
Annex 3

Meteorological Aerodrome Reports (METARs)

Introduction

- The letters METAR stand for METeorological Aerodrome Report.

- METARs contain coded messages pertaining to the actual weather conditions at a given aerodrome, at a stated time.

- METARs are usually issued every half hour during aerodrome operating hours.

Decoding the METAR

This example reproduces the first eight code-groups normally found in a METAR.

METAR EGTK 231020Z 26012G25KT 220V300

For clarity the METAR has been split into its significant parts - (a) to (h):

METAR	EGTK	231020Z	260	12	G	25KT	220	V	300
(a)	(b)	(c)	(d)	(e)	(f)	(g)		(h)	

Report Type

The first code, (a), is the identification of the type of report; in this case a METAR.

Aerodrome

The four-letter ICAO designator of the issuing aerodrome is shown next, (b); this example is for Oxford/Kidlington, EGTK.

Date-Time Group

• The third group, (c), is the date/time group, which simply gives the date of the actual weather observation.

• The first two digits represent the day of the month, followed by the time in hours and minutes.

• Time is always given as Coordinated Universal Time (UTC), which is, for all practical purposes, the same as Greenwich Mean Time (GMT): the local time at Greenwich, London.

• In the METAR, itself, UTC is indicated by the code Z, pronounced “Zulu”.

Wind Information

• The next items in the METAR (d, e, f and g) are the observed wind information.

• Firstly, the direction of the wind given in degrees true, rounded up or down to the nearest 10 degrees, (d), and then the wind speed in knots, (e), which is a mean speed taken over a 10 minute period.

• However, if a gust is observed which is at least 10 knots more than the mean wind speed, then a gust figure, (g), comes after the mean wind; this gust figure is preceded by the letter G, (f).

• The next code-group, (h), may or may not appear depending on the directional variability of the wind.

• Variability of direction is included when the wind direction, over the preceding 10 minutes, has changed by 60° or more.

• The letter V will appear between these two extremes.

• If there is no wind, the coding, 00000KT, will be used.

• If the wind direction cannot be defined then VRB (for variable) replaces the direction.

Visibility

• In the METAR, the reported visibility is the prevailing visibility and, may, under certain conditions, include the minimum visibility.

• Prevailing visibility is the visibility value which is either reached, or exceeded, around at least half the horizon circle, or within at least half of the surface of the aerodrome.

• 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, and its general direction, should also be reported.

• Up to 10 km, the visibility is measured in metres. For example, 6000 means that the prevailing visibility is 6000 metres. Once the visibility reaches 10 km or more, the code figure used is 9999.

• Visibility of less than 50 metres is indicated by the code 0000.

METAR EGTK 231020Z 26012G25KT 220V300 0800

• In some instances, runway visibility information is given in a METAR; this is known as Runway Visual Range (RVR).

• RVR is given only when either the horizontal visibility or the RVR, itself, is less than 1500 metres.

• In the following example, for Oxford Kidlington, we have a prevailing visibility of 800 metres, with an RVR, at the threshold of Runway 30, of 1100 metres.

METAR EGTK 211020Z 26012G25KT 0800 R30/1100

• If the RVR is more than the maximum reportable value of 1500 metres, the code P is used in front of the visibility value, R30/P1500. If the visibility is less than 50 m then the prefix M will be used.
e.g. R30/M0050

• A letter can sometimes come after the RVR to indicate any trends that the RVR has shown.

• A U means that the visibility has increased by 100 m or more in the last 10 minutes, e.g. R30/1100U.

• A D shows that visibility has decreased by 100 m or more in that same time period, R30/1100D.

• An N added to the visibility group shows that there is no distinct trend observed, R30/1100N.

The Weather Group

- The next section of the METAR is the weather group.
- The weather group gives information on the present weather at, or near, the aerodrome at the time of the observation.

METAR EGTK 211020Z 26012G25KT 0800 R30/1100 +SHRA

- The weather group +SHRA added to our example METAR means “heavy showers of rain”.

Annex 3

Qualifier		Weather Phenomena		
Intensity or Proximity	**Descriptor**	**Precipitation**	**Obscuration**	**Other**
- Light Moderate (no Qualifier) +Heavy (well developed in the case of FC and PO) VC - In the vicinity	MI - Shallow BC - Patches BL - Blowing SH - Shower(s) TS - Thunderstorms FZ - Freezing (Supercooled) PR - Partial (covering part of aerodrome)	DZ - Drizzle RA - Rain SN - Snow IC - Ice Crystals (Diamond Dust) PL - Ice Pellets GR - Hail GS - Small hail - (<5 mm in diameter and/or snow pellets) UP - Unknown Precipitation PY - Spray	BR - Mist FG - Fog FU - Smoke VA - Volcanic Ash DU - Widespread Dust SA - Sand HZ - Haze	PO - Dust/Sand Whirls (Dust Devils) SQ - Squall FC - Funnel Cloud(s) (tornado or water spout) SS - Sandstorm/ Duststorm

Vicinity :
Between approximately 8 and 16 km of the aerodrome reference point and used only in METAR and SPECI with present weather in

Thunderstorms

• A Thunderstorm report will appear in a METAR if thunder has been heard within the last 10 minutes.

• A thunderstorm is represented by the letters TS. If there is no precipitation, the letters TS will appear on their own.

• However, if there is precipitation, a further two letters, which signify the type of precipitation, are inserted after the TS.

