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1. Overview — Met T-3 vs Met T-4

Met T-3 (Tabular Form): Used for flights up to **500 nm**. Presents weather data in tabular columns for waypoints along the route.

Met T-4 (Cross Section Form): Used for flights beyond **500 nm**. Presents data as a vertical cross-section of the atmosphere along the route, showing weather at different flight levels.

Feature	Met T-3 (Tabular)	Met T-4 (Cross Section)
Distance covered	≤ 500 nm	> 500 nm
Format	Table — columns per waypoint	Vertical cross-section diagram + table
Heights in	Feet amsl	Flight Levels
Cloud depiction	Text (amount, type, height)	Pictorial (cloud symbols)
Surface visibility	✓ Included	✓ Included (in Remarks)
Freezing level	✓ Height of 0° isotherm (feet)	✓ Included
QNH	✓ Forecast QNH (hPa)	✓ MSL pressure

flowchart LR

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dist{"Flight Distance"} -- "≤ 500 nm" --> T3["MET T-3\nTabular Form\n(Heights in FEET)"]
dist -- "> 500 nm" --> T4["MET T-4\nCross Section Form\n(Heights in FLIGHT LEVELS)"]
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2. Met T-3: Flight Forecast Tabular Form — Annotated Sample

Below is an annotated breakdown of the sample Met T-3 (Table 29.1), dated **04 April 2023**:

FLIGHT FORECAST (TABULAR FORM) — MET T-3 | Table 29.1

Route: VECC → VIDP via VILK (Kolkata → Delhi via Lucknow)

Valid for Departure: 0300 UTC to 0500 UTC

Valid for Arrival: 0600 UTC to 0800 UTC

Special Features: A WD LIES OVER W RAJASTHAN WITH UPPER AIR CYCIR UP TO 20,000 FT

Upper Winds and Temperatures — Sample Data

Height (ft amsl)	Temp (°C)	KOLKATA Wind	LUCKNOW Wind	DELHI Temp (°C)
30,000 ft	M33	300/50	270/70	M30
20,000 ft	M20	340/55	260/55	M18
10,000 ft	M12	050/15	120/25	14
5,000 ft	M22	220/05	160/15	24

Wind format: Direction(°)/Speed(kt) | M = Minus (negative temperature) | LOC = Locally

Cloud Forecast

Cloud Element	Details
Top/Base	SCT ST 1000 ft
	FEW SC 2500 ft
	SCT AC 12000 ft; ISOL EMBD CB 2000/35000 ft
	BKN CS 35000 ft
	3000 M IN RAIN AND [thunderstorm areas]

Other Parameters

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Parameter	Value
Surface Visibility (general)	6 km
Surface Visibility (in TS)	1500 m in Thunderstorm
Significant Weather	ISOL THUNDERSTORM; ICING, TURB IN CB 25000/15000 ft
Height of 0° Isotherm	15000 ft (Kolkata) 14000 ft (Lucknow)
Forecast QNH	1006 hPa (Kolkata) 1008 hPa (Lucknow)

⚠ **Icing and Turbulence in CB:** Noted between 15,000 ft (base) and 25,000 ft (top). Aircraft must avoid CB areas.

3. How to Read a Met T-3

Wind Entry Format: DDD/SSS = Direction in degrees / Speed in knots

Example: 300/50 = Wind from 300° at 50 kt

M33 = Minus 33°C (temperature)

