



NAMIBIAN CIVIL AVIATION AUTHORITY

Advisory Pamphlet (AP)

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ISSUING OF METAR, SPECI AND TAF

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ISSUING OF METAR, SPECI AND TAF

1. Purpose

- 1.1 This Advisory Pamphlet (AP) provides information and guidance relating to the issuance of aerodrome meteorological reports (METAR, SPECI and TAF).
- 1.2 METAR and SPECI is for dissemination beyond the aerodrome of origin. It should be representative of the whole runway.
- 1.3 An aerodrome forecast (TAF) shall be issued at a specified time not earlier than one hour prior to the beginning of its validity.
- 1.4 It consists of a concise statement of the expected meteorological conditions at an aerodrome for a specified period.

2. Background

- 2.1 At aerodromes, routine observations must be made throughout the 24 hours of each day, at intervals of one hour or at intervals of one half-hour, unless otherwise agreed between the MET service provider, the ATS service provider and the operators concerned.
- 2.2 Such observations must be made at intervals of one hour or, if so determined by regional air navigation agreements, at intervals of one half-hour.
- 2.3 At other aeronautical meteorological station considering the requirements of air traffic services units and aircraft operations, such observations must be made as determined by the designated meteorological authority.
- 2.4 Aerodrome forecasts (TAFs) are complete descriptions of the meteorological elements expected at and over the aerodrome throughout the whole of the forecast period, including any changes considered to be significant to aircraft operations.
- 2.5 A MET service provider preparing TAF must keep the forecasts under continuous review and, when necessary, must issue amendments promptly.
- 2.6 The period of validity of a routine TAF must be not less than 6 hours or more than 30 hours; the period of validity must be determined by regional air navigation agreement.

3. Extracts from NAM-CARS, PART 174

174.06.6 Observing and reporting meteorological elements

The A-MET service must ensure that observation and reporting of the following meteorological elements is carried out in accordance with the standards set out in Document NAM-CATS-MET:

- (a) surface wind;
- (b) visibility;
- (c) runway visual range;
- (d) present weather;
- (e) clouds;
- (f) air temperature and dew-point temperature;
- (g) atmospheric pressure; and
- (h) any other supplementary information.

174.06.7 Reporting meteorological information from automatic observing systems

The A-MET service must ensure that meteorological information, such as METAR, SPECI, local routine and special reports, received from automatic observing systems is reported in accordance with the standards set out in Document NAM-CATS-MET.

174.08.2 Aerodrome forecasts

The A-MET service must-

- (a) prepare aerodrome forecasts for aerodromes for which it has the responsibility to provide MET services; and
- (b) ensure that aerodrome forecasts are prepared, issued and amended in accordance with the standards set out in Document NAM-CATS-MET.

4. Extracts from NAM-CATS-MET

174.06.6 Observing and Reporting Meteorological Elements

The following standards and procedures apply in relation to observing and reporting meteorological elements:

1.1 Surface wind

- 1.1.1 The mean direction and the mean speed of the surface wind must be measured, as well as significant variations of the wind direction and speed, and reported in degrees true and kilometers per hour (or knots), respectively.
- 1.1.2 When local routine and special reports are used for departing aircraft, the surface wind observations for these reports must be representative of conditions along the runway; when local routine and special reports are used for arriving aircraft, the surface wind observations for these reports should be representative of the touchdown zone.
- 1.1.3 For METAR and SPECI, the surface wind observations must be representative of conditions above the whole runway where there is only one runway and the whole runway complex where there is more than one runway.

1.4 Visibility

- 1.2.1 The visibility must be measured or observed, and reported in meters or kilometers.
Compliance Note. Guidance on the conversion of instrument readings into visibility is given in Attachment D to this NAM-CATS-MET.
- 1.2.2 When local routine and special reports are used for departing aircraft, the visibility observations for these reports must be representative of conditions along the runway; when local routine and special reports are used for arriving aircraft, the visibility observations for these reports should be representative of the touchdown zone of the runway.
- 1.2.3 For METAR and SPECI, the visibility observations must be representative of the aerodrome.

1.3 Runway visual range

- 1.3.1 Runway visual range must be assessed on all runways intended for Category II and III instrument approach and landing operations.
- 1.3.2 Runway visual range must be assessed on all runways intended for use during periods of reduced visibility, including:
 - (a) Precision approach runways intended for Category I instrument approach and landing operations; and

- (b) Runways used for takeoff and having high-intensity edge lights and/or centre line lights.

1.3.3 The runway visual range, assessed in accordance with 1.3.1 and 1.3.2, must be reported in meters throughout periods when either the visibility or the runway visual range is less than 1 500 m.

1.3.4 Runway visual range assessments must be representative of:

- (a) The touchdown zone of the runway intended for non-precision or Category I instrument approach and landing operations;
- (b) The touchdown zone and the mid-point of the runway intended for Category II instrument approach and landing operations; and
- (c) The touchdown zone, the mid-point and stop-end of the runway intended for Category III instrument approach and landing operations.

