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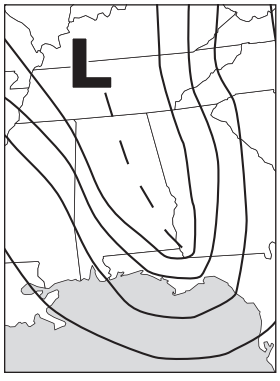
IFR

The Magazine for the Accomplished Pilot

Which panel are you flying today? ... page 14



Red flag ... page 9

Butting heads ... page 22

ALSO INSIDE THIS ISSUE ...

A STRATEGY FOR WX SAVVY

You can glance at the charts and then blindly accept Flight Service's prediction, or you can use a system to find what most pilots miss.

by Scott C. Dennstaedt

Most freely confess that weather is by far their weakest link in the chain. Many hoped it would somehow magically fall into place and they'd get the weather know-how they never learned as a student. Not according to the NTSB. A recent safety study concluded, "It appears that pilots generally require formal training to obtain weather knowledge and cannot be expected to acquire it on their own as they simply gain more flight experience."

Don't blame your instructors, because they were likely just as handicapped; you can't teach something you don't really understand. And I'm not just speaking about a bunch of weather theory. Theory is essential, but knowing how the pressure-gradient force creates wind doesn't help make preflight decisions.

There are three steps to building your weather savvy when it comes to planning a flight: Identify which weather products are the most useful to you; learn how to read and interpret them; practice assembling them to make an informed decision.

The Negative-Tilt Trough

Most pilots have heard of a constant-pressure (upper-level) chart, such as the 500-mb chart. These are a dime-a-dozen on the internet and might tell you more about the adverse weather than several other charts combined. The problem is knowing what to look for. I can't show you every smoking gun, but let's look at one.

A negatively-tilted trough means the angle of the trough—the line you'd get if you connected the "bumped-out" part of the low-pressure contours—slants from the northwest to the southeast.

This formation is indicative of a mature system with potential for strong middle- and upper-level winds wrapping around the base of the trough, nasty vertical wind shear and the potential for severe weather. IFR pilots should know to look for this and have small alarm bells go off when they see it, if the trough is expected to cross their proposed flight path.

You don't want to fixate about staying above an icing layer, only to miss the 35-knot crosswind at your destination.

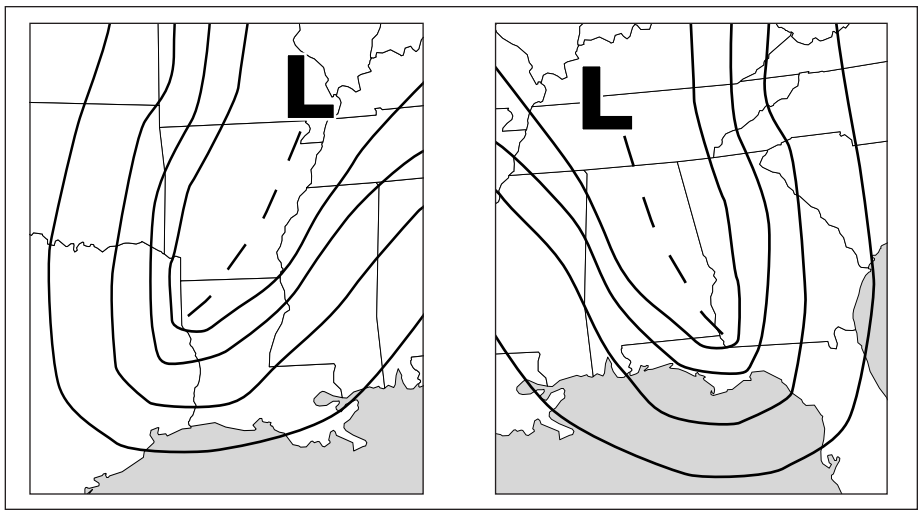
But the savvy pilot can compare the 500-mb forecast against the precipitation forecast, lifted-index forecast and convective outlook. The trough might not be a huge deal in the early morning when the instability is forecast to be the lowest, or when there isn't a source of moist air to feed the monster.

