

You've Got Fog

Forget the winds of November. Spool up for rapidly-forming fog and approaches to mins.

When was the last time you flew in the early morning hours? Not the eight or nine o'clock kind of morning hours but the graveyard shift. What happens when the sun goes down and you find yourself burning the midnight avgas? Are all of the rules the same—even the weather rules?

Most pilots tend to fly during the waking hours. Few depart after midnight and land just before sunrise. A few of us, like my buddy Steve, volunteer time, talent, and aircraft to help those in need of organ transplants. The fact is that a transplant doesn't plan itself around the pilot; instead, the pilot may be asked to voluntarily fly at any time of the day or night, and that means being prepared for any IFR weather obstacle.

Call To Duty

Last November, Steve got such a call from the Volunteer Pilots Association at nine PM for a mission to transport a liver from Baltimore, Maryland to Pittsburgh, Pennsylvania. Like any good pilot, he immediately put his planned route into DUATS and briefed himself on the weather between Baltimore and Allegany County. The newly issued area forecast and 00Z terminal area forecasts (TAFs) were fairly benign. There were no hints of any adverse weather. It promised to be a routine round-robin flight.

Steve checked DUATS once again at one AM, just before he was to depart Montgomery County Airpark, his home airfield in Gaithersburg, Maryland. Montgomery County Airpark is just a short hop away from Baltimore where he was scheduled to pick up the donor liver.

The area forecast, valid until nine AM, hinted at occasional visibilities from 3-5 statute miles during the over-

night hours with skies clear below 12,000 feet. On the other hand, the 0600 UTC TAFs were just beaming with better than 6-mile visibilities and a scattered to broken ceiling at 12,000 feet. About the only fly in the ointment was the temperature/dew point spread (also known as the dew point depression) at Dulles was 1 degrees C, and was 0 degrees C at Baltimore by this time. Not to worry, Steve thought, a nearly perfect VFR weather forecast for the round-robin flight.

With this forecast in hand, he

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made the short flight to Baltimore. It was a little after two AM when Steve departed Baltimore for Allegany County in his Cirrus SR20. Little did he know that his return to Gaithersburg would be anything less than routine. It was a beautiful night to fly; what could go wrong?

As expected, his hour-and-a-half flight to Allegany County Airport went perfectly. With an easy visual approach, he landed and handed over his liver—well, not *his* liver—mission accomplished. Now it was time to get outta Dodge.

With the nearest frontal system over 300 miles away, he didn't think to get an update on the weather prior to leaving Allegany County. After all, it hadn't been more than three hours since he'd left Gaithersburg, and the promise was for a nearly clear and calm night with a high scattered-to-broken ceiling. He wasn't expecting anything less. Although, the 0 degree

C dew point depression at Baltimore should've raised a red flag. He got his IFR clearance and departed Allegany County a little after four AM and was headed home to get some sleep. He was unaware by this time that Dulles—just 18 nautical miles to the southwest of Montgomery County Airpark—was reporting an overcast ceiling of 700 feet.

Surprise, Surprise

With a beautiful full moon to guide him home, Steve didn't realize what was in store for him until he was about 40 miles away from his home airport. Instinctively, he decided to listen to the Montgomery County AWOS, and to his astonishment the report wasn't good—visibility was reported at 4 statute miles with a ceiling of 700 feet. Huh? What happened to that severe clear forecast?

Now wasn't the time to figure out what went wrong. He told Dulles approach that he wanted to try the RNAV (GPS) Runway 14 at Montgomery County even though the ceiling was already at published approach minimums and worsening by the minute. He was handed off to Baltimore approach and attempted the RNAV approach with no luck. With a solid overcast below him throughout the approach, he flew the published missed approach and once again contacted Baltimore approach.

Time for plan B. He asked for a clearance to Dulles, which was immediately granted. About two minutes later, Baltimore approach relayed the bad news; Dulles was 1/4-mile visibility with an indefinite ceiling at 100 feet. While there were many alternates available to the north, Baltimore was his best local choice even though its weather was decaying rapidly as well. He was vectored onto the ILS Runway 10 final approach course, flew the approach to minimums, and landed.

