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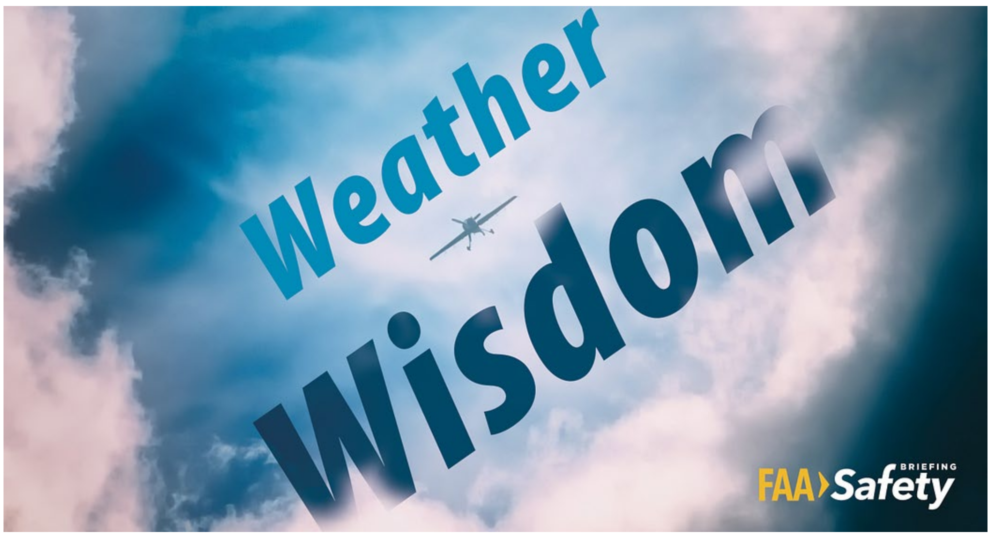
SAFETYWIRE

Expanding the Envelope with Aviation Weather

(Source: Adam Magee; FAA Safety Briefing, February 29, 2024)

Have you ever encountered unexpected instrument conditions, marginal VFR, just been surprised by weather, or been fearful of experiencing unexpected weather? You're not alone. Aviation weather is complex. There are PhDs in meteorology after all! It's no wonder pilots, at every skill level, struggle with weather knowledge. One study even graded properly rated instrument pilot's performance on instrument flight rules (IFR) and VFR knowledge and skills a "D." One thing I always love about the FAA Safety Team (FAASTeam), and this magazine, is the sharing of knowledge from all different areas of aviation to improve overall aviation safety. Microscale meteorology is one such area that provides an opportunity for myself and my fellow balloonists to share knowledge of how we fly.



I've explained in a previous article ("Teaching the Unknown," Nov/Dec 2018 issue) that balloons are unique aircraft.

Given their unique flight characteristics, like being susceptible to winds and without an engine or mechanical directional control, balloons truly are a part of weather. If you think about it, a balloon aloft is nothing more than a particle in the sky susceptible to the forces of nature. That's why it's so important for balloon pilots to know and understand weather on a small scale. When we fly, we become one with the weather. The slightest miscalculation on weather — winds, fog, clouds, thunderstorms — puts a balloon at risk of an accident. Once a balloon is in bad weather, there's no getting out of that until the weather changes.

As pilots, we know 14 CFR section 91.103 states: "Each pilot in command shall, before beginning a flight, become familiar with all available information concerning that flight." FAA Advisory Circular (AC) 91–92, *Pilot's Guide to Preflight Briefing*, provides guidance that aids in meeting the regulatory requirements of 91.103. The problem for balloon pilots though is that many available weather resources are too broad. Many weather forecast tools cover large geographic areas and apply mostly to the upper layers of the atmosphere. Here are some microscale resources that provide balloonists the additional safety data we need for safe flight, but may also benefit aviators in any aircraft type.

There are several microscale weather resources that provide balloonists the additional safety data they need for safe flight, but which may also benefit aviators in any aircraft type.

