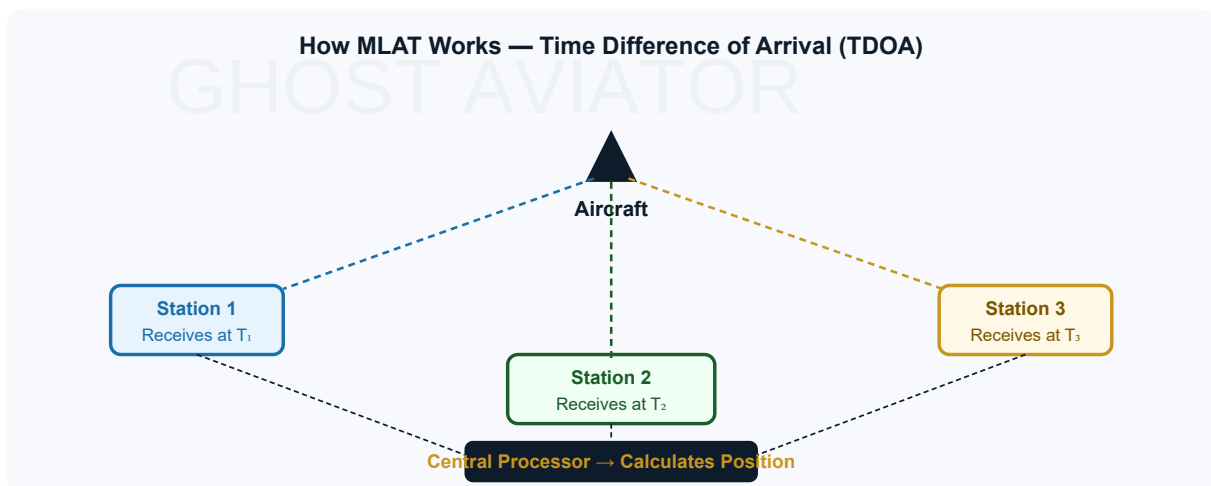


Fig 5.1 — MLAT calculates aircraft position by measuring Time Difference of Arrival at multiple ground stations

MLAT KEY POINTS

- **No additional avionics required** — uses replies from **Mode A, C and S transponders**, as well as **military IFF** and **ADS-B transponders**
- Individual aircraft will be at **different distances** from each ground station — their replies are received at **fractionally different times**
- Advanced computer processing techniques use these individual time differences to **precisely calculate** aircraft position
- MLAT is particularly useful in **surface movement** (airport ground) and **terminal area** applications

Radar Applications

RADAR VECTORS — HEADINGS

Radar vectors given to an aircraft will be related to **magnetic headings only.**

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.**

Types of Radar Services



(i) Radar Control Service

For aircraft operating within **controlled airspaces**



(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**

TWO-WAY COMMUNICATION REQUIREMENT

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.

Exception: 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.

Radar in Approach Control Service

✓ APPROACH CONTROL — RADAR USES

Surveillance Radar is extensively used in approach control to:

- Sequence the traffic
- Vector aircraft to position for pilot-interpreted approach aids
- Conduct **surveillance radar approaches**

Radar in Aerodrome Control Service

✓ AERODROME CONTROL — RADAR USES

- Surveillance radar is used as an **approach monitor aid**
- **Surface Movement Radar (SMR)** is used to control traffic on the ground in the movement area

Position Indication Display Formats

📺 HOW POSITION MAY BE DISPLAYED

Position indications may be displayed as:

- **(a)** Individual position symbols — e.g. PSR, SSR, ADS-B or MLAT symbols, or combined symbols
- **(b)** PSR blips
- **(c)** SSR responses

Use of ATS Surveillance Service in Air Traffic Control Service

✓ PRIMARY PURPOSES OF ATS SURVEILLANCE SERVICE

Provide radar service to:

- (i) Improve airspace utilisation | (ii) Reduce delays | (iii) Enhance safety

Provide radar vectoring to:

- (i) Departing aircraft for expeditious and efficient departure flow and expediting climb to cruising level
- (ii) Arriving aircraft for 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

Provide separation and maintain normal flow when an aircraft experiencing **communication failure** is within area of ATS surveillance service coverage.

