

Aerodrome Reports and Forecasts

A Users' Handbook to the Codes

WEATHER CLIMATE WATER



WORLD
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FOREWORD

This booklet is a simple guide to the aeronautical meteorological codes, **METAR**, **SPECI** and **TAF**, applicable on 8 November 2018, updated as a result of the alignment of the *Technical Regulations* (WMO-No. 49), Volume II – Meteorological Service for International Air Navigation, Parts I and II, with Amendment 78 to Annex 3 to the Convention on International Civil Aviation. It is aimed at a wide range of users such as pilots, flight dispatchers, air traffic control staff and meteorological observers at smaller aerodromes where sophisticated automated instruments are not available. Although the readers of this handbook may not be professional meteorologists, it is assumed that they have some formal meteorological training.

The handbook answers basic questions on the preparation of meteorological reports and forecasts, such as:

- The information to be included;
- The order to be used;
- How the information is to be encoded and decoded.

At the end of the booklet, explanations of weather phenomena significant to aviation are provided. For more details on the codes, the relevant sections of the WMO *Manual on Codes* (WMO-No. 306) on **METAR**, **SPECI** and **TAF** should be consulted.

METAR and **SPECI** are still being encoded mainly based on human weather observations. Although instruments are increasingly being used, the observer continues to play a major and important part in ensuring that prepared weather reports satisfy the stated requirements. Nevertheless, certain limitations should be understood. For instance, when visibility is 10 km or more, the observer at the usual observing site, even at larger airports, should be able to see and report clouds over a wide area, including some distance on the approach. If visibility is, for instance, only 2 000 m, the field of vision is greatly reduced and patches of low cloud on the approach may not be seen or so reported.

Aerodrome forecasts, in **TREND** and **TAF** forms, are not intended to provide detailed descriptions of the weather during the forecast period. The first part of the **TAF** gives the forecaster's assessment of the most likely forecast values at the start of the forecast period. Any changes that take place during the forecast period are indicated only if the changes are significant. Significant changes are defined as a result of full discussions with the International Civil Aviation Organization (ICAO) and the aviation users.

PART A

AVIATION WEATHER REPORTS – METAR AND SPECI

METAR is the name of the code for an aerodrome routine weather report. A **METAR** is issued at hourly or half-hourly intervals.

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 (see *Technical Regulations* (WMO-No. 49), Volume II, Part II, Appendix 3, section 2.3).

Both **METAR** and **SPECI** have the same code form and both may have a **TREND** forecast appended (see Part B (page 29)).

METAR or **SPECI** contains the following information in the order shown:

IDENTIFICATION GROUPS

SURFACE WIND

PREVAILING VISIBILITY

RUNWAY VISUAL RANGE (if available)

PRESENT WEATHER

CLOUD (or vertical visibility if appropriate)

AIR AND DEWPOINT TEMPERATURE

PRESSURE – QNH

SUPPLEMENTARY INFORMATION

Notes:

1. The code word **CAVOK** is used to replace the visibility, present weather and cloud groups when the three following conditions are simultaneously met:
 - Visibility is 10 km or more;
 - There is no cloud below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater, and no cumulonimbus;
 - There is no significant weather phenomenon as contained in Code table 4678 (reproduced on page 13) of the *Manual on Codes* (WMO-No. 306), Volume I.1, Part A – Alphanumeric codes, section C.
2. At the end of a **METAR** or **SPECI**, a remarks section starting with the code word **RMK** may be appended. This section contains information required by a national authority and, as such, this information is not disseminated internationally.

CODE FORMAT

METAR
or
SPECI } COR CCCC YYGGggZ NIL AUTO

ENCODE SO FAR

SPECI LUDO 211025Z

1. **IDENTIFICATION GROUPS**

This section will have three parts:

- The report code name (**METAR** or **SPECI**).
- The ICAO location indicator of the reporting station, for example, **LUDO**.
- The day of the month and the time of observation in hours and minutes UTC (coordinated universal time), followed by the letter **Z**.

Notes:

1. The code words **COR** and **NIL** are inserted after the code name and the time group, respectively, as appropriate.
2. The code word **AUTO** is inserted when the report contains a fully automated observation, that is without human intervention.

The encode on the opposite page reads:

Aerodrome special report at **LUDO** on 21 of the month at 10 h and 25 min UTC, being the time of occurrence of the change.

CODE FORMAT

dddffG_mf_m $\left\{ \begin{array}{l} \text{KT} \\ \text{or} \\ \text{MPS} \end{array} \right\} d_n d_n d_n V d_x d_x d_x$

ENCODE SO FAR

SPECI LUDO 211025Z 31015G27KT 280V350

2. SURFACE WIND

Normally, there will be a five-figure group to indicate the 10-min mean wind followed by an abbreviation to indicate the wind speed units used, where **KT** denotes knots and **MPS** denotes metres per second. The first three figures indicate the wind direction, and the last two the wind speed.

Examples: **31015KT**

27006MPS

The surface wind direction and speed shall be reported in steps of 10° true and 1 kt, respectively. Any observed value which does not fit the reporting scale in use shall be rounded to the nearest step in the scale.

Additionally, if, during the 10 min preceding the observation, the maximum gust speed has exceeded the mean speed by 10 kt (5 m s^{-1}) or more, this gust will be reported by inserting the letter **G** followed by the gust speed directly after the mean speed.

Example: **31015G27KT**

If, during the 10 min immediately preceding the observation, the wind direction has varied by 60° or more but less than 180° and the mean wind speed is 3 kt (2 m s^{-1}) or more, the two extreme directions should be indicated in clockwise order, with the letter **V** inserted between the two directions.

Example: **31015G27KT 280V350**

Notes:

1. The wind reported should be the mean over the 10 min preceding the observation. If during this period there has been a marked discontinuity lasting at least 2 min, the mean values should be assessed over the period after the discontinuity. A marked discontinuity occurs when there is a wind direction change of 30° or more with a wind speed of 10 kt (5 m s^{-1}) or more, before or after the change, or a wind speed change of 10 kt (5 m s^{-1}) or more.
2. The averaging period for measuring variations from the mean wind speed (gusts) should be 3 s.

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Special cases

Variable: The wind direction is encoded as **VRB** only if one of the following conditions is met:

- (a) The wind speed is less than 3 kt (2 m s^{-1}).

Example: **VRB02KT**

- (b) The wind speed is higher and wind direction is varying by 180° or more and a single direction is impossible to determine, for example when a thunderstorm is over the aerodrome.

Example: **VRB28KT**

Calm: When a wind speed is less than 1 kt (0.5 m s^{-1}), the group is encoded as 00000 followed by the abbreviation for the wind speed units.

Example: **00000KT**

Speeds of 100 kt (50 m s^{-1}) or more: The wind speed shall be preceded by the letter indicator **P** and reported as **P99 KT (P49 MPS)**.

Example: **240P99KT**

CODE FORMAT

VVVV
or
CAVOK } $V_N V_N V_N V_N D_v$

ENCODE SO FAR

**SPECI LUDO 211025Z 31015G27KT 280V350
4000 1400SW**

3. VISIBILITY

The group VVVV shall be used to report prevailing visibility. When horizontal visibility is not the same in different directions, and when visibility is fluctuating rapidly and the prevailing visibility cannot be determined, the group VVVV shall be used to report the lowest visibility.

Example: Prevailing visibility of 4 000 m is encoded as **4000**.

When visibility sensors are used in such a manner that no directional variations can be given, the abbreviation **NDV** shall be appended to the visibility reported.

The reporting scales of visibility are as follows:

- (a) In steps of 50 m if VVVV is less than 800 m;
- (b) In steps of 100 m if VVVV is 800 m or more, but less than 5 km;
- (c) In steps of 1 000 m if VVVV is 5 km or more, but less than 10 km;
- (d) As 10 km when visibility is 10 km or more.

Directional variation in visibility $V_N V_N V_N V_N D_v$

When the visibility is not the same in different directions and when the minimum visibility is different from the prevailing visibility, and less than 1 500 m or less than 50 per cent of the prevailing visibility, the group $V_N V_N V_N V_N D_v$ shall also be used to report the minimum visibility and its general direction.

Example: **1400SW** means that the minimum visibility equals 1 400 m with SW as its general direction.

If the minimum visibility is observed in more than one direction, then D_v shall represent the most operationally significant direction.

Exception

When the minimum visibility is less than 1 500 m and the visibility in another direction is more than 5 000 m, the maximum visibility and its direction should also be reported.

Example: **1400SW 6000N** (1 400 m to the south-west and 6 km to the north)

If the maximum visibility is observed in more than one direction, then the most operationally significant direction is reported.