ISOL EMBD CB 2000/35000 = Isolated Embedded CB, base 2000 ft, top 35000 ft

flowchart TD

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RT["Read Met T-3"] --> SP["1. Check Special Features\n(Synoptic situation, WD, etc.)"]
SP --> UW["2. Read Upper Winds at each waypoint\n(Direction/Speed at each altitude level)"]
UW --> CL["3. Note Cloud Types, Base & Top\n(SKC/FEW/SCT/BKN/OVC + CB/EMBD)"]
CL --> VIS["4. Surface Visibility\nGeneral + In Significant Wx"]
VIS --> SX["5. Significant Weather\n(ISOL/OCNL TS, Icing, CAT etc.)"]
SX --> FZ["6. Height of 0° Isotherm\n(Freezing level – icing risk above this)"]
FZ --> QN["7. QNH – for altimeter setting\nat destination/en-route"]

```

✓ Decision-Making from Met T-3:

- Check Special Features first — they summarise the biggest hazard
- ISOL CB with EMBD = avoid — radar/pilot deviation required
- 0° isotherm height = icing risk ceiling for unpressurised/piston aircraft
- QNH tells you if pressure setting will differ from standard — plan altimeter corrections

4. Met T-4: Cross Section Route Forecast — Annotated Sample

The cross-section shows the atmosphere from **VIDP (Delhi)** → **VECC (Kolkata)** as a vertical slice, with cloud types depicted pictorially at their respective flight levels. (Table 29.2)

Cross Section Diagram — Cloud Symbols Identified

Symbol	Cloud Type	Typical Level
CI	Cirrus	High (FL300+)
CS	Cirrostratus	High (FL250+)
AC	Alto cumulus	Medium (FL100–FL250)
AS	Altostratus	Medium (FL100–FL250)
SC	Strato cumulus	Low (below FL100)
ST	Stratus	Low (surface to FL050)
CU	Cumulus	Low-Medium
CB	Cumulonimbus	All levels (vertical)

The diagram shows the route from VIDP to VECC with CB embedded near the eastern end, cirrus cloud at high levels throughout, and SC/ST near the surface.

Met T-4 Data Table — Sample

Remarks: VIS **8–10 km**, **2000 m** in Scattered TS

Lowest MSL Pressure: **1002 hPa**

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FL	Temp (VIDP side)	Wind (VIDP)	Wind Trend	Wind (VECC)	Temp (VECC side)
FL400	M38°C	270/80KT	WEAKENING	300/60KT	M39°C
FL300	M32°C	270/45KT	VEERING	300/35KT	M35°C
FL200	M15°C	260/30KT	VEERING	300/25KT	M16°C
FL150	05°C	210/20KT	VEERING	300/15KT	08°C
FL100	18°C	140/10KT	BCKING	300/20KT	20°C

📌 Wind Trend Terms:

VEERING = Wind direction changing clockwise (e.g. 260° → 300°) — indicates warm air advection

BCKING (Backing) = Wind direction changing anti-clockwise — indicates cold air advection

WEAKENING = Wind speed decreasing along route

5. How to Read a Met T-4

Cross Section Format: Vertical slice of the atmosphere along the route. X-axis = route (departure to destination). Y-axis = Flight Levels (30 to 400+). Cloud symbols drawn at their actual position and level.

flowchart TD

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T4["Read Met T-4"] --> DIAG["1. Study the cross-section diagram\nIdentify cloud positions by FL and route position"]
DIAG --> REM["2. Read Remarks\n(Visibility + TS visibility)"]
REM --> MSL["3. Note Lowest MSL Pressure\n(for altimeter planning)"]
MSL --> WT["4. Read wind/temp table by FL\nNote VEERING / BCKING / WEAKENING"]
WT --> TMP["5. Track temperature at each FL\n(M = negative; find 0°C isotherm)"]
TMP --> CB["6. Identify CB locations on diagram\n(avoid ±20nm laterally from CB)"]

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✓ Key Operational Tips from T-4:

- VEERING winds at FL100–FL200 indicates warm front/WD approach — expect cloud build-up
- BCKING at FL100 (near surface) indicates cold air — low cloud and reduced visibility possible
- CB shown near VECC end — route planning: plan diversion or delay if embedded CB
- MSL pressure **1002 hPa** is below standard (1013.25) — altimeters will read lower than actual altitude if QNH not set

6. Cloud Amount Abbreviations

Standard ICAO cloud amount code (Oktas = eighths of sky covered)

Code	Oktas	Meaning
SKC	0 oktas	Sky Clear
FEW	1–2 oktas	Few clouds
SCT	3–4 oktas	Scattered
BKN	5–7 oktas	Broken
OVC	8 oktas	Overcast

📌 Mnemonic — Sky From Clear to Covered:

Some Flying Scheduled Below Overcast

SKC (0) → FEW (1-2) → SCT (3-4) → BKN (5-7) → OVC (8)

Exam tip: BKN means sky is more than half covered (>50%), OVC = fully covered.

7. Frequency Abbreviations (ISOL / OCNL / FRQ)

Code	Area Coverage	Meaning
ISOL	< 50% of area	Isolated — occasional, well-separated
OCNL	50–75% of area	Occasional — more frequent but not dominant
FRQ	> 75% of area	Frequent — widespread, dominant hazard

📌 Memory Aid:

ISOL = Infrequent (<50%) | OCNL = Often (50–75%) | FRQ = Frequent (>75%)

Also: **EMBD** = Embedded (CB hidden within other cloud layers — most dangerous as not visible on approach)