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

Use of SSR Without Primary Radar

SSR ALONE — SEPARATION PROVISION

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**

⚠️ **NON-TRANSPONDER AIRCRAFT — NON-RADAR SEPARATION**

Non-radar separation will be applied between:

- A transponder-equipped aircraft, AND
- An aircraft *without* SSR transponder, OR an aircraft with a **non-functioning** SSR transponder

✅ **TRANSPONDER FAILURE PROCEDURES**

1. **Failure detected during flight:** The aircraft (for whom carriage of transponder is mandatory) will *normally be permitted to continue to operate to the next point of landing*.
2. **Failure detected before departure:** The aircraft may be specifically *authorised by ATC* to operate without a serviceable transponder — provided a **request is included in the flight plan**.

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ATS Surveillance Service Identification Procedures

⚠️ **MANDATORY RULE — IDENTIFICATION BEFORE SERVICE**

Before providing ATS surveillance service to an aircraft, **radar identification shall be established** by one of the methods in *Doc 4444-PANS-ATM*, and the **pilot so informed**.

If identification is subsequently *lost*, the pilot shall be **informed accordingly** and instructions will be issued so as to restore **non-ATS surveillance service separation**.

ADS-B Identification Procedures

Where ADS-B is used for identification, aircraft may be identified by:

ADS-B — IDENTIFICATION METHODS (3 METHODS)

- **(a)** Direct recognition of the aircraft identification in an **ADS-B label**
- **(b)** Transfer of ADS-B identification
- **(c)** Observation of compliance with an instruction to **TRANSMIT ADS-B IDENT**

SSR and/or MLAT Identification Procedures

Where SSR and/or MLAT is used for identification, aircraft may be identified by:

SSR/MLAT — IDENTIFICATION METHODS (6 METHODS)

- **(a)** Recognition of the aircraft identification in a SSR and/or MLAT label
- **(b)** Recognition of an **assigned discrete code**, the setting of which has been verified, in a SSR and/or MLAT label
- **(c)** Direct recognition of the aircraft identification of a **Mode S-equipped** aircraft in a SSR and/or MLAT label
- **(d)** By **transfer** of identification
- **(e)** Observation of compliance with an instruction to **set a specific code**
- **(f)** Observation of compliance with an instruction to **squawk IDENT**

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PSR Identification Procedures

When SSR is not available, PSR identification may be achieved by the following methods:

Method 1 — Position Report Method

✓ POSITION REPORT METHOD

By **correlating** a particular radar position indication with an aircraft reporting:

- Its position **over** or as **bearing and distance from** a point shown on the situation display;
AND
- By **ascertaining** that the track of the particular radar position is consistent with the aircraft path or reported heading

Method 2 — Departing Aircraft Method

✓ DEPARTING AIRCRAFT METHOD

By correlating an observed radar position indication with an aircraft **known to have just departed**, provided that:

- Identification is established **within 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
 - Departing from or making a missed approach over *adjacent runways*

Method 3 — The Turn Method

✓ THE TURN METHOD

(a) An aircraft may be identified by ascertaining the aircraft heading, if circumstances require, and following a period of track observation by:

- ▶ 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
- (ii) Ensure that the manoeuvre(s) will **not carry the aircraft outside** the coverage of the radar or the situation display

PSR ID Method	Key Requirement	Critical Limit
Position Report	Aircraft reports position over / bearing & distance from a known point	Track must be consistent with reported heading/path
Departing Aircraft	Aircraft known to have just departed a runway	Within 1 NM from end of runway used
Turn Method	Aircraft executes an instructed heading change	30° or more heading change

Separation Minima

⚠️ SEPARATION MINIMA — CORE RULE

The separation minima specified shall **only be applied** between *identified aircraft* when there is **reasonable assurance that identification will be maintained**.

When is Procedural (Non-Radar) Separation Applied?