CODE FORMAT

$R D_{R} D_{R} / V_{R} V_{R} V_{R} V_{R} i$

ENCODE SO FAR

**SPECI LUDO 211025Z 31015G27KT 280V350
4000 1400SW R24/P2000**

4. RUNWAY VISUAL RANGE

Where the runway visual range (RVR) can be determined and when it is reported, the group starts with the letter **R** followed by the runway designator $D_R D_R$ and / followed by the RVR in metres. Up to a maximum of four groups may be reported.

Example: **R24/1100** (runway visual range on runway 24, 1 100 m)

Special cases

When the RVR is assessed to be more than 2 000 m, it should be reported as **P2000**.

Examples: **R24/P2000** (runway visual range on runway 24, greater than 2 000 m)

R24/1800 (prevailing visibility less than 1 500 m, RVR assessed to be 1 800 m)

When the RVR is below the minimum value that can be assessed, the RVR should be reported as **M** followed by the appropriate minimum value that can be assessed.

Example: **R24/M0150** (runway visual range on runway 24, less than 150 m)

The reporting scales of RVR are as follows:

- (a) Increments of 25 m, if RVR is less than 400 m;
- (b) Increments of 50 m, if RVR is between 400 and 800 m;
- (c) Increments of 100 m, if RVR is more than 800 m.

Observed values are rounded down to the nearest lower step of the scale.

Note: For commercial operations many users consider runway visual range to be the most important and critical information. Therefore, where there is the required instrumentation capable of assessing and displaying 1-, 2-, 5- and 10-min mean values, the variations and the tendency of the change are required. The tendency is indicated by **i**, as follows:

- (a) **i = U** when the runway visual range has increased during the 10 min preceding the observation;
- (b) **i = D** when the runway visual range has decreased;
- (c) **i = N** indicates no distinct change in runway visual range;
- (d) When it is not possible to determine a tendency, **i** is omitted.

CODE FORMAT

w'w'

ENCODE SO FAR

**SPECI LUDO 211025Z 31015G27KT 280V350
4000 1400SW R24/P2000 +SHRA**

5. **PRESENT WEATHER**

Code table 4678 (*Manual on Codes*, WMO-No. 306)

QUALIFIER		WEATHER PHENOMENA		
<i>Intensity or proximity</i>	<i>Descriptor</i>	<i>Precipitation</i>	<i>Obscuration</i>	<i>Other</i>
- Light	MI Shallow	DZ Drizzle	BR Mist	PO Dust/sand whirls (dust devils)
Moderate (no qualifier)	BC Patches	RA Rain	FG Fog	SQ Squalls
+ Heavy (well-developed in the case of dust/sand whirls (dust devils) and funnel clouds)	PR Partial (covering part of the aerodrome)	SN Snow	FU Smoke	FC Funnel cloud(s) (tornado or waterspout)
	SG Snow grains	VA Volcanic ash	DU Wide-spread dust	SS Sandstorm
	DR Low drifting	PL Ice pellets	SA Sand	DS Duststorm
	BL Blowing	GR Hail	HZ Haze	
	SH Shower(s)	GS Small hail and/or snow pellets		
	TS Thunderstorm	UP Unknown precipitation		
VC In the vicinity	FZ Freezing (super-cooled)			

Once it has been decided there is a weather phenomenon to be reported, the present weather is encoded by considering each column in the table above.

Example: There is rain: **RA**
 It is heavy: **+**
 It is a shower: **SH**

The encode becomes **+SHRA**.

If more than one weather phenomenon is observed, separate groups will be encoded. However, for more than one form of precipitation, these forms of precipitations will be combined in a single group with the dominant type of precipitation being reported first.

Example: Moderate rain and snow with snow as the dominant precipitation should be encoded as:

SNRA

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There are a few restrictions on the weather phenomena, the most significant being:

- Intensity is reported only with precipitation (including showers and thunderstorms with precipitation), duststorms or sandstorms.
- Smoke, haze, widespread dust and sand (except drifting sand) are reported only when visibility has been reduced to 5 000 m or less.
- Mist is reported when visibility is reduced by water droplets to 1 000 to 5 000 m.
- Fog is reported when visibility is reduced by water droplets to less than 1 000 m.
- Hail (**GR**) should be used only when the diameter of the largest hailstones observed is 5 mm or more. **GS** shall be used in all other cases.
- **VC** denotes not at the aerodrome but not further away than 8 km from the aerodrome perimeter.

Notes:

1. When visibility is 5 000 m or less, one of the phenomena **FU**, **HZ**, **DU**, **SA** and **BR** is reported in the **METAR/SPECI**.
2. When visibility is above 5 km, the phenomena **FU**, **HZ**, **DU**, **SA** and **BR** are not present by definition and are therefore not reported. For instance, if visibility is 5 000 m, it will be encoded as 5000 together with the phenomena **FU**, **HZ**, **DU**, **SA** and **BR**, causing this reduction in visibility.
3. Whereas if visibility is 5 001 to 5 999 m this is still encoded as 5 000 (rounded down to the nearest 1 000 m) in the **METAR/SPECI**, but the phenomena **FU**, **HZ**, **DU**, **SA** and **BR** will not appear.
4. The qualifier **TS** shall be used whenever thunder is heard or lightning detected at the aerodrome within the 10-min period preceding the observation.
5. The descriptor **SH** (showers) cannot be associated with ice pellets (**PL**).
6. When an automatic observing system is used and when the type of precipitation cannot be identified by this system, the abbreviation **REUP** shall be used for recent unknown precipitation.
7. When an automatic observing system is used and when showers (**SH**) cannot be determined with a method that takes account of the presence of convective cloud, the precipitation should not be characterized by **SH**.

CODE FORMAT

$\left\{ \begin{array}{l} N_s N_s N_s h_s h_s h_s \\ \text{or} \\ VV h_s h_s h_s \\ \text{or} \\ \mathbf{NSC} \\ \text{or} \\ \mathbf{NCD} \end{array} \right\}$

ENCODE SO FAR

**SPECI LUDO 211025Z 31015G27KT 280V350
4000 1400SW R24/P2000 +SHRA FEW005
FEW010CB SCT018 BKN025**

6. CLOUD or VERTICAL VISIBILITY

Cloud groups consist of six characters under normal circumstances. The first three indicate cloud amount with:

1/8 to 2/8	being reported as	FEW	(few)
3/8 to 4/8	being reported as	SCT	(scattered)
5/8 to 7/8	being reported as	BKN	(broken) and
8/8	being reported as	OVC	(overcast)

The last three characters indicate the height of the base of the cloud in units of 30 m (100 ft) up to 3 000 m (10 000 ft) and in steps of 300 m (1 000 ft) above.

Example: 3/8 of stratocumulus with a base of 1 850 ft will be encoded as:

SCT018

Note: The cloud base is rounded down, in this case to 1 800 ft.

Cloud type

Types of clouds other than significant convective clouds are not identified. Significant convective clouds are:

- Cumulonimbus indicated by **CB**;
- Cumulus congestus of great vertical extent indicated by **TCU**.

The contraction **TCU**, taken from “**T**owering **C**Umulus”, is an ICAO abbreviation used to describe this type of cloud.

Reported cloud groups

The cloud group can be repeated to report different layers or masses of cloud, but the number of groups should not normally exceed three. The following criteria should be followed when selecting the cloud layers to be reported:

- The lowest individual layer (mass) of any amount;
- The next individual layer of more than 2/8;
- The next higher layer of more than 4/8.

In addition: Significant convective clouds (**CB** or **TCU**) should be reported if not already reported in one of the three groups above.

Example: If there were 1/8 stratus at 500 ft,

2/8 cumulonimbus at 1 000 ft,

3/8 cumulus at 1 800 ft,

5/8 stratocumulus at 2 500 ft,

the reported cloud would be:

FEW005 FEW010CB SCT018 BKN025

At mountain stations, when cloud base is below station level, the cloud group should read **N_sN_sN_s///**.

Example: **SCT///, FEW///CB**

Notes:

1. The cloud groups are reported in ascending order of height.
2. When there are no clouds below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater, no restriction to vertical visibility and the abbreviation **CAVOK** is not appropriate, the abbreviation **NSC** (Nil Significant Cloud) is used.
3. When cumulonimbus (**CB**) and Towering **CU**mulus (**TCU**) have a common cloud base, the type of cloud is reported as **CB** and the amount of cloud is encoded as the sum of **CB** and **TCU** amounts at that cloud base.
4. When an automatic observing system is used and the cloud type cannot be observed by that system, the code type in each cloud group shall be replaced by **///**. If no clouds are detected by that system, the abbreviation **NCD** shall be used.

Vertical visibility

When the sky is obscured and cloud details cannot be assessed but information on vertical visibility is available, the cloud group should be replaced by a five-character group, the first two characters being **VV** followed by the vertical visibility in units of 30 m or 100 ft, as for cloud base. When the sky is obscured but the vertical visibility cannot be assessed, the group will read **VV///**.

