METEOROLOGICAL AIRPORT REPORT

1. Introduction

Meteorological service for international aviation is provided by meteorological authorities designated by States.

The actual weather observations at aerodromes and offshore structures are made by aeronautical meteorological stations. The specific types of observations and related reports are disseminated either locally, or to other aerodromes.

Observations of meteorological conditions are made by means of instruments and visual estimation and are used for landing and take-off, en-route navigation and flight performance, and as a basis for forecasting.

High-quality and timely meteorological observations and reports for international air navigation are the foundation upon which an effective aeronautical meteorological service is based and of direct consequence to aviation safety.

1.1. OPMET / SIGMET / AIRMET

Those observations used primarily for aircraft operations are called "OPMET information" while those used primarily for forecasting purposes are considered to be "basic meteorological data".

OPMET information includes aerodrome reports, landing forecasts, aerodrome forecasts, special aircraft observations, SIGMET and AIRMET information, tropical cyclone and volcanic ash advisories and WAFS forecasts.

Basic meteorological data include synoptic surface and upper-air observations, satellite images, weather radar data and routine aircraft observations.

1.2. METAR / SPECI

At aerodromes, routine observations are made and reported at hourly or half-hourly intervals.

When required as a result of specified operationally significant changes in the meteorological conditions, special observations and reports are made whenever such changes occur between routine observations

Observational data are combined into a report for dissemination at the local aerodrome or beyond.

Depending on their use, the reports are presented in two forms:

- Aerodrome routine meteorological report named METAR is local routine and special reports in abbreviated plain language intended for dissemination and use at the aerodrome of origin
- Aerodrome special meteorological report named SPECI is intended for dissemination and use beyond the aerodrome of origin.

It allows knowing the meteorological conditions at an airfield at a given timeframe. Its elements are determinants in order to choose the landing/departing direction for example.

A SPECI is identical to a METAR with the difference that it is not created regularly but from time to time. It is a special observation message showing a punctual meteorological event that occurred since the last METAR or SPECI published. The issuance of a SPECI is not necessary if METAR are issued at half-hour intervals.

The need to provide aeronautical users with two reports, one for local aerodrome use and one for use beyond the aerodrome, is to meet operational requirements as follows:
- local routine and special reports for aircraft about to land or take off including requirements for ATIS (voice-ATIS and D-ATIS)
- METAR/SPECI for flight planning and en-route flight information service purposes, including requirements for OPMET information for aircraft in flight (VOLMET) broadcasts and D-VOLMET.

Local routine and special reports, and METAR and SPECI from fully automatic systems can be used without human intervention (Automated METAR).

1.3.   Syntax and Structure

The METAR and SPECI code forms were developed by the World Meteorological Organization on the basis of aeronautical requirements established by ICAO. These codes and local reports use the approved ICAO abbreviations contained in the Procedures for Air Navigation Services.

Example of METAR:
METAR YUDO 221630Z 24004MPS 0800 R12/1000U DZ FG SCT010 OVC020 17/16 Q1018

Example of local routine report:
MET REPORT YUDO 221630Z WIND 240/5MPS VIS 600M RVR RWY 12 TDZ 1000M MOD DZ FG CLD SCT 300M OVC 600M T17 DP16 QNH 1018HPA

Example of local special report:
SPECIAL YUDO 151115Z WIND 050/26KT MAX37 MNM10 VIS 1000M RVR RWY 12 1200M HVY TSRA CLD BKN CB 500FT T25 DP22 QNH 1008HPA

Example of SPECI:
SPECI YUDO 151115Z 05025G37KT 2000 1000S R12/1200N +TSRA BKN005CB 25/22 Q1008

1.4. Unities

The unities are also variables and have been settled from the history development of aviation and the influence of USA and British pioneers in aerospace.

We use:
- The **feet (ft)** for the clouds height above ground
- The **knot (kt)** for the wind speed (kt=nautical mile per hour)
- The **meter (m)** for the horizontal visibility
- The **hectopascal (hPa)** for the atmospheric pressure (QNH QFE)
- The **degree Celsius (°C)** for the temperature measurement

Some unities can change depending of the countries.
For example, we use:
- The **meter per second 'mps' (m/s)** in Russia for the wind speed
- The **kilometer per hour 'km' (km/h)** in Russia for the indicated airspeed
- The **American land mile 'SM'** for the visibility in North America
- The **inch of mercury (inHg)** for the atmospheric pressure in America (1013hPa=29,92 inHg)

2. Decoding the METAR

Now, we will start decoding the following METAR:

LFPO 041300Z 36020KT 320V040 1200 R26/0400 +RASH BKN040TCU 17/15 Q1015 RETS 26791299

2.1. Location Indicator

The location indicator is the ICAO four-letter location indicator for the aerodrome for which the report is made.

Nearly all airports in the world have a unique ICAO code; it is a location indicator **with 4 letters**.
- 1st letter determines an area in the world (France is in the **L** area)
- 2nd letter determines a country in the world area (**F** for France)
- 3rd and 4th letters determine an airfield

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- This ICAO code is Paris-Orly airport / LFPO.

2.2. Time of the observation

The time of observation is the day and actual time of observation: day of the month and time in hours and minutes, in Coordinated Universal Time (UTC).

This group is constructed with:
- Two figures which represent the day of the weather observation, followed by
- Four figures which represent the hours and minutes, followed by
- The letter **Z** which means that the hour and day information are expressed in Coordinated Universal Time (UTC).

Times are always in UTC using a 24-hour clock.

