



FLYING LESSONS for April 18, 2013

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:

The previous two editions of *FLYING LESSONS Weekly* (available through links in the left column at www.mastery-flight-training.com) addressed a reader's introspective call for help:

I know aviation is a complex undertaking. Most do it safely. However, it disturbs me when I listen to ...transcripts [of flights by] intelligent, successful pilots who ultimately killed themselves in planes. I don't see a clear path to safe, happy flying, [and] that's what I'm looking for. But here is no simple, clear-cut path, i.e. a one-page syllabus that guarantees safe flying.

I've promised to suggest a specific syllabus (although nothing will *guarantee* accident-free flying), and this week I will begin. To derive this plan, though, let's first review the Top 10 causes of fatal general aviation crashes, using NTSB's rank-ordered review of reports from 2001 through 2011. Long-time *FLYING LESSONS* readers will recall that we focused on the 2000-2010 record approximately one cause per month in issues during 2011. This slightly newer list does not differ from our earlier compilation.

The Top 10 Leading Causes of Fatal General Aviation Accidents, 2001-2011

1. Loss of Control In Flight
2. Controlled Flight Into Terrain
3. System Component Failure – Powerplant
4. Low Altitude Operations
5. Unknown or Undetermined
6. Other
7. Fuel Related
8. System Component Failure – Non-Powerplant
9. Midair Collision
10. Wind Shear or Thunderstorm

Given the consistency of these causes over the past decade, it stands to reason that avoiding the worst general aviation crashes means working to avoid these 10 causes. Here are some ideas, beginning with the top two causes:

1. Loss of control in flight

By FAA/NTSB definition "loss of control" (LOC) includes inability to identify or contend with instrument failure in instrument meteorological conditions (IMC), attempted visual flight in IMC and pilot medical issues that contribute to loss of control. By far, however, LOC refers to aerodynamic stalls. *FLYING LESSONS* has spent much time in the past seven years detailing the concept of angle of attack...as well as avoiding the other LOC scenarios. Avoiding this most common scenario for death in GA airplanes results from:

- Stall avoidance and angle of attack awareness training and practice;

- Avionics fluency and mode awareness...because if you don't fully understand the logic and "language" of the equipment (hence "avionics fluency"), and know at all times how the equipment is programmed and what will happen next (i.e., "mode awareness"), advanced avionics can actually be a detriment to situational awareness and even contribute to LOC.
- Instrument training and practice, including (if possible) simulator-based training for loss of flight instruments—because flying "partial panel" is easy to practice in airplanes, but it's impossible to experience identification of a failed instrument and transition to partial panel flight except in a real instrument failure emergency;
- Weather training and evaluation, including continual in-flight evaluation of weather and consideration of go/no-go criteria (see the [Categorical Outlook Flying](#) technique and [Estimating Inflight Visibility](#));

See:

www.thomaspturner.net/Categorical%20outlook%20matrix.htm
www.mastery-flight-training.com/estimating_inflight_visibil.pdf

- Attention to aeromedical factors, most notably avoiding flight when taking medication (including any over-the-counter drugs that affect cognitive function or balance), when fatigued, when dehydrated, and of course when under the influence of alcohol.
- Aeronautical Decision-Making (ADM) and Scenario-Based Training (SBT).

2. Controlled flight into terrain (CFIT)

CFIT occurs primarily in four varieties:

1. Visual descent in dark or low-visibility conditions (especially when cleared for a visual approach in unfamiliar areas);
2. Descent below safe altitudes during instrument procedures;
3. Collision with obstacles as a result of insufficient climb following takeoff or in a go-around or missed approach; and
4. Attempted visual flight in IMC.