• For example, if there is rain observed from the thunderstorm, TSRA will appear in the METAR. If hail were to be observed, the code would read TSGR, or TSGS, with GS meaning small hail.

Cloud Coverage

• The next code-group to appear in the METAR gives detail of cloud coverage.

METAR EGTK 211020Z 26012G25KT 0800 R30/1100 +SHRA OVC020CB

• In this case the highlighted code means: overcast sky, base 2000 ft, with cumulonimbus.

• There are several prefixes which are used to describe cloud amount, at any given level. Cloud coverage is reported in the METAR using the following three-letter codes:
• FEW (FEW) meaning one to two eighths of cloud coverage.
• SCATTERED (SCT) meaning three to four eighths of cloud coverage.
• BROKEN (BKN) meaning five to seven eighths of cloud coverage.
• OVERCAST (OVC) meaning complete cloud coverage, or eight eighths.

• The only cloud types that are specified in the METAR are the significant convective clouds. These are cumulonimbus (CB) and towering cumulus (TCU).

Obscuration

• If the sky at an aerodrome is obscured for reasons other than cloud cover, and cloud coverage cannot easily be determined, the code VV is used in place of the cloud information.

• VV is followed by the vertical visibility in hundreds of feet.

METAR EGTK 231020Z 26005KT 0300 FG VV002

• The highlighted codes in this METAR indicate that:

Visibility is 300 m in fog (a), the sky is obscured and the vertical visibility is 200 ft.

• If the vertical visibility cannot be assessed, three forward slashes will replace the cloud height figures, e.g**. VV///**.

• The code CAVOK is frequently used in the METAR code, being the abbreviation for “cloud, ceiling and visibility are OK.”

• If CAVOK is used, it will replace the visibility, RVR, weather and cloud groups.

• There are four criteria which must be met in order for CAVOK to appear in the METAR.
These are:

• the visibility must be 10 kilometres or more.
• the height of the lowest cloud must be no less than 5000 ft, or the level of highest minimum sector altitude, whichever is the greater.
• there must be no cumulonimbus or ‘towering cumulus’ (TCU) present.
• there must be no significant weather at or in the vicinity of the aerodrome.

METAR EGTK 231020Z 26012G25KT 220V300 CAVOK

Temperature and Dew Point

• The temperature and dew point code is simply a two-digit number giving the air temperature, with a forward slash, followed by another two-digit number which indicates the dew point.

• Both temperatures are measured in degrees Celsius.

• If either figure is negative, the prefix M will be used, as in 10/M02. The dew point in the example just given is minus 2°C.

METAR EGTK 231020Z 26012G25KT 220V300 CAVOK 10/M02

QNH

- The QNH will be represented by the letter Q, followed by a four digit number representing the actual pressure value.

- If the QNH is less than 1000 hectopascals, the value will be preceded by a zero.

METAR EGTK 231020Z 26012G25KT 220V300 9999 -RA FEW060 SCT120 10/M02 Q0991

Recent Weather

• If there has been recent significant weather, either in the past hour, or since the last METAR was issued, and if the significant weather has ceased, or reduced in intensity, a METAR code group beginning with RE will appear.

• RE stands for recent.

• If there has been a thunderstorm during the hour, but which has now abated, giving only light rain, the present weather is reported as light rain, –RA; the fact that there have been thunderstorms in the past hour is reported by the code RETS:

METAR EGTK 231020Z 26012G25KT 220V300 9999 –RA FEW060 SCT120 10/M02 Q0991 RETS

Windshear

- windshear information may be reported in the METAR.

- This will simply be denoted by the letters WS, followed by the necessary details, such as WS ALL RWY, meaning windshear on all runways, or WS 30, meaning windshear present on Runway 30.

METAR EGTK 231020Z 26012G25KT 220V300 9999 –RA FEW060 SCT120 10/M02 Q0991 RETS
WS ALL RWY

TREND, BECMG, TEMPO

• A TREND forecast is valid for 2 hours after the time of the observation of the METAR, and constitutes the final section of the METAR.

• The change in weather conditions indicated by the code, TREND, can be further qualified by the codes, BECMG, meaning becoming, or TEMPO meaning temporarily.

• BECMG indicates that the change in the present weather will be long-lasting.

• TEMPO, on the other hand, means that the change is temporary, and that the different conditions will prevail for periods of less than one hour, only, and no more than half the time period, in aggregate.

• The codes may be followed by a time period in hours and minutes. The time periods given may be preceded by **FM** meaning from, **TL** meaning until, or **AT** meaning at.

• For example, TEMPO FM1020 TL1220 1000 +SHRA translates as: temporarily, from 1020Z to 1220Z, the visibility will reduce to 1000 metres, in heavy showers of rain.

• If there is no expected change in the meteorological conditions being forecast by the METAR, the code NOSIG is used to indicate that no significant change is expected in the next two hours.

METAR EGTK 231020Z 26012G25KT 220V300 9999 –RA FEW060 SCT120 10/M02 Q0991 RETS WS ALL RWY NOSIG

Special Reports

• A variation on the METAR is the Special Report.

• A Special Report, which is denoted by the abbreviation, SPECI, has the same format as a METAR except that the code SPECI will replace METAR at the beginning of the report.

• A SPECI will be issued when the weather conditions significantly change in the period between routine observations.

• A SPECI can be issued to indicate either an improvement or a deterioration in the weather.

SPECI EGTK 231025Z 26012G25KT 220V300 2000 +RA OVC010 5/M02 Q0991 RETS WS ALL RWY NOSIG

When SPECI must be issued?