LFPO **041300Z** 36020KT 320V040 1200 R26/0400 +RASH BKN040TCU 17/15 Q1015 RETS 2679199

- This group means that the date and time of the weather observation is number **04** of the current month, at **13:00** hours UTC (Z or GMT)

2.3. Identification of an automated or a missing report

In the case of local routine reports and METAR from automatic observing systems with no human intervention, the report is to be identified with **AUTO**.
In the event of missing METAR, the abbreviation **NIL** should be used, and NIL will end the METAR.

2.4. Surface wind

Wind observations in local routine reports used for arriving or departing aircraft should be representative of the touchdown zone and the conditions along the runway, respectively.

Positions of wind sensors along individual runways should be indicated in local routine reports together with the reported wind data by the sections of the runway for which the wind data are to be representative.

Direction (true) from which surface wind is blowing should be indicated in degrees rounded off to the nearest 10°.

Surface wind should be based on an average period of ten minutes, except that when the ten-minute period includes a marked discontinuity in the wind direction and/or speed, only data occurring since the discontinuity should be used for obtaining mean values, and the time interval should be correspondingly reduced.

The group is constructed by:
- The wind direction is reported in steps of 10 degrees using three figures, e.g. 030 or 240.
- The wind speed is reported in steps of 1 metre per second or 1 knot using two figures, e.g. 05 or 15, supplemented by the units used (MPS or KT)

The wind direction indicates that the wind comes in front of the aircraft when its heading equals the wind direction.

The wind direction values below 100° are always preceded by a **0**.
A wind blowing from the true north is indicated by **360°** (and not 000°).
The unit used for wind speed should be indicated both in local routine reports and METAR.

Special definition:
- Wind speed of 50 m/s (100KT) or more is to be indicated as **ABV49MPS** or **ABV99KT**.
- Calm conditions are reported as **00000KT** when a wind speed of less than 0.5 m/s (1KT) is observed.

A marked discontinuity occurs when there is an abrupt and sustained change in wind direction of 30° or more, with a wind speed of 5 m/s (10 kt) before or after the change, or a change in wind speed of 5 m/s (10 kt) or more, lasting at least 2 minutes.

LFPO 041300Z **36020KT** 320V040 1200 R26/0400 +RASH BKN040TCU 17/15 Q1015 RETS 26791299

- This group means that the wind comes from **360°** blowing at **20** knots (kt).

2.5. Significant speed and directional variations

There are several cases to express variation of the wind information.

Directional variations are indicated when the wind direction varies by 60° or more and when the mean speed is 1.5 m/s or 3kt or more, and the wind direction varies by less than 180°, METAR indicates the two extreme directions (reported clockwise) using 3 figures between which the wind has varied (in degrees) with the letter **V** between the 2 values.

These values are inserted after indication of the mean wind direction and speed.

Example: "01009KT **350V050**" = mean surface wind direction 10°; wind speed 9 kt; wind direction variable between 350° and 050°.

Directional variations are indicated when the wind direction varies by 60° or more and when the mean speed is less than 1.5 m/s or 3kt and the wind direction varies by less than 180°, METAR replaces the wind direction by the variable indicator "**VRB**" followed by the mean wind speed and its unit.

Example: "VRB01MPS"; "VRB02KT"

Directional variations are indicated when the wind direction varies by 180° or more, METAR indicates the wind direction by the variable indicator "**VRB"** followed by the mean wind speed and its unit.

Example: "VRB05MPS"; "VRB14KT"

When the wind is gusty with variations from the mean wind speed (gusts) exceeding 5 m/s or 10kt, speed variations are indicated after the mean wind direction and speed and preceded by the letter indicator "**G**" (for gusts).

Example: 25020G35KT, 20010G17MPS

The minimum wind speed is never included. When wind speed is 50 m/s or 100kt or more, the wind speed is reported as P49MPS or P99KT.

LFPO 041300Z **36020G50KT 320V040** 1200 R26/0400 +RASH BKN040TCU 17/15 Q1015 RETS 26791299

- This group means that the wind comes from **360**° blowing at **20** knots with gust peaking at **50** knots.
- This group means that the wind direction is variable around 360° BETWEEN **320**° and **040**°.

Note that Variation information is an optional group inserted only when the conditions are present.

2.6.   Visibility

Visibility may be observed by a human observer or measured by instruments.
The **visibility** is a measure of the opacity of the atmosphere.

Visibility for aeronautical purposes is the greater of:
- the greatest distance at which a black object of suitable dimensions, situated near the ground, can be seen and recognized when observed against a bright background; and
- the greatest distance at which lights in the vicinity of 1 000 candelas can be seen and identified against an unlit background.

In METAR, visibility observations should be representative of the aerodrome. In such observations, special attention should be paid to significant directional variations in visibility.

The visibility information is reported in steps of
- 50 m when visibility is less than 800 m;
- 100 m when visibility is 800 m or more but less than 5 km;
- 1 km when visibility is 5 km or more but less than 10 km.

When visibility is 10 km or more, it is given as 10 km, except when conditions for the use of CAVOK apply

The visibility is reported by four figures.
When visibility is 10 km and above and the conditions for the use of CAVOK do not apply, visibility shall be indicated as **9999**.
When visibility is below 50m, visibility shall be indicated as **0000**.

Examples: 0200, 0350, 1500, 4000, 9999

The unit of visibility is meter by default, but in some countries we can use the American land mile (SM).

