New Aviation Weather Formats: METAR/TAF

June 1995
U.S. Department of Transportation
Federal Aviation Administration

NOTICE: The following METAR/TAF code formats are undergoing final changes. The proposed effective date is mid 1996, however the date may change. This booklet is for information only. The information is correct as of June 1, 1995.

INTRODUCTION

Beginning mid 1996, the United States will convert airport surface observations (SA's and SP's) and airport terminal weather forecasts to the International Civil Aviation Organization (ICAO) formats. The surface observations and terminal forecast formats and coding will change. Other weather products such as winds aloft (FD), area forecasts (FA), and pilot reports (PIREPs) will begin to incorporate the new weather coding and station identifiers.

The hourly surface observations (SA) will be referred to as METAR (Aviation Routine Weather Report) and the airport terminal forecast will be referred to as TAF (Aerodrome Forecast). Pilots will notice some differences in the sequence in which information is presented, formatted (e.g. winds and cloud cover), and the abbreviations used.

With a little practice and the help of the tear-out "decoder" card included in this booklet, pilots will find it is easy to understand the new code and will find the additional information in the forecasts (TAF) very useful. Those who use DUATs (Direct User Access Terminal) or commercially provided weather services will find all have included a plain language interpreter just as before. Flight service briefings will be slightly changed with the sequence of information possibly different and temperature and dew point in
degrees Celsius.

METAR

Let's check out a **METAR**

METAR (or SPECI for Special Report) KPIT 201955Z (COR for correction to observation) 22015G25KT 3/4SM R28R/2600FT TSRA OVC010CB 18/16 A2992 RMK SLP013 T01760158

Note: When METAR data is missing from the body of the report (e.g. dew point), it is simply omitted and the user must know the sequence to recognize this. Some exceptions apply in remarks such as RVRNO, or SLPNO when RVR or SLP are normally reported but not currently available.

To help remember the sequence, think of 3W's at the beginning -
Where, When, and Wind. *This works for METAR as well as TAF!*

METAR KPIT 201955Z 22015G25KT

Where

KPIT is the ICAO station identifier. The usual 3 letter identifiers we are all familiar with are now preceded by a "K" for the contiguous United States. Alaska and Hawaii will use 4 letter identifiers beginning with "PA" and "PH" respectively. Changes are planned to incorporate alphabetic identifiers for those ***weather reporting*** stations where numbers and letters are now used (e.g., W10 to HEF).

When

201955Z is the **20th day** of the month.

201955Z at **1955Z** time

Wind

22015G25KT is reported as the 3 digit direction to the nearest 10 degrees.

22015G25KT next is the 2 or 3 digit speed.

22015G25KT a "G" comes next if the wind is gusting.

22015G25KT followed by the 2 or 3 digit maximum speed and units (**KT**).

00000KT for calm winds.

20015KT 180V260 When wind direction varies 60 degrees or more and wind is greater than 6 knots.

VRB Used when wind direction is variable and speed is less than or equal to 6 knots.

RMK Peak wind data shall be reported in the remarks section whenever the maximum instantaneous speed is greater than 25 knots. **22030/15** means a maximum instantaneous wind at **30** knots occurred **15** minutes past the hour from **220** degrees.

Visibility

3/4SM meaning **3/4** statue mile visibility. Miles and fractions are also reported (e.g., **2 3/4SM** for 2 and 3/4 statute miles visibility).

R28R/2600FT Means Runway Visual Range (RVR). Signifies that the runway visual range for **runway 28 Right is 2600** feet. The format is **R**(XXX)Runway Designator including (**L**)eft (**C**)enter or (**R**)ight (XXXX) 4 digit visibility in feet.

Some coding pilots may also see for RVR include:

M	Indicates that RVR is less than lowest reportable sensor value(e.g. M600FT)
P	Indicates RVR greater than highest reportable sensor value (e.g.P6000FT).
V	Variable If the RVR is variable between 2000 and 4000 feet for runway 6L: R06L/2000V4000FT).

Significant Present Weather

TSRA: **Thunderstorm/Moderate Rain** Format is a two character descriptor (e.g. TS, SH, DR) followed by a two character weather phenomenon (e.g.RA, SN, FG). (See Abbreviations Section)

Intensity values include:

"-"	**Light**
"+"	**Heavy**
"no sign"	**Moderate**

Clouds

OVC010CB: Specifies cloud amount, height, and type. **Overcast** clouds are present at 1000 feet consisting of **cumulonimbus** clouds.

Cloud height is reported in hundreds of feet. When clouds are composed of towering cumulus or cumulonimbus **TCU** or **CB** will follow cloud height.