⚠ **EMBD CB — Most Dangerous Scenario:** An Embedded CB (ISOL EMBD CB) is concealed within stratiform cloud layers. It cannot be visually avoided and may not always be clearly detected on weather radar. FRQ EMBD CB = route deviation mandatory.

8. Appendix A — Key Synoptic System Definitions

Appendix A provides concise definitions of synoptic systems relevant to aviation in India. These are high-yield for DGCA written exams.

Term	Definition
Depressions and Cyclones	Intense LP systems with 2 or more closed isobars at 2 hPa interval and strong winds.
Trough in Westerlies	A wave in mid latitudes, moving from W to E over the globe. Affects northern parts of India.
Trough in Easterlies	A wave in the equatorial easterlies moving from East to West.
Western Disturbance (WD)	Low pressure area on surface or cyclonic circulation/trough in mid and lower tropospheric levels, originating over Mediterranean Sea, Caspian Sea, and Black Sea, moving across N India. Systems on the surface with 2 or more closed isobars are called Western Depressions .
Induced Low	Under the influence of WD, a low develops to the South of the system. Called an Induced Low . Cyclonic circulation in the upper air developed to the south = Induced Cyclonic Circulation .
Easterly Wave	A shallow trough in the equatorial region of tropics, more evident in upper level winds than surface pressure pattern. Moves from E to W. Causes clouds and showers. Affects S peninsular India.
High/High	Area in the atmosphere where pressures are higher than surroundings at the same level. Represented on synoptic chart by at least one closed isobar.
Shear Line	A line or narrow zone across which there is an abrupt change in the horizontal wind component. It is a line of maximum horizontal wind shear.
Wind Discontinuity	A line across which there is an abrupt change in wind direction.

📌 WD Key Facts for Exam:

- Origin: **Mediterranean Sea, Caspian Sea, Black Sea**
- Movement: **W to E** across N India
- With 2+ closed isobars = called **Western Depression**
- Induced Low develops to the **South** of WD
- Easterly Wave moves **E to W** (opposite to Westerlies trough)

9. Quick Revision Summary

CHAPTER 29 — KEY POINTS AT A GLANCE

Item	Value / Fact
Met T-3 used for flights	≤ 500 nm
Met T-4 used for flights	> 500 nm
T-3 heights in	Feet amsl
T-4 heights in	Flight Levels
T-4 cloud depiction	Pictorial (cross-section diagram)
SKC	0 oktas (Sky Clear)
FEW	1–2 oktas
SCT	3–4 oktas
BKN	5–7 oktas
ISOL	<50% area
OCNL	50–75% area
FRQ	>75% area
EMBD CB	Embedded CB — invisible, most dangerous
VEERING winds	Clockwise change → warm air advection
BCKING winds	Anti-clockwise change → cold air advection
WD origin	Mediterranean / Caspian / Black Sea
WD movement	W → E across N India
Easterly Wave movement	E → W (affects S peninsular India)
Induced Low location	To the South of the WD

Master Reference Tables

Complete Cloud Amount Code Reference

Code	Oktas	Fraction of Sky
SKC	0	0/8 — No cloud
FEW	1–2	1/8 – 2/8 — Mostly clear
SCT	3–4	3/8 – 4/8 — Half covered
BKN	5–7	5/8 – 7/8 — More than half
OVC	8	8/8 — Fully overcast

Frequency Terms

Code	Area %	Practical Meaning
ISOL	<50%	Isolated — route largely clear, avoid specific cells
OCNL	50–75%	Occasional — expect significant deviations
FRQ	>75%	Frequent — route likely impassable without deviation

Wind Direction Change Terms

Term	Meaning	Meteorological Significance
VEERING	Clockwise change	Warm air advection, approaching warm front
BCKING	Anti-clockwise change	Cold air advection, cold front passage
WEAKENING	Speed decreasing	Jet stream or gradient wind reducing

Met T-4 Sample Data — Freeze Frame (Table 29.2)

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FL	Temp Delhi	Wind Delhi	Trend	Wind Kolkata	Temp Kolkata
FL400	M38°C	270/80KT	WEAKENING	300/60KT	M39°C
FL300	M32°C	270/45KT	VEERING	300/35KT	M35°C
FL200	M15°C	260/30KT	VEERING	300/25KT	M16°C
FL150	05°C	210/20KT	VEERING	300/15KT	08°C
FL100	18°C	140/10KT	BCKING	300/20KT	20°C

Appendix A — Synoptic Systems Quick Reference

System	Key Feature
Western Disturbance (WD)	From Mediterranean/Caspian/Black Sea, moves W→E, affects N India
Western Depression	WD with 2+ closed isobars at surface
Induced Low	Forms south of WD; upper air = Induced Cyclonic Circulation
Trough in Westerlies	W→E wave, mid-latitudes, affects N India
Trough in Easterlies	E→W wave in equatorial easterlies
Easterly Wave	Shallow trough, tropics, E→W, affects S peninsular India
Shear Line	Abrupt horizontal wind component change, max wind shear line
Wind Discontinuity	Abrupt change in wind direction
High	Pressure higher than surroundings; ≥1 closed isobar on chart



COURSE COMPLETE — Aviation Meteorology

All 29 Chapters of Aviation Meteorology have been covered.
You have completed a comprehensive review of DGCA CPL/ATPL Meteorology theory.

Best of luck in your DGCA examination, the Captain!