Wind

When you think about a forecast, specifically for winds, you may focus on surface winds and winds aloft, but winds are so much more than that. Maybe during take-off or landing in an airplane you've had the feeling of being rocked around a bit or faced an unexpected loss of lift. After that encounter, you might have reviewed the weather again for the airport and realized there weren't any gusts reported or forecasted. You might wonder, what just happened? As a balloonist knows, winds can change constantly on a microscale level, both in speed and direction as you move up the wind profile. While the observed winds and forecast could be for calm winds, the winds not far off the tops of the trees could be 20 knots.

The National Oceanic and Atmospheric Administration (NOAA) has a Rapid Refresh (RAP) model that provides a forecasted wind profile. A balloon pilot, Ryan Carlton, created RyanCarlton.com to display the contents of the RAP hourly wind profile model based on the user-identified location. This microscale wind profile provides great data points, which I often refer to as a simplified Skew-T. It provides hourly wind direction, speed, and temperature/dewpoint for the specified altitude.

In the example shown in figure 1, you can see there is a temperature inversion. In ballooning, we always want to know what time the inversion is predicted to weaken because when it does, the strong surface winds will mix downward to the surface and make landing difficult. A good rule of thumb is to find the temperature at the top of the inversion (around 46 degrees in the example) and know that once the surface temperature heats up to at or near the inversion temperature, the winds will pick up. If you were to advance the hourly forecast, you would see this trend. This simplified Skew-T also has other benefits we'll discuss later.

Sunrise 7:12 AM CST — Sunset

RAP 2/6/2024 4:12 PM	7:00 AM CST 2/7/2024	8:00 AM CST 2/7/2024
0 ft	141 @ 7 KTs 34°F / 33°F	132 @ 8 KTs 34°F / 33°F
92 ft	146 @ 12 KTs 34°F / 33°F	135 @ 12 KTs 34°F / 33°F
253 ft	150 @ 14 KTs 33°F / 32°F	137 @ 14 KTs 33°F / 32°F
519 ft	166 @ 19 KTs 33°F / 32°F	153 @ 19 KTs 33°F / 32°F
899 ft	187 @ 27 KTs 39°F / 29°F	179 @ 24 KTs 42°F / 27°F
1401 ft	201 @ 29 KTs 44°F / 22°F	198 @ 22 KTs 48°F / 19°F
1880 ft	206 @ 25 KTs 45°F / 18°F	203 @ 20 KTs 48°F / 17°F
1998 ft	207 @ 25 KTs 46°F / 18°F	205 @ 20 KTs 48°F / 16°F
2684 ft	210 @ 21 KTs 45°F / 14°F	210 @ 18 KTs 48°F / 10°F
3455 ft	215 @ 20 KTs 44°F / 8°F	216 @ 19 KTs 47°F / 5°F
4167 ft	218 @ 19 KTs 43°F / 1°F	218 @ 22 KTs 46°F / 5°F

