

WEATHER INTERPRETATION GUIDE

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BASED ON WSI INFORMATION

FOR USE BY UNIVERSITY OF DUBUQUE STUDENTS, TEACHERS AND  
INSTRUCTORS ONLY

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### IMPORTANT NOTE

THIS GUIDE IS INTENDED FOR USE ONLY AS A QUICK REFERENCE AND NOT AS A REPLACEMENT FOR A METEOROLOGY TEXT

Decoding surface observations in METAR format  
 Decoding METARs-Example:

KPVD 231551Z 03007KT 5SM-RA BR SCT 035 OVC050 19/17 A2994 RMK A02 SLP 130  
 P0005 T011940172

ELEMENT	EXPLANATION
KPVD	Observation for Providence, RI
231551Z	Report issue on the 23 <sup>rd</sup> at 1551 GMT
03007KT	Winds from 030 at 7 knots
-RA	Light Rain
BR	Mist
SCT035	Scattered Clouds (3/8 to 4/8 coverage) at 3500' AGL
OVC 050	Overcast at 5000' AGL
19/17	Temperature 19, Dew Point 17 (Celsius)
A2992	Altimeter 29.92
RMK	Remarks (precedes remarks section)
A02	Automated observation with precipitation discriminator
SLP130	Sea Level Pressure 1013.8 mill bars
P0005	0.5 inches of liquid precipitation in the last hour
T01940172	Temperature/dew point in tenth (19.4.17.2 Celsius)

### METAR Abbreviations

A01	Automated observation w/o precipitation discriminator (rain/snow)
A02	Automated observation w/ precipitation discriminator (rain/snow)
BKN	Broken (5/8 to 7/8 coverage)
CLR	Clear at or below 12,000 (AWOS/ASOS report)
COR	Correction to the observation
FEW	1/8 to 2/8 cloud coverage
LDG	Landing
M	In the temperature field means "minus" or below zero
M	In the RVR listing indicates visibility less than lowest reportable sensor value
NO	Not available
NSW	No Significant Weather
OVC	Overcast
P	In RVR indicates visibility greater than highest reportable sensor value
Prob40	Probability 40 percent
R	Runway (used in RVR measurement)
RMK	Remark
RY/RWY	Runway
SCT	Scattered
SLP	Sea Level Pressure (e.g. 1013.8 millibars reported as SLP138)
SM	Statute Miles

SPECI	Special Report
TKOF	Takeoff
T	Temperature/dew point given to nearest 1/10 degree
V	Varies
VC	Vicinity
VRB	Variable wind direction when speed is equal to or less than 6 knots
VV	Vertical Visibility

### METAR Descriptors

BC	Patches
BL	Blowing
DR	Low Drifting
FZ	Super Cooling/Freezing
MI	Shallow
PR	Partial
SH	Showers
TS	Thunderstorms

### METAR Cloud Types

CB	Cumulonimbus
TCU	Towering Cumulus

Decoding surface observations in SA format  
 Decoding SA Reports – Example 1:

INK SA 1054 CLR 15 106/77/63/1112G18/000

INK	Station ID (Wink, Texas)
SA	Type of report (SA = hourly observation)
1054	Time observation was taken (1054Z)
CLR	Sky Condition (Clear)
15	Visibility in statute miles (15 miles)
106	Station pressure in millibars (1010.6 millibars)
77	Temperature in Fahrenheit (77 degrees)
63	Dew Point in Fahrenheit (63 degrees)
1112	Wind Direction and velocity (wind from 110 degrees at 12 knots)
G18	Wind gusts (wind gusting to 18 knots)
00	Altimeter reading (30.00 inches)

Decoding SA reports – Example 2:

MDW RS 1056 -X M7 OVC 1 ½ R+F 990/63/61/3205/980/RF2 RB12

MDW	Station ID (Midway Airport, Chicago, IL)
RS	Type of report (Record Special)
1055	Time of observation (1856Z)
-X	Sky Condition (partial obscuration)
M7 OVC	Ceiling (measured 700' overcast)
1 ½	Visibility (1 ½ statute miles)
R+F	Weather (Rain, Heavy, with Fog)
990	Station Pressure
63	Temperature (63 degrees)
61	Dew Point (61 degrees)
3205	Wind (from 320 degrees at 5 knots)
980	Altimeter setting (29.80 inches)
RF2	Explanation of sky obscuration (2/10 of the sky obscured by rain and fog)
RB12	Remarks (rain began 12 minutes past the hour)

