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1. Radar Report (RAREP) — Introduction & Code

RAREP = Radar Report. Reports the location, intensity, movement, and height of radar echoes (precipitation areas, thunderstorms) from a ground-based weather radar station.

RAREP is normally reported only at **synoptic hours**. In case of any break in observations or rapid development, additional messages are transmitted as necessary.

RAREP Code Form

```
RAREP  FEBB          llllll      YYGGg
CHARACTER (b.b.b.b.b.f.t.t) b.b.b.h.h./f.t.t.
Intensity Tendency:  d.d.f.f.    ALTD   (bbb/H.H/rrr)
```

Code Elements Explained

Code	Meaning
RAREP	Radar Report identifier
FEBB	Station Index number
YYGGg	Date and time of RAREP
lllll	Station Index number
bbb	Azimuth in three digit degrees of points on the periphery of an echo area
rrr	Range: three digit in kilometres
ALTD	Indicator of Echo Height Information
H.H.	Height of Top of Echo amsl in km (may be repeated as required)
d.d.	Direction in tens of degrees in which echo is moving
f.f.	Speed in km per hour of the echoes

2. RAREP — Character of Echoes & Intensity Terms

Character of Echoes

Code	Character	Description
EYE	Eye	An echo of eye wall of a tropical cyclone
SPRL BAND	Spiral Band	A continuous or broken curved line of echoes of spiral band associated with a cyclone
SQL LN	Squall Line	Having length 60 km or more and length to width ratio about 10 to 1
BRKN LN	Broken Line	Broken line of echoes
SLD	Solid	An area fully covered with echoes
BRKN	Broken	An area 4/8 to 7/8 covered with echoes
SCT	Scattered	An area 1/8 to 4/8 covered with echoes
WDLY SCT	Widely Scattered	An area less than 1/8 covered with echoes
ISLTD	Isolated	Isolated solid mass of echo
ECHO ALOFT	Echo Aloft	Echoes seen only at elevations higher than the beamwidth

Intensity Tendency

Code	Meaning
INCG	Increasing
DEC	Decreasing
NO CHG	No Change

Bright Band & Anomalous Propagation (AP) are reported in **plain language**.

Bright Band = A radar echo caused by enhanced reflectivity of partially melted snowflakes — occurs at the melting level.

AP (Anomalous Propagation) = False echoes caused by abnormal bending of radar beam near the ground (temperature inversions etc.)

3. RAREP — Important Notes

1. Groups within brackets () are repeated as many times as necessary.
2. To define the shape of **line echoes**, spiral bands and eye wall: as many bbb/rrr points as necessary are used. Points given along the line in **anticlockwise direction**.
3. To define the shape of **areas**: as many bbb/rrr points as necessary. Points given in **anticlockwise order** starting from the northernmost point. The first point is repeated as the last point to indicate it is a closed area.
4. If an echo system with a distinct characteristic is partly or wholly embedded in another, the two systems are reported in **separate groups**.
5. Reports of heights are restricted to a maximum range of **200 km** from the station.

4. RAREP Decoded Examples

Example 1

```
RAREP 42375 15030 270/050 300/060 350/025 280/ 010 SLD INCG 1525 ALTD  
270/09 050 340/10/060 280/12/ 010 =
```

Radar Report for 42375 (International Identification No.) (say) Palam Date 15th at 0300
UTC Area of Solid echo from and 270 deg 50, 300 deg 60 km, 350 deg 25 km, 280 deg 10 UTC
Area of Solid echo Moving in 150 direction with speed of 25 KMH
Altitude of echoes in 270 direction 9 km at 50 km
In 340 direction 10 km at 60 km; in 280 direction 12 km at 10 km = Intensity: **INCREASING**

Example 2

```
RAREP 43003 10143 270 / 030 / 330 / 040 050 / 020 MDT INCG RPD NW / 012 ALTD  
260/ 15 / 030 BRIGHT BAND 280 / 30 AP 300/ 330 /150 Angles between the Azimuth  
270° to 340° Range 15 to 20 nm (AP - Anomalous Propagation)
```

Station 43003, Date 10th at 14:30 UTC

Echo area defined by azimuths 270°/030 km, 330°/040 km, 050°/020 km (anticlockwise from northernmost)

MDT INCG RPD NW/012 → Moderate intensity, Increasing Rapidly, Moving NW at 012 km/h

ALTD 260/15/030 → Echo height: At azimuth 260°, top at 15 km, at 030 km range

BRIGHT BAND 280/30 → Bright Band at 280° azimuth, 30 km range

AP 300/330/150 → Anomalous Propagation between azimuth 270° to 340°, Range 15–20 nm

5. SIGMET Message

SIGMET = Significant Meteorological Information

Prepared in **abbreviated plain language** using ICAO approved abbreviations. Contains information about significant en-route weather hazards.

SIGMET types: WS identifies phenomena other than tropical cyclones and volcanic ash; WC identifies tropical-cyclone SIGMETs; WV identifies volcanic-ash SIGMETs. These are bulletin data-type designators.

