

CHAPTER 3 • REFERENCE DEPTH

Licensing, Radio Apparatus & Minimum Equipment

A legal radio call needs two licences working together — one for the operator, one for the box — and the aircraft must carry a defined minimum of communication, navigation and surveillance equipment set by ICAO Annex 6. This chapter unpacks the regulatory machinery behind a single "Delhi Tower, good morning".

SYLLABUS MAP

Part I (vi) Licensing of radio apparatus • (vii) Minimum radio equipment per Annex 6 (ICAO & DGCA)

🎯 Learning objectives — by the end of this chapter you will be able to...

- Distinguish the operator's licence (RTR) from the aircraft radio station licence, and name the authority that issues each.

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- Describe how radio apparatus is licensed in India (WPC, NFAP, SACFA) and why type approval matters.
- State the minimum communication, navigation and surveillance equipment Annex 6 requires, and how it scales with the operation.
- Explain the independence (no single-point-failure) requirement and apply it.
- Describe ELT and transponder carriage and the role of the Minimum Equipment List (MEL).
- Explain how India's CARs give Annex 6 domestic effect.

3.1 Why two licences, not one

3.2 The operator's licence (RTR)

3.3 Licensing the apparatus — WPC, NFAP, SACFA

3.4 Annex 6 — the minimum-equipment standard

3.5 Communication equipment required

3.6 Navigation & surveillance required

3.7 The independence rule

3.8 ELT & emergency equipment

3.9 The MEL — flying with an item u/s

3.10 How India applies Annex 6

3.1 Why two licences, not one



FIRST PRINCIPLES — POLICING THE SPECTRUM AT TWO LEVELS

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The radio-frequency spectrum is policed at two independent levels because two different things can go wrong. The **person** can be untrained — so the operator is licensed (the RTR). The **equipment** can be the wrong type, off-frequency, or interfering — so the apparatus is licensed too (the aircraft radio station licence). Remove either control and the system fails: a trained pilot on an unapproved, interfering transmitter is as dangerous as an approved radio in untrained hands. To make a single legal transmission, **both** authorisations must exist at the same time.

THE TWO AUTHORISATIONS

Operator's licence — RTR(A): authorises a *person* to operate aeronautical radio equipment and use the airwaves.

Aircraft Radio Station Licence / installation approval: authorises the *radio apparatus installed in a particular aircraft* to transmit on assigned frequencies. Issued by the national radio authority and carried/registered with the aircraft.

EXAM TRAP

"What licences are needed to operate an aircraft radio?" — the complete answer is **both**: the operator's RTR *and* the aircraft radio station licence. Naming only one is the classic half-mark answer.

| 3.2 The operator's licence (RTR)

IN PLAIN TERMS

The RTR(A) is the certificate covered in Chapter 1 — the licence of the *person* at the microphone. It certifies that the operator knows the regulations, the radio theory, and the disciplined phraseology needed to use a shared, safety-critical frequency.

✔ WHERE THE RTR SITS IN THE CARRIAGE RULES

The aircraft may carry a fully approved, licensed radio installation, but it may only be **operated** by a person holding a valid radio operator's licence appropriate to the equipment — for civil aircraft radiotelephony, the **RTR(A)**. Operation by an unlicensed person is an offence even if the equipment itself is fully licensed.

AUTHOR CHECK BEFORE PUBLISHING

Confirm the exact wording linking operator licensing to operation of aircraft radio under the RTR (Restricted) Rules, 2025, and any categories of person permitted to operate under supervision/exemption.

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3.3 Licensing the apparatus — WPC, NFAP, SACFA

FIRST PRINCIPLES — WHY A RADIO CANNOT JUST TRANSMIT

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A transmitter radiates energy into shared spectrum. If it is the wrong type, drifts off frequency, or radiates spurious emissions, it interferes with everyone else on the band — potentially blocking a distress call. So the State requires that each radio station be **type-approved** and **licensed**, and that its frequencies be **assigned** from the national plan so two stations don't clash.



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Aircraft antennas are part of the licensed radio station apparatus and are governed by WPC and DGCA fitment regulations.

THE INDIAN APPARATUS-LICENSING MACHINERY

WPC (Wireless Planning & Coordination) Wing, Ministry of Communications — the national radio regulator: it licenses the use of radio spectrum and apparatus and assigns frequencies.

NFAP (National Frequency Allocation Plan) — India's table of which services may use which bands, derived from the ITU Radio Regulations.

SACFA (Standing Advisory Committee on Frequency Allocation) — clears siting of transmitters/masts.

The **DGCA** separately regulates the **airworthiness and operational fitment** of the equipment in the aircraft.

MNEMONIC — WHO DOES WHAT

WPC licenses the box; DGCA approves the fitment; you (RTR) operate it.