To avoid this second most common cause of fatal GA events:

- When arriving in dark or low-visibility conditions, decline the visual approach unless you are extremely familiar with the airport and surrounding terrain, and then accept a visual approach only when the airport is in sight. Until reaching that point, fly the IFR arrival and approach, with close attention to minimum safe altitudes for the entire route you take. If you see the airport and begin a visual descent, and then lose sight of the airport, something is between you and the aerodrome. Begin an immediate climb back to an altitude you can again see the airport or the lowest safe altitude for your location and your route toward the field.
- Thoroughly brief your instrument arrival, from Top of Descent (TOD, the point where you leave cruising altitude) to the Missed Approach Point (MAP) and including the Missed Approach Procedure.
- Attain avionics fluency and mode awareness, again because without this level of mastery advanced avionics can actually be a detriment to situational awareness and become a contributor to CFIT.
- In IMC or low visibility conditions, follow IFR departure procedures for the runway in use. If no IFR departure procedure exists, depart using the full length of the runway, climb as swiftly as possible to the minimum circling altitude for an approach for the runway in use, then follow the published missed approach

procedure until further direction from Air Traffic Control. If the runway does not have a published approach, and therefore no missed approach procedure, thoroughly plot out a safe departure path and altitudes—this may involve climbing to a safe altitude in the pattern directly above the airport. Then fly your departure until at the Minimum Safe Altitude (MSA) and given directions from ATC.

- When briefing an approach, determine the specific information you need to safely fly from the Final Approach Fix (FAF) to the MAP and the climbout. Write the **ADM** specifics—the **A**ltitude for each segment of the approach; the **D**istance you'll fly each altitude to the next change; and the initial altitude and heading of the **M**issed approach procedure—on a sticky note or your kneeboard, so you can find them quickly without having to locate these vital data on a busy approach procedure chart inside the FAF.
- Weather training and evaluation, including continual in-flight evaluation of weather and consideration of go/no-go criteria (see the [Categorical Outlook Flying](#) technique and [Estimating Inflight Visibility](#));

See:

www.thomaspturner.net/Categorical%20outlook%20matrix.htm
www.mastery-flight-training.com/estimating_inflight_visibil.pdf

Here's my challenge to you (and I'm doing it too): Log sufficient dual flight instruction and solo practice in 2013 (readers in the [American Bonanza Society](#) saw a version of this challenge in December 2012). **Aim not for the traditional minimum standards, but instead train to mastery of your aircraft and the operations you choose to fly.** Unless you've recently earned a pilot certificate or rating, I bet it's been many years since you took that much instruction in a single year. Just think how good you can become if you commit to earning a "*mastery rating*"!

Map out a year-long training plan that includes at least this experience, to avoid the two most common causes of fatal general aviation accidents:

Pilot Type	Log	Dual	Solo	Task	Addresses Causes
Day/VFR Only	1.0 hour	x		Stalls, steep turns and slow flight	1, 2
	1.0 hour		x	Stalls, steep turns and slow flight	1, 2
	1.0 hour	x		Emergency flight by reference to instruments	1, 2
	1.0 hour	x		Pattern and go-around procedures	1, 2
	1.0 hour		x	Pattern and go-around procedures	1, 2
Night and/or IFR	1.0 hour	x		Stalls, steep turns and slow flight	1, 2
	1.0 hour		x	Stalls, steep turns and slow flight	1, 2
	2.0 hours	x		Basic attitude flight by reference to instruments	1, 2
	1.0 hour	x		Partial panel basic attitude flight and unusual attitudes recovery	1, 2
	2.0 hours	x		Instrument procedures from ToD through missed approach	1, 2
	1.0 hour	x		Simulated low-visibility departures	1, 2
	1.0 hour	x		Pattern and go-around procedures	1, 2
	1.0 hour		x	Pattern and go-around procedures	1, 2

We'll build upon this syllabus by addressing the remaining common causes of fatal GA crashes as the weeks unfold.

Spread your training across the entire year, so you're always within a few months of a quality control check. Consider spending some of your training time in a simulator for better emergencies training and decision-making scenarios. Get a little outside your comfort zone to become an even better pilot and master of your aircraft.

Let us know how you plan to spend your training time in 2013, and what you expect you'll learn as a result...at Mastery.flight.training@cox.net



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See <https://www.avemco.com/Information/Products.aspx?partner=WMFT>.