- Temperature increase 2°C or more .
- Wind direction change 60° or more .
- Wind speed change 10 knots or more .
- Significant change in cloud base .
- Significant phenomena such as freezing PPTN or TS.

Auto

• Many aerodromes which are not used on a regular basis, or have limited staff available, have automatic meteorological stations which generate the METARs.
This is an example of such a METAR:

EGDL 070650Z AUTO 03013KT //// // FEW110/// 09/06 Q1023 =

• Note that where a field cannot be determined it is not omitted but replaced by '/'.

• So at Lyneham the visibility, weather and type of cloud cannot be determined and these groups have been replaced by a '/' for each element of the group.

End of Message

- An equals sign (=) appears at the end of the METAR to denote that the message is complete.

METAR EGTK 231020Z 26012G25KT 220V300 9999 –RA FEW060 SCT120 10/M02 Q0991 RETS WS ALL RWY NOSIG =

Terminal Aerodrome Forecasts (TAFs)

Introduction

• Terminal Aerodrome Forecasts (TAFs) are forecasts of meteorological conditions at an aerodrome, as opposed to the report of actual, present conditions as given in a METAR.

• The period of validity of a routine TAF should be not less than 6 hours nor more than 30 hours.

• Routine TAF valid for less than 12 hours should be issued every 3 hours and those valid for 12 to 30 hours should be issued every 6 hours.

Decoding TAFs

- The first code which appears in the TAF is the identifier, TAF.
- The next code is the ICAO location indicator of the aerodrome for which the report is issued.

TAF EGTK 130600Z 1307/1316 31015KT 8000 -SHRA SCT010 BKN018=

The Date-Time Information

- As we have established, the TAF gives a forecast for a period of time.

- In the TAF, there are two items of date-time information.

- The first date-time group indicates the date and time at which the TAF was issued.

TAF EGTK 130600Z 1307/1316 31015KT 8000 -SHRA SCT010 BKN018=

- in the example , the date and time of the origin of the report is 0600 UTC on 13th of the month, and the validity period, highlighted in red, is from the 13th at 0700 UTC to 1600 UTC on the same day. This example, then, is a nine hour TAF.

• The wind and weather codes in the TAF are the same as in the METAR.

Cloud

• If there is no cloud below the greater of 5000 ft or minimum sector altitude and if there is no CB or TCU and CAVOK is not appropriate, the code NSC is used, which stands for no significant cloud.

• As with METARs, only CB or TCU clouds will be included in TAFs.

TAF EGTK 130600Z 1307/1316 31015KT 8000 –SHRA SCT010 BKN018=

Forecast Change Indicators

• There are distinctive TAF codes which indicate that a change is expected in some or all of the forecast meteorological conditions.

• These codes are **FM** (meaning FROM), **BECMG** (meaning BECOMING), **TEMPO** (meaning TEMPORARILY), and **PROB** (meaning PROBABILITY).

The From (FM) Group

• The FROM group in a TAF is introduced by the code FM and marks the fact that a rapid change in the forecast conditions is expected, which will lead to the appearance of a new set of prevailing conditions becoming established at the aerodrome.

• The change indicator FM is followed by a six-digit date and time group.

TAF EGTK 130600Z 1307/1316 31015KT 8000 –SHRA SCT010 BKN018 FM 131220 27017KT 4000 BKN010=

• The first two digits are the day of the month followed by the hours and minutes to indicate the time at which the change is expected to begin.

The Becoming (BECMG) Group

• The change group BECMG, meaning becoming, is followed by an eight-figure date and time group which indicates the period during which there will be a permanent change in the forecast conditions.

• The forecast change, introduced by BECMG, will occur at an unspecified time within the time period stated.

TAF EGTK 130600Z 1307/1316 31015KT 8000 –SHRA SCT010 BKN018 BECMG 1309/1311 5000 –RA=

• The following example TAF indicates that, at some time on the 13th between 0900 UTC and 1100 UTC, but definitely by 1100 UTC, the prevailing conditions will give 5000 metres visibility, in light rain. There is no new wind information after BECMG, so the inference is that the wind will be as previously forecast: 310° (T) at 15 kt.

The Temporary (TEMPO) Group

• TEMPO, meaning temporarily, indicates that a change in meteorological conditions will occur at any time within the specified time period, but is expected to last less than one hour each time, and, in aggregate, will last no longer than half the time period of the complete forecast.

• The TEMPO indicator is followed by an 8-digit date and time group indicating the hours between which the temporary conditions are expected to begin and end.

TAF EGTK 130600Z 1307/1316 31015KT 8000 –SHRA SCT010 BKN018 TEMPO 1312/1314 4000 TSRA BKN010CB=

• The example TAF, which follows, tells us that sometime on the 13th between 1200 UTC and 1400 UTC, the visibility will fall to 4000 metres, with the weather being thunderstorms and moderate rain. There will be 5 - 7 oktas of cumulonimbus cloud at 1000 ft. However, after 1400 UTC, the weather will return to the conditions specified in the first part of the message.

The Probability (PROB) Indicator

• The code PROB (meaning probability) in a TAF indicates the probability of the occurrence of specified weather phenomena.

• The probability indication is a percentage probability of the occurrence of significant weather events such as thunderstorms and associated precipitation.

• A 30% probability is considered low, while a 40% probability indicates that it is highly likely that the weather being forecast will actually occur.

• The code PROB can be followed by a time group of its own, and/or by an indicator, such as BECMG or TEMPO.