Example: **VV003** (vertical visibility 300 ft)

CAVOK

The code word **CAVOK** shall be used when the following conditions occur simultaneously at the time of the observation:

- (a) Visibility is 10 km or more;
- (b) No cloud below 1 500 m (5 000 ft) or below the higher minimum sector altitude, whichever is greater, and no **CB**;
- (c) No significant weather phenomena as indicated in Code table 4678 (reproduced on page 13) of the *Manual on Codes* (WMO-No. 306), Volume I.1, Part A – Alphanumeric codes, section C.

CODE FORMAT

T'T'/T'_dT'_d

ENCODE SO FAR

**SPECI LUDO 211025Z 31015G27KT 280V350
4000 1400SW R24/P2000 +SHRA FEW005
FEW010CB SCT018 BKN025 10/03**

7. **AIR AND DEWPOINT TEMPERATURE**

The observed air temperature and dewpoint temperature, each as two figures rounded to the nearest whole degree Celsius, should be reported as follows:

Temperatures below 0 °C will be preceded by **M** to indicate “minus”.

Example: -9.5 °C is reported as **M09**.

Note: Air temperature and dewpoint values of 0.5° will be rounded up to the higher whole degree.

Example: Air temperature: 9.5 °C
Dewpoint temperature: 3.3 °C
Will be reported as: **10/03**

CODE FORMAT

QP_HP_HP_HP_H

ENCODE SO FAR

**SPECI LUDO 211025Z 31015G27KT 280V350
4000 1400SW R24/P2000 +SHRA FEW005
FEW010CB SCT018 BKN025 10/03 Q0995**

8. **PRESSURE – QNH**

The last group of the main part of the report should indicate the QNH rounded down to the nearest whole hectopascal. The group starts with the letter **Q** followed by four figures.

Example: A QNH of 995.6 hPa is reported as:

Q0995

Note: In some countries, inches of mercury are used as the unit of QNH. In this case, the indicator will be **A** (instead of **Q**).

Example: A QNH of 30.05 in is reported as:

A3005

CODE FORMAT

$REw'w' \left\{ \begin{array}{l} WS RD_R D_R \\ \text{or} \\ WS ALL RWY \end{array} \right\} \left\{ \begin{array}{l} (WTT_s/SS') \\ \text{or} \\ (WTT_s/HH_s H_s H_s) \end{array} \right\} (RD_R D_R / E_R C_R e_R e_R B_R B_R)$

ENCODE SO FAR

SPECI LUDO 211025Z 31015G27KT 280V350
4000 1400SW R24/P2000 +SHRA FEW005
FEW010CB SCT018 BKN025 10/03 Q0995
RERA WS R24 W19/S4 24451293

9. SUPPLEMENTARY INFORMATION

For international dissemination, this section is used to report:

- Recent weather phenomena of operational significance;
- Information on wind shear in the lower layers;
- Other information only in accordance with regional air navigation agreements, including:
 - Sea-surface temperature and the state of the sea or significant wave height;
 - State of the runway.

Recent weather

Using the indicator letters **RE**, information on recent weather shall be reported, up to a maximum of three groups using the abbreviations given in section 5, if the following weather phenomena were observed during the previous hour, or since the last observation, but not at the time of observation. The time of observation is taken to cover the previous 10 min.

- Freezing (FZ) precipitation
- Moderate or heavy precipitation (including showers – SH)
- Moderate or heavy ice pellets (PL), hail (GR), small hail and/or snow pellets (GS)
- Blowing (BL) snow
- Sandstorm or duststorm (SS or DS)
- Thunderstorm (TS)
- Funnel cloud(s) (tornado or waterspout – FC)
- Volcanic ash (VA)

No intensity of significant recent weather phenomena shall be indicated.

Example: Heavy rain 20 min before the time of observation, with moderate rain at the time of observation, is coded as:

RERA

Note: When an automatic observing system is used and when the type of precipitation cannot be identified by this system, the abbreviation **REUP** shall be used for recent unknown precipitation.

Wind shear

Where local circumstances so warrant, information on the existence of wind shear significant to aircraft operations along the take-off or approach paths in the lowest 500 m (1 600 ft) should be reported using the following groups, as necessary:

WS R_RD_RD_R

WS ALL RWY

where **D_RD_R** is the runway designator.

WS R24 indicates that wind shear has been reported in either the take-off or landing zones, or both, of runway 24.

Sea-surface temperature and the state of the sea or significant wave height

Information on sea-surface temperature and the state of the sea or significant wave height shall be given using the following group:

(W_{T_sT_s}/SS') or (W_{T_sT_s}/HH_sH_sH_s)

where:

- **W** is a letter indicator for the temperature of the sea surface;
- **T_sT_s** is the sea-surface temperature coded or decoded as indicated in Part A, section 7 (page 21);
- **SS'** is the state of the sea as indicated in Code table 3700 where **S** is the letter designator and **S'** is the state of the water surface;
- **HH_sH_sH_s** is the significant wave height where **H** is the letter indicator and **H_sH_sH_s** is the significant wave height in decimetres.

Example: Sea-surface temperature: 18.7 °C

State of the sea: Moderate

W19/S4

State of the runway

The runway state group is expected to be included in the **METAR** as received from airport managers.

Information on the state of the runway shall be given using the following group:

(RD_RD_R/E_RC_Re_Re_RB_RB_R)

where:

- **D_RD_R** is the runway designator reported in accordance with the relevant regional ICAO air navigation plan;
- **E_R** is the runway deposit (Code table 0919);
- **C_R** is the extent of the runway contaminated (Code table 0519);
- **e_Re_R** is the depth of the deposit (Code table 1079);
- **B_RB_R** is the estimated surface friction (Code table 0366).

Example: 30 per cent of runway 24 is covered with dry snow with a depth of 12 mm and leading to a medium braking action:

D_RD_R = 24

E_R = 4

C_R = 5

e_Re_R = 12

B_RB_R = 93

24/451293

COMPLETE CODE FORMAT

METAR
or
SPECI } **COR CCCC YYGGggZ NIL AUTO**

ddfffG_{f_mf_m} { **KT** or
MPS } d_nd_nd_nVd_xd_xd_x

VVVV
or
CAVOK } V_NV_NV_NV_ND_v **RD_RD_R/V_RV_RV_RV_Ri**

w'w' } $\left\{ \begin{array}{l} N_s N_s N_s h_s h_s h_s \\ \text{or} \\ VV h_s h_s h_s \\ \text{or} \\ \text{NSC} \\ \text{or} \\ \text{NCD} \end{array} \right\} T'T'/T'_d T'_d \quad QP_H P_H P_H P_H$

REw'w' } $\left\{ \begin{array}{l} \text{WS RD}_R D_R \\ \text{or} \\ \text{WS ALL RWY} \end{array} \right\} \left\{ \begin{array}{l} (WT_s T_s / SS') \\ \text{or} \\ (WT_s T_s / HH_s H_s H_s) \end{array} \right\} (RD_R D_R / E_R C_R e_R e_R B_R B_R)$



PART B

TREND FORECASTS

TREND forecasts are appended to a **METAR** or **SPECI**. The forecaster should ensure that the encoding of the forecasts follows the agreed international standard practices. The decoding of these forecasts is carried out by a variety of people: pilots, air traffic services staff, operations personnel and meteorologists. Consequently, this guidance is aimed at decoding. However, in order to overcome any confusion, the encoder may find it useful to note how the user interprets the forecast.

A first and very important point is that the information contained in the **TREND** is a forecast covering a period of 2 h from the time of observation, and this information is the forecaster's best estimate of its likely occurrence. The atmosphere is not homogeneous and sizeable variations in the visibility and cloud base occur naturally. For instance:

- With visibilities of less than 1 000 m, changes of 30 per cent or more in a period of 4 min occur on a significant number of occasions (5–10 per cent).
- With runway visual range in the range 360–1 100 m, changes at the rate of 100 m/min can occur.
- Cloud base changes of 45 m (150 ft) in 1 min and/or over a horizontal distance of 1.6 km occur on a significant number of occasions.

The forecast times of occurrence are also the forecaster's best estimate. Statistically, differences between forecast and actual times of 30 min will occur on a significant number of occasions.

A **TREND** forecast consists of a concise statement of expected significant changes in the meteorological conditions at the aerodrome to be appended to a routine or special report (**METAR**, **SPECI**). The period of validity of a **TREND** forecast is 2 h from the time of the report, and this report forms an integral part of the forecast. The **TREND** forecast indicates significant changes in respect of one or more of the elements: surface wind, prevailing visibility, weather and cloud. Only those elements for which a significant change is expected are included. When no significant change is expected to occur, this is indicated by the abbreviation **NOSIG**.

