activity twelve

Become a Squadron Weather Officer

OBJECTIVE

The overall objective is to make the senior member aware of what is known as "pilot weather." There are certain aspects that are more important to pilots than an in-depth understanding of the science of meteorology.

WEATHER INFORMATION OF SPECIAL INTEREST TO PILOTS

Before starting a long and boring experience trying to learn weather theory, let's take a look at a Station Model of the Surface Analysis Chart. You may wonder why this particular item was used. The surface analysis chart has been around for several decades and pilots have used it to get an overall picture of the weather that may be encountered enroute to a destination.

NATIONAL SCIENCE STANDARDS

Content Standard D: Earth and Space Science

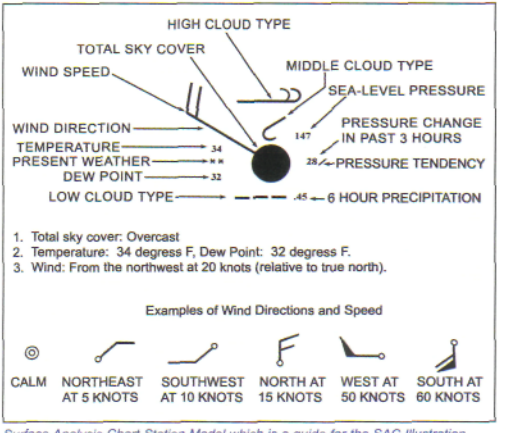
- Energy in the earth system

Content Standard F: Science in Personal and Social Perspectives

- Natural and human-induced hazards

When you look at the Surface Analysis Chart, you will see that every major city has a "symbol" with a lot of strange information around it. **This is pilot information.** Let's find out more.

This is a Station Model and it **gives information important to pilots.** This might be Oklahoma City; it might be Oshkosh, Wisconsin; it might be Las Vegas, Nevada, and on and on.



Surface Analysis Chart Station Model which is a guide for the SAC Illustration.

The National Oceanic and Atmospheric Administration and the Federal Aviation Administration produced this book, "Aviation Weather Services" (Advisory Circular AC 00-45E) which contains a wealth of information about the science and technology surrounding the study of aviation weather.

Now you can own a weather station for about the price of a tank of gasoline for your car! This EnviraStation has a wealth of information including barometric pressure in both millibars and inches, barometric trend, outside ambient temperature, humidity, inside temperature, date and time. It also shows clouds at the very top (although it is not easily seen in this photograph). The EnviraStation has a monitor that sits outside so that local atmospheric conditions can be read indoors.

Look at the station model as you would the face of a clock. Let's start at noon and go "clockwise."