Examples:
- **10SM** = visibility of 10 statute miles or American land mile (=1.625km)
- **1/4 SM** = visibility of 0.25 statute miles (one quarter)
- **1 1/2 SM =** visibility of 1 SM + 0.5 SM = 1.5 statute miles (one and a half)

When the visibility is not the same in different directions and when the lowest visibility is different from the prevailing visibility and less than 1 500 m, less than 50% of the prevailing visibility and less than 5 000 m the lowest visibility observed should also be reported and, when possible its general direction in relation to the aerodrome reference point indicated by reference to one of the eight points of the compass.

Examples: 2000 1200NW; 4000 3000S

Determining visibility (sectors* considered for prevailing visibility indicated by shading)		Minimum visibility	Prevailing visibility
Four sectors 1.			
Visibility (metres) — Approximate degrees	5 000 / 2 000 / 1 500 / 2 500		
5 000 — 90 $\}$ 180 2 500 — 90 —— —— —— 2 000 — 90 1 500 — 90		1 500	2 500
Five sectors 2.			
Visibility (metres) — Approximate degrees	1 500 / 2 000 / 5 000 / 1 000 / 2 500		
5 000 — 50 $\}$ 270 2 500 — 90 2 000 — 130 —— —— —— 1 500 — 50 1 000 — 40		1 000	2 000
Six sectors 3.			
Visibility (metres) — Approximate degrees	1 500 / 2 500 / 5 000 / 2 000 / 1 000 / 3 000		
5 000 — 60 $\}$ 190 3 000 — 50 2 500 — 80 —— —— —— 2 000 — 90 1 500 — 70 1 000 — 10		1 000	2 500

When instrumented systems are used, the average period should be ten minutes for METAR.
Any observed value that does not fit the reporting scale in use shall be rounded down to the nearest lower step in the scale

Prevailing visibility is defined as the greatest visibility value which is reached at least within half the horizon circle or within half of the aerodrome surface. This could be formed by sectors, which could be contiguous or non-contiguous.

LFPO 041300Z 36020KT **1200** R26/0400 +RASH BKN040TCU 17/15 Q1015 RETS 26791299

- This group means that the minimal horizontal visibility is **1200 meters over the whole horizon**

Note: In special cases, if local conditions vary greatly then two groups may be displayed showing the visibility variation in different sectors.

Automated stations can use an **M** to indicate "less than" when reporting visibility. (Example: **M1SM**)

Sometimes the visibility can contain an additional letter which indicates the direction of this visibility:
4000NE = visibility is 4000 m at north-east (mean visibility = 1.5x4000 = 6000 M)

1400S 4000N = visibility is 1400 m at south but 4000 m at north

In some METARs, the visibility information can be replaced by a group of letters:
CAVOK = **C**louds **A**nd **V**isibility **OK**
NSC = **N**o **S**ignificant **C**louds = no clouds below 5000 feet, no cumulonimbus (CB) or towering cumulus(TCU)
SKC = **SK**y **C**lear – no clouds

Three conditions in order to have a CAVOK:
1. No clouds exist below 5000 feet or below the highest minimum sector altitude, whichever is greater, and no cumulonimbus or towering cumulus are present.
2. Visibility is 10 kilometres or greater
3. No precipitation, thunderstorms, sandstorm, dust storm, shallow fog, or low drifting dust, sand or snow is occurring (no significant weather).

Note that the term **CAVOK** is not used in the United States

2.7.   RVR - Runway visual range

The runway visual range named RVR should be reported whenever visibility or RVR is less than 1 500 m, particularly at aerodromes having precision approach runways or runways used for take-off with high-intensity edge lights and/or centre line lights, including aerodromes with runways intended for Category I approach and landing operations.

RVR is the best possible assessment of "the range over which the pilot of an aircraft on the centre line of a runway can see the runway surface markings or the lights delineating the runway or identifying its centre line".

RVR is reported using instrumented systems at all runways intended for Category II or III instrument approach and landing operations by
- steps of 25 m are used for RVR below 400 m,
- steps of 50 m for RVR between 400 m and 800 m
- steps of 100 m for RVR above 800 m.

Any observed RVR value that does not fit the reporting scale in use should be rounded down to the nearest lower reporting step in the scale.

The lower limit of the reporting range should be 50 m; below this limit, reports should merely indicate that the RVR is less than 50 m (M0050).
The upper limit of the reporting range should be 2000 m; above this limit, reports should merely indicate that the RVR is more than 2000 m (P2000).

RVR values in metres are reported by four figures preceded by the letter indicator **R** followed by the runway designator in two figures with an additional R,L,C letter when applicable and the sign slash '**/**'.

When more than one runway is in use, the report would include all such runways up to a maximum of four. RVR values from parallel runways may be included in a report by attaching "L, C, R" (L = left, C = centre, R = right) to the runway designator.

Some letters can be added to the RVR to specify the evolution of visibility.

- When the RVR is below the minimum value that can be determined by the system in use, it should be reported using the abbreviation **M** followed by the minimum value that can be determined by the system.
- When the RVR is above the maximum value that can be determined by the system in use, it should be reported using the abbreviation **P** followed by the maximum value that can be determined by the system.

Additional information concerning the variations of RVR is included in METAR/SPECI. All these variations refer to the ten-minute period immediately preceding the observation:

If the RVR values (during the ten-minute period) have shown a distinct tendency, i.e. the mean during the first five minutes varies by 100 m or more from the mean during the second five minutes of the period; this should be indicated by the abbreviation:

- "**U**" for an upward tendency
- "**D**" for a downward tendency.