1.3.5 The units providing air traffic service and aeronautical information service for an aerodrome must be kept informed without delay of changes in the serviceability status of the automated equipment used for assessing runway visual range.

1.4 **Present weather**

1.4.1 The present weather occurring at the aerodrome and/or its vicinity must be observed and reported as necessary. The following present weather phenomena must be identified, as a minimum: precipitation and freezing precipitation (including intensity thereof), fog, freezing fog and thunderstorms (including thunderstorms in the vicinity).

1.4.2 For local routine and special reports, the present weather information must be representative of conditions at the aerodrome.

1.4.3 For METAR and SPECI, the present weather information must be representative of conditions at the aerodrome and, for certain specified present weather phenomena, in its vicinity.

1.5 **Clouds**

1.5.1 Cloud amount, cloud type and height of cloud base must be observed and reported as necessary to describe the clouds of operational significance. When the sky is

obscured, vertical visibility must be observed and reported, where measured, in lieu of cloud amount, cloud type and height of cloud base. The height of cloud base and vertical visibility must be reported in meters (or feet).

1.5.2 Cloud observations for local routine and special reports must be representative of the approach area.

1.5.3 Cloud observations for METAR and SPECI must be representative of the aerodrome and its vicinity.

1.6 Air temperature and dew-point temperature

1.6.1 The air temperature and the dew-point temperature must be measured and reported in degrees Celsius.

1.6.2 Observations of air temperature and dew-point temperature for local routine and special reports and METAR and SPECI must be representative of the whole runway complex.

1.1 Atmospheric pressure

1.7.1 The atmospheric pressure must be measured, and QNH and QFE values must be computed and reported in hectopascals.

1.8 Supplementary information

1.8.1 Observations made at aerodromes should include the available supplementary information concerning significant meteorological conditions, particularly those in the approach and climb-out areas. Where practicable, the information should identify the location of the meteorological condition.

174.06.7 Reporting Meteorological Information from Automatic Observing Systems

1.1 METAR and SPECI from automatic observing systems may be used, to the maximum extent practicable, during non-operational hours of the aerodrome, and during operational hours of the aerodrome as determined by the meteorological authority in consultation with users based on the availability and efficient use of personnel.

- 1.2 A MET provider must develop procedures on the use of automatic meteorological observing systems.
- 1.3 Local routine and special reports from automatic observing systems may be used during operational hours of the aerodrome as determined by the meteorological authority in consultation with users based on the availability and efficient use of personnel.
- 1.4 Local routine and special reports and METAR and SPECI from automatic observing systems must be identified with the word "AUTO".

174.08.2 Aerodrome Forecasts

- 1.1 A MET service provider must prepare an aerodrome forecasts for aerodromes for which they have the responsibility to provide MET services.
- 1.2 An aerodrome forecast must be issued at a specified time not earlier than one hour prior to the beginning of its validity period and consist of a concise statement of the expected meteorological conditions at an aerodrome for a specified period.
- 1.3 Aerodrome forecasts and amendments thereto must be issued as TAF and include the following information in the order indicated:
 - (a) Identification of the type of forecast;
 - (b) Location indicator;
 - (c) Time of issue of forecast;
 - (d) Identification of a missing forecast, when applicable;
 - (e) Date and period of validity of forecast;
 - (f) Identification of a cancelled forecast, when applicable;
 - (g) Surface wind;
 - (h) Visibility;
 - (i) Weather;
 - (j) Cloud; and
 - (k) Expected significant changes to one or more of these elements during the period of validity.
 - (l) Optional elements must be included in TAF in accordance with regional air navigation agreement.

Compliance Note: The visibility included in TAF refers to the forecast prevailing visibility.

- 1.4 A MET service provider preparing TAF must keep the forecasts under continuous review and, when necessary, must issue amendments promptly. The length of the forecast messages and the number of changes indicated in the forecast must be kept to a minimum.
- 1.5 TAF that cannot be kept under continuous review must be cancelled.
- 1.6 The period of validity of a routine TAF must be not less than 6 hours or more than 30 hours; the period of validity must be determined by regional air navigation agreement. Routine TAF valid for less than 12 hours should be issued every 3 hours and those valid for 12 to 30 hours must be issued every 6 hours.
- 1.7 When issuing TAF, meteorological offices must ensure that not more than one TAF is valid at an aerodrome at any given time.

ISSUING OF METAR, SPECI AND TAF

1. Guidance and Procedures

1.1 General

- 1.1.1. METAR is the name of the code for an aerodrome routine weather report. A METAR is issued at hourly or half-hourly intervals.
- 1.1.2. SPECI is the name of the code for an aerodrome special weather report. A SPECI can be issued at any time when certain criteria are met.
- 1.1.3. METAR information is used by Meteorological Watch Office in the production of Aerodrome Forecasts (TAF) and other forecasts.
- 1.1.4. Meteorological aerodrome report (METAR), may be disseminated beyond an aerodrome to pilots and other meteorological service providers using processes that adhere to NAM-CARs/CATS Parts 174.

