

Seasonal Climatology for Fort Campbell, Kentucky

A. Winter months (December, January, February)

1. Frontal activity. Winters in Kentucky-Tennessee are usually short and mild, with January being the true winter month. The presence of continental polar (cP) air becomes common as fronts trailing Alberta Lows transit the state with greater regularity. It is at this time, too, that continental arctic air (cA) is most likely to invade Kentucky. A variety of systems will continue to affect the local area. During these months, cold and warm frontal passages are at a maximum which make this period a time of poor flying weather. Instrument conditions or worse can be expected approximately 15 percent of the time. Skies will normally clear rapidly following a fast moving cold front which is oriented N-S. However, some fronts oriented NE-SW may take as much as 24 hours for skies to clear unless the front is accompanied by moderate winds aloft. Cold fronts that are oriented E-W often become stationary and may result in 1 to 4 days of poor visibility and low ceilings. Cold fronts that have reached the Gulf of Mexico and then return as a warm front are normally preceded by 12 to 36 hours of instrument weather. An average of eight cold fronts, three warm fronts, and two stationary fronts can be expected during each month of this period. Because the Fort Campbell area lies in an air mass transition zone, forecasting the type of precipitation accompanying these systems becomes the forecaster's primary challenge. With its inherent hazards, freezing precipitation is the greatest threat during this season. Frozen precipitation occasionally develops across Kentucky-Tennessee, but not as often as freezing precipitation. Fort Campbell averages 2.9 and 1.6 inches of snow in January and February respectively. This is not to say that heavy snow does not occur in this area. By the end of February, continental polar (cP) air slowly gives way to predominately maritime polar (mP) air. South Pacific and Texas Lows/Waves, often occluded, become the primary systems that affect Kentucky at this time.

2. General weather activity. Fog most often occurs between 0400 and 1000 CST. Fog is primarily of frontal origin and occurs principally on the cold air side of stationary fronts. Radiation fogs are normally associated with wet ground, clear skies, and light winds. Visibility is most often restricted between the hours of 0600 and 0800 CST as the sun begins to mix the lower levels of the air. Precipitation is chiefly of frontal origin. Freezing precipitation rarely occurs in more than trace amounts. Snowfall accumulation of more than 4 inches is uncommon during these, the coldest months of the year. Though measurable snow has been recorded as late as April 10 at Fort Campbell, winter precipitation usually does not occur after mid-March.

3. Impact on operations. Winter is the worst season for local flying; however, there will be several periods of VFR conditions when cP and mP high pressure systems transit the area. Missions may be curtailed for extended periods, but usually not for more than 3 consecutive days.

B. Spring months (March, April, May)

1. Frontal activity. With increased insolation and resultant warming, the semipermanent systems begin to move into their summer positions. The Bermuda ridge expands westward, increasing the flow of maritime tropical air (mT) over the south-central US. In response, polar air slowly recedes northward. This retreat is occasionally interrupted when the polar jet surges southward causing the clash of cP and mT air and the production of severe thunderstorms, which often spawn tornadoes. A marked decline in frontal activity, associated with the blocking effect of the Bermuda High, becomes more and more apparent, especially during April and May. March weather is very similar to that experienced during the winter months, but with an increase in shower-type precipitation. Most bad weather is related to low pressure systems approaching from the southwest and is associated with cold fronts that have stagnated to the south. This situation is characterized by 2 to 4 days of low ceilings, gusty surface winds, and poor visibility. Frequent polar outbreaks continue through this period; however, there is a substantial decrease in the intensity of the cold air advection. The fast zonal flow of the winter months relaxes and is more southwesterly. Total precipitation is slightly more than the winter months. March has the greatest monthly average precipitation of the year with 5.2 inches. Spring is the wettest season of the year. Periods of clear to scattered skies will develop when modified maritime polar (mP) air, trailing Pacific fronts, move across the state. Since precipitation is common during this period, residual moisture may result in morning fog that lifts to form a stratus deck after sunrise. June generally brings a sharp decrease in frontal passage and thunderstorms. Mostly fair skies allow the surface to warm rapidly and maximum temperatures of 90°F are not uncommon as summer nears.

2. General weather activity. As is true of the entire southern United States, the spring season brings the greatest frequency of tornado occurrences. The system that is responsible for most of the severe storms in this area is the Colorado Low, which becomes very active by the beginning of April. Fort Campbell is located on the extreme northeastern side of the area of maximum tornado activity. Generally, tornadoes will accompany cold frontal situations either with the front itself or with a squall line in advance of the front. Climatology indicates that an average of three tornadoes per year occur in the state of Kentucky.

3. Impact on operations. Though thunderstorms and morning fog/stratus often occur through central Kentucky-Tennessee during this season, the flying weather is generally good. Thunderstorms are usually frontal and will move out of the area within a few hours while stratus/fog events usually dissipate by late morning. Maritime polar (mP) air trailing Pacific fronts also provides periods of clear to scattered skies.

C. Summer months (June, July, August)

1. Frontal activity. Summer in Kentucky is characterized by hot days and warm, humid nights interspersed with rainshowers and thunderstorms. By July the Bermuda High has pushed westward across the southern US effectively blocking the southern migration of cooler air. The frequency and intensity of frontal activity diminish to a minimum during the summer. Except for periods of short duration, ceilings and visibilities are generally well above instrument conditions. Occasional exceptions do occur with low ceilings and visibilities persisting for 1 to 2 days.

