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Flying Operations

Aircrew Quick Reference to the METAR and TAF Codes

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Introduction

The Aircrew Quick Reference Guide to the METAR and TAF Codes helps aircrews quickly and clearly translate METAR and TAF codes into plain language. See Attachment 1 for a list of source documents.

METAR reports are observed weather conditions while the TAF indicates forecast conditions. Both are lines of text made up of coded data groups separated by spaces. Some groups are not discussed because they are only intended for use by the weather community. Differences between military and civilian renderings of the code are discussed.

Aircrews should always check METAR and TAF reports thoroughly for all hazards to flight safety and other elements that may affect aircraft performance or mission accomplishment. When users have weather-related questions, they should contact a certified US military forecaster or MAJCOM-approved weather source for clarification. Weather briefing requirements for USAF Aircrews are spelled out in AFI 11-202, Volume 3, *General Flight Rules*.

Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF Form 847, Recommendation for Change of Publication; route AF Form 847s from the field through the appropriate functional's chain of command. This publication may not be supplemented.

SUMMARY OF CHANGES

This document includes clarifications of METAR sector visibility and vertical visibility and removes references to runway surface conditions (now reported via NOTAMs). It also incorporates several changes to the TAF format, specifically: repositioning the AMD and COR modifiers for emphasis, adding a "prepared/disseminated" time group to military TAFs (already included in civilian TAFs), reformatting of the TAF valid time groups, noting that some civilian TAFs are valid for up to 30 hours, and adding a "T" before both maximum and minimum temperature groups in military TAFs.

Table of Contents

METAR *Report Type*

What kind of report is this?

```
KBLV 011657Z AUTO 25015G30KT 210V290
3/8SM R32L/1000FT FG BKN005 01/M01 A2984
RMK A02 SLP034
```

This report is a **METAR** (roughly translated from French as Aviation Routine Weather Report)—a scheduled observation normally taken between 50-59 minutes past the hour (also referred to as a routine ***hourly*** observation). A METAR can be distinguished from a TAF by its single date/time group.

```
SPECI KBLV 011715Z 25015G30KT 210V290 3SM
BR BKN015 01/M01 A2984 RMK SLP034
```

SPECI (Aviation Selected Special Weather Report) refers to an unscheduled report taken when certain criteria have been met (such as a change from VFR to IFR) and may be taken anytime.

METAR Location and Date/Time

How do I determine the location and the date and time of issuance?

PAAQ 011657Z AUTO 25015G30KT 210V290
3/8SM BKN005 03/M01 A2984 RMK A02 SLP034

KCLK 291012Z AUTO 08009KT 2SM -RA SCT005
OVC009 M01/M01 A2999 RMK AO2

The 4-character ICAO identifier is the location; **PAAQ** (Palmer Municipal) and **KCLK** (Clinton Regional) are the locations/stations in these examples.

The 7-character group following the ICAO identifier is the date and time of issuance. The first two digits are the date; the last four digits are the coordinated universal time (UTC), sometimes called "zulu time."

In the first example, **01** is the 1st day of the month, and **1657Z** is 1657 UTC. The second example takes place on the 29th day of the month at 1012 UTC.

When ICAO identifiers are not available or cannot be used, a 4-character identifier starting with KQ will be used. This practice is normally found in a contingency environment, where the location/identifier combination is often classified. Consult the local weather flight for more details.

What does AUTO and/or COR mean, if included?

Let's look at the meanings of AUTO and COR separately.

```
KBLV 011657Z AUTO 25015G30KT 210V290 3/8SM
R32L/1000FT FG BKN005 01/M01 A2984 RMK A02A
SLP034
```

AUTO refers to an automated observation with measurements taken by equipment such as the domestic Automated Weather Observing System (AWOS) or Automated Surface Observation System (ASOS), or the Air Force's Automated Meteorological Station (AMS), also known as AN/FMQ-19. AO1 denotes an observation taken by equipment lacking a precipitation type discriminator (rain vs. snow). AO2 denotes an observation taken by standard equipment with a full complement of sensors. **A02A** denotes an automated observation augmented by a human observer. Absence of these indicators denotes a manual report by a human observer.

```
KBLV 011657Z AUTO COR 25015G30KT 210V290
3/8SM R32L/1000FT FG FU BKN005 01/M01 A2984
RMK A02A SLP034 COR 1725
```

COR indicates a corrected observation. Disregard the previous transmission. **COR 1725** means that the correction was transmitted at 1725Z.

How do I determine the wind speed and direction?

```
KBLV 011657Z AUTO 25015G30KT 210V290
3/8SM R32L/1000FT FG BKN005 01/M01 A2984
RMK A02 SLP034
```

The data group followed by KT (knots) is the wind.

The first three digits are the true direction to the nearest 10 degrees from which the wind is blowing. The next two digits are the sustained speed. If gusts are present, the next two or three digits following the "G" are the "gust," the maximum wind speed in the last ten minutes.

In this example, the **25015G30KT** group is the wind direction and speed. Here, the wind is blowing from 250 degrees (true) at a sustained speed of 15 knots, gusting up to 30 knots.

Calm wind is encoded as **000000KT**.

How do I determine if the wind is varying between directions?

```
KBLV 011657Z AUTO 25015G30KT 210V290
3/8SM R32L/1000FT FG BKN005 01/M01 A2984
RMK A02 SLP034
```

A wind variability group will be reported if the wind is variable by 60 degrees or more and the speed is greater than 6 knots. This remark will contain the extremes of the wind directions, separated by "V."

In the example above, **210V290** reads, "wind direction varying between 210 and 290."

```
KBLV 011657Z AUTO VRB03KT 3/8SM
R32L/1000FT FG BKN005 01/M01 A2984 RMK
A02 SLP034
```

VRB is used (without direction extremes) when the wind speed is less than or equal to 6 knots. In the example above, **VRB03KT** reads, "wind direction is variable at 3 knots."

