



The Front



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Mobile Aviation Website Available At Oakland CWSU

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With increasing availability of the Internet in the mobile phone sector, our lives are becoming more mobile as well. The Internet is now accessible in more places, with faster, cheaper data plans from mobile phone carriers and the latest phones are now capable of surfing the Web using free wireless hotspots. With this in mind, NWS is trying to maximize the ability of pilots to be at the forefront of technology. NWS is continuously searching for better and more immediate ways to get current aviation hazards and forecasts while “mobile.”

The Center Weather Service Unit (CWSU) at the Oakland (ZOA) Air Route Traffic Control Center (ARTCC) has developed an experimental mobile version of their [homepage](#) (link to mobile page on top-left menu) to bring aviation-focused weather hazard products into a “one-stop-shop.” The Website has been reformatted with automated graphics that load more efficiently onto smaller mobile screens: <http://www.wrh.noaa.gov/zoa/MOBILE/ZOA2.htm>

About the Mobile Web



For those of us with limited data plans, mobile browsing can be expensive. Mobile pages are developed with minimum bandwidth usage in mind and mobile wireless network speeds also are slower, at least for now. Trying to view regular html Websites on mobile phones can be challenging.

Not all cell phones come with a standard html browser or standard keyboard. Instead, many have their own proprietary browser and number buttons for link shortcuts. Mobile browsers have to render normal Website content for smaller screens; this takes bandwidth and load-time.

Several mobile phone manufacturers have their own mobile Web formats. Many experts say the need for standardization is becoming increasingly important. To

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The Front

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Mission Statement

To enhance aviation safety by increasing the pilot's knowledge of weather systems and processes and National Weather Service products and services.

maximize mobile Web compatibility, ZOA CWSU's mobile Website reformats auto-updated text and graphics for the smaller mobile screens to ensure compatibility with most mobile browsers using the most standardized XHTML mobile 1.0 format.

To see what your favorite aviation weather page may look like on a mobile phone browser, Google has created an xhtml site that automatically converts regular Web pages to a mobile profile. Check out the link below, then replace the CWSU address at the end (www.wrh.noaa.gov/zoa) with your favorite: www.google.com/gwt/n?u=http://www.wrh.noaa.gov/zoa

Now shrink your browser size to 2.5 to 3 inches; that is what a regular Web page appears on a mobile phone. It probably looks a bit less clear and will take longer to load due to increased image sizes. That is why many popular Websites offer mobile content pages for this increasingly popular market segment. If you have feedback or suggestions for aviation related mobile content, please email: Kenneth.Venzke@noaa.gov. →

Example ZOA CWSU Mobile Homepage and Quicklook AIRMETs/SIGMETs layout

Current CCFP display



The Importance of Climatology in Aviation

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Climatology is historical weather data averaged over time, usually 30 years. Most people are familiar with climatology as it relates to the average high and low temperatures and rainfall or snowfall for their area. Pilots also should be interested in the ceiling height, visibility, wind speed and wind direction.

The Aviation Forecast and Preparation System (AvnFPS), (See *The Front*, November 2004,) is the software application most NWS forecasters use to produce and monitor their Terminal Aerodrome Forecast (TAF). This software has the capability of calculating the climatology of ceilings, visibilities, wind direction and wind speed for TAF sites.

For instance, the aviation Website at NWS Cleveland, OH, (CLE), www.erh.noaa.gov/cle/Aviation/aviation-climo.html, contains climatological data on ceilings, visibilities, and wind roses (distribution of wind direction and wind speed) at the seven TAF sites in CLE forecast area.

But why would pilots want to know about aviation climatology? Don't they just want to know if they can fly today, or fly Visual Flight Rules (VFR), on the weekend? Aviation climatology has helped new pilots, or pilots new to an area, by offering information on the time of the year and the time of day that is best for flying. Climatology can also shed light on how the weather may vary over a few hundred miles in areas such as the Great Lakes.

This article looks at aviation climatology and the influence of Lake Erie on the TAF sites at CLE; Toledo, OH, (TOL); Akron-Canton, OH, (CAK); and Erie, PA, (ERI). (See **Figure 1**.)

TOL is the most continental of the sites. TOL can get lake effect snow from Lake Michigan under a persistent northwest flow. CLE is just west of what is referred to as the snow belt of northeast Ohio and northwest Pennsylvania. CLE is about 5 miles inland of Lake Erie. ERI, which is about 1 mile south of Lake Erie, is also in this snow belt. ERI is especially impacted by lake effect snow with a westerly flow, which has a long fetch across Lake Erie. CAK is about 50 miles south of CLE and is impacted by Lake Erie in the winter when there is a northerly flow.

