# *FLYING LESSONS* for August 13, 2020

*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:*

**Read this** recently published Preliminary Report *from the NTSB*. When you're done, I have just one question for you.

> On August 1, 2020, at an unknown time, a Grumman American AA-5, N7192L, sustained substantial damage when it impacted terrain less than a mile west of the Marion County Airport (X35), Dunellon, Florida. The private pilot was fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.
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> The pilot/co-owner held a private pilot certificate with a rating for airplane single-engine land. According to the airport manager, the pilot texted his girlfriend at 1527 eastern daylight time and said he was going to "fly a couple laps" around the X35 traffic pattern. The pilot did not file a flight plan and was not in communication with air traffic control. When the girlfriend did not hear back from the pilot later that afternoon, she contacted the airport manager, who in turn notified law enforcement. A search was initiated, and the airplane was located the following morning less than a mile west of the airport in heavily wooded terrain.
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> A Federal Aviation Administration (FAA) inspector examined the wreckage at the accident site and reported that the airplane collided with several trees and came to rest inverted. There was no post-impact fire. The engine had separated from the airframe and both wings sustained extensive impact damage.
>
> According to the airplane's co-owner, she and the pilot had recently purchased the airplane. She said it had not flown in 14 years and the airplane was "in pieces" when it was purchased. The unassembled airplane was transported to the pilot's home, where it was partially assembled by the pilot, and then moved to X35. The pilot did not hold an FAA-issued mechanic certificate but was known to restore, build and repair vehicles and boats. The co-owner, who is not a pilot, said the pilot performed a test-flight of the newly assembled airplane on July 14, 2020, and reported that some of the gauges were not working. She thought one of the gauges was a fuel gauge.
>
> The airport manager said the pilot was a "staple" at the airport and liked to "tinker" with things. His goal was to get the airplane to a point where he could have a certificated airframe & powerplant mechanic perform an annual inspection. The airport manager said the pilot had flown the airplane a few times before the accident flight. On one flight the engine sputtered and lost power, but the pilot was able to land safely back at the airport. The pilot told the airport manager he had a problem with vapor lock and some of the gauges were "acting up." The airport manager said that on the July 14th flight, the pilot was taking off and landing numerous times on the 5,000-ft-long runway. During this flight, the airplane struck a runway light and had a tail strike.
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> The pilot's last FAA third-class medical was issued on November 21, 2017 and expired at the end of November 2019. He did not report his flight hours at the time the medical certificate was issued.
>
> The airplane wreckage was recovered for further examination.

See https://app.ntsb.gov/pdfgenerator/ReportGeneratorFile.ashx?EventID=20200802X53946&AKey=1&RType=Prelim&IType=LA

**Undoubtedly** the accident pilot felt he was being reasonable and *right* in doing the things he did. Yet the implication of this NTSB preliminary report is that his choices cost the pilot his life. **Your *FLYING LESSONS Weekly* homework question: *If you were that pilot*, how would you rationalize or justify these actions?**

**I'll be going somewhere** with this next week. We'll learn more with your help, by sending your answers to the question. All responses will be confidential and I won't use anyone's name. I'll analyze, not criticize, your thoughts; we can discuss them together in later Debriefs. To further our discussion, hopefully in ways that will enlightening us all, please send **how *you* think the pilot may have justified his actions**, to mastery.flight.training@cox.net.

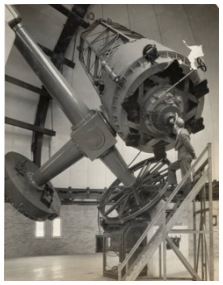


# Debrief: Readers write about recent *FLYING LESSONS:*

Reader and flying club chief instructor Roy Aycock writes about last week's *LESSONS* on knowing the relationships in your airplane's performance:

> I always use questions to see if students/clients **understand the big picture** relative to performance … in my mind anyway. I get frustrated when someone just parrots the numbers (rote knowledge), rounds everything up and then doubles it for "risk management." Not all bad, but I don't believe that approach develops a good base to evaluate if they are getting close to the performance they should realistically expect (***correlation & application knowledge***).
>
> I'm hoping they have a good expectation of performance for that day's flight before they get out of their car in the airport parking lot. Thus, I ask a question along the lines of, ***"Without looking at the book, how do to you expect the airplane to perform on a solo flight on clear high pressure day in January compared to a murky calm humid fourth of July afternoon flight with your two favorite offensive linemen?"*** Or maybe, "I see you planned a trip to [airport]. Can you show me on the airport diagram where you expect the airplane to be lifting off on your takeoff roll? In other words, **can you correlate your math to something on the actual airport environment? Would you change your expectation/location based on the conditions of the day and your mission?"**
>
> "Look at Happy Landings Residential Airpark on Google Earth. After you clear the trees on the approach end, would you expect to touch down at the 3rd or 4th house along the runway? How many houses would you let go by before you called the go-around?" I also like to ask what takeoff technique, rotation, and climb speeds they are expecting to use to get the calculated performance. I'm not so much concerned if they can parrot the numbers, but do they have an understanding that the airplane will fly sooner when it is lighter, and further are prepared to fly slower speeds to get the book performance at lower weights.

That's *exactly* what I was aiming for last week when I challenged pilots to investigate the **relationships** that apply to their airplane's performance, Roy. Thank you.



I started college (in 1979) as an astronomy major. I told people, "I went to college to take up space" (sorry, bad joke). Although later I moved into the history department ("but I ended up just talking about old times," is the rest of my bad joke), I learned a lot from my astronomy professor and later friend and mentor Phillip Stanger, a WWII meteorologist forecasting weather for flights over The Hump into China. Before making a complicated astronomical calculation, Professor Stanger encouraged us first to **make an estimation**. That way if we make an error in the formal calculation it will stand out because it differs radically from our estimation.

The Professor wasn't a pilot, but he was an avid airplane modeler and a life-long aviation enthusiast. I think he would have understood the value of knowing the performance **relationships** of an airplane as a "sanity check," an estimation, for more detailed performance computations.

See https://www.mastery-flight-training.com/20200813-flying-lessons.pdf

Reader and Designated Pilot Examiner (DPE) Ron Horton adds his insights:

> Thank you for the succinct challenge you presented in [last week]'s *FLYING LESSONS*. As a DPE I have seen that the knowledge of these items (Takeoff and Landing Charts, Fuel consumption and performance tables) is very poor at the Private Pilot level and not that much better at the Instrument or Commercial. Often the candidate is stumped when presented with a scenario of a real-life Takeoff, Landing, or Fuel Burn Enroute situation. **Remember, it's a *PRACTICAL* test.** Your CFI should make sure you know how to read the tables and determine if Takeoffs or Landings can be conducted safely (or at all, especially when you consider performance vs ODPs) or what Cruise setting makes the most sense for a cross-country trip.
>
> Your email each week is full of practical, invaluable insight. I make sure each of my students and each checkride candidate knows about *FLYING LESSONS*!

Precisely, Ron. We to remember the basics of performance calculations, and how to make them. Thanks, and thank you also for referring your students and pilots to this publication.

Reader Julian Yates continues:

> Once again wise advice from yourself on the importance of being able to use performance charts in your 13 August 2020 *FLYING LESSONS* (and yes, there's a small hint about my comments in the way I put the date!).
>
> There are some additional issues for those of us who fly older aircraft: the POH with charts has lived in the back of the aircraft for decades, the charts use a font of 1 or 2, or so it seems, they've been folded an infinite number of times, and [they] use weird measures like gallons, pounds, degrees Fahrenheit and so on. These, of course, don't relate to sensible measures like liters, Celsius and so on that are widely used outside the US. Potential for error – very high (I recall a Canadian incident where a big jet turned into a glider because of it).
>
> While I am no Excel expert, I found a great way to master the weight and balance chart, for example, was to extract all the data points, put in the conversion factors and have entry cells for the variable data, and use Excel to plot where the TOW [takeoff weight], LW [landing weight] and ZFW [zero fuel weight] were on any given flight. Sure, you can purchase this via most flight planning software, but **the afternoon spent doing this gave me a great understanding of what was happening as weight was added or subtracted**. It took longer to verify that the outputs were correct, but ***the learning gained was invaluable***.

Many airplane owners proclaim the value of participating in an owner-assisted annual inspection to better understand more about the workings of their aircraft. Spending some time with the raw data of weight and balance might be analogous to understanding the **relationships** that apply there. Thank you, Julian.

