FLYING LESSONS for November 25, 2021

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 in your success as the 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.**

FLYING LESSONS is an independent product of MASTERY FLIGHT TRAINING, INC. www.mastery-flight-training.com

Pursue ***Mastery of Flight***™

This week's LESSONS:

***FLYING LESSONS*' mission** is to use the circumstances of recent aircraft accident reports to suggest things we need to think about and do in our everyday flying. I've been publishing *LESSONS* online nearly every week since 1998, beginning with my Beech Weekly Accident Update (which I still publish concurrently with *FLYING LESSONS* at www.mastery-flight.training.com). Over the years I think I've got a good handle on the long-term accident trends in light airplanes.

The bad news is that accidents result from the same things done again and again and again. **The good news** is that accidents result from the same things done again and again and again…meaning that **most accidents are predictable**, and with that predictability, **we can take active steps *before* a mishap to severely limit the chances** we will repeat accident history.

A few years ago my friends at AVEMCO Insurance (a past *FLYING LESSONS* sponsor) asked me to write a synopsis of what I've learned. The result was a two-part article published in January and February 2016. You can read the whole thing through those links if you wish; I'll list the basics here again now, and consider whether anything has changed in the last five years.

See:
https://www.avemco.com/news-events/pirep-blog/accident-prevention-facts-from-the-master-part-i
https://www.avemco.com/news-events/pirep-blog/accident-prevention-facts-from-the-master-part-ii

From those articles, here are the long-term *LESSONS* from (then) almost two decades of tracking lightplane mishaps:

- **Don't push it with fuel.** Plan to land with no less than one hour in the tanks, including reserves…and have the discipline to land before violating that plan, even it if means landing just a few miles short of your intended destination.
- **Consider weighty matters.** Don't take off without absolutely confirming the airplane is loaded within its approved envelope, and will stay within its envelope as fuel burns in flight. The more critical performance becomes—short runways, density altitude, obstacles to clear—the further from the edges of the envelope you ought to be. The closer to the edges of the envelope the fewer options you have, especially if something starts to go wrong.
- **Stay within limitations—**limits on the airplane, the environment (weather, etc.) and yourself.

- **Employ SOPS.** Standard Operating Procedures means using industry best practices to do things the same way every time as much as possible, so you can predict what the airplane will do and have more mental bandwidth to deal with unusual situations. If circumstances require you to deviate from SOPs, you can only do so safely by knowing the results of the "standard" way to fly so you can predict *how* to fly differently, and what the airplane's response to your different technique will be.
- **Fly stabilized approaches—**a valuable SOP. 'nuf said.
- **Get real about fatigue.** Establish a duty day length, and don't violate this personal limitation.
- **Involve your passengers and family.** It's likely you'll find that external pressures to "go" will cease when your passengers and family know ***why*** you make a no-go decision.
- **Maintain your airplane.** What most aircraft owners call "maintenance" is really three different things: ***inspection, maintenance and repair***. We inspect airplanes before flight, annually and at other times to ensure they are airworthy. We maintain airplanes proactively to keep them airworthy, and prevent the need for repairs. We repair airplanes if inspection reveals that our attempts at maintenance have proved unsuccessful (or if a sudden event has damaged the aircraft). Accident history shows that trouble happens when owners ignore their responsibility to continually maintain their airplanes.
- **Put time into training.** Periodic training through the year is **the maintenance you need** as a pilot—the skills equivalent of maintaining your airplane.
- **Get comfortable with angle of attack and stalls.** Most pilots who are uncomfortable flying the proper speeds for landing and takeoff feel that way because they don't spend enough time flying at high angles of attack. To make better takeoffs and landings you don't need to fly some arbitrary speed above a stall, you need to **fly the proper speed for the conditions**. If you're well practiced at flying those speeds, and also have recent experience flying slower and at higher angles of attack, you'll be far safer and precise.
- **Hand-fly the airplane…a lot.** Be confident and capable with all the automation you may have, but practice enough that you never let the automation take you into a situation where you cannot immediately take over and fly by hand, either completing the planned trip or flying yourself out of the situation and into better circumstances.
- **Maintain mode awareness.** When you do use cockpit automation and complex navigation systems, be familiar enough with it that you never ask, "what is it doing now?"
- **Practice partial panel.** Pilots who fly by reference to instruments have an abysmal record when primary instruments fail. You can load an airplane up with backups to the backups to the backups…or you can spend a fraction of the cost getting some dual instruction a couple of times each year, including identification of failed instruments and flight without your primary attitude reference.
- **Know your EPs.** Emergency procedures may seem complex and hard to remember. But with some study to understand the systems of the airplane you fly, what you need to do in the event of an emergency becomes clear. With that understanding and some practice you'll be as prepared as you can be for an emergency in flight.