How do I determine the prevailing visibility?

```
KBLV 011657Z 25015G30KT 210V290 3/8SM
R32L/1000FT FG BKN005 01/M01 A2984 RMK SLP034
```

Visibility is measured in statute miles. In this example, **3/8SM** (3/8 of a statute mile) is the prevailing visibility. Prevailing visibility is the greatest horizontal visibility observed throughout at least half the horizon circle, not necessarily continuous. Surface visibility is measured at a point six feet above ground level.

Sector visibility may be reported in the remarks section if it differs from the prevailing visibility and is less than 3 miles, or otherwise considered operationally significant. For sector visibility format, see VIS remarks in Figure 2 on page 18.

```
EDDF 071320Z 22008KT 9999 SCT036 SCT090
BKN280 19/10 Q1011 NOSIG
```

Most overseas locations report visibility in meters and omit the SM identifier. The largest reportable metric value is **9999**. This value represents a visibility greater than 9000 meters (7 SM or more). The contraction CAVOK (ceiling and visibility OK) may be used when there is no significant weather, the visibility is 10 km or greater, and the ceilings are greater than 5,000 ft. To convert visibility values from meters to statute miles see Attachment 3 or the Flight Information Handbook conversion tables.

What if there is a group that begins with the letter "R?"

```
KBLV 011657Z AUTO 25015G30KT 210V290 3/8SM
R32L/1000FT FG BKN005 01/M01 A2984 RMK A02
SLP034
```

Runway Visual Range (RVR) follows the visibility and begins with the letter "R." The runway heading will follow the "R," and in this example, "32L" represents runway 32-Left (C-Center, R-Right). The last four digits report the visibility in feet.

In this example, **R32L/1000FT** reads, "runway visual range for runway 32 Left is 1,000 ft."

Most overseas locations report visibility in meters and omit the FT identifier from the RVR group. The same RVR at an overseas location would appear as R32L/0300 and read, "runway visual range for 32 Left is 300 meters."

How would I decode the formats M0600FT or P6000FT or R06L2000V4000FT (not in example above)?

M0600FT	Reads, "RVR is less than 600 feet." (**M** = less than)
P6000FT	Reads, "RVR is greater than 6,000 feet." (**P** = greater than)
R06L2000V4000FT	Reads, "RVR for 6 Left is variable between 2,000 and 4,000 feet." "**V**" indicates that the RVR is variable between two thresholds.

For RVR conversion charts, see Attachment 4 or the front section of any Instrument Approach Procedures (IAP) booklet.

How do I determine if there is any weather?

```
KBLV 011657Z AUTO 25015G30KT 210V290
3/8SM R32L/1000FT FG BKN005 01/M01 A2984
RMK A02 SLP034
```

If a weather element (precipitation or obstruction to visibility) is observed, it will be found in the data group following the visibility. The absence of a weather element group indicates that no precipitation or obstruction to visibility is occurring at the time of the observation. In this example, "**FG**" represents "Fog."

To methodically decode a weather group, look for six key elements (*depending on the phenomena*, *one or more may be omitted*). In order, these elements are: **Intensity** (symbol preceding the code), **Proximity**, **Descriptor**, **Precipitation Description**, **Obscuration** (other than precipitation), and **Other**.

For a complete table of weather group elements and examples, see Figure 1 on page 12, or reference Section C "METAR and TAF Code" of the Flight Information Handbook.

METAR Weather/Obscuration Table

Figure 1. Weather/Obscuration Table

Phenomenon Qualifiers

Element 1: Intensity		Element 2: Proximity		Element 3: Description	
-	Light	none	On station	BC	Patches
none	Moderate	VC	In the vicinity (5-10 miles)	BL	Blowing
		DSNT	> 10 miles		
+	Heavy			DR	Low Drifting
Note: + can also mean a well-developed dust storm, sandstorm, whirl, dust devil, tornado, or waterspout				FZ	Freezing
				MI	Shallow
				PR	Partial (covering part of the sky)
				SH	Shower(s)
				TS	Thunderstorm

Types of Weather Phenomenon

Element 4: Precipitation		Element 5: Obscuration		Element 6: Other	
DZ	Drizzle	BR	Mist, vis. ≥ 5/8SM (or ≥ 1000m)	DS	Dust Storm
GR	Hail, diam. ≥ 5mm (.25")	DU	Widespread Dust	FC	Funnel cloud(s) e.g., tornado or waterspout
GS	Small Hail / Snow Pellets, diam. < 5mm (.25")	FG	Fog, vis. < 5/8SM (or ≥ 1000m)	PO	Well-developed dust/sand whirls
IC	Ice Crystals	FU	Smoke	SQ	Squalls
PL	Ice Pellets	HZ	Haze	SS	Sandstorm
RA	Rain	PY	Spray		
SG	Snow Grains	SA	Sand		
SN	Snow	VA	Volcanic Ash		
UP	Unknown Precipitation (Automated only)				

Examples:

+SHRASNPL	heavy rain showers, snow, ice pellets	+DRSN	heavy snow, drifting
TSRAGS	thunderstorm, moderate rain, small hail	VCSH	showers in vicinity
BR HZ	mist (vis. >= 5/8SM), haze	FZDZ	freezing drizzle
BCFG	patchy fog (vis. < 5/8SM)	BLPY	blowing spray
PRFG	partial fog (sector vis. < 5/8SM)	+DS	heavy dust storm

A similar table can be found in Section C of the Flight Information Handbook.

How do I determine the layers of clouds?

```
KBLV 011657Z AUTO 25015G30KT 210V290 3/8SM
R32L/1000FT FG BKN005 01/M01 A2984 RMK A02
SLP034
```

Each observed cloud layer is encoded in a cloud group with sky coverage, altitude of the cloud base above ground level (AGL), and sometimes cloud type. The first three letters of each cloud group denote sky coverage as in the table below. In this example, **BKN** indicates broken cloud coverage. To interpret the reported cloud base, append two zeros to the value given. In this example, **005** represents the value 500 feet AGL. Finally, in augmented or manual observations, codes for convective cloud types may be appended. CB stands for cumulonimbus; TCU stands for towering cumulus.