If there is no distinct tendency during the ten-minute period, this should be indicated by using the abbreviation "**N**". When indications of tendencies are not available, none of the three abbreviations should be used.

LFPO 041300Z 36020KT 320V040 1200 **R26/0400** +RASH BKN040TCU 17/15 Q1015 RETS 26791299

- This group means that the RVR or runway visibility range is **400** meters on runway **26**

Examples:
R25/M0075 = RVR runway 25 is less than 75 meters (M=Minus)
R33L/P1500 = RVR runway 33 LEFT is greater than 1500 meters (P=Plus)
R16R/1000D = RVR runway 16 RIGHT is 1000 meters with aggravation (D=Down)
R16R/1000U = RVR runway 16 RIGHT is 1000 meters with improvement (U=UP)
R33C/0900N = RVR runway 33 CENTRE is 900 meters with no change (N=No change)
R27/0150V0300U = RVR runway 27 variable (V) from 150 to 300 meters with improvement (U= Up)

ICAO DOC 9328 Manual of Runway Visual Range Observing and Reporting Practices - 3rd Edition - 2008

2.8.   Present Weather

As a minimum, the following weather phenomena are to be identified and reported
- Precipitation and its intensity
- Freezing precipitation and its intensity
- Fog
- Freezing fog
- Thunderstorms (also those occurring in the vicinity).

In METAR, present weather information should be representative of conditions at the aerodrome and, for certain specified present weather phenomena, in its vicinity, i.e. the area that lies within a radius of approximately 8 km and 16 km of the aerodrome reference point.

In METAR, present weather phenomena are reported in terms of types and characteristics and are qualified with respect to intensity or proximity to the aerodrome, as appropriate. (see tables below).

One or more, up to a maximum of three, of the present weather abbreviations given in tables of type of present weather phenomena (see tables below) and table of characteristic of present weather phenomena (see tables below) are to be used, as necessary, together with an indication, where appropriate, of the characteristics and intensity or proximity to the aerodrome.

The following general rules apply:

- an indication of intensity or proximity (METAR only), as appropriate, is to be reported first;
- this is followed by both the characteristics and the type of weather phenomena in the form "+TSRA" or "VCFG"
- where two different types of weather are observed, they are to be reported in two separate groups, in the form "+DZ FG" or "–DZ VCFG" where the intensity or proximity indicator refers to the weather phenomenon which follows the indicator; and
- different types of precipitation occurring at the time of observation are to be reported as one single group with the dominant type of precipitation reported first, preceded by only one intensity qualifier which refers to the intensity of the total precipitation, in the form "+TSRASN" and "–SNRA FG"

In cases where the visibility is less than 1 000 m and the temperature is below minus 30º C it is unlikely that suspended super cooled water droplets are present (unless there are sources of open water nearby). Under these circumstances "FG" rather than "FZFG" is to be reported since airlines tend to experience operational penalties whenever FZFG is reported.

2.8.1. Types of present weather phenomena

Precipitation is any of the forms of water particles, whether liquid or solid, that falls from the atmosphere and reaches the ground. The types of precipitation are:

- **Drizzle**: Fairly uniform precipitation composed exclusively of fine drops with diameters of less than 0.02 inch (0.5 mm) very close together. Drizzle appears to float while following air currents, although unlike fog droplets, it falls to the ground.
- **Rain**: Precipitation, either in the form of drops larger than 0.02 inch (0.5 mm), or smaller drops which, in contrast to drizzle, are widely separated.

- **Snow**: Precipitation of snow crystals mostly branched in the form of six-pointed stars.
- **Snow Grains**: Precipitation of very small, white, and opaque grains of ice.
- **Ice Crystals** (Diamond Dust): A fall of unbranched (snow crystals are branched) ice crystals in the form of needles, columns, or plates.
- **Ice Pellets**: Precipitation of transparent or translucent pellets of ice, which are round or irregular, rarely conical, and which have a diameter of 0.2 inch (5 mm), or less. There are two main types: Hard grains of ice consisting of frozen raindrops, or largely melted and refrozen snowflakes. Pellets of snow encased in a thin layer of ice which have formed from the freezing, either of droplets intercepted by the pellets, or of water resulting from the partial melting of the pellets.
- **Hail**: Precipitation in the form of small balls or other pieces of ice falling separately or frozen together in irregular lumps.
- **Small Hail and/or Snow Pellets**: Precipitation of white, opaque grains of ice. The grains are round or sometimes conical. Diameters range from about 0.08 to 0.2 inch (2 to 5 mm).

Type	Phenomenon	Abbreviation	Remarks
Precipitation	Drizzle	DZ	
Precipitation	Rain	RA	
Precipitation	Snow	SN	
Precipitation	Snow grains	SG	
Precipitation	Ice Pellets	PL	
Precipitation	Ice Crystals (diamond dust)	IC	Reported only when associated visibility is 5000m or less
Precipitation	Hail	GR	Reported when diameter of largest hailstone is 5mm or more
Precipitation	Small hail Snow pellets	GS	Reported when diameter of largest hailstone is less than 5mm
Precipitation	Unknonw precipitation	UP	