The predictability of accident scenarios is depressing, but it also gives me hope. If we can avoid accidents from just one of these causes we can make a serious dent in the accident rate. We know what we need to do; now we just need to do it, together.

Has anything changed in the past five years? Readers, what do you think?

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

Debrief: Readers write about recent *FLYING LESSONS:*

Frequent Debriefer Jeff Edwards wrote:

> [Jim] Lara's piece on single pilot SMS is really about developing and using good SOPs, good risk management, ADM, etc. **No matter how the often the core concepts are repackaged, the safe pilot is one who recognizes his or her limits and stays within them**.

Exactly. Jim did a great job of phrasing his ideas in terms of the latest philosophy—Safety Management Systems, or SMS. I know Jim and he is very dedicated; I laud him for writing this to try to get the message across to a new audience. But I agree with you, too, Jeff…we're screaming in the wilderness to try to get the same basic ideas across. It's sometimes exhausting and at times disillusioning, but we have to keep trying. Thank you, Jeff.

See https://nbaa.org/news/business-aviation-insider/2021-nov-dec/scalable-proactive-safety/?utm_medium=email&utm_source=rasa_io&PostID=40600881&MessageRunDetailID=6880653198

A long-time reader who asks to remain anonymous cites recent *LESSONS* about supplemental oxygen use and writes:

> I'll submit an interesting observation regarding blood oxygen level during flight.
>
> Maybe twenty years ago I realized the after-flight benefits of breathing supplemental oxygen during flights at or above 7,000 feet. Thereafter, I can't recall when, I sprung for an oximeter and developed a habit of keeping my O_2 level above the low 90%s by breathing supplemental oxygen.
>
> About five years ago I was diagnosed with Atrial Fibrillation (AF) but was fortunate in being able to keep it completely controlled using drugs. While I require a bit more testing each year to maintain my SI [Special Issuance] medical certificate, I was not aware of side effects from the drugs.
>
> Just recently I noticed while cruising at 6,000 [feet] that my blood oxygen level was at 88%. The oximeter showed my heart rate was at my normal 58 bpm [beats per minute]. Upon checking my passenger, also a senior citizen, she was at 97% with a heart rate of 85 bpm. She said her normal was around 70 bpm.
>
> I started thinking about it, and bingo, it all came together. **The AF medication, while controlling the AF, was keeping my heart rate from increasing when my O_2 level dropped**. ***The solution was to start breathing supplemental oxygen***, which solved my low blood oxygen level.
>
> So the bottom line is that **there are surely lots of pilots flying around using this very common medication to control AF and other minor cardiac conditions, and they are most likely (as I was) totally unaware that their bodies have likely lost the ability to naturally compensate for a reduced blood oxygen level**.

Thank you for helping fellow readers understand the impact of common medications, and the need to compensate with supplemental oxygen. I looked up atrial fibrillation on AOPA's website and found information about the condition and certain medications' acceptance for special issuance medical certification, but I did not see anything about the detrimental (to pilots) effect of medically controlled heart rate. I appreciate you passing it along.

See:
http://www.mastery-flight-training.com/20211111-flying-lessons.pdf
https://pilot-protection-services.aopa.org/news/2016/february/08/atrial-fibrillation-treatments-and-the-faa?_ga=2.215858963.525292562.1637632324-1354599609.1637632323

Reader Jack Spitler continues:

> Because the topic has been in play for more than one week, I offer my observations on the use of oxygen inflight, for what it's worth...
>
> By following the regulated guidance on use of supplemental oxygen in both military and civilian operations I experienced no contrary events or outcomes over the years. As my work expanded to include long haul flight, routinely six to fifteen hours at or near 8000 cabin altitude, in a type with particularly demanding and unforgiving landing characteristics, I developed a personal **routine prior to top of descent to improve the odds of a routine arrival experience**.
>
> TOD is generally half an hour or so from landing [in long-haul airline operations], so all crew members begin changing from cruise attire back to uniforms in the hour prior. Last, I would capture **a can of red label Coke from the galley and down it while briefing the arrival, followed by a few minutes on the [oxygen] hose at 100% to improve O_2 saturation before leaving altitude.** This method added both caffeine and sugar early enough to have effect during arrival procedures and **reduced the odds of physical, cognitive, and visual impairment on approach and landing**. There were many factors contributing to successful outcomes, but this was another thing I could do to improve probabilities for my constituencies.
>
> I did not reply to your thread at first because of the operational differences, but I want to point out that ***even pressurized airframes functioning properly have factors which should be considered*** in order to optimize outcomes.