6. SIGMET Content & Structure

flowchart TD

```
A[SIGMET Message Contains] --> B[Identification of MWO\neg. VECC]
A --> C[Message ID and Sequence No.\neg. SIGMET 2 = 2nd SIGMET]
A --> D[Date-Time Group\nValidity Period in UTC\neg. VALID 221215/221600]
A --> E[Description of Phenomenon\neg. SEV FRQ]
A --> F[Phenomenon for which issued\neg. TURB, TS]
A --> G[Observed or Forecast + expected\ncontinue time\neg. OBS AT 1150 UTC, FCST AT 1000 UTC]
A --> H[Location\nLat/Lon or geographic feature\neg. FCST TOPS FL390 S OF 54 DEG N\nor OVER KOLKATA AT FL250]
A --> I[Movement\neg. MOVE E 25 KT]
A --> J[Change in intensity\neg. INTSF, WKN or NC]
A --> K[Volcanic ash outlook\nbeyond validity period\neg. VABB SIGMET 3 VALID 221600/222000]
```

SIGMET Element	Abbreviation	Meaning
Sequence	SIGMET 2	2nd SIGMET = 2nd SIGMET in series
Validity	VALID 221215/221600	Valid from 22nd 1215 UTC to 22nd 1600 UTC
Severity	SEV	Severe
Frequency	FRQ	Frequent
Observed/Forecast	OBS / FCST	Observed at time / Forecast at time
FL	FL250, FL390	Flight Level (×100 ft)
Tops	TOPS FL390	Cloud/echo tops at FL390
Intensity change	INTSF / WKN / NC	Intensifying / Weakening / No Change
Movement	MOVE E 25 KT	Moving East at 25 knots
Outlook in the historical example	OTLK	Outlook; not a cloud-top code

7. SIGMET Examples

TS SIGMET Examples

VECC SIGMET 4 VALID 161200/101600 TC OBS 20.2N 89.2E AT 1130 UTC FRQ
 TS TOPS FL350 W 150NM OF CENTRE MOV NW 10 KT OTLK TC CENTRE
 110300 21N 87.9E 111200 21.5N 86.4E.

VABB SIGMET 3 VALID 151600/152200 SEV TS TOPS FL400 W 150NM OF CENTRE
 MOV NW 10 KT NC.

VECC SIGMET 3 VALID 151600/152000 TC FCST 20.2N 89.2E AT 1200 UTC FRQ
 TS TOPS FL500 W 150NM OF CENTRE MOV NW 10 KT NC OTLK TC CENTRE
 160300 21N 87.9E 161200 21.5N 86.4E.

1603001 21N 87.9E 16200 21.5N 86.4E.

Decoded (first SIGMET):

VECC SIGMET 4 → Met Watch Office Kolkata, SIGMET number 4

VALID 161200/101600 → Valid from 16th 1200 UTC to 16th 1600 UTC

TC OBS 20.2N 89.2E AT 1130 UTC → Tropical Cyclone Observed at 20.2N 89.2E at 1130 UTC

FRQ TS → Frequent Thunderstorm

TOPS FL350 → Cloud tops at FL350 (35,000 ft)

W 150NM OF CENTRE → Within 150 NM west of cyclone centre

MOV NW 10 KT → Moving NW at 10 KT

OTLK TC CENTRE 110300 21N 87.9E → Outlook: TC centre forecast at 0300 UTC on 11th at 21N 87.9E

111200 21.5N 86.4E → At 1200 UTC on 11th at 21.5N 86.4E

SIGMET Sub-types — Key Phenomena:

Phenomenon	Code in SIGMET
Thunderstorm	TS
Severe Turbulence	SEV TURB
Severe Icing	SEV ICE
Tropical Cyclone	TC
Volcanic Ash	VA
Severe Mountain Wave	SEV MTW
Widespread Sand/Dust Storm	DS, SS
Marked Mountain Wave	MTW

8. Satellite Bulletin

Satellite imageries are analysed and supplied as **Bulletins in abbreviated form.**

Format: **SAT BLTN BASED ON METSAT PIC OF YYGGgg UTC**

Satellite Bulletin Abbreviations

Abbreviation	Meaning
CONVTE	Convective
CLDS	Clouds
EMBDD	Embedded
MOD	Moderate
INT CONVTN	Intense Convection
SKM	Srikakulam
EC BAY	East Coast Bay (of Bengal)
AFSN PAK	Afghanistan Pakistan
RPT	Repeat
IDS	Islands
COT	Coast
ADJ	Adjoining
EXT	Extending
S AREA	Sea Area
BET LAT	Between Latitude
LONG	Longitude
W COT	West Coast
SB	Scattered to Broken (cloud coverage)

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9. Satellite Bulletin Decoded Example

Original Satellite Bulletin (coded)

SAT BLTN BASED ON METSAT PIC OF 271200 UTC.