⚠️ PROCEDURAL SEPARATION MINIMA WILL BE APPLIED IN:

- (i) In the event of **ATS surveillance service failure**
- (ii) In the area **outside** the ATS surveillance service coverage
- (iii) To aircraft **leaving** ATS surveillance service coverage or entering an **adjacent FIR** — except where ATS surveillance service transfer is effected

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ICAO Separation Minima — Radar / ADS-B / MLAT

Horizontal Separation Minima — Visual Scale

Condition	Separation Minimum	Authority	Notes
Standard (Default) — Radar / ADS-B / MLAT	9.3 km (5.0 NM)	ICAO	Unless otherwise prescribed
Reduced — where capabilities at a given location so permit	5.6 km (3.0 NM)	ICAO	May be reduced but <i>not below</i> this minimum (unless category (b) applies)
Further Reduced — Succeeding aircraft on same final approach track within 18.5 km (10 NM) of runway end threshold	4.6 km (2.5 NM)	ICAO	Provided local factors permit such reduction

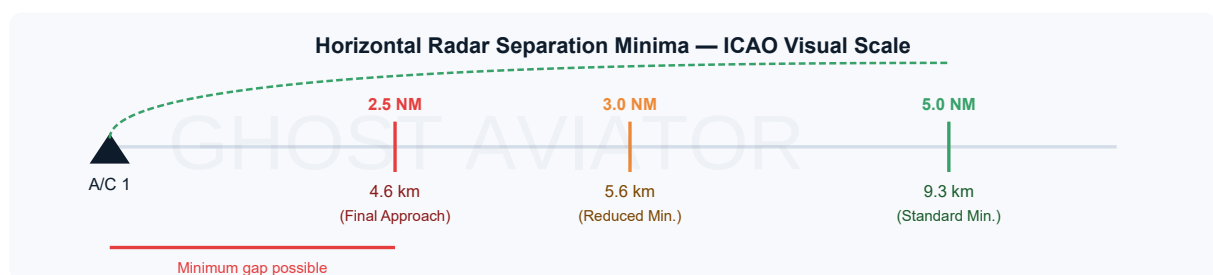


Fig 10.1 — ICAO Horizontal Radar Separation Minima (Note: values decrease from standard to final approach minimum)

⚠ CRITICAL EXAM VALUES — MEMORISE THESE

Minimum	NM	km	Condition
Standard Horizontal	5.0 NM	9.3 km	Default — Radar / ADS-B / MLAT
Reduced	3.0 NM	5.6 km	Where ATS authority permits; local capabilities
Final Approach (same track)	2.5 NM	4.6 km	Within 10 NM (18.5 km) of runway threshold; local factors permit
Departing Aircraft ID	1 NM	—	PSR ID must be established within 1 NM of runway end
Turn Method heading change	—	—	30° or more

India — Separation Minima

IN DGCA / AIP INDIA — SEPARATION MINIMA

DGCA For separation minima based on ATS surveillance systems in **India**, please refer to **Chapter Six** of the Air Regulations text.

The ICAO standard of **5.0 NM / 9.3 km** applies unless otherwise prescribed by the appropriate ATS authority.

MLAT and PSR Blip Separation Application

✓ SEPARATION USING MLAT SYMBOLS / PSR BLIPS

Separation based on the use of MLAT position symbols and PSR blips shall be applied so that:

The distance between the **centres** of the position symbols and PSR blips, representing the positions of the aircraft concerned, is **never less than a prescribed minimum**.

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Speed Control Procedures

⚠ SPEED CONTROL — MANDATORY LIMITS (AIP INDIA)

- All aircraft (including arrivals and departures) operating **below 10,000 ft** shall fly at IAS not greater than **250 KT**
- All arriving aircraft operating **below 10,000 ft within 15 NM radius** of VOR/DME serving the aerodrome shall fly at IAS not greater than **220 KT**
- Additional speed control restrictions may be imposed for arriving and en-route aircraft by ATC whenever traffic conditions so require

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Speed Control — Below 10,000 ft (AIP India)