If surface-based obscurations (e.g., clouds, smoke, haze) are reported, and the lowest broken or overcast cloud base cannot be determined, then vertical visibility in hundreds of feet determines the ceiling. For example, VV002 represents a vertical visibility of 200 feet.

Sky coverage in eighths:

SKC or CLR	Sky clear
FEW	Few (Trace – 2/8)
SCT	Scattered (3/8 – 4/8)
BKN	* Broken (5/8 – 7/8)
OVC	* Overcast (8/8)

* The lowest layer reported as broken or overcast constitutes a "ceiling"

A similar table can be found in Section C, "METAR and TAF Code", of the Flight Information Handbook.

How do I determine the current temperature and dewpoint?

```
KBLV 011657Z AUTO 25015G30KT 210V290
3/8SM R32L/1000FT FG BKN005 01/M01 A2984
RMK A02 SLP034
```

The group following the sky condition is the temperature and dewpoint information in degrees Celsius. To convert temperatures from Celsius to Fahrenheit see Attachment 2 or the Flight Information Handbook conversion tables.

In this example, **01** is the temperature in degrees Celsius (1ºC), and **M01** is the dewpoint in degrees Celsius (-1ºC). An "M" in the temperature or dewpoint field means "minus" (below zero).

How do I determine the current altimeter setting?

KBLV 011657Z AUTO 25015G30KT 210V290
3/8SM R32L/1000FT FG BKN005 01/M01 **A2984**
RMK A02 SLP034

The 5-character group beginning with A, following the temperature/dewpoint group is the altimeter setting in inches and hundredths of an inch of mercury (inches Hg), used in the United States and at US airfields overseas. In this example, **A2984** represents a current altimeter setting of 29.84 inches Hg.

EDDF 071320Z 22008KT 9999 SCT036 SCT090
BKN280 19/10 **Q1011** NOSIG

The 5-character group beginning with Q, following the temperature/dewpoint group is the altimeter setting in hectopascals (hPa), used at most overseas locations. A hectopascal is equivalent to a millibar (mb). In this example, **Q1011** represents a current altimeter setting of 1011 hPa or 1011 mb.

To convert altimeter settings from mb (or hPa) to inches Hg, see Attachment 5 or the Flight Information Handbook conversion tables.

What is RMK?

```
KBLV 011657Z AUTO 25015G30KT 210V290 3/8SM
R32L/1000FT FG BKN005 01/M01 A2984 RMK A02
SLP034
```

In METAR reports from the United States and from overseas US military airfields, **RMK** indicates the start of the Remarks section. Remarks contain any pertinent information beyond the standard fields provided and can be either encoded or spelled out in plain language. For a partial listing of possible METAR remarks, see Figure 2 on page 18. Additional abbreviations are constructed in accordance with FAA Order 7340.1, *Contractions*.

In this example, the remark, **SLP034**, is the sea level pressure in millibars (or hectopascals) to the nearest tenth. To decode, place a "10" or "9" before the first digit (use a 9 if the 3-digit value is 500 or more), and place a decimal point before the last digit. The sea level pressure remark in the above example would read "current sea level pressure of 1003.4 millibars."

Caution: Do not confuse the **METAR** remarks "5####" group or "6####" group with the **TAF** "5######" (turbulence) group or the **TAF** "6######" (icing) group. Unlike TAF code usage, METAR "5" and "6" group codes indicate pressure tendency and cumulative precipitation amounts--if you need these values, contact your weather provider for decoding instructions. See pages 28 and 29 for more info on decoding TAF icing and turbulence forecasts.

What is supplemental information?

Overseas (except at US military installations), METAR remarks are called "supplemental information." Supplemental information follows the altimeter setting and uses remark codes like US remarks, as in Figure 2 on page 18, but is not preceded by RMK.

Supplemental information can also include:
- Recent weather elements, coded with a leading RE
- Sea surface temperature in ºC and sea state 0-9, coded W##/S#
- Runway state, coded as an 8-digit numerical group
- A 2-hour forecast trend as described below

```
EDDF 071320Z 22008KT 9999 SCT036 SCT090 BKN280
19/10 Q1011 NOSIG
```

Overseas METAR forecast trend groups either start with BECMG or TEMPO, consistent with TAF coding conventions, or they consist entirely of **NOSIG**, which indicates that no significant changes in reportable weather elements are expected during the 2 hours following the reported observation.

METARs issued by North Atlantic Treaty Organization (NATO) observers have, as the last data group, a color code for ceiling and visibility data:

NATO Airfield Weather Color Code. source: AFMAN 15-111 USAFESUP1

Color Code	Color	* Ceiling at or above:	Visibility at or above:
BLU	blue	2500 feet	8000 meters
WHT	white	1500 feet	5000 meters
GRN	green	700 feet	3700 meters
YLO	yellow	300 feet	1600 meters
AMB	amber	200 feet	0800 meters
RED	red	< 200 feet	< 0800 meters
BLACK	black	***Airfield not useable for reasons other than ceiling or visibility***	

* Belgium, France, Netherlands, and United Kingdom use scattered clouds instead of ceiling

METAR Remarks Decode Table

Figure 2. Remarks Decode Table

A01 – Reported by automated observation equipment that **CANNOT** distinguish between rain and snow

A02 – Reported by automated observation equipment that **CAN** distinguish between rain and snow

ACC W – **A**lto**C**umulus **C**astellanus clouds **W**est

ACSL SW-S – **A**lto**C**umulus **S**tanding **L**enticular clouds **S**outh**W**est through **S**outh

ALSTG/SLP ESTMD– Estimated Pressure. Primary airfield sensors are suspect or inoperative; backup equipment is being used.