The clouds are categorized based on eighths (octas) of the sky:

SKC Sky Clear
FEW 1-2 octas
SCT 3-4 octas
BKN 5-7 octas
OVC 8 octas

VV may be listed here for **indefinite ceiling** such as **"VV004"** for **Vertical Visibility 400 feet.** "**VV**///" means indefinite ceiling, height not available.

18/16 **Temperature/Dew Point** listed in degrees Celsius. When temperatures are below zero degrees Celsius, they are preceded by **"M"** for **Minus** (e.g., **10/M06** for temperature **10 degrees C, dew point Minus 6 degrees C**).

A2992 **Altimeter Setting "A"** indicates setting in **inches** of mercury for United States. Consists of 4 digits: inches and hundredths.

RMK SLP013 T01760158

RMK SLP013 T01760158. **Remarks** come last.

RMK SLP013 T01760158. Selected stations will contain **SLP** for **Sea Level Pressure** reported as the last three digits in hectoPascals (milibars) (e.g., 1013 is reported as SLP013).

RMK SLP013 T01760158. Also, at selected stations, the 9 character code (**T01760158**) breaks down the temperature and dew point to the nearest 1/10th of a degree Celsius. The "**T**" stands for temperature and the "**0**" means positive temperature. A "**1**" in place of the "0" stands for negative temperature. At selected stations, other temperature codes, such as **10142**, **20012**, or **401120084**, may appear to document temperatures not related to aviation.

METAR ON ASOS/AWOS

Pilots will notice the METAR/SPECI code and sequence replaces the format on automated weather observations (AWOS/ASOS). Also when a METAR/SPECI is supplied by an automated source, the notation "AUTO" for automated observation will appear in the report. The Remarks(RMK) will then contain an abbreviation for the type and number of sensors(AO1, AO2). If the site is attended, the METAR may contain information that has been manually provided by the observer, as in the case of some weather phenomena. The observer's comments will appear in the RMK section.

An example of a fully automated AWOS/ASOS METAR without human intervention contains the word **AUTO**:

METAR KOFP 251955Z AUTO **30008KT 10SM CLR 22/10 A3010 RMK**
AO2 **SLP138 T02180096**
When AWOS/ASOS reported sky condition is **clear (CLR)** it means no clouds at or below 12,000 feet.

TAF

Let's try a TAF

TAF contains a definitive forecast for specific time periods and will replace the terminal forecast.

TAF (TAF AMD is Amended Forecast when included**) KPIT 091720Z**
091818 22020KT 3SM -SHRA BKN020

FM2030 30015G25KT 3SM SHRA OVC015 PROB40 2022 1/2SM TSRA OVC008CB

FM2300 27008KT 5SM -SHRA BKN020 OVC040 TEMPO 0407 00000KT 1SM -RA FG

FM1000 22010KT 5SM -SHRA OVC020 BECMG 1315 20010KT P6SM NSW SKC

Once you know how to pick out the TAF forecast time periods, the same logical sequence that we saw in METAR will follow. Below, a TAF is broken down to highlight its individual segments. Key words, and their definitions, indicating a new time period has started are highlighted in red.

TAF KPIT 091720Z 091818 22020KT 3SM -SHRA BKN020

FM2030 30015G25KT WS015/30045KT 3SM SHRA OVC015
PROB40 2022 1/2SM TSRA OVC008CB

FM2300 27008KT 5SM -SHRA BKN020 OVC040 TEMPO 0407
00000KT 1SM -RA FG

FM1000 22010KT 5SM -SHRA OVC020 BECMG 1315 20010KT
P6SM NSW SKC

The Where, When, and Wind trick works with TAF, too. There's a little twist with the "when," however.

TAF KPIT 091720Z 091818 22020KT

Where

KPIT is the ICAO station identifier. The usual 3 letter identifiers we are all familiar with preceded by a "K" for the contiguous United States. Alaska and Hawaii will use 4 letter identifiers beginning with "PA" and "PH" respectively. Changes are planned to incorporate three letter identifiers for those ***weather reporting*** stations where numbers and letters are now used (e.g., W10 to HEF).

When

After **KPIT**, we see

091720Z This is the forecast for the **9**th day of the month with an issuance time of **1720 Z** or UTC. This is a 2 digit date and 4 digit time.

091818 is the valid period with the first two digits containing the day of the month (**09**).

091818 the second two digits specify the hour beginning the forecast period (**1800Z**).

091818 the last two digits are the hour ending the forecast period (**1800Z** on the next day, (the 10th).