1.2 Meteorological Elements in a METAR

1.2.1 Surface wind

Surface wind coding requirements

1.2.1.1 General format: dddffGfmfmKTdndndnVdxdxdx

Where

- ddd is the mean surface wind direction over the previous 10 minutes
- ff is the mean surface wind speed over the previous 10 minutes
- fm is the maximum surface wind gust speed over the previous 10 minutes
- dn and dx describe the variation in surface wind speed (in clockwise order) over the previous 10 minutes is the surface wind speed

1.2.1.2 Surface wind information for the METAR report should be taken from an anemometer located on the aerodrome.

1.2.1.3 The anemometer should be sited in a suitable location to provide a representative measurement of conditions over the whole of the runway

where there is only one runway or the whole runway complex where there are two or more.

1.2.1.4 The direction from which the surface wind is blowing shall be given in degrees from true North and the speed shall be given in knots.

1.2.1.5 The surface wind direction and speed reported is the average taken over a ten-minute period immediately preceding the time of the observation.

1.2.1.6 When the wind speed is less than 1 knot, this should be reported as calm.

1.2.1.7 It is recommended that averages of wind speed and variations in the wind direction and speed should be generated by automatic equipment.

1.2.1.8 The surface wind direction mean and variations in direction shall be rounded to the nearest 10 degrees in the METAR.

1.2.1.9 Wind directions of 005, 015 degrees etc. should be rounded down.

1.2.1.10 Surface wind direction is reported between 010 and 360 degrees.

1.2.1.11 The surface wind mean speed and maximum speed shall be rounded to the nearest knot in the METAR.

1.2.1.12 Surface wind speed is reported between 01 and 99 knots. If the speed is 100 knots or more, the wind speed should be encoded as "P99".

1.2.2 CAVOK

Coding requirements

1.2.2.1 General format: CAVOK

1.2.2.2 The visibility, RVR, weather and cloud groups are replaced by **CAVOK** (Cloud And Visibility OK) when the following conditions exist simultaneously:

- 1) Prevailing visibility is 10 km or more.
- 2) No minimum visibility is reported.
- 3) No cloud below 5000 ft or below the highest Minimum Sector Altitude, whichever is the greater.

4) No towering cumulus or cumulonimbus clouds.

5) No significant weather phenomena at or in the vicinity of the aerodrome.

1.2.2.3 CAVOK should be used when the meteorological visibility is 10 km, there is no weather and there is broken cloud (5-7 oktas) at 5000 ft.

1.2.3 Visibility – meteorological minimum and maximum

Visibility coding requirements

1.2.3.1 General format: VVVV VNVNVNVNDv

Where

- VVVV = prevailing meteorological visibility
- VNVNVNVN = minimum meteorological visibility
- DV = one or two letters indicating one of the eight points of the compass that best describes the direction of the meteorological visibility, relative to the aerodrome meteorological observer's station.

1.2.3.2 Prevailing visibility is defined as “the greatest visibility value that is reached within at least half the horizon circle or within at least half of the surface of the aerodrome. These areas could comprise contiguous or noncontiguous sectors.”

1.2.3.3 In the METAR, the visibility reported is the prevailing visibility and, under certain circumstances, the minimum visibility. In order to determine the prevailing visibility and any requirement to report the minimum visibility, the variation of visibility in all directions around the aerodrome should be considered.

1.2.3.4 The visibility reported in the METAR should be assessed at a height of about 1.5 m above the ground at the observing site. Observers should be aware of possible errors generated by reporting ‘slant’ visibility when meteorological visibility is assessed at heights greater than 1.5 m above the ground.

1.2.3.5 If the visibility in one direction which is not the prevailing visibility, is less than 1500 m or less than 50% of the prevailing visibility, the lowest visibility observed should be reported after the prevailing visibility and its general direction in relation to the aerodrome indicated by reference to one of the eight points of the compass. If the lowest visibility is observed in more than one direction, then the most operationally significant direction should be reported. When the visibility is fluctuating rapidly and the prevailing visibility cannot be determined, only the lowest visibility should be reported, with no indication of direction.

1.2.3.6 There is no requirement to report the lowest visibility if it is 10 km or more.

1.2.3.7 When conditions exist such that 'CAVOK' (defined in 1.2.2 above) applies, visibility shall be omitted from reports, and 'CAVOK' shall be reported instead. The applicability of CAVOK shall be based on the minimum visibility, if reported in the METAR, otherwise on the prevailing visibility.

1.2.3.8 **VVV** shall always appear in the METAR as four figures, expressed in metres when the visibility is less than 10 km (coded as '9999' when the visibility is 10 km or more).

