



FLYING LESSONS for January 1, 2015

suggested by this week's aircraft mishap reports

FLYING LESSONS uses the past week's 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 make and model airplane have little direct bearing on the possible causes of aircraft accidents, so apply these *FLYING LESSONS* to any 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:

FLYING LESSONS is in its eighth year of weekly discussion of flying and decision-making technique to reduce risk in the most common air crash scenarios. *FLYING LESSONS Weekly's* predecessor the Beech Weekly Accident Update (still posted weekly at www.mastery-flight-training.com) goes a full decade further back than that, with analyses dating back to 1998.



I think we've learned a few things about flying's risks—and its rewards—in the past 17 years of data-driven discussion. To kick off a much safer 2015 let's update (only slightly) an early 2013 *FLYING LESSONS* list of suggestions for avoiding the vast majority of all general aviation accidents...putting into practice what we've learned from the unfortunate experiences of others.

Some of these suggestions may sound overly conservative. But I bet the pilots who crashed in the events these rules suggest thought they could get away with it too. You'll find, also, that these suggestions are *not* onerous, or restrictive, or even expensive to make your standard operating procedure. History shows that implementing these few personal rules will make it *far* less likely that you, your passengers, or people over whom you fly will ever get killed, hurt, or make the evening news.

First, some general tenets:

1. **Know what the airplane is...and isn't.** The airplane you're flying may have extraordinary avionics and equipment, but it is *not* an airliner. It is a recreational and perhaps a business tool. It has not been designed, tested, certificated or maintained to the same level as an air carrier aircraft. It doesn't have the performance or redundancy of an airliner. It is very safe and very capable...*if* it's flown within its limitations.
2. **Know what you are...and aren't.** You are probably not an air carrier pilot. Even if you are, or have been at one time or another, your air carrier experience does not fully prepare you for the workload of single-pilot operations in a less capable airplane. You almost certainly do not get the level of initial and recurrent training in light airplane single-pilot operations that an airline pilot routinely receives. You won't be able to do everything that you could do as part of a jet airliner crew. This is doubly true if you are a retired airline pilot, because like it or not, age takes its toll on endurance, reaction time and cognitive ability.
3. **Know and evaluate the environment.** By far, the most common reason for airline delays is adverse weather. Your airplane is less capable to handle adverse weather than an air carrier airplane. Consequently, you will need to delay, divert or cancel flights more frequently than the airlines. I flew Beech Barons 250-300 hours a year for several years in the U.S. Southeast, and I routinely diverted around weather, landed at an alternate to sit out the weather, missed approaches "for real," parked myself in holding patterns for showers to move on or fog to finish clearing, and canceled a trip and drove a rental car home because of long-lasting weather hazards. It's not "if", it's "when." The more you fly, the more you'll delay, re-route or cancel because of the weather.

If you are the person who sets the schedule for events or meetings that create the need for your trip, or if there are adverse repercussions or lost revenue if you have to delay or cancel a flight, then plan to depart in time to delay, divert or cancel and make it to your commitment by other means if necessary. This is especially true for the trip back home, when you generally have more pressure to arrive on schedule. This sometimes means traveling to your destination a day earlier, or cutting your trip a day or two short if the forecasts show the weather may close in on the last day of your vacation. The old adage is spot on: "Time to spare, go by air."

4. **Fulfill your roles.** You are pilot-in-command—the Captain of your aircraft. You are also Dispatcher and the Director of Maintenance. You are the aviation medical examiner, responsible for self-certification before and during flight. Plan each flight consciously thinking about the responsibility of all four of these roles. To paraphrase a self-help cliché, "if it's to do, it's up to you." Flying a cross-country aircraft is a profession, whether it's your chosen or compensated profession or not. It requires the time and study and practice of a second job.

Now, for some specific recommendations, based on actual mishap history in the order of most to least likely cause of a fatal crash:

- **Put time into training.** One hour of flight instruction every two years (the regulatory requirement under U.S. rules) is probably sufficient for the pilot of a very simple, VFR-only airplane flown outside the realm of Air Traffic Control. But it's almost certainly not nearly enough for the cross-country pilot (even in visual conditions), the instrument pilot, and/or the pilot of a complex or high performance aircraft. My four years of experience teaching multiengine pilots at a simulator-based training facility convinced me it is not enough for a pilot to *increase* his or her capabilities in the practice of flying.

The less you fly, the more you need to train and practice. A corollary is that more flying time does not by itself replace the need to train. Two hundred hours of point A to point B probably won't protect you if an engine-driven fuel pump dies close to the ground, or if the weather moves in faster than forecast and low-level wind shear affects everywhere within the airplane's fueled range. Two hours of solid practice and/or challenging instruction of some sort two or three times a year is probably a better measure of the prepared pilot.