The usual discussion of hypoxia centers on specific, well-defined altitudes. The implication is that going above a certain altitude subjects a pilot to hypoxia that is resolved by using supplemental oxygen, and that descending below that altitude renders the issue moot by removing the risk of insufficient O_2 in the blood.

Read far enough down the FAA's hypoxia page, however, and you'll find:

> The appearance and severity of the signs and symptoms are aggravated by several factors; rate of ascent, time spent at altitude, physical activity at altitude, fatigue, self-imposed stress, extreme ambient temperature, and individual physiological fitness.

Take a look at one factor within that statement:

> …time spent at altitude….

Continuing under "**Prevention of Hypoxia**," the FAA writes:

> If pressurization is not an option and supplemental oxygen is not available, limit your exposure time to less than 1 hour between 10K feet and 14K feet, including not more than 30 minutes between 12K feet and 14K feet.

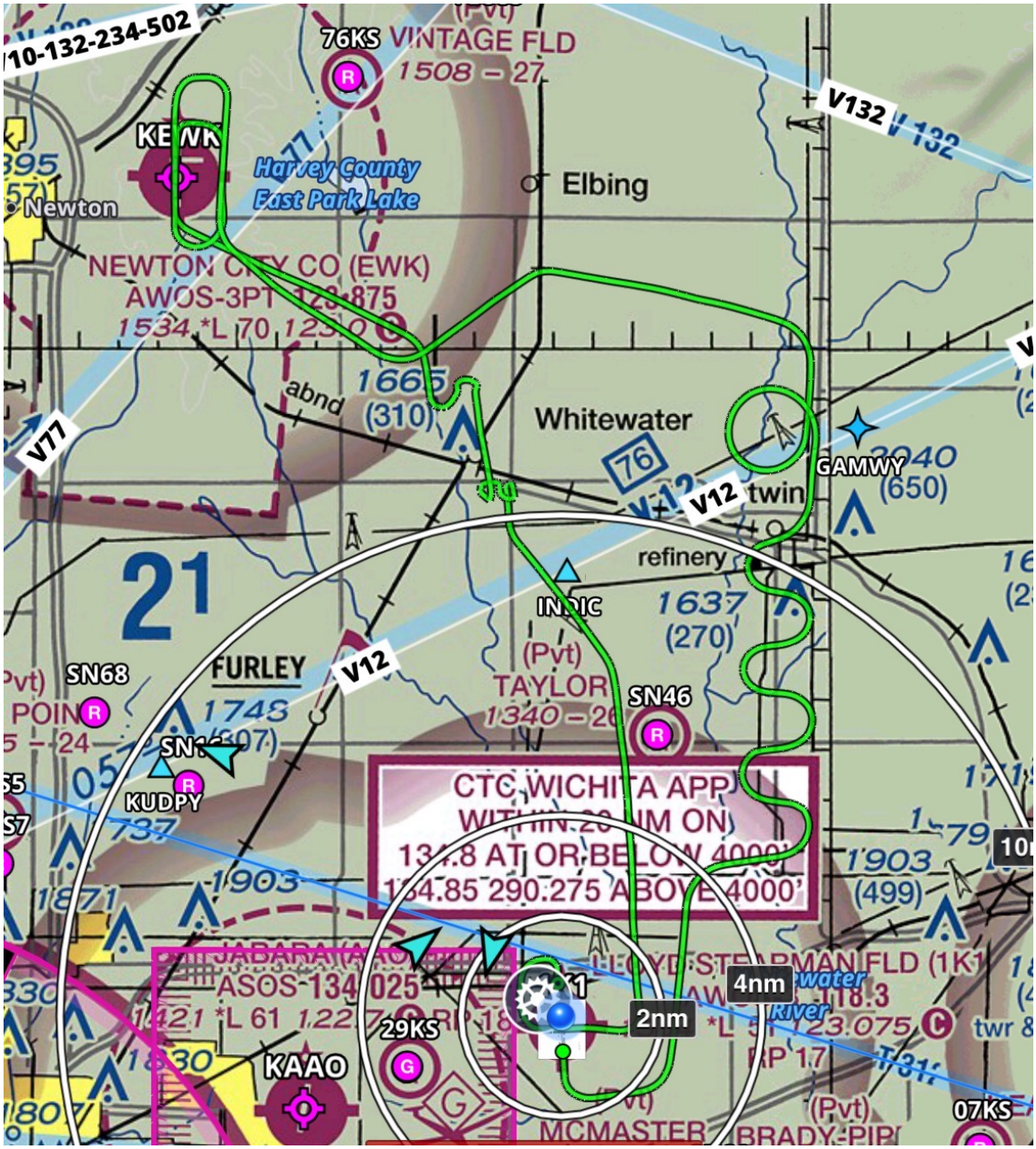
This is a very important point that is not directly addressed in FAA's guidance but which is hinted at here: the *time* you're exposed to a reduction in natural oxygen pressure has an impact as much as the altitude itself. Further, the FAA itself suggests long exposure to reduced O_2 is hazardous at heights lower than those at which the FAA requires using supplemental oxygen.

