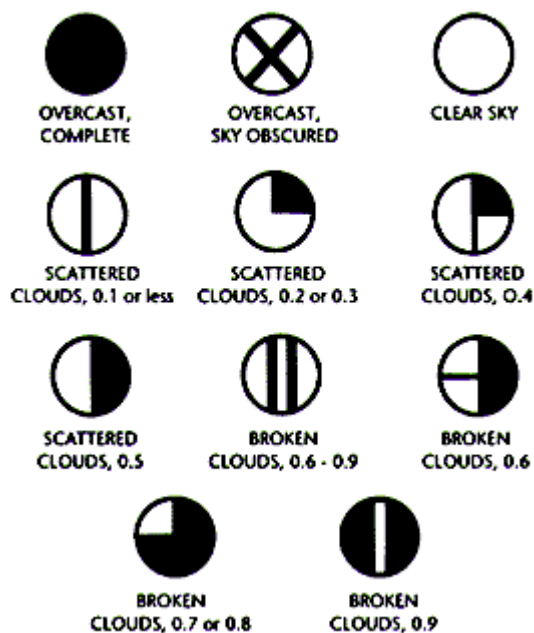


# Aviation Weather

## Tutorial

### 6. Weather Services for Pilotage

#### Weather Map Symbols for Cloud Cover



When an airplane takes flight, the type and intensity of the weather determine the Federal Aviation Regulations (FARs), Federal Laws, used for that flight. Conditions where the ceiling is more than 1,000 feet and the visibility is greater than three miles are known as Visual Meteorological Conditions (VMC) and Visual Flight Rules (VFR) are used. Conditions where the ceiling is less than 1,000 feet and/or the visibility is less than three miles are known as Instrument Meteorological Conditions (IMC) and Instrument Flight Rules (IFR) are in effect. A ceiling is the height above the Earth's surface of the lowest layer of clouds or obscuring phenomena that is reported as "broken," "overcast," or "obscuration," and is not classified as "thin" or "partial."

The US Weather Service and many private organizations report and forecast the weather. It is important for pilots and air traffic management personnel to know that a weather report or a weather map is history and a weather forecast is a computer-generated best guess. They must use all available weather data from real time to forecasts before and during the flight to make decisions that maintain safety in the skies. There are many sources of weather data, all of which are covered briefly below. For convenience they are categorized into printed reports and forecasts, graphic weather analyses and briefings and advisories. Not all are used all the time, but each provides valuable information. For short, local flights, a pilot may only need to be informed of general weather conditions. For extended or cross-country flights, a pilot will need more detailed information covering a greater area and perhaps at various altitudes.

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#### Printed Reports and Forecasts

**METAR** is the Aviation Routine Weather Report and is more or less standard around the world. The temperatures are given in Celsius degrees. The atmospheric pressure however is reported in hecto pascals everywhere, but the US where the atmospheric pressure is reported in inches of mercury. For aviation purposes the standard temperature and atmospheric pressure are 59° F (15°C) and 29.92 in. Hg (1013.2 hPa). Follow this link to [examine a sample METAR](#).

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**TAF** is an airport forecast. TAF is more or less standard around the world. TAF forecasts significant weather changes, temporary changes, probable changes and expected changes in weather conditions. Follow this link to [examine a sample TAF](#).

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The **SA** report is a concise picture of the weather on the surface where an airport weather station or other weather facility is located (station designator). This report might contain up to the 10 separate elements listed here:

- Station designator (airport or other type of aviation facility)
- Time of report and type (this could be a record observation or a special report)
- Sky condition and ceiling
- Visibility
- Weather and obstructions to vision
- Sea level pressure (in millibars)
- Temperature and dew point
- Wind information
- Altimeter setting
- Remarks and coded data

Follow this link to [examine an SA report](#).

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**Notice to Airmen (NOTAM)** may be found at the end of the SA report or is given as separate information. This report includes timely information about the aviation facility such as runway closures, obstructions in the approach and departure paths to airports, outages and operational hours of the facility.

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**Pilot reports (PIREPs)** offer current weather conditions as reported by pilots who have just recently flown through an area. Pilots are encouraged to make these reports as they keep weather information updated and assist in warning pilots in preflight of potential weather hazards along their planned route. This report usually includes such information as height of cloud layers, in-flight visibility, icing conditions and turbulence which sometimes confirms what is already know, but can also inform about newly developed conditions. Follow this link to [see the types of information included in a PIREP](#).

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**Radar Weather Reports (RAREPs)** are issued by most radar stations each hour with special reports provided as needed. This report provides information regarding general areas of precipitation, noting thunderstorm activity. It also includes type of precipitation, its intensity, direction and speed of activity as well as height of rain-bearing clouds. These reports are regularly transmitted over weather service circuits and can be found in Flight Service station weather broadcasts.