Spectrum & apparatus = Communications ministry; airworthiness & operation = Civil Aviation.

AUTHOR CHECK BEFORE PUBLISHING

Confirm the exact current name and validity period of the **aircraft radio station licence** in India and whether the 2025 framework changed the issuing route. Insert the validity figure if examinable.

3.4 Annex 6 — the minimum-equipment standard

IN PLAIN TERMS

An aircraft may not set off carrying whatever radios the owner happens to fancy. ICAO **Annex 6 (Operation of Aircraft)** prescribes the *minimum* communication, navigation and surveillance equipment that must be carried — and the requirement **scales with the kind of flying**: more is required for IFR and night than for simple day-VFR.

DEFINITION — ICAO ANNEX 6

Annex 6 — Operation of Aircraft. Part I covers international commercial air transport (aeroplanes); **Part II** international general aviation (aeroplanes); **Part III** helicopters. It prescribes, among much else, the minimum communication, navigation and surveillance equipment to be carried.

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Figure 3.1 — ICAO Annex 6 minimum equipment scaling from Day VFR to IFR complex.

3.5 Communication equipment required

✓ THE CORE RADIO REQUIREMENT (ANNEX 6)

An aircraft shall carry radio communication equipment capable of:

- conducting **two-way communication** with the appropriate aeronautical stations on the frequencies required by the authority;
- receiving **meteorological information at any time** during flight;

- conducting two-way communication **at any time** with at least one aeronautical station and such other stations/frequencies as prescribed for the route.



A dual VHF COM setup ensuring two-way communication and met broadcast reception at any time during flight.

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WHY THE WORDING IS "TWO-WAY" AND "AT ANY TIME"

Notice the standard is written around **capability and availability**, not mere possession of a box. A receive-only set, or one that cannot reach a met broadcast en route, would not satisfy it. This is precisely why airliners carry **multiple independent COM radios** and can tune VOLMET/ATIS — the rule demands the capability to talk both ways and to get weather throughout the flight.

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3.6 Navigation & surveillance required

✔ NAVIGATION & SURVEILLANCE (ANNEX 6)

The aircraft shall also carry **navigation equipment** sufficient to proceed in accordance with its **flight plan** and the requirements of air traffic services; and, where required for the airspace, a **transponder (SSR/Mode S)** and other surveillance equipment. For **IFR or night** operations the standard rises to redundant communication and navigation equipment appropriate to the route, and for precision approaches the relevant ILS/radio-altimeter fit.

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✈ COCKPIT REALITY — "RNP/PBN APPROVAL"

"Sufficient to proceed per flight plan" is why an aircraft must hold the right **navigation approval** (e.g. RNP/PBN, Chapter 12) for the route it files. File an RNP route without the equipment and approval, and you are below the Annex 6 minimum for that flight.

3.7 The independence rule

✓ NO SINGLE POINT OF FAILURE

Communication and navigation equipment shall be installed so that the **failure of any single unit** required for either communication or navigation purposes **will not result in the failure of another** unit required for the other purpose. In plain words: **one failure must not take out both your talking and your navigating.**

🔧 WORKED EXAMPLE — APPLYING THE RULE

Two VHF radios and two navigation receivers share a **single power bus** and a **single antenna coupler**.

Does this meet the independence rule? **No** — the shared bus (or coupler) is a single point whose failure disables comms *and* nav together.

Compliant design: separate power sources/buses and separate antenna feeds, so any one failure leaves the other function working. This is why airliners split avionics across independent buses and generators.

3.8 ELT & emergency equipment

EMERGENCY LOCATOR TRANSMITTER

Annex 6 requires the carriage of an **ELT** (the number/type depending on the operation). It activates automatically on impact (or manually) and transmits on the **406 MHz** satellite distress frequency (with a coded, registered identity) and **121.5 MHz** for homing, to summon search and rescue. (Full detail in Chapter 22.)

AUTHOR CHECK BEFORE PUBLISHING

Insert the exact Indian CAR figures: number/type of **ELTs** required by operation, mandatory **transponder (Mode S / ADS-B)** carriage threshold, and the precise minimum-equipment wording from the current DGCA CAR mirroring Annex 6.

3.9 The MEL — flying with an item unserviceable

IN PLAIN TERMS

If a required item is unserviceable, the aircraft is not automatically grounded. The **Minimum Equipment List** tells the crew whether, and under what conditions, the flight may still be made.