Hood Time for WX

I challenge my students to plan flights that they never intend to take. It's like going out and shooting practice approaches to keep proficient. When the weather's looking low for the next couple of days, pick a random day and time and typical destination. Start watching the weather a couple of days before departure. The evening prior to the mock flight, make a rough guess as to the best route and altitude for the flight.

Spend 30 to 45 minutes during each session. Experiment with weather products that are unfamiliar. Here's the important part: Write down your observations from your analysis at each session. You might document, "The cold front that is forecast to move into my route currently has few clouds and no precipitation. Its movement over the last 24 hours has been consistent with earlier forecasts. The wind behind the front is exceptionally strong at the surface, but there are no reports

Below: *Learning to watch out when a positively-tilted trough (left) becomes a negatively-tilted trough (right) is one example of weather savvy any pilot can acquire.*



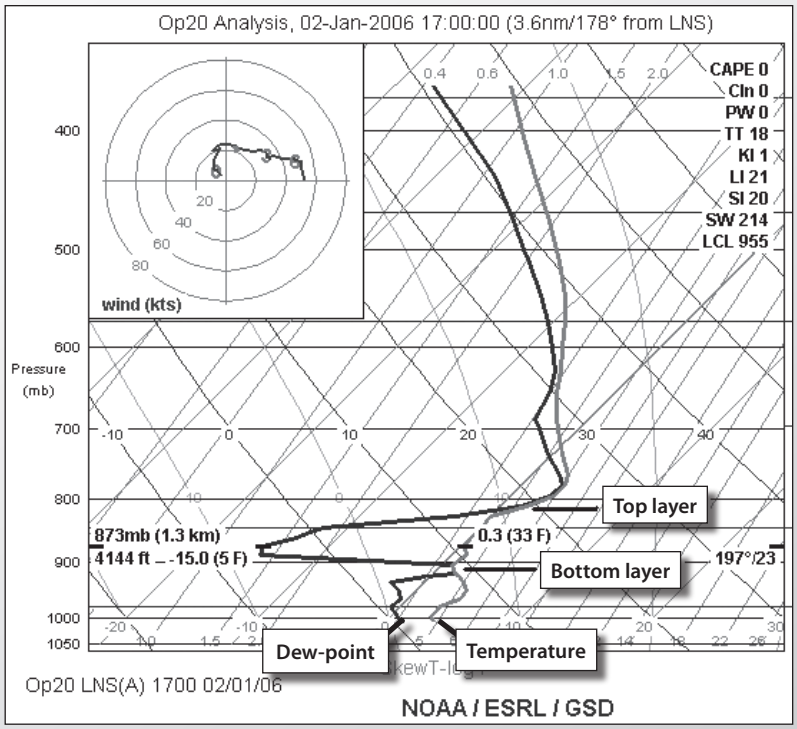
SOMETIMES IT PAYS TO CHECK THE WEATHER POST FLIGHT

Pilot reports (PIREPs) are one of my favorite ways to learn about the weather. When I was doing a post-flight review with my instrument student, I noticed this pilot report (PIREP) from the ADDS web site (right). We just happened to be flying southwest of Lancaster, Pa., at about the same time as the pilot of this Piper Aztec. What drew my attention was that the pilot reported flying between layers (BTWN LYRS) at 4000 feet over Lancaster and the pilot reported icing in precipitation (ICG IN PRECIP) while being in clear air.

We were also flying in-between layers at this same time, but didn't notice any icing.

I took this opportunity to teach my instrument student how to recognize what a layered atmosphere might look like. My first choice for this kind of detailed analysis is to examine the Rapid Update Cycle (RUC) sounding analysis (below, left). Since the PIREP is at 1726 UTC, the best I could do is to retrieve the sounding analysis for 1700 UTC.