An obscuration is any phenomenon in the atmosphere, other than precipitation, that reduces the horizontal visibility. These include:
- **Mist**: A visible aggregate of minute water particles suspended in the atmosphere that reduces visibility to less than 7 statute miles but greater than or equal to 5/8 statute miles.
- **Fog**: A visible aggregate of minute water particles (droplets) that is based at the earth's surface and reduces horizontal visibility to less than 5/8 statute miles and, unlike drizzle, it does not fall to the ground.
- **Smoke**: A suspension in the air of small particles produced by combustion. A transition to haze may occur when smoke particles have travelled great distances (25 to 100 miles or more) and when the larger particles have settled out and the remaining particles have become widely scattered through the atmosphere.
- **Volcanic Ash**: Fine particles of rock powder that originate from a volcano and that may remain suspended in the atmosphere for long periods.
- **Widespread Dust**: Fine particles of earth or other matter raised or suspended in the air by the wind that may have occurred at or far away from the station that may restrict horizontal visibility.
- **Sand**: Sand particles raised by the wind to a height sufficient to reduce visibility.
- **Haze**: A suspension in the air of extremely small, dry particles invisible to the naked eye and sufficiently numerous to give the air an opalescent appearance.
- **Spray**: An ensemble of water droplets torn by the wind from the surface of an extensive body of water, generally from the crests of waves, and carried up a short distance into the air.

Type	Phenomenon	Abbreviation	Remarks
Obscuration (hydrometeors)	Fog	FG	Reported when visibility is less than 1000m except when qualified by MI, BC, PR or VC
Obscuration (hydrometeors)	Mist	BR	Reported when visibility is at least 1000m but not more than 5000m
Obscuration (lithometeors)	Sand	SA	The obscuration by lithometeors should be used only when the obscuration consists predominantly of lithometeors and the visibility is 5 000 m or less except "SA" when qualified by "DR" and volcanic ash
Obscuration (lithometeors)	Dust	DU	
Obscuration (lithometeors)	Haze	HZ	
Obscuration (lithometeors)	Smoke	FU	
Obscuration (lithometeors)	Volcanic ash	VA	

These other phenomena include:

- **Well-developed Dust/Sand Whirl**: An ensemble of particles of dust or sand, sometimes accompanied by small litter, rose from the ground in the form of a whirling column of varying height with a small diameter and an approximately vertical axis.
- **Squall**: A strong wind characterized by a sudden onset in which the wind speed increases at least 16 knots and is sustained at 22 knots or more for at least one minute.
    - **Funnel Cloud (Tornado Activity)**: These include:
    - **Tornado** = A violent, rotating column of air touching the ground.
    - **Funnel Cloud** = A violent, rotating column of air which does not touch the surface.
- **Waterspout** = A violent, rotating column of air that forms over a body of water, and touches the water surface.
- **Sandstorm**: Particles of sand carried aloft by a strong wind. The sand particles are mostly confined to the lowest ten feet, and rarely rise more than fifty feet above the ground.
- **Dust storm**: A severe weather condition characterized by strong winds and dust-filled air over an extensive area.

Type	Phenomenon	Abbreviation	Remarks
Other phenomena	Dust/sand whirls (dust devil)	PO	
Other phenomena	Squall	SQ	
Other phenomena	Funnel cloud (tornado or watersprout)	FC	
Other phenomena	Duststorm	DS	
Other phenomena	Sandstorm	SS	

Characteristic	Abbreviation	Remarks
Thunderstorm	TS	Used to report a thunderstorm with rain "TSRA", snow "TSSN", ice pellets "TSPL, hail "TSGR", small hail and/or snow pellets "TSGS", unknown precipitation "TSUP" (automatic observing systems only) or combinations thereof, for example, "TSRASN". When thunder is heard during the ten-minute period preceding the time of observation but no precipitation is observed at the aerodrome, the abbreviation "TS" is used without qualification
Shower	SH	Used to report showers of rain "SHRA", snow "SHSN", ice pellets "SHPL", hail "SHGR", small hail and/or snow pellets "SHGS", unknown precipitation "SHUP" (automatic observing systems only) or combinations thereof, for example, "SHRASN". In METAR, showers observed in the vicinity of the aerodrome should be reported as "VCSH" without qualification regarding type or intensity of precipitation.
Freezing	FZ	Supercooled water droplets or precipitation, used only with FG, DZ, RA and UP (automatic systems only).
Blowing	BL	Used to report DU, SA or SN raised by the wind to a height of 2 m (7 ft) or more above ground level.
Low drifting	DR	Used with SA, DU or SN raised by the wind to less than 2 m (7 ft) above ground level.
Shallow	MI	Less than 2 m (7 ft) above ground level.
Patches	BC	Fog patches randomly covering the aerodrome
Partial	PR	A substantial part of the aerodrome covered by fog while the remainder is clear

2.8.3. Intensity/proximity of present weather phenomena

Intensity/proximity	indicator	Remarks
Light	**-**	
Moderate	No indicator	
Heavy	**+**	used only with: DZ, FC (heavy used to indicate tornado or waterspout; moderate to indicate funnel cloud not reaching the ground), GR, GS, PL, RA, SG, SN and UP (automatic observing systems only), or in combinations involving these present weather types (in these cases, intensity refers to precipitation) DS, SS (in these cases, only moderate and heavy intensities to be indicated)
Vicinity	**VC**	Between approximately 8 and 16 km of the aerodrome reference point and used only in METAR with DS, SS, FG, FC, SH, PO, BLDU, BLSA, BLSN, TS and VA when not reported under the characteristics of the present weather phenomena

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- This group is the present weather phenomena and means that at the airfield, we have heavy (**+**) Shower (**SH**) Rain (**RA**)

2.9. Cloud layers

2.9.1. Cloud amount and height

Cloud observations in METAR should be representative of the aerodrome and its vicinity, this combined area being the area located within a radius of approximately 16 km of the aerodrome reference point

A METAR can include one or several layers of clouds or no layer at all.