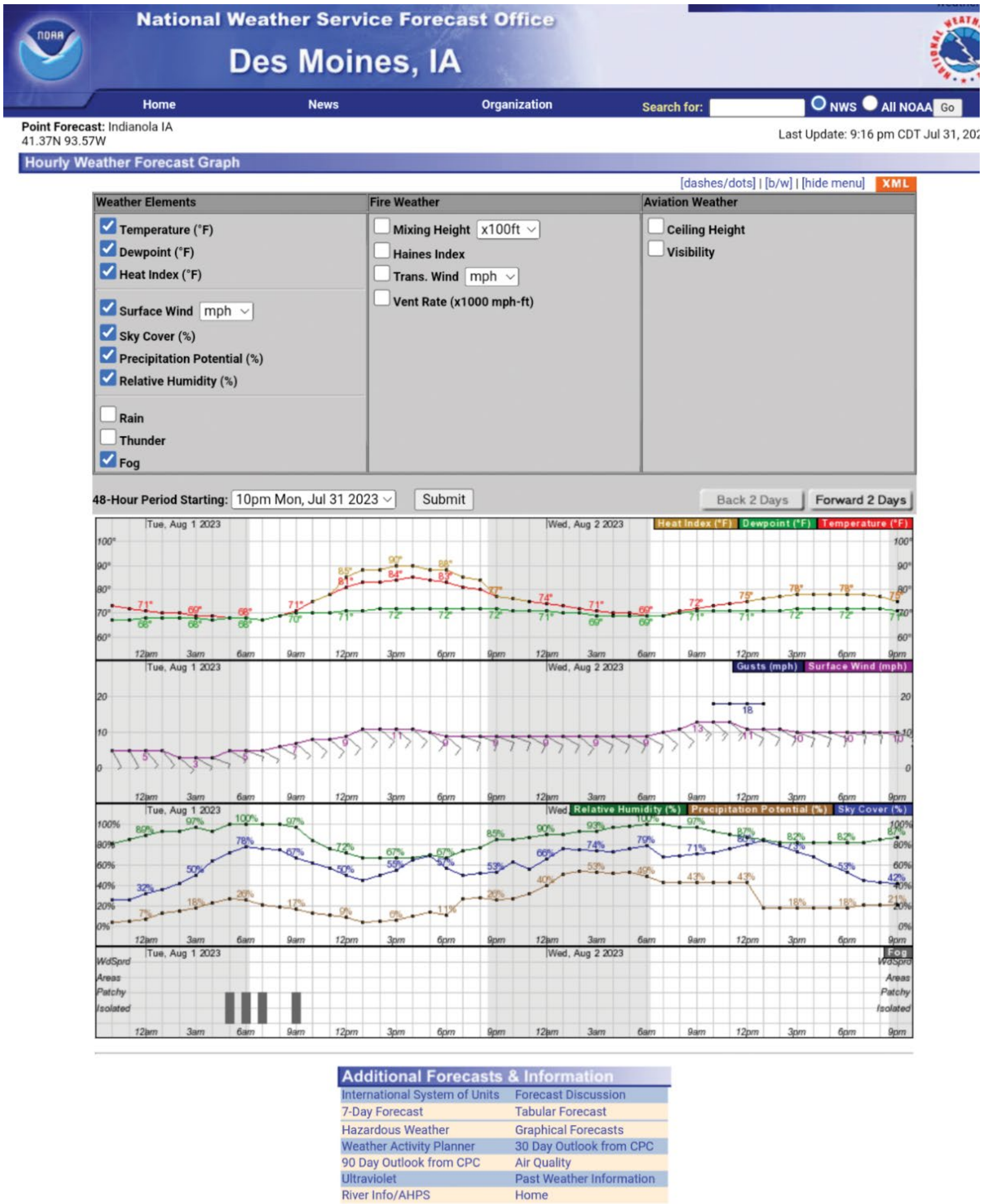
Figure 1: RyanCarlton.com displays the contents of the Rapid Refresh model (RAP), which provides an hourly wind profile model based on a user-identified location.

It's interesting to note that gusts need to be 10 mph greater than the sustained wind to be added to a forecast. Winds just above the trees can often be greater (15–20 mph) and create a strong speed gradient that can affect the aircraft's performance on takeoff and landing.

It's important for all pilots to know that a reported calm wind isn't always calm. There's likely a wind direction above the surface or during the profile to landing, which is impacting aircraft performance. Any tailwind does have a significant impact on your landing roll-out and has the same effect as excess airspeed on touchdown in no-wind conditions, so beware. A tailwind compounds your landing roll-out distance by the square of the ratio of the tailwind component plus your actual touchdown speed over your normal touchdown speed. You could also experience a loss of lift from a sudden headwind reduction. This might cause you to hit the ground a little harder than anticipated.

Fog/Clouds

My meteorologist friends always say that pinpointing exactly where fog and clouds will develop is incredibly challenging. It’s no surprise that finding an accurate microscale forecast on fog and clouds is equally challenging. Flight into IFR is incredibly problematic for any aircraft, but especially for a balloon, which is a part of the weather once airborne. The National Weather Service has an excellent hourly weather graph that provides good data. It’s easy to see when the temperature and dewpoint might be close and when the relative humidity is high. There is also a fog weather element check box, which can be checked to show the likelihood of fog by the hour.