1.2.3.9 Visibility shall be recorded in metres rounded down to:

- 1) the nearest 50 m when the visibility is less than 800 m;
- 2) the nearest 100 m when the visibility is 800 m or more but less than 5000 m;
- 3) the nearest 1000 m when the visibility is 5000 m or more but less than 10 km.

1.2.3.10 Any observed value which does not fit the reporting scale in use shall be rounded down to the nearest lower step in the scale.

1.2.3.11 A visibility of less than 50 m shall be encoded as '0000'.

1.2.3.12 A visibility of 50 m shall be encoded '0050'.

- 1.2.3.13 A visibility of 10 km or more shall be encoded '9999' (unless CAVOK applies).

1.2.4 Runway visual range

Runway visual range coding requirements

1.2.4.1 General format: RDRDR/VRVRVRVR

Where

- R is the group identifier.
- DRDR is the runway designator of the threshold nearest to which the RVR is measured, followed (if necessary) by L, C or R to distinguish left, centre and right parallel runways respectively.
- VRVRVRVR is the RVR value reported in metres.

1.2.4.2 Runway Visual Range (RVR) is a measure of the horizontal visibility along the runway. RVR assessments are made either by human observation (HORVR) or an Instrument RVR (IRVR).

1.2.4.3 HORVR is only reported for the touchdown zone. IRVR systems may have sensors located at the touchdown zone, mid-point and stop end of each runway. However, for METAR purposes, only the touchdown zone measurement is given. If the touchdown zone value is not available, then the RVR group for that runway shall be omitted.

1.2.4.4 Where there is more than one runway available for landing, the touchdown zone RVR should be included for all such runways (up to a maximum of four).

1.2.4.5 When IRVR systems are used an RVR should not be computed for a light intensity of 3 per cent or less of the maximum light intensity available on a runway. For METAR reports the RVR should be based on the maximum light intensity available on the runway.

1.2.4.6 The RVR group shall be reported in the METAR only when either the minimum visibility or the runway visual range is observed to be less than 1500 m.

NOTE: Runway visual range reports may be provided locally in other circumstances to support operational requirements.

1.2.4.7 VRVRVRVR shall be inserted in the METAR after a solidus (/) and always as four figures.

1.2.4.8 50 m should be regarded as the minimum value that is possible to report. When the actual RVR is less than this, the minimum value shall be preceded by 'M'.

1.2.4.9 2000 m should be regarded as the maximum value that it is possible to report. If the actual value is greater than can be reported by the runway visual range equipment or human observed method, the maximum value shall be preceded by 'P'.

NOTE: The maximum value of runway visual range that can be reported for a particular runway may be significantly less than 2000 m due to equipment limitations or topography.

1.2.4.10 IRVR systems shall be sampled at a minimum of once per minute. An averaging period of 1 minute should be used for weather reports to ATS. An averaging period of 10 minutes for METAR reports should be used, however where a marked discontinuity occurs only those values after the discontinuity should be used for obtaining mean values.

NOTE: A marked discontinuity occurs when there is an abrupt and sustained change in runway visual range, lasting at least 2 minutes and which reaches or passes through the criteria for the issuance of special reports to ATS as detailed in Chapter 5 Para 5.38 and 5.39 Runway Visual Range.

1.2.4.11 VRVRVRVR shall always appear in the METAR as four figures expressed in metres.

1.2.4.12 RVR is reported in metres, rounded down to:

- 1) the nearest 25 m for RVR below 400 m;
- 2) the nearest 50 m for RVR between 400 m and 800 m;
- 3) the nearest 100 m for RVR above 800 m.

1.2.4.13 Any observed value which does not fit the reporting scale in use shall be rounded down to the nearest lower step in the scale.

