



SAFETY GRAM

January 2020

For this month's safety gram, I'm unearthing a briefing from years back from Lt Col McBride, the previous Director of Operations and Safety. Please use this as a guide to at your monthly safety meetings and/or briefings with your pilots.

Aviation comes with inherent risk. If you don't understand that, you need to sit down with an instructor! Flying an airplane should never be approached carelessly. But having risk doesn't mean aviation is unsafe – far from it. I try to emphasize in every Safety Gram that pilots have a disproportionate ability to control much of the risk. Even though risk can't be completely eliminated, aviation safety means actively managing risk. One of the many risks that you can control is fuel planning and management.

As the old saying goes, fuel you don't have in the airplane is useless. Fuel starvation and exhaustion are still causal factors in many GA accidents according to the FAA. The first rule of flight planning is to mitigate risk; always have an out (Plan A...Plan B...Plan C...). With respect to fuel planning, that means planning the flight so I always meet my reserve. If I can't do that in one leg, it means a fuel stop; never give in to the temptation to cut into the reserve! If I'm even close to reserve limits, I opt for a fuel stop anyway for the sake of safety, peace of mind, and my bladder – particularly if my experience in that aircraft is limited. That's Plan A. Knowing your fuel burn rate, gallons on board, and a good watch should keep the engine running.

When you examine causes for fuel exhaustion/starvation, it becomes obvious pilots need to do some nitty-gritty fuel planning to make sure the airplane has enough fuel on board for the intended flight, feed from the correct tank, and lean properly. I can't emphasize enough how important it is to check your fuel on board during ALL phases of flight. Properly leaning the mixture and burning off the correct tank are also simple but important. There's a link to an engineering dissertation on proper leaning below, but basic application makes a huge difference in keeping enough fuel in the tanks.

That sounds simple enough, but successful execution has several layers – and forgetting one of them can be a costly lesson. So here's the next layer...all my fuel planning might be drastically off if Mother Nature doesn't agree with the forecast. Winds, temperature and density altitude differences from forecast can have a huge effect on the validity of my plan. Deviations around weather in flight can impact the plan too. How often do I actually get the groundspeed I planned for? Did I climb out exactly on profile like the test pilots did? Have I got the engine leaned correctly? Exactly how many gallons of gas did I start with? Ever thought an airplane was full, then fit another five gallons in after the tank "burped"...so why ever intentionally cut it close?

That's why verifying the plan during each phase of execution is crucial. Verify the fuel on board when you preflight the airplane; verify your fuel burn during and after flight. I fully appreciate how easy that sounds vs. how tough they are to do in reality. GA gas gauges are perpetual

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liars, only required by the regs to be truthful when empty. Most GA airplanes don't give you accurate fuel flow information in flight either. So verification before and during flight can be tough...verification after the flight could be too late. That's why Plan B & C are so important ...always have a way out and be prepared to execute it!

If I'm half way through my flight and the gas gauge indicates half full, do I have enough gas to complete the flight? Maybe. Maybe not. I would argue probably not since you need a reserve, but that's a tough argument to win on the ground with the gauge errors we tolerate every flight. The point is, you should be cross checking your fuel gauge in flight at certain points against what you planned. If you see less than expected, start thinking about a possible fuel stop. Further, if the gauge approaches empty (the only guaranteed accurate indication), don't overfly a good fuel stop because your very detailed fuel planning said you didn't need it. Finally, after you fuel the airplane, do a good comparison of how many gallons you expected to put in the tanks vs. what you actually did. If there's a difference, figure out why and apply the knowledge to future legs/flights!

Pilots make their best decisions on the ground before flight. Sometimes psychological drivers make us want to stick to Plan A dogmatically. Knowing an unplanned fuel stop may cost me \$2/gallon more for 100LL than my intended refueling point can be hard to swallow. And the extra time to stop, refuel, and refile is unappealing as well. Or if my destination is one of those high cost places, it doesn't make sense to completely fill up unless I absolutely have to. The temptation is to just put in the bare minimum in the tanks, but remember the gauge error I mentioned earlier? How will you ever really know if you got what you need? Dipping the tanks if less than full is the only way to know how much you are starting with. Erring towards the conservative option is worth it though. Plan B & C can cost extra \$\$ or time, but that cost beats the heck out of a forced landing!

Running a good airplane out of fuel is just tough to explain...to the FAA...to your passengers ...to the club...to future employers...to anyone. The AOPA "Never Again" link below is a great read along those lines. The pilot had good reason not to fill the tanks all the way (hot day, full payload), but failed to recognize his well thought out fuel plan was not matching reality.

I can't believe I'm saying this, but I think a recent FAA article summed up fuel planning nicely: "Know how much fuel you plan to burn and how much fuel you're burning. If you don't have on-board equipment to answer this question, calculate your fuel burn before each flight and confirm your calculations each time you refuel. Comparing your actual fuel burn to your calculated fuel burn will give you confidence in your fuel planning and you can often uncover fuel leaks or other small problems before they become big ones."

References:

["The Fuel Air Mixture"](https://www.aopa.org/training-and-safety/students/solo/special/the-fuel-air-mixture)

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[AOPA "Never Again"](https://www.aopa.org/news-and-media/all-news/2007/june/pilot/never-again-online-fuel-gauge-on-empty)

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CONTINUE TO FLY SAFE!

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