It makes sense that clear air existed at 4000 feet. At this altitude, there's a 15-degree C dew-point depression (temperature/dew-point spread). There are definitely two saturated layers indicated above and below 4000 feet (shown by the temperature and dew-point lines overlying each other), implying overcast cloud layers existed at those altitudes. The base of the bottom layer is roughly at 2500 feet and the base of the top layer is roughly at 5400 feet.



The METARs for 1700 and 1800 check with this as they show the lower layer going from overcast to scattered and revealing the upper layer. (Field elevation at KLNS is 400 feet.)

KLNS 021653Z 11003KT 5SM -RA BR OVC019 03/01 A3014 RMK AO2 RAB02 SLP209 P0002 T00330011

KLNS 021753Z 09006KT 4SM RA BR SCT017 OVC049 03/02 A3009 RMK AO2 SLP193 P0004 60006 T00330017 10039 21011 58029

What about the report of light icing in precipitation? The temps between layers are above freezing, so where was the ice coming from? I bet the precipitation was partially evaporating into the dry layer, causing a cooling effect. This may have cooled to a temperature a degree or two below freezing in the clear air just above the lower cloud layer, giving rise to some freezing precipitation.

—S.D.

of severe turbulence." This kind of written discussion forces you to make precise observations without jumping to any specific conclusions. Often these sessions will uncover some of the knowledge that you are missing. After the time of the real flight passes, take a look at the surface observations and PIREPs to see how you did.

After each real flight, review it carefully as well. Record some specifics during the flight, such as the location and altitude you broke out on top, icing layers including type and intensity you may have encountered, temperatures (especially the freezing level) and turbulence you might have experienced. If possible, compare this against the charts you were using before you departed.

Weather forensics can be tough because many weather products quickly disappear from the internet and are replaced by newer ones. I typically archive my analysis from each flight. Basically, if I look at it, I save it.

The goal of this exercise is training yourself to pick out features from the products you used to point out where adverse weather existed or where it didn't exist. Was that area of thunderstorms really scattered as the forecast implied? Did that moderate turbulence cease once

you climbed into the stable layer that was forecast? Was that layer of stratus clouds only 2000-feet thick as you expected?

For my own flight planning and for working with my students, I created what I call the Internet WX-Brief Roadmap. The Roadmap is a comprehensive, ordered list of free NWS internet sites that I visit prior to each and every flight. Just like any checklist that I might use in the cockpit, I start at the top and work my way to the bottom. A checklist imposes a repeatable method and emphasize completeness. You don't want to fixate about whether or not you'll be able to stay on top of an icing layer, only to totally miss the 35-knot crosswind at your destination.

AOPA's weather site and the Aviation Digital Data Service (ADDS) are fairly comprehensive, but they don't include all the products that provide you with the best resolution in time and space. For example, ADDS provides links to the Storm Prediction Center's (SPC) convective outlook. I always look at this forecast, but it is a time-smeared product valid over a 24-hour period.

A lifted-index forecast from the North American Mesoscale (NAM) model, on the other hand, is available for three-hour blocks out to 84 hours. From the lifted index, I can get a sense of where the instability will be located *and* where it might be moving within that 24-hour forecast period. This may show a possible good route through what didn't look so promising before.

Visit the Pros

No, I'm not talking about paying a visit to your local flight school. Visit your local NWS forecast office (see http://www.wrh.noaa.gov/wrh/forecastoffice_tab.php for a list of offices). The forecasters at these offices are responsible for issuing the TAFs for the local area. Tell them you're a pilot and would like to observe how they build these point forecasts. Even though the local weather-forecast offices are not aviation-centric, a good amount of their time is spent constructing and amending the TAFs.