CB W MOV E – **C**umulonim**B**us clouds **W**est **MOV**ing **E**ast

CBMAM DSNT S – **C**umulonim**B**us **MAM**matus clouds to the **DiSta**ce **NT S**outh

CCSL OVR MT E – **C**irro**C**umulus **S**tanding **L**enticular clouds **OVeR** **MounT**ain(s) to the **E**ast

CONS LTGCA – **CON**tinuou**S** (more than 6 flashes per minute) **LighTninG**, **C**loud to **A**ir

FROPA – … due to **FRO**ntal **Pa**ssage

FRQ – **FR**e**Q**uent (1-6 flashes per minute for lightning)

LTGCA – **LighTninG**, **C**loud to **A**ir

LTGCC – **LighTninG**, **C**loud to **C**loud

LTGCG – **LighTninG**, **C**loud to **G**round

LTGIC – **LighTninG**, **I**n-**C**loud

OCNL – **OC**cassio**NaL** (less than 1 flash per minute for lightning)

PK WND 28045/1955 – **PeaK WiND 280** at **45** knots occurred at **1955**Z

PK WND 34050/38 – **PeaK WiND 340** at **50** knots occurred at **38** minutes past the hour

PRESRR / PRESFR – **PRES**sure **R**ising **R**apidly / **PRES**sure **F**alling **R**apidly

RAB20SNB20E55 – **RA**in and **SN**ow **B**egan at **20** minutes past the hour, **E**nded at **55** min past

RVRNO – **RVR**-equipped, but **NO** report

SFC VIS 2 1/2 – **S**ur**F**a**C**e **VIS**ibility is **2 ½** statute miles; remarked when (lower) tower visibility is reported in METAR body

SLP015 – **S**ea **L**evel **P**ressure is 10**01.5** millibars

TCU OHD – **T**owering **CU**mulus clouds **O**ver**H**ea**D**

TCU W – **T**owering **CU**mulus clouds to the **W**est

TSB05E30 – **T**hunder**S**torm **B**egan at **05** minutes past the hour and **E**nded at **30** min past

TWR VIS 1 – **T**o**W**e**R** **VIS**ibility is **1** statute mile; remarked when (lower) surface visibility is reported in METAR body

VIRGA – **VIRGA** at the station; precipitation observed but not reaching the ground

VIRGA DSNT NE – **VIRGA** to the **DiSta**ce **NT** **N**orth**E**ast

VIRGA SW – **VIRGA** to the **S**outh**W**est

VIS 1V2 – **VIS**ibility is **V**ariable between **1** and **2** miles

VIS 2 RWY 11 – **VIS**ibility is **2** statute miles at **R**un**W**a**Y 11**

VIS N 2 – **VIS**ibility in the **N**orthern sector is **2** statute miles

WND DATA ESTMD – Estimated Wind. Primary airfield sensors are suspect or inoperative; backup equipment is being used.

WSHFT45 – **W**ind **SHiFT** at **45** minutes past the hour

TAF Report Type

What type of report is this?

```
KBLV 051151Z 0512/0612 14005KT 8000 BR FEW030
WS010/18040KT QNH2960INS
BECMG 0513/0514 16010KT 3200 -SHRA OVC020 QNH2959INS
TEMPO 0514/0516 21015G30KT 1600 TSRA BKN008CB OVC020
BECMG 0518/0519 31012G22KT 9999 NSW SCT040 WSCONDS
520004 QNH2952INS
BECMG 0520/0521 30008KT CAVOK QNH2950INS T08/0518Z
TM01/0611Z
```

This report is a **TAF** (Terminal Aerodrome Forecast)—a weather forecast at an airport or military base for a specific period. A TAF is distinguished from a METAR by its multiple date/time groups.

```
AMD KBLV 051820Z 0518/0612 21015KT 0800 TSRA BKN008CB
QNH2958INS
BECMG 0518/0519 29008KT 1600 -RA OVC030 QNH2958INS
BECMG 0520/0521 30008KT CAVOK QNH2950INS T08/18Z
TM01/11Z AMD 1820
```

AMD (Amended Aerodrome Forecast) is issued because the previous version is no longer representative of the current or expected weather. The amended TAF supersedes the previous TAF. In the above example, **AMD 1820** indicates that the forecast was amended at 1820Z. Always refer to the date/time group at the end of the TAF to determine the most current forecast.

```
AMD KBLV 051925Z 0518/0612 21015KT 0800 TSRA BKN008CB
QNH2958INS
BECMG 0518/0519 29008KT 1600 -RA OVC030 QNH2958INS
BECMG 0520/0521 18015KT CAVOK QNH2950INS T08/18Z
TM01/11Z COR 1925
```

AMD is also used with **COR** (Corrected Aerodrome Forecast) to indicate that a TAF has been corrected. When a corrected TAF is issued, disregard previous TAFs. In the above example, **COR 1925** indicates that the amended forecast was corrected at 1925Z. Always refer to the date/time group at the end of the TAF for the most current forecast.

How do I determine the location?

```
PAAQ 041419Z 0414/0512 VRB03KT 6SM BR OVC003
TEMPO 0414/0418 5SM BR
FM042000 34005KT P6SM FEW008 SCT070

KCLK 081126Z 0812/0912 07009KT 3SM -SN BR OVC003
FM082100 05008KT 1SM -SN BR OVC001
```

The 4-character ICAO identifier is the location. **PAAQ** (Palmer Municipal) and **KCLK** (Clinton Regional) are the locations/stations in these examples.

When ICAO identifiers are not available or cannot be used, a 4-character identifier starting with KQ will be used. This is usually in a contingency environment, and the location/identifier combination is often classified. Consult the local weather flight for more details.