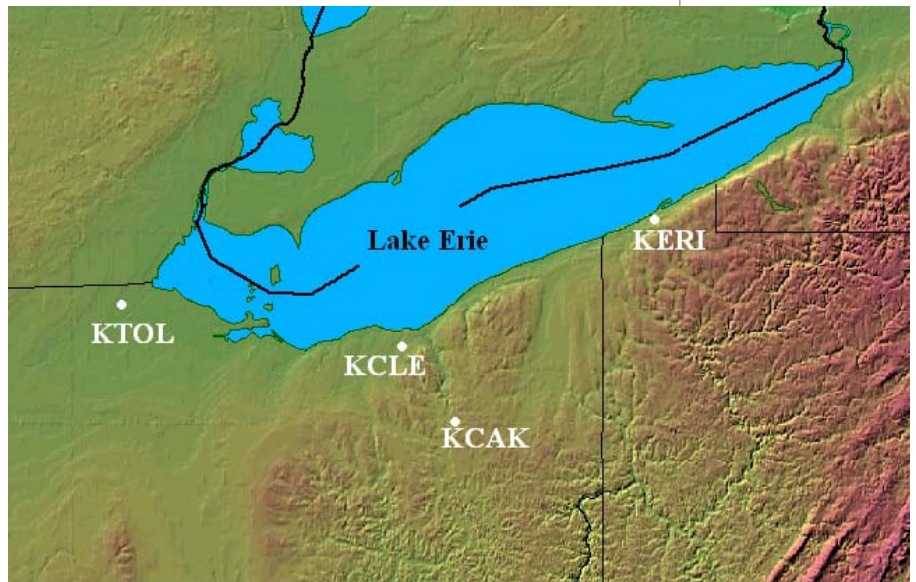
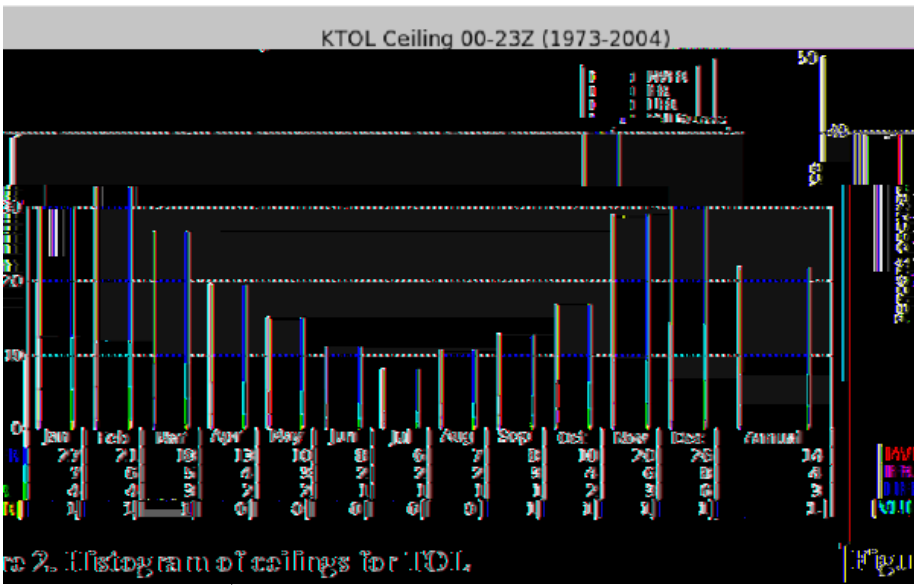


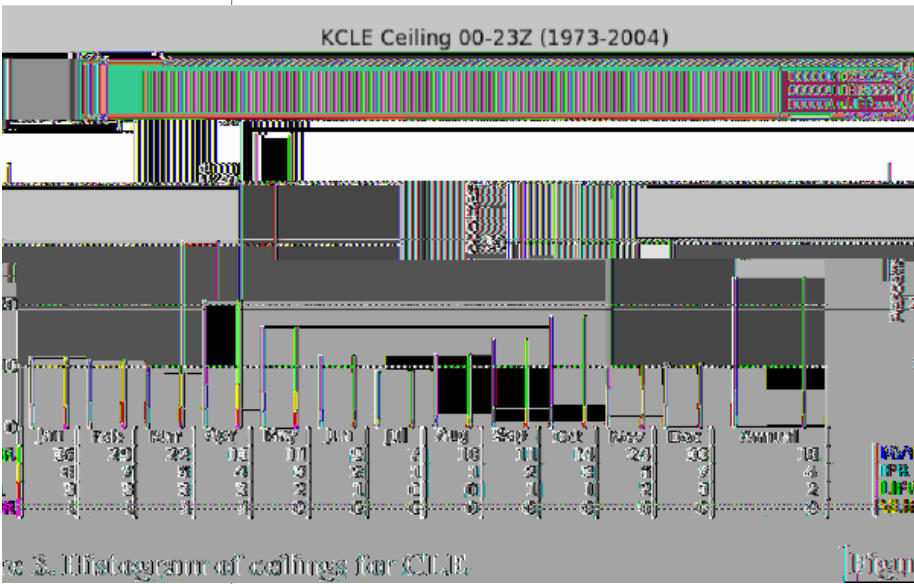
Figure 1. Location of relevant WFO Cleveland TAF sites

Figures 2-5 show histograms with the distribution of ceilings by month and year for TOL, CLE, CAK and ERI, respectively. The histograms are for varying flight categories covering the 30 year period 1973-2004. These data include every routine and special observation taken at those airports. The flight categories are:

- ◆ VFR: ceilings above 3,000 ft.
- ◆ Marginal Visual Flight Rules (MVFR), ceilings above 1,000 ft. to \leq 3,000 ft.
- ◆ Instrument Flight Rules (IFR) 500 to $<$ 1,000 ft.
- ◆ Low Instrument Flight Rules (LIFR) 200 ft. to \leq 500 ft.
- ◆ Very Low Instrument Flight Rule (VLIFR) $<$ 200 ft.