Decoding SA Reports – Example 3 – (Automated Surface Observation)

FCO AMOS 76/610308/007 PK WND 18 013

FCO	Station ID (Page, Oklahoma)
AMOS	Type of observation (Automated Meteorological Observation System)
76	Temperature (76 degrees)
61	Dew Point (61 degrees)
308	Wind (from 030 degrees at 8 knots)
007	Altimeter setting (30.07 inches)

PK WND 18 Peak wind recorded since the last hourly observation (18 knots)  
 13 Precipitation (0.13" since the last synoptic observation)

\*Note: "RAMOS" indicators Remote Automated Meteorological Observation System; AUTOB indicates an AMOS with added capability to automatically report sky condition (with an upper limit of 6,000); AWOS indicates an Automated Weather Observation System (Capability to broadcast minute-by-minute weather observation directly to the pilot); AO2 indicates an ASOS system (an Automated Surface Observation System with the capability of measuring cloud heights up to 12,000'); AO2A indicates an ASOS system supplemented by observer data.

NOTAMs

The acronym stands for NOTice to AirMen. This is a notice containing essential flight operation information not known sufficiently in advance to [publicize by other means. Types of NOTAMs include the following:

1. NOTAM (D): Information that requires wide dissemination and pertains to enroute navigational aids, civil public use landing areas listed in the Airports Facility Directory and aeronautical data related to IFR operations.

2. NOTAM (L): Information that required local dissemination, but does not qualify as NOTAM (D) information. This includes, but is not limited to, aircraft jettisoning fuel, bird activity, moored balloons, military training activity, etc.
3. FDC: Information that is regulatory in nature pertaining to flight including, but not limited to, changes to charts, procedures, and airspace usage.

On the PILOTbrief Vector system,

- \*D NOTAMs are provided for Canada, the United States, and Puerto Rico
- \*FDC NOTAMs are provided for the United States and Puerto Rico
- \*L NOTAMS are not provided

### Area Forecasts

An area forecast (FA) is a forecast of Visual Flight Rules (VFR) clouds and weather conditions over an area as large as the size of several states. It must be used in conjunction with the AIRMET Sierra bulletin for the same area in order to get a complete picture of the weather. The area forecast together with the AIRMET Sierra bulletin is used to determine forecast enroute weather and to interpolate conditions at airports that do not have terminal forecasts (TAFs) issued. The color coded map indicates domestic FA areas. FAs are issued 3 times a day by the Aviation Weather Center in Kansas City for each of the 6 areas in the contiguous 48 states. In Alaska, FAs are issued by the Weather Service Forecast Office (WSFO's) in Anchorage, Fairbanks, and Juneau for their respective areas. The WSFO in Honolulu issues FAs for Hawaii.

Each FA consists of a 12 hour forecast plus a 6 hour outlook. All times are Coordinates Universal Time (UTC). All distances except visibility are nautical miles. Visibility is in statute miles.

The FA consists of:

1. A synopsis section, which is a varied summary of the location and movement of fronts, pressure systems, and circulation patterns for an 18-hour period.
2. A VFR clouds and weather is a 12 hour forecast, in broad terms, of clouds and weather significant to flight operations, plus a 6 hour categorical outlook. This section is usually several paragraphs. AIRMET Sierra supplies information regarding Instrument Flight Rule (IFR) conditions. The breakdown may be by states, by well known geographical areas, or in reference to location and movement of a pressure system or front. A categorical outlook, identified by OTLK, is included for each breakdown.

Amendments to the FA are issued as needed, with only that portion that is being revised transmitted. An amended FA is identified by "AMD"; a corrected FA by "COR"; and a delayed FA is identified by "RTD".

### AIRMETS

An AIRMET (AIRman's METeorological Information) advises of weather that may be hazardous, other than convective activity, to single engine, other light aircraft, and Visual Flight Rule (VFR) pilots. However, operators of large aircraft may also be concerned with these phenomena. The items covered are:

In the AIRMET Sierra bulletin:

- Ceilings less than 1000 feet and/or visibility less than 3 miles affecting over 50% of the area at one time.
- Extensive mountain obscuration.

In the AIRMET Tango bulletin:

- Moderate icing.
- Freezing levels.

These AIRMET items are considered to be widespread because they must be affecting or be forecast to affect an area of at least 3000 square miles at any one time. However, if the total area to be affected during the forecast period is very large, it could be that only a small portion of this total area would be affected at any one time.