- **Get very comfortable with angle of attack and stalls.** Loss of control ("LOC") is a hot item because [LOC is the cause of over 40% of all fatal general aviation events](#) in the approach and landing phase of flight. Although aeromedical factors and partial panel flight are included, LOC is in most cases a euphemism for "stall." Many pilots are not comfortable flying an airplane at the slow end of its flight envelope. These are *precisely* the people who need more training in stall recognition, recovery and avoidance—discomfort is a symptom of undeveloped or atrophied skill.

See www.aopa.org/advocacy/articles/2013/130327safety-committees-report-focuses-on-loss-of-control-ac.html?CMP=News:S1RM

- **Hand-fly the airplane—a lot.** Fatal crashes often resulting from a pilot's inability to hand-fly the airplane in the event of an autopilot disconnect or failure. Often pilots lose control almost immediately upon a trim runaway or autopilot disconnect, when the pilot must instantly transition from automated flight to hand-flying with an airplane that is radically out of trim as a result of the failure mode. Be as comfortable and capable hand-flying all phases of flight as you are using an autopilot.
- **Maintain mode awareness.** The corollary to hand-flying is to be adept at the operation of your avionics and autopilot, so there's never any doubt about the mode in which it's operating, or what the equipment is going to do next.
- **Practice partial panel.** A couple hours of partial panel flying every six months to a year may be worth more than a panel full of backup instruments. The hard part, however, is identification of a partial panel situation in the first place. Unless this has actually

happened to you at night or in IMC (and you bucked the odds by surviving your first encounter), the only way to experience this realistically is in a flight training device or simulator.

- **Maintain situational awareness.** NTSB says the rate of Controlled Flight Into Terrain (CFIT) is declining noticeably. The Board attributes this to the almost universal availability of at least some type of moving map display and the situational awareness it provides (and to a far lesser extent synthetic vision, because extremely few airplanes have this equipment yet). That said, CFIT continues to be a problem, especially at night and during visual approaches in marginal visibility. VFR or IFR, always knowing the lowest safe altitude for your current and next segment of flight.
- **Know your EPs.** EPs, short for Emergency Procedures, at those airplane attitudes, configurations (flap and landing gear positions, etc.) airspeeds, angles of attack and checklist procedures for abnormal conditions or catastrophic failures. Why are airline operations so safe? In large part it's because the crews are required to perform normal *and* EPs in simulated scenarios every six months, so when an actual abnormality or emergency arises (which almost never "textbook" as presented in the simulator) the pilots have a recent wealth of experience with which to correlate to the situation at hand. If you've not been practicing and reviewing EPs regularly, you won't be ready on the unlikely but far from impossible day an actual emergency occurs.
- **Don't push it with fuel.** It seems to be in vogue to talk about flying maximum range, requiring running all but your last tank dry and the last tank down to minimum fuel. Far too many people have died trying to make it home because that's where the cheaper fuel was, or stretched the airplane's range to its limits to avoid the inconvenience of a stop or simply to have a story to tell or chat about online. When one tank is down to 1/8 full and the other is at 1/4, it's time to be inbound on the approach or entering the traffic pattern. History shows that a great many fuel exhaustion mishaps happen within five miles of the intended destination—the pilot *thought* he could make it, and was *almost* right.
- **Consider weighty matters.** Calculating aircraft weight and balance isn't a training exercise that only applies for checkrides and flight reviews. You need to know your airplane is loaded within its control and performance flight envelope at all times. An overweight airplane or one loaded at or beyond its design capability will be harder to control under abnormal situations, and perform less well when other conditions (density altitude, wind, etc.) adversely affect the aircraft. Except in fuel as needed for endurance, fly at the lowest weight that meets the trip requirements—the lighter the airplane the better it will perform, and the more options you'll have in an emergency.
- **Stay within limitations.** This means the *airplane's limitations* (there's no such thing as "a little overweight" or "a little over redline"). It means the *weather limitations* (no flying through "a little thunderstorm" or "a trace of ice," or flying "a little lower" to find the runway on approach to your home airport). It means *your limitations* (certificates, ratings, and currency). If you allow yourself to "fudge" the limitations, human nature says it's likely you'll soon be accepting more and more risk as "creeping normalcy" (or as reader Tony Kern of [Convergent Performance](http://www.convergentperformance.com/) says, "normalization of risk") sets in, and what was once unacceptable has gradually become your norm. It means the mechanical limitations. Follow the FARs about required equipment and inoperative equipment. Get familiar with the airplane's Kinds of Operation and Equipment Limitations (KOEL chart) if one exists for the aircraft.