1.2.5 Present weather

Present weather coding requirements

1.2.5.1 General format: w'w'

Where

- w'w' is the present weather

- 1.2.5.2 Entries of present weather shall only relate to weather occurring at the time of observation on or over the aerodrome, or, in the case of reporting phenomena in the vicinity of the aerodrome, within approximately 8 km of the Aerodrome Reference Point. Visual reference points, information from radar, pilot reports and automatic sensors may be used to assist in this determination.
- 1.2.5.3 If there is no weather of significance to aeronautical operations at the time of the observation, either on or in the vicinity of the aerodrome, the group is omitted. The abbreviation 'NSW' (no significant weather) is not used in the METAR.
- 1.2.5.4 The intensity of weather phenomena shall only be reported if it relates to precipitation (including that qualified by freezing, shower or thunderstorm) and blowing snow. The intensity is indicated by the appropriate symbol.
- 1.2.5.5 The symbol for heavy ('+') may also be used to qualify a 'well developed' funnel cloud, waterspout or dust/sand whirls.
- 1.2.5.6 Only certain phenomena are reported if they occur within approximately 8 km of the Aerodrome Reference Point. These are blowing dust, sand and snow, funnel cloud, waterspout, dust/sand whirls, fog, shower and thunderstorm. In all cases the intensity of the phenomenon is not reported. Also, in the case of shower in the vicinity and thunderstorm in the vicinity, the precipitation type is not specified.
- 1.2.5.7 The following restrictions apply to the use of the descriptors:
- 1) No more than one descriptor shall be included in a w'w' group.
 - 2) The following descriptors shall only be used in combination with fog: shallow (less than 2 m above ground level), patches (fog patches randomly covering the aerodrome) and partial (a substantial part of the aerodrome covered by fog while the remainder is clear).
 - 3) The following descriptors shall only be used in combination with dust, sand and snow: low drifting if raised by the wind to a height less than 2 m above ground level and blowing if raised by the wind to a height of 2 m or more above ground level.
 - 4) The freezing descriptor shall be used only in combination with fog, drizzle and rain.
 - 5) The thunderstorm descriptor may be inserted alone if thunder is heard with no precipitation.
 - 6) The descriptors for thunderstorm and shower shall be used only in combination with rain, snow, small hail/snow pellets and hail.
- 1.2.5.8 The present weather codes for fog patches, fog covering a partial part of the aerodrome and fog in the vicinity of the aerodrome may be reported whatever the meteorological visibility reported.
- 1.2.5.9 The present weather code for fog shall be used only when the prevailing visibility is less than 1000 m in all directions from the observer's position. If this is not the case then the observer should consider the use of one of the descriptors given in paragraph 1.2.5.8.

- 1.2.5.10 The present weather code for freezing fog shall be used only when the prevailing visibility is less than 1000 m in all directions from the observer's position and the air temperature is less than 0°C.
- 1.2.5.11 The present weather code for shallow fog and mist shall be used only when the prevailing visibility reported is 1000 m or more. Observers should ensure that the reduction in visibility is due to water droplets (relative humidity should be at least 95%) and not due to smoke or haze.
- 1.2.5.12 The present weather codes for mist, dust, smoke and haze shall be used only when the prevailing visibility is 5000 m or less.
- 1.2.5.13 There are two present weather codes for hail. Hail is reported if transparent, translucent or opaque balls or pieces of ice (hailstones) are observed. Hailstones have a diameter of 5 mm or more and fall from deep cumuliform cloud. When they fall on hard ground, they bounce with an audible sound. Small hail and/or snow pellets on the other hand have a diameter of less than 5 mm and take the form of translucent ice particles, or snow pellets encased in ice. The largest stones shall determine which element is reported and it shall be used only in combination with shower or thunderstorm.
- 1.2.5.14 If a mixture of precipitation types is falling at the time of the observation, they shall be encoded and combined into a single group in order of dominance, prefixed by intensity (which refers to the intensity of the total precipitation) and/or shower or thunderstorm as appropriate, e.g. '-DZRA', 'RADZ', '-SHRASN', '+TSSNRAGS'.
- 1.2.5.15 When more than one independent phenomenon is occurring simultaneously, separate groups shall be inserted (up to a maximum of three groups), in the order given by the columns, that is: precipitation first, then 'obscuration', and finally 'other' (e.g. '+SHGS BLSN SQ'). However, if a thunderstorm is reported, then this shall take precedence over any precipitation in the coding of present weather groups in the METAR.
- 1.2.5.16 When snow falling from cloud and blowing snow are observed simultaneously, both shall be included in the present weather report; e.g. 'SN BLSN'. However, if due to heavy blowing snow it cannot be ascertained that snow is falling from cloud, only '+BLSN' shall be reported.
- 1.2.5.17 Thunderstorm, thunderstorm in the vicinity and thunderstorm with precipitation, shall be reported as 'present weather' if thunder is heard within ten minutes preceding the observation. If lightning is seen but thunder not heard, then it is likely that the thunderstorm is not within 8 km of the Aerodrome Reference Point and should not be reported in the METAR. Observers based in buildings that contain sound-reduction materials should try to establish whether thunder is heard or if the thunderstorm is within 8 km of the Aerodrome Reference Point by any appropriate means.

1.2.5.18 A guide to the descriptors and weather phenomena

Blowing (BL)

- A descriptor used to indicate that dust, sand or snow has been raised by the wind to a height of 2 m or more.

Drizzle (DZ)

- A fairly uniform precipitation of very fine drops of water with a diameter less than 0.5 mms, falling from thin stratiform cloud.
- The impact of drizzle droplets falling on a water surface is imperceptible, but continuous drizzle may produce run-off from roofs and runway surfaces.
- Visibility is inversely related to both the intensity of the precipitation and the number of droplets.
- Also, generally, the heavier the drizzle, the lower the cloud base will be. Light drizzle corresponds to negligible run-off from roofs, whilst moderate drizzle, typically associated with visibility less than 3000 m, will produce some run-off.
- Heavy drizzle corresponds to a rate of accumulation greater than 1 mm per hour.