MEL & MMEL

The **MMEL (Master MEL)** is produced by the manufacturer/State of design and lists items that may be inoperative for a type. The operator's **MEL** is at least as restrictive and approved for that operator. It specifies any limitations and "O" (operational) or "M" (maintenance) procedures required to dispatch with the item inoperative. The Annex 6 minimum-equipment principle is exactly what the MEL enforces: **never depart below the legal minimum for the intended flight.**

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| 3.10 How India applies Annex 6

IN PLAIN TERMS

Annex 6 is the global standard; the DGCA writes the Indian version into its Civil Aviation Requirements, so the minimum-equipment rule you are tested on is the Indian CAR that mirrors Annex 6 — confirmed at every pre-flight by checking the required radios are fitted, serviceable, and (if not) permitted by the MEL.

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▼ Deep dive — type approval & spurious emissions

"Type approval" means a radio model has been tested to confirm it transmits only within its assigned channel, with controlled power and acceptably low **spurious emissions** (unwanted outputs on other frequencies). A non-type-approved or faulty transmitter can splatter energy across adjacent channels — the same effect as over-modulation in Chapter 10 — which is why both the equipment *and* its installation are licensed, not just bought and bolted in.

☆ Numbers to memorise

Essential Facts for Chapter 3

Fact	Value
Licences needed	Operator's RTR(A) + Aircraft Radio Station Licence (apparatus)
Apparatus regulator (India)	WPC Wing, Ministry of Communications (NFAP, SACFA)
Fitment/airworthiness regulator	DGCA
Minimum-equipment standard	ICAO Annex 6 — Operation of Aircraft (Parts I/II/III)
Core radio capability	Two-way comms on required frequencies + receive met at any time
Navigation requirement	Sufficient to proceed per flight plan + ATS requirements (+ transponder)
Independence rule	Single failure must not disable both comms and navigation
Emergency beacon	ELT — 406 MHz (satellite) + 121.5 MHz (homing)

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Fact	Value
Dispatch with item u/s	Governed by the MEL (derived from the MMEL)

Question bank

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Part A — MCQs (click an option to check)

1. To legally operate an aircraft radio you require:

Only the RTR(A)

Only the aircraft radio station licence

Both the RTR(A) and the aircraft radio station licence

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Neither, below 5,700 kg

Answer: Both the RTR(A) and the aircraft radio station licence.

Both — the operator (RTR) and the installed apparatus (station licence) must be licensed.

2. The minimum radio equipment to be carried on an aircraft is prescribed in:

ICAO Annex 10

ICAO Annex 6

ICAO Annex 2

ICAO Annex 11

Answer: ICAO Annex 6.

Annex 6 — Operation of Aircraft. Annex 10 is the telecom standards themselves.

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3. In India, radio spectrum and apparatus are licensed by:

DGCA

AAI

WPC (Ministry of Communications)

ICAO

Answer: WPC (Ministry of Communications).

The WPC Wing; DGCA handles airworthiness/operational fitment.

4. India's table of which services may use which bands is the:

MEL

NFAP (National Frequency Allocation Plan)

CAR Section 7

AIP

Answer: NFAP (National Frequency Allocation Plan).

The NFAP, derived from the ITU Radio Regulations, allocates Indian spectrum.

5. SACFA is concerned primarily with:

Pilot licensing

Clearing the siting of transmitters/masts

Weather forecasting

Accident investigation

Answer: Clearing the siting of transmitters/masts.

The Standing Advisory Committee on Frequency Allocation clears transmitter siting.

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6. Annex 6 Part I applies to:

Helicopters

International general aviation aeroplanes

International commercial air transport (aeroplanes)

Gliders only

Answer: International commercial air transport (aeroplanes).

Part I = commercial air transport aeroplanes; Part II = international GA; Part III = helicopters.

7. The core Annex 6 radio capability includes the ability to:

Transmit only

Conduct two-way communication and receive meteorological information at any time

Receive broadcast entertainment

Operate without an assigned frequency

Answer: Conduct two-way communication and receive meteorological information at any time.

Two-way comms on required frequencies plus the ability to receive met information at any time.

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8. The "independence" requirement means:

Each radio must be a different brand

A single failure must not disable both communication and navigation

The pilot must operate independently of ATC

All equipment must be battery-powered

Answer: A single failure must not disable both communication and navigation.

Installation must ensure one unit's failure won't take out another required for the other function.

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9. Two COM and two NAV sets sharing a single power bus:

Always meet the independence rule

May fail the independence rule because the shared bus is a single point of failure

Need no antenna

Are exempt from Annex 6

Answer: May fail the independence rule because the shared bus is a single point of failure.

A shared bus whose failure kills both comms and nav violates the no-single-point-of-failure principle.

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10. Navigation equipment under Annex 6 must be sufficient to:

Reach any airport in the world

Proceed in accordance with the flight plan and ATS requirements

Replace the transponder

Operate without approval

Answer: Proceed in accordance with the flight plan and ATS requirements.

It must let the aircraft fly its filed plan and meet ATS requirements (e.g. PBN where required).