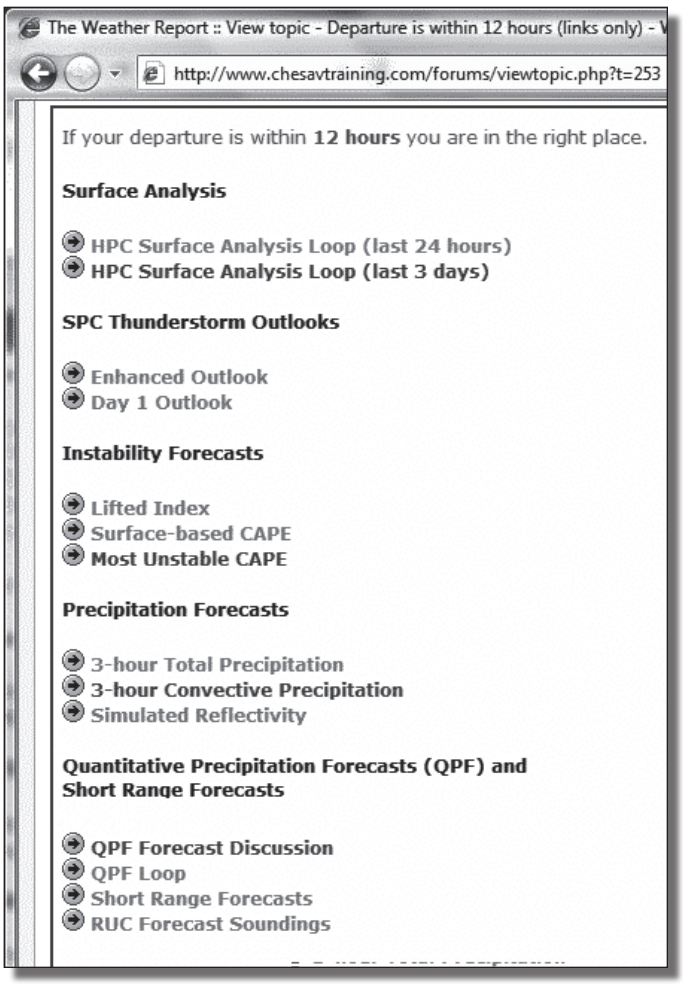
You might consider visiting the Aviation Weather Center (AWC) in Kansas City, Mo., (http://aviationweather.gov). The forecasters at the AWC issue convective SIGMETs, AIRMETs and SIGMETs as well as the area forecast (FA) and high- and low-altitude SIGWX products. You'll get an education about how difficult a forecaster's job can be and how vital PIREPs are to issue these advisories.

If you're up for a serious lesson, check out the NWS Discussions (the web addresses vary quite a bit but can be googled). Pilots often shy away from these because they can be highly technical and use a lot of unfamiliar terms. Even so, they can provide you with insight on the timing, movement and magnitude of a particular weather event. For example, a convective outlook discussion from the Storm Prediction Center may mention an upper-level trough becoming negatively-tilted with time, which might cue you to go check out that 500-mb chart. The area forecast discussions, or AFDs, typically have an aviation section and will often allude to the forecaster's confidence and provide insight and/or explanation behind his or her terminal forecasts. If thunderstorms are missing from the terminals because they are expected to be scattered or isolated, that's usually discussed in the AFDs. These are available for every forecast office in the nation.

Take Some Advice

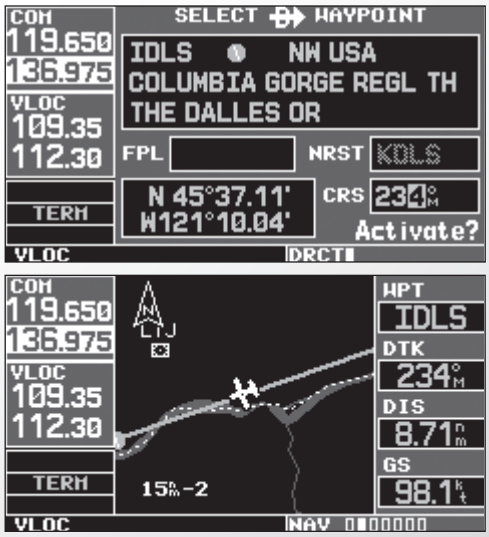
Low-time instrument pilots could consider enlisting an experienced pilot mentor. (Notice I didn't say, "experienced flight instructor.") This is a great way to tap into a resource that may lead you to new tools or techniques that you were not aware existed. Additionally, it provides another unbiased set of eyes to be sure that you didn't overlook anything.

