What the Examiner Sees – Aeromedical Factors

by Larry Bothe, 6/28/2014

One of the less exciting subjects we have to test Private Pilot applicants on is aeromedical factors. Most physiological problems are rare in the real world of flying. However, that task is in the PTS so we have to do it. DPE's are not permitted to skip anything in the PTS. There are 8 aeromedical factors listed, and the instructions say we must select at least 3 of them. The applicant then has to demonstrate knowledge of the symptoms, causes, effects and corrective actions for the selected conditions. In addition, applicants have to know about the hazards of taking medications and consuming alcohol, and about nitrogen in the bloodstream (SCUBA diving).

In keeping with the concept of scenario based testing, we don't ask: "What is hypoxia?" Rather, we might pose the situation that you are on a long flight in the summer and climb up high, say 9,500 feet (eastbound), in order to get cooled off and get the benefit of a tailwind. If everyone in the plane becomes very sleepy, what might be going on? What will you need to do about that? The important point is that in order to do well on oral quizzing in aeromedical factors, the applicant must be able to relate the information to real-world situations -- not just spout off definitions and fixes from rote memory. A corollary to that is applicants should know the early symptoms of each type of problem. You never want to let yourself or your passengers get to the extreme symptomatic end, such as passing out or passing away, or blowing lunch all over the inside of the airplane.

It's actually pretty easy to make up a quick scenario for each of the 8 aeromedical factors. Here's a run-through.

Hypoxia: The first symptom of hypoxia is sleepiness. Don't believe me? The next time you go up in an airliner, take a look around you during the initial climb. Half of the passengers nod off. Why? Because most airliners are pressurized to a cabin altitude of 8000 feet. About 30% of sea-level oxygen is no longer available at that altitude. Feel sleepy and want to confirm hypoxia? Have a look at your fingernail beds. If they are blue/purple instead of healthy pink, you have hypoxia. Your lips will be blue too, but you probably won't have a mirror available to check. A pulse-oximeter would be handy, but most people don't have one. For a real story of extreme hypoxia Google 'Payne Stewart' and read the Wikipedia account of that accident (1999). For fun: Ask a guy to look at his fingernails and he will curl his fingers, bend his elbow, and look at his hand, palm inward. A girl will extend

her arm full-length, point her fingers nearly straight up, and look at the back of her hand. Try it.

What will you do if you think you have hypoxia? Well, if you have supplemental oxygen aboard you can use it, but most light planes are not equipped. In 41 years and over 7000 hours I have never donned an oxygen mask (or cannula). That leaves you with no choice but to descend. Hot and bumpy down there? Lousy viz? Do it anyway.

Carbon monoxide poisoning: Here's another one that I have never personally experienced (in the air), and have never known anyone who has. But I have had CO poisoning on the ground (car, closed garage, dumb teenager), and I can tell you that the symptoms of headache and nausea are very real. I get strange answers when I ask applicants what to do about CO poisoning. Very common is "close the vents". What "vents"? A much better answer would be "turn off the cabin heat". OK, then what? "Open the window". I get that answer even when the flight test aircraft doesn't even have windows. At about this point I know I'm getting rote memory answers with no real understanding. "Open all the fresh air vents" would be so much better. Well, how would CO ever get into the cabin? I thought there was a firewall separating the engine from the cabin--?? Here is where once again it really helps to have taken your student to the maintenance area and shown him an airplane with engine cowling removed. Show him how the heating system works and then he'll understand.

With the CO poisoning line of questioning I often get the "land as soon as possible" answer. That's also a favorite for any sort of system or equipment malfunction when the applicant doesn't really know what to do. We know that at some point you will land and have the problem corrected. What we are trying to ascertain is whether or not the applicant knows what to do in order to maintain safe flight until a landing can be made. In many parts of our country landing right away may not be an option.

Middle ear and sinus: What will you do if you are descending for landing and your passenger complains that her ears hurt? Chewing gum or swallowing might help, but the best answer is "I'll have her do the Valsalva maneuver". I don't care if the applicant knows the name, but he should know the procedure; close your mouth, pinch your nostrils shut, and try to blow out. Then swallow. Blowing out raises the pressure in the inner ear to equal (or exceed) the increasing outside pressure, and swallowing relieves any excess. If that works, and it usually does, the problem is solved. But if it doesn't, and your passenger's ears really get painful, you'll have to go back up again. How high? Applicants sometimes really agonize over the "how high" question. The answer is obvious -- however high you were during the

flight. Going back up to your maximum altitude lowers the outside (ambient) pressure to equal the trapped middle ear pressure. A quick Valsalva maneuver will relieve any small remaining imbalance. With your passenger's ears cleared you can again initiate a descent. Keep the descent rate low, less than 500 FPM, and have your passenger perform the Valsalva maneuver about every 5th breath. That will keep middle ear pressure equalized with ambient and prevent a strong blockage as happened the first time.

Motion sickness: Ah, here's one that's common. First, don't take people you don't know flying on bumpy days, and a first-time airplane ride should never exceed 20 minutes, no matter how much the passenger appears to be enjoying it. Make sure passengers eat something before going up. Tell them the day before the flight. Inexperienced ones sometimes think that they won't get sick if their stomach is empty, but the opposite is true. You have to keep an eye on passengers. Sometimes they won't say anything about feeling sick until they are *really* sick, because they are embarrassed. A sure sign is if your passenger becomes very quiet. What now? Suggesting that passengers fly the plane "to take their mind off it" doesn't work; they won't fly if they feel lousy. Once you determine that a passenger is sick, the ride is over. Head back to the airport, and fly very smoothly along the way. No more yanking and banking to look at things. Open the air vents to get your passenger some fresh air. Have him look out the front at a fixed point on the horizon. You do know where the sick-sacks are in the plane, and you can get to them quickly, right?

