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What the Examiner Sees – The ‘Navigation’ Area of Operation

by Larry Bothe, 8/24/2013

FAA Practical Test Standards for Private Pilot require that applicants be able to navigate by pilotage, dead reckoning and electronic means. They must also demonstrate an ability to divert to an airport to which they had not originally intended to go, and know the procedures for locating themselves in the event they get lost. In this installment of the *Examiner Sees* series we’ll examine each of these tasks to point out common errors, and how to avoid them.

The biggest single problem with pilotage and dead reckoning is not keeping track of time. Increasingly, especially among young people, applicants come to the checkride without a wristwatch. Watches are no longer cool. You can look at your cell phone if you want to know the time. But cell phones as time-keeping devices don’t work very well in airplanes. It’s in your pocket when you need to look at it. If you leave it out it falls on the floor, and you’re unlikely to be able to retrieve it in flight. How about the clock in the instrument panel? Most airplanes have one; why not use it? Because it probably doesn’t work. Clocks fail and operators don’t replace them. A panel-mounted clock is not required for VFR flight. (If the clock in your training aircraft doesn’t work make sure it’s placarded INOP. If not, the plane isn’t airworthy.) The wristwatch is a tool of the trade for pilots; have your student get a watch. It’s not necessary to spend hundreds of dollars on a fancy chronograph. Walmart carries Casio/Timex/Armitron chronographs, even in ladies sizes, for \$20 to \$35.

GPS is rapidly overtaking VOR as the primary form of electronic navigation in light training aircraft. However, VOR is going to be around for the long haul. I attended an FAA presentation at Oshkosh this year where we were informed that the current network of just under 1000 VOR’s will be reduced to about 500 by the year 2020. Those remaining 500, mostly in the western mountainous areas, will form the Minimum Operating Network; the backup system to GPS. The FAA’s concern is that if bad guys disrupt (jam?) the GPS signal regionally then we still need some way for airplanes to find their way and get on the ground. (If the entire GPS system were to go down then we would have some enormous problem almost too horrific to contemplate!) The point is that learning how to use the VOR system is still valid, and will be for years to come.

The FAA does not require that Private Pilot applicants know how to use VOR specifically, but it does require the demonstration of “the ability to use an airborne electronic navigation system.” As a practical matter that means either VOR or GPS, or perhaps, increasingly rare, ADF. Further, the FAA guidance to DPE’s is that any equipment in the aircraft presented for the practical test is fair game for testing. If the only electronic guidance system in the airplane is VOR then the applicant will obviously have to know how to use it. If the plane has both VOR and GPS, or the plane has VOR and the applicant brings along a portable GPS, VOR can still be tested. Bottom line: If the plane has a VOR receiver the applicant needs to know how to use it.

And please don't placard the VOR "INOP" to avoid your student being tested on it. DPE's hate that ploy. If the VOR is INOP there should be a supporting entry in the maintenance logs, and it better not work if the examiner turns it on. After all, it was supposed to be disabled, right? If it works and the applicant doesn't know how to use it, remedial training will be in his or her immediate future.

Here's a situation for you to avoid. If the airplane you are training in has only VOR for electronic navigation, don't loan your student your personal handheld GPS for his/her solo cross-country flights. If you do then they won't pay any attention to the VOR, even though you tell them to use the VOR and take the GPS "just in case." Human nature says we take the path of least resistance, and GPS is a whole lot easier. They won't use the VOR, and they won't learn it.

In the past few months I have had two applicants fail in the electronic navigation task. In both cases the airplane had only VOR, and the instructor loaned them his GPS for their cross-country flights (but not for the checkride - ??). In both instances I had told the applicants, during the telephone briefing a week or so before the checkride, to plan a cross-country using VOR navigation. Being tested on VOR was not a surprise to them. In the first failure the applicant had no idea that he couldn't receive the VOR signal at low altitude while still a long distance from the station. After all, GPS signals come down from the sky and have no such limitations. The instructor never told him about VOR service volume. He was so confused by not being able to receive the VOR signal that he became disoriented, got lost, and gave up. If he had just flown along using pilotage until receiving the VOR signal he would have been just fine, but he didn't know that. (Low clouds prevented him from climbing.) In the second instance the applicant was unable to perform the simple task of "take me to the XYZ VOR", even after I pointed out the nearby VOR on the chart and read him the frequency. How simple can it get?

Another error in the two instances mentioned above is that both applicants wandered all over the place while trying to sort out their problem. They flew as much as 150 degrees off the course they had computed to get to their destination. Tell your students to fly in the general direction of where they want to go while they solve the details of a navigation problem. If you know you need to go generally east to get where you want to go, then head East. Anything else is counterproductive, more confusing, and wastes fuel. By the way, the same principle applies in the Diversion task. If the examiner presents a scenario like "you can't go back to your home field because the runway is closed due to a gear-up landing; where will you go?", then turn the plane to head in the general direction of the alternate airport you have picked. You can refine the navigation solution while getting closer to where you want to be.