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Notes:

1. In the case of significant changes in respect of cloud, all cloud groups, including layers or masses not expected to change, are indicated.
2. In the case of significant changes in visibility, the phenomenon causing the reduction of visibility is indicated.
3. The units and scales used in **TREND** shall be the same as those used in the report to which it is appended.

CODE FORMAT

{ (TTTT
or
NOSIG)

Example: BECMG FM 1100

Decode: Becoming from 1100 UTC

ENCODE SO FAR

BECMG FM1100

1. CHANGE INDICATORS

When a significant change is expected in one or several of the observed elements (surface wind, prevailing visibility, weather, clouds or vertical visibility), one of the following change indicators is used for **TTTT**:

BECMG or **TEMPO**

The time group, **GGgg**, preceded without a space by one of the letter indicators **FM** (from), **TL** (until) or **AT** (at) is used as appropriate.

Example: **TEMPO FM1030**

BECMG

The change indicator **BECMG** is used to describe expected changes which reach or pass specified values at a regular or irregular rate. The period during which, or the time at which, the change is forecast to occur is indicated using the abbreviations **FM**, **TL** or **AT**, as appropriate.

- (a) When a change is forecast both to begin and end within the **TREND** forecast period, the beginning and end of change are indicated by using the abbreviations **FM** and **TL**, respectively, with the associated time groups, for example, for a **TREND** forecast period from 1000 to 1200 UTC in the form:

BECMG FM1030 TL1130

- (b) When the change is forecast to start at the beginning of the **TREND** period but to be completed before the end of that period, only the abbreviation **TL** and its associated time group is used to indicate the end of the change.

Example: The prevailing visibility at observation time is 6 km and is expected to decrease, becoming 3 000 m in mist until 1100 UTC.

BECMG TL1100 3000 BR

- (c) When the change is forecast to begin during the **TREND** forecast period and to be completed at the end of that period, the abbreviation **FM** and its associated time group is used to indicate the beginning of the change. For example:

BECMG FM1100

- (d) When the change is forecast to occur at a specific time during the **TREND** forecast period, the abbreviation **AT** followed by the associated time group is used to indicate the time of the change. For example:

BECMG AT1100

- (e) When the change is forecast to start at the beginning of the **TREND** forecast period and to be completed by the end of that period, or when the change is forecast to occur within the **TREND** period but the time is uncertain, the abbreviations **FM**, **TL** or **AT** and their associated time groups are omitted and the change indicator **BECMG** is used.
- (f) When changes are forecast to take place at midnight UTC, the time is indicated as follows:
- (i) By 0000 when associated with **FM** and **AT**;
 - (ii) By 2400 when associated with **TL**.

TEMPO

The change group **TEMPO** is used to describe forecast temporary fluctuations in the meteorological conditions which reach or pass specified values and last for a period of less than 1 h in each instance and in total for less than half of the forecast period during which the fluctuations are forecast to occur. The period during which the temporary fluctuations are expected to occur is indicated by using the abbreviations **FM** and/or **TL**, as appropriate, followed by a time group.

- (a) When the period of temporary fluctuations is forecast to begin and end within the **TREND** forecast period, the beginning and end are indicated by using the abbreviations **FM** and **TL**, respectively, with their associated time groups, for example, for a **TREND** forecast period from 1000 to 1200 UTC, in the form:

TEMPO FM1030 TL1130

- (b) When the period of temporary fluctuations is forecast to start at the beginning of the **TREND** period but to finish before the end of that period, only **TL** and its time group is used to indicate the end of the fluctuations. For example:

TEMPO TL1130

- (c) When the period of temporary fluctuations is forecast to begin during the **TREND** period and to continue throughout the remainder of the period,

the abbreviation **FM** and its associated time group only is used to indicate the beginning of the fluctuations. For example:

TEMPO FM1030

- (d) When the period of the temporary fluctuations is forecast to start at the beginning of the **TREND** period and to continue throughout the remainder of that period, the change indicator **TEMPO** is used alone.

NOSIG

When no significant changes are forecast to occur during the **TREND** forecast period, the change indicator groups are omitted and the abbreviation **NOSIG** is used instead.

Following the change indicator groups, only the group(s) referring to the element(s) which is/are forecast to change significantly is/are included. However, in the case of clouds, if a significant change is expected, all cloud groups including any significant layer(s) or masses not expected to change are given.

Note: The indicator **PROB** shall not be used in **TREND** forecasts.

CODE FORMAT

dddffG_mf_m { **KT** or **MPS**

Example: 25035G50KT

Decode: Forecast surface wind 250° 35 kt with gusts to 50 kt

ENCODE SO FAR

BECMG FM1100 25035G50KT

2. **SURFACE WIND**

TREND indicates changes in the surface wind which involve either:

- (a) A change in the mean wind direction of 60° or more, the mean speed before and/or after the change being 10 kt (5 m s^{-1}) or more;
- (b) A change in the mean wind speed of 10 kt (5 m s^{-1}) or more;
- (c) A change of wind through values of operational significance. These values are established following consultation between the air traffic services authority, the meteorological authority and the operators concerned.

Example: An expected increase in the wind speed to 35 kt with a maximum gust of 50 kt sometime during the **TREND** period is indicated by:

BECMG 25035G50KT

CODE FORMAT

{ VVVV
or
CAVOK

Example: 6000

Decode: Forecast visibility 6 km

ENCODE SO FAR

BECMG FM1100 25035G50KT 6000

3. **VISIBILITY**

Change indicators are used when the prevailing visibility is expected:

- (a) To improve and change to or pass through one or more of the following values: 150, 350, 600, 800, 1 500 and 3 000 m;
- (b) To deteriorate and pass through one or more of the following values: 150, 350, 600, 800, 1 500 and 3 000 m. Depending upon the number of lights conducted in accordance with the visual flight rules, an additional value of 5 000 m may be added to the list.

Example: Temporary reductions throughout the **TREND** forecast period of the prevailing visibility to 740 m in fog is rounded down to 700 m and indicated by:

TEMPO 0700

CODE FORMAT

{ w'w'
or
NSW

Example: NSW

Decode: No significant weather

ENCODE SO FAR

BECMG FM1100 25035G50KT 6000 NSW

4. WEATHER PHENOMENA

Significant forecast weather, using the abbreviations as indicated in Part A, section 5 (page 13), is restricted to the onset, cessation or change in intensity of the following weather phenomena:

- Freezing (FZ) precipitation;
- Freezing fog;
- Moderate or heavy precipitation (including showers – SH);
- Low drifting (DR) dust, sand or snow;
- Blowing (BL) dust, sand or snow;
- Duststorm (DS);
- Sandstorm (SS);
- Thunderstorm (TS);
- Squall (SQ);
- Funnel cloud (tornado or waterspout – FC);
- Other weather phenomena given in Code table 4678 (see page 13) which are expected to cause a significant change in visibility.

To indicate the end of the occurrence of significant weather phenomena, the abbreviation **NSW** (Nil Significant Weather) replaces the group **w'w'**.

Example: For a **TREND** forecast period 0300 and 0500, a thunderstorm with rain expected between 0300 and 0430 UTC is indicated by:

TEMPO TL0430 TSRA

The cessation of significant weather at 1630 UTC is indicated by:

BECMG AT1630 NSW

CODE FORMAT

$\left\{ \begin{array}{l} N_s N_s N_s h_s h_s h_s \\ \text{or} \\ V V h_s h_s h_s \\ \text{or} \\ \mathbf{NSC} \end{array} \right.$

ENCODE SO FAR

BECMG FM1100 25035G50KT 6000 NSW NSC

5. **CLOUD or VERTICAL VISIBILITY**

Significant changes in cloud are indicated when one or more of the following four conditions are expected:

- (a) The height of the base of a cloud layer of **BKN** or **OVC** extent is below or expected to fall below 450 m (1 500 ft) and is forecast to change to or pass any one of the following values: 30, 60, 90, 150, 300 and 450 m (100, 200, 300, 500, 1 000 and 1 500 ft).

Example: A forecast of a lowering of the cloud base to 500 ft starting at the beginning of the **TREND** period and ending by 1130 UTC is indicated by:

BECMG TL1130 OVC005

- (b) The height of the base of the cloud layer is below, or is expected to fall below, 450 m (1 500 ft), and the cloud amount is forecast to change from:

SCT or **FEW** increasing to **BKN** or **OVC**

or

BKN or **OVC** decreasing to **SCT** or **FEW**

Example: A forecast of a rapid increase in stratus cloud at 1130 UTC from **SCT** to **OVC** is indicated by:

BECMG AT1130 OVC010

- (c) The sky is expected to remain or become obscured, vertical visibility observations are available, and the forecast indicates changes in vertical visibility to, or passing, any one of the following values: 30, 60 or 150 m (100, 200 or 500 ft).