AIRMETs are routinely issued for 6 hour periods beginning at 0145 UTC during Central Daylight Time and 0245 during Central Standard Time. AIRMETs are also amended as necessary due to changing weather condition or issuance/cancellation of a SIGMET.

### SIGMETs

A SIGMET (SIGNificant METeorological Information) advises of weather potentially hazardous to all aircraft other than convective activity. In the conterminous U.S. Items covered are:

- Severe icing
- Severe or extreme turbulence
- Dust storms and sandstorms lowering visibilities to less than 3 miles
- Volcanic Ash

In Alaska and Hawaii, SIGMETs are also issued for the following events:

- Tornadoes
- Lines of thunderstorms
- Embedded thunderstorms
- Hail greater than or equal to ¾ inch in diameter

For the lower 48 states and adjacent coastal waters, Convective SIGMETs are issued hourly for Thunderstorms-related aviation hazards.

These SIGMET items are considered to be widespread because they must be affecting or be forecasted to affect an area of at least 3000 square miles at any one time. However, if the total area to be affected during the forecast area, it could be that only a small portion of the total area would be affected at any one time.

SIGMETs are issued for 6 hour periods for conditions associated with hurricanes and 4 hours for all other events. If conditions persist beyond the forecast period, the SIGMET is updated and reissued.

### CONVECTIVE SIGMETs

Convective SIGMETs are issued in the conterminous U. S. for any of the following:

- Severe thunderstorms accompanied by
- surface winds greater than or equal 50 knots.
- hail at the surface greater than or equal to 3/4 inches in diameter
- tornadoes
- embedded thunderstorms
- line of thunderstorms
- thunderstorms greater than or equal to VIP level 4 affecting 40% or more of an area at least 3000 square miles

Any Convective SIGMET implies severe or greater turbulence, severe icing and low level wind shear. A Convective SIGMET may be issued for the Eastern (E), Central (C), and Western (W) United States, The areas separate at 87 and 107 degrees west longitude with sufficient overlap to cover most cases when the phenomenon crosses the boundaries. Bulletins are issued hourly at Hour +55. The test of the bulletin consists of either an observation and a forecast or just a forecast. The forecast is valid for up to 2 hours.

### Decoding TAFs

A terminal Aerodrome Forecast (TAF) is a concise statement on the expected meteorological conditions at an airport during a specified period (usually 24 hours). Each country is allowed to make modifications or exceptions to the code for use in each particular country. The TAF code, as described here is the one used in the United States. TAFs use the same weather code found in METAR weather reports.

### TAF Report Elements

TAF

```
KOKC 051130Z 051212 14008KT 5SM BR TEMPO 1316 1 1/2 SM BR
FM 1600 16010KT P6SM NSW SKC
BECMG 2224 20013G20KT 4SM SHRA OVC020 PROB40 0006 2SM TSRA OVC008CB
BECMG 0600 21015KT P6SM NSW SCT 040=
```

A TAF report contains the following sequence of elements in the following order:

1. Type of forecast
2. ICAO Station Identifier
3. Date and Time Origin
4. Valid Period Date and Time
5. Forecast Meteorological

The international TAF also contains forecast temperature, icing and turbulence. These three elements are not included in National Weather Service (NWS) prepared TAFs. The U.S. has no requirement to forecast temperatures in an aerodrome forecast and the NWS will continue to forecast icing and turbulence in AIRMETs and SIGMETs.

### Type of Report

The report type header will always appear as the first element in the TAF AMD. An amended TAF is issued when the current TAF no longer adequately describes the ongoing weather of the forecaster feels the TAD is not representative of the current or expected weather.

Corrected (COR) or delayed (RTD) TAFs are identified only in the communication header which precedes the forecast text.

### ICAO Station Identifier

The TAF code uses the ICAO four-letter location identifiers. In the conterminous United States, the three-letter identifier is prefixed with a K. For example SEA (Seattle) becomes KSEA. Elsewhere the first one or two letters of the ICAO identifier indicates in which region of the world and country (or state) the station is. Pacific locations such as Alaska, Hawaii and other Marianas Islands start with a P followed by an A, H, or G respectively. The last two letters reflect the specific station identification. If the location's three-letter identifier begins with an A, H, or G, the P is just added to the beginning. If the location's three-letter identification does not begin with an A, H, or G, the last letter is dropped and the P is added to the beginning.