Speaking of refining a navigation solution, lately, even when applicants understand VOR, some take very large intercept angles, occasionally more than 45°, to get back on course. Sharp zigging and zagging is inefficient at best, and can result in crossing the desired course so fast that the applicant wonders how the needle got on the other side. That confusion can lead to major needle-chasing. I teach initially turning 20° toward the needle, and then have patience to wait for it to come in. If you don't get the desired needle movement in a few minutes (not seconds!) then turn an additional 10°. Still not working? Has the student checked the DG against the wet compass since he took off? Many navigational difficulties can be corrected by

simply setting the DG and then correcting your heading. The DG should be checked every 10 minutes in flight.

I often test “Lost” by asking the applicant where she is, right after completing the required ground reference maneuver, which was preceded by hood work and the simulated engine failure. That means the applicant is about 800 feet above the ground and has just done a lot of maneuvering. So CLIMB already! It’s just not safe to stay down close to the ground for extended periods of time if it’s not necessary to be there. Besides, you’ll be able to see further, and both your VOR receiver and voice radio will work much better. But some applicants just head off at 800 or 1000 feet, oblivious to radio towers and other obstructions. I may give a hint, like “you’re making me uncomfortable here”, but I won’t put up with it for very long, because I *am* in fact uncomfortable. Don’t scare the examiner!

During the oral portion of the checkride we discuss lost procedures. The first answers I often get are using VOR triangulation, or GPS. That’s good, but what about non-electronic solutions? When I became an examiner in 2002 most applicants knew that towns have their name painted on the water tower, but today I rarely get offered that solution. Not technical enough? When I mention “lost” applicants sometimes become totally empty-headed, like they know nothing. But even pilots who become “temporarily disoriented” (P-C for “lost”) still know the general area. If you’re out flying around in southern Indiana and you get lost, you’re still in southern Indiana. You have not suddenly been mysteriously transported to West Texas. If I-65 is to the East, or the Ohio River is to the South, those terrain features are still there. Fly to one, find a town, read the name on the water tower.

Badly confused? Low on fuel? Getting dark? Could you get help from the outside world? Sure, I can call somebody on the radio. OK, who would you call? I often hear that “I’ll call the so-and-so tower.” For some reason today’s Private Pilot applicant thinks that all control towers have radar. I guess the thought of controllers directing air traffic solely by looking out the window is just too low-tech for them to even consider. A visit to a control tower would really help your student understand how the system works. After we determine that towers don’t have radar (I know, B & C towers have a repeater off Approach Control) then the applicant thinks maybe calling Approach would be a good idea. Then I ask what frequency they would call on. Much shuffling followed by blank stare. They don’t know that approach control frequencies are in the easy-to-find white boxes near Class C airspace. Why? Because you didn’t tell them! Don’t skip over things that you think are obvious. They aren’t obvious to a student pilot. Better yet; during a dual cross-country have your student call Approach Control and ask for assistance to get to a nearby airport. Once they do it and see how easy it is they will remember the procedure, and they won’t be reluctant to call if they really need help when they’re out there alone.

I don’t want to leave you thinking that somehow I’m opposed to students using GPS during their Private Pilot training. On the contrary, I’m dismayed when I have an applicant that has never used GPS. It’s the way of the future. The plane I recently started teaching in has a Garmin 750 touch-screen navigator in it, and my 1961 7EC Champ has a panel-mounted GPS/COM radio (and no VOR). I allow Private applicants to use GPS, if they have it, on every checkride. I just don’t like it if they have VOR in the plane but have not been trained to use it.

GPS has revolutionized the way we navigate. It's easier to understand and use, and provides a lot more information than a VOR receiver. But the venerable VOR is here to stay, and pilots need to know how to use it. If it's in the plane, make sure your student can navigate with it. Pilotage and dead reckoning are necessary if the electronic stuff goes dark. Have them keep time (get a wristwatch); and especially note time-off (write it down). Teach your student that if he or she gets lost, or has to divert to another airport, they should climb to a safe altitude, at least a couple thousand feet above the ground. They'll be safer, see further, their radios will work better, and ATC will be able to "see" them on radar. Show them how to locate frequencies on a chart, both the white Approach Control boxes near Class C and on the frequency tab on the edge of the chart. They won't have any trouble doing the Navigation tasks for the examiner, and hopefully won't often become temporarily disoriented in the real world.

Larry Bothe is an FAA Designated Pilot Examiner, FAAS Team Representative and Gold Seal Instructor in the Indianapolis, IN FSDO area. He is also a Master Certified Flight Instructor and has over 7000 hours in more than 80 types of aircraft. Larry is part-owner of a 1961 7EC Champ and may be contacted at LBothe@comcast.net.

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