- (d) No significant change in the clouds is expected during the period of the **TREND**, the cloud groups are not repeated and therefore no cloud details are given.

To indicate a change to no cloud below 1 500 m (5 000 ft) or the highest minimum sector altitude, whichever is the greater, and when no **CB** are forecast, and **CAVOK** is not appropriate, the abbreviation **NSC** (Nil Significant Cloud) replaces the cloud and vertical visibility groups.

Criteria for indicating changes in the **TREND** forecast, based on local aerodrome operating minima, additional to those specified above, shall be used only when these criteria have been agreed by the meteorological authority and the operator(s) concerned.

COMPLETE CODE FORMAT

{	(TTTTT TTGGgg dddffGf _m f _m	{	KT
	or		or
{	NOSIG)	{	MPS

{	VVVV	{	w'w'	{	N _s N _s N _s h _s h _s h _s	(RMK...)
	or		or		or	
{	CAVOK	{	NSW	{	VVh _s h _s h _s	
					or	

Complete example:

BECMG FM1100 25035G50KT 6000 NSW NSC

DECODE

Becoming after 1100 UTC, surface wind 250° 35 kt, gusts to 50 kt, visibility 6 km, nil significant weather and nil significant cloud

PART C

AERODROME FORECASTS – TAFs

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.

TAFs are prepared by professional staff who, using the latest available regulations, ensure that internationally agreed practices are followed. The decoding of these forecasts is carried out by people of various disciplines and many will not have easy access to these regulations. Consequently, this guidance is aimed at decoders, although it may also be of interest to encoders.

As with the **TREND** forecast, it should be appreciated that, owing to the variability of meteorological elements in space and time and to limitations of forecasting techniques and the definitions of some of the elements, the specific value of any element given in the forecast should be understood to be the most probable value that the element is likely to assume during the period of the forecast.

TAFs describe the forecast prevailing conditions at an aerodrome and cover a period of not less than 6 h and not longer than 30 h. The period of validity of **TAFs** produced by meteorological offices should be determined by regional air navigation agreement. Routine **TAFs** valid for less than 12 h should be issued every 3 h, and those valid for 12 h up to 30 h every 6 h.

Amendments are issued as and when necessary. It is assumed that a later **TAF** automatically amends and updates the ones issued previously, and not more than one **TAF** is valid at an aerodrome at any given time.

TAFs are issued separately from the **METAR** or **SPECI** and do not refer to any specific report. However, the preparation, amendment and cancellation, as necessary, of the **TAF** depend, among others, upon receipt of the **METAR** or **SPECI** of that aerodrome.

Aerodrome forecasts contain specific information presented in a fixed order. The information and order are as follows:

IDENTIFICATION GROUPS

SURFACE WIND

PREVAILING VISIBILITY

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WEATHER

CLOUD (or vertical visibility, if appropriate)

EXPECTED SIGNIFICANT CHANGES

Notes:

1. **CAVOK** is used to replace the visibility, weather and cloud groups when the following three conditions are simultaneously met:
 - Visibility is 10 km or more;
 - There is no cloud below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater, and no cumulonimbus;
 - There are no significant weather phenomena (see Code table 4678 on page 13).
2. The forecast period of the **TAF** may be divided into two or more self-contained parts by using the indicator **FMYYGggg**, where **FM** is the abbreviation of "from" and **YYGggg** is the date and time in UTC. A complete description of the prevailing conditions is given at the beginning of the forecast or the self-contained parts designated **FMYYGggg**. Forecast significant changes to these conditions are indicated as necessary.

CODE FORMAT

TAF or TAF AMD or TAF COR	}	CCCC YYGGggZ NIL Y₁Y₁G₁G₁/Y₂Y₂G₂G₂ CNL
--	---	---

Example 1: **TAF** LUDO 130530Z 1307/1316

Decode: Aerodrome forecast for LUDO international airport, time of origin 0530 UTC on the 13th, forecast valid for the period 0700 to 1600 UTC on the 13th

Example 2: **TAF AMD** LUDO 161500Z 1606/1712 CNL

Decode: Amended **TAF** for LUDO international airport issued on the 16th of the month at 1500 UTC cancelling the previously issued **TAF** valid from 0600 UTC on the 16th to 1200 UTC on the 17th of the month

1. **IDENTIFICATION GROUPS**

This section contains eight parts, as follows:

- The aerodrome forecast code name (**TAF**) included at the beginning of an individual aerodrome forecast and at the beginning of a bulletin consisting of one or more aerodrome forecasts;
- The code word **AMD** if the **TAF** is amended;
- The code word **COR** if the **TAF** is corrected;
- The ICAO location indicator of the aerodrome to which the forecast refers;
- The date and time of issue of the forecast;
- The code word **NIL** if the **TAF** is missing;
- The period covered by the forecast;
- The code word **CNL** if the **TAF** is cancelled.

CODE FORMAT

dddffGf_mf_m { KT
or
MPS }

Example: 31015KT

Decode: Forecast surface wind 310° at 15 kt

ENCODE SO FAR

TAF LUDO 130530Z 1307/1316 31015KT

2. SURFACE WIND

Normally this is a five-figure group followed by an abbreviation to indicate the wind speed units used. The first three figures indicate the wind direction from true north, and the last two the mean wind speed.

Example: **31015KT**

Additionally, if the wind is expected to be gusty and the maximum gust speed likely to exceed the mean speed by 10 kt (5 m s^{-1}) or more, this gust must be indicated using the letter **G** directly after the mean speed, followed by the gust speed.

Example: **31015G27KT**

The encode **VRB** is used only when the mean wind speed is less than 3 kt (2 m s^{-1}). **VRB** for higher wind speeds shall be used only when the variation of wind direction is 180° or more, or when it is impossible to forecast a single wind direction, for example during a thunderstorm.

When a wind speed of 100 kt or more is forecast, it should be indicated as **P99KT**.

Example: **310P99KT**

CODE FORMAT

{ VVVV
or
CAVOK

Example: 8000

Decode: Visibility 8 km

ENCODE SO FAR

TAF LUDO 130530Z 1307/1316 31015KT 8000

3. **VISIBILITY**

Forecast prevailing visibility is encoded as a four-figure group. As with the **METAR** code, the figures are the expected values in metres, except that 9999 indicates a prevailing visibility of 10 km or greater.

Example: A forecast prevailing visibility of 8 km is indicated as 8000.

When the prevailing visibility cannot be forecast, the lowest forecast visibility shall be used.

CODE FORMAT

{ w'w'
or
NSW

Example: SHRA

Decode: Moderate rain shower

ENCODE SO FAR

TAF LUDO 130530Z 1307/1316 31015KT 8000 SHRA

4. **WEATHER**

Forecast weather, using the appropriate abbreviations given in Code table 4678 (see page 13), is restricted to the occurrence of one or more, up to a maximum of three, of the following weather phenomena, together with their characteristics, which are deemed significant to aircraft operations:

- Freezing (FZ) precipitation;
- Freezing fog;
- Moderate or heavy precipitation (including showers – SH);
- Low drifting (DR) dust, sand or snow;
- Blowing (BL) dust, sand or snow;
- Duststorm (DS);
- Sandstorm (SS);
- Thunderstorm (TS);
- Squall (SQ);
- Funnel cloud (tornado or waterspout – FC);
- Other weather phenomena given in Code table 4678 which are expected to cause a significant change in visibility.

Example: **SHRA** (moderate rain shower)

If no significant weather, as defined above, is expected to occur, the group is omitted. However, after a change group, if the weather ceases to be significant, the weather group **w'w'** is replaced by **NSW** (abbreviation for **Nil Significant Weather**).

CODE FORMAT

$\left\{ \begin{array}{l} N_s N_s N_s h_s h_s h_s \\ \text{or} \\ VV h_s h_s h_s \\ \text{or} \\ \mathbf{NSC} \end{array} \right\}$

Example: FEW005 FEW010CB SCT018 BKN025

Decode: 1/8 to 2/8 cloud with base 500 ft

1/8 to 2/8 cumulonimbus with base 1 000 ft

3/8 to 4/8 cloud with base 1 800 ft

5/8 to 7/8 cloud with base 2 500 ft

ENCODE SO FAR

**TAF LUDO 130530Z 1307/1316 31015KT 8000
SHRA FEW005 FEW010CB SCT018 BKN025**

5. CLOUD (or VERTICAL VISIBILITY)

Cloud information is presented in the same format as in the **METAR**. The group usually consists of six characters, the first three indicating the expected cloud amount, using the following abbreviations:

FEW	-	Few	-	1/8 to 2/8
SCT	-	Scattered	-	3/8 to 4/8
BKN	-	Broken	-	5/8 to 7/8
OVC	-	Overcast	-	8/8

The last three figures indicate the expected height of the base of the cloud, in units of 30 m (100 ft).