Wind

22020KT

See description under METAR

WS015/30045KT means at 1500 feet we expect wind to be **300** degrees at **45 KT**. This indicates low level wind shear, not associated with convective activity.

Time Periods, Etc.

FM2030 **From 2030Z or UTC time**. Indicates hours and minutes.

PROB40 **2022** There is a **40 percent probability** of this condition occurring between **2000Z and 2200Z**.

FM2300 FROM 2300Z.

TEMPO 0407 Temporary changes expected between 0400Z and 0700Z.

FM1000 FROM 1000Z.

BECMG 1315 Conditions **Becoming** as described between **1300Z and 1500Z**.

Once the specific time periods can be discerned, the sequence **of wind, visibility, significant weather, cloud cover and cloud height** follows and is repeated for each time block. The only exception is after qualifiers such as **PROB40, TEMPO**, and **BECMG**, some of the components may be omitted if these are not expected to change. Notice after **PROB40 2022**, there is no wind given and **after TEMPO0407**, there is no cloud cover listed. TAF's will also contain wind shear information not associated with convective activity.

It's **BECMG CLR** now, isn't it?

International Differences

Pilots and operators who fly to international destinations are cautioned to be alert to differences between U.S. METAR/TAF and international METAR/TAF. Some key differences follow.

Altimeter Setting

The United States reports the altimeter setting in inches of mercury (e.g., **A2992**) and internationally it will be reported in hectoPascals (milibars) (e.g., **Q1013**).

Wind

Internationally wind may be reported in knots (KT), kilometers per hour (KMH) or meters per second (MPS). Appropriate units are indicated on both METAR and TAF.

Wind Shear

Low level wind shear, not associated with convective activity (e.g., **WS015/30045KT**, **see TAF**) will appear in TAFs in the United States, Canada, and Mexico only.

Visibility

Internationally, visibility is reported in 4 digits using meters with the direction of the lowest visibility sector (e.g., 6000SW - meaning visibility is lowest at 6000 meters to the southwest). In the United States, we use prevailing visibility, in statue miles, not the lowest visibility, so the same conditions would be reported differently.

International visibility reports also contain a trend such as:

D Down
U Up
N No change
V Variable

Other

Remarks (**RMK**) included in U.S. METAR are transmitted to only Canada and Mexico and no other international stations.

Pilots may also see the notation on International METAR/TAF: **CAVOK**. This means ceiling and visibility OK and is used to replace weather and clouds if visibility is 10 kilometers or more, there are no clouds below 1500 meters (5000 feet) or below the highest minimum air traffic control sector altitude, whichever is greater. Also, there must be no other significant weather. **NSC** means no significant clouds.

International TAFs may include temperature, turbulence, and icing forecasts.

Abbreviations

AO1	Automated Observation without precipitation discriminator (rain/snow)
AO2	Automated Observation with precipitation discriminator (rain/snow)
AMD	Amended Forecast (TAF)
BECMG	Becoming (expected between 2 digit beginning hour and 2 digit ending hour)
BKN	Broken
CLR	Clear at or below 12,000 feet (AWOS/ASOS report)
COR	Correction to the observation
FEW	1 or 2 octas (eighths) cloud coverage
FM	From (4 digit beginning time in hours and minutes)
LDG	Landing
M	In temperature field means"minus" or below zero
M	In RVR listing indicates visibility less than lowest reportable sensor value (e.g. M600)
NO	Not available (e.g. SLPNO, RVRNO)
NSW	No Significant Weather
OVC	Overcast
P	in RVR indicates visibility greater than highest reportable sensor value (e.g. P6000FT)
P6SM	Visibility greater than 6 SM (TAF only)
PROB40	Probability 40 percent
R	Runway (used in RVR measurement)
RMK	Remark
RY/RWY	Runway
SCT	Scattered
SKC	Sky Clear
SLP	Sea Level Pressure (e.g., 1013 reported as 013)
SM	Statute mile(s)
SPECI	Special Report
TEMPO	Temporary changes expected (between 2 digit beginning hour and 2 digit ending hour)
TKOF	Takeoff

T01760158, 10142, 20012 and 401120084
In Remarks - examples of temperature information

V	Varies (wind direction and RVR)
VC	Vicinity
VRB	Variable wind direction when speed is less than or equal to 6 knots
VV	Vertical Visibility (Indefinite Ceiling)
WS	Wind shear (In TAFs, low level and not associated with convective activity)

Descriptors

BC Patches	FZ Supercooled/freezing	SH Showers
BL Blowing	MI Shallow	TS Thunderstorms
DR Low Drifitng	PR Partial	