Examples:

ANG (Anchorage, AK) becomes PANG  
OME (Nome, AK) becomes PAON  
HNL (Honolulu, HI) becomes PHNL  
KOA (Keaholo, Point, HI) becomes PHKO  
VAN (Anderson AFB) becomes PGVA

Canadian station identifiers start with C. Mexican and western Caribbean station identifiers start with M. The identifier for the eastern Caribbean is T, followed by the individual country's letter.

### Date and Time of Origin

This element is the UTC date and time the forecast is actually prepared. The format is a two-digit date and four-digit time followed, without a space, by the letter Z. Routing TAFs are prepared and filed approximately one-half hour prior to scheduled issuance times. TAFs are scheduled for issuance four times daily at 000Z, 0600Z, 1200Z, and 1800Z.

Example:

091050Z – Forecast prepared on the ninth day of the month at 1050Z.

### Valid Period Date and Time

The UTC valid period of the forecast is a two-digit date followed by the two-digit beginning hour and two-digit ending hour. Routine TAFs are valid for 24 hours. Valid periods beginning at 0000Z shall be indicated as 00. Valid periods ending at 0000Z shall be indicated as 24. The 24 indication applies to all time group ending times.

In the cast of an amended forecast, or a forecast which is corrected or delayed, the valid period may be for less than 24 hours. Where an airport or terminal operates on a part-time basis (less than 24 hours/day), the TAFs issued for those locations will have the abbreviated statement NIL AMD SKED AFT (closing time)Z, added to the end of the forecast. For the TAFs issued while these locations are closed, the word NIL will appear in place of the forecast text. A delayed (RTD) forecast will then be issued for those locations after two complete observations are received.

Examples:

091212 – Forecast valid from the ninth at 1200Z until the tenth at 1200Z

110023 – Forecast valid from the eleventh at 0000Z until the eleventh at 2300Z

010524 – Amended forecast valid from the first at 0500Z until the second at 0000Z

### Forecast Meteorological Conditions

This is the body of the TAF. The basic format is:

Wind – Visibility – Weather – Sky Conditions – Optional Data (Wind Shear)

The wind, visibility, and sky conditions elements are always included in the initial time group of the forecast. Weather is included in the initial group only if significant to aviation. If a significant, lasting change in any of the elements is expected during the valid period, a new time period with changes is included. It should be noted that, with the exception during the valid period, a new time period with changes is included. It should be noted that, with the exception of a FM group, the new time period will include only those elements which are expected to remain the same, the new time period reflecting the lower visibility would not include a forecast wind. The forecast wind would remain the same as in the previous time period.

Any temporary conditions expected during a specific time period are included with that time period.

#### Wind

The wind group included forecast surface winds. The surface wind is the exposed wind direction (first three digits) and speed (last two or three digits if 100 knots or greater). The contraction KT follows to denote the units of wind speed in knots. Wind gusts are

noted by the letter G appended to the wind followed by the highest expected gust (two or three digits if 100 knots or greater).

Calm winds (three knots or less) are encoded as 00000KT.

Variable winds are encoded when it is impossible to forecast a wind direction due to winds associated with convective activity or low wind speeds. A variable wind direction is noted by VRB where the three-digit direction usually appears.

Examples:

18010KT – wind from one eight zero at one zero knots

35012G20KT – wind from three five zero at one two gust two zero knots

00000KT – wind calm

VRB16G20KT – wind variable at one six gust two eight knots

### Visibility

The expected prevailing visibility is forecast in statute miles and fractions of statute miles followed by SM to note the units of measure. Statute miles followed by fractions of statute miles are separated with a space, for example, 1 1/2SM. Forecast visibility greater than 6 statute miles is indicated by coding P6SM. Directional or variable visibility is not forecast and the visibility group is emitted if missing.

Examples:

1/2SM – visibility one-half statute mile

2 1/4SM – visibility two and one-quarter statute miles

5SM – visibility five statute miles

P6SM – visibility more than six statute miles

### Weather

The expected weather phenomenon or phenomena is coded in TAF reports using the same format, qualifiers, and phenomena contractions as METAR reports (except UP).