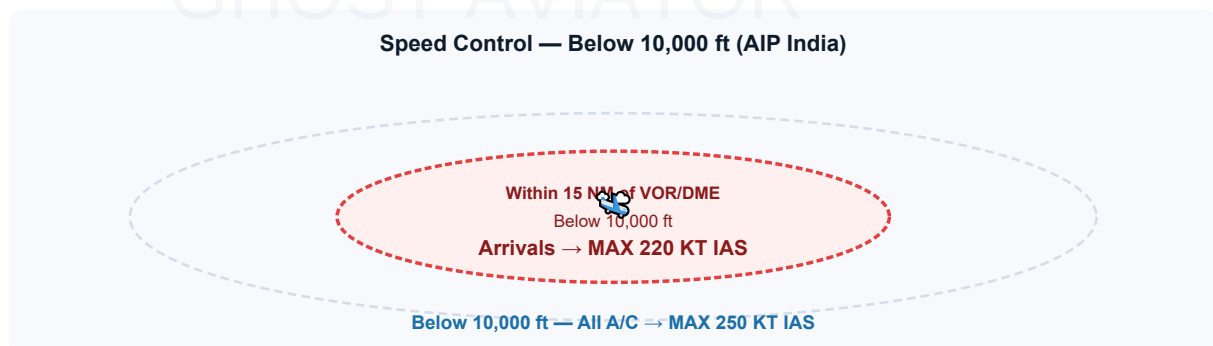


Fig 11.1 — Speed control zones below 10,000 ft per AIP India

✅ ATC SUSPENSION OF SPEED CONTROL

ATC may suspend speed control by using the phrase:

"NO SPEED RESTRICTION"

This suspension applies when traffic conditions permit.

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Termination of ATS Surveillance Service

⚠️ TERMINATION — MANDATORY NOTIFICATION

An aircraft that has been informed it is provided with ATS surveillance service **should be informed immediately** when for any reason ATS surveillance service is **interrupted or terminated**.

✅ AUTOMATIC TERMINATION — ARRIVING AIRCRAFT

ATS surveillance service is **automatically terminated** when an arriving aircraft receiving ATS surveillance service has been **instructed to contact tower frequency**.

Important: Position of aircraft from *touchdown* should be given to the aircraft **before** changing over the aircraft to tower.

SSR Transponder — Operating Procedures (India)

⚠ TRANSPONDER OPERATION — MANDATORY RULE (INDIA)

DGCA All aircraft carrying a 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.

Operating Procedures — Pilots

✅ TRANSPONDER MODE & CODE PROCEDURES

- i **Departing aircraft** from aerodromes 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 **International flights entering** Chennai, Delhi, Guwahati, Kolkata and Mumbai FIR shall *continue to maintain the SSR code* being squawked in the adjacent FIR.
- iii **Domestic flights** 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 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

Until **vacating the runway after landing**

EMERGENCY / SPECIAL TRANSPONDER CODES — MEMORISE

Code	Condition	Meaning
7700	Emergency	General Emergency (distress)
7600	Communication Failure (Radio Failure)	NORDO — Lost communication
7500	Unlawful Interference	Hijack / Unlawful seizure of aircraft
2000	No SSR code assigned	Default code before entry into Indian FIR

MEMORY AID — EMERGENCY CODES

"7700 — SEVENS, SAVE ME (Distress)"

"7600 — SIXES, SILENT (Radio Failure)"

"7500 — FIVE, HIJACK ALIVE (Unlawful Interference)"

Or remember: 7700 → *Emergency* | 7600 → *Comms fail* | 7500 → *Hijack*

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Mode C / ADS-B Altitude Verification

⚠ ALTITUDE TOLERANCE VALUES — EXACT DGCA/ICAO VALUES

Airspace Type	Tolerance (metres)	Tolerance (feet)
RVSM Airspace	±60 m	±200 ft
Other (non-RVSM) Airspace	±90 m	±300 ft
ATS Authority may specify smaller criterion But not less than ±60 m (±200 ft)		

🔑 GEOMETRIC HEIGHT — SEPARATION RULE

Geometric height information shall NOT be used for separation.