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**Terminal Forecasts (FT)** is one of the best sources for predicting what the weather at a particular airport (terminal) will be in the future. These forecast predictions cover an area within 5 nautical miles of the center of the runway field. FTs are usually issued 3 times a day and are valid for accuracy up to 24 hours. The first section of the FT covers the expected weather for the upcoming 18-hour period. This includes information about ceiling, visibility, vision obstructions, wind and expected weather changes at that facility. Follow this link to [examine a sample FT report](#).

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An **Area Forecast (FA)** reports the general weather conditions of a particular region. The contiguous states are divided into 6 regions for which area forecasts are prepared. This is a good source of weather information for en route weather and helps to determine the weather conditions for airports that do not provide terminal forecasts. The FA gives a 12-hour forecast plus a 6-hour outlook with information describing five specific weather conditions:

- Hazards/flight precautions (H)
- Synopsis (S)
- Icing (I)
- Turbulence (T)
- Significant clouds/weather (C )

Follow this link to [examine a sample FA report](#).

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The **Winds and Temperatures Aloft Forecast (FD)** gives an estimate of wind direction as it relates to true north, the wind speed (in knots) and the temperature (degrees Celsius) for selected levels of altitude. Follow this link to [examine an FD report](#).

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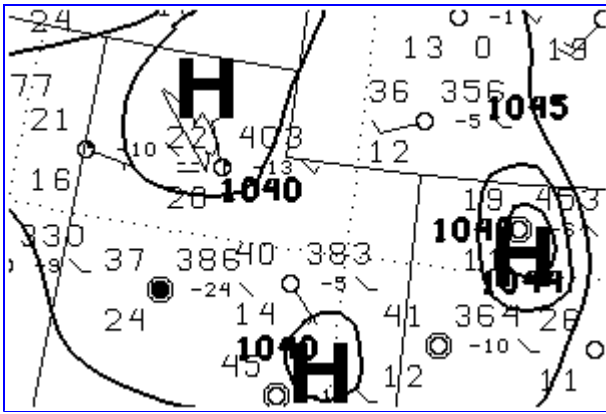
Severe Weather Reports and Forecasts include **convective outlook (AC)** and **severe weather watch bulletin (WW)**. The AC forecasts general thunderstorm activity the 24-hour period after the report is issued. The WW defines areas where thunderstorms or tornadoes have the possibility of developing.

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### Graphic Weather Analyses

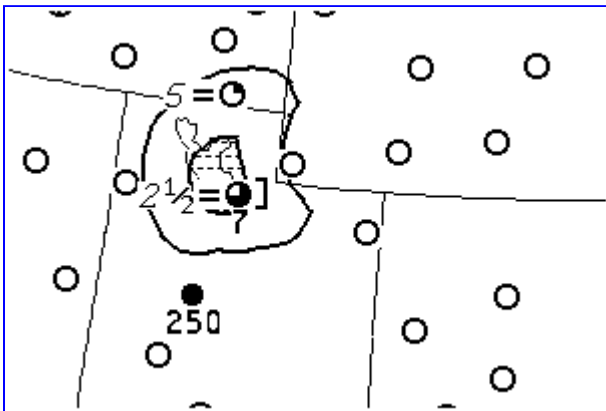
Flight Service Stations and weather services offices offer a wide variety of pictorial views of the weather. These charts and maps provide lots of information on large-scale weather patterns and trends.

**Surface Analysis Chart (or Surface Weather Chart)** depicts the weather conditions as they were a few hours earlier to the time stamped on the chart. These charts are developed every 3 hours. Reviewing this chart gives a picture of atmospheric pressure patterns, locations of high and low pressure systems as well as frontal movements.



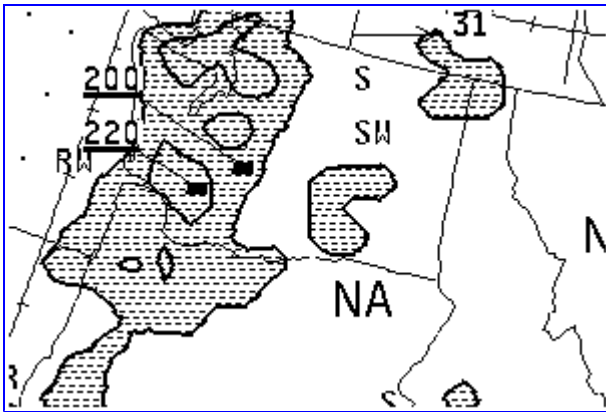
Click the image to view the entire chart.

Perhaps the most useful information to a pilot planning a flight during preflight is the **Weather Depiction Chart**. This is actually a simplified version of the weather surface chart. This chart is also generated every 3 hours. It contains information on frontal activity and has an abbreviated version of station models. It does not contain as much detailed information as the surface weather chart, but offers pilots a way to easily and quickly scan for adverse weather conditions.