The height of cloud base is reported in steps of 30m or 100ft up to 3000m or 10000ft, together with the units used, in the form "010" in METAR with 3 figures.

Sky condition shall be coded in the format **XXXYYY** where **XXX** is the **cloud amount code** (e.g. FEW or BKN) and **YYY** its **height above surface using 3 figures**:
- Heights of sky cover shall be evaluated in <u>feet above the surface</u>.
- Heights of layers shall be reported <u>in hundreds of feet</u>, rounded to the nearest reportable increment.
- When a cloud layer is <u>50 feet or less above the surface</u>, the height shall be reported as <u>000</u>.
- Each layer shall be separated from other layers by a space.

Cloud amount is given using the abbreviations FEW, SCT, BKN, OVC:
- **FEW** = *Few* = 1/8th to 2/8th of sky coverage (1-2 octas)
- **SCT** = *Scattered* = 3/8th to 4/8th of sky coverage (3-4 octas)
- **BKN** = *Broken* = 5/8th to 7/8th of sky coverage (5-6-7 octas)
- **OVC** = *Overcast* = 8/8th of sky coverage (8 octas)

If the layer is below station level, the height of the layer shall be coded as *III*.

Only clouds of operational significance are to be reported.

The type of cloud is identified only for CB and TCU clouds when observed at or near the aerodrome. When several layers or masses of cloud of operational significance are observed, their amount, type (CB and TCU only) and height of cloud base should be reported in increasing order of the height of cloud base and in accordance with the following criteria:
- the lowest layer or mass, regardless of amount, reported as FEW, SCT, BKN or OVC, as appropriate;
- the next layer or mass, covering more than 2 octas, reported as SCT, BKN or OVC, as appropriate;
- the next higher layer or mass, covering more than 4 octas, reported as BKN or OVC, as appropriate; and
- CB and/or TCU clouds independently of their height(s) of cloud base, whenever observed and not reported in previous parts of the report.

When an individual layer or mass of cloud is composed of CB and TCU clouds with a common cloud base, the type of cloud is reported as CB only.

If there is no significant layer, METAR can use this term:

- **NSC** = **N**o **S**ignificant **C**louds
- **NCD** = **N**o **C**loud **D**etected
- **SKC** = **S**ky **C**lear
- **CAVOK** = **C**eiling **A**nd **V**isibility **OK**

If no clouds of operational significance are present and no restriction on vertical visibility exists and the abbreviation "**CAVOK**" is not appropriate, the abbreviation "**NSC**" (i.e. nil significant cloud) should be used.

The term **CAVOK** is used when the following visibility/cloud/weather conditions occur simultaneously:

- <u>Visibility</u>: 10 km or more, and the lowest visibility is not reported.
- <u>Cloud</u>: No cloud of operational significance.
- <u>Weather</u>: No weather of significance to aviation as given in the tables of the types of present weather phenomena above.

Clear skies shall be coded in the format, **SKC** or **CLR**, where **SKC** is the abbreviation used by manual stations to indicate no layers are present and **CLR** is the abbreviation used by automated stations to indicate no layers are detected **at or below 12,000 feet**.

The ceiling (coverage > 50% or 4/8th) is the <u>height above the earth's surface of the lowest layer that is reported as broken (BKN) or overcast (OVC)</u>; or if the sky is totally obscured, the vertical visibility shall be the ceiling.

LFPO 041300Z 36020KT 320V040 1200 R26/0400 +RASH **BKN040TCU** 17/15 Q1015 RETS 26791299
This group is the cloud layer group. The example means that we have a broken (**BKN**) clouds layer at 4000ft (**040**) with presence of tower cumulus (**TCU**)

Example:
FEW015 SCT023 BKN041 = describes 3 layers in the following order: FEW clouds layer at 1500ft AGL, SCT clouds layer at 2300ft AGL and BKN clouds layer at 4100ft AGL.
BKN025TCU = BROKEN cloud layer at 2500ft with **towering cumulus**
SCT020CB = SCATTERED cloud layer at 2000ft with **cumulonimbus**

2.9.2. Vertical visibility

When the sky is obscured, the observations of vertical visibility should be reported in lieu of cloud amount, cloud type and height of cloud base. The reporting steps for vertical visibility are 30 m/100 ft up to 600 m/ 2000 ft. The vertical visibility value is reported in the <u>same manner as the height of cloud base</u> with 3 figures preceded by the letter indicator VV.

When the cloud amount or cloud type cannot be identified by the automatic observing system, the cloud amount or cloud type in each cloud group should be replaced by "///"; when no clouds are detected by the automatic observing system, this should be indicated by using the abbreviation "NCD".

Example:
VV010 reports a vertical visibility of 1000ft.

2.10.   Air temperature and dew point

Observations of air temperature and dew-point temperature should be representative of the whole runway complex.

The temperature is the **degree of hotness or coldness of the ambient air** as indicated as measured by any suitable instrument.

The dew point is the **temperature** where the water vapor in a volume of humid air at a constant barometric pressure will condense into liquid water. The dew point is a water-to-air saturation temperature.

The **dew point is associated with relative humidity**. A high relative humidity indicates that the dew point is closer to the current air temperature. Relative humidity of 100% indicates the dew point is equal to the current temperature and that the air is maximally saturated with water. When the dew point remains constant and temperature increases, relative humidity decreases

The temperatures are reported in steps of whole degrees Celsius with 2 figures, with observed values involving 0.5° rounded off to the next higher whole degree Celsius.