How do I determine the date and valid times of the forecast?

```
KBLV 051151Z 0512/0612 14005KT 8000 BR FEW030
WS010/18040KT QNH2960INS
BECMG 0513/0514 16010KT 3200 -SHRA OVC020 QNH2959INS
TEMPO 0514/0516 21015G30KT 1600 TSRA BKN008CB OVC020
BECMG 0516/0517 29008KT 3200 -RA OVC030 620304
QNH2958INS
BECMG 0518/0519 31012G22KT 9999 NSW SCT040 WSCONDS
520004 QNH2952INS
BECMG 0520/0521 30008KT CAVOK QNH2950INS T08/0518Z
TM01/0611Z

KPVU 081123Z 0812/0906 32009KT P6SM OVC050
TEMPO 0812/0816 SCT050
FM081600 VRB04KT P6SM SCT200

KSLC 081123Z 0812/0918 35007KT P6SM BKN120
FM090400 15005KT P6SM SCT200
FM090900 14004KT P6SM SCT120 BKN200
```

The next two groups that follow the ICAO identifier show the preparation/dissemination time of the TAF and the valid time of the forecast. In the KBLV (Scott AFB) example, **051151Z** shows that the TAF was prepared/disseminated on the 5th day of the month at 1151Z. The valid time of the forecast follows as **0512/0612** and indicates that the forecast valid time is from 1200Z on the 5th day of the month to 1200Z on the 6th day.

Although most TAFs are forecasted for a 24-hour period, the valid times may vary, up to a maximum of 30 hours. For example, the TAF at KPVU (Provo Municipal) is only valid from 1200Z on the 8th day until 0600Z on the 9th day, while the TAF at KSLC (Salt Lake City International) is valid from 1200Z on the 8th day until 1800Z on the 9th day.

TAF Time and Type of Change Expected

How do I determine the time and type of changes that will occur?

```
KSTL 051130Z 0512/0612 14008KT 5SM BR BKN030
WS010/18025KT
TEMPO 0513/0516 1 1/2SM BR
FM051600 16010KT P6SM NSW SKC
BECMG 0522/0524 20013G20KT 4SM SHRA OVC020
PROB40 0600/0606 2SM TSRA OVC008CB
BECMG 0606/0608 21015KT P6SM NSW SCT040
```

Civilian and military forecasters alike encode the time and type of change expected with TEMPO, FM, and BECMG groups.

TEMPO represents a temporary condition. In this example, **TEMPO 0513/0516** 1 1/2SM BR reads, "Temporary condition between 1300Z and 1600Z on the 5th day of 1 1/2 statute mile visibility in mist." Only the temporary changing conditions are included in TEMPO groups.

FM means "from" and indicates a rapid weather change where all data groups in the previous line are superseded. In this example, **FM051600** reads, "From 1600Z on the 5th day…".

BECMG means "becoming" or a "gradual change" in meteorological conditions and becomes the predominant group by the end time listed. In this example, **BECMG 0522/0524** reads "Becoming from 2200Z to 2400Z on the 5th day."

PROB40 (civilian use only) represents a 40% probability or chance of conditions occurring along with associated weather conditions (wind, visibility, sky conditions).

In this example, **PROB40 0600/0606** 2SM TSRA 0VCOO8CB reads, "40% chance between 0000Z and 0600Z on the 6th day of visibility 2 statute miles in moderate thunderstorms, 800 overcast cumulonimbus clouds."

How do I determine the wind speed and direction?

```
KBLV 051151Z 0512/0612 14005KT 8000 BR FEW030
WS010/18040KT QNH2960INS
BECMG 0513/0514 16010KT 3200 -SHRA OVC020 QNH2959INS
TEMPO 0514/0516 21015G30KT 1600 TSRA BKN008CB OVC020
BECMG 0516/0517 29008KT 3200 -RA OVC030 620304
QNH2958INS
BECMG 0518/0519 31012G22KT 9999 NSW SCT040 WSCONDS
520004 QNH2952INS
BECMG 0520/0521 30008KT CAVOK QNH2950INS T08/0518Z
TM01/0611Z
```

The data group after the valid time and followed by KT (knots) is the forecast wind speed.

The first three digits within a wind group are the true direction to the nearest 10 degrees from which the wind will blow. The next two digits are the sustained speed. If gusts are forecasted, the next two or three digits following the "G" are the "gust," the maximum wind speed in a ten-minute window.

In this example, **14005KT**, 16010KT, **21015G30KT**, 29008KT, 31012G22KT, and 30008KT are the wind direction and speed groups**.**

In the first wind group, the wind is forecasted to blow from 140 degrees (true) at a sustained speed of 05 knots. No gust is forecasted.

In the third wind group, the wind is forecasted to blow from 210 degrees (true) at a sustained speed of 15 knots, gusting up to 30 knots.

How do I determine the forecast visibility?

```
KBLV 051151Z 0512/0612 14005KT 8000 BR FEW030
WS010/18040KT QNH2960INS
BECMG 0513/0514 16010KT 3200 -SHRA OVC020 QNH2959INS
TEMPO 0514/0516 21015G30KT 1600 TSRA BKN008CB OVC020
BECMG 0516/0517 29008KT 3200 -RA OVC030 620304
QNH2958INS
BECMG 0518/0519 31012G22KT 9999 NSW SCT040 WSCONDS
520004 QNH2952INS
BECMG 0520/0521 30008KT CAVOK QNH2950INS T08/0518Z
TM01/0611Z
```

In the military and at most overseas locations, visibility is forecasted in meters. The 4-character group following the wind is the forecast visibility. In the KBLV example, **8000**, **3200**, **1600**, **3200**, and **9999** are the forecast visibilities in meters. 9999 is the greatest value forecasted. A value of 9999 indicates a forecast visibility of greater than 9000 meters (7 statute miles or greater). To convert visibility values from meters to statute miles, see Attachment 3 or the Flight Information Handbook conversion tables.

Overseas locations may use the contraction "**CAVOK**" (ceiling and visibility OK) when there is no significant weather, the visibility is 10 km or greater, and the ceilings are greater than 5,000 ft.

```
KSTL 051130Z 0512/0612 14008KT 5SM BR BKN030
WS010/18025KT
TEMPO 0513/0516 1 1/2SM BR
FM051600 16010KT P6SM NSW SKC
BECMG 0522/0524 20013G20KT 4SM SHRA OVC020
PROB40 0600/0606 2SM TSRA OVC008CB
BECOMG 0606/0608 21015KT P6SM NSW SCT040
```

In the CONUS, civilian TAFS forecast visibility in statute miles up to 6 statute miles, beyond which **P6SM** is used to indicate forecast visibility greater than 6 statute miles.