Only pressure-altitude-derived level information and Mode C / ADS-B altitude data transmission are used for verification and separation.

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Verification Procedure — Step by Step

✓ MODE C / ADS-B ALTITUDE VERIFICATION PROCEDURE

- 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 / ADS-B altitude data transmission.
- 2 Verification shall be effected **at least once** by each suitably equipped ATC unit on *initial contact* with the aircraft — or as soon as possible thereafter. Verification is by **simultaneous comparison** with *altimeter derived level information* received from the aircraft by radio telephony.
- 3 If Mode C / ADS-B altitude data transmission is **within the approved tolerance** → pilot is **NOT** advised of verification.
- 4 If the displayed information is **NOT within approved tolerance**, or if a discrepancy *in excess* of the approved tolerance is detected subsequently: Pilot is **advised and requested to check his pressure setting and confirm his level**.
- 5 If, following confirmation of level and correct pressure setting, the **discrepancy continues**: Controller may request the pilot to **stop his Mode C transmission**.

ATC PHRASEOLOGY — STOP MODE C

If the Mode C discrepancy continues after confirmation:

"STOP SQUAWK CHARLIE. WRONG INDICATION"

"STOP ADS-B ALTITUDE DATA TRANSMISSION (WRONG)"

ATS Identification — Decision Flowchart

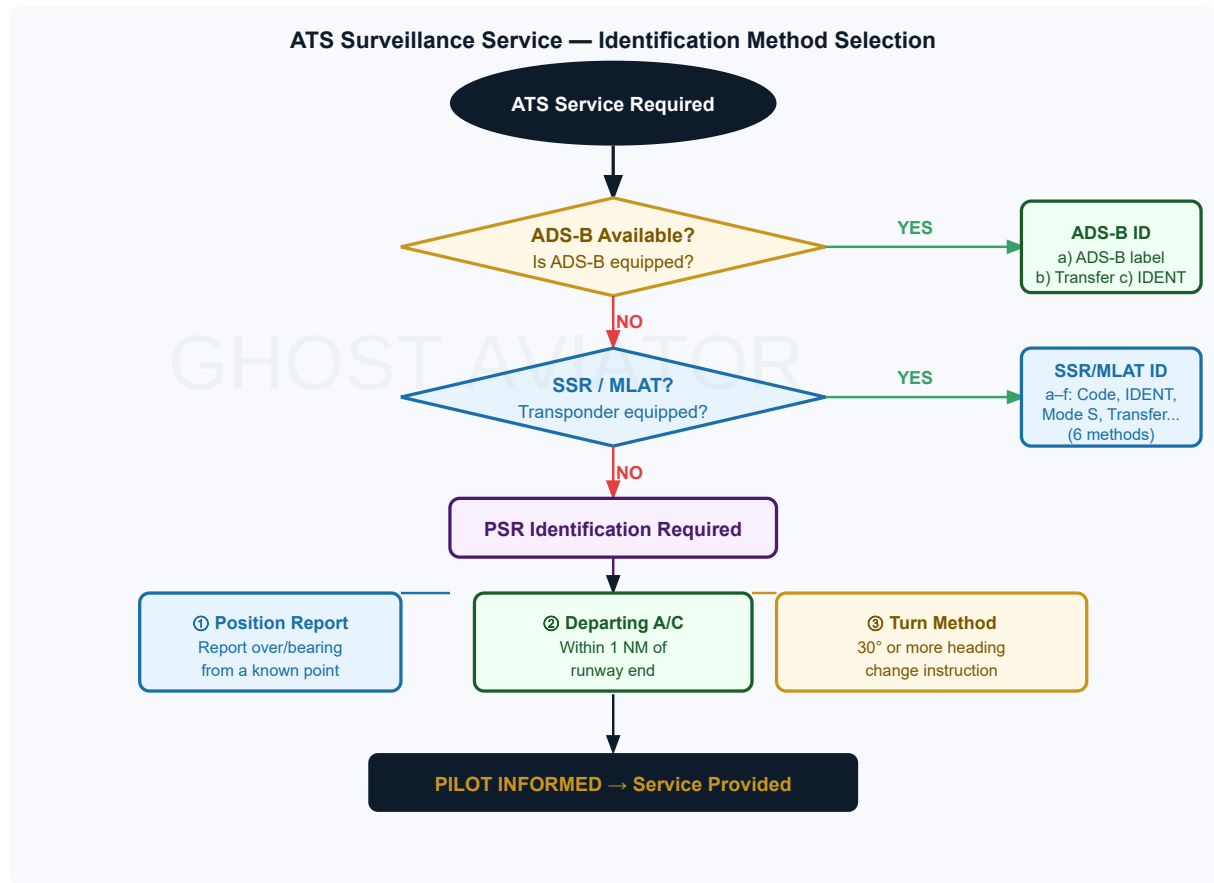


Fig — ATS Surveillance Identification Method Decision Flow

Practice Questions & Detailed Answers

EXAM PRACTICE — ALL 21 QUESTIONS FROM CHAPTER 9

All questions are drawn directly from the DGCA/Doc 4444 question bank. Green-highlighted options are correct answers. Review the regulatory basis after each answer.

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Q.01

The minimum radar separation to be provided to aircraft established on the localizer course shall be:

- A 2.0 NM between aircraft on adjacent localizer course
- B 2.5 NM between aircraft on the same localizer course
- C 5.0 NM between aircraft on the same localizer course

✓ Answer: B — 2.5 NM (4.6 km) is the minimum radar separation on the same final approach / localizer track within 10 NM of the runway threshold. This is the reduced minimum permitted when local factors allow.

Q.02