TAF EGTK 130600Z 1307/1316 31015KT 8000 –SHRA SCT010 BKN018 PROB40 TEMPO 1310/1314 +TSRAGR SCT005CB=

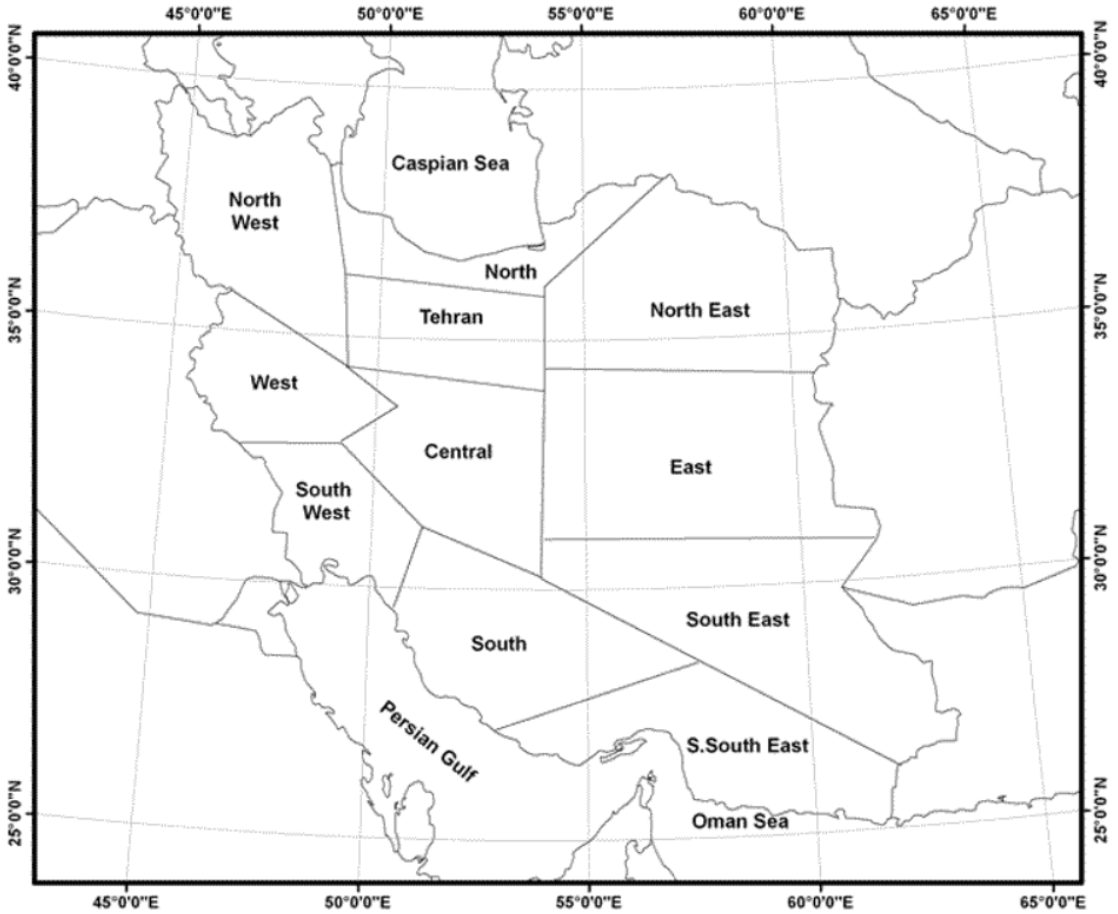
• The example TAF below tells us that there is a high probability that, between 1000 UTC and 1400 UTC, there will be thunderstorms with heavy rain and hail, and from 3 to 4 oktas of cumulonimbus clouds at 500 ft.

• The storms will not last longer than one hour at a time and less than two hours in total, which is one half of the period to which the TEMPO applies.

Route or area forecast (RAF)

Introduction

- Raf is valid for 12 HRS.
- iran divided into different geographic parts as shown in figure.



Decoding RAF

AREA FORECAST 14/1200-2400Z (WIND IN MPS)

