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WINGS OVER NEBRASKA

Every day, Nebraska's aviators connect people, transport cargo, and support lifesaving medical missions using airplanes, helicopters, gliders, hot air balloons, and even drones. The 2027 Nebraska Aviation Art Contest challenges you to capture those missions and journeys. From the Sandhills to the Omaha skyline, what are the most "Nebraskan" ways to be in the sky? Grab your colored pencils, markers, and paints to show us how aviation keeps the Cornhusker State on the go!

More information can be found on the NDOT website
https://dot.nebraska.gov/aeronautics/art-contest/

Let's Talk About Wind Gusts

By Mark A. Sheldon C.M., University of Nebraska-Omaha, Aviation Institute

What is a Wind Gust?

Wind gusts are a brief, sharp increase in wind speed that stands out from the steady background flow of air. Wind gusts are characterized by a variation of 10 knots or more between peaks and lulls. The maximum instantaneous wind speed during these fluctuations is considered the gust speed. While sustained wind reflects the average movement of air over time, gusts reveal the atmosphere's turbulent nature.

Where do Gusts Occur?

Most gusts originate in the boundary layer, which is below 2,000 feet AGL, where friction between the air and the Earth's surface creates turbulence. This turbulence forms swirling eddies that mix faster winds from aloft downward. This movement of air creates Mechanical turbulence which is created as wind flows across the Earth's surface and is slowed due to friction. This can be enhanced by buildings, trees, or irregular terrain. ***See Figure 1***.

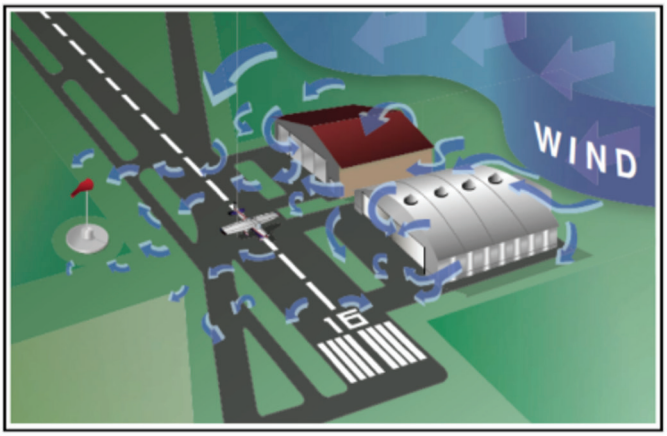


Figure 1: Mechanical Turbulence

Why do Wind Gusts Seem to Dissipate When the Sun Goes Down, and Start Again Around 10 am?

Have you noticed that the wind seems to die off when the sun goes down, and then the next morning, the winds gusts come back around 10 am? It all revolves around the Radiational Inversion setting up and being broken. When the Sun goes down, the air near the Earth's surface will cool faster than the air above it, causing a Radiational Inversion (Temperature increases with height) to develop, trapping the stronger winds above the inversion. Image 2 shows a Skew-T that was taken on the 9th at 00Z. There is no inversion, which allows the wind to mix down to the surface. This is shown by the wind speeds on the right side of ***Figure 2***, but even better in ***Figure 3,*** which has the surface observations from Omaha (OMA) taken before (the 09/0052Z observation) and after (the 09/0152Z observation) the inversion sets up. The winds go from 34018KT to 35008KT.

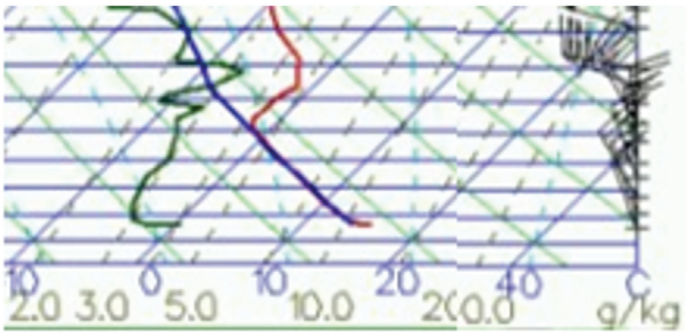


Figure 2: No Inversion on 9h at 00Z

KOMA 090152Z 35008KT 10SM FEW100 10/M03 A3001 RI
KOMA 090052Z 34018KT 10SM SCT100 13/M03 A2997 RM
KOMA 082352Z 35017G27KT 10SM SCT100 15/M02 A299

Figure 3: Winds Before / After Inversion Set Up

Now, ***Figure 4*** shows the Radiational Inversion (circled) that was set up the night before. This traps the winds above the inversion, and the winds below the inversion to remain light. You can see this by the wind speeds on the right side of the image.