1. **The High Cloud Types** - If a pilot is going to fly at *high altitudes, he/she wants to know if these clouds* might be of a type that is threatening to the overall safety along the route of flight.
2. **The middle cloud types** -These clouds, because of their location can also present a problem if they contain severe weather that may affect the safety and visibility of the flight. **If a pilot is not rated to fly in clouds, an overcast at any level may present a problem of legality. An example of this would be having an "under-cast" develop (where the pilot is on top of an overcast) and, if only VFR rated, the pilot would have to descend through the clouds to make an approach to land. This means that during this descent through the clouds, the pilot would not only be illegal, he/ *she would be a threat to other aircraft flying in* the vicinity.**
3. **Sea-Level Pressure** - The barometric pressure is especially important because it is used to set the correct altimeter. A constant monitoring of the pressure is essential for a safe and legal flight.
4. **The pressure change and pressure tendency** is a forecaster of changing weather. If the barometric tendency is falling, this could easily indicate a deteriorating weather situation. As the barometer falls, again, a pilot has to make corrections to instruments to know the exact altitude the aircraft is flying to maintain legality and safety along the route of flight.
5. **Regarding the 6 hour precipitation** symbol, thi *gives the pilot a "history" of the environment into* which he/she is flying. If the weather has been a hazard in the past 6 hours, there is a good chance that conditions might very well be hazardous when the pilot approaches the area along the route of *flight.*
6. **Low Cloud Type** - This is especially important to a pilot because it gives him/her an idea of what conditions are going to be like close to the airport. If the clouds are low and dense, there is a possibility that fog may exist and that would require the pilot to take action to go to another airport or, if instrument qualified, make sure that he is legal to continue with a landing.
7. **The Dew Point** - If the dew point comes within 4° F of the temperature, there is a likelihood that fog will be forming. The dew point is that temperature *at which the humidity within the air condenses out* to form water, i.e. saturation.
8. **Present Weather** - This is especially important to a pilot because it gives the pilot a look at what's going on, or was going on at the time the data *was collected by the local observer. If the weather* is threatening to the safety or legalilty of the flight, the pilot should know this immediately.
9. **The temperature** - This information is especially important in relation to the dewpoint. The temperature can also be an indicator of the possibility of icing conditions and of course, this may be a threat to the safety of the flight if the aircraft is not equipped with anti-icing equipment.
10. **Wind Direction / Wind Velocity** - Wind is defined as air in motion. If the aircraft is part of the moving environment, then the pilot is going to have to make corrections in the direction of flight to maintain a desired flight path across the ground. If the wind is very high at the point of intended landing, then it may exceed the skill level and legality of the pilot. If that condition exists, corrections or alterations must be made to land safely, possibly at another airport.
11. ***Total Sky Cover*** *- This is the first thing a pilot will* observe when studying the Surface Analysis Chart. This gives a knowledgeable pilot a quick picture of what's happening along the route of flight or at the destination.
12. **Remember, everything you're looking at is HISTORY.**

(See symbols on Surface Analysis Chart page 69.)

Color	Symbol	Description
Blue	H	High Pressure Center
Red	L	Low Pressure Center
Blue		Cold Front
Red		Warm Front
Red/Blue		Stationary Front
Purple		Occluded Front
Blue		Cold Frontogenesis
Red		Warm Frontogenesis
Red/Blue		Stationary Frontogenesis
Blue		Cold Frontolysis
Red		Warm Frontolysis
Red/Blue		Stationary Frontolysis
Purple		Occluded Frontolysis
Purple		Occluded Frontolysis
Brown		Squall Line
Brown		Dryline
Yellow		Ridge

THE ACTUAL SURFACE ANALYSIS CHART

The Surface Analysis Chart shown in this example was taken from the AVIATION WEATHER SERVICES ACE 00-45E advisory circular, page 5-3.

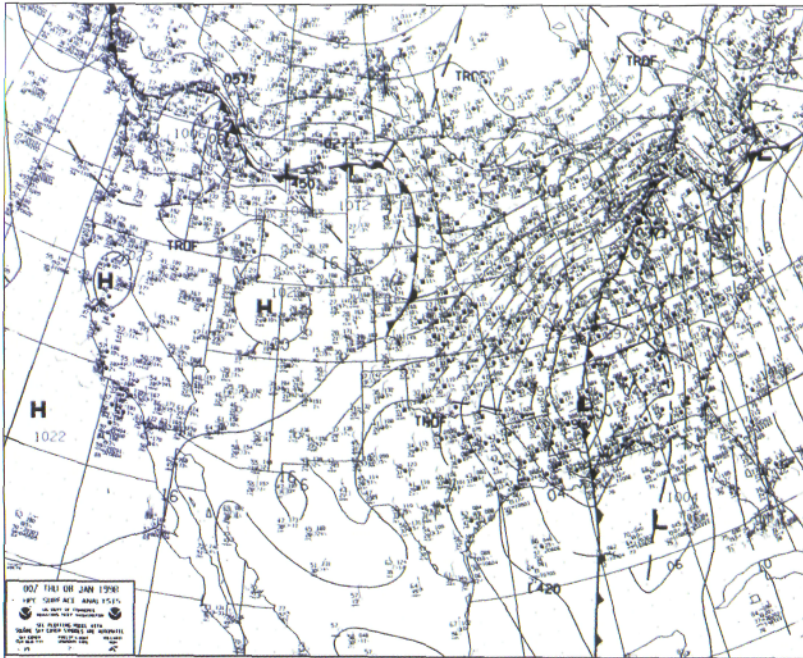
In "Section 5" of this ACE 00-45E, it states at the beginning:

SURFACE ANALYSIS CHART

The surface analysis chart is a computer-generated chart, with frontal analysis by HPC forecasters, transmitted **every 3 hours** covering the contiguous 48 and adjacent areas. Figure 5-1 is a sample surface analysis chart and 5-2 illustrates the symbols **depicting fronts and pressure centers.**

VALID TIME - This is very important because it tells the planner when the data was gathered. It is but one of several pieces of information a pilot can use to "forecast" the weather along the route of flight. The Aviation Weather book has this to say:

"Valid time of the chart corresponds to the time of the plotted observations. A date-time group UCT or Universal Coordinated Time tells the user when conditions portrayed on the chart occurred."


TRDF
TRDF
TRDF
TRDF
H
H
H
1022
L
L
L

ISOBARS - Isobars are solid lines depicting the sea-level pressure pattern and usually space at intervals of 4 millibars. Each isobar is labeled. For example, 1032 signifies 1,032.0 millibars.

PRESSURE SYSTEMS - The letter "L" denotes a lower pressure center, and the letter "H" denotes a high pressure center. The pressure of each center is indicated by a three-or four-digit number that is the central pressure.

FRONTS - The analysis shows positions and types of fronts by the symbols shown in Figure 5-2 (symbols). The symbols on the front indicate the type of front and point in the direction toward which the front is moving. If the front has arrowhead-shaped symbols, it is a cold front. If the front has half-moon symbols, it is a warm front. If there is a number near a front, these are "classification" designations and the senior member is urged to look these up on page 5-1 of the Aviation Weather ACE 00-45E Advisory Circular (text).

TROUGHS AND RIDGES - A trough of low pressure with significant weather will be depicted as a thick, dashed line running through the center of the trough and identified with the word, "TROF." The symbol for a ridge of high pressure is rarely, if at all, depicted.

OTHER INFORMATION - The observations from a number of stations are plotted on the chart to aid in analyzing and interpreting the surface weather features. These plotted observations are referred to as station models. There are two primary types of station models plotted on the chart. Those with a round station symbol are observations taken by observers. The locations with a square station symbol indicated the sky cover was determined by an automated system. Other plotting models that appear over water on the chart are data from ships, buoys, and offshore oil platforms.

USING THE CHART - The surface analysis chart provides a ready means of locating pressure systems and fronts. It also gives an overview of winds, temperatures, and dew point temperatures at chart time. When using the chart, keep in mind that weather moves and conditions change. Using the surface analysis chart in conjunction with other information gives a more complete weather picture.

AUTHOR'S PHILOSOPHY FOR THIS ACTIVITY

For many years, the author taught an aviation ground school for a high school in a pre-career program. The Jeppesen Aviation Fundamentals textbook was used and of all the chapters, the students feared the unit on weather. It took a while, but it was found they were receptive to learning about meteorology when it was connected directly to "what a pilot really needs to know." Before opening the book, a brief coverage of the "basic science" was taught for about two weeks. We would go through each facet of weather science before connecting it to charts, new symbols, and available services. Here's how it was approached:

1. Air is to a pilot as water is to a sailor. It is home! So what is air like - we can't see it but we can study it.
2. Air is made up of molecules (Nitrogen, Oxygen, Carbon Dioxide, etc.)
3. Air in motion is wind. What do molecules do when they start to move? (examples - cyclones, tornadoes, etc.)
4. Air down close
5. Air up high - why does a pilot care?
6. Water in the atmosphere?
7. What is pressure? Why do we care?
8. What is drag?
9. Hot air?
10. Cold air?
11. Frozen air?
12. Solid air?
13. What is a cloud?
14. **NOW....put an airplane in the picture...**
15. When an airplane leaves the ground (relating back to #1) it enters an environment for which it was designed. As air starts to move around the airplane, what changes occur?
16. Does air density affect an airplane?
17. You hear on the "News" about 190 mph winds in a tornado...yet many airplanes fly at those speeds all the time - why aren't they torn up like a barn is when a tornado hits it?

18. What happens to an airplane when air goes straight up or straight down?
19. We can't let a big string out that goes all the way from the airplane to the ground (like a boat dropping an anchor)...we use differences in pressure to do this.
21. When the air gets really cold, airplanes fly better. Why?
22. When the moisture in the air becomes visible, it means a cloud might be forming. A cloud on the ground is known as fog. Is it difficult to drive through really thick fog. What about flying or landing in thick fog? Is fog up in the sky really a cloud?
23. Are some clouds more threatening to an airplane than others?
24. *Why are clouds called the "Sign Posts Of The Sky?"*
25. **OKAY...Take a look at the station symbol** (no need to open the textbook yet...we're getting there). As I indicated earlier, can you see how each one piece of information has some relationship to the needs of a pilot?
26. **Each day, in the class, we would start clockwise and spend the entire period on just one or two segments of the station model. We would cover that component, discuss its importance to a pilot, and then go on. By the end of the station model, they had little or no fear of meteorology and were willing to see what else was available in the way of pilot-related information.**

REALITY WEATHER FROM LOCAL TV AND THE WEATHER CHANNEL®.

When you are watching television and the local, or national, weather forecaster is giving you conditions and forecasts, these are generally not aimed specifically at pilots. They are aimed at the general public; *however, it is information that is usable by a pilot.* Pilots can, however, use the Weather Channel® and local TV to get some of the data that was featured above.

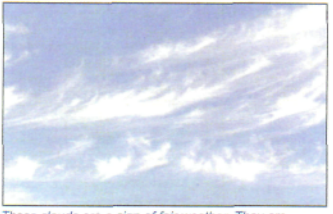
VISITS FROM GOVERNMENT OR EVEN TV WEATHER PERSONALITIES

Schools and even CAP squadrons can request, as a guest speaker, a visit from a local TV weather personality. They will usually do this without charge and it is a great "drawing" item to have the weather person visit your squadron.

A VISIT FROM A GOVERNMENT WEATHER OFFICIAL

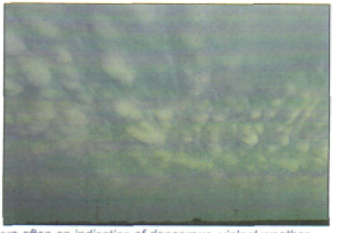
A Civil Air Patrol squadron staff member (now Weather Officer) can request a guest speaker by calling any office of the Federal Aviation Administration. These officials will give the squadron an overview of the job and in the case of a composite or cade squadron, give the individual a career overview. This may just be the "spark" that turns a cadet, or younger senior member, on to a career in meteorology.

Ah-h-h-h! Good flying weather! Temperature was 72 degrees (F), visibility was 100+ miles and the winds were light and variable. This is a condition jokingly called "Severe Clear" by pilots.



These clouds are a sign of fair weather. They are known as Cirrus and are located at very high altitudes. Generally, the barometric pressure is high and conditions like this make pilots want to "go flying!"

If clouds are the sign posts of the sky, what would you say about these towering cumulus? If a cloud is puffed upward this means that some force (turbulence) shaped it that way. If you drew "force lines" on this image, what would they look like?



These are the very dangerous "Mammato" clouds. These are often an indication of dangerous, violent weather....

...Like this.

Some very beautiful scenery...flight above the clouds.