Dust (DU)

- A widespread suspension of small particles of dust raised from the ground, reported when it reduces the prevailing visibility to 5000 m or less.

Dust devil (PO)

- A near vertical, rapidly rotating column of air, forming a dust and/or sand whirl as a result of very strong local convection over hot, dry ground; lifting dust, sand, grass cuttings and other light materials picked up from the surface.
- Dust devils are usually only a few metres in diameter and extend no higher than 200-300 ft. They can be qualified by 'well developed' ('+PO').

Fog (FG)

- A suspension in the air of very small water droplets (or at very low temperatures, minute ice crystals), the prevailing visibility within which is less than 1000 m.
- Relative humidity will be at or near 100% (viz. dry bulb and dew point temperatures equal or very close to each other in value).

Freezing (FZ)

- A descriptor used when it is necessary to indicate that the water droplets in fog, drizzle or rain are in a supercooled state (viz. liquid at a temperature below 0.0°C).
- On impact with the ground or an airframe, supercooled precipitation usually forms glaze (clear ice); usually, it falls from stratiform cloud.
- Supercooled fog may deposit rime (scales or grains of ice), but rarely clear ice.

Funnel cloud (FC)

- This is a rotating column of air, often a violent whirlwind, indicated by the presence of an inverted cone-shaped cloud, extending downwards from the base of a cumulonimbus cloud, but not necessarily reaching the surface.
- The diameter can vary from a few metres to some hundreds of m. A funnel cloud that touches the surface is described as 'well developed', and known as a tornado if over ground, and a waterspout if over water.

Hail (GR)

- Transparent, translucent or opaque balls or pieces of ice (hailstones) with a diameter of 5 mms or more, falling from deep cumuliform cloud with vigorous updraughts within.
- When falling on hard ground, it bounces with an audible sound.

Small hail (GS)

- As 'hail', but with a diameter less than 5 mms, in the form of translucent ice particles, or snow pellets encased in ice.

Haze (HZ)

- Haze is caused by a widespread amount of extremely small dry particles in the air, invisible to the naked eye, but sufficiently numerous to give the air a pale, whitish or opalescent appearance.
- It shall be reported when it reduces the prevailing visibility to 5000 m or less. In this case, the relative humidity will be less than 95% (and, as a guide, the difference between dry bulb and dew point temperatures is usually greater than 1°C).

Ice pellets (PL)

- Frozen raindrops or re-frozen melted snowflakes falling from deep stratiform cloud, in the form of transparent or translucent ice particles, usually having a diameter of 5 mms or less, which bounce with an audible sound on impact and are not easily crushed.
- Ice pellets indicate that supercooled precipitation may be present at higher levels and may occur before or after freezing rain.

Low drifting (DR)

- A descriptor used to indicate that dust, sand or snow has been raised by the wind to a height of less than 2 m.

Mist (BR)

- A suspension of microscopic water droplets or wet hygroscopic particles in the air.
- It should be reported when it reduces the prevailing visibility to between 1000m and 5000m or less.
- In this case, the relative humidity will be 95% or more (and, as a guide, the difference between dry bulb and dew point temperatures is usually 1°C or less).

Partial (PR)

- A descriptor used only in combination with 'FG' to indicate that fog, 2 m or more deep, covers a substantial part of the aerodrome, while the remainder is clear (e.g. a bank some hundreds of metres across).
- The meteorological visibility reported will depend on the proximity of the edge of the fog bank to the observer.

Patches (BC)

- A descriptor used only in combination with 'FG' to indicate that fog, 2 m or more deep, is present on the aerodrome in irregularly distributed patches.
- The meteorological visibility reported will depend on the proximity of the nearest fog patch to the observer.

Rain (RA)

- A precipitation of liquid water droplets with a diameter of 0.5 mms or more, falling from cloud. Diameter and concentration of the drops may vary considerably according to the intensity of the precipitation, its nature and source (viz. light, moderate or heavy; intermittent or continuous).
- If the precipitation falls from cumiliform cloud, then it is further described as a shower.

NOTE: As a guide to observers, light rain is precipitation of low intensity; it may consist of scattered large drops or more numerous smaller drops. The rate of accumulation on the ground is such that puddles form only slowly, if at all. Moderate rain falls fast enough to form puddles rapidly, to make down-pipes flow freely, and to give some spray on hard surfaces. Heavy rain is a downpour, which makes a roaring noise on roofs, forms a misty spray on road surfaces etc.

Sand (SA)

- This typically would be used only in combination with 'BL' or 'DR', to report particles of sand lifted off the ground by the wind.

Shallow (MI)

- A descriptor used only in combination with 'FG' when ground fog, whether patchy or a continuous layer, is less than 2 m deep, and hence the reported meteorological visibility will be 1000 m or more.
- Operationally shallow fog may cause problems by obscuring runway markings and lights.

Shower (SH)

- A descriptor used to identify precipitation (rain, snow, hail, snow pellets) falling from cumuliform clouds.
- Showers are often short-lived and can be characterised by their sudden beginning and ending, and by large and rapid changes in precipitation intensity.

