



FLYING LESSONS for June 21, 2018

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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:

These reports appeared on the FAA’s preliminary accident report website just last Monday:

- ...the A35 Bonanza crashed under unknown circumstances....*
- ...the Cessna 172N crashed under unknown circumstances....*
- ...the Cessna 421B crashed under unknown circumstances....*
- ...the Johnson Air Cam crashed during takeoff under unknown circumstances....*
- ...the Cessna 180K crashed under unknown circumstances....*
- ...the Cessna T210F crashed under unknown circumstances....*
- ...the Piper Navajo crashed under unknown circumstances....*

What can we learn from these reports? ***Don’t fly under unknown circumstances.***

OK, that’s not fair, and it’s not funny, because “unknown circumstances” refers to the status of the accident investigation, not the conditions of the flight. But it *does* serve as a reminder to...

Strive to know all the circumstances of your flight. Before you take off you should understand completely the circumstances of:

- Weather, including chances and extent of the five hazards (thunderstorms, turbulence, low-altitude wind, reduced visibility and ice), your options for avoiding each, and an escape route if your avoidance technique fails.
- Fuel, including not only fuel to destination, an alternate plus reserves, but also expected fuel burn in climb and en route, with checkpoints to compare expected fuel burn to actual along your route so you can divert if needed before entering a low fuel state.
- Airworthiness, including the maintenance state of the aircraft, known discrepancies and the status of required and recommended inspections.
- Yourself, including training and currency, health fatigue, stress, hydration and nutrition.

Several mnemonics exist to help pilots “know the circumstances” and make appropriate decisions, whether related to the environment (including weather), the aircraft (airworthiness, fuel and equipment), and pilot factors (experience, currency, condition and stressors). Most commonly cited of late is the “PAVE” checklist, below.

PAVE Checklist (to identify hazards and personal minimums)

PAVE
checklist,
from the
*Pilot's
Handbook of
Aeronautical
Knowledge*

P ilot	experience, recency, currency, physical and emotional condition
A ircraft	fuel reserves, experience in type, aircraft performance, aircraft equipment (e.g., avionics)
e n V ironment	airport conditions, weather (VFR & IFR requirements), runways, lighting, terrain
E xternal pressures	allowance for delays and diversions; alternative plans, personal equipment

See https://www.faa.gov/training_testing/training/fits/guidance/media/personal%20minimums%20checklist.pdf

For more intricate decision-making other tools exist, including a [weather go/no-go decision matrix](#) from the [Tools for Flying Safely](#) page of the [Mastery Flight Training](#) website. Several chapters of the [Pilot's Handbook of Aeronautical Knowledge](#) are devoted to risk management and decision-making. In fact, there's an entire FAA manual called the [Risk Management Handbook](#).

See:

http://www.mastery-flight-training.com/tools_for_flying_safely.html

www.mastery-flight-training.com

https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/phak/

https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/media/risk_management_hb_change_1.pdf

U.S. Federal Air Regulation 91.103 leaves no leeway for preflight information gathering:

§ 91.103 Preflight action. Each pilot in command shall, before beginning a flight, become familiar with *all available information* concerning that flight [including]:

- For a flight under IFR or a flight not in the vicinity of an airport, weather reports and forecasts, fuel requirements, alternatives available if the planned flight cannot be completed, and any known traffic delays of which the pilot in command has been advised by ATC;
- Runway lengths at airports of intended use.
- Takeoff and landing distance data [from an Approved Flight Manual or otherwise computed using] reliable information appropriate to the aircraft relating to aircraft performance under expected values of airport elevation, runway slope, aircraft gross weight, wind and temperature.

If you fly under a different regulatory system you likely have a very similar requirement to learn “all that is knowable” before you fly.

What 91.103 doesn't say is that we not only need to consider these things during preflight (along with the unstated but not-inconsequential *human* side of risk management), but we also need to continually update our information and make revised go/no-go decisions *during* flight as well.

Eventually, we hope, the circumstances of the mishaps related at the top of this report will become known and their *LESSONS* learned for the benefit of all. As pilot-in-command you are tasked with ensuring all circumstances that can possibly be known are indeed known before you fly, actively updated as circumstances change and new information becomes available en route.

Comments? Questions? Let us learn from you, at mastery.flight.training@cox.net



How Much Flight Risk Should You Accept?

[Watch this video](#) for a thought-provoking answer to this important question.



See https://www.pilotworkshop.com/how-much-risk?utm_source=flying-lessons&utm_medium=banner&utm_term=&utm_content=&utm_campaign=risk&ad-tracking=fl-risk

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Debrief: Readers write about recent *FLYING LESSONS*:

Readers Dan Drew writes about [last week's LESSONS](#):

The section this week on fuel in the tanks brings to mind something we do in scuba instruction now. To teach an awareness of gas (air) and time in their tanks, we teach about Surface Consumption Rate (fuel flow and time for aircraft) and to keep a mental running clock as well as gauges and computers. The instructor should be able to point to a student and give the air signal and the student should, with looking, be able to signal back how much gas they have within 300 PSI at any time. As with flying, we teach safety *avoiding emergencies by heading them off prior to becoming an emergency*. Same thing I did as a flight instructor. Know your amount of fuel and consumption and time and **keep a running mental clock** and as you stated **a hard and fast minimum**.

See <http://www.mastery-flight-training.com/20180616-flying-lessons.pdf>

Interesting correlation, Dan...and as instructors know, *correlation* is the highest level of learning. Thank you.

Reader James Badgett adds:

A super-good issue. In defense of the CFIs who are willing to use part of their reserves: I use a two-part reserve:

I have a **90-minute reserve for planning purposes**. If planning shows I can't reach my desired destination without using some of the reserve, I plan a stop that does allow me to have a 90-minute reserve.

