Aviation Weather Charts - what a picture is worth

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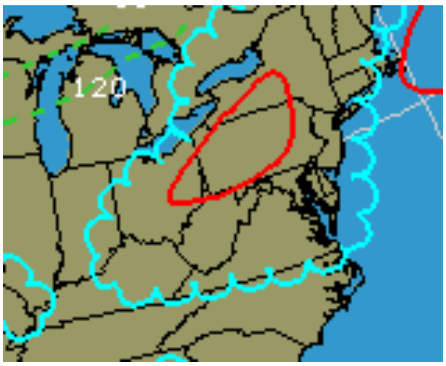
Despite the availability of high-speed internet access and an abundance of websites carrying aviation weather, not much has changed in how pilots obtain weather information. Student pilots still spend a great deal of time learning to decode METAR, TAF and the FA. The FAA knowledge tests, flight reviews and instructors will make you believe that decoding the two-letter codes such as “BR” and “MI” are the cornerstones of weather knowledge. Nothing could be further from the truth. These codes might have been of great value in the days when weather data was sent by teletype terminals. A printout of several METAR observations allowed one to efficiently scan multiple stations and get a quick idea of the current conditions. Although more useful products like the weather depiction chart and significant weather prognosis chart were available, we simply did not have enough bandwidth to get these charts into the hands of pilots. But things have changed. Downloading a chart doesn’t take any longer than downloading the raw text data. Charts provide the big picture of the weather by including information from hundreds of stations across the country all at once. They are, quite literally, worth a thousand words.

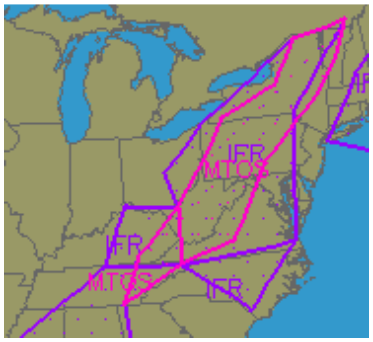
The Aviation Weather Center (AWC), a branch of the National Weather Service (NWS), produces a wonderful array of useful charts. These charts are not new. They have always been there. It’s just that they have become a lot more accessible now. AWC maintains a website at http://aviationweather.gov. All of the charts discussed in this article can be found under the “Standard Briefing” section of the AWC website.

As an example, let’s consider a flight from Dayton, OH to Pittsburg, PA at 18Z tomorrow. One way to do the briefing would be to get the FA and TAF for all the stations along the route and decode the data. This is how DUATS presents its briefing. A much more elegant way is to look at the *significant weather prognosis chart*, also known as *prog charts*. Without a doubt, this is the most useful forecast chart in existence. The valid time for the chart is stamped on the bottom left corner. Different contours depict areas of MVFR (scalloped blue lines) and IFR (red lines) forecasted to exist at the valid time. From the example shown on the right, it is easy to see that it is going to be MVFR in Dayton and worsening to IFR as we get closer to Pittsburg. We don’t need to decode dozens of coded text to figure this. There’s more. Freezing levels are shown by the dashed green lines. By interpolating between two levels (not shown in this cropped figure), we can find the freezing level for our planned route to be 14,000ft. Areas of turbulence are also shown. Prog charts are wonderful for advance flight planning. They come in a standard four-panel format: the left and right columns are 12-hour and 24-hour forecasts respectively; the top row is for atmospheric conditions (MVFR and IFR areas, freezing levels, turbulence) and bottom row is for surface conditions (rain, snow, thunderstorms, frontal positions). In most cases, this information is sufficient to make a go/no-go decision. If we decide to go, we would need more specific information on ceilings, cloud types and surface winds. This is when we have to look at the TAF & FA. However,



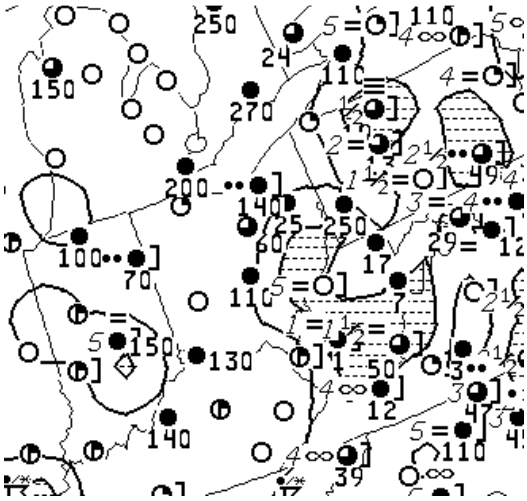
Low level Significant Weather Prognosis Chart

going straight to the TAF & FA without looking at the *prog charts* deprives the pilot of the big picture.

