

# Alien21

## Read a Metar

Inside each airspace, there are specific Visual Meteorological Conditions, in short VMC. However, to understand better this specific argument, we need to learn how to read a weather report. The most simple, is know as METAR (Meteorological Terminal Air Report), which report weather conditions of a specific location at the time when it was published. It could be complicated learn how to read it during your first flights. This guide will help you how to understand each detail.

Small notification: METAR's can be different for each region and country. In United States, for make you an example, they use inches of mercury instead hectopascal as unit measure for pressure. This guide will explain the ICAO format.

### 1-Take the METAR

If we would see a METAR, in Italy you can check website <http://www.meteoam.it/metar/grafica> of the Italian air force, but in case you would see other countries, just click <https://www.en.allmetsat.com/metar- taf/> which is, probably one of the best sources for see any METAR.

I found this very simple report for Malpensa:

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LIMC 240950Z 24006KT 210V270 CAVOK 14/06 Q1019 NOSIG
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Maybe can seems just a bunch of random numbers and codes without a specific significate, but let's analyze each section.

## 2-General data

The first data will be ALWAYS, the indicator of the ICAO code (not always is showed) of our weather station (isn't always an airport), the day and UTC time when it was published.

A METAR which will start with the codes LIMV 151855Z, mean that was published from Passo dei Giovi weather station (a station between Firenze and Bologna over Appennini mountains) on day 15<sup>th</sup>, at 1855 UTC.

If a METAR was made with an Automatic Weather Observing System, or AWOS, will be indicated also the diciture AUTO.

## 3-Wind and visibility

Next data are correlated with surface wind, and visibility value's. An observation will be done always 10 mintutes before each data will be published.

Wind will be published with the 10<sup>th</sup> degrees most closer to the real value, and it will be indicated in consideration of the Geographic North (True North). If the wind average report that wind come from 277 degrees, on the METAR will be visible 280 degrees, in this case, a data modified in excess. It will follow the wind speed, in knots.

It wil be published a series of 5 numbers like this: 28005KT.

If in these 10 minuts of observations was detected gusts, it will be added a G (Gusts) and the maximum value of wind speed. With a report like 18017G30KT, it mean that we have wind from 180 degrees, with average speed of 17 knots, and gusts of 30 knots.

Could happen that will be indicated the value VRB (Variable). This abbreviation it will be published in substitution of average

direction with these requirements: If wind speed is less than 3KT and with an average direction of 60 degrees or more recorded during the 10 minutes of data recording. If the speed is equal or more than 3KT, VRB will be reported only with a variable direction equal or more than 180 degrees.

In case the wind recorded it have a speed more than 3 knots, but with a variation between 60 and 180 degrees, will be added the variation detected with a numeric indication. For example, with 06010KT 360V120, wind come from 60 degrees with 10 knots, but it was observed a variation between 360 degrees and 120 degrees.

Very rare, but in case wind reported is 00000KT, it mean that wind speed is less than 1 knots.

Visibility is reported in meters with 4 numbers and are used different minimum critheria for these reports. If visibility is less than 800 meters, will be present a difference of 50 meters with the report (EX: 0400, 0450, 0500), but if the visibility is equal or more than 800 meters, and less than 5 km, the difference will be of 100 meters (EX: 1200, 1300, 1400); finally, in case of visibility equal or more than 5 kilometers, our difference will be of 1000 meters (EX: 6000, 7000, 8000)

Value 9999 report a visibility equal or greater than 10 kilometers, but in some cases can be reported the abbreviation CAVOK (Cloud And Visibility OK). CAVOK will be used only if visibility is equal or more than 10 km, no CB (cumolonimbus) or TCB (towering cumolonimbus), and no cloud below 5000ft or highest value of airport Minimum Sector Altitude, if this is the highest

value (in Italy the MSA's are published inside runway approaches charts). And finally, for a CAVOK shouldn't be detected any weather phenomena, like precipitations.

As we can see, CAVOK is connected to clouds, which will be explained later.

If visibility is equal or less than 1500 meters, will be reported also RVR's. Runway Visual Range are basically, the best visibility value which allow to see, for a plane pilot located on the centerline runway, to see runway lights, or in case to identify the centerline and runway marks indicators, and as reported from ICAO Annex 6 operation of aircraft, are a main criteria for minimum airport operative requirements.

RVR's is calculated on the TouchDown Zone (TDZ), for each runway approved for CAT I, II and III approaches. The value is in meters. For example, R04R/1000 it show an RVR of 1000 meters for runway 04R, if there are other runways with similar approach procedures, it will be published also the RVR for these runways.

If in the 10 minutes observation was recorded a difference of 100 meters between the first 5 minutes and the last 5 minutes of observations, some indicators will be added; U for Upgrade, D for Downgrade, but there are also others, like N for No change, P for a value higher than highest value which can be recorded with RVR's (EX: P2000), M in case RVR's are below the lowest value recordable (EX: M0050), V in case inside the 10 minutes of observations, one of these minutes report an observation different of 50 meters or which is more than the 20% of average observation value, whichever is higher, and with the report of highest and minimum value (EX: 300V1500)

## 4-Weather

Inside the section for weather phenomena, are reported all weather phenomena detected above or in the proximity of the station. It could be present a maximum of 3 of these indicators made usually with 2 letters. These indicators are inside this table. Some of them have also a specific description, visible on Skybrary