Weather Phenomena

BR Mist	GS Small Hail/Snow Pellets	SN Snow
DS Dust Storm	HZ Haze	SQ Squall
DU Widespread Dust	IC Ice Crystals	SS Sandstorm
DZ Drizzle	PE Ice Pellets	UP Unknown Precipitation (Automated Observations)
FC Funnel Cloud	PO Dust/Sand Whirls	VA Volcanic Ash
+FC Tornado/Water Spout	PY Spray	
FG Fog	RA Rain	
FU Smoke	SA Sand	
GR Hail	SG Snow Grains	

Cloud Types

CB	Cumulonimbus
TCU	Towering Cumulus

METAR (SPECI or Special Report)

Note: When METAR data is missing (e.g. dew point), it is simply omitted and the user must know the sequence to recognize this. Some exceptions apply in remarks such as RVRNO, or SLPNO when RVR or SLP are normally reported but not currently available.

METAR KPIT 201955Z 22015G25KT 3/4SM R28R/2600FT TSRA OVC010CB 18/16 A2992 RMK SLP013 T01760158

Where:	**KPIT**
When:	**201955Z** 20th day of month at 1955Z
Wind:	**22015G25KT 220** degrees at 15 gusting to 25 knots
V:	Variable direction e.g., 20015KT 220V280
VRB:	Variable direction when speed is less than or equal to 6 knots
Visibility:	**3/4SM** 3/4 statute miles, typical: 2 3/4SM, 1SM,

RVR **R28R/2600FT** Runway 28 Right visibility 2600 feet

M:	Used for RVR less than lowest reportable sensor value (e.g **M600FT**)
P:	Used for RVR greater than highest reportable sensor value (eg. **P6000FT**)
V:	Variable

Significant Weather:	**TSRA** thunderstorm/moderate rain (See Abbreviations)
Sky Condition:	**OVC010CB** overcast clouds at 1000 feet consisting of cumulonimbus
Typical:	**SKC, FEW, SCT, BKN, VV004** indefinite ceiling (Vertical Visibility) 400 feet or V V///indefinite ceiling height not available
Temperature/Dew Point:	**18/16** 18 degrees Celsius/dew point 16 degrees Celsius **M** = Minus (below zero)
Altimeter:	**A2992** inches of mercury and preceded by an "A"

RMK SLP013 T01760158 10142 20012 401120084 At selected stations, Sea Level Pressure is reported as the last three digits in hectoPascals (milibars) (e.g., 1013 is reported as **SLP013**). Codes such as T01760158 10142 20012 and 401120084 are climate temperature information.

TAF (TAF AMD is Amended Forecast when included)

KPIT 091720Z 091818 22020KT WS015/30045KT 3SM -SHRA BKN020

FM2030 30015G25KT 3SM SHRA OVC015 PROB40 2022 1/2 TSRA OVC008CB
FM2300 27008KT 5SM -SHRA BKN020 OVC040 TEMPO 0407 00000KT 1SM -RA FG

FM1000 22010KT 5SM -SHRA OVC020 BECMG 1315 20010KT P6SM NSW SKC

Where:	**KPIT**
When:	**091720Z** issuance day and time: 9th day at 1720Z
	091818 valid period: 9th day at 1800Z to next day (10th) at 1800Z
Wind:	**22020KT WS015/30045KT** 220 degrees at 20 knots with low level wind shear at 1500 feet forecast to be 300 degrees at 45 knots (only nonconvective, low level, wind shear is forecast)
Visibility:	**3SM** 3 statute miles, typical -**2 3/4SM, 1SM**,
P6SM:	Greater than 6 statute miles
Significant Wx:	**-SHRA** light rain showers (See Abbreviations)
Sky Condition:	**BKN020** broken clouds at 2000 feet.
Typical:	**FEW, SCT, BKN, OVC.**
	VV004 indefinite ceiling (Vertical Visibility) 400 feet or **VV**///. Indefinite ceiling height not available **CB** and **TCU** clouds noted when present.

Sequence of Wind, Visibility, Significant Weather and Sky Condition repeats preceded by:

FM2030:	rom 2030Z
PROB40 2022	here is a 40 percent probability between 2000Z and 2200Z.
FM2300:	From 2300Z
TEMPO 0407:	Temporarily between 0400Z and 0700Z
FM1000:	From 1000Z
BECMG 1315:	Becoming between 1300Z and 1500Z

Note: Weather conditions such as wind and sky condition may be omitted after **PROB40, TEMPO, and BECMG** if no change is expected from those same conditions given in the previous time block.