

Summer Weather for Aviation

What do you think of when you hear “spring” or “summer”? Family vacations? Beach trips? BBQs? Swimming? Picnics at the lake? Berry picking? Mowing the lawn?

Sounds like fun---except for the part about mowing the lawn! To most meteorologists and aviators, “spring” and “summer” conjure up something very different. Air mass thunderstorms. Sea breezes. Outflow boundaries. Microbursts. Severe weather. Squall lines. Hurricane season.

Spring/summer is a time when many flight hazards exist for Army aviators. Understanding these hazards and preparing for them are the keys to staying safe while executing the Army aviation mission.

Let’s start with thunderstorms. All thunderstorms imply severe icing, severe turbulence, lightning, heavy precipitation, hail, and low-level wind shear (LLWS). Says so right there in Block 22 of your DD 175-1 Flight Weather Briefing. I’ll go a step further and add that all thunderstorms have the potential to produce a microburst.

Thunderstorms: To understand the basic dynamics of a thunderstorm, just remember M-I-L. Moisture. Instability. Lift. Start with some moisture. Add a pinch of instability. And a dash of lift. That’s the basic recipe for a thunderstorm. Throw in a sea breeze, an outflow boundary, or other interaction, and an air mass thunderstorm can quickly ramp up in intensity and coverage.

Of all the tools at our disposal, radar is the single most important in monitoring the development and progression of thunderstorms. Using radar imagery, we can track the location and movement of precipitation; identify thunderstorms versus showers; pin-point any areas of hail or rotation; interpret whether the storms are building or weakening.

Radar imagery can be deceiving ... if you don’t know what you’re looking at. Seeing a red blob on radar imagery does not necessarily mean there’s a thunderstorm present. The red could mean a thunderstorm, but it could also mean large raindrops or a large number of raindrops. The interpretation of red also depends on which product you are viewing (base reflectivity (BR) or composite reflectivity CR).



Figure 1, Source: Gibson Ridge 2

Sea Breeze: The sea breeze forms along coastlines due to the differential heating of land and water. By day, the land heats up more quickly than the water, which creates a pressure gradient and an on-shore flow. By night, the process reverses. This same effect can occur with any large body of water (lake, river, etc.). The sea breeze is evident in satellite and radar imagery.

Outflow Boundaries: An outflow boundary, or gust front, marks the dissipating stage of a thunderstorm. You’d think that’s good news, but it’s not! Across an outflow boundary, you’ll notice a wind shift, gusty winds, LLWS, and turbulence. There’s even a difference in the temperature and dew point. Sounds like a very small-scale cold front. It is along these boundaries, that new thunderstorms tend to form. When outflow boundaries converge with each other or with other storm cells, things can go downhill fast. Since most commercial websites and apps (including ForeFlight) filter the outflow boundaries and air traffic control (ATC) radar doesn’t detect them, it’s challenging to identify one unless you know what to look for.

So what are you looking for? First, use a data source that does not filter outflow boundaries. National Oceanic and Atmospheric Administration (NOAA)/ National Weather Service (NWS) and College of DuPage are excellent sources. Be sure you’re looking at a BR product with, lowest elevation (typically 0.5 degrees). Finally, look for the classic arc-shaped return that is moving away from the parent storm. Check out the

radar images below of outflows near Cairns Army Airfield (AAF) captured a couple of summers ago.

Microbursts: As noted earlier, every thunderstorm has the potential to produce a microburst. A microburst is a sudden, violent downdraft of wind in a thunderstorm that is less than 2.5 miles in scale. The winds rush down and out, radially, in all directions. The damage from a microburst can be even worse than that of a tornado, and microbursts present a grave danger to aviation, particularly to rotary-wing pilots.

Air Mass Thunderstorms: These thunderstorms are prevalent during the summer months. In and of themselves, they are usually manageable and easy to pick around. However, certain interactions can quickly wreak havoc on aviation. We constantly monitor the radar for outflow boundaries, merging cells, sea breeze, and other interactions that tend to ramp up convective activity.

Thunderstorm hazards exist up to 20 miles outside of the core of a thunderstorm. The best way to avoid thunderstorm hazards is to steer clear of thunderstorms.

Squall Lines: Squall lines occur frequently during the springtime. A squall line looks nasty (Figure 2). That's because it IS nasty. Even nastier is the bow echo (Figure 3). When you see a line of thunderstorms begin to bow out, that's an area you want to avoid. A bow echo is usually indicative of damaging straight-line winds.

Hurricanes: Hurricane season runs from 01 June through 30 November. Hurricanes form over the warm ocean waters and can even impact areas well inland. Impacts vary by location. Coastal locations will see the strongest winds along with storm surge. Winds weaken as a tropical cyclone moves inland, but inland locations can still see hurricane-force winds, heavy rain, flooding, and tornadoes as the rain bands rotate around the center of circulation.

Hurricane Season 2020 was a record-breaking year! By mid-September, our alphabet was exhausted, and we got nine letters into the Greek alphabet by the end of the season. The 2020 season featured a record-breaking 30 named storms; 13 hurricanes (average is 6); and 6 major hurricanes (average is 3). Twelve storms hit the US coastline, smashing the previous record of nine in 1916. Five of these storms made landfall in LA.

What do the tropics have in store for 2021? Only time will tell, but the experts will weigh in soon. The



Figure 2, Source: Plymouth State



Figure 3, Source: Plymouth State

Colorado State University team will release their first stab on April 8, 2021, and NOAA usually issues their initial outlook in early May.

A Final Word

Many aviation hazards exist during the spring and summer months. The threats from severe weather and thunderstorms must not be underestimated during Army aviation operations during the summer months. Make sure you get a thorough weather brief for your mission time period and update periodically. Summer weather can change rapidly. Be informed. Ask questions. Fly safe! ■

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