Unless otherwise prescribed by the appropriate ATS authority, the horizontal radar separation minimum prescribed by ICAO shall be:

- A 3.5 NM
- B 8 NM
- C 5.0 NM

✓ Answer: C — Unless otherwise prescribed, the horizontal separation minimum based on radar and/or ADS-B and/or MLAT systems shall be 9.3 km (5.0 NM) per ICAO Doc 4444.

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Q.03

Where ADS-B is used for identification, aircraft may be identified by the following procedure:

- A Asking him to squawk assigned Mode A code C
- B Direct recognition of the aircraft identification in an ADS-B label**
- C Recognition of an assigned discrete code, the setting of which has been verified

✅ **Answer: B** — Option C is an SSR/MLAT identification procedure, not ADS-B. ADS-B identification uses: (a) direct recognition in ADS-B label, (b) transfer of ADS-B identification, (c) TRANSMIT ADS-B IDENT compliance.

Q.04

An aircraft is considered to be maintaining its assigned level as long as the SSR mode C derived level information indicated that it is within:

- A +/- 500 ft of the assigned level in non-RVSM airspace
- B +/- 200 ft of the assigned level in RVSM airspace
- C +/- 300 ft of the assigned level in RVSM airspace**

✅ **Answer: B** — RVSM airspace tolerance is ± 60 m (± 200 ft). Non-RVSM is ± 90 m (± 300 ft). Note: Option B states 200 ft for RVSM which is correct per the text (± 200 ft). ⚠️ Some interpretations use ± 300 ft for non-RVSM. Per the source document: RVSM = ± 200 ft; Other = ± 300 ft.

Q.05

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:

A +/- 300 ft

B More than 300 ft

C 300 ft

✓ **Answer: B** — The aircraft is considered to have crossed a level when SSR Mode C indicates it has passed through in the required direction by **more than 300 ft** (which aligns with the non-RVSM tolerance of ± 300 ft / 90 m).

Q.06

Secondary Surveillance Radar (SSR) information may be used alone in the provision of separation between aircraft provided:

A Instructions to pilot are acknowledged by him by making specific maneuver(s)

B Aircraft identification is established and maintained by use of discrete SSR codes

C It cannot be used for providing separation

✓ **Answer: B** — SSR alone can be used for separation provided aircraft identification is established and maintained by use of discrete SSR codes.