2. General weather activity. This period is generally characterized by warm and humid weather due to mT air circulating around the Bermuda High. Surface flow becomes predominantly southerly and southwesterly. The mean flow pattern aloft is from the southwest. Total precipitation shows a decrease from that of the spring season. Thunderstorm activity becomes common and constitutes the major hazard to summer flying. Except for brief periods of time, air mass thunderstorms are generally accompanied by ceilings and visibilities not particularly adverse to flying. The most intense thunderstorm activity is usually that associated with an unstable line that occurs along, or in advance of, a cold front. Thunderstorms of this nature are often accompanied by the threat of dangerous winds and hail more often than the air mass thunderstorms.

Thunderstorms formed by localized forcing mechanisms such as differential heating or outflow boundaries, become the forecaster's primary challenge. Their movement is usually erratic and slow. Severe parameters rarely accompany these storms; however, downrush gusts of 35 to 45 knots, and 1/4 inch hail are not uncommon. On occasion, very dry continental tropical air (cT), originating over Mexico and the southwest US, advects into Kentucky temporarily replacing the predominate maritime tropical (mT) air. This event will be accompanied by southwest winds gusting to 20 knots or greater and very hot surface temperatures. The air mass is very dry and will prevent thunderstorm development.

Haze becomes a problem by July and will persist until September. Surface and in-flight visibility is often markedly reduced.

By mid-August the Bermuda High begins to recede. North Pacific/Northern Rocky Mountain Lows begin to track farther southward. Cold fronts trailing these systems will enter Kentucky, usually becoming quasi-stationary along the Kentucky-Tennessee border. Intense (severe) thunderstorms often develop across northern Arkansas along these boundaries, and, on occasion, move eastward into Kentucky-Tennessee. These events signal the transition into fall.

3. Impact on operations. Except for haze restricting surface and in-flight visibility, the flying weather during summer is very good. Afternoon and evening thunderstorms frequently occur; however, they are short-lived and can be circumnavigated since they usually develop as individual cells or in small clusters. Their bases are usually 3,000 feet or greater. The showers accompanying them may reduce the visibility to 1 mile or less, but only for short periods of time.

D. Fall months (September, October, November)

1. Frontal activity. The Bermuda High continues to recede and by mid-September cold fronts will move through central Kentucky generally every other week. Thunderstorms that accompany these systems usually form in short lines and are often intense (severe). These systems have a tendency to stall just south of Fort Campbell. When this occurs, weak waves may form along their boundaries causing low ceilings/visibilities and periods of light precipitation to persist in the local area. Frontal passage increases to about one every 7 to 10 days by the middle of October. Thunderstorms accompanying these fronts are rarely intense due to the lack of insolation. These fronts will usually move well east and south of Fort Campbell. Increasing frontal activity, both cold and warm, occurs during the period accompanied by a gradual transition from predominately maritime tropical air masses to polar air masses. The increase in the amount of precipitation is slight. In September the cold fronts move farther southward and then gradually move toward this area causing general IFR conditions for 2 to 4 days. Warm fronts and stationary fronts are more frequently encountered in this area during the latter part of the fall season, with the usual rain and fog that result in IFR and occasionally below minimum flying conditions. Cyclones of weak to moderate intensity forming in Texas or the Gulf of Mexico occasionally move northward into this area. The modified maritime polar air (mP) that trails them often provides prolonged periods of clear to scattered skies and mild temperatures across Kentucky; however, because of this cooler air, radiation fog frequently develops. Rapid dissipation of ground fog normally occurs with sunrise, whereas frontal fog and associated low ceilings and visibilities may persist for 2 to 4 days.

2. General weather activity. A sharp decrease in thunderstorms is evident as the fall season progresses. October is “normally” one of the driest months of the year, but exceptions do occur. The frequency of fronts traversing the state increases to one every 3 to 7 days during November and December. Rain showers may accompany these systems, but thunderstorms are rare. Gulf stratus may advect into central Kentucky as these fronts approach. Cold air progressively surges southward. Eventually the polar front becomes quasi-stationary over the Gulf of Mexico and Southern Texas. Modified maritime polar air (mP) becomes the dominant air mass over the state, occasionally being replaced by continental polar (cP) air on rare occasions.

By mid-December, continental polar (cP) air invades the area with greater frequency, and on rare occasions, trailing continental arctic (cA) air may wedge beneath it and overspread Arkansas. These air masses are dry and often provide several days of clear to scattered skies across the state, but this may only be “the calm before the storm.” When polar air is displaced deep into the southern U.S., any southwesterly flow aloft may cause South Pacific Lows, Texas Lows/Waves, and occasionally a Colorado Low, to interact with, or form on the cold air boundary to the southwest of Arkansas. These events will enhance overrunning across the area, and the forecaster’s primary concern then becomes the winter precipitation associated with these systems. A variety of phenomena may occur at Fort Campbell as these lows move eastward. Conditions at the base will depend on their track and the density (thickness) of the air mass over Fort Campbell as they approach. Frozen or freezing precipitation may develop at Fort Campbell by early November. The earliest date that measurable snow has been recorded at Fort Campbell is the 30th of October.

3. Impact on operations. Flying weather during this period is generally good. Low ceilings/visibilities associated with stationary fronts and radiation fog during September and October will primarily impair morning missions. By mid-November through December, these conditions become more common, widespread, and persistent, due to overrunning events. Missions may be curtailed or canceled for extended periods, but usually not more than 3 consecutive days.