THE CONVTE CLOUDS CURVED BANDS OF VORTEX OVER EC BAY HAS REDUCED NOW CENTERED OVER 16.5N/91.0E RPT 16.5N/91.0E(.) INTENSITY T REDUCED MOV 1.5 RPT T 1.5 (.) ASSTD BKN LOW MED CLOUDS EMBDD SCT MOD TO INT CONVTN (AT10.5N TO 14.0N LONG 85.5E TO 91.5E AND LAT 14.0N TO 18.5N EAST OF LONG 87.5E ARAKAN COT AND S MYANMAR(.) SCT M/LAYERED CLOUDS OVER NW JK AND AREA BET LAT 37.0N TO 16.0N LONG 60.0E TO 100.0E(.) SCT LOW /MED CLOUDS OVER SKM NE STATES BAY IDS KER(.) SCT MED/HIGHCLOUDS OVER AFSN PAK REST JK HP UTRCL PJB AND NW GUI(.) SCT TO BKN LOW/MED CLOUDS EMBDD, MOD TO INT CONVTN OVER S AREA BET LAT 5.0N TO 14.8N LONG 60.0E TO 68.0E SE ARSEA ADJ INDIAN OCEAN BET LAT 2.0N TO 8.0N LONG 69.0E TO 76.0E S SRILANKA GULF OF MARTABAN SUMATTRA ADJ W COT BORNEO JAVA IDS AND SEA EXT. N MADAGASCAR(.)=

Interpretation (Plain Language)

Satellite Bulletin based on METSAT picture of 27th day at 1200 UTC:

The convective clouds — curved bands of vortex over **East Central Bay** (of Bengal) — has reduced. It is now centred over **16.5N/91.0E**. Repeat 16.5N/91.0E. Intensity **1.5**. Associated broken low and medium clouds embedded, scattered to moderate to intense convection at 10.5N to 14.0N long 85.5E to 91.5E and lat 14.0N to 18.5N east of long 87.5E — Arakan coast and S Myanmar.

Scattered medium layered clouds over **NW J&K** and area bet lat 37.0N to 16.0N long 60.0E to 100.0E. Scattered low/medium clouds over **Sikkim, NE states, Bay Islands, Kerala**. Scattered med/high clouds over **Afghanistan, Pakistan, rest J&K, HP, Uttaranchal, Punjab and NW Gujarat**.

Scattered to broken low/medium clouds embedded, moderate to intense convection over sea areas between lat 5.0N to 14.8N long 60.0E to 68.0E, **Arabian Sea**, adjoining Indian Ocean between lat 2.0N to 8.0N long 69.0E to 76.0E, **S Sri Lanka, Gulf of Martban, Sumatra**, adjoining west coast of **Borneo, Java, islands** and sea extending N of **Madagascar**.

10. Master Reference & Quick Revision

RAREP Key Reference

Parameter	Key Value
SQL LN length	≥ 60 km , length:width ratio ≈ 10:1
SLD echo coverage	Fully covered
BRKN echo coverage	4/8 to 7/8
SCT echo coverage	1/8 to 4/8
WDLY SCT coverage	Less than 1/8
Max RAREP height range	200 km from station
Area shape direction	Anticlockwise from northernmost point
Line shape direction	Anticlockwise direction
Intensity INCG / DEC / NO CHG	Increasing / Decreasing / No Change
Bright Band / AP	Reported in plain language

SIGMET Key Reference

Parameter	Key Value
SIGMET for subsonic aircraft	SIGMET (plain) or SIGMET SST
SIGMET for supersonic aircraft	Identified as SIGMET SST
SIGMET dissemination to neighbours	Within 1100 NM of FIR boundaries
SIGMET transmission priority	D/D priority on AFTN
Intensity codes	INTSF (intensifying) / WKN (weakening) / NC (no change)
Observed vs Forecast	OBS AT time / FCST AT time

SIGMET Phenomena Quick Reference

Phenomenon	SIGMET Code	Significance
Thunderstorm	TS (FRQ/EMBD/SEV)	Major icing, turbulence, lightning hazard
Tropical Cyclone	TC	Extreme winds, rain, turbulence
Severe Turbulence	SEV TURB	Structural damage risk
Severe Icing	SEV ICE (non-FZ or FZRA)	Control surface icing
Volcanic Ash	VA	Engine damage, windshield abrasion
Mountain Wave	SEV MTW	Extreme turbulence & downdrafts

Quick Revision — Chapter 27:

RAREP: Radar Report at synoptic hours; echoes plotted anticlockwise; max height reports within 200 km; AP and Bright Band in plain language.

SIGMET: En-route hazard information; in abbreviated plain language; SIGMET SST for supersonic; disseminated to MWOs within 1100 NM; INTSF/WKN/NC for intensity change.

SAT Bulletin: Based on Metsat pictures; abbreviated form; describes cloud coverage, convective activity, vortex positions; identifies geographic areas using standard abbreviations.

RAREP Echo Coverage Mnemonic: "Widely-Scattered-Broken-Solid"

WDLY SCT <1/8 → SCT 1–4/8 → BRKN 4–7/8 → SLD 8/8 (full coverage)