The National Weather Service hourly weather graph is a nice tool to help spot potential fog. To access this, go to weather.gov, enter your location or ZIP code, and then click the Hourly Forecast link.

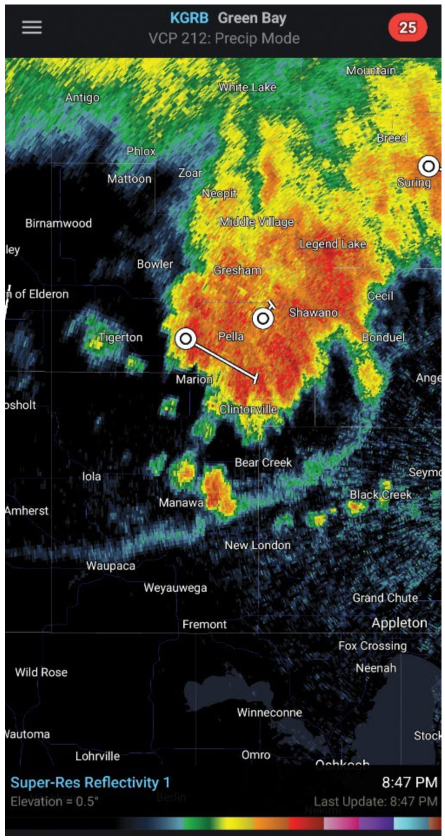
The simplified Skew-T found by looking at RyanCarlton.com also provides good data points to consider when analyzing microscale weather. The temperature and dewpoint spread provided hourly at the various altitudes does a good job of letting the pilot visualize fog or low clouds.

Sometimes there's that pesky low-level cloud deck that has pilots hanging out around the airport wondering when it will lift. Using resources such as RyanCarlton.com allows pilots to advance the forecast and see when the clouds might lift to visual meteorological conditions (VMC) while also analyzing the macro weather factors impacting the fog/cloud development and prolonged occurrence.

When dealing with unexpected fog and low clouds during flight, it's important to remember that they likely didn't appear out of nowhere. Instead, it was likely the result of a missing microscale forecast. It's always better to err on the side of caution. Sometimes an AIRMET (Airmen's Meteorological Information) isn't issued, but the fog is there, and visibility is low. It's important to understand the local environment — lakes, rivers, rain the night before, etc. — that can impact fog development. Use microscale weather sources to supplement your weather forecasts and help you in spotting fog or low clouds. Finally, avoid the hazardous attitude of impulsivity, where pilots feel the need to do something immediately. Remember to think first and not rush through decisions when faced with observed or forecasted fog or low clouds.

Thunderstorms

One of the biggest realizations that balloon pilots make is that radar apps could be deceiving you. The radar image you see could be delayed by 15 minutes. Projecting out to compensate for the delay is likely not telling the whole story. For example, you can't tell if the storm is building or dissipating, or what else might be developing that you can't see. Sometimes the outflow from thunderstorms can be seen on radar, and sometimes it can't. Whether a fixed-wing flyer or balloon pilot, give thunderstorms the respect and space they deserve.



This radar image depicts a strong outflow south of a storm near EAA AirVenture in Wisconsin, the green line running from Waupaca to the west of Angel.

For balloon pilots, a good rule of thumb is to give thunderstorms space of 100 miles. Outflow winds are often felt more than 100 miles away, and the outflow winds can be in any direction. Give thunderstorms the respect and space they deserve.

Whether you're a fixed-wing flyer, or rely on hot air to get you there, I hope these weather resources and tips are useful to you as you prepare for your next flight. Everyone in the aviation community has unique skill sets and knowledge, which if shared, can improve safety for all of us. If you'd like to help, I encourage you to volunteer with the FAA Safety Team and share your experience and expertise.