How do I determine if there is any forecast weather?

```
KBLV 051151Z 0512/0612 14005KT 8000 BR FEW030
WS010/18040KT QNH2960INS
BECMG 0513/0514 16010KT 3200 -SHRA OVC020 QNH2959INS
TEMPO 0514/0516 21015G30KT 1600 TSRA BKN008CB OVC020
BECMG 0516/0517 29008KT 3200 -RA OVC030 620304
QNH2958INS
BECMG 0518/0519 31012G22KT 9999 NSW SCT040 WSCONDS
520004 QNH2952INS
BECMG 0520/0521 30008KT CAVOK QNH2950INS T08/0518Z
TM01/0611Z
```

The weather data group (forecast precipitation or obstruction to visibility) follows the visibility data group.

In this example, **BR** means "mist," **-SHRA** means "light rain showers," **TSRA** means a "thunderstorm with moderate rain," and **-RA** means "light rain." **NSW** (no significant weather) is used to indicate that the weather or obscuration listed in the previous group is no longer expected to occur. Absence of a weather or obscuration group means that no weather or obscuration is expected during the forecast period.

To methodically decode a weather group, look for six key elements (depending on the phenomena, one or more may be omitted). In order, these elements are: **Intensity** (symbol preceding the code), **Proximity**, **Descriptor**, **Precipitation Description**, **Obscuration** (other than precipitation) and **Other**.

For a complete table of weather group elements and examples, see Figure 1 on page 12, or reference Section C, "METAR and TAF Code", of the Flight Information Handbook.

How do I determine the layers of forecast clouds?

```
KBLV 051151Z 0512/0612 14005KT 8000 BR FEW030
WS010/18040KT QNH2960INS
TEMPO 0514/0516 21015G30KT 1600 TSRA BKN008CB OVC020
BECMG 0520/0521 30008KT 9999 SKC QNH2950INS T08/0518Z
TM01/0611Z
```

Cloud height is forecasted in hundreds of feet. Add two zeros to the end of the value given. In this example, **FEW030**, **BKN008CB**, **OVC020**, and **SKC** represent the values 3,000 few, 800 broken cumulonimbus, 2,000 overcast, and sky clear. Overseas locations may use the contraction CAVOK (ceiling and visibility OK) when there is no significant weather, the visibility is 10 km or greater, and the ceilings are greater than 5,000 ft.

In place of cloud layers, vertical visibility in hundreds of feet will appear in a TAF cloud group when the sky is forecast to be totally obscured. For example, VV002 represents a vertical visibility of 200 feet. Vertical visibility in a TAF represents the forecast ceiling.

When a surface-based partial obscuration is forecasted, it will be encoded as FEW000, SCT000, or BKN000 in the cloud layer area. A remark will appear after the altimeter that will describe the phenomena responsible. For example, FG SCT000 would indicate the weather element causing the obscuration is caused by fog and the layer amount is SCT. Surface-based partial obscurations will not be considered a ceiling.

Sky coverage (eighths):

SKC or CLR	Sky clear
FEW	Few (Trace – 2/8)
SCT	Scattered (3/8 – 4/8)
BKN	* Broken (5/8 – 7/8)
OVC	* Overcast (8/8)

* The lowest layer reported as broken or overcast constitutes a “ceiling”

A similar table can be found in Section C, “METAR and TAF Code”, of the Flight Information Handbook.

How do I determine if wind shear is in the forecast?

```
KBLV 051151Z 0512/0612 14005KT 8000 BR FEW030
WS010/18040KT QNH2960INS
BECMG 0513/0514 16010KT 3200 -SHRA OVC020 QNH2959INS
TEMPO 0514/0516 21015G30KT 1600 TSRA BKN008CB OVC020
BECMG 0516/0517 29008KT 3200 -RA OVC030 620304
QNH2958INS
BECMG 0518/0519 31012G22KT 9999 NSW SCT040 WSCONDS
520004 QNH2952INS
BECMG 0520/0521 30008KT CAVOK QNH2950INS T08/0518Z
TM01/0611Z
```

A wind shear group is included if non-convective low-level winds (up to 2,000 feet) will change in speed and/or direction and result in a shearing action. WS indicates forecast wind shear and is followed by a 3-digit height in hundreds of feet AGL, a slant character, "/," and forecast wind at the height indicated. **WS010/18040KT** reads, "forecast wind shear at 1,000 feet above the station; wind at 1,000 feet is from 180 degrees (true) at 40 knots."

The remark **WSCONDS** is used to indicate the potential for wind shear when there is not enough information available to reliably predict the height, direction and speed of the wind shear. WSCONDS is normally used beyond the first 6 hours of the TAF.

For some locations, the wind shear group will follow the minimum altimeter setting group (in the TAF remarks) instead of following the cloud group.

How do I determine forecast icing conditions?

```
KBLV 051153Z 0512/0612 14005KT 8000 BR FEW030
WS010/18040KT QNH2960INS
BECMG 0516/0517 29008KT 3200 -RA OVC030 620304
QNH2958INS T08/0518Z TM01/0611Z
```

If forecasted, the icing group will be prefixed by the number 6, and follows the cloud group. To decode, follow these instructions:
1. Find the icing designator "6" following the cloud group (**6**20304).
2. The next digit gives icing type and intensity (6**2**0304). See Figure 3.
3. The next three digits give the base of the icing layer in hundreds of feet (62**030**4).
4. The last digit provides the icing layer depth in thousands of feet (6203**04**), so add this value to the base height to determine the top limit of the icing conditions.

In the above example, the icing forecast will read, "light rime icing (in cloud) from 3,000 to 7,000 feet."