S - SW 9999 SCT060 BKN120 LOC 4000 BR/SHRA SCT065CB BKN100

410001 23010 420069 25030 430090 27040 440005 26025

Decoding temp and wind

- 410001 23010

  10000 feet temp+1 230 deegree 10 MPS

- 430090 27040

  30000 feet temp: 50-90 = -40 270 40MPS

- 410062 23010

  temp : 50-62= -12

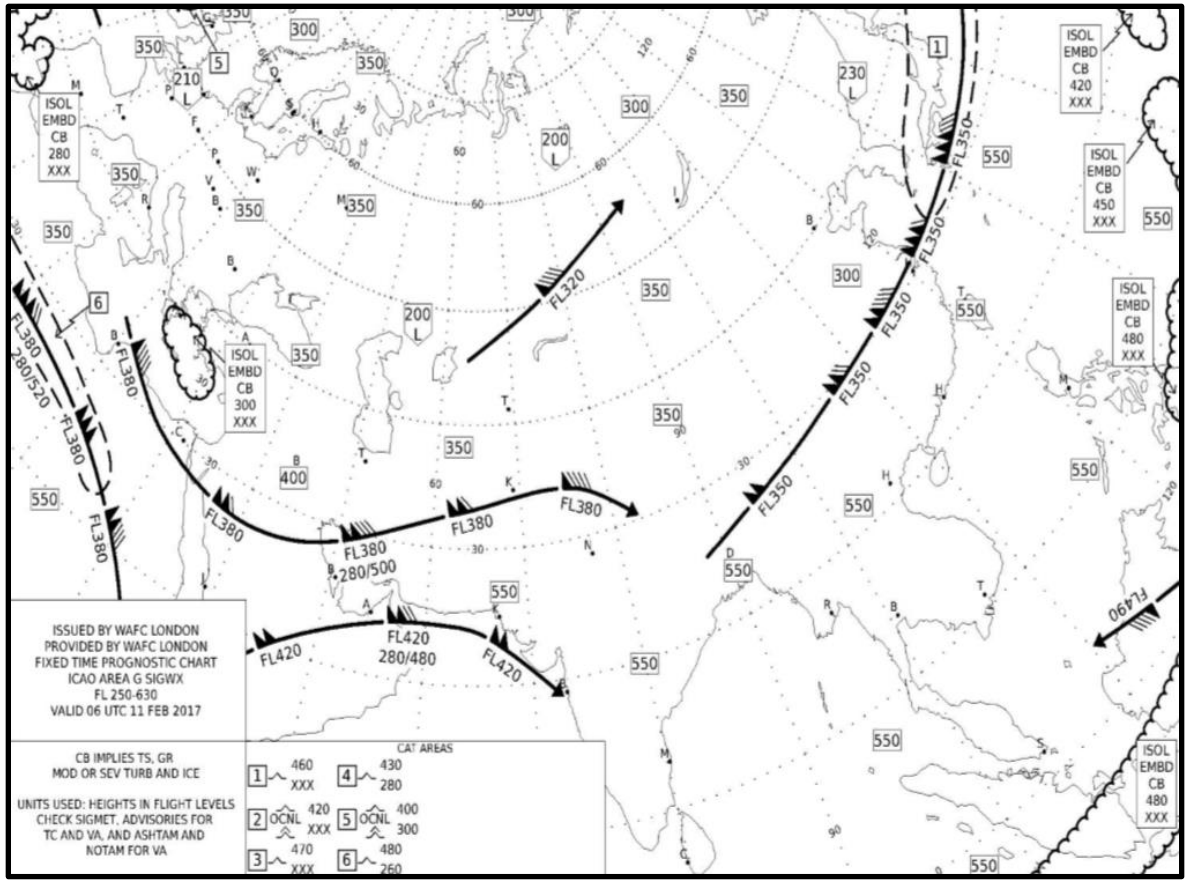
Significant Weather and Wind Charts

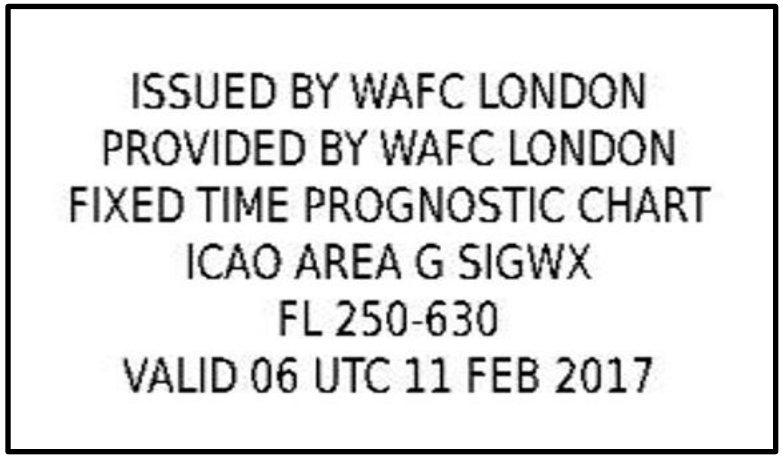
Introduction

• These charts are medium level (FL100 to FL250) and high level (FL250 to FL630) significant weather (SIGWX) charts and spot wind and temperature charts for FL100, FL180, FL240, FL300, FL340, FL390, FL450, FL530 and FL610.

• All the charts are fixed time charts valid only at the time stated on the chart. These charts are issued at 6 hour intervals. Flight in between the validity times will require the pilot to interpolate between consecutive charts.

Annex 3





• a reminder that these are fixed time charts valid only for the time stated (0600 UTC 11 FEB 2017). Note that this chart, unlike other SIGWX charts, covers levels FL250 to FL630 .

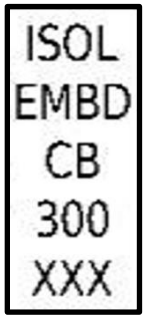
• Here are some of the abbreviations associated with CB (and TS) with their meaning:

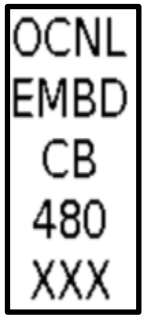
ISOL, (Isolated): individual - less than 1/8 (less than 50%)

OCNL, (Occasional): well separated - 1/8 – 4/8 (50-70%)

FRQ, (Frequent): little or no separation between CB - 5/8–8/8 (more than 70%)