Adam Magee is a commercial hot air balloon pilot and flight instructor, designated pilot examiner, and FAASTeam Lead Representative. He was named the 2021 National FAASTeam Representative of the Year. He is co-founder/president of The Balloon Training Academy, a 501(c)(3) nonprofit organization and industry member of the FAASTeam, as well as serves as a member of the board of directors and treasurer of the National Association of Flight Instructors (NAFI).

World Helicopter Day: An opportunity to share information with pilots, owners, and operators to influence safety

(Source: Australian Transport Safety Board, August 18, 2024)

The ATSB continues to acknowledge and support World Helicopter Day to help raise awareness of the valuable contributions helicopters make to society, and as an opportunity to share information to influence safety.

On this World Helicopter Day – as a pilot or an operator – have you the required knowledge and skills in place to manage the risk of an inadvertent entry into IMC?

Since the release of our final report into the fatal VFR into IMC, loss of control and collision with terrain accident involving an EC130 T2 near Mount Disappointment, Victoria in March 2022 we have been advocating for all VFR-rated helicopter pilots, particularly those undertaking Part 133 passenger carrying operations, to develop the knowledge and skills required to manage the risk of inadvertent entry into IMC.

While avoidance of IMC is important, it is not always assured. And to help mitigate against inadvertent entry into IMC, there are several available risk controls for VFR pilots to strongly consider.

Before flight, decision-making in marginal weather conditions can be supported with the use of a pre-flight risk assessment tool. And to increase the chances of safely recovering from an inadvertent entry, we highly encourage VFR pilots undertake recovery training and basic instrument flying competency checks during their operator proficiency checks or during other training.

At an organizational level, the risk of helicopter inadvertent IMC should be considered within the context of a company's operations. The effective management of this risk relies on multiple layers of controls to reduce the risk of single point-of-failure accidents. This includes training and procedures for both avoidance and recovery, which can be enhanced with equipment, such as autopilots to reduce the risk of loss of control, and terrain awareness and warning systems to reduce the risk of controlled flight into terrain.

The ATSB continues to monitor the intended safety action by CASA in response to our safety recommendation to further address the risk of inadvertent IMC events in Part 133 helicopter passenger operations.

Overcoming the Human Factor With DiSC

(Source: United States Helicopter Safety Team, Skip Johnson)

"We don't rise to the level of our expectation; we fall to the level of our training." Archilochus, Greek Philosopher and Soldier, 650 BC. The Greeks survived as the underdog for centuries because they trained that way, startled, and frightened. They became self-aware of their personal strengths and weaknesses. They incorporated resilience training to overcome the extreme stress in chaotic situations. In aviation you never know when YOU will be the underdog. How far will you fall before your training catches you?

In no other industry is safety as paramount as it is in aviation. We can't afford even one mental failure or unforced error. I ask you this; how self -aware are you of your strengths and weaknesses, or better yet where are your blind spots? What if I told you I have a powerful tool to help define your behavioral strengths, reveal your weaknesses, and blind spots, and better yet give you an understanding of those traits of your teammates? I have one, it's called the DiSC Behavioral assessment.

The DiSC assessment was developed in the early 1900s and has evolved over time to become an incredible tool. Based on a battery of questions it VERY accurately determines your behavior style. Not your personality, which is unique to all humans. Behaviors can be categorized into Dominate, Influential, Steadiness and Conscientious styles. Each with its unique characteristics such as your priorities, and what motivates and stresses you out.

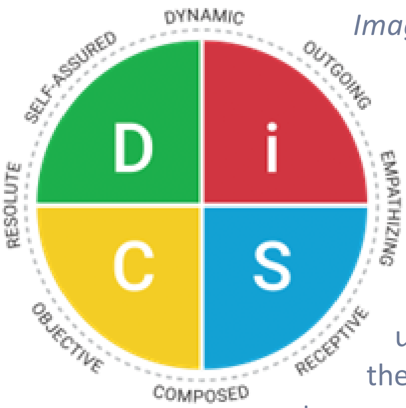


Image courtesy of discprofiles.com

This diagnostic powerhouse gives you a deeper dive and understand about you, AND just as important those characteristics of your teammates.