Figure 3. Icing Intensity Decode Table

CODE	DECODE
0	Trace Icing or None (see note)
1	Light Mixed Icing
2	Light Rime Icing In Cloud
3	Light Clear Icing In Precipitation
4	Moderate Mixed Icing
5	Moderate Rime Icing In Cloud
6	Moderate Clear Icing In Precipitation
7	Severe Mixed Icing
8	Severe Rime Icing In Cloud
9	Severe Clear Icing In Precipitation
Note:	Air Force code "0" means a trace of icing, World Meteorological Organization code "0" means no icing

How do I determine forecast turbulence conditions?

```
KBLV 051153Z 0512/0612 14005KT 8000 FEW030 QNH2960INS
BECMG 0518/0519 31012G22KT 9999 NSW SCT040 520004
QNH2952INS T08/0518Z TM01/0611Z
```

If forecasted, the turbulence code will be prefixed by the number 5, and will follow the cloud or icing group. To decode, follow these instructions:
1. Look for the turbulence designator "5" that follows the cloud or icing group (**5**20004).
2. The next digit will determine the intensity (5**2**0004). See Figure 4.
3. The next three digits will determine the base limit of the turbulence layer in hundreds of feet AGL (52**000**4).
4. The last digit will determine the turbulence layer depth in thousands of feet (52000**4**), so add this value to the base height to determine the top limit of the turbulence conditions.

In the above example, the turbulence forecast will read, "occasional moderate turbulence in clear air from the surface to 4,000 feet."

Figure 4. Turbulence Intensity Decode Table

CODE	DECODE
0	None
1	Light turbulence
2	Moderate turbulence in clear air, occasional
3	Moderate turbulence in clear air, frequent
4	Moderate turbulence in cloud, occasional
5	Moderate turbulence in cloud, frequent
6	Severe turbulence in clear air, occasional
7	Severe turbulence in clear air, frequent
8	Severe turbulence in cloud, occasional
9	Severe turbulence in cloud, frequent
X	Extreme turbulence
Note:	Occasional is defined as occurring less than 1/3 of the time

How do I determine the forecast lowest altimeter setting?

```
KBLV 051151Z 0512/0612 14005KT 8000 BR FEW030
WS010/18040KT QNH2960INS
BECMG 0513/0514 16010KT 3200 -SHRA OVC020 QNH2959INS
TEMPO 0514/0516 21015G30KT 1600 TSRA BKN008CB OVC020
BECMG 0516/0517 29008KT 3200 -RA OVC030 620304
QNH2958INS
BECMG 0518/0519 31012G22KT 9999 NSW SCT040 WSCONDS
520004 QNH2952INS
BECMG 0520/0521 30008KT CAVOK QNH2950INS T08/0518Z
TM01/0611Z
```

Forecast minimum altimeter settings are only found in military forecasts. These are near the end of the line, beginning with QNH (minimum) and ending with INS (inches). To convert altimeter settings from inches Hg to hectopascals (millibars), use Attachment 4 or the Flight Information Handbook conversion tables.

In the example shown above, **QNH2960INS**, **QNH2959INS**, **QNH2958INS**, **QNH2952INS**, and **QNH2950INS** are read as minimum altimeter settings of 29.60, 29.59, 29.58, 29.52, and 29.50 inches of mercury, respectively.

How do I determine the forecast temperatures?

```
KBLV 051151Z 0512/0612 14005KT 8000 BR FEW030
WS010/18040KT QNH2960INS
BECMG 0513/0514 16010KT 3200 -SHRA OVC020 QNH2959INS
TEMPO 0514/0516 21015G30KT 1600 TSRA BKN008CB OVC020
BECMG 0516/0517 29008KT 3200 -RA OVC030 620304
QNH2958INS
BECMG 0518/0519 31012G22KT 9999 NSW SCT040 WSCONDS
520004 QNH2952INS
BECMG 0520/0521 30008KT CAVOK QNH2950INS T08/0518Z
TM01/0611Z
```

Forecast temperatures for the forecast period are routinely found only in military TAFs. They are found on the last line, following the minimum altimeter, beginning with the designator "T," maximum temperature first. To convert temperature units from Celsius to Fahrenheit, use Attachment 2 or the Flight Information Handbook conversion tables.

In this example, **T08/0518Z** indicates a forecast maximum temperature of 8°C on the 5th day at 1800Z, and **TM01/0611Z** indicates a forecast minimum temperature of -1°C on the 6th day at 1100Z.

HERBERT J. CARLISLE, Lt Gen, USAF
DCS, Operations, Plans, and Requirements

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

AFMAN 15-111, *Surface Weather Observations*

AFMAN 15-124, *Meteorological Codes*

ICAO Document 8896AN/893/4, *Manual of Aeronautical Meteorological Practice,* ISBN 92-9194-345-2

AFMAN 15-111 USAFESUP1, *United States Air Forces in Europe Supplement to Surface Weather Observations*

FAA Order 7340.1, *Contractions*

Abbreviations and Acronyms

AGL—Above Ground Level

FAA—Federal Aviation Administration

ICAO—International Civil Aviation Organization

METAR—Aviation Routine Weather Report

NATO—North Atlantic Treaty Organization

RVR—Runway Visual Range

SPECI—Aviation Selected Special Weather Report

TAF—Terminal Aerodrome Forecast

UTC—Coordinated Universal Time, sometimes called “zulu time”