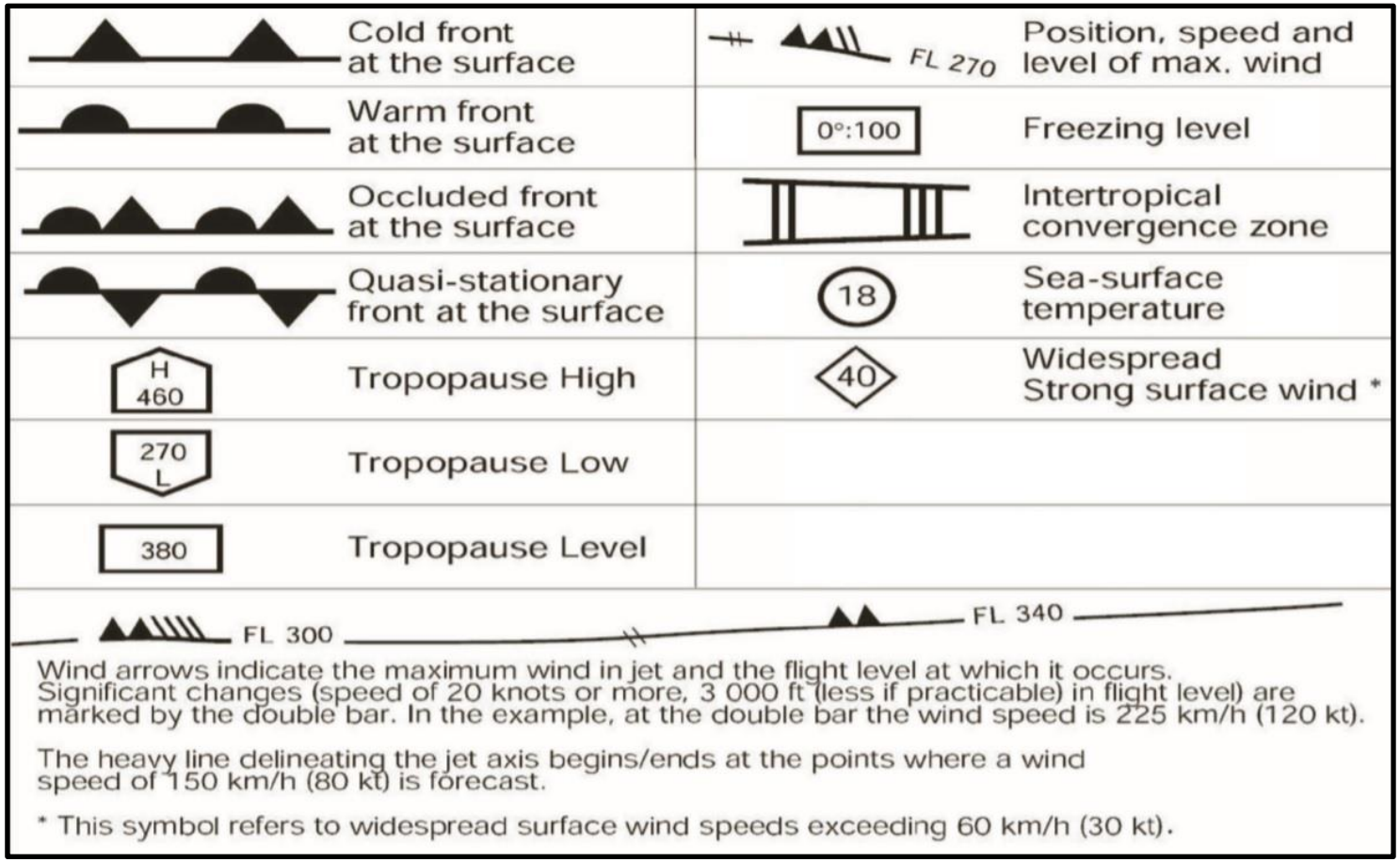
SQL, (Squall): a line of CB with little or no separation

