FLYING LESSONS for June 6, 2019

by **Thomas P. Turner**, Mastery Flight Training, Inc.
National Flight Instructor Hall of Fame inductee

FLYING LESSONS uses recent mishap reports to consider what *might* have contributed to accidents, so you can make better decisions if you face similar circumstances. In almost all cases design characteristics of a specific airplane have little direct bearing on the possible causes of aircraft accidents—but knowing how your airplane's systems respond can make the difference as a scenario unfolds. So apply these *FLYING LESSONS* to the specific airplane you fly. Verify all technical information before applying it to your aircraft or operation, with manufacturers' data and recommendations taking precedence. **You are pilot in command and are ultimately responsible for the decisions you make.**

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This week's LESSONS:

I saw a sign an Air Force friend had posted on Facebook, reminding pet owners that the temperature of parking lot pavement is much higher than the ambient air temperature on a sunny day, and that pet owners should not let their animals walk on the pavement when the reported temperature is more than about 80°F (27°C) to keep from burning their paws. That reminded me of a phenomenon not usually reported in aviation circles, certainly not in the United States: the concept of **runway temperature**.

Runway temperature (the temperature of the air over a paved runway) can be as much as 40°F (5°C) above that reported by ATIS, ASOS or AWOS on a hot, sunny day. The atmosphere warms from the surface up. Solar radiation is absorbed (or reflected) by the surface; the air just above the surface is then warmed by contact. Warm air will rise, to be sure, but the greatest heat can dissipate a short distance above the ground—or the runway.

That is significant, because it's that lowest level of the air that determines an airplane's takeoff performance. The wing, especially in low-wing airplanes, is clawing through this layer to develop lift for takeoff and depends on the drag from this air to match distance expectations during landing. The engine is sucking on this hot, low-density air to combine with fuel to turn it into power. If the airplane is propeller driven, the prop is chewing into this lowest level of air to turn that power into thrust.

Be very conservative about performance margins when departing or landing any paved runway on a hot, sunny day. The airplane will probably not perform even as well as a careful performance calculation may predict, if the reported air temperature is the basis of the calculation.

Even without the phenomenon of runway temperature, density altitude is often more a factor than many pilots might think. For example, last summer I took a pilot in his Beech Bonanza an hour and a half or so west of my home at Wichita, Kansas (elevation about 1500 feet Mean Sea Level, or MSL). Kansas is mainly flat, but it's tilted at an angle—the typical elevation on its eastern border is around 900 feet MSL, and the elevation around 350 nautical miles at the border with Colorado is a little over 3500 feet. You don't see many hills, but you're going uphill all the way west.

3500 feet doesn't *seem* terribly high, and it's certainly not mountain flying. But it's high enough that as the temperature rises the density altitude has a big impact on airplane performance.

Consider this table of density altitudes I calculated for summertime temperatures at that "still low altitude" airport in the typically low humidity of America's outback:

Temperature °F	°C	Density Altitude
70	21	5317 ft
80	27	5931 ft
90	32	6532 ft
100	38	7120 ft

Even in flat Kansas, not a mountain in sight, the density altitude can (and does) reach Rocky Mountain proportions when the air is hot.

Your takeoff technique will need to vary with increases in temperature, sometimes when you wouldn't think about calculating density altitude at all. Even field elevations near sea level can have a high enough density altitude on a hot day to require a change in your technique. Compute density altitude for any airport where the ambient temperature is above about 70℉/20℃. Add say 20°F/3°C to the reported temperature and use data from this calculation as a safety buffer for your hot-runway performance.

Add the concept of runway temperature, and you should be leaning the mixture for best takeoff power and monitoring the airplane's takeoff performance when departing *any* runway at *any* elevation.

Questions? Ideas? Opinions? Send them to mastery.flight.training@cox.net

Debrief: Readers write about recent *FLYING LESSONS:*

First a correction thanks to several readers. In last week's report I mentioned that the FAA pilot database has no record of pilots' BasicMed status. I was wrong, at least partly. When a pilot completes the required BasicMed online training course initially and every two years afterward (remember it's a recurring requirement, BasicMed pilots), "big brother" tells the FAA that pilot has done so. The airman's record is updated with the course completion date, indicating at least the intention to adhere to BasicMed requirements.

The airman's record also includes the BasicMed CMEC date, the date the online Form FAA 8700-2 - Comprehensive Medical Examination Checklist (BasicMed) was completed. This is the form the pilot takes to his/her physician, a copy of which the pilot must maintain in his/her pilot logbook. Reading the instructions, there is no requirement for the completed form to be sent to the FAA, or for the doctor to notify the FAA about the results of the exam. So having filled out the form does not necessarily mean the pilot has actually fulfilled the requirements of BasicMed certification. It's up to the pilot to produce the proof on demand it the question ever arises. Thanks to the current BasicMed pilots who prompted me to look deeper into this—as I said last week, I'm constantly learning too.