From this Skew-T, forecasters can forecast when the winds gusts will start again, and that is by figuring out when the inversion will be broken. To do this, forecasters will go to the max temperature of the inversion and follow that point down the dry adiabat to the surface. This is the temperature the surface must warm to so the inversion will be broken, and the

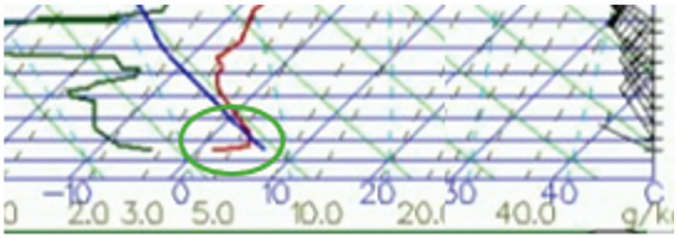


Figure 4: Inversion on 9th at 12Z

KOMA 091452Z 29018G24KT 10SM SCT200 SCT250 09/M06
KOMA 091352Z 27017G22KT 10SM SCT200 BKN250 07/M06
KOMA 091252Z 27011KT 10SM SCT200 SCT250 05/M06 A30
KOMA 091152Z 30011KT 10SM SCT200 04/M05 A3005 RMK

Figure 5: Winds Before / After Inversion is Broken

winds can then mix to the surface. In this example, if you complete this process, the temperature needed to break the inversion is about 7°C. Now, we will forecast when we think the temperature will hit 7°C, and that is the time we will put in the forecast for the winds to become gusty again. You can see this in the winds and temperatures I have highlighted in ***Figure 5.***

When flying, you can feel this inversion when you are descending or ascending through it as you can experience predominate light and occasionally moderate turbulence when you pass this level. Forecasters will forecast this for you as Low-Level Wind Shear (LLWS). In the TAF, you will see WS015/21040KT in the Remarks section. Of course, the WS is windshear, the 015 is the height you will experience windshear (1,500 feet AGL), and the 21040KT is the wind direction and speed at the level.

Why Gusts Matter Pilots?

For pilots, wind gusts are more than atmospheric noise—they directly affect air speed control, lift production, control authority, and stability during all phases of flight. A sudden gust can momentarily increase or decrease indicated air speed, alter angle of attack or disrupt a stabilized approach. Understanding what gusts cause helps pilots anticipate rapid changes and make safer operational decisions. Pilots should anticipate wind gusts on hot afternoons, over rough terrain, and near obstacles, and around thunderstorms (insert Foot Stomp! I always stomp when talking about thunderstorms with my students). When gusts are occurring, pilots should anticipate airspeed fluctuations during climb out and on short final and use appropriate gust correction on approach.

Let's Talk About Wind Gusts *(cont'd.)*

Looking at the TAF and pulling up observations will help you when you are flight planning. I always advise my students to call up a list of observations for each point along your flight path. This allows you to see the trend of winds across the area. Be sure to read the Remarks section of the observations also to see if any Peak Winds are being reported. You can do this easily on the Aviation Weather Center (AWC) page by going to the "Product" tab and then selecting the "METAR/TAF data". Now you can list all the locations you need for flight planning. Be sure to turn on the TAF button, so you get TAFs for any location that has one and change the "most recent" box to the past 6 hours.

I hope this has helped you have a better understanding of winds gusts. If you have any questions, feel free to email me at msheldon@unomaha.edu, or ask me at the annual aviation conference in Kearney next year.

Safe Flying

Gopher Mounds on Turf Runways



The most effective method is the use of carbon monoxide gas piped from the exhaust of a car or truck directly into the gopher mound hole. This is accomplished by using a sharp spade for cutting through the mound to the defined tunnel, in which you should insert the end of a rubber hose or sufficient size to slip over the car exhaust pipe. At the ground connection, pack moist earth around the hose to prevent loss of gas. After running the motor for 15 to 20 minutes, the hose is removed and the hole closed and sealed with moist dirt. By following up with the treatment on fresh mounds daily for a few weeks, no more trouble will be experienced.

--From the July 1951 issue of Nebraska Aeronautics PIREPs

Nominations being accepted for 2026 Airport of the Year and 2026 Airport Project of the Year

The NDOT Division of Aeronautics requests nominations for the ***2026 Airport of the Year*** award and the ***2026 Airport Project*** of the Year award. To qualify for the award; the airport or project must be located in Nebraska and demonstrate how it benefits aviation in Nebraska. All information should be based on the 2026 calendar year.