Qualifiers of Intensity or Proximity

- Light

Moderate (no qualifier)

+ Heavy or well-developed

VC in the Vicinity

Qualifier Descriptor

MI Shallow

BC Patches

DR Low Drifting

BL Blowing

SH Showers

TS Thunderstorms

FZ Freezing  
PR Partial

Precipitation

DZ Drizzle  
RA Rain  
SN Snow  
SG Snow Grains  
IC Ice Crystals  
PL Ice Pellets  
GR Hail  
GS Small Hail or Snow Pellets (less than 1/4<sup>th</sup> inch diameter)  
UP Unknown Precipitation (automated stations only)

Obscuration

BR Mist (foggy conditions with visibilities greater than 5/8 miles)  
FG Fog (visibility 5/8 statute miles or less)  
FU Smoke  
DU Dust  
SA Sand  
HZ Haze  
PY Spray  
VA Volcanic ash

Other

PO Well-developed dust/sand whirls  
SQ Squalls  
FC Funnel Clouds  
+FC Well-developed funnel cloud, tornado, or waterspout  
SS Sandstorm  
DS Dust Storm

Obscuration to vision will be forecast whenever the prevailing visibility is forecast to 6 statute miles or less.

If no significant weather is expected to occur during a specific time period in the forecast, the weather group is omitted for that time period. If, after a time period in which significant weather had been forecast, a change to a forecast of no significant weather occurs, the contraction NSW (No Significant Weather) will appear as the weather group in the new time period. However, NSW is only included in the BECMG or TEMPO groups.

Sky Conditions

TAF sky condition forecasts use the METAR format. Cumulonimbus clouds (CB) are the only cloud type forecast in TAFs.

When the sky is obscured due to surface-based phenomenon, vertical visibility(VV) into the obscuration is forecast. The format for vertical visibility is VV followed by a three digit height in hundreds of feet.

Note: ceiling layers are not designated in the TAF code. For aviation purposes, the ceiling is the lowest broken or overcast layer or vertical visibility into a complete obscuration.

Examples:

SKC- sky clear

SCT005 BKN025CB BKN 250 five hundred scattered, ceiling two thousand five hundred broken cumulonimbus clouds, two thousand broken

VV008- Indefinite ceiling eight hundred

Optional Data( wind sheer)

Wind shear is the forecast of non-convective low-level winds ( up to 2000ft) and is the entered after the sky conditions when wind shear is expected. The forecast includes the height of the wind shear followed by the wind direction and wind speed at the indicated height. Height is given in hundreds of feet AGL up to and including 2000 feet. Wind shear is encoded with the contraction WS followed by a three digit height, slant character, and winds at the height indicated in the same format as surface winds. The wind shear element is omitted if not expected to occur.

Example:

WS0010/18040KT- low level wind shear at one thousand, wind one eight zero at four zero.

Probability Forecast

The probability or chance of thunderstorms of other precipitation events occurring, along with associated weather conditions (wind, visibility, and sky condition).

The PROB40 group is used when the occurrence of the thunderstorm or precipitation is in the 30% to less than 50% range, thus the probability value 40 is appended to the PROB contraction. This is followed by a four-digit group giving the beginning hour and ending hour of the time period during which the thunderstorm of precipitation is expected.

Note: PROB40 will not be shown during the first six hours of a forecast.

Examples:

PROB40 210 1/2SM+TSRA- chance between 2100Z and 0200Z of visibility one-half, thunderstorm, heavy rain.

PROB40 1014 1SM RASN- chance between 1000Z and 1400Z of visibility one, rain and snow.

PROB40 2024 2SM FZRA- chance between 2000z and 0000Z of visibility two, freezing rain.

Forecast change indicators

The following change indicators are used when a rapid, gradual, or temporary change is expected in some or all of the forecast meteorological conditions. Each change indicator marks a time group within the TAF report.

#### FROM group

The FM group is used when a rapid change, usually occurring in less than one hour, in prevailing conditions is expected. Typically, a rapid change of prevailing conditions is associated with a synoptic feature passing through the terminal area (cold or warm frontal passage). Appended to the FM indicator is the four-digit hour and minute the change is expected to begin and continues until the next change group or until the end of the current forecast.

A FM group will mark the beginning of a new line in a TAF report. Each FM group contains all the required elements—wind, visibility, weather, and sky condition. Weather will be omitted in the FM groups when it is not significant to aviation. FM groups will not include the contraction NSW

#### Examples:

FM0100 SKC- after 0100Z sky clear  
FM1430 OVC020- after 1430Z ceiling two thousand overcast

#### BECOMING (BECMG) Group

The BECMG group is used when a gradual change in conditions is expected over a longer time period, usually two hours. The time period when the change is expected is a four digit group with the beginning hour and ending of the change period which follows the BECMG indicator. The gradual change will occur at an unspecified time within this time period. Only the conditions are carried over from the previous time group.