Smoke (FU)

- A suspension in the air of small particles produced by combustion, frequently imparting a grey or blue hue to the atmosphere.
- It should be reported when it reduces the prevailing visibility to 5000 m or less; it may even be reported when the prevailing visibility is less than 1000 m if there are no suspended water droplets, and the relative humidity is not higher than 90%.

Snow (SN)

- A solid precipitation of aggregated ice crystals falling from cloud as snowflakes.
- The shape, size and concentration of snowflakes vary considerably according to the temperature at which they form and the conditions in which they develop.
- At very low temperatures, snowflakes are small and often show a six-rayed starlike structure. Near to freezing point, they are agglomerated, and may have a diameter greater than 25 mms.

Snow grains (SG)

- Very small opaque white particles of ice, fairly flat or elongated with a diameter generally less than 1 mm, that fall from a layer cloud – the frozen equivalent of drizzle.

Snow pellets (GS)

- White, opaque, approximately round ice particles falling from cumuliform cloud, often together with snow, at temperatures near 0.0oC, and usually having a diameter of 2 to 5 mms, resembling tiny compacted snowballs.
- They rebound when falling on a hard surface and are crisp and easily crushed. Snow pellets result from hail being blown out of the side or top of cumulonimbus before the manufacturing process is complete.

Squall (SQ)

- A strong wind that rises suddenly: that is by at least 16 knots, increasing to 22 knots or more, and sustained for at least one minute, then dying away quickly; distinguished from a gust by its longer duration.
- A squall is associated with violent convective activity and the passage of active cold fronts. In the latter case, typically squalls occur along the line of the front, accompanied by a veer in wind, a sharp fall in temperature, a rise in relative humidity and the appearance of a roll-shaped cloud with a horizontal axis.

Thunderstorm (TS)

- One or more sudden electrical discharges manifested by a flash of light (lightning) and a sharp crack or rumbling sound (thunder).
- Thunderstorms are associated with cumulonimbus clouds.
- When thunder is heard with no precipitation falling on the aerodrome, 'TS' alone is reported in the METAR, or 'VCTS' if the source is estimated to be within 8 km of the Aerodrome Reference Point.

- To report a thunderstorm with precipitation at the aerodrome, 'TS' is used as a descriptor, and combined with the appropriate precipitation abbreviations and prefixed (where necessary) by an intensity symbol based on the rate of fall of the precipitation.

Volcanic ash (VA)

- A suspension or precipitation of dust or solid particles in the atmosphere, known to be originating from an active volcano.

1.2.6 Cloud

Coding requirements

1.2.6.1 General format: NsNsNshshs(CC) or NSC or NCD or VVhshshs

Where

- NsNsNs is the cloud amount expressed as either FEW, SCT, BKN, OVC. hshshs is the height of the cloud base in 100s of ft above aerodrome.
- (CC) is the cloud type where applicable, only cumulonimbus (CB) and/or towering cumulus (TCU) are coded in the METAR.
- NSC represents no significant cloud i.e. no cloud below 5000 ft or below the minimum sector altitude (whichever is the greater) and no towering cumulus or cumulonimbus (TCU or CB).
- NCD is not used by human observers. It represents no cloud discernible and is ONLY reported by automatic observing systems to indicate that no clouds are detected by the system.
- VVhshshs is the vertical visibility height. VV/// indicates that vertical visibility height is not measured, or sky obscured.

1.2.6.2 Normally up to three cloud layers may be reported (although in certain circumstances more can be reported - see (4) below):

- 1) the lowest layer, whatever the amount;
- 2) the next layer above of amount 3 oktas or more (SCT, BKN or OVC);
- 3) the next layer above of amount 5 oktas or more (BKN or OVC);
- 4) insert any towering cumulus or cumulonimbus cloud omitted by the above rules, whilst retaining base height order from lowest to highest.

1.2.6.3 The cloud amount (NsNsNs) can be expressed as:

- 1) FEW no more than quarter cover (1-2 oktas)
- 2) SCT over $\frac{1}{4}$ but no more than $\frac{1}{2}$ cover (3-4 oktas)
- 3) BKN over half but not complete cover (5-7 oktas)
- 4) OVC complete cover (8 oktas)

1.2.6.4 The height of the cloud base (hshshs) is reported in hundreds of ft above aerodrome level.

1.2.6.5 Where there is no cloud below 5000 ft or below the highest minimum sector altitude (whichever is greater) and there is no towering cumulus or cumulonimbus, 'NSC' (no significant cloud) is reported.

1.2.6.6 The cloud type is usually not specified. However, significant convective cloud, indicated by 'TCU' (Towering Cumulus), defined as 'cumulus with

strong vertical development', and 'CB' (Cumulonimbus), shall be inserted (without a space) after the height of the cloud base. The amount, height of cloud base and cloud type of towering cumulus or cumulonimbus shall be reported, irrespective of the cloud base height.

