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IFR

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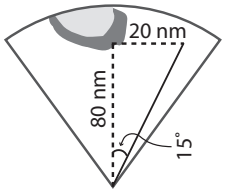
Training controllers at the speed of light ... page 9



Good math ... page 6

Bad Heading ... page 16

ALSO INSIDE THIS ISSUE ...

VOR approach that required a course change at the final approach fix. During that high-workload moment, my student inadvertently changed the altimeter to read 200 feet higher. Our first indication that it had happened was that the ground looked mighty close when we were down at MDA. That's scary.

With so much automatic slewing of courses, you rarely have to touch the CRS knob. It's only when you lose GPS or decide to fly a VOR approach that you really need to use it, which is exactly why the accidental altimeter change doesn't crop up more often and is easy to forget.

I now treat the CRS knob with the same care I would give the landing-gear switch on a retractable. Whenever I touch it, I think to myself, "Looks like a CRS knob; feels like a CRS knob; it must be a CRS knob." It is the only triangular knob on the entire panel, and if you try to grab just the tip of the knob, your thumb and first two fingers fall nicely on each side of the triangle. Once you start paying attention to the feel of the knob, it is hard to mess up.

In addition, I now cross-check my altitude against the backup altimeter at the final approach fix. If there is a discrepancy between the two, then I at least level off if not immediately start a climb to missed approach altitude. The final approach segment is the last place you would want to be diagnosing errors.

Viva the Error-Tolerant

Automation reduces some workload, but it's no panacea. If you approach automated flying with some discipline and really learn your systems, then you should be able to reap the safety benefits promised—even when the inevitable error crops up. If you let the system lull you into complacency with all it does for you when everything is going right, then you may find yourself at the wrong end of a no-longer-trivial mistake.

Peter King is a CFI in Bend, Ore.

POLARIMETRIC RADAR

The next generation of ground-based weather radar has some cool tricks up its sleeve, but don't expect to see them soon.

by Scott C. Dennstaedt

There haven't been any significant upgrades in the national network of weather radars since NEXRAD was introduced back in 1988. It was 15 years before data from these stations' radars appeared in the cockpit thanks to broadcast datalink weather.

So what will be the next big thing? Engineers at the National Severe Storm Laboratory in Norman, Okla., are working to develop a polarimetric NEXRAD Doppler radar. There has already been some scuttlebutt about what this new radar can do. It's cool stuff, but polarimetric radar isn't going to drastically change the way we do business.

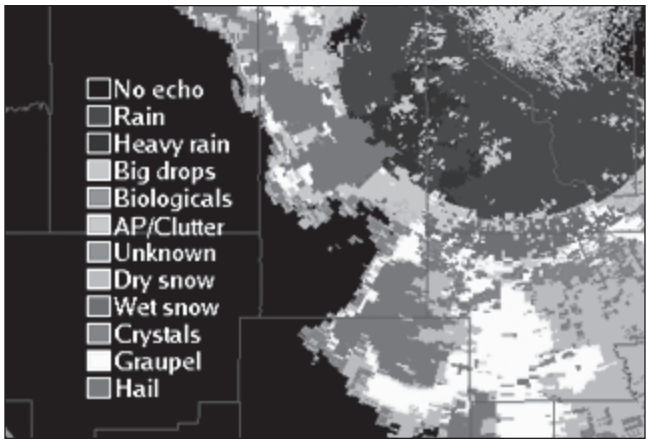
Radar with a Twist

Weather radars operate on a very simple principle. They send out pulses of energy (radio waves) and then listen to how much of that energy gets reflected back. The energy that gets reflected back is called base reflectivity and is measured in decibels of Z (dBZ), where Z is the reflectivity parameter. Scans are done at multiple elevations of 0.5 degrees to 19.5 degrees above the horizon.

Currently the NWS WSR-88D Doppler radars (NEXRAD) are not polarimetric. That means they only transmit and receive waves within a single horizontal plane at a time. Polarimetric radars transmit and receive energy on both a horizontal and vertical orientation. This allows the radar to measure both the horizontal and vertical dimension of cloud particles (such as cloud drops and ice crystals) and precipitation particles (such as rain, snow and hail).