The lack of BasicMed info for the person assumed to me Pilot-in-Command of the Lake Michigan Bonanza makes the idea of intentional noncompliance more likely in the case of the cold-water ditching we discussed in the past few weeks. However since the airplane impacted under control, and the occupants appear to have exited the airplane before being lost, pilot capability or compliance status doesn't seem to have been a factor—except to the extent that the nonconforming attitude may have contributed to the decision to fly over deadly-cold waters in a single-engine airplane in the first place.

See:
http://www.mastery-flight-training.com/20190530-flying-lessons.pdf
https://www.faa.gov/documentLibrary/media/Form/FAA_Form_8700-2.pdf

Frequent DeBriefer Lorne Sheren writes:

> Assuming that normally we land with full flaps, why further compound a difficult situation by landing in a configuration that is unfamiliar (partial or no flaps)? I would much rather land in a strong crosswind with the aircraft configured the way I am most familiar and comfortable with. Why compound an already challenging situation by landing in a configuration that is rarely, if ever used?

You can argue this both ways. I agree, and try to land the same way every time to the extent possible. That includes flap position, which determines speed, attitude and power requirements and the visual cues that are all part of an accurate landing. Still, I also land flaps up every now and then to keep myself ready for the possibility. I include no-flap landings in the training I provide for the same reason. As Lorne knows, in the type of airplane I most commonly fly the flaps are electrically driven. A loss of electrical power means there is no way to extend the flaps. Outside of that, however, I personally use full flaps for every landing. Thanks, Lorne.

Reader Joe Pullium is on the same page for a different reason:

> I did some no flap landings in the Baron on my last [Flight Review]. Not a big deal other than a longer rollout and different sight picture at touchdown. I don't think [it's] too bad an idea to do in case you have to land with some ice on the plane.

That's a valid thought too, Joe. If you have airframe ice you don't want to be adding flaps that can cause the tailplane angle of attack to become critical and stall.

Back to flights over water, reader Tom Haskin makes an interesting point:

> The *LESSON* on flights over water was very interesting. It brought to mind pilots who fly far offshore to spot fish for commercial and game fishermen. May of their single engine airplanes are modified to carry extra fuel. It would be interesting to learn how they prepare for emergency ditches, since they do on a daily basis what so many of us find too risky. Here is a 1990 *Sports Illustrated* article about some pilots who make their living spotting fish off the east coast.

See https://www.si.com/vault/1990/12/03/123208/dogfights-over-fish-its-aerial-war-when-tuna-spotters-fly

Yes, that's a very interesting article! The featured pilot isn't the poster child for risk management either—certainly the author wanted to paint him as a "colorful character." That said, I know some fish spotters who take risks, for sure, but nothing like the article implies. The biggest advantage they have when flying single-engine over water? By design they are always in radio contact with and in close proximity to boats staffed by people who know the airplane is there and will be able to respond immediately if the pilot radios that something has gone wrong, or if radio contact is suddenly lost. Thanks for the article, Tom.

Reader Josiah Jameson makes me feel good about the newest generation of career-bound pilots. He writes:

> After reading *FLYING LESSONS* for the past six months, I wanted to reach out, and thank you for what a wonderful job you do. As a fairly low time, 17-year-old, instrument rated pilot, *FLYING LESSONS* has been a great tool for developing my piloting skills. I really appreciate how you take one thought provoking topic each week and break it down, so we as readers can learn from it. I like how you share the mistakes you and others have made, so that less experienced pilots, such as myself, can learn from them. I appreciate you spending the time to produce such a great training material that is available to any pilot who wants to read it. You are doing an outstanding job encouraging those of us who do read it to make better decisions while flying. Keep up the good work!

I was going to skip publishing *FLYING LESSONS* this week because I have so much other writing to do in the short term. But your email made me want to stay up an extra while and get another edition out, even if it's a short one this week. Thanks for letting me be a part of your training, and also for letting me know I'm part of it. ***You*** keep up the good work, Josiah, and let me hear about your progress and your adventures every now and then.

Questions? Comments? Suggestions? Let us know, at mastery.flight.training@cox.net

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From all the comments that flow through your *FLYING LESSONS Weekly* issues it is very clear that you are making a difference in aviation safety and enjoyment. The list of those who can make that kind of impact is very short. – Gerald Gaige

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