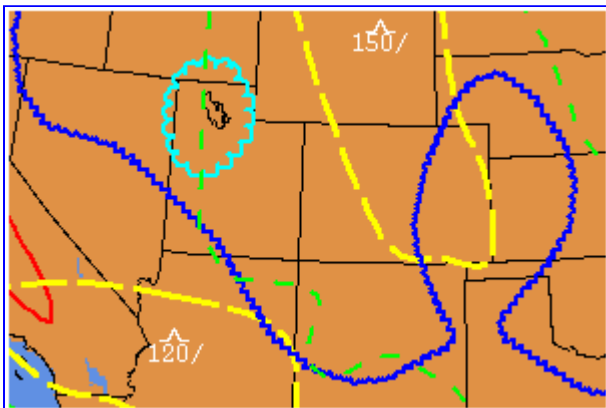
Click the image to view the entire chart.

Special weather radar systems can detect certain types of weather phenomena. These radar systems emit pulses of radar energy from a rotating antenna. If the signals encounter precipitation, they are reflected back to the antenna as echoes. These are then graphically depicted displaying the strength and location of the precipitation. This radar detection does not detect all cloud formations, only frozen or liquid forms of precipitation. It will not detect fog or the actual tops of rain clouds. The radar summary chart has limitations in that it only displays the conditions that existed at the time recorded on the chart. Remember that thunderstorms can develop rapidly and recently developed thunderstorms might not be displayed.



Click the image to view the entire chart.

The low level significant weather prognostic chart is different from the three previous charts described in that it is a forecast chart (not an observation chart). The "prog" chart is issued four times daily and provides a 12-hour and a 24-hour weather forecast for a given region. It also, only covers from the surface up to the 400-millibar pressure level (24,000 feet in altitude). It is to be used only in planning flights below 24,000 feet.



Click the image to view the entire chart.

## Briefings and Advisories

Whether a commercial, military or private pilot, all must obtain a formal weather briefing during preflight. Based upon the following pilot's information a briefing is given:

- type of flight (VFR or IFR)
- aircraft type
- departure and destination airport
- flight route
- flight altitudes
- estimated time of departure (ETD)
- estimated time of arrival (ETA)

There are three types of briefings that are offered to pilots by "pilot weather briefers" who have been

certificated by the National Weather Service. These "briefers" can be contacted at local Flight Service Stations and Weather Service Offices. Pilots need to know which weather briefing to request when contacting "briefers". These are standard, abbreviated and outlook briefings.

The **Standard Briefing** is the most complete weather briefing and for the pilot who does not have an opportunity to gather any other weather data, gives the following information:

- adverse conditions
  - VFR (visual flight rules) flight not recommended
  - Synopsis
  - Current conditions
  - En route forecast
  - Destination forecast
  - Winds aloft
  - Notices to airmen (NOTAM)
  - ATC (air traffic control) delays
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The **Abbreviated Briefing** is for pilots who need to update previous weather data they have gathered or who only need a few bits of weather data to complete their weather picture.

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The **Outlook Briefing** is requested by pilots whose departure time is 6 or more hours away. The briefer then gives forecast information appropriate to the proposed flight route. This will assist the pilot in making an initial decision about the feasibility of such a flight.

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Because of the quickly growing number of flight operations daily there is a tremendous demand for weather information services. Because of this many weather information services are recorded. Pilots can use a telephone to obtain preliminary weather information and decide based upon that information if he or she needs to speak with a briefer. There are various automated systems available. One such system, the **Pilots Automatic Telephone Weather Answering Service (PATWAS)**, offers a continuous weather recording that gives a summary of weather data for an area within 50 nautical miles of the station. This information will help pilots in their decision-making process for a "go/no-go" decision.

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While en route on a flight there are many in-flight weather advisories available to pilots via radio frequencies. The weather information provided helps pilots during their en route decision-making processes. The pilot uses the weather information to determine whether or not the conditions may be hazardous to the flight. It also helps the pilot working with air traffic management personnel to decide on a change in the flight plan.

**AIRMET (WA)** is broadcasted for weather phenomena that potentially affects all aircraft. For pilots of light aircraft, AIRMET (acronym for "AIRman's METeorological information) gives valuable information about the following conditions: moderate icing, moderate turbulence, sustained winds 30 knots or greater at the surface, widespread area with a ceiling of less than 1,000 feet and/or visibility less

than 3 miles and extensive obscurement of mountains. These are important to light aircraft, as they have limited flight capabilities due to lack of equipment and/or instrumentation and less pilot flight experience. Follow this link to [examine a sample AIRMET](#).

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**SIGMETs (WS)** are broadcasted for hazardous weather that is considered of extreme importance to all aircraft. SIGMETs (acronym for "SIGnificant METeorological information") warn of the following weather hazards: severe icing, severe and extreme turbulence, duststorms, sandstorms, or volcanic ash lowering visibility to less than 3 miles. A Convective SIGMET (WST) is issued for hazardous convective weather (such as tornadoes, thunderstorms, hail) and covers severe or great turbulence, severe icing, and low-level wind shear. Follow this link to [examine a sample SIGMET](#).