Q.07

Radar identification of a departing aircraft can be achieved if a radar blip is observed within a certain distance from the end of the runway. Identification has to be achieved within:

A 1 NM

B 3 NM

C 5 NM

✓ Answer: A — PSR identification using the departing aircraft method must be established **within 1 NM from the end of the runway used.**

Q.08

Separation based on the use of MLAT position symbols and PSR blips shall be applied so that:

A The distance between the centres of the position symbols and PSR blips, representing the positions of the aircraft concerned, is never less than a prescribed minimum

B The distance between the edges of the position symbols and PSR blips... is never less than a prescribed minimum

C The distance between the furthest edges... is never more than a prescribed minimum

✓ Answer: A — Separation is measured between the **centres** of the position symbols and PSR blips. The distance between centres must never be less than the prescribed minimum.

Q.09

The air traffic control unit has reported "radar contact". What does that mean to the pilot?

- A The aircraft is subject to positive control
- B Position reports may be omitted
- C The radar identity of the aircraft has been established

✓ **Answer: C** — "Radar contact" means the radar identity of the aircraft has been established. Further services are then provided based on this identification. Position reports may be omitted only when ATC specifically advises this.

Q.10

When a RADAR operator says the following to an aircraft: "fly heading 030°", the pilot must fly heading:

- A 030° magnetic in still air conditions (thereby flying the magnetic track)
- B 030° compass in still air conditions (thereby flying the compass heading)
- C 030° true, in still air conditions (thereby flying the true track)

✓ **Answer: B** — Radar vectors are related to **magnetic headings only**. The pilot flies the magnetic heading as indicated on the compass. In still air (no wind), the magnetic heading equals the magnetic track.

Q.11 Which code shall be used on Mode "A" to provide recognition of an aircraft subjected to unlawful interference?

A Code 7700

B Code 7600

C Code 7500

✓ **Answer: C — 7500 = Unlawful Interference (Hijack). 7700 = Emergency. 7600 = Radio/Communication Failure.**

Q.12 Upon intercepting the assigned radial, the controller advises you that you are on the airway and to "resume own navigation". This phrase means that:

A Radar services are terminated and you will be responsible for position reports

B You are to assume responsibility for your own navigation

C You are to contact the center at the next reporting point

✓ **Answer: B — "Resume own navigation" means you assume responsibility for your own navigation (self-navigate using your instruments/FMS). Radar service itself may continue, but you navigate independently using the assigned route.**

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Q.13 What does the ATC term "radar contact" signify?

- A** Your aircraft has been identified on the radar display and radar flight instructions will be provided until radar identification is terminated
- B** You will be given traffic advisories until advised that the service has been terminated or that radar contact has been lost
- C** ATC is receiving your transponder and will furnish vectors and traffic advisories until you are advised that contact has been lost

✓ **Answer: A** — "Radar contact" = aircraft identified on radar display. Radar flight instructions (which may include vectors and traffic advisories) will be provided until radar identification is terminated.

Q.14 Where a "Secondary Surveillance Radar" (SSR) is not available, radar identification may be achieved by one of the following procedures:

- A** To instruct the pilot to execute one or more changes of 10°
- B** To instruct the pilot to execute one or more changes of 45°
- C** To instruct the pilot to execute one or more changes of 30° or more

✓ **Answer: C** — The Turn Method (PSR only) requires **30° or more** heading change(s) to correlate the radar position with the specific aircraft.

Q.15

When "Secondary Radar" is used, an aircraft may be identified by one of the following procedures:

- A To request pilot to set transponder on position "OFF"
- B To request pilot to switch from "ON" to "STBY"
- C Observation of compliance with an instruction to operate transponder from "ON" to "STBY" and back to "ON"

✓ Answer: C — SSR identification by switching from ON → STBY → ON is equivalent to "squawk IDENT" type compliance verification. This correlates the radar response disappearance and reappearance with the specific aircraft.

Q.16

The Air Traffic Control Service: do not prevent collisions with terrain.

- A Wrong, they do prevent collisions with terrain
- B Except when an aircraft is flying IFR in IMC
- C Correct, except when an IFR flight is vectored by radar

✓ Answer: C — ATC does not generally prevent terrain collisions. However, when an IFR flight is being vectored by radar, the controller is responsible for providing terrain clearance, as the pilot is following ATC instructions rather than the published procedures that guarantee terrain clearance.