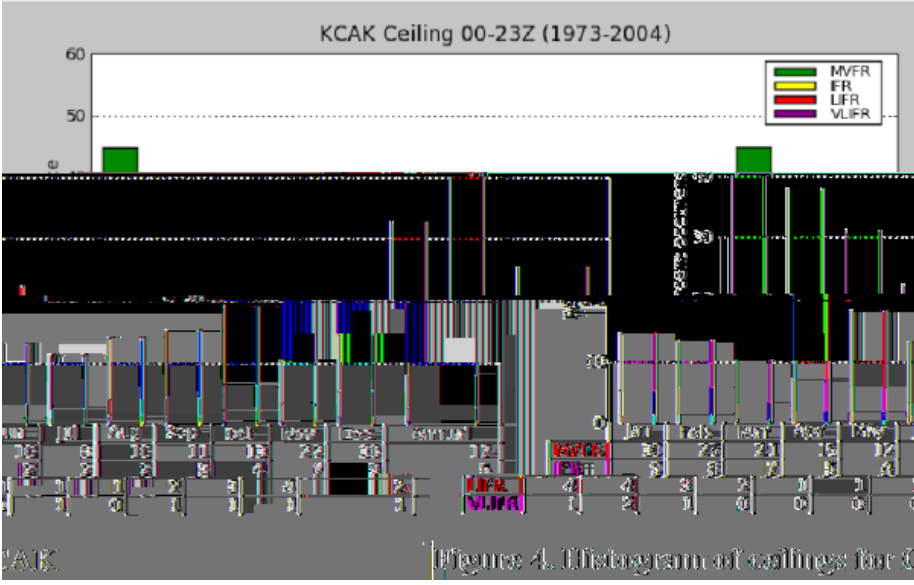


For example, Figure 2 shows the percentage occurrence at TOL of MVFR and lower conditions in January was 39%. You can determine the non-VFR percentage by examining the histogram or adding up the percentages in each flight category in the table below the histogram. The percentage of time the ceiling is VFR is implied by subtracting 100% from the MVFR and lower conditions. In January, TOL was 61%. Figure 3 shows that in January CLE recorded MVFR and lower conditions 48% of the time. Figure 4 shows that in January, ERI observed MVFR and lower conditions 54% of the time.



VFR ceilings are dominant during the summer at TOL, CLE, CAK and ERI. The generally fair weather is attributed to several factors:

- ◆ The jet stream and attendant storm track usually are well north of the Great Lakes
- ◆ Short nights limit the formation of fog and low clouds
- ◆ Thunderstorms result in only a brief occurrence of non VFR ceilings.



In the winter, the occurrence of VFR conditions decreases dramatically, especially near the down wind shores of the Great Lakes in typical snow belt locations. Around Lake Erie, VFR ceiling conditions are found more often at TOL and CAK than at CLE and ERI.