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Debrief: Readers write about recent *FLYING LESSONS*:

The [most recent edition of *FLYING LESSONS*](#) provoked what may have been the most interesting response I've seen in its history. I had more readers unsubscribe that in any other week—it's probably coincidental, or perhaps it was (as I foretold in the report) a result of the length, and not the content, of the report. I can't help but wonder, however, if "it was something I said," that stating that appropriate risk management (ARM, i.e., "safe" flight) takes more commitment to training was more than even some *FLYING LESSONS* readers were willing to accept. At one point, for the first time ever, I had more unsubscribes than new subscribers for a week...happily, that reversed and we're still well in the positive in readership numbers this week.

See www.mastery-flight-training.com/20130404flying_lessons.pdf

At the same time, two factors confirm readers agree that ARM takes work: more readers made [financial contributions to support *FLYING LESSONS*](#) than any single week before (a vote of confidence if ever there is one), and more importantly, you sent these insightful comments:

Reader Dick Druschel comments:

This was a truly great piece of writing. What I liked most was that it contained information that we all need to think about constantly.....both high time, complex airplane operators and novice beginners and everyone in between. It is not so much "in your face" as it was the plain reality of truth. In my own case I know my airplane, I practice SOPs, I know the regulations, etc. The TRUTH, however is like ALL pilots, I could and should do better. Thanks for the wake-call.

You and me both, Dick!

Airline and general aviation pilot David Heberling adds:

Thanks again for a very interesting subject. Not enough can be said about safely flying our aircraft. While reading your list, I was struck by how introspective it is. Some personality types fall naturally to introspection, whereas others would have to work at it. Why else would we still have people running out of gas or flying VFR into IFR? **None of those people thought they were doing anything particularly risky.**

It took a long time for me to get to my current mindset about safety. It sometimes makes me wonder how I survived into my adult flying career. It certainly was not for a lack of trying to do myself in. Starting as I did in my early teens, **I thought I was bullet proof.** At salient points along the way, I either did the right thing or survived the wrong decision. Due to my basically conservative nature, my first scud running adventure made

me highly uncomfortable and it was my last (even though it was successful). Those who seek risk will behave differently.

What proportion of the GA population do you think will subscribe to an airline approach to flying? It will never be 100%. Some people would rather not fly than subject themselves to this rigorous approach. Like all things in life, **to do anything well takes a lot of practice. In other words, hard work.** Just look at how easy airshow performers make it look when in truth they have to practice their craft often to stay at the top of their game. Judgment is a muscle that needs to be exercised. Often.

Recently at an aviation event in Australia I met retired RAAF Wing Commander and F-18 pilot [Matt Hall](#), now an internationally known air racing and, as you note, air show pilot. Matt spoke at the dinner and proposed a brilliant thesis that applies to this (and most other) *FLYING LESSONS*:



Matt says pilots follow a predictable, three-phase path of development, which I'll related and expand upon here.

First is the **learning phase**. Everything is new, and the pilot is eager and impressionable. Learning pilots listen to others in authority—but since they have no frame of reference to determine what is good behavior and what is bad, it is the more experienced pilots' responsibility to model and mentor the “right” attitudes and practices.

Next comes the **complacency phase**. This is usually the longest phase of a pilot's career...one in which the pilot feels he or she has learned virtually everything he/she needs to know about flying, with the exception perhaps of learning about the newest avionics in the airplane. The complacent pilot believes he/she has achieved “safety” (as if risk management is a *state*, and not a *process*), and that bad outcomes are something that can only happen to lesser pilots.

Finally, the pilot moves to the **professional phase**. In this context “professional” has nothing to do with being paid to fly. Professionalism is a mindset in which the pilot seeks out opportunities to learn and practice, and to actively look for gaps in his/her knowledge and proficiency. The professional pilot actively works to fill those gaps by taking classes, attending safety seminars, reading and doing self-paced learning, and engaging expert flight instructors to learn from their and others' experiences.