We have incorporated DiSC training at my Airline over 12 years ago, It is ingrained in our culture. All 17,000 pilots know what their style is AND the most important aspects of the other styles. It's contribution to our safety culture cannot be understated. Aside from giving aviators a deep understand and self-awareness of how they respond in stressful situation it gives you a deep Emotional Intelligence (EQ) of your teammates.

Just one example is our ability to safely and effectively communicate and function at the highest level of professionalism across 4 decades of age differences in the cockpit and in operations. DiSC is part of our bedrock safety culture, a safety line to catch should we have our worst day and fall. Should it be part of yours???

About the author

Greetings, my name is Skip Johnson and I've been a pilot for over 50 years with 9,000 hours of flight time and even today, every time I fly, I remind myself that I could be the underdog. No matter how much I prepare, the Universe gets to decide how good I must be that day. And will I be good enough when things go wrong. I am a Captain, Instructor, Evaluator and Human Factors Pilot Development facilitator for a Major US Carrier as well as Founder of my own Leadership Development company and teach Upset (UPRT) and Cockpit Resource Management (CRM). My past is steeped in safety and developing a safety culture.

SAFETY MANAGER'S CORNER

The Corrective Action Trap

When every new safety/hazard report comes into the SMS there's a process to follow that ensures the information revealed is evaluated and the appropriate actions are taken in response. This process contains many important parts, but none as important as the corrective action employed to address the situation and most importantly, manage the risk.

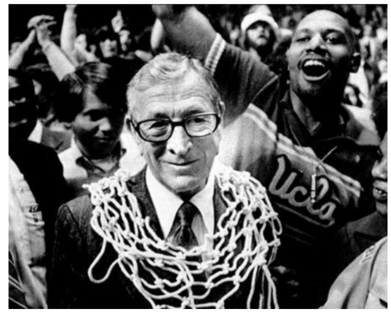
Corrective actions can be tricky so beware. First, make sure the action actually applies to the real source of the hazard or problem identified. For example, a report describing aircraft battery draining due to the DC selector switch being left in the "Batt" position after completion of maintenance pre-flight. What is the real source of this problem? Will a correction action to brief the mechanics at the next meeting work to effectively solve the problem? Perhaps, in the short term it may but what about the long term?

Determining exactly why the mechanics come to leave the switch in this position is the more critical information. Appropriate questions might be: Are maintenance pre-flight items conducted exclusively by memory; Is it absolutely necessary to place the switch in the "Batt' position during maintenance pre-flight; Should the battery be disconnected after pre-flight? Answering questions like these will lead to the problem's root cause and facilitate the best corrective action determination.

Discovering the best corrective action requires discipline. It's always easiest to "talk about the problem" and hope it goes away. Don't misunderstand, communication is extremely important but it's almost always not the long term solution. As a solution it relies exclusively upon the weakest part of any process: human memory. Much better to decrease reliance upon habits and memories, which are highly subject to distraction, and establish aids that reinforce required actions.

In this specific example, briefing the mechanics is a terrific idea, but it doesn't go far enough because it relies exclusively upon their ability to remember and may be contrary to their current habit patterns. Establishing the use of a pre-flight shutdown checklist that includes the "Batt" switch might be a good solution, or a two person check of essential items before vacating the aircraft might work effectively. The point being, do not rely upon briefing a problem and expect it is the be all, end all solution. It may be the easiest but it's not the best.

Quote of the Month



It's the little details that are vital. Little things make big things happen

BY: John Wooden

In every aspect of SMS, it is critical to look beyond the obvious and look in to the details. Investigate the issue thoroughly. A complete and accurate root cause can be completed more effectively when a detailed investigation is completed. It is critical to develop the best possible corrective action to reduce the risk as much as possible, and a detailed root caused analysis can help.

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UPCOMING COURSES

September 12, 2024—PROS Course **Risk-Based IOSA Training**

Virtual

November 7, 2024—PROS Course **Risk-Based IOSA Training**

Virtual

November 11 to November 15, 2024—PROS Course

ALAT Training

Denver, CO

Go to Upcoming Training Classes to register.

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