The average winter snowfall around Lake Erie ranges from 40 to 45 inches at TOL and CAK to near 65 inches at CLE and to nearly 90 inches at ERI.

The higher amounts of snowfall near CLE and ERI are attributed to lake effect snow, which also increases the occurrence of non-VFR visibility and ceiling conditions.

Lake effect clouds occur when cool air moves over the relatively warmer waters of any of the Great Lakes. As

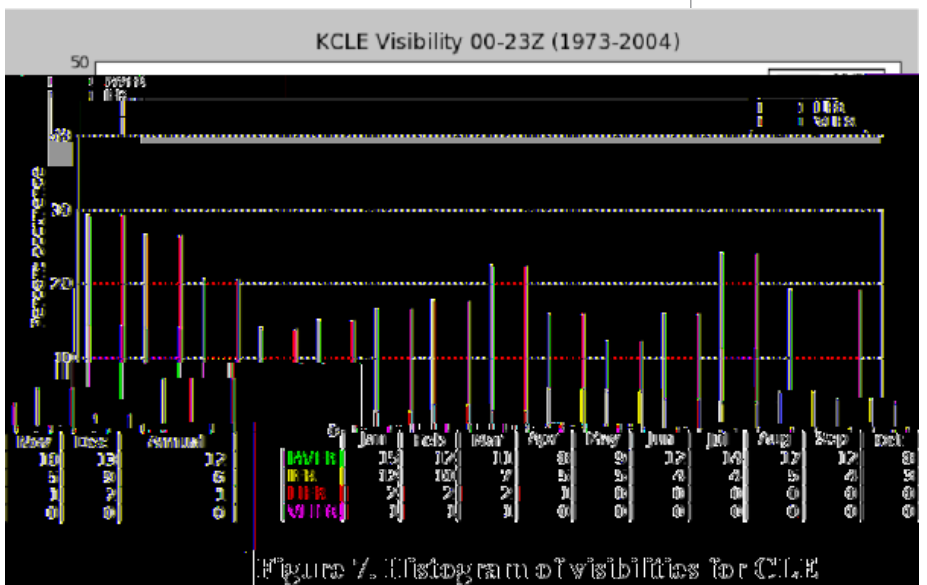
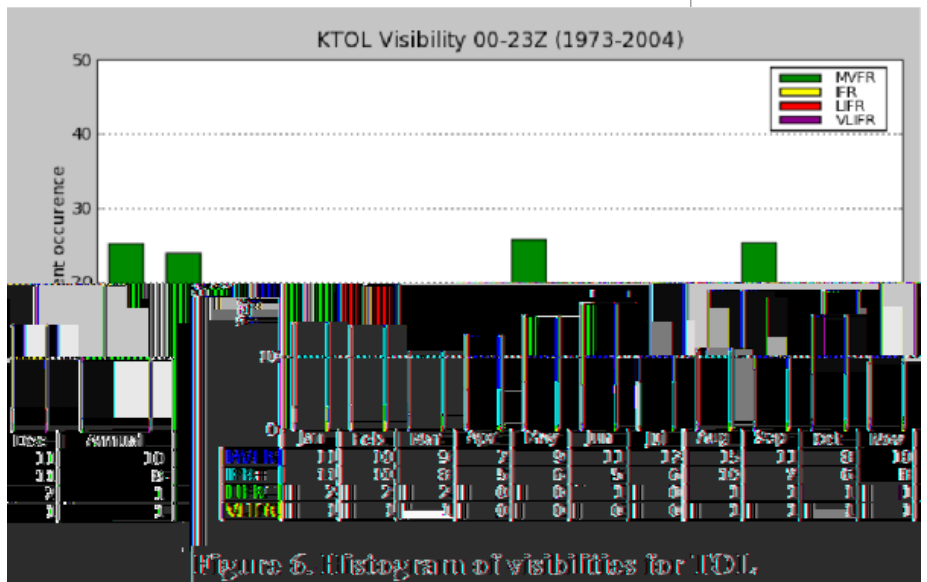
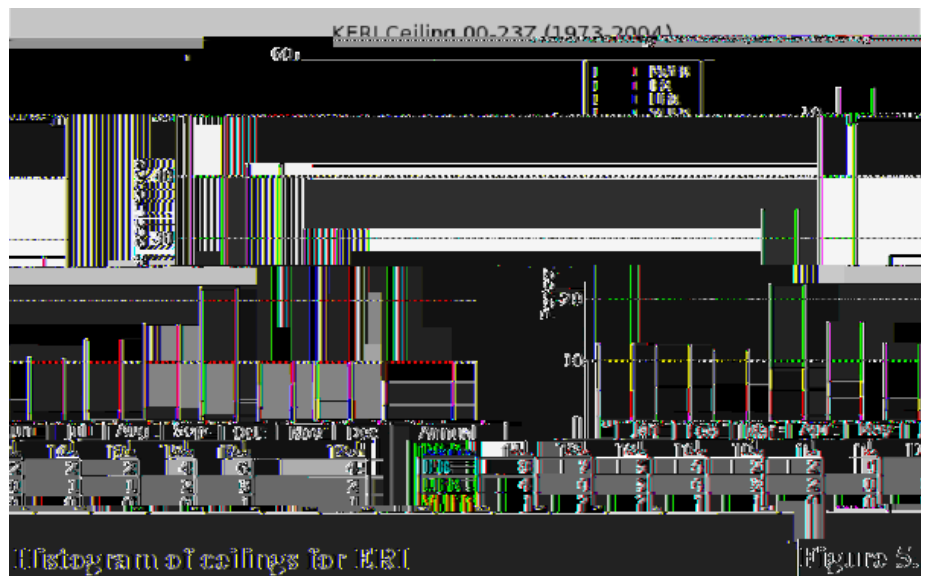
long as the wind flow is onshore between 2,000 and 5,000 feet and the air is moist enough without much sinking motion, lake effect clouds will move inland. Lake effect clouds will dissipate or clear an area when the 850 MB (approximately 5,000 feet) ridge moves east of a location and the low level winds shift from onshore to offshore. Typically, the clearing of lake effect clouds occurs only a few hours before the clouds from a synoptic system start overspreading the area.