See https://en.wikipedia.org/wiki/Gimli_Glider

Reader and Society of Aviation and Flight Educators (SAFE) instructor Alan Davis adds:

> Great review of performance and charts in this edition. One thing that many fail to consider is water - in the form of on the ground (grass strip) or in the air (humidity). If it is on the ground and you are flying from a grass strip there is NO chart to give you the performance changes, so it may be a good idea to go get a burger and wait for better conditions. If it is humidity, that is a different issue as your density altitude may be way different that your charts calculate!
>
> **All performance charts are based on Density Altitude charts, which are "dry" charts, i.e. no humidity included.** Barry Schiff got me going on this a long time ago when there was a site at a Naval Air Station that one could access that included humidity, but it is no longer available. There is one site, however, that is available from an engineer in Colorado and all one has to do is enter the dew point along with the other standard information: **www.wahidudden.net/calc**. There is a disclaimer at the end that the calculator is for "educational purposes only", mainly because the FAA has never really taken the issue on!
>
> **Density Altitude calculations at sea level on a hot humid day (say 90 degrees Fahrenheit and 90%) can be off by as much as 30% or more.** On a shorter strip with the obstacle, that is a real problem! While at higher elevations the percentage is less, one is already at a disadvantage in performance to begin with,

especially on hot days. SAFE members can read all about it by going to the "How Humid Is Your Day" item in the performance portion of the Resource Center on the SAFE website (**www.safepilots.org**). Meanwhile, use the calculator and give yourself a SAFE-ty margin.

See www.safepilots.org

That's an important consideration, Alan. Thank you.

Reader, past test pilot and recently retired DPE Dale Bleakney wraps up our discussion of performance **relationships** for this week:

I like your *FLYING LESSON* [last week] where it talks about performance. I thought I might share some **common misconceptions about performance** that I have seen via observation of people landing and doing pilot examinations.

***It is very important to fly the airplane using the POH procedures if you want POH numbers***. If you are going into that short runway with obstacles, here are some interesting data:

If you are 5 KIAS fast coming across the end of the runway, and 10 feet high (Vref+5, 60' vs 50'), you will need to multiply the total landing distance by at least 1.4. If you don't bring the throttle to idle (most airplanes) or to maintain 600/800 fpm (Beech Bonanza/Baron), don't touch down at 6 feet per second (firm landing), don't use maximum braking or bring the flaps up (in a Cessna Cessna), then your numbers will get even bigger.

I have had some people say that they should land on the 1000-foot markers. If that is the case it is coincidental. To find out where you should touch down (if done perfectly), subtract your total distance from your ground roll and you will find the place you should touch down. On a 172, it is about 600-700 feet [from the threshold]. **I always take the book numbers and multiply by 1.5 if I am proficient, times 2 if I am not.**

I have heard some people try to factor takeoff and landing speeds using the "square root of the weight ratio" to come with different speeds. Although this technique works very well on airplanes that use pure Vx/Vy (takeoff) and 1.3 Vso (landing numbers), there are some other things that get taken into consideration when these speeds are developed. If someone is interested in why that formula works, the simple answer is the in normal unaccelerated flight, Lift equals weight. Lift is equal to ½ time dynamic pressure times velocity-squared. With everything else constant, the "V" varies as a function of the square root of the weight ratio (actual weight/gross weight). For example:

(1) The approach speed can be 1.3 Vso, unless that number does not leave enough aerodynamic authority to flare properly. In a number of airplanes, the speed is adjusted up slightly to give landing flare authority. If you adjust this number down using the weight-ratio method, you might get surprised when you try to flare and run out of elevator.

(2) The takeoff speed at 50 feet can be Vx, but can also be higher, if you need that speed to be able to safely return to the runway after a sudden engine stoppage at 50 feet. Reducing the speed as stated in (1) above, can cut into your flare margins.

(3) Vy can vary with the weight ratio but can also be a higher number, if needed for engine cooling.

**Bottom line** is that people should find out what goes into the POH/AFM numbers before they use an anecdotal method to change them.

…and most Pilot's Operating Handbooks and Airplane Flight Manuals prescribe *different* takeoff and landing speeds for different airplane weights, so we don't have to make these adjustments ourselves. Thank you, Dale.

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

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