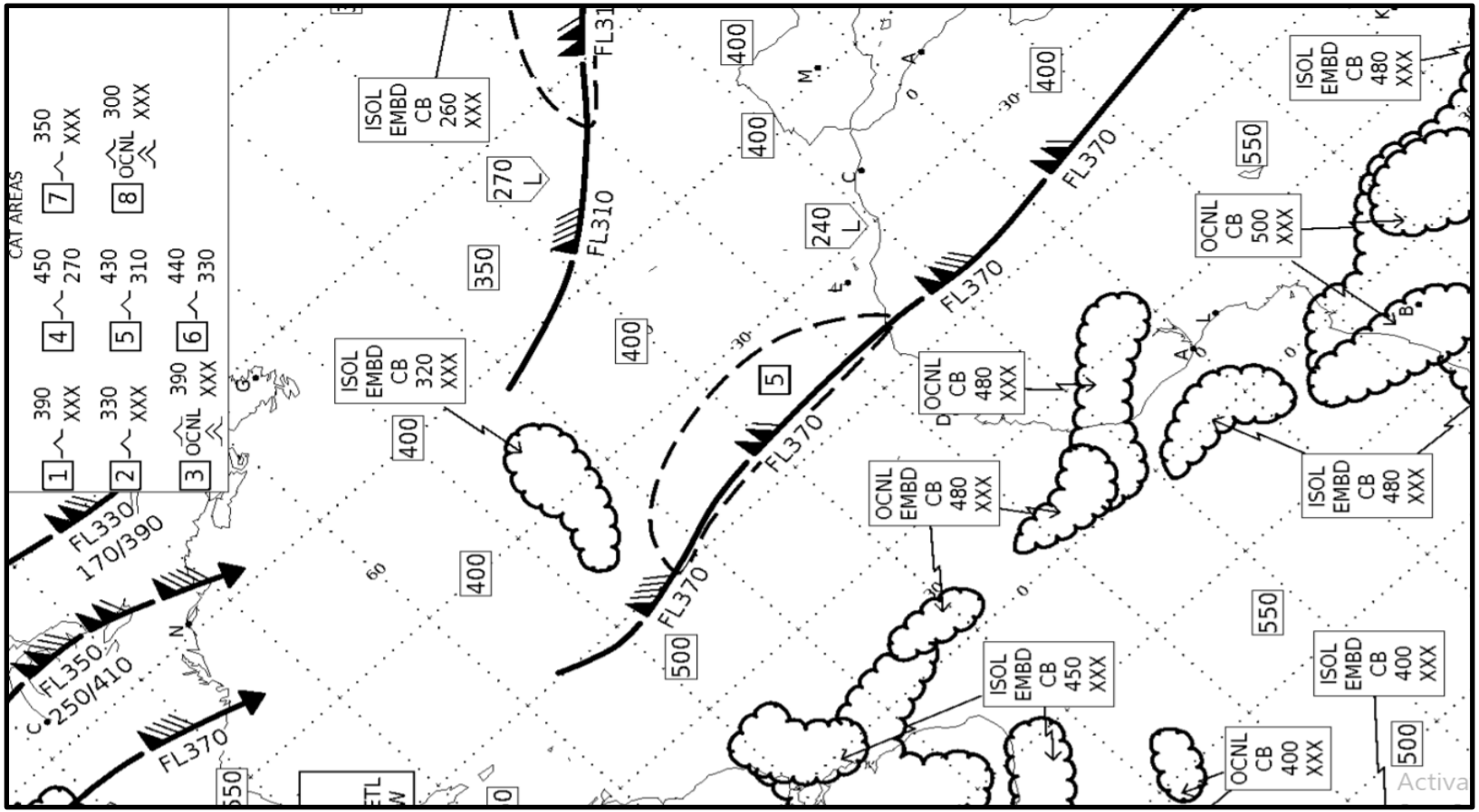


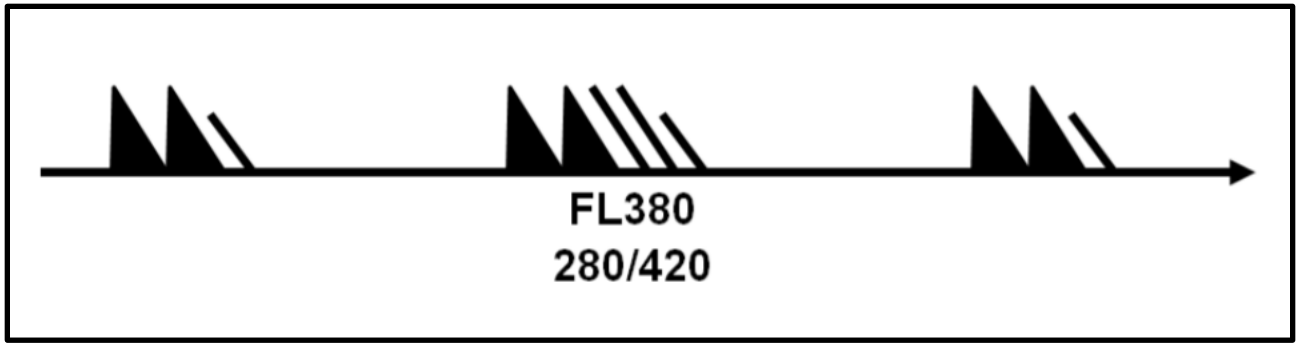


Symbols for Significant Weather

	Thunderstorms		Drizzle
	Tropical cyclone		Rain
	Severe squall line*		Snow
	Moderate turbulence		Shower  Hail
	Severe turbulence		Widespread blowing snow
	Mountain waves		Severe sand or dust haze
	Moderate aircraft icing		Widespread sandstorm or dust storm
	Severe aircraft icing		Widespread haze
	Widespread fog		Widespread mist
	Radioactive materials in the atmosphere**		Widespread smoke
	Volcanic eruption***		Freezing precipitation ****
	Mountain obscuration		Visible ash cloud *****