Once I'm enroute, I have a better idea of what my range really is, and **the reserve drops to 1 hour that cannot be violated**.

I do the same thing with surface wind limits. With a Cessna 172 or 182 I don't takeoff if winds are exceeding 30 knots. However, I'm willing to land in 30 to 35 knots as long as there is little or no crosswind component. **When making a go/no-go decision I now treat the winds with the same respect as I give to ceiling and visibility**.

If you run the numbers you'll come to the conclusion that you can't save fuel going upwind by reducing power. You can save a lot of fuel going downwind, but do you need to? In the past two years I have landed Cessna airplanes early both on local flights and on cross-countries because the fuel was not feeding evenly from both tanks.

I'm careful not to exceed [maximum] gross weight, but I really feel uncomfortable taking off to go cross country, at night, or IFR without at least four hours fuel on board. I'm most comfortable taking off with full tanks, because **I really know how much fuel is on board** when I can see it at the top of the tank.

Excellent strategies, James. Thank you.

A reader who wishes to remain anonymous writes:

Good article on fuel reserves...and what they really are. I teach/preach this topic religiously. My personal reserve is one hour. That is, one hour depending on where I am landing. **In some cases it just may be substantially more than one hour, but never, ever less.**

As a very young pilot with my boss (a military guy) on board we were doing a flight and were getting low on fuel. I suggested we land and get some fuel. I was overruled because home base fuel was cheaper and “we had plenty” on board. The weather was not very nice. We did make it to home base, partly because I knew where we were and partly because I started to lean very aggressively. After we landed I had the line boy fill the tanks to see just how much we had left. I think I broke out in a cold sweat. I promptly informed my boss that he could have his job if he ever tried to put me in that position again.

Fuel reserves are what you have left when all the good planning goes down the tubes. Fuel reserves are my “I can sleep well tonight” card.

Another anonymous reader adds:

Reference fuel reserves and personal minimums: I am a member of the [Civil Air Patrol](#), which safely flies the world's largest fleet of single-engine Cessna aircraft. One of the ways we help to enhance safety is by taking the question of FAA standards for minimum fuel reserves out of the hands of our pilots. We have a mandatory, internal regulation that **requires minimum fuel at landing to be at least one hour**. Our pilots know that if they violate this hard requirement, they will lose their flying privileges, so they treat it seriously. **It can be tempting to reduce fuel margins when performing Search and Rescue flights, but this internal regulation completely removes that option, leading to increased safety.** Many CAP pilots extend that personal minimum to their private flying in non-CAP aircraft since the comfort it brings quickly becomes habit. I agree with you that this should be taught and encouraged universally. **If it is good enough for CAP when flying missions where lives on the ground are at stake, it is also appropriate for pleasure and business flights.**

Thanks for all that you personally do! You make a difference by helping people think.

See <https://www.gocivilairpatrol.com/>

Thank you, anonymous. Inspiring thought works both ways, as you'll see in the next Debrief item.

Reader Don Lawton scrutinizes the fuel rules:

Thanks for another (typically) great *FLYING LESSONS* post, but I do I have a nit to pick. This concerns whether a certain fuel load is required only prior to beginning a flight, or that a certain fuel load must be maintained throughout a flight. You wrote:

...I'm not a fan of stretching fuel minimums even when it's perfectly legal to do so (at least for my U.S. readers; other regulatory structures have different views on fuel reserves). Under FAA rules we have to plan our flights so we expect to have at least a minimum amount of fuel on board upon reaching destination. However, once we're in the air all bets are off—there is no requirement to have a specific amount of fuel on board when you actually arrive at the end of your flight. [emphasis added]

For example, for a Day VFR flight I must plan to have at least 30 minutes of fuel on board upon landing. But if the winds or my power management are different from expected and I only have 25, or 15 (or five) minutes of fuel on board when I land I have not violated any regulations.

Had you said in the first paragraph above, “...we have to plan our VFR flight...,” I believe you would have been correct. Your second paragraph above correctly uses a VFR example that agrees with the language of **§91.151 Fuel requirements for flight in VFR conditions**. It's my contention that **§91.167 Fuel requirements for flight in IFR conditions** applies not just to the point of beginning a flight, but also applies continually *throughout* the flight. I read that from the first words of the section [emphasis added]:

No person may operate a civil aircraft in IFR conditions...

There being no possibility of either operating a flight or IFR conditions in the preflight planning room, it's my take away that this section applies throughout the flight.

Curiously, the FAR language for Part 121 airline lies closer to the Part 91 VFR operating rules than the IFR side of the fence.

§121.639 Fuel supply: All domestic operations begins with:

No person may dispatch or take off an airplane unless it has enough fuel—

I suppose the regulators believed that Part 91 VFR and Part 121 operators deserved a greater degree of flexibility than those conducting Part 91 IFR operations.

The longer I participate in this endeavor called “airmanship,” the more I try to never say, “I’ll never do (that).” “That” being the probably cause of the latest accident or incident I’ve read about - running out of fuel, flying too fast on final, maneuvering up to the limits of airplane and pilot without knowing where those limits are, etc. Instead, **I try to continually recognize that I am not infallible** and I am perfectly capable of doing “that” action that we all should avoid.

Thank you for providing a stream of enlightenment to those of us who need it.

Thank you, Don, for pointing out that important distinction in the wording of the fuel requirements not only before but during IFR flight. Reading the regulation itself I completely agree with your interpretation—it corresponds to my practice (although I require a higher fuel reserve for myself), but now I know that I do not have the flexibility to assume otherwise where IFR operations are concerned, even if that IFR flight is operating in visual conditions.

One of the best parts of *FLYING LESSONS Weekly* is learning from my readers. Thank you all!

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

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