The Federal Air Regulations (or those of your home country) are a *minimum* standard...the very edge of appropriately managed risk. Where limitations are concerned, "no means no."

See <http://www.convergentperformance.com/>

- **Employ SOPs.** Standard Operating Procedures (SOPs) are the normal way you do things. Strive to take off and climb, fly an approach, and make your landings as close to

the same way every time. This eliminates the need for many in-flight decisions (actually not eliminated, just decided ahead of time), and permits you to more easily detect and act upon variables like wind, traffic, equipment issues and other factors—you're not so busy with the basics of flying that you have no mental bandwidth for external variables.

Knowing and using SOPs has one other advantage as well—in the very unusual case you need to do something different from your SOP, you'll know what “good” is, and be better able to judge how what you're actually doing compared to your expectations and needs.

- **Fly stabilized.** Unstabilized approaches, those where the airspeed, power and airplane configuration do not conform to an established and nearly uniform SOPs for the final approach segment until the flare, commonly correlate to airport environment crashes. Further, know and use the same power, attitude and configuration cues for approach every time, and on final approach ask yourself three things:
 - Is the airplane on speed ($V_{ref} +5$ knots -0 knots) at the proper rate of descent (usually 500 to 750 feet per minute, except in an obstacle landing)?
 - Is the airplane on target (proceeding at the proper attitude and glide path to touch down at 1000 feet from the runway threshold or in the first third of the runway, whichever is shorter)?
 - Is the airplane in configuration (flaps and gear set correctly, power and attitude as expected

If the answer to any of these is “no” when you're within, say, 500 feet of the ground, go around, set up properly and try again.

- **Get real about fatigue.** Pilot fatigue is one of the great unknowns of general aviation air crash investigation. Yet even more so than in highly regimented airline operations, with maximum duty days and mandated sleep periods and time off, nothing stands between the pilot and command and his or her own judgment of their fatigue state. If you're a morning person, don't fly after work. If you dance or work the night away, don't plan on an 0600 departure. A Friday evening trip after a long work week, or a Sunday afternoon flight home after a whirlwind vacation or active vacation trip, is setting you up for bad decision-making...which we all know is a factor in as much as 80% of all general aviation crashes.

Even more challenging: evaluate not only how you feel for departure, but predict how you're likely to perform three hours later after bouncing around in turbulence or solid in IMC or at high altitude at reduced cabin pressure or on supplemental oxygen—and then are faced with a missed approach or an abnormal or emergency condition.

- **Involve your family and passengers.** Teach your family (whether they're riding with you, or just expecting you to be somewhere at some specific time) and your passengers what it is you're looking for when you gather information and make informed decisions about appropriately managed risks. Ask them to concur with your go/no-go decision, and give them the power to recommending you cancel or delay a flight, or divert it while en route. Often it's pressure from family or the passengers that leads a pilot to accept an unacceptable level of risk, usually because nonpilots have no idea what conditions you require to safely complete a flight. If those around you have some basic understand of what is acceptable, and what is not, you may find you're under far less pressure to “go” into conditions that would normally cause you to decide against it.
- **Maintain your airplane.** Normally it's decision-making that results in a crash. Sometimes things do break, however. The failure may not be complete, but the status and reduced capability will demand more of the pilot's attention, making it harder to appropriately manage risk in other areas. Pilots and airplane owners tend to interchange the words “maintenance” and “repair,” but there is a vital distinction. One is to keep things from breaking, the other is to fix it once it's broken. Think about what

“maintainance” means: It is what you do routinely, *before* something breaks or fails, to **maintain** the current level of system fidelity and functionality. It may be “safe” (appropriately managed risk) to defer some maintenance tasks for a time, assuming that you step up the intensity and frequency of inspections to confirm the item has not yet showing signs of imminent failure.

Going beyond recommended Time Before Overhaul of an engine or a landing gear motor, for example, may be safe (if it’s legal for your operation under the rules of its governing authority), but you’ll have more down time and spend more money on inspections to properly confirm it *remains* safe until the time comes you indeed do overhaul or replace. Continuing to defer the maintenance task will soon reach a point of diminishing returns, when the cost of more frequent and intrusive inspections could have been folded into the cost of the overhaul or replacement you know you’ll eventually need.

There are more LESSONS from the past 17 years. But if we all followed just those tenets and recommendations listed above, imagine how positively we’d change the record of fatal general aviation crashes.

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

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See <http://pilotworkshop.com/cmd.php?ad=710283>

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“The Two Thoughts he thought were these: a) Anything can happen to anyone, and b) It is best to be prepared.”

—Arundhati Roy, *The God of Small Things*

Happy and safe flying in the New Year!

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