Only the cloud type cumulonimbus (**CB**) is indicated.

Examples: 1. 4/8 stratus at 1 000 ft is coded as:

SCT010

2. 7/8 cumulonimbus at 1 000 ft is coded as:

BKN010CB

When the forecaster expects more than one layer or mass of cloud, additional cloud groups are given in accordance with the following:

- The lowest individual layer of any amount;
- The next individual layer covering more than 2/8;
- The next individual layer covering more than 4/8, additionally;
- Cumulonimbus cloud (**CB**) when forecast, if not already in one of the groups above.

Normally, the number of groups will not exceed three, except that cumulonimbus will always be included if forecast.

The cloud groups are in the order of lower to higher levels of cloud base.

Example: The forecast is for 1/8 stratus at 500 ft
2/8 cumulonimbus at 1 000 ft
3/8 cumulus at 1 800 ft
5/8 stratocumulus at 2 500 ft
which would be encoded as:

FEW005 FEW010CB SCT018 BKN025

When the sky is expected to be obscured and information on vertical visibility is available, the cloud group is replaced by **VVh_sh_sh_s**, where the last three figures for **h_sh_sh_s** indicate the vertical visibility in units of 30 m (100 ft).

In some regions cloud information is limited to cloud of operational significance. This is considered to be cloud below 1 500 m (5 000 ft) or the highest minimum sector altitude, whichever is the greater, and cumulonimbus, whenever forecast. Therefore, when no cumulonimbus or clouds below 5 000 ft or below the highest minimum sector altitude, whichever is the greater, are forecast and **CAVOK** is not appropriate, **NSC (Nil Significant Cloud)** is used.

Example: When the prevailing visibility is expected to be 8 km and altocumulus and cirrus clouds are forecast above 10 000 ft, the cloud group would be replaced by **NSC**. If the prevailing visibility is expected to be 10 km or more with the same cloud conditions, then **CAVOK** should be used.

6. EXPECTED SIGNIFICANT CHANGES

Changes in the prevailing meteorological conditions which are considered significant, and which therefore need to be indicated in the aerodrome forecast (and also the thresholds for deciding if the TAF should be amended), are as follows.

Surface wind

When the surface wind is forecast to change through operationally significant values. These values vary from one aerodrome to another and are agreed upon following discussions between the meteorological authority, the appropriate air traffic services authority and operators.

Visibility

When the surface prevailing visibility is forecast to improve and change to, or pass through, one or more of the following values, or when that visibility is forecast to deteriorate and pass through one or more of the following values:

150, 350, 600, 800, 1 500 and 3 000 m

Depending upon the number of flights conducted in accordance with visual flight rules, an additional value of 5 000 m may be added.

Weather

When any of the weather phenomena listed in Part C, section 4 (page 55), is forecast to begin, end or change in intensity. If significant weather as indicated in the main body of the TAF message is forecast to end, after the change group, the 'w'w' group is replaced by NSW, the abbreviation for Nil Significant Weather.

Example: TAF LUDO 130530Z 1307/1316 31015KT 8000 RA SCT006
BKN012 BECMG 1312/1314 NSW SCT025

Cloud height

When the height of the base of the lowest layer or mass of cloud covering 5/8 or more (BKN or OVC) is forecast to lift and change to, or pass through, one or more of the following values or to lower and pass through one or more of the following values:

30, 60, 150 or 300 m (or 100, 200, 500 or 1 000 ft)

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Depending upon the number of flights conducted in accordance with visual flight rules, an additional value of 450 m (1 500 ft) may be added.

Cloud amount

When the amount of a cloud layer or mass of cloud below 450 m (1 500 ft) is forecast to change

- from **SCT** or **FEW**, increasing to **BKN** or **OVC**
or
- from **BKN** or **OVC**, decreasing to **SCT** or **FEW**.

When cumulonimbus clouds are expected to develop or dissipate.

When vertical visibility is forecast to improve and change to, or pass through, one or more of the following values, or to deteriorate and pass through one or more of the following values:

30, 60, 150 or 300 m (100, 200, 500 or 1 000 ft)

CAVOK

When conditions are forecast to change to **CAVOK**, or **CAVOK** conditions will cease (conditions requiring **CAVOK** are found under Part A, section 6 (page 17)).

CODE FORMAT

$\left. \begin{array}{l} \text{TTTTT YYGG/Y}_e\text{Y}_e\text{G}_e\text{G}_e \\ \text{or} \\ \text{TTYGGgg} \end{array} \right\}$

Example: TEMPO 1311/1316 4000 +SHRA

Decode: Temporarily between 1100 and 1600 UTC visibility 4 000 m and heavy rain showers

ENCODE SO FAR

**TAF LUDO 130530Z 1307/1316 31015KT 8000
SHRA FEW005 FEW010CB SCT018 BKN025
TEMPO 1311/1316 4000 +SHRA**

7. INDICATION OF SIGNIFICANT CHANGES

- (a) When one set of prevailing weather conditions is expected to change significantly and more or less completely to a different set of conditions, the time indicator group **FMYYGGgg** (where **FM** is the abbreviation for "from", **YY** is the date and **GGgg** is the time in hours and minutes UTC) is used to indicate the beginning of a self-contained part of the forecast. All conditions given before this group are superseded by conditions indicated after the group.

Example: **TAF LUDO 130530Z 1307/1316 27015KT 6000 NSC
FM131215 27017KT 4000 BKN010**

- (b) The groups **BECMG YYGG/Y_eY_eG_eG_e** indicate a regular or irregular change to the forecast meteorological conditions expected at an unspecified time within the period **YYGG** to **Y_eY_eG_eG_e**. This period will normally not exceed 2 h but will never be more than 4 h.

The change indicator is followed by groups describing only the meteorological elements which are forecast to change significantly. However, in the case of significant changes in cloud, all the cloud groups as set out in Part C, section 5 (page 57), including layers or masses not expected to change, should be indicated.

Unless a further set of change groups is used, the conditions given after **BECMG YYGG/Y_eY_eG_eG_e** are expected to prevail from the date and time **Y_eY_eG_eG_e** to the end of the forecast period.

Example: **TAF LUDO 130530Z 1307/1316 27015KT 6000 NSC
BECMG 1310/1312 4000 BKN010**

Meaning

The forecast conditions start to change at 1000 UTC and the prevailing conditions for the period 1200 to 1600 UTC are expected to be:

Surface wind: 270° at 15 kt

Visibility: 4 000 m

Weather: None significant to operations

Cloud: 5/8 to 7/8 with a base of 1 000 ft

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- (c) The groups **TEMPO YYGG/Y_eY_eG_eG_e** indicate temporary fluctuations in the forecast meteorological conditions which may occur at any time during the period **YYGG** to **Y_eY_eG_eG_e**. The meteorological conditions following these groups are expected to last less than 1 h in each instance and in aggregate less than half the period indicated by **YYGG/Y_eY_eG_eG_e**.

Note: If a temporary fluctuation persists longer than 1 h or in aggregate more than half the forecast period, these conditions would be the predominant ones and the change indicator **BECMG** should be used.

- (d) When the confidence in forecasting alternative values is not high, yet the forecast element being considered is significant to aircraft operations, the groups **PROBC₂C₂YYGG/Y_eY_eG_eG_e** are used. **C₂C₂** indicates the percentage probability of occurrence, with only the values 30 or 40 per cent being used. The **PROB** group is always followed by a time group **YYGG/Y_eY_eG_eG_e** (example 1) or a change group and a time group **TTTTT YYGG/Y_eY_eG_eG_e** (example 2).

Example 1:

**TAF LUDO 132030Z 1322/1407 27003KT 4000 SCT008 BECMG
1403/1405 1500 BR BKN004 PROB30 1405/1407 0800 FG**

This indicates that the visibility will fall to 1 500 m by 0500 UTC on the 14th with a moderate probability of fog with a visibility of 800 m between 0500 and 0700 UTC on the same day (14th).

Example 2:

**TAF LUDO 130530Z 1307/1316 27015KT 9999 SCT015 TEMPO
1311/1316 4000 +SHRA BKN010CB PROB30 TEMPO 1314/1316 TSRA**

This indicates that, on the 13th, heavy showers of rain are likely after 1100 UTC with a moderate probability of a thunderstorm with moderate rain after 1400 UTC.

Note: It is assumed that, if the probability of an occurrence is 50 per cent or greater, confidence is high and the alternative values are indicated using **BECMG**, **TEMPO** or **FM**, as appropriate. When the probability of occurrence is less than 30 per cent, it is not considered significant from an operational point of view and the associated phenomena are therefore not mentioned.