#### Example:

OVC012 BECMG 1416 BKN020- ceiling one thousand two hundred overcast.  
Then a gradual change to ceiling two thousand broken between 1400Z and 1600Z.

#### TEMPORARY (TEMPO) group

The TEMPO group is used for any conditions in wind, visibility, weather, or sky condition which are expected to last for generally less than an hour at a time (occasional), and are expected to occur during less than half the time period. The TEMPO indicator is followed by a four digit group giving the beginning hour and ending hour of the time period during which the temporary conditions are expected. Only the changing forecast meteorological conditions are included in the TEMPO groups. The omitted conditions are carried over from the previous group.

#### Examples:

SCT030 TEMPO 1923 BKN030- three thousand scattered with occasional ceilings three thousand broken between 1900Z and 2300Z. 4SM HZ TEMPO 0006 2SM BR HZ- Visibility four in haze with occasional visibility two in mist and haze between 0000Z and 0600Z.

### Convective outlook

A convective outlook describes the prospects for general thunderstorm activity during the following 24 hour. Outlooks are prepared and transmitted by the severe storm forecast center (NSSFC) in Kansas City, MO every 6 hours. Forecasts in each outlook are valid until 1200Z the following day are used to prepare and update the severe weather outlook chart. The convective outlook should be used primarily for planning flights later in the day.

### State Forecast

State forecast are normally issued twice a day at 4am and 4pm, but can be updated more frequently as changing conditions warrant. The Forecasts consist of a detailed 48 hour forecast, and a more general, extended 3-4 day outlook.

### Wind and Temperature Aloft Forecast

Winds aloft forecasts are computer prepared and contain forecast wind direction and speed as well as forecast temperatures. Forecast winds and temperatures aloft are prepared for the following levels:

3,000 feet  
6,000 feet  
9,000 feet  
12,000 feet  
18,000 feet  
24,000 feet  
30,000 feet  
34,000 feet  
39,000 feet  
45,000 feet (selected locations only)  
53,000 feet (selected locations only)

All heights are above Mean Sea Level. Wind directions are true directions.  
Sample winds aloft text message

```
DATA BASED ON 010000Z  
VALID 010600Z FOR USE 0500-0900Z TEMPS NEG ABV 24000  
FT 3000 6000 9000 12000 18000 24000 30000 34000 39000  
MKC 2426 2726-09 2826-14 2930-21 2744-32 2751-41 275550 276050 276547
```

Interpretation:

```
DATA BASED ON 010000Z
```

Forecast data is based on computer forecasts generated the first day of the month at 0000 UTC

```
VALID 010600Z FOR USE 0500-0900Z TEMPS NEG ABV 24000
```

The valid time of the forecast is the first day of the month at 0600 UTC. The forecast winds and temperature are to be used between 0500 and 0900 UTC. Temperatures are negative above 24,000 feet

FT 3000 6000 9000 12000 18000 24000 30000 34000 39000

This is the heading for the actual wind and temperature forecast data. FT indicates the forecast location with the following numbers indicating the forecast levels in feet.

MKC 2426 2726-09 2826-14 2930-21 2744-32 2751-41 275550 276050 276547

In this example, this is forecast winds and temperature data for MKC, Kansas City, MO. The 3,000 foot wind is forecast to be 240 degrees at 26 knots. The 6,000 foot wind is forecast to be 270 degrees at 26 knots and the air temperature is forecast to be -9 degrees Celsius. The 30,000 foot wind is forecast to be 270 degrees at 55 knots with the air temperature forecast to be -50 degrees Celsius.

Temperature is in whole degrees Celsius for each forecast point. Temperatures are assumed to be negative above 24,000 feet. Wind direction is coded to the nearest 10 degrees. A calm wind or light and variable wind is indicated by 99. No temperatures are forecast for the 3,000' level, or for a level within 2,500' of the ground. No winds are forecast for within 1,500' of station elevation. Denver, for example, which is above 5,000' would show no wind forecast for the 3,000' and 6,000' levels.

Encoded wind speeds 100-199 knots have 50 added to the direction code and 100 subtracted from the speed. For example, 731960 indicates the wind is from 250 degrees at 119 knots with a temperature of minus 60 degrees Celsius.

#### Center Weather Advisories and Meteorological Impact Statements

Air Route Traffic Control Centers (ARTCCs) issue two types of aviation weather forecast products: Center Weather Advisories and Meteorological Impact Statements.