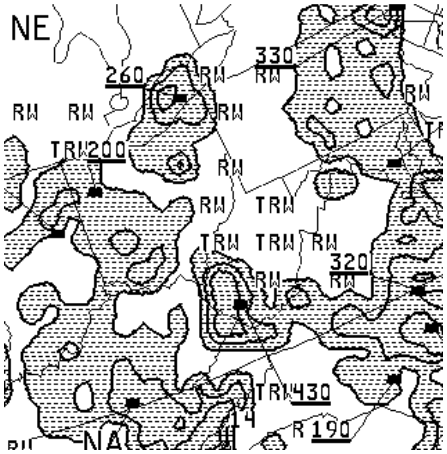


Airmet Sierra Chart

Next, let's take a look at Airmets. These are issued in coded text, just like the TAF and FA. However, the boundaries of the Airmet regions are defined by airport codes. The same is true about FA's weather synopsis. Unless you are a walking encyclopedia of airport codes and their locations, this format is practically useless. This is one reason why very few pilots actually bother to check Airmets. This is unfortunate because Airmets are issued for a variety of serious conditions, such as turbulence, icing, and extensive IFR. In fact, the FAA enforcement actions have frequently used Airmets as the most important source for 'known icing conditions'. The graphical Airmets are easy to use. Contours depict areas where Airmets are effective. The example on the right shows areas of extensive IFR and mountain obscurations. The valid time and expiration time are stamped at the top of the chart. For the planned flight from Dayton to Pittsburg, we can expect extensive IFR and possible mountain obscurations. Like before, if we want to get specific details about the Airmets, we can always check the text format of the Airmet.


Weather Depiction Chart

As the departure time draws closer, it is important to look at the current conditions and compare them to the forecasted conditions. This can be used to develop a confidence factor for the arrival forecast. One way to get the current conditions is to download a bunch of METAR observations. A more elegant way is to use the *weather depiction* chart. This chart shows the big picture of the last reported conditions across the entire country. Like the other charts, the observation time is stamped on the bottom left corner. Different contours are used to depict MVFR and IFR areas, and each station is shown with visibility, ceilings, extent of cloud cover and precipitation type. The chart on the right shows clear weather in Dayton, and deteriorating to MVFR and then IFR towards Pittsburg. It also shows that better weather exists to the north and south of the planned route. An alternate, if necessary, could be selected from these clear areas.



Radar Summary Chart

The *radar summary chart* is a composite plot of precipitation cells across the country. It contains a few extra pieces of information that is not usually shown on live Doppler radar. Precipitation is classified into levels 1 through 6 and is depicted in three contour levels. Near Dayton, we can see levels 1 & 2 with small pockets of levels 3 & 4. No precipitation is seen to the east towards Pittsburg. The height of the cells and their movement are also noted on the chart. If there is lightening, the cell is categorized as a

thunderstorm (TRW). Otherwise, it will be designated simply as a rain shower (RW). Precipitation alone is not particularly hazardous to flight. It is the downdrafts and thunderstorms that we need to stay away from. Generally, the higher the tops are, the worse the downdrafts. For example, even a level 4 precipitation may be harmless if the cell tops are lower than 10,000ft. When the tops reaches above 20,000ft, we can expect some significant weather. Therefore, it is important to take note of the cell tops. Thunderstorms that produce hail and tornadoes usually have cells with tops in excess of 50,000ft.

In order to be fast and efficient, it is important to be systematic when obtaining weather information. When sitting down in front of the computer for a weather briefing, it is better to use a shopping list rather than randomly scanning interesting items. Weather briefing could benefit from a checklist just as we do when operating an airplane. Since NOTAMs and TFRs are often included as part of a standard weather briefing, it becomes even more important to do this briefing from a checklist. An example of such a checklist is shown below.

Prog Chart ☐	Wx Depiction Chart ☐ Radar Summary Chart ☐	METAR ☐ TAF ☐	NOTAM ☐
Wind Aloft ☐ Lapse Rate:	AIRMET/SIGMET ☐	PIREP ☐ Where is VFR?	TFR ☐

The aforementioned charts are some of the most commonly used products. But the AWC site has a lot more. ADDS (Aviation Digital Data Service) is another service from the AWC. It provides an array of advanced weather products that makes life even easier. Icing, winds and turbulence forecast charts for different altitudes, convective charts and satellite charts as well as several java tools make weather briefing a snap. All this technology may be intimidating to the uninitiated, and at first it may in fact take longer to do the weather briefing compared to the traditional method. But once you become familiar with all the products, it is not unrealistic to do a complete and thorough briefing in less than five minutes.

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