The trouble is, according to Matt (and echoed in the air crash record) **most general aviation pilots never make it past the complacency phase**. These are the seemingly “unreachable” pilots lamented in the numerous instructor symposia, FAA meetings, NTSB hearings and (Australian) ATSB discussions in which I've participated over the past few years. Yet the need for professionalism is as acute in a Light Sport as it is in a Light Jet, and everything in between.

It takes some unique event or condition to cause a pilot to move to the professional level. It may be as subtle as exposure to a group of professional-thinking aviators or even one good instructor or mentor. It may be a realization based on events in the pilot's non-aviation career or family life. Unfortunately it is usually the result of a frightening aviation experience, personally encountered or (less frequently) when a close friend meets his or her end in an air crash.

What triggering mechanisms can we create and employ to guide complacent pilots to the next, sustainable and “safe” level? We can't usually affect the non-aviation/family triggers (although the FAA claims to be successfully reducing accident rates in Alaska in part by communicating directly with pilots' spouses). We don't want to rely on deaths and near-death experiences to force pilot change. That leaves us with setting a consistent, good example among our piloting peers, mentoring other pilots and actively intervening when we see excessively risky behavior, as the best alternative for bringing complacent pilots to a level of professionalism that will make personal aviation exceedingly “safe.” **We have to make mastery, not minimalism, the norm.**

Thanks, David. And thank you, Matt. Your views are brilliant and insightful. I greatly enjoyed our (unfortunately brief) discussion at the Cowra NSW flying club the day after our presentations.

See <http://matthallracing.com/>

Reader Paul Sergeant returns us to reaction to the most recent *LESSONS*:

[Thank you once again for a well thought out treatise on reducing the risk for private flight. I agree with you](#)

that **there is always some risk in any flying, but thinking about how to reduce it and having a safety mindset can go a long way towards mitigating that risk.**

Looking at accident statistics, and simplifying the actual percentages for effect, I conclude that:

- **About half of all fatal accidents can be attributed to “stupid pilot tricks”** – famous last words “Watch This!” I place fuel exhaustion into this category (deliberate or accidental), but also buzzing; aerobatics, especially low-level or in an aircraft not specifically designed for [aerobatics] (inherently less-than-safe); and even non-essential formation flight. Some of my pilot friends will erupt over a few of these.

I expected to receive some reader mail about specifics of my statements as well. Maybe that caused some of the “unsubscribes” last time.

- Of the remainder, most of the rest can be categorized as [a] judgment lapse: VFR into IMC; thunderstorms; instrument approaches below DH or MDA; and failure to use checklists. **The rules that exist for these are good ones, based on experience, and combined with judgment, following [the rules] will keep you safe.**

A common theme: the regulatory “rules” are a *minimum* standard of safety, and in most cases are written not proactively, but as a reaction to fatal crashes after the *LESSON* was learned too late.

- Only between 10 and 25% are of the Oh S**t variety, where something broke, or another aircraft was at fault, and such like. **Many [systems failures crashes] can be mitigated by emergency preparedness and readiness** (this may have saved my own life a few weeks ago when I had to take emergency evasive action at 50 ft AGL), control over the airplane over a wide range of flight conditions, and advanced cockpit technology (XM Weather, autopilots and ADS-B or TIS traffic). I also think taking aerobatic lessons and flying a glider are a great aid – it takes away fear of stalls, spins and unusual attitudes.

Nothing in life is guaranteed risk free, not even getting out of the bath tub, which is statistically more dangerous than boarding a commercial flight. **Private flying has been likened to driving a motorcycle in terms of acceptance of risk, but with the appropriate attitudes and recurrent training, it can be as safe as driving in a modern car.** That’s still not guaranteed safety, but I’m willing to bet it’s a risk that [the reader whose question prompted this discussion] is willing to take on a daily basis.

Thank you very much, Paul.