Figures 6-9 show histograms for visibilities for TOL, CLE, CAK and ERI by month and annually for the 30-year period from 1973-2004. The flight categories for visibilities are:

- ◆ VFR > 5SM
- ◆ MVFR ≥ 3SM to ≤ 5SM
- ◆ IFR ≥ 1SM to < 3SM
- ◆ LIFR ≥ 1/2SM to < 1SM
- ◆ VLIFR < 1/2SM.

For visibility climatology, Figures 6-9 show that for all four TAF sites the visibility is 6SM or greater about 80% of the time. For the more continental sites such as TOL and CAK, the MVFR and lower conditions are evenly distributed throughout the year, with a little higher percentage in the winter.

These figures show that during the summer months, visibility restriction because of fog and thunder is much more frequent at CAK and TOL than at CLE and ERI. The annual occurrence of IFR visibilities at TOL is 8%, which is 2% higher than at CLE, ERI or CAK. TOL is slightly more prone to radiational fog than CLE, ERI and CAK. In the winter, northward moving warm fronts tend to slow as they approach



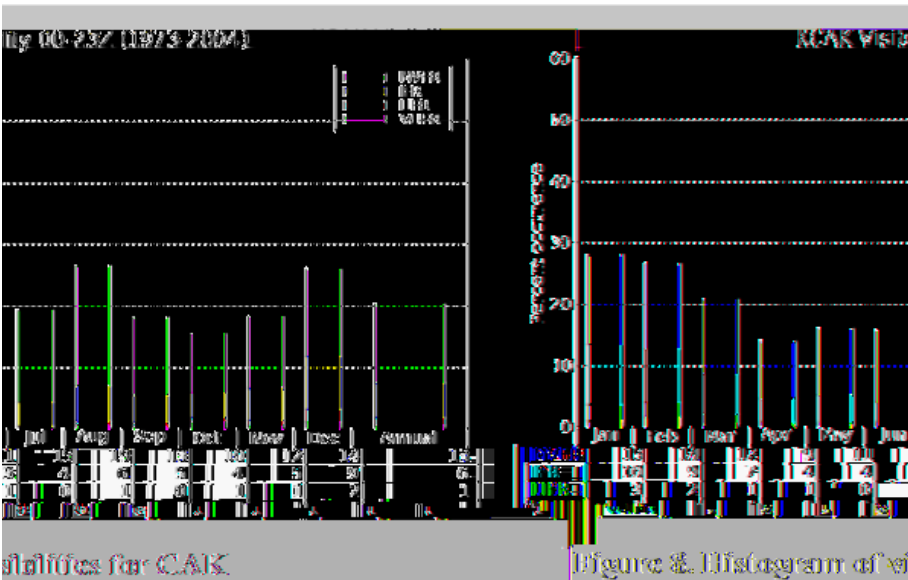


Figure 8. Histogram of visibilities for CAK

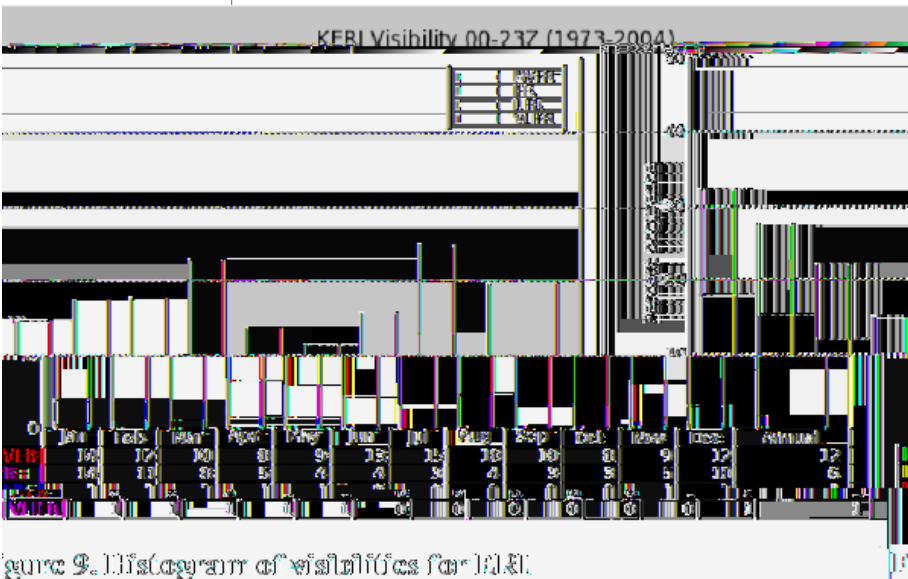


Figure 9. Histogram of visibilities for ERI

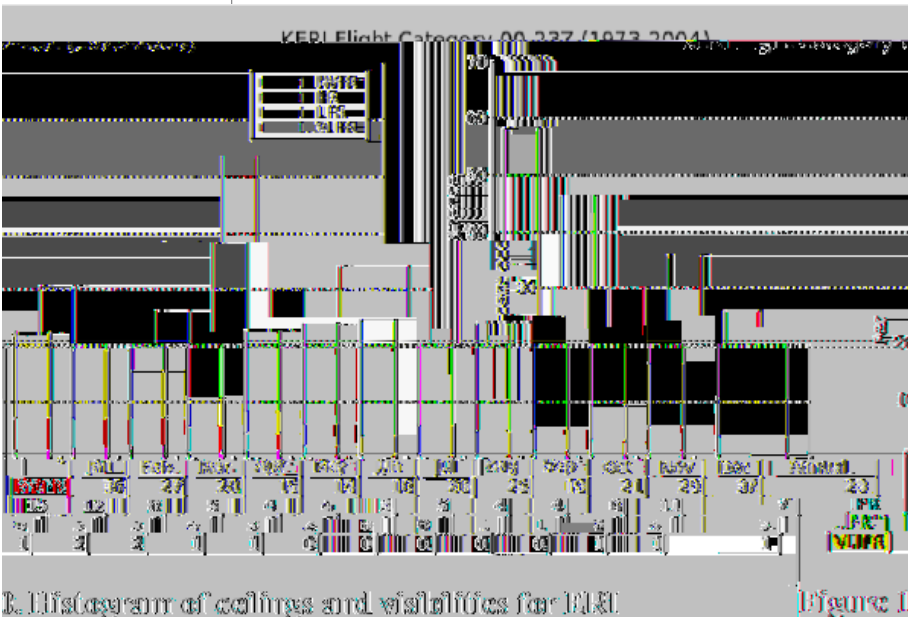


Figure 10. Histogram of ceilings and visibilities for ERI

TOL. This happens because the wind is usually east or northeast, coming off of a cool lake, ahead of the warm front. Consequently, lower conditions tend to persist at TOL.

During the summer, fog occurs less often at CLE and ERI because of the land breeze. During the day when the pressure gradient is weak and the land heats up more than the water, an onshore wind develops.

At night, the opposite wind flow occurs when the land breeze develops. Cooler air over land will flow out over the lake and create an offshore flow. The offshore flow is also slightly downslope, which can limit fog formation by increasing the surface wind and elevating the temperature slightly.

At TOL and CAK, where the effects of Lake Erie are more muted, the higher dew points of the summer, light winds, and some left over moisture from daytime thunderstorms allow shallow radiational fog to form more readily.

The shallow radiational fog increases the occurrence of non-VFR visibilities more than the occurrence of non-VFR ceilings. This is because the fog that forms is usually not deep enough to form an obscuration or ceiling. As summer progresses and moisture remains nearly the same, days become shorter and make conditions more favorable for nocturnal fog formation. By August, the histograms show a peak in MVFR and lower visibilities.

Several times during the summer the lake breeze and its convergence can cause thunderstorms to develop. On a typical afternoon, by the time thunderstorms develop along the lake breeze, they are well south of ERI and just south of CLE, which limits the amount of MVFR and lower visibilities at those sites. The influences of Lake Erie are more subtle near TOL; CAK may receive a slight increase in thunderstorms and attendant non-VFR conditions from a southward, inland-moving late afternoon lake breeze.