Recipe For Fog

So, what happened to that nearly perfect forecast for VFR conditions? How could it go from severe clear to very low IFR (VLIFR)? Two words: Radia-

tional cooling. In Steve's case it was all a matter of bad timing and a busted forecast.

Many factors can lead to the production of poor visibility, low ceilings, and fog. We all learned in our early days of training that on clear and calm nights, the earth radiates heat back to the atmosphere. As a result, radiational cooling will produce a nocturnal temperature inversion at the surface. The temperature inversion essentially traps moisture near the surface allowing the temperature and dew point to converge as the temperature at the surface continues to fall.

Let's take a step-by-step look at what happened through the evening and early morning hours. The first thing to point out is that the Baltimore and Washington, D.C. area had received a fair amount of rain a couple of days earlier. Therefore, the soil was still moist. High temperatures during the afternoon at Dulles and Baltimore climbed to a mild 15 degrees C, with dew point temperatures hovering near freezing under essentially clear skies and light winds. At first glance, these appear to be optimal conditions. As the sun was begin-



ning to set, the temperatures began to rapidly drop as the radiational cooling process took over. By one AM the temperature at both Dulles and Baltimore bottomed out at 1 degree C, with the dew point anchored near the freezing point. Skies remained clear, and the wind at the surface was calm.

The Forecast Systems Laboratory (FSL) MAPS skew-T diagram (profile view of temp/dew point and wind from surface to tropopause) clearly depicted a surface-based temperature inversion beginning to form shortly after sunset. As the temperature

***Above:** Coastal fog is relatively easy to predict. The autumnal stuff is sneakier...*

dropped at the surface throughout the evening into the early morning hours, the inversion continued to grow, peaking at about four AM, just when things started to get interesting.

In addition to clear skies, calm winds and an impressive nocturnal temperature inversion, you add wet
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The Quiz

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soil, a pinch of dampened vegetation and continuous evaporation, and you have the recipe for poor visibility, low ceilings, and fog. That's exactly what happened.

Devil In The Details

At 3:51 AM, Dulles was reporting calm winds, unlimited visibility, scattered clouds at 12,000 feet with a temperature and dew point of 2 degrees C and 1 degree C, respectively. Just seven minutes later, Dulles dropped to a visibility of 8 miles, overcast ceiling of 700 feet and a temperature and dew point of 2 degrees C.

The TAF for Dulles issued at 12:28 AM for the period beginning at four AM was VRB03KT P6SM BKN120. At 5:11 AM the Sterling, Virginia Weather Forecast Office, amended the Dulles TAF to 16003KT 5SM BR OVC003. Ironically, also at 5:11 AM, Dulles continued its downhill trend to VRB03KT 1/4SM R01R/3500VP6000FT FG VV001 06/05. In astonishment, the forecaster probably put on his coat and went home.

Martinsburg, West Virginia, only 37 miles to the northwest of Dulles, was spared. Martinsburg remained VFR the entire time while Dulles and Baltimore were VLIFR. Just about the time Dulles and Baltimore were on the verge of going VLIFR, Martinsburg was starting to pick up an overcast cloud deck at 10,000 feet. This medium-level overcast was just in time to minimize the radiational cooling and pro-

tect Martinsburg from an encounter with IFR conditions.

Just as the old saying goes, "A picture can speak a thousand words," a distinct hole could be seen on the infrared satellite picture keeping Dulles and Baltimore in clear skies an hour or two longer than the surrounding terminal areas such as Martinsburg.

I can't say why the forecast was so poor. It was evident from the 0000 UTC run of the ETA forecasting model that a low overcast ceiling was indeed possible. Perhaps the forecaster felt the medium-level overcast layer would arrive sooner as it did in Martinsburg? Perhaps soil moisture and evaporation were overlooked? Perhaps it was just a matter of bad timing and a little meteorological risk? We'll probably never know.

The lesson: A whole different world exists when you fly outside of your normal routine. You can become complacent and sometimes assume that the rules applied during the day also apply at night. This is especially true when flying during the overnight hours. Once the sun sets, radiational cooling can have a huge impact, turning a perfect VFR night into low IFR conditions. Fortunately, these events don't happen too frequently, but when they do, they can catch you by surprise.

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Quiz Answers

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