TEMPO, which means that the fluctuations will occur for less than half of the time, should not be confused with a probability of 30 or 40 per cent. With **TEMPO**, the forecaster is confident that the temporary fluctuations will take place; with **PROB30** there is only a moderate probability that they will occur.

- (e) The number of change and probability groups should be kept to a minimum and should not normally exceed five groups.

Amendments

When an aerodrome forecast **TAF** requires amendment in accordance with Part C, section 6 (page 59), the amended forecast is indicated by inserting **AMD** after **TAF** in the identifier, and this new forecast covers the remaining validity period of the original **TAF**.

Example: **TAF AMD LUDO 130820Z 1308/1316 . . .**

Note: The time of issue of this **TAF AMD** is 0820 UTC but the forecast is valid from 0800 to 1600 UTC.

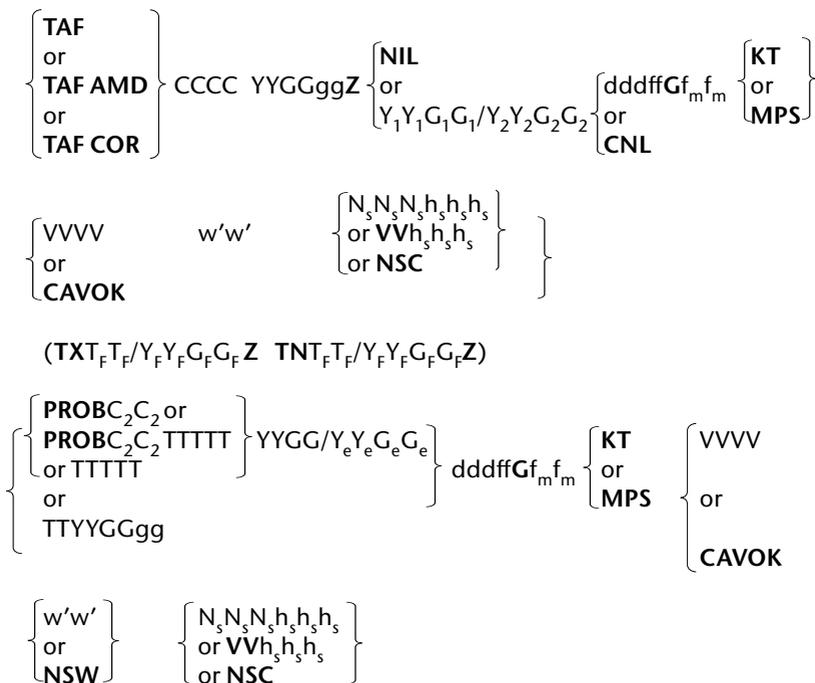
Regional code forms:

Forecast maximum and minimum temperatures (TX_FT_F/Y_FY_FG_FG_FZ TNT_FT_F/Y_FY_FG_FG_FZ)

This group is used only if agreed regionally and is included here for the sake of completeness. A full description of this code can be found in the *Manual on Codes* (WMO-No. 306).

Only meteorological offices determined by regional air navigation agreement shall issue 30-h **TAFs**.

COMPLETE CODE FORMAT



Complete example:

TAF LUDO 130530Z 1307/1316 31015KT 8000 SHRA FEW005
 FEW010CB SCT018 BKN025 TEMPO 1311/1316 4000 +SHRA
 PROB30 TEMPO 1314/1316 TSRA SCT005 BKN010CB

DECODE

Aerodrome forecast for LUDO international airport, time of origin 0530 UTC on the 13th, valid for the period 0700 on the 13th to 1600 UTC on the 13th. Surface wind 310° 15 kt, visibility 8 km, moderate rain shower, cloud 1/8 to 2/8 base 500 ft, 1/8 to 2/8 cumulonimbus base 1 000 ft, 3/8 to 4/8 base 1 800 ft, 5/8 to 7/8 base 2 500 ft. Temporarily between 1100 and 1600 UTC same day, visibility 4000m in heavy rain showers, with a moderate probability temporarily between 1400 and 1600 UTC of a thunderstorm with moderate rain, cloud 3/8 to 4/8 base 500 ft and 5/8 to 7/8 cumulonimbus base 1 000 ft

EXPLANATION OF WEATHER PHENOMENA SIGNIFICANT TO AVIATION

1. **Drizzle (DZ)**

Fairly uniform precipitation in very fine drops of water with a diameter of less than 0.5 mm. The impact of drizzle droplets falling on a water surface is imperceptible, but continuous drizzle may produce a runoff from roofs and runway surfaces. The drops can only reach the ground without evaporating if they fall from very low clouds. Generally, the heavier the drizzle, the lower the cloud base. Visibility is inversely related to both the intensity of precipitation and the number of droplets. Light drizzle corresponds to negligible runoff from roofs; heavy drizzle to a rate of accumulation greater than 1 mm/h.

2. **Rain (RA)**

Precipitation of liquid water droplets of appreciable size (greater than 0.5 mm). Raindrops form in quite deep clouds where there is vertical motion capable of supporting sizeable water droplets. The heavier the rain, the deeper the clouds producing it. Intermittent rain of moderate or heavy intensity indicates that cells with locally strong updraughts are present.

3. **Snow (SN)**

Solid precipitation of single or agglomerated ice crystals falling from a cloud. At very low temperatures, snowflakes are small and their structure simple. At temperatures close to freezing point, the individual flakes may be composed of a large number of ice crystals (predominantly star-shaped) and the flakes may have a diameter greater than 25 mm.

4. **Snow grains (SG)**

The frozen equivalent of drizzle. They are very small and opaque white particles of ice which fall from stratiform clouds. These particles are fairly flat or elongated and their diameter is generally less than 1 mm.

5. **Ice pellets (PL)**

Transparent or translucent ice particles that cannot be crushed easily and have a diameter of 5 mm or less. They are formed from freezing raindrops or largely

melted snowflakes which can indicate that at higher levels freezing rain may be present, with the danger of severe icing after take-off or during descent/ landing. Ice pellets may occur before or after freezing rain.

6. **Hail (GR)**

Transparent or partly or completely opaque pieces of ice (hailstones) with a diameter generally between 5 mm and 50 mm. Very large stones weighing 1 kg or more have been observed.

7. **Small hail and/or snow pellets (GS)**

The abbreviation GS is used to report two different types of precipitation:

(a) Small hail

Translucent ice particles with a diameter up to 5 mm which, when falling on hard ground, bounce with an audible sound. Small hail consists of snow pellets totally or partially encased in a layer of ice and is an intermediate stage between snow pellets and hailstones.

(b) Snow pellets

White, opaque and approximately round ice particles, often falling together with snow at a temperature near 0 °C. Snow pellets normally have a diameter of 2 mm to 5 mm, are crisp and easily crushed and rebound when falling on a hard surface.

8. **Mist (BR)**

The suspension of microscopic water droplets or wet hygroscopic particles in the air, reducing horizontal visibility to 1 000 to 5 000 m. The relative humidity is greater than 95 per cent.

Note: [concerning 7 and 8] Large cumulonimbus clouds are the main “factories” where hail is produced in the atmosphere. Great cloud depth and extremely vigorous updraughts within the cloud are necessary to support these pieces of ice long enough for them to grow. Some of the hail is blown out of the side or top of the cloud before it has completely formed, leading to reports of snow pellets.

9. **Fog (FG)**

The suspension in the air of very small water droplets, which reduces horizontal visibility to less than 1 000 m.

10. **Smoke (FU)**

The suspension in the air of small particles produced by combustion, which reduces horizontal visibility to 5 000 m or less. It should be noted that smoke may be reported with a horizontal visibility of less than 1 000 m, if there are no suspended water droplets and the relative humidity is not greater than about 90 per cent.

11. **Volcanic ash (VA)**

Atmospheric dust or particles varying considerably in size, originating from active volcanoes. The small particles often penetrate the stratosphere and remain suspended for a long period. Larger particles remain within the troposphere and can be carried by the wind to different regions of the Earth. Scavenging by rainfall and gravity eventually leads to the removal of volcanic ash from the atmosphere. Larger particles, or a concentration of smaller ones, can considerably damage aircraft, including their engines.

12. **Widespread dust (DU)**

The reduction of horizontal visibility to 5 000 m or less caused by the suspension in the air of small particles of dust raised from the ground.

13. **Sand (SA)**

The reduction of horizontal visibility to 5 000 m or less caused by the suspension in the air of small particles of sand raised from the ground.

14. **Haze (HZ)**

The suspension in the air of extremely small dry particles invisible to the naked eye and sufficiently numerous to give the air an opalescent appearance with a reduction in horizontal visibility to 5 000 m or less.

15. **Dust/sand whirls (dust devils) (PO)**

A rapidly rotating column of air over a dry and dusty or sandy ground carrying dust and other light material picked up from the ground. Dust or sand whirls are of a few metres in diameter. Normally in the vertical, they extend no higher than 200 to 300 ft, but in very hot desert regions they may reach 2 000 ft.