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11. An ELT transmits on:

118.0 MHz only

406 MHz (satellite) and 121.5 MHz (homing)

1030 MHz

75 MHz

Answer: 406 MHz (satellite) and 121.5 MHz (homing).

406 MHz for satellite detection with coded ID, plus 121.5 MHz for homing.

12. If a required item is unserviceable before departure, the document that governs whether the flight may proceed is the:

AIP

NOTAM

Minimum Equipment List (MEL)

NFAP

Answer: Minimum Equipment List (MEL).

The MEL (from the MMEL) states whether and how the aircraft may dispatch with the item inoperative.

13. The MMEL is produced by:

The operator

The manufacturer / State of design

The crew

The ITU

Answer: The manufacturer / State of design.

The Master MEL comes from the manufacturer/State of design; the operator's MEL is at least as restrictive.

14. Type approval of a radio mainly ensures it:

Is the cheapest available

Transmits within its assigned channel with low spurious emissions

Needs no licence

Works only on HF

Answer: Transmits within its assigned channel with low spurious emissions.

Type approval confirms controlled frequency/power and acceptably low spurious emissions to avoid interference.

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15. Which body regulates the airworthiness and fitment of the radio in the aircraft?

WPC

DGCA

ITU

IATA

Answer: DGCA.

DGCA regulates airworthiness/fitment; WPC licenses the spectrum/apparatus.

16. Compared with day-VFR, IFR/night operations under Annex 6 generally require:

Less equipment

More — including redundant comms/nav appropriate to the route

No transponder

No navigation equipment

Answer: More — including redundant comms/nav appropriate to the route.

The minimum scales up with the operation; IFR/night needs redundancy.

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17. The requirement to "receive meteorological information at any time" means a receive-only set that cannot reach a met broadcast en route:

Is sufficient

Does not satisfy Annex 6

Is required by Annex 10

Is exempt for IFR

Answer: Does not satisfy Annex 6.

The standard is about capability/availability — it must be able to obtain weather throughout the flight.

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18. The complete answer to "what is needed to make a legal aircraft radio transmission" is:

A serviceable radio

A licensed operator

A licensed operator (RTR) AND a licensed/approved aircraft radio station

ATC permission only

Answer: A licensed operator (RTR) AND a licensed/approved aircraft radio station.

Both the person and the apparatus must be licensed simultaneously.

Part B — Oral / viva (tap to reveal model answers)

▼ ? **What licences are required to operate the radio on an aircraft, and who issues each?**

Model Answer:

Two: the operator's Radio Telephone Operator (Restricted) licence, RTR(A); and a licence for the aircraft's radio station/apparatus issued by the national radio authority (in India, the WPC Wing). The DGCA separately approves the airworthiness and fitment.

▼ ? **Where is the minimum radio equipment to be carried prescribed, and how is it structured?**

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Model Answer:

In ICAO Annex 6 (Operation of Aircraft) — Part I commercial aeroplanes, Part II general-aviation aeroplanes, Part III helicopters — reflected in India by the DGCA's CARs. The required equipment scales with the operation (more for IFR/night).

▼ ? State the basic communication requirement under Annex 6.**Model Answer:**

Equipment capable of two-way communication with the appropriate aeronautical stations on the required frequencies, and of receiving meteorological information at any time during flight.

▼ ? Explain the independence requirement and give an example.**Model Answer:**

Equipment must be installed so the failure of any single unit needed for communication or navigation will not cause the failure of another unit required for the other function. For example, comms and nav must not depend on a single shared power bus whose failure would disable both.

▼ ? What is an ELT and on what frequencies does it transmit?**Model Answer:**

An Emergency Locator Transmitter, carried under Annex 6, which activates on impact and transmits on 406 MHz (satellite, with a coded registered identity) and 121.5 MHz (for homing) to aid search and rescue.

▼ ? What is the MEL and why does it exist?

Model Answer:

The Minimum Equipment List — derived from the manufacturer's Master MEL and approved for the operator — states whether, and under what conditions, an aircraft may be dispatched with a particular item unserviceable. It enforces the Annex 6 principle of never departing below the legal minimum for the intended flight.

⚡ 60-SECOND REVISION CARD

Two licences: **RTR(A)** (operator) + **aircraft radio station licence** (apparatus, via WPC).

India: **WPC** = spectrum/apparatus (NFAP, SACFA); **DGCA** = airworthiness/fitment.

Minimum-equipment standard = **ICAO Annex 6**; scales up for IFR/night.

Core radio: **two-way comms** on required frequencies + **receive met any time**; nav per flight plan + transponder.

Independence: one failure must not kill both comms and nav. **ELT** 406 + 121.5; dispatch u/s governed by the **MEL**.