Spatial disorientation: Not knowing which way is up. At the Private Pilot (non-IFR) level this is most likely to happen when taking off from a country airport on an overcast night with no surrounding ground lights. As you rotate and start to climb out the windscreen suddenly goes black, all black. The pilot abruptly turns his head to look down and to the rear for lights, which are no longer visible because they are way back, under the tail. Then he whips his head back to the front, desperately looking for some sort of horizon reference. He's disoriented. There is no choice but to fly on the artificial horizon until some ground lights finally appear. That's much easier said than done if you haven't practiced for a while, and didn't expect the problem in the first place. It's right up there with partial-panel in the IFR world; people die trying. What should you do about this? My best suggestion is avoidance, followed by practicing IFR flight more often.

Stress & fatigue: Ever have one of those days when nothing goes right? If you have trouble driving your car to the airport you shouldn't be flying a plane. If you had difficulty at work or an argument with your significant other, going flying won't suddenly clear your head and relieve your stress. Rather, the distraction of your problems will more likely impair your ability to

conduct a safe flight. Avoidance is the best plan, but if you get up in the air and become all stressed out, you need to terminate the flight. Go back to the airport and land, or if it's a long trip, land and get some rest, continue the next day. This is one of the few instances where "land as soon as possible" is the right answer.

Dehydration: The symptoms are thirsty, headache, inability to concentrate, confusion. How would a pilot become dehydrated? How about by working on the plane when it's really hot out, being late, and taking off in a big hurry without pausing to drink enough liquids. That would do it. Very often when someone gets a headache and takes medication, it's not the meds that made him feel better, it's the glass of water he drank to take the meds that did the trick. The best thing to do is simply take water with you in the airplane. And don't cut off your intake of liquid before a flight before you make a trip because you don't want to have to stop to pee. If you get dehydrated you'll have to land anyway to get water.

Hyperventilation: I have never experienced hyperventilation, either myself or in an airplane passenger. The symptom is the action, very rapid breathing, mouth open, like a dog panting. The best remedy is for somebody to tell the person to consciously slow their breathing rate. Breathing into a paper bag is also said to help, but that assumes there is a bag available, unlikely in an airplane. What can cause hyperventilation? Fear, stress, panic attack. Beware of fearful passengers. If they are really afraid of flying they should not be made to go up.

Years ago I was taking a large group of Explorer Scouts (teenagers) for quick airplane rides. Other than the obligatory passenger briefing, I wasn't paying any attention to them as individuals. After one takeoff I looked into the back seat and found this girl frozen in place, wide-eyed, not speaking. She was petrified with abject fear. I made an abbreviated pattern and landed immediately. I later asked her why she went up. She said her friends made her do it. Talk about peer pressure! I should have been paying more attention.

If you are about to take someone for an airplane ride and you learn that they have been SCUBA diving earlier in the day, what will you do? No ride today. When could we go? The practical answer is *tomorrow*, and don't go diving in the morning. There is a complicated rule about waiting at least 12 hours if it was an uncontrolled ascent, and 24 hours if it was controlled. Even the shorter 12 hour period will probably end long after I'm home in bed, so *tomorrow* covers it all.

Can you fly if you are taking medication? Maybe. Does it matter if the medication is prescription or non-prescription (over-the-counter)? No. If you look at AOPA's extensive listing of medications online, will that tell you? Not necessarily. Sound confusing? Yes. So how do we know? I personally take 3 medications every day. How do I know it's OK to fly? The answer is the same for everybody: **Call your airman medical examiner's (AME) office and ask.** Don't have an AME because you're a Sport Pilot? Call the FSDO and get a list of area AMEs and call one of them. Why can't you just use the listing on the AOPA website? That listing of more than 2000 drugs doesn't account for drug interactions that could occur from taking more than one drug. Why can't I just ask my regular (non-AME) family doctor? Because he is not specially trained in aviation medical concerns the way an AME is trained. So the correct answer is "I'll call my AME and ask."

I have never quizzed an applicant who didn't know about the 8-hours bottle to throttle rule with respect to alcoholic beverages and flying. Unfortunately, that's often about all they know. It's very possible to have not had a drink for 8 hours and still not be anything like safe to fly. It's the dreaded H-word: Hangover. When I was in the Army in the fall of 1965 and stationed in northeastern PA, I got orders to go to Vietnam. There was a party, and I had more than a few drinks. I had been invited to ride along on a courier run to Ft. Dix (McGuire AFB) in NJ the next day. I dragged my sorry butt out of bed at 6:30 to make the 8:00 AM departure in a de Havilland Beaver, but it was a big mistake. I think the 450 HP Pratt & Whitney was inside my head. I never knew they could be so loud! Had I been "straight" I could have gotten some stick time, but I could no more have flown the plane than walk on water. There is way more to the alcohol thing than 8 hours.

When examiners quiz applicants about aeromedical factors we aren't expecting them to have in-depth technical knowledge about these problems. Rather, we are looking for a basic understanding of what to do when one of these problems crops up, so the flight can be continued safely until the problem can be remedied. If the examiner and the applicant can have a reasonably intelligent discussion about the 3 aeromedical factors the examiner chooses (examiners rarely choose more than the minimum), and talk about alcohol, drugs and nitrogen, then the applicant will do just fine in this portion of the practical test.

Larry Bothe is an FAA Designated Pilot Examiner, FAASTeam 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.