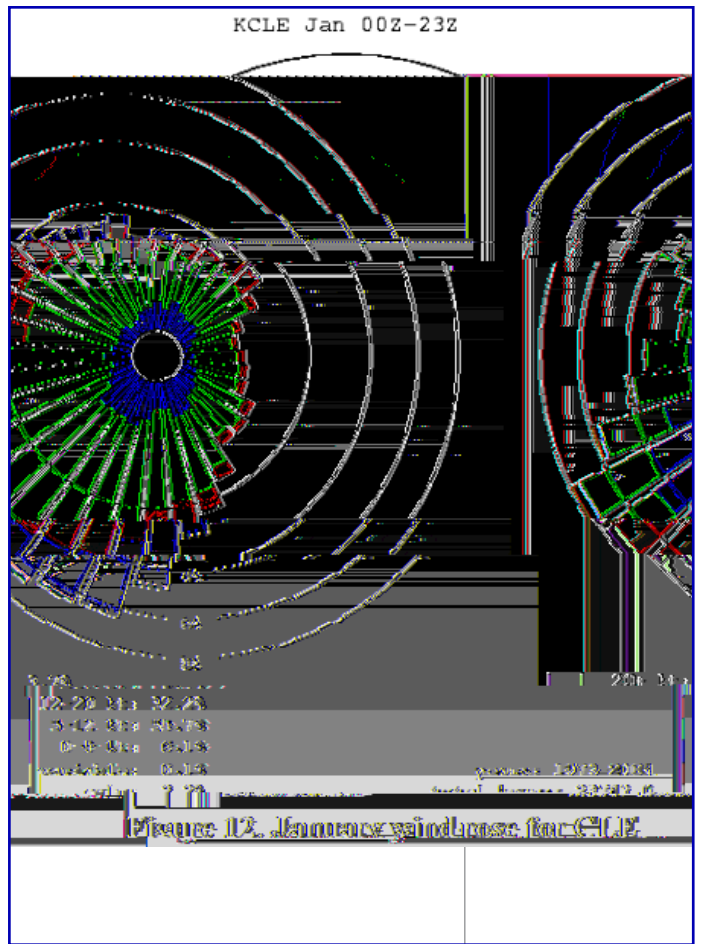
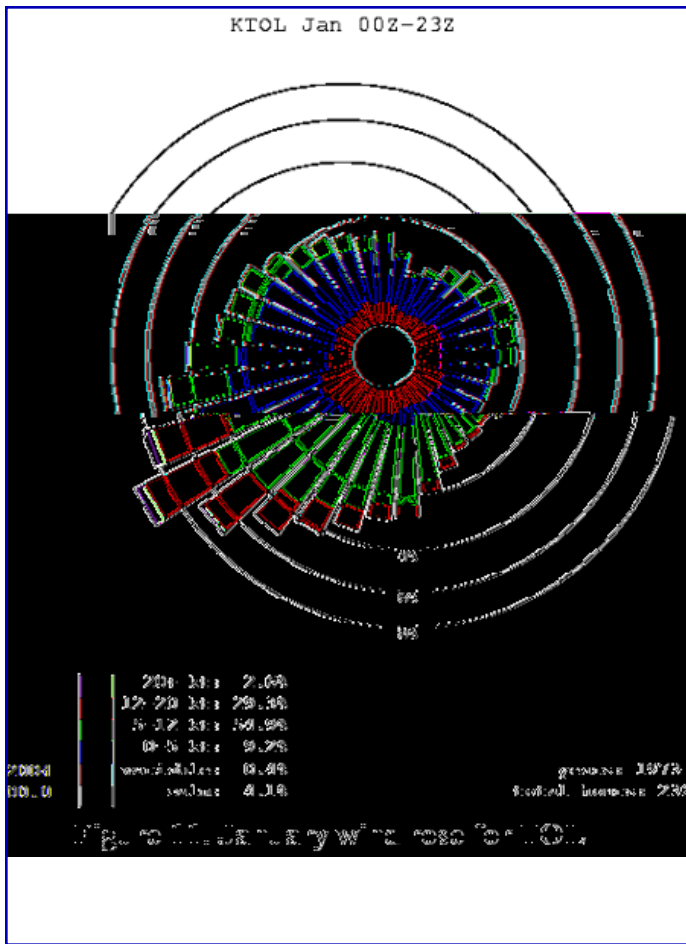


Figure 12. January windrose for CLE

Figure 10 shows a histogram for a combination of ceiling and visibility for ERI, which tends to increase the percentage of time of MVFR and lower conditions.

Figures 11 and 12 are the wind roses for January at TOL and CLE from the 30-year period 1973-2004, respectively. These wind roses show the distribution of wind direction by month. They show the percentage of time the wind is from a certain direction. The rings and the color indicates what percentage of time the wind speed is from that direction.

The wind roses show that even in the winter the dominant wind direction is from the southwest, thus the reason why the primary runways at TOL and CLE are oriented southwest to northeast.

Figure 13 shows the wind rose for CLE during May, illustrating the influence of the lake breeze.

Histograms can be generated by the month, by the hour, by several hours, and by wind direction for ceilings and visibilities and even by wind direction and wind speed.