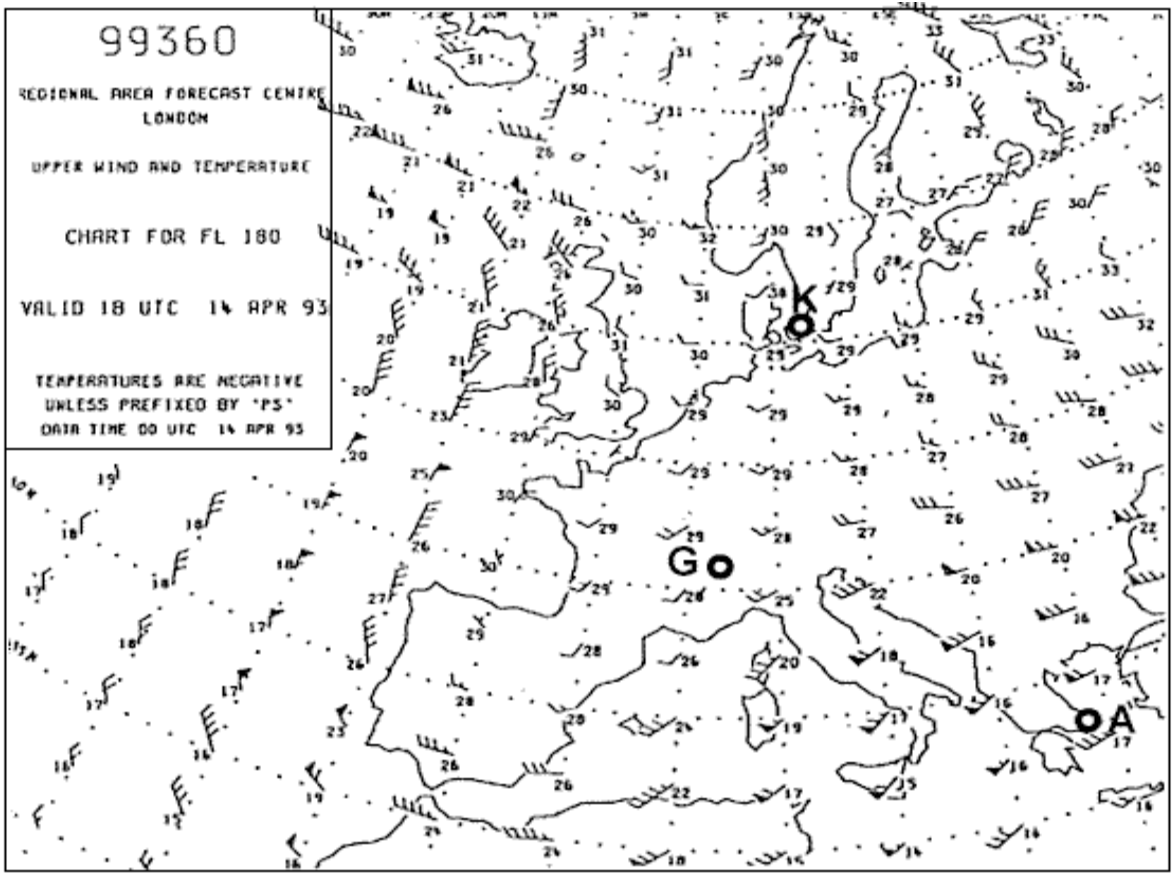


• A jet core with wind speed increasing from 105 knots to a maximum of 125 knots then decreasing to 105 knots. The jet core is at FL380 and at the location of the maximum wind speed the wind speed is 80 knots or greater between FL280 and FL420.

Wind temperature chart

• each chart showing wind and temperature for a particular flight level.

• On these charts winds are given every 5° of latitude and longitude.



warnings

Aerodrome Warnings

WARNING NO.1 231030/231130

SCTCB TOP 28000 FT WITH TSSH OVER

MEHRABAD AIR PORT .

Windshear Warnings

• Windshear warnings for aerodromes may be appended to METARs or passed by ATC.

• They will be issued for conditions on approach or departure paths up to 1600 ft above aerodrome level.

SIGMET

• SIGMETs are warnings of the occurrence of the significant weather hazards noted below to aircraft within a flight information region (FIR), they are not issued for hazards at aerodromes.

• The competent meteorological watch office will issue a SIGMET when hazardous conditions are forecast and/or reported by aircraft.

• ICAO requires that they are valid for 4 hours, but SIGMET for tropical cyclones (WC) or volcanic ash (WV) are valid for 6 hours.

- SIGMET will be issued for:

- thunderstorm;
- heavy hail;
- tropical cyclone;
- freezing rain;
- severe turbulence (not associated with convective cloud);
- severe icing (not associated with convective cloud);
- severe mountain waves;
- heavy sand/dust storm;
- volcanic ash cloud.

EGPX SIGMET 02 VALID 091115/091715 EGRR
EGPX SCOTTISH FIR SEV TURB FCST AND OBS BLW FL060 NW OF A LINE N5425 W00810 TO N5900 E00200 MOV SE AT 20KT AND SE OF LINE N5800 W01000 TO N6100 W00800 MOV SE AT 25KT NC=

• Second SIGMET issued for the Scottish flight information region (EGPX) by the meteorological watch office at Exeter (EGRR), valid from 1115Z to 1715Z on the 9th of the month. Severe turbulence forecast and observed below FL060 northwest of a line from 5425N 00810W to 5900N 00200E moving southeast at 20 kt and southeast of a line from 5800N 01000W to 6100N 00800W moving southeast at 25 kt. No change in intensity expected.

AIRMET

- SIGMETs are warnings of the occurrence of a weather hazards noted to aircraft below 10000 feet.
- maximume vali for 6 HRS.
- phenomena with moderate intensity.
- Low level flight.

Meteorological Information for Aircraft in Flight

VOLMET

• VOLMET broadcasts are ground-to-air radio transmissions of meteorological reports and forecasts made on the High Frequency (HF) and Very High Frequency (VHF) bands.

• These transmissions are broadcast in plain language, and give the latest weather reports and forecasts, in the form of spoken METARs, TAFs and SIGMETs.

• VOLMET broadcasts transmit weather information for a number of different aerodromes, sequentially.

ATIS

• The Automatic Terminal Information Service (ATIS) is a continuous broadcast of current aerodrome weather and other aerodrome information.

• The purpose of the ATIS is to improve controller effectiveness and to reduce congestion on busy ground, tower and approach frequencies by automatically transmitting on a discrete VHF radio frequency.

• Pilots departing from or arriving at aerodromes which offer ATIS are encouraged to listen to the ATIS broadcast and to notify air traffic control, on initial contact, that they have received the ATIS broadcast, by passing the phonetic alphabet code letter by which all ATIS broadcasts are identified.

• In order to free up air traffic VHF communication frequencies, some aerodromes transmit the ATIS information on the voice channel of a VOR beacon located at the aerodrome.