(continued on page 20)



Right: *By developing a checklist of internet weather sites to visit, you will be able to have a repeatable process for each and every flight. Start at the top and work your way to the bottom. When you're done, you can be pretty sure you didn't miss anything. This checklist is part of the subscription to www.chesavtraining.com/forums/.*

FLY DIRECT-TO THE LOC ON YOUR TERMS



This is an old trick, but it's still useful now and again. When you create a direct-to the localizer fix, enter a course that matches the final approach course. To do it, push direct-to, enter the localizer identifier, but only push Enter once, instead of the double stab you're used to.

Next, turn the large, outer FMS knob one click counter-clockwise to highlight the course (CRS) field. Enter the final approach course from your approach plate using the FMS knobs and then push Enter twice.

This creates a magenta line similar to activating vectors-to-final for an approach from the database. After you intercept the localizer, you can use the airplane symbol on the line as a backup for your localizer navigation. Note that you won't get approach sensitivity unless you force it, but you probably won't be using a CDI either. — *Jeff Van West*

be flown. Jeppesen codes to a set of coding standards called ARINC 424. There is no provision within this standard that provides coding rules regarding LDA with glideslope. Because of this, Jeppesen cannot code the procedure or provide it to our customers."

I checked a couple other LDA approaches and, sure enough, she was right. The LDA Rwy 19R at Santa Ana (KSNA) without glideslope is in the database. The LDA/DME Rwy 28R at San Francisco (KSFO) with a glideslope isn't in the database. The distinction is the inclusion of a glideslope.

An LDA is similar to a localizer in use and accuracy, but not part of a complete ILS. An LDA is not aligned with a runway. When a glideslope is added to the LDA, it becomes a member of a new classification called Approach with Vertical Guidance (APV), which includes Baro-VNAV, LNAV/VNAV, and LPV. These approaches all have DAs rather than MDAs for straight-in approaches.

Incidentally, the LDA/DME Rwy 25 at The Dalles has an unusual notation that you must fly the glideslope to the MDA for the circle-to-land, too. There's some terrain in this area and a couple towers along the approach course that could be a nasty surprise if you dive and drive from LIREY.

The Missing Missed

While you can legally fly the approach by putting IDLS as a direct-to fix, that doesn't help if you can't find the runway at DA. We GPS-enabled fliers get spoiled knowing we can punch the OBS button and follow the magenta line on the missed. Not so for this approach.

It's not a trivial missed, either. You'll climb straight ahead and then fly a 135 heading to intercept the 165 radial off the Klickitat VOR (LTJ). Then you'll need to hold at the 15-mile DME fix. Get ready to put LTJ in that GPS and don't expect a pretty holding pattern on the moving map to help you visualize the hold.

All my time flying ILSs, which are coded into the database, gave me a false sense of security, figuring all fixes and intersections would always be in the box. I struggled with the decision to add a DME when I was upgrading my Cessna 172's avionics. Experience with my previous plane, a T210N with a GNS-430 and DME, made me feel, "We don't need no stinkin' DME."

I was right, but there are still holes in the system. Tracking inbound on final approach is not the time to be searching the database for an intersection or fix that may or may not be there. When it comes to new or unusual approaches, I think I'll try them out on the simulator or in VFR first.

Jim Follansbee is a commercial pilot who lives in Pasco, Wa., and owns a Cessna 172.