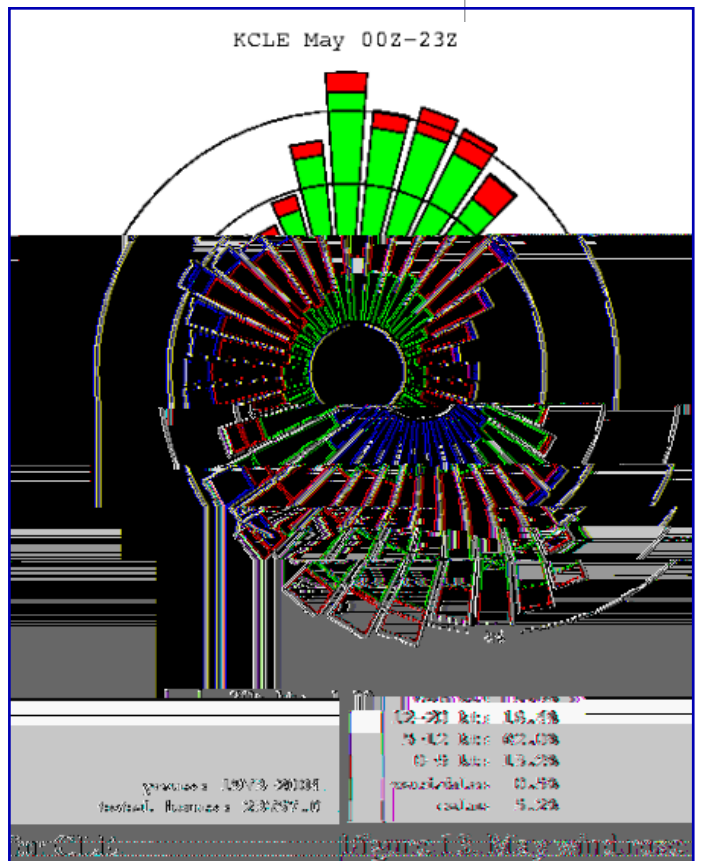
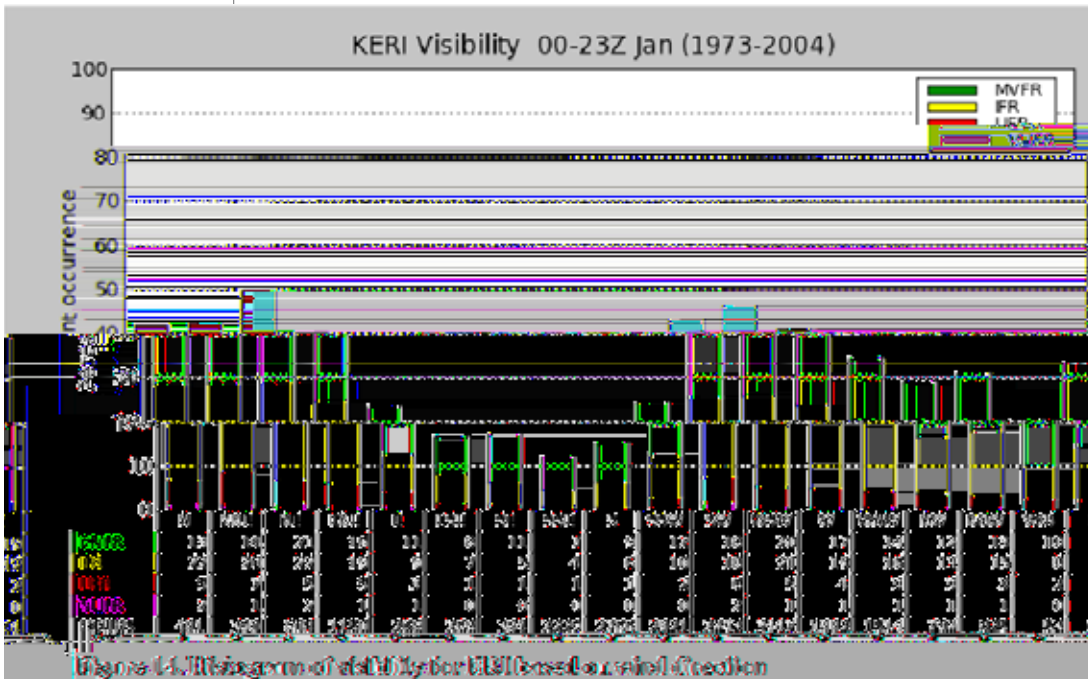


Figure 13. May windrose for CLE

Figure 14 shows ERI's January aviation visibility climatology for 1973-2004 by wind direction. It shows that the worse visibility occurs with an onshore wind (west through northeast) compared to a southerly downslope wind flow.

Figure 15 shows visibility climatology for ERI in January by the hour.



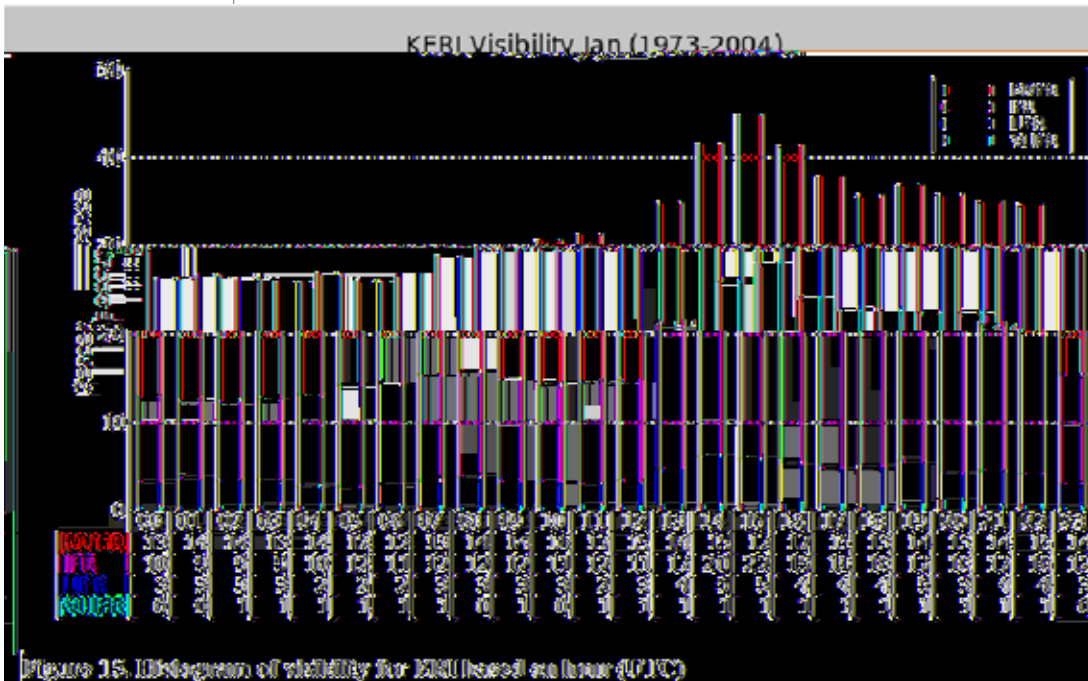
Conclusion

Aviation climatology for TAF sites may not be relevant on any given day; however, it is useful for new pilots and those who have recently relocated to help them become familiar with the typical time of day and time of year that certain conditions develop and how they may vary across an area.