1.2.6.7 When concurrent TCU and CB cloud masses appear to have a common base, the amount shall be encoded from the sum of the individual amounts, and the type reported as cumulonimbus.

1.2.6.8 The height of the cloud base is rounded down to the nearest hundred ft up to 10000 ft and to 1000 ft thereafter. A base height of less than 100 ft above the aerodrome is encoded '000'.

1.2.6.9 When the term CAVOK applies (see paragraphs 4.22 to 4.24), 'CAVOK' is reported in lieu of cloud information.

1.2.6.10 When the sky is obscured due to fog, falling or blowing snow, 'VV///' is reported in lieu of cloud information. Note that in the UK, vertical visibility is not assessed.

1.2.6.11 When 'TS' (thunderstorm) is reported as present weather, 'CB' (cumulonimbus) shall be reported.

1.2.7 Air temperature and dew point

Coding requirements

1.2.7.1 General format: T'T' / T'dTd

Where

- T'T' = the dry bulb temperature to the nearest whole °C. T'dTd = the dew point temperature to the nearest whole °C.

1.2.7.2 Two temperatures are given in the METAR; the outside air temperature and the dew point. The dew point is not measured directly from a thermometer; however, it can be calculated from the dry bulb and wet bulb temperatures or the relative humidity.

1.2.7.3 When the wet-bulb is frozen, the ice-bulb temperature is used to compute dew point.

1.2.7.4 The dry bulb and dew point temperatures are reported to the nearest whole degree Celsius (°C). A two-digit figure for each temperature is given, preceded by 'M' if a temperature is negative.

1.2.7.5 When the temperature value is a 0.5 reading, the value is reported to the warmer temperature. Therefore 3.5°C is rounded up to 4°C and minus 3.5°C is rounded up to minus 3°C.

1.2.7.6 A temperature or dew point between minus 0.5°C and minus 0.1°C is encoded as 'M00', whilst a temperature or dew point between 0.0°C and plus 0.4°C is encoded as '00'.

1.2.7.7 Exceptionally, if a dew point temperature is unavailable, it is replaced by additional solidii (//).

1.2.8 Atmospheric pressure

Coding requirements

1.2.8.1 General format: QPHPHPHPH

Where

- Q is the group identifier PHPHPHPH is the atmospheric pressure, corrected to mean sea level (QNH).

1.2.8.2 Atmospheric pressure is used by aircraft altimeters and for this reason it is important to provide accurate pressure measurements.

1.2.8.3 The QNH is the atmospheric pressure corrected to mean sea level (based on International Standard Atmosphere conditions throughout the height difference) and is reported in the METAR rounded down to the nearest whole hectopascal.

1.2.8.4 The SI unit of pressure is the Pascal; for reference the millibar is equivalent to 10000 Pascals or 1 hectopascal).

1.2.8.5 The pressure is inserted in the METAR rounded down to the nearest whole hectopascal, prefixed by indicator letter 'Q'.

1.2.8.6 Pressure settings, such as QNH and QFE, are normally integer values. Pressure settings should be available to an accuracy of one tenth of a hectopascal on request.

1.2.8.7 If the value is less than 1000 hectopascals, a zero shall be inserted following 'Q'.

1.2.9 Recent weather

Coding requirements

1.2.9.1 General format: REWW'

Where

- w'w' is the abbreviation for recent weather groups; always preceded by RE.

1.2.9.2 Recent weather is defined as the weather that has ceased or decreased in intensity since the last routine report or within the last hour, whichever is the shorter. In the METAR, it is reported after the QNH.

1.2.9.3 Recent weather should be encoded and inserted in the METAR if, during the period since the last routine report or in the last hour (whichever is the shorter), one or more of the phenomena listed below was observed at the station and has since ceased or is still on-going, but decreased in intensity.

- 1) Freezing precipitation of any intensity.
- 2) Moderate or heavy: drizzle, rain, snow, ice pellets, snow pellets, hail (any diameter), blowing snow.
- 3) Funnel cloud (tornado, waterspout); volcanic ash.
- 4) Thunderstorm (that occurred with or without precipitation) - however the recent thunderstorm is reported in one group. Any associated precipitation is reported in separate groups following rules 1) and 2) above.

1.2.9.4 Up to three recent weather groups may be reported. Each group is formed using the appropriate present weather two-letter abbreviations prefixed by the indicator letters 'RE'.

1.2.9.5 Not all recent weather is regarded as operationally significant.

1.2.9.6 A recent weather group is not inserted if the same phenomenon of a similar or greater intensity is reported as present weather.

1.2.9.7 Intensity qualifiers are not used when reporting recent weather.

1.2.10 TREND forecast

General format: NOSIG or BECMG [change group] or TEMPO [change group]

1.2.10.1 Time indicators and periods are used to give additional meaning to the above change descriptors