Example, +2.5°C is rounded off to +3°C and –2.5°C is rounded off to –2°C.

Air temperature and dew point temperature values are reported in METAR in two figures separated by a solidus "/".
Temperatures below 0°C are preceded by M (meaning minus).

Temperatures in the range of –0.5°C to –0.1°C are reported as "M00", while temperatures in the range of 0.0° to 0.4°C are reported as "00"

If the temperature is not available, the entire temperature/dew point group shall not be coded. If the dew point is not available, the temperature shall be coded followed by a solidus "/" and no entry made for dew point.

LFPO 041300Z 36020KT 1200 R26/0400 +RASH BKN040TCU **17/15** Q1015 RETS 26791299
This group is the air temperature and dew point group. The example means the air ***temperature*** is **17 degrees Celsius** and its ***dew point*** at **15 degrees Celsius**.

Examples:
00/M00 = Air temperature is +0°C, dew point temperature is -0°C
(Example if air temperature is +0.3°C and dew point is -0.2°C)
M03/M05 = Air temperature is -3°C, dew point temperature is -5°C

2.11.   Atmospheric pressure

QNH is the altimeter showing aerodrome elevation when the aircraft is on the ground and QNH is set on the altimeter sub-scale.
QFE is the altimeter showing zero elevation when the aircraft is on the ground and QFE is set on the altimeter sub-scale.

QFE is normally used only at the aerodrome where it is provided on request or, by local agreement, on a regular basis, in addition to QNH. Only QNH is included in METAR.

Atmospheric pressure is given in hecto Pascal (hPa) rounded off to the nearest lower value and reported in 4 figures.

Example: QNH 1011.4 is reported "Q1011" in METAR.

Where the earth's surface is above sea level, it is assumed that the atmosphere extends to sea level below the station and that the properties of that hypothetical atmosphere are related to conditions observed at the station.

Specific regulation:

In some countries (example in USA, Canada), the mean sea level pressure is not given in hecto Pascal but in inches of mercury (inHg).

When inches of mercury is used as unit for the atmospheric pressure, the altimeter group always starts with an **A** letter. The altimeter setting shall be coded as a 4 digit group immediately following the **A** using the tens, units, tenths, and hundredths of inches of mercury. The decimal point is not coded.

LFPO 041300Z 36020KT 320V040 1200 R26/0400 +RASH BKN040TCU 17/15 **Q1015** RETS 26791299
This group is the pressure at mean sea level group. The example means that the sea level pressure or QNH at the aerodrome is **1015** hectopascal.

2.12.   Supplementary information

In METAR, additional groups may be included as supplementary information:
- Recent weather
- Information on sea-surface temperature and the state of the sea at aeronautical meteorological stations established on offshore structures in support of helicopter operations; and
- Information on the state of the runway(s).

2.12.1.   Recent weather

Supplementary information includes information on recent weather as given in the table below, observed at the aerodrome during the period since the last issued routine report or last hour, whichever is the shorter, but not at the time of observation.

Up to three groups of recent weather information selected from the table below may be included in these reports.

Where local circumstances so warrant, wind shear should be included as necessary, information on wind shear is added in the form "WS RWY 12" or "WS ALL RWY

Abbreviation	Phenomenon/Decode
REFZDZ	Recent freezing drizzle
REFZRA	Recent freezing rain
REDZ	Recent drizzle (moderate or heavy)
RERA	Recent rain (moderate or heavy)
RESN	Recent snow (moderate or heavy)
RERASN	Recent rain and snow (moderate or heavy)
RESG	Recent snow grains (moderate or heavy)
REPL	Recent ice pellets (moderate or heavy)
RESHRA	Recent rain showers (moderate or heavy)
RESHSN	Recent snow showers (moderate or heavy)
RESHGR	Recent showers of hail (moderate or heavy)
RESHGS	Recent showers of small hail and/or snow pellets
REBLSN	Recent blowing snow
RESS	Recent sandstorm
REDS	Recent duststorm
RETSRA	Recent thunderstorm with rain
RETSSN	Recent thunderstorm with snow
RETSGR	Recent thunderstorm with hail
RETSGS	Recent thunderstorm with small hail
RETS	Recent thunderstorm without precipitation
REFC	Recent funnel cloud (tornado or waterspout)
REVA	Recent volcanic ash
REUP	Recent unidentified precipitation (only when automatic observing systems are used)
REFZUP	Recent freezing rain with unidentified precipitation (only when automatic observing systems are used)

REFSUP	Recent thunderstorm with unidentified precipitation (only when automatic observing systems are used)
RESHUP	Recent showers of unidentified precipitation (only when automatic observing systems are used)
WS TKOF RWY xx	WindShear during take-off on runway xx
WS LDG RWY xx	WindShear during landing on runway xx

LFPO 041300Z 36020KT 320V040 1200 R26/0400 +RASH BKN040TCU 17/15 Q1015 **RETS** 26791299
This group is the recent weather group. The example means Recent (**RE**) Thunderstorm (**TS**)

Examples:
RERA = REcent RAin
WS TKOF RWY 26 = WindShear during take-off on runway 26 reported
WS LDG RWY28L = WindShear during LANDING on runway 28 LEFT reported

2.12.2.   Sea level pressure

The sea-level pressure group is included in the remarks section of the message. It starts with 'SLP' and is followed by 3 figures (units, tenths and hundreds).