- Slight Leggero	+ Heavy	BC Patches	BL Blowing
BR Mist	DR Low Drifting	DS Dust storm	DU Widespread Dust
DZ Drizzle	FG Fog/Nebbia	FC Funnel Cloud	FU Smoke
FZ Freezing	GR Hail	GS Small Hail	HZ Haze
IC Ice crystals	MI Shallow Superficiale	PL Ice Pellets	PO Dust devils
RA Rain	SA Sand	SG Snow grains	SH Shower
SN Snow Neve	SQ Squall	SS Sand Storm.	TS Thunderstorm
VA Volcanic Ash	VC In the vicinity	UP Unidentified Precipitation	RE Recent

## 5-Clouds

Clouds are reported in octal with these indicators: FEW (1 to 2 octals), SCT (ScaTtered, 3 or 4 octals), BKN (BroKeN, from 5 to 7 octals), and OVC (OverCast, 8 octals). These indicators show the percentual of coverage from the clouds in the skies, and each of these values are followed from a series of number which indicate the HEIGHT of that cloud layer about the weather station. Regarding clouds, the ceiling will be always the lowest cloud layer detected which cover more than the 50% of the sky from ground, or above sea level, until 6000 meters or 20000 feets.

## 6-Temperature

Air temperature and dewpoint (is the temperature at which a sample of air would reach 100% humidity based upon its current degree of saturation) are showed in Celsius degrees 14/06 mean temperature 14, dew +6.

## 7-QNH

QNH allow to set the barometric altimeter and, for a pilot, it allow to see the current altitude above sea level. However, each station will always detect local QFE, the local pressure at the level of that station. For calculating the QNH, a weather operator must do a simple math operatuion. Our airport is located at 200 feet, let's divide for 30 and we get 6,66. The station it detect a QFE of 1023 hPA. Let's add to this QFE 6,66 and we get 1029,66, and we take the number and round it down, or over in this case, and we know finally that the QNH is 1030.

## 8-Recent Weather

Recent significant weather observed after last planned observation will be reported with abbreviations used before for weather phenomena, but after another abbreviation, RE (EX: RERA it mean Recent Rain)

## 9-Windshear

Inside a METAR, wind shear is reported if detected near the paths used for departures and approaches to a runway below 1600 meters above runway height, with the code WS. Is reported also where it was detected. It could be a specific area(EX: WS TKOF RWY36/ LNDG RWY36 report a windshear on takeoff or, on landing for runway 36), but also if it was detected for every runway (EX: WS ALL RWY)

## 10-Color Military METAR

Inside a military METAR, for a faster report of visibility conditions, a code will be used for reporting these conditions. This table will explain the code. Black code mean that airbase is closed for different reason not connected with clouds and visibility.

Minimum base of lowest cloud (SCT or more) above aerodrome level:	>= 2500 ft	1500-2499 ft	700-1499 ft	300-699 ft	200-299 ft	< 200 ft
<b>Minimum reported visibility</b>						
>= 8 km	BLU	WHT	GRN	YLO	AMB	RED
5000-7999 m	WHT	WHT	GRN	YLO	AMB	RED
3700-4999 m	GRN	GRN	GRN	YLO	AMB	RED
1600-3699 m	YLO	YLO	YLO	YLO	AMB	RED
800-1599 m	AMB	AMB	AMB	AMB	AMB	RED
< 800 m	RED	RED	RED	RED	RED	RED

## 11-Runway status group (RSG)

Inside civilian METAR's, a 8 number code could be added for showing current runway status.

First two numbers is the runway. If is a single runway, or left runway, will be reported normal runway heading. A right runway will be reported with the heading plus 50 (EX: 35R will be reported as 85 on this code). If these conditions could be applicated for all runways, this number will be 88. 99 will be used only if the RSG will be exactly like last report and there aren't new informations.

It follow 1 number, called Runway Deposit:

0= Clean and dry

1=Damp

2=Wet or water patches

3=Rime or frost covered, less than 1mm

4=Dry snow

5=Wet snow

6=Slush

7=Ice

8=Compacted or rolled snow

9=frozen ruts or ridges

/=type of deposit not reported

After RWY deposit, the percentual of surface contaminated:

1=10% or less

2=11/25%

5=26/50%

9=51/100%

/=not reported



It follow how much is deeper the coverage:

00=less than 1 mm

01 to 90=thickness in mm

92=10 cm

93=15 cm

94=20 cm

95=25 cm

96=30 cm

97=35 cm

98= 40 cm or more

99= runway not operative

Last is runway braking action:

00/90= friction coefficient

91= poor

92= medium poor

93= medium

94=medium good

95=/good

99=not indicated or runway not operative.

NOTE: if a contamination will disappeared, abbreviation CLRD will be indicated between runway and braking friction coefficient 16CLRD95 report that runway 16 or 16L, is free and with braking action good.

## 12-TREND

Trend forecast is reported with abbreviations BECMG (Becoming, it will be a permanent changement) or TEMPO (Temporary, it mean that after that phenomena it will return back the previous weather)

After a trend it could be present also the time slot when it will be applied that trend, reported in UTC starting with FM (FROM that time UTC), RL (UNTIL that time UTC) and AT (when it will happen). NOSIG it replace the trend report only if there aren't any significant weather predicted for next 2 hours after the time when it was published a METAR.

In case must be reported the end of significant weather, abbreviation NSW will be added (No Significant Weather).

Any complementary information which follow national rules, will be reported with remarks= RMK, and could have data about clouds, sea status, clouds over hills/mountains, valleys and so on.

## Sources

ICAO documentation 8896 Manual of Aeronautical Meteorological Practice

ICAO documentation Annex 3 Meteorological Service for International Air Navigation