A STRATEGY FOR WX SAVVY

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Discuss your analysis with your mentor before each one of your flights (preferably with both of you behind a computer connected to the internet). Talk about specifics, but be objective. Make observations about your proposed flight, but try not to jump to conclusions too quickly. Highlight the hotspots of adverse weather and identify the risk as they relate to pilot experience and aircraft capability. In the end, both pilot and mentor will benefit from the experience.

I currently mentor about a dozen

or so instrument pilots including several that make the coast-to-coast trek. Most are amazed at how they build the ability to "visualize" the weather ahead and how well the forecast matches the actual weather along their route.

If the butterflies in your stomach are your primary way to make the decision to go or stay, you should consider making some time to further expand your weather knowledge and beef up your internet weather briefings. While no forecast is perfect, having a repeatable process that you practice using will build a useful, practical weather understanding that reduces your exposure to the nasty stuff in flight.

Scott Dennstaedt teaches weather for pilots in person and online. Contact him at scott@chesavtraining.com.

PLAN A REAL ALTERNATE

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gets the basics, but a lot of information is omitted. Among the missing information is the alternate, if any.

Even if the weather goes down at your destination or alternate there is no need to advise ATC of a revised alternate meeting the latest forecasts. It's a good idea to keep yourself aware of the big picture and have a viable Plan B in mind at all times, even if you don't have to share it with ATC—until it becomes Plan A and requires a new clearance, that is.

The bottom line is that ATC doesn't care what you filed; they just want to know what you're going to do now. You get to do what's safe, makes sense and does you the most good. You'll complete many more of your flights and enjoy that golf game you've been anticipating for so long.

Frank Bowlin plays the alternate shell game with ATC from his Cessna 340.

QUIZ ANSWERS *(questions on page 12)*

1. **c.** You're approaching the Kennebunk VOR (ENE).

2. **d.** You may only be 100 feet low in this snapshot but some immediate action is required.

3. **d.** Because you are on the holding radial, the recommended entry technique allows either teardrop or parallel, but anything that gets you turned around within the safe airspace works. You have no way of knowing which way the KQ pilot will turn.

4. **a.** The FAA recommends attempting to track course guidance when available. At station passage, dial the appropriate radial outbound.

5. **d.** This Beechcraft uses positive air pressure rather than suction for it's "vacuum" instruments. The final effect is the same, though, and, it's not working.

6. **c.** This is an unusual attitude for IMC. Think RCR: recognize, confirm, recover.

7. **a.** These describe the accepted sequence of events for the two major upset recoveries.

8. **d.** You have an emergency on your hands, so declare it. We didn't say why you went missed, so assuming the weather allows, you may want to attempt another approach. This airport also offers an ILS.

9. **b.** The point is that few controllers are pilots and can't mind-read the ramifications of an equipment failure – that's why "emergency" is a good first step and attention-grabber. Controllers know the phrase "no gyro," so using that should provide the response you desire.

10. **c.** No-gyro vectors are simple and effective. Use standard-rate turns if you are able; if not, do the best you can. Attempt to be consistent, as the controller is gauging when and how much to turn you based on how you have been responding. If you need no turns in order to settle down a moment, tell ATC.

11. **c.** The star by Portland App Con means the facility is part-time. It also turns out on this approach that Boston Approach vectors from the south on 125.05 per an agreement between the two TRACONs. You have no way of knowing Boston's frequency from the plate, but it reinforces that the plate doesn't always tell you everything.

12. **False.** Radar vectors supercede the procedure turn. If you'd like a turn for some other reason, be sure to have it approved before you turn.

13. **a.** Although vectors and the Manchester transition are "NoPT," beginning the approach at ENE or BYREN require a holding-in-lieu-of (HILO) procedure turn maneuver, as indicated by the thick racetrack.

14. **c.** or **d.** Runway 7 offers PAPI, REIL, and HIRL, via pilot control at this non-towered airport. No clicks equals pitch darkness.

15. **b.** We can see why you might say "c"; however, straight-in approaches technically reference height above touchdown (HAT), while circling is height above aerodrome (HAA).