Information and the forms may be found in the Additional Links at: https://dot.nebraska.gov/aeronautics/

Can you identify the following Nebraska public airport based on the following aerial snippet? North is up. *(Answer is on the last page)*



CALENDAR OF EVENTS

November

11/5 | Nebraska Business Aviation Association Fall Luncheon | 11:30am-1:30pm | Location TBD | https://nebaa.org/event-6409341

December

12/4 | Nebraska Aeronautics Commission Meeting | NDOT Central Complex, 1500 Nebraska Parkway, Lincoln, NE 68502 | 1pm | agenda will be available in the Nebraska Aeronautics Commission section of the website

Multiengine Training

By David Morris

Stepping up to a multiengine airplane typically means stepping up to greater climb, cruise, and payload performance than most singles, and to the perceived safety of two engines and two systems. The following discussion pertains to multiengine airplanes of which the propellers all rotate clockwise as viewed from the cockpit.

Multiengine training also provides new perspectives on planning and decision-making. But two engines can be a double-edged sword. If a pilot of a multiengine airplane is not trained and proficient in handling an engine failure, it can be even more dangerous than a failed engine in a single. That's why a large part of the training for a multiengine rating concentrates on single-engine emergencies.

Multiengine aerodynamics are different from the aerodynamics of single-engine airplanes. Because the propellers are in front of the wings, prop blast increases the airflow over the wing to generate as much as 60 percent of the wing's lift. The prop-blast portion of the wings' lift is relatively independent of angle of attack because the props are in a fixed position. Among other things, this can result in high pitch angles for power-on stalls. It also means that gross or abrupt power changes can cause significant changes in lift. When one engine loses power, the operating engine yaws the airplane substantially because the thrust lines for the two engines run parallel to, but on opposite sides of the aircraft centerline. This means if one engine loses power, the pilot must counteract the resulting yaw with strong pressure on the opposite rudder pedal to restore directional control.

At first thought, you might assume that losing half your total power results in a 50-percent decrease in climb capability. An airplane's climb capability is related to the power available in excess of that needed for straight and level cruise. An engine failure can reduce climb performance 80 percent or more.

Depending on aircraft weight and flight conditions, some twins cannot maintain a positive rate of climb or even maintain altitude on one engine.

When an engine fails, the aircraft rolls and yaws toward the dead engine. The wing with the failed engine produces less lift and causes most of the roll. Asymmetric thrust, also referred to as "P Factor", coupled with the increased drag of the dead engine's windmilling prop, causes the yaw.

To recover, you must counter the roll with aileron, counter the yaw with rudder, and feather the windmilling propeller to reduce drag. If your airspeed is too low, you might not have enough aileron and rudder effectiveness (particularly rudder) to correct the problem.

Multiengine performance and control depend on two important airspeeds. The first is the single-engine best rate of climb speed-VYSE. It's often called "blue line" because this speed is marked on the airspeed indicator with a blue radial line. Although the resulting best rate of climb when flying on one engine might be negative, VYSE gives you the best performance the aircraft can muster.

The second is the minimum control airspeed-VMC. Marked on the airspeed indicator with a red radial line, it is the slowest airspeed at which you can maintain directional control of the airplane if the "critical engine", the engine whose failure most adversely affects performance or controllability, suddenly fails while the other engine is producing takeoff power. Maintaining "directional control" means you won't exceed a 20-degree heading change or a five-degree bank into the operating engine.

Regardless of how many propellers an airplane has, each one produces P-factor, especially at low airspeeds and high angles of attack. Because the descending blade on the right produces more thrust than the ascending blade on the left. This means the thrust line for the left engine is closer to the aircraft centerline than the thrust line for the right engine. The turning tendency will be much greater if the left engine fails.

Factors that affect minimum control speed - VMC: The rudder must compensate for the turning tendencies (yaw) caused by the operating engine, the drag of the windmilling propeller, and the aileron drag caused from trying to hold the wings level. As airspeed decreases, the rudder becomes less effective. Below VMC, the rudder can no longer do the job and the aircraft yaws uncontrollably toward the dead engine.

The airplane's center of gravity (CG) also plays a part in single-engine performance. All airplanes rotate around their CG. When the CG is at its aft limit, the rudder's lever arm is short, and the turning moment it creates is reduced. The opposite is true when the CG is at its forward limit, which means VMC can be lower. The airspeed indicator's red radial line notes VMC for the worst-case scenario, an aft CG.

When the engine on a single-engine airplane fails, your course of action is obvious and uncomplicated. In a light twin, however, your decision-making process is more complex because you have more options. To make the right decisions in an emergency, you must know the airplane's single-engine performance capability and your available options for each phase of flight.

Airport quiz answer: Grand Island