Center Weather Advisories are unscheduled weather advisories by meteorologists at the ARTCCs to advise pilots of existing or anticipated adverse weather conditions within the next 2 hours within 150 nautical miles of the Center. The advisory may modify or redefine a SIGMET or a convective SIGMET currently valid for the specified aviation weather forecast area.

Meteorological Impact Statements are unscheduled planning forecasts describing conditions expected to begin within 4-8 hours, which may impact the flow of air traffic within the ARTCCs jurisdiction.

The approximate geographic coverage and the controlling facility for each ARTCC area are shown on the Center Weather Advisory selection map.

#### Pilot Reports (PIREPs)

Pilot Reports provided by PILOTbrief Vector system include reports for the most recent 3 hours. The reports are provided on a state-by-state basis and are updated every 15 minutes. The letters “UA” identify the message as a pilot report. The letters “UUA” identify an urgent pilot report. Required elements for all PIREPs are message type, location, time, flight level, type of aircraft, and at least one weather element encountered. When not required, elements without reported data are omitted. All altitude references are MSL unless otherwise noted. Distances are in nautical miles, and time is in UTC. A PIREP is usually transmitted as an individual report but can be appended to a surface aviation weather report or placed into collectives. The weather phenomena are coded in contractions and symbols.

Standard Contractions:

<u>PIREP</u>	<u>PIREP</u>	<u>CONTENTS</u>
<u>ELEMENT</u>	<u>CODE</u>	
Station ID	XXX	Nearest weather reporting location to the reported phenomena
Report type	UA, UUA	Routine or Urgent PIREP
Location	/OV	In relation to a VOR
Time	/TM	Coordinated Universal Time
Altitude	/FL	Essential for turbulence and icing reports
Aircraft type	/TP	Essential for turbulence and icing reports
Sky cover	/SK	Cloud height and coverage (Sky clear, few, scattered, broken, or overcast)
Weather	/WX	Flight visibility, precipitation, restrictions to visibility, etc
Temperature	/TA	Degrees Celsius
Wind	/WV	Direction in degrees true north and speed in knots
Turbulence	/TB	See turbulence footnote
Icing	/IC	See turbulence footnote
Remarks	/RM	For reporting elements not included or to clarify previously reported elements

Example 1

KCMH UA /OV APE 230010/TM 1516/FL085/TP BE20/SK BKN 0650/WX FV035M  
HZ FU/TA 20/TB LGT

Interpretation

One zero miles southwest of Appleton VOR; time 1516 UTC; altitude eight thousand five hundred; aircraft type BE 200; bases of the broken cloud layer are six thousand five hundred; flight visibility 3 miles with haze and smoke; air temperature 20 degrees Celsius; light turbulence.

Example 2

KCRW UV /OV KBKW 360015-KCRW/TM 1815/FL 120//TP BE99/SK IMC/WX  
RA/TA M08/WV 290030/TB LGT-MDT/IC LGT RIME/RM MDT MXD ICG DURGC  
KROA NW BND FL080-100 1750Z

Interpretation:

From 15 miles north of Beckley VOR to Charleston VOR; time 1815 UTC; altitude 12,000 feet; type of aircraft BE-99; in clouds; rain; temperature minus 8 Celsius; wind 290

degrees true at 30 knots; light to moderate turbulence; light rime icing; encountered moderate mixed icing during climb northwest bound from Roanoke, VA between 8,000 and 10,000 feet at 1750 UTC.

#### Turbulence Footnote, icing intensities

Trace: Ice becomes perceptible. Rate of accumulation is slightly greater than sublimation. Deicing/Anti-icing equipment is not utilized unless encountered for an extended period of time (over an hour).

Light: The rate of accumulation may create a problem if flight is prolonged in this environment (over an hour). Occasional use of deicing/anti-icing equipment removes/prevents accumulation. It does not present a problem if the deicing/anti-icing equipment is used.

Moderate: The rate of accumulation is such that even short encounters become potentially hazardous and use of deicing/anti-icing equipment or flight diversion is necessary.

Severe: The rate of accumulation is such that deicing/anti-icing equipment fails to reduce or control the hazard. Immediate flight diversion is necessary.

#### Convective Outlook

A convective outlook describes the prospects for general thunderstorm activity during the following 24 hour. Outlooks are prepared and transmitted by the Severe Storm Forecast Center (NSSFC) in Kansas City, MO every 6 hours. Forecasts in each outlook are valid until 1200Z the following day and are used to prepare and update the Severe Weather Outlook Chart. The convective outlook should be used primarily for planning flights later in the day.