Conventional weather radar can't directly tell what types of precipitation are falling from a cloud. Polarimetric radar can discern distinct signatures for rain, dry and wet snow, ice crystals, ice pellets (sleet), freezing rain and hail. It can judge drop size as well as detect false echoes such as ground clutter, anomalous propagation or even birds.

Below: *The polarimetric technology is an upgrade to existing WSR-88D. Norman, Okla., still has the only one.*



Left: *It's called the Dual-Pol Based Surface Precipitation Type Algorithm and it combines polarimetric radar data with surface temperature sensors and weather prediction model data to produce a fairly accurate depiction of freezing rain, snow, hail and other precipitation types*

These abilities have some interesting ramifications for pilots. For example, melting snow shows a distinct signature. This would provide the freezing-level height in precipitation events. Conventional radar cannot tell you directly about the potential for lightning, although a high dBZ return on the radar makes it a good bet that lightning is nearby. Polarimetric radar can't detect lightning either, but can see ice crystals in the cloud, which is a precursor for lightning. It also sees the horizontal or vertical orientation of the ice crystals, which might provide a clue where the lightning threat begins and where it ends.

Conventional weather radar can only hint at the presence of hail and estimate hail size in a thunderstorm. Hail, especially wet-coated hail, produces a high reflectivity (60 dBZ or more). Forecasters use a product (among others) from the radar called vertically integrated liquid (VIL). VIL relates reflected energy to the total water content above a given location. Higher VILs could imply the presence of hail, but it has some serious limitations. Polarimetric radar, on the other hand, will help identify the size and movement of hail shafts within thunderstorms with better accuracy and confidence than conventional radar.

Today's radar can identify a tornadic vortex signature (TVS) by using the velocity (Doppler) field produced by the radar. Many of these vortices don't result in a tornado reaching the surface. The only way at this time to identify that the funnel cloud has touched down is by someone seeing it, and then reporting it before they run like a greyhound for the next county. Once the funnel cloud starts to produce a particle debris-field after reaching the surface, polarimetric radar can lock in on the location and movement of the tornado.

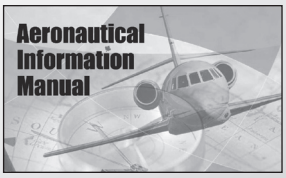
New Tool for Icing?

I asked my colleague and leading icing expert Ben C. Bernstein about the use of polarimetric radar for icing. He said, "Other than supercooled large drop (SLD) icing, NEXRAD pretty much can't see icing ... so it's missing 98 percent of the icing that's out there. Polarization allows you to see some information about the shape and canting of precipitation-sized particles, among other things. It's definitely useful, but its value for 'regular' icing has been pretty limited in my opinion."

According to radar researcher Dr. Terry Schuur at the National Severe Storms Laboratory in Norman, Okla., we are three to five years away from seeing polarimetric technology added to the current national radar network. Dr. Schuur added that much of this research on what polarimetric radar can see and tell us is yet to be done.

Based on the current schedule, upgrading the existing WSR-88D network could begin as early as 2011. If it demonstrates any use to pilots, a year or two later you can look for the new data on your Garmin 896 or iPhone III.

QUIZ ANSWERS *(questions on page 12)*



1. **c.** If you're heading more than 25 nm from your departure aerodrome, you need a flight plan or flight itinerary. The latter can simply be telling Bob you'll call him when you land.

2. **b.** Towers can open and close VFR flight plans just like IFR flight plans. Answer **a** is possible, but it never hurts to make sure. Answer **d** might be true, depending on how you read the regs.

3. **c.** The phrase "Line up" or "Line up and wait [reason for waiting]" is the ICAO version of the U.S. "Taxi into position and hold." Canada is changing their phraseology to fit the ICAO standard.

4. **b.** Call ATC and tell 'em what you need. The procedure is less common in Canada, though, so be prepared to get sloughed off to Flight Service

5. **False.** You're now a VFR flight with the same flight plan/itinerary requirements. Since you're landing at a towered field, it won't matter, as they'll close the flight plan for you. At an untowered field, though, you'd still have to call and close your flight plan.

Scott Dennstaedt is a former meteorologist, IFR *contributing editor, and flight instructor.*