Example: A sea-level pressure of 1002.5 hecto Pascal is **SLP025**.

2.12.3.   Runway status

This table includes the optional data of a runway condition indication in a METAR and declares how its syntax works:

Runway designator	Type of coverage	Dimension of coverage	Height of coverage	Friction coefficient and braking action
15: RWY15 or 15L **65**: 15R (15+50) **88** : ALL RWYs	**0**: dry and clear **1**: humid **2**: wet or puddles **3**: collar **4**: dry snow **5**: wet snow **6**: snow slush **7**: ice **8**: compressed snow **9**: frozen wheel tracks **/**: type not specified or unavailable	**1**: up to 10% **2**: 11 - 25% **5**: 26 - 50% **9**: 51 - 100% **/**: not specified	**00**: < 1 mm **01**: 1 mm **02**: 2 mm **03**: 3 mm ... **10**: 1 cm (10 mm) ... **50**: 5 cm **90**: 9 cm **92**: 10 cm **93**: 15 cm **94**: 20 cm ... **97**: 35 cm **98**: >= 40 cm **99**: RWY not useable **//**: No measurement	Frictional coefficient **R** and braking action **B**: **R** < 26 - **B** bad **R** 26-29 - **B** bad/moderate **R** 30-35 - **B** moderate **R** 36-39 - **B** moderate/good **R** > 39 - **B** good **91**: **B** bad **92**: **B** bad/moderate **93**: **B** moderate **94**: **B** moderate/good **95**: **B** good **99**: **B** and **R** not specified or not reliable **//**: RWY not in use

Note: It is an optional group. This group is present only to indicate special runway conditions.

LFPO 041300Z 36020KT 1200 R26/0400 +RASH BKN040TCU 17/15 Q1015 RETS **26791299**
Runway **26**: ice (**7**) covering more than 51% of the runway (**9**), coverage height of 12 millimeters (**12**), braking coefficient incapable of measurement or not reliable (**99**)

2.13. Prevision

The Prevision group can be found in the METAR.
Hereunder you will find some definitions and examples.

Examples:
NOSIG = **NO SIG**nificant changes coming within the next two hours
BECMG = weather development (**BEC**o**M**in**G**)
TEMPO = **TEMPO**rary existing weather phenomena (changes to the main report)
FM = **F**ro**M** (time)
AT = **AT** time
TL = un**T**i**L** (time)
SNOCLO = Airfield closed due to snow

2.13.1. Becoming group

BECMG is the indicator of regular or irregular evolution of weather conditions. It is only used when the evolution begins and ends at the hours of the beginning and the end of the tendency or occurs at the uncertain one o'clock during the validity of the tendency.

BECMG AT1200 33010KT = wind becomes 330° at 10 knots at 12h00 UTC
BECMG FM1130 TL1230 0350 = visibility will be 350m from 11h30 until 12h30 UTC

2.13.2. Temporary group

TEMPO is the indicator of temporary weather fluctuations of one or several parameters for less than one hour and covering less than half of the period. It is only used when the beginning and the end of the period of temporary fluctuations correspond at the beginning and at the end of the validity of the tendency.

TEMPO FM1130 TL1230 OVC006 = temporary fluctuation between 11h30 and 12h30 UTC, with overcast cloud layer at 600ft
TEMPO 3000 SHRA = temporary visibility 3000m with rain showers

3. AIRMETs

Hazardous weather advisories of **moderate** intensity will be issued as AIRMETs. AIRMETs are issued when the following conditions are expected to cover an area of at least 3000 square miles:
- Moderate icing.
- Moderate turbulence.
- Sustained surface winds of 30 knots or more.
- Ceilings less than 1,000 ft. and/or visibility less than 3 miles affecting 50% of an area at one time.
- Extensive mountain obscuration.

4. SIGMETs

Hazardous weather advisories of **severe** intensity will be issued as SIGMETs. SIGMETs are reported as convective or no convective:
- Convective SIGMETs report only thunderstorms and related phenomena (tornadoes, heavy precipitation, hail and high surface winds).
- No convective SIGMETs are issued when the following conditions occur or are expected to cover an area of at least 3,000 square miles:
  - Severe or extreme turbulence or clear air turbulence (CAT) not associated with thunderstorms.
  - Severe icing not associated with thunderstorms.
  - Widespread dust storms, sandstorms, or volcanic ash lowering surface or in-flight visibilities to below three miles.

4.1. Volcanic eruption

Volcanic eruption SIGMETs are identified by an alphanumeric designator which consists of an alphabetic identifier and issuance number.

The first time an advisory is issued for a phenomenon associated with a particular weather system, it will be given the next alphabetic designator in the series and will be numbered as the first for that designator. Subsequent advisories will retain the same alphabetic designator until the phenomenon ends.

In the conterminous U.S., this means that a phenomenon that is assigned an alphabetic designator in one area will retain that designator as it moves within the area or into one or more other areas. Issuances for the same phenomenon will be sequentially numbered, using the same alphabetic designator until the phenomenon no longer exists. Alphabetic designators NOVEMBER through YANKEE, except SIERRA and TANGO are only used for SIGMETs, while designators SIERRA, TANGO and ZULU are used for AIRMETs

4.2. Pilot weather report

Pilots will report any significant weather or flight condition to you as ATC as soon as possible. Additionally, you can expect that all significant weather or flight conditions that clearly differ from the forecast will be reported by the pilot. There is no specific format for this type of report.

Remember: If there is any wind shear during departure or approach the pilot will inform the tower controller.

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