You can contact your local NWS Weather Forecast Office if it's not readily available on your local NWS Website.

Acknowledgement

My thanks to WFO Cleveland Forecaster Dan Leins for his assistance with the graphics. →



The Practically Perfect TAF: A Customer Oriented Philosophy to Writing TAFs

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One of the most widely used forecast products for flight planning, the Terminal Aerodrome Forecast (TAF), unquestionably has a large impact on airport, airspace and aircraft operations. This impact is felt not only in the briefing room, but also in the financial statements of aviation interests in the form of delays and increased fuel expenditures.

In an attempt to minimize such unnecessary impacts to the aviation community, the NWS has introduced new training courses for its aviation forecasters to better acquaint them with the National Airspace System, the weather needs and requirements of the various users of TAFs and the impacts that forecasting certain weather conditions have on aircraft operations.

The aviation forecaster faces two challenges when creating a TAF. The first challenge is to accurately forecast the expected meteorological conditions at the specific airport. The second challenge is to correctly assess the impacts this forecast will have on aviation operations. While a TAF with many From (FM) and Temporary (TEMPO) groups may be meteorologically correct, it can lead to confusion for users.

The Practically Perfect TAF training now provided to NWS forecasters presents guidelines for the following:

- ◆ Writing an effective, concise TAF that addresses flight categories
- ◆ Clearly conveying forecaster thinking
- ◆ Focusing detail on the first 6 hours of the forecast.

So how will this user-oriented way of writing TAFs look in the final product? First, the TAF will give the greatest detail for the first 6 hours of the forecast, where forecaster skill is greatest.

TEMPO groups should be confined to this time period because timing and magnitude of expected weather conditions are forecasted most accurately in the first 6 hours.

TEMPO groups, however, are encouraged outside of the first 6 hours if the forecaster has high confidence in IFR or convective events. The goal is to reduce the use of unnecessary TEMPO groups that can muddle the TAF instead of creating a concise product.

Additionally, NWS does not allow the use of PROB30 groups within the first 9 hours of the TAF. One of the greatest challenges that confront the aviation forecaster is the timing and severity of thunderstorms throughout the TAF valid time. Instead of using the (+/-) Thunderstorm and Rain (TSRA) descriptor and associated conditions expected to occur with possible thunderstorms in a predominant group, forecasters are using thunderstorm in the vicinity (VCTS) or adding cumulonimbus (CB) to the cloud group to indicate the presence of thunderstorms in the TAF area. This practice reduces the amount of predominant thunder groups in the TAF and allows the forecaster to update the TAF for specific conditions and timing when storms threaten the airport. Although thunderstorms may be in the general area of the TAF site, the amount of time they directly affect the airport may be minimal. Therefore, it is most effective to avoid unnecessarily large TSRA groups while still alerting pilots to the thunderstorm hazard.

For example, in the 18z TAF issuance, the forecaster notes there is a slight chance (20% or less) for severe thunderstorms from 21z to 01z with a greater chance for less intense thunderstorms in the period. Instead of a 4 hour TEMPO consisting of VRB35G50KT +TSRA GR from 21z to 01z, a 5 hour predominant group of VCTS is included in the forecast as shown below:

Example

Non-Practically Perfect TAF

KBIS 191731 191818 19013G21KT P6SM SCT060
 FM2000 29016G25KT P6SM SCT040
 TEMPO 2101 VRB35G50KT 3SM TSRA GR
 FM0100 30010KT P6SM BKN100

Practically Perfect TAF

KBIS 191731 191818 19013G21KT P6SM SCT060
 FM2000 29016G25KT P6SM VCTS SCT040CB
 FM0100 30010KT P6SM BKN100

Aviation thunderstorm hazards are also discussed in the aviation section of the Area Forecast Discussion, <http://aviationweather.gov/testbed/afd/> and convective outlooks from the Storm Prediction Center at <http://www.spc.noaa.gov/>. Aircraft and airport operators can more effectively assess the situation if they review these products and know the TAF will be updated for more specific conditions if a storm develops. NWS also encourages the use of current satellite and radar information to supplement the TAF forecast.

The Practically Perfect TAF philosophy strives to attain the most concise and effective forecast possible. TAFs should be confined to five to six lines regardless of the weather situation. Through this practice, forecasters can emphasize the first 6 hours and introduce new predominant FM groups only when changes in expected flight category, precipitation or significant changes in wind direction and speed occur. There is no need to add a new FM group to the TAF merely to change a ceiling from BKN100 to BKN080. While this may be meteorologically correct, it is operationally insignificant. Furthermore, aviation forecasters have received training on the National Airspace System and the importance of knowing local airport minimums and conditions that require IFR alternates.

While not all TAFs will conform to the philosophy of the Practically Perfect TAF, the guidelines set by this training will continue to forge a greater understanding of the needs of the aviation industry and how the NWS can most effectively serve those needs. NWS recognizes the importance of the TAF to a wide spectrum of users. The Practically Perfect TAF philosophy can aid in better serving the varied needs of NWS users while producing the most accurate and effective forecast. The end result allows our aviation partners to make better decisions and increase safety. ➔