Q.17 Which code shall be used on mode "A" to provide recognition of an emergency aircraft?

A Code 7600

B Code 7500

C Code 7700

✓ **Answer: C — 7700 = Emergency (Distress / Urgency).** This is the universal emergency transponder code recognised worldwide.

Q.18 One of the functions ensured by a radar control unit for the provision of approach control service is:

A To conduct surveillance radar approaches

B To apply a horizontal separation less than 5 NM

C To provide instructions in order to reduce separations minima, if accepted by the pilots

✓ **Answer: A — Surveillance radar is extensively used in approach control to conduct surveillance radar approaches (SRA), sequence traffic, and vector aircraft to position for approaches.**

Q.19 The primary duty provided by a radar unit is:

A To assist aircraft on the location of storms

B To provide radar separation

C To assist aircraft where navigation appears unsatisfactory

✓ **Answer: B — The primary duty of a radar unit is to provide radar separation between identified aircraft — this is the core safety function of ATS surveillance service in ATC.**

Q.20

What is meant when departure control instructs you to "resume own navigation" after you have been vectored to an airway?

- A Advisories will no longer be issued by ATC
- B You are still in radar contact, but must make position reports
- C You should maintain that airway by use of your navigation equipment

✓ **Answer: C** — "Resume own navigation" after being vectored to an airway means you should now maintain the airway using your own navigation equipment (VOR, FMS, GPS etc). You are responsible for staying on track.

Q.21

All aircraft carrying serviceable transponder shall operate the transponder:

- A At all times during flight, regardless of whether the aircraft is within or outside airspace where SSR is used for ATS purposes
- B Only when the aircraft is flying within airspace where SSR is used for ATS purposes
- C As and when required by the pilot

✓ **Answer: A** — Per DGCA / AIP India: All aircraft carrying a serviceable transponder shall operate the transponder at **all times during flight** within Chennai, Delhi, Guwahati, Kolkata and Mumbai FIR — regardless of whether SSR is used for ATS in that specific area.

Quick Reference — All Critical Values

Parameter	Value	Condition / Notes
Standard Horizontal Separation (ICAO)	5.0 NM / 9.3 km	Radar / ADS-B / MLAT — default
Reduced Horizontal Separation	3.0 NM / 5.6 km	Where ATS authority permits; local capability
Final Approach Separation (same track)	2.5 NM / 4.6 km	Within 10 NM (18.5 km) of runway threshold; local factors permit
Departing Aircraft PSR ID — limit	1 NM	Must identify within 1 NM from end of runway
Turn Method — minimum heading change	30° or more	For PSR identification when SSR unavailable
RVSM altitude tolerance (Mode C / ADS-B)	±200 ft / ±60 m	RVSM airspace — hard limit
Non-RVSM altitude tolerance (Mode C / ADS-B)	±300 ft / ±90 m	Non-RVSM airspace; ATS may specify smaller
Speed limit — below 10,000 ft (all flights)	250 KT IAS	AIP India — arrivals and departures
Speed limit — arrivals within 15 NM of VOR/DME	220 KT IAS	AIP India — below 10,000 ft
Emergency transponder code	7700	Distress / General Emergency
Radio failure transponder code	7600	Communication failure (NORDO)

Parameter	Value	Condition / Notes
Unlawful interference transponder code	7500	Hijack / Unlawful seizure
Default code (no SSR assigned) — India	Mode A3 – 2000	Before entry into Chennai/Delhi/Guwahati/Kolkata/Mumbai FIR
Transponder on ground — when to operate?	Only on/off runway	Enter runway for T/O; till vacating after landing
Radar vectors — heading reference	Magnetic only	All radar vectoring uses magnetic headings

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Chapter 9: Use of Air Traffic Services Surveillance System | Reference: Doc 4444 (PANS-ATM) & AIP India

These notes are for educational purposes. Always verify against the latest DGCA/ICAO publications before examinations and actual operations.

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