#### State Forecasts

State forecasts are normally issued twice a day at 4am and 4pm, but can be updated more frequently as changing conditions warrant. The forecasts consist of a detailed 48 hour forecast, and a more general, extended 3-4 day outlook

#### Lifted/K Index Aviation Chart

The Lifted/K Index chart is updated twice daily at approximately 0330Z (00Z data) and 1530Z (12Z data). The Lifted/K Index Chart combines two indices commonly used to measure atmospheric instability and the related potential for thunderstorm development. The first, the Lifted Index (upper number), is a measure of the chance of severe thunderstorms. It is the difference between the observed 500mb temperature and the temperature that a parcel of air would have if lifted from the boundary layer to the 500mb level. If the temperature at 500mb is warmer than the parcel lifted to that level, the air is stable and the chance of thunderstorms is low, if the temperature at 500mb is colder than the parcel lifted to that level, the air is unstable

and thunderstorms are likely. The difference in temperature is directly related to the chance of severe thunderstorms.

<u>Lifted Index</u>	<u>Chance of Thunderstorms</u>
0 to -2	weak
-3 to -5	moderate
-6 or less	strong

The second index, the K Index (Lower number), is a measure of the probability of airmass thunderstorms. It takes into account the temperature lapse rate between 850mb and 500mb, the amount of moisture at 850mb, and the dryness of the air at 700mb.

<u>K Index</u>	<u>Thunderstorm Probability(%)</u>
Less than 15	near 0
15 to 20	20
21 to 25	20 to 40
26 to 30	40 to 60
31 to 35	60 to 80
36 to 40	80 to 90
Over 40	near 100

#### Observed Winds Aloft

Vector observed winds aloft charts are updated twice daily at 0200Z (00Z data) and 1400Z (12Z data). Levels shown are the 2<sup>nd</sup> Standard Level (approximately 2,000' above the surface), 14,000' (600mb level), 24,000' (400mb level), and 34,000' (250mb level). Temperatures are given in de

#### Upper Air Analyses

Upper air analyses charts show actual, observed upper air conditions and are updated twice daily at approximately 0200Z (00Z data) and 1400Z (12Z data). The charts show standard reporting levels from 850mb to 200mb. Dashed lines are isotherms (equal pressure lines); solid lines are lines of equal height. Temperatures are given in degrees Celsius; pressure heights are given in meters. On 850mb, 700mb, and 500mb charts green shading indicates areas of dew point depression less than 5 degrees Celsius. These are areas where clouds are likely based on the temperature/dew point spread. On 300mb, 250mb, and 200mb charts red shading indicates where wind velocity is 70 knots or greater.

#### Weather Watch Boxes

Weather watches are issued by the Storm Prediction Center (SPC). They are issued in advance of expected severe thunderstorms or tornadoes. The "current watches" advisory graphic will plot these watch boxes in yellow for severe thunderstorms watches and red for tornado watches. The watch number and expiration time will also be plotted near the box. Occasionally the SPC issues a watch which is not immediately valid, but scheduled to become valid within an hour. These "impending" watch boxes will be plotted with the dashed lines from time of issuance until the time they are scheduled to become valid. At "valid" time, the dashed lines change to solid lines.

The SPC will also issue status messages referring to the valid watch boxes. These messages will often cancel portions of the original box. As the severe weather threat diminishes, the effect on the plot will be for the box to become “trimmed” away.

#### Perceptible Water

The Perceptible Water (PW) graphic depicts the observed quantity of water vapor between the surface and 500mb (18,000 feet MSL). The chart shows the amount of water (inches) the air would contain if the entire vapor were condensed.

#### Some Constants

- Warmer air has the ability to store more water vapor, hence the amounts are generally higher in the summer months.
- Higher elevations have less vertical atmosphere between the surface and 500mb, hence they generally have lower PW values.

#### Freezing Level

The freezing level chart contains a blue contour where the surface is below freezing (BF). It also contains a plot of the stations from which balloon sounding is available. The plot includes the RADAT information capable of depicting multiple freezing levels.

- Blue contour – the surface is below freezing.
- BF plotted alone – all levels are below freezing
- BF plotted with a column of numbers – the surface is below freezing and remains below freezing up to the first level, then changes to above freezing at the next level and eventually changes back to below freezing.
- Single number plotted – this is the height of the only freezing level. It is above freezing up to that level and below freezing above that level.
- Where only numbers are plotted – it is above freezing at the surface up to the lowest level, then below freezing for a layer, above freezing again for a layer then eventually below freezing.