16. **Squall (SQ)**

A strong wind that rises suddenly, generally lasting for at least 1 min. It is distinguished from a gust by its longer duration. The sudden increase in wind speed is at least 16 kt (8 m s^{-1}), the speed rising to 22 kt (11 m s^{-1}) or more and lasting at least 1 min. Squalls are often associated with large cumulonimbus clouds and violent convective activity, extending some kilometres horizontally and several thousands of feet vertically.

17. **Funnel cloud(s) (tornado or waterspout) (FC)**

A phenomenon consisting of an often violent whirlwind, indicated by the presence of a cloud column or funnel-shaped cloud, extending downwards from the base of cumulonimbus cloud but not necessarily reaching the ground. The diameter can vary from a few metres to some hundreds of metres. A well-developed funnel cloud is called a tornado if over land and a waterspout if over water. The most violent tornado can have associated wind speeds of up to about 300 kt (150 m s^{-1}).

18. **Sandstorm (SS)**

An ensemble of particles of sand energetically lifted by a strong and turbulent wind. The forward portion of the sandstorm may have the appearance of a wide and high wall. The height to which sand is raised will increase with increasing wind speed and instability.

19. **Duststorm (DS)**

Particles of dust energetically lifted by a strong and turbulent wind. Dust storms are usually associated with hot, dry and windy conditions, especially just ahead of vigorous cold fronts that can be cloud free. Dust particles typically have a diameter of less than 0.08 mm and consequently can be lifted to far greater heights than sand.

20. **Shallow (MI)**

This descriptor is used only with FG (fog) when the observed horizontal visibility is 1 000 m or more, but, when between the ground and 2 m above the ground (the assumed eye level of the observer), there is a layer in which the apparent visibility is less than 1 000 m. Operationally, MIFG may cause problems because runway markings and lights may be concealed.

21. **Patches (BC)**

This descriptor is used only with fog (FG) and indicates that there are fog patches randomly covering the aerodrome. Hence, although the horizontal visibility as reported in the METAR/SPECI is 1 000 m or more, the observer can see areas where the apparent visibility is less than 1 000 m.

22. **Partial (covering part of the aerodrome) (PR)**

This descriptor is used only with fog (FG) and indicates that a substantial part of the aerodrome is covered by fog, while the remainder is clear.

23. **Low drifting (DR)**

This descriptor indicates that dust, sand or snow has been raised by the wind to a height of less than 2 m (the assumed eye level of the observer).

24. **Blowing (BL)**

This indicates that dust, sand or snow has been raised by the wind to a height greater than 2 m and that consequently horizontal visibility has been reduced.

25. **Shower(s) (SH)**

Precipitation, often short-lived and heavy, falling from convective clouds. A shower is characterized by the suddenness with which it starts and stops, and generally by large and rapid changes in precipitation intensity.

26. **Thunderstorm (TS)**

One or more sudden electrical discharges, manifested by a flash of light (lightning) and a sharp or rumbling sound (thunder). Thunderstorms are associated with convective clouds (cumulonimbus) and are usually accompanied by precipitation. The associated cumulonimbus has vertical updraughts that may reach 30 m s^{-1} in the more vigorous cells. Downdraughts also occur, especially in the later stages of development, with speeds of about half of those for updraughts.

27. Freezing (supercooled) (FZ)

This descriptor is used only with fog (FG), drizzle (DZ) or rain (RA) when the waterdrop temperature is below 0 °C (supercooled). On impact with the ground or an aircraft, the drops of supercooled water form a mixture of water and clear ice. Freezing fog normally deposits rime, rarely clear ice.

28. Precipitation intensity criteria

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|------------------------------------|-----------|--|
| (a) Drizzle | Light: | rate < 0.1 mm h ⁻¹ |
| | Moderate: | 0.1 ≤ rate < 0.5 mm h ⁻¹ |
| | Heavy: | rate ≥ 0.5 mm h ⁻¹ |
| (b) Rain
(including
showers) | Light: | rate < 2.5 mm h ⁻¹ |
| | Moderate: | 2.5 ≤ rate < 10.0 mm h ⁻¹ |
| | Heavy: | rate ≥ 10.0 mm h ⁻¹ |
| (c) Snow
(including
showers) | Light: | rate < 1.0 mm h ⁻¹ (water equivalent) |
| | Moderate: | 1.0 ≤ rate < 5.0 mm h ⁻¹ (water equivalent) |
| | Heavy: | rate ≥ 5.0 mm h ⁻¹ (water equivalent) |

Note: Great care must be taken when interpreting observations of light snow without understanding the potential hazard to aircraft operations. The accumulation of snow on aircraft prior to take-off represents a significant safety hazard because of possible loss of lift and increasing drag during take-off. The accumulation of as little as 0.8 mm of snow or ice on the upper wing surface can result in a loss of lift and therefore endanger flight safety.

AERODROME FORECAST – TAF DECODE

IDENTIFICATION GROUPS	CCCC ICAO four-letter location indicator YGGGgZ Date and time of issue of forecast in UTC NIL Indicator of missing forecast Y ₁ Y ₁ G ₁ G ₁ Y ₂ Y ₂ G ₂ G ₂ Period of validity, beginning on Y ₁ Y ₁ day of month at G ₁ G ₁ (UTC) and ending on Y ₂ Y ₂ day of month at G ₂ G ₂ (UTC) CNL Indicator of cancelled forecast	FORECAST SURFACE WIND	KT or MPS ddddffg _m Maximum wind speed (gust) Indicator of Gust Mean wind speed Mean wind direction in degrees true rounded to nearest 10° (VRB – Variable when ff < 3 kt) 00000 = calm P99 KT (P99 MPS) f _g g _m 100 KT (50 MPS) or more	FORECAST PREVAILING VISIBILITY	VVV Prevailing visibility in metres 9999 = 10 km or more Replaced when significant weather phenomenon forecast to end by:	FORECAST SIGNIFICANT WEATHER	w'w' Forecast significant weather (see table w'w' for METAR/SPECI decode) Replaced when obscured and vertical visibility is available by:	FORECAST CLOUD AMOUNT AND HEIGHT^a	N ₁ N ₂ N ₃ h ₁ h ₂ h ₃ (cc) Cloud type – only CB (cumulonimbus) is indicated Height of base of cloud in units of 30 m (100 ft) FEW – FEW (1–2 oktas) SCT – Scattered (3–4 oktas) BKN – BrokeN (5–7 oktas) OVC – OverCast (8 oktas)	CAVOK	Ceiling And Visibility OK. Replaces visibility, weather and cloud if: (1) Visibility is forecast to be 10 km or more (2) No cumulonimbus cloud and no other cloud forecast below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater, and (3) No significant weather forecast (see Table: Aerodrome Weather Report – METAR and SPECI decode)	SIGNIFICANT CHANGES IN FORECAST CONDITIONS INDICATED BY:		PROBABILITY	PROBb ₂ c ₂ Only 30 or 40 used, indicating 30% or 40% PROBability Probability is used to indicate the probability of occurrence of: (a) an alternative element or elements (b) temporary fluctuations	DATE AND TIME	YGGG/Y ₀ G ₀ G ₀ Beginning day and time (UTC) YGGG and end day and time (UTC) Y ₀ Y ₀ G ₀ G ₀ of forecast period	CHANGE	TTTT Type of significant changes: BECGM – BECGMinG, used where changes are expected to reach or pass through specified values at a regular or irregular rate TEMPO – TEMPOrary fluctuations of less than one hour and in aggregate less than half the period indicated by YGGG/Y ₀ G ₀ G ₀	DATE AND TIME	YGGG/Y ₀ G ₀ G ₀ Beginning day and time (UTC) YGGG and end day and time (UTC) Y ₀ Y ₀ G ₀ G ₀ of forecast period	BY REGIONAL AGREEMENT	Z Indicator of UTC Y ₀ Y ₀ G ₀ G ₀ Date and time UTC to which forecast temperature refers YYT _F T _F Date and forecast temperatures at G ₀ G ₀ Temperatures below 0 °C preceded by M TX, TN Indicators of maximum and minimum forecast temperatures, respectively	FORECAST TEMPERATURE	(XX)Y _F T _F /Y ₀ Y ₀ G ₀ G ₀ Z (M)Y _F T _F /Y ₀ Y ₀ G ₀ G ₀ Z
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April 2019

^a Clouds of operational significance (i.e. below 1 500 m (5 000 ft) or below highest minimum sector altitude, whichever is greater, and CB or TCU).
 Note: Meteorological offices to issue 30-h TAFs are determined by regional air navigation agreement.

Abbreviated decode of TAF
 For details of codes, see
 Manual on Codes,
 (WMO-No. 306).



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