Why do I bring this up? Reader Jack Spitler's airline experience is pertinent even to those of us flying unpressurized light airplanes. In his case long hours at 8000 feet cabin altitude, that is, where the air in the pressurized cabin is equivalent of that naturally occurring at 8000 feet above sea level, caused noticeable adverse effects that he needed to compensate for before approach and landing. In other words, ***longer times at lower altitudes can be as hypoxically detrimental as shorter periods spent at higher altitudes***. Thanks for providing a personal example to help make this important point, Jack.

See https://www.faa.gov/pilots/training/airman_education/topics_of_interest/hypoxia/

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

Here's what happens when a friend pleads with you to go fly his airplane for him:



After a continual series of S-turns across and along a highway I made a circle-around-a-point, all with a 20-knot wind from the southwest at my height of 3500 feet. I then flew some "slow flight" en route to the pattern at KEWK (Newton, Kansas), the first time around extending my downwind for traffic, the second time flying a Power Off 180 to a spot landing.

On my way back to 1K1 (Stearman Field), I first flew a level 60° bank turn of 180 degrees to the left then rolled immediately into a 60° bank turn 180 degrees back to the right (you can see the effect of wind on these non-ground-reference maneuvers). I then flew two consecutive 60° bank 360° turns before descending back into the airplane's home base.

I truly enjoy the opportunity provided by a solo flight to warm up the oil for an oil change, or to check the outcome of maintenance event, or as was the case here, the airplane hasn't been in the air for a while and just needs to be flown. Sometimes I just take off and sightsee, or make a few trips around the pattern.

But it'd be a shame to miss the opportunity to practice my skills, confirm my ability to fly some of the maneuvers required for the level of my pilot certification, and to draw pretty pictures in the sky courtesy the flight tracking of ForeFlight or Flightaware.

Do you take those opportunities to sharpen your skills and draw pictures in the sky? Send them in (no political messages or Navy skywriting, please). As I used to sign off of *FLYING LESSONS*, ***"fly safe, and have fun."***

Share safer skies. Forward *FLYING LESSONS* to a friend

Happy Thanksgiving!

…and to readers around the world, ***fly safe, and have fun***.

Please help cover the costs of providing *FLYING LESSONS* through the secure PayPal donations button at www.mastery-flight-training.com.

Or send a check to **Mastery Flight Training, Inc.** to 247 Tiffany Street, Rose Hill, Kansas USA 67133.
Thank you, generous supporters.

See:
www.mastery-flight-training.com/be_a_master_pilot.html
https://www.paypal.com/donate/?token=E78wOSz-a-IWNuNMxHjQRZ4awYMDr8zvX2iJxHs_Cv-b7_6nFbhuIMAIJTU-IkBDsW160G&country.x=US&locale.x=US

Pursue *Mastery of Flight.*

Thomas P. Turner, M.S. Aviation Safety
Flight Instructor Hall of Fame Inductee
2021 Jack Eggspuehler Service Award winner
2010 National FAA Safety Team Representative of the Year
2008 FAA Central Region CFI of the Year
Three-time Master CFI