Attachment 2

TEMPERATURE CONVERSION

Degrees Fahrenheit to Degrees Celsius

°F		°C	°F		°C	°F		°C	°F		°C
From	To		From	To		From	To		From	To	
128.3	130.0	54	83.3	85.0	29	38.3	40.0	04	-4.8	-3.1	M20
126.5	128.2	53	81.5	83.2	28	36.3	38.2	03	-6.6	-4.9	M21
124.7	126.4	52	79.7	81.4	27	34.7	36.2	02	-8.4	-6.7	M22
122.9	124.6	51	77.9	79.6	26	32.9	34.6	01	-10.2	-8.5	M23
121.1	122.8	50	76.1	77.8	25	32.0	32.8	00	-12.0	-10.3	M24
119.3	121.0	49	74.3	76.0	24	31.2	31.9	M00	-13.8	-12.1	M25
117.5	119.2	48	72.5	74.2	23	29.4	31.1	M01	-15.6	-13.9	M26
115.7	117.4	47	70.7	72.4	22	27.6	29.3	M02	-17.4	-15.7	M27
113.9	115.6	46	68.9	70.6	21	25.8	27.5	M03	-19.2	-17.5	M28
112.1	113.8	45	67.1	68.8	20	24.0	25.7	M04	-21.0	-19.3	M29
110.3	112.0	44	65.3	67.0	19	22.2	23.9	M05	-22.8	-21.1	M30
108.5	110.2	43	63.5	65.2	18	20.4	22.1	M06	-24.6	-22.9	M31
106.7	108.4	42	61.7	63.4	17	18.6	20.3	M07	-26.4	-24.7	M32
104.9	106.6	41	59.9	61.6	16	16.8	18.5	M08	-28.2	-26.5	M33
103.1	104.8	40	58.1	59.8	15	15.0	16.7	M09	-30.0	-28.3	M34
101.3	103.0	39	56.3	58.0	14	13.2	14.9	M10	-31.8	-30.1	M35
99.5	101.2	38	54.5	56.2	13	11.4	13.1	M11	-33.6	-31.9	M36
97.7	99.4	37	52.7	54.4	12	9.6	11.3	M12	-35.4	-33.7	M37
95.9	97.6	36	50.9	52.6	11	7.8	9.5	M13	-37.2	-35.5	M38
94.1	95.8	35	49.1	50.8	10	6.0	7.7	M14	-39.0	-37.3	M39
92.3	94.0	34	47.3	49.0	09	4.2	5.9	M15	-40.8	-39.1	M40
90.5	92.2	33	45.5	47.2	08	2.4	4.1	M16	-42.6	-40.9	M41
88.7	90.4	32	43.7	45.4	07	0.6	2.3	M17	-44.4	-42.7	M42
86.9	88.6	31	41.9	43.6	06	-1.2	+0.5	M18	-46.2	-44.5	M43
85.1	86.8	30	40.1	41.8	05	-3.0	-1.3	M19	-48.0	-46.5	M44

Attachment 3

REPORTABLE VISIBILITY CONVERSION

Statute Miles (SM) to Meters (m)

STATUTE MILES	METERS	STATUTE MILES	METERS	STATUTE MILES	METERS
0	0000	**1-1/8**	1800	**2-3/4**	4400
-	0050	**-**	1900	**-**	4500
1/16	0100	**1-1/4**	2000	**-**	4600
-	0150	**-**	2100	**-**	4700
1/8	0200	**1-3/8**	2200	**3**	4800
-	0250	**-**	2300	**-**	4900
3/16	0300	**1-1/2**	2400	**-**	5000
-	0350	**-**	2500	**4**	6000
¼	0400	**1-5/8**	2600	**-**	7000
-	0450	**-**	2700	**5**	8000
5/16	0500	**1-3/4**	2800	**6**	9000
-	0550	**-**	2900	**7**	9999
3/8	0600	**1-7/8**	3000	**8**	9999
-	0650	**-**	3100	**9**	9999
-	0700	**2**	3200	**10**	9999
-	0750	**-**	3300	**11**	9999
½	0800	**-**	3400	**12**	9999
-	0900	**-**	3500	**13**	9999
5/8	1000	**2-1/4**	3600	**14**	9999
-	1100	**-**	3700	**15**	9999
¾	1200	**-**	3800	**20**	9999
-	1300	**-**	3900	**25**	9999
7/8	1400	**2-1/2**	4000	**30**	9999
-	1500	**-**	4100	**35**	9999
1	1600	**-**	4200	**40**	9999
-	1700	**-**	4300	**Etc.**	9999

Double underline marks a change in increment

Attachment 4

RUNWAY VISIBILITY CONVERSION

RVR IN HUNDREDS OF FEET	STATUTE MILES	NAUTICAL MILES	METERS	KILO METERS
12	1/4 *	2/10	370	.4
16	1/4	2/10	490	.5
20	3/8	3/10	610	.6
24	1/2	4/10	730	.7
32	5/8	6/10	970	1.0
40	3/4	7/10	1220	1.2
45	7/8	8/10	1370	1.4
50	1	9/10	1520	1.5
60	1-1/4	1-1/10	1830	1.8

* Helicopter Only

Attachment 5

PRESSURE CONVERSION

Millibars (mb)* to Inches of Mercury (inches Hg)

	_ _ _0	_ _ _1	_ _ _2	_ _ _3	_ _ _4	_ _ _5	_ _ _6	_ _ _7	_ _ _8	_ _ _9
094_	27.76	27.79	27.82	27.85	27.88	27.91	27.94	27.96	27.99	28.02
095_	28.05	28.08	28.11	28.14	28.17	28.20	28.23	28.26	28.29	28.32
096_	28.35	28.38	28.41	28.44	28.47	28.50	28.53	28.56	28.59	28.61
097_	28.64	28.67	28.70	28.73	28.76	28.79	28.82	28.85	28.88	28.91
098_	28.94	28.97	29.00	29.03	29.06	29.09	29.12	29.15	29.18	29.21
099_	29.23	29.26	29.29	29.32	29.35	29.38	29.41	29.44	29.47	29.50
100_	29.53	29.56	29.59	29.62	29.65	29.68	29.71	29.74	29.77	29.80
101_	29.83	29.85	29.88	29.91	29.94	29.97	30.00	30.03	30.06	30.09
102_	30.12	30.15	30.18	30.21	30.24	30.27	30.30	30.33	30.36	30.39
103_	30.42	30.45	30.47	30.50	30.53	30.56	30.59	30.62	30.65	30.68
104_	30.71	30.74	30.77	30.80	30.83	30.86	30.89	30.92	30.95	30.98
105_	31.01	31.04	31.07	31.10	31.12	31.15	31.18	31.21	31.24	31.27

* A millibar (mb) is equal to a hectopascal (hPa)