First-time Debriefing Tony Crescimanno writes:

Spot on Tom. Excellent advice. I’ve been flying since 1975; civilian, USAF, Airline. When I decided to buy a Beech Baron I searched for ground school and simulator instruction first. My flying background would not allow me to approach flying a light twin any other way. **Everyone flying needs to ask themselves if they have done all they could to ensure the safest flight.** That means having the best flying skills and the best maintained aircraft, complying with all the rules and regs. **There are no short cuts to safety.** Great job Tom of helping to make us all better and safer pilots.

Thank you, Tony. I hope you’ll continue to write so we may all benefit from your experience.

Reader David Kenny, safety statistician of the AOPA Air Safety Institute, gives me the opportunity to clarify a discrepancy that apparently affects some transmissions of the last report. David writes:

Good afternoon, Tom. I enjoyed your take on a one-page safety syllabus (which also dovetailed nicely with your article on “[The Utility Myth](#)” for *Aviation Safety*, another sound and useful piece of work). However, I don’t think your advice on fuel management was conservative enough.

If one tank is reading 1/8 full and the other reading “??,” you shouldn’t even be “inbound on the approach or entering the traffic pattern;” you should be ON THE GROUND. In almost all of the United States, there are enough potential fuel stops that **there’s simply no good reason to ever land with less than an hour’s reserve remaining.** If that’s not possible on the route you propose to try, that’s grounds for a very serious re-evaluation of the feasibility of the flight.

From 2003 to 2008, the number of fuel-mismanagement accidents in the U.S. dropped by half. By 2010, it had climbed back up 20% from that low. Aside from a couple due to mis-fueling or other types of contamination, **every single one of those accidents could have been avoided if those pilots had placed**

appropriate priority on making sure they never violated that hour's reserve.

This is one of the simplest and easiest things pilots can do to keep themselves out of an emergency, yet 100 or so of us still fail to manage it every year. No wonder the NTSB gets frustrated!

Keep up the good work!

I responded:

I wrote if one was 1/8 and **"the other 1/4"**...if that did not survive the electronic transmission I will absolutely correct it! Thanks, David, for all your efforts in this same endeavor.

David replied:

In my e-mail, at least, the "1/4" came out as "??". I interpreted that to mean "so low you can't even guess what might be left in that tank" – hence my reply! I meant to send compliments on "[The Utility Myth](#)" earlier. It said exactly what a great many of us need to hear.

Now I understand your reaction, David. Thanks for letting me know how that was received. This is one of those statements I expected, as Paul suggested above, would solicit some reader mail given the common chat-room discussion about intentionally running fuel tanks completely dry as a routine cruise technique. As I wrote last time and several readers note above, those pilots all likely feel intentional engine failure in flight as a routine procedure is an entirely acceptable risk. I disagree (bring on the predictable comments). I'll repeat my viewpoint: if getting the added endurance of a few minutes' extra flight makes the difference between making your destination and not, then perhaps you should revisit your entire approach to the appropriate management of risk. The need for added fuel may be entirely outside your control. How many pilots land gear up or have a gear collapse on the runway every week? What if you are inbound for the runway when the airplane ahead of you closes the field?

See www.aviationsafetymagazine.com/issues/32_5/features/Dangers-of-Overloading-Personal-Aircraft_10198-1.html

Tony Caldwell comments:

Shortly after I earned my [Private Pilot certificate] someone on [Beechtalk](#) recommended Dr. Paul Craig's excellent book [The Killing Zone: How and Why Pilots Die](#). It was an interesting and sobering read [that] definitely tempered the enthusiasm of earning my "wings". It also informs my flying decisions, perhaps too much at times, but I'm too old not to be conservative. My point in bringing it up is that **I think your list is the best antidote I've yet seen for the ways pilots come to grief**. There are a couple of things on your list that I need to work on. **They will be great excuses to get more training!** Thanks for taking the time to be as thoughtful about the subject as you have been!

Thank you very much, Tony. That's what I'm striving for. I too learned much from Paul Craig. He and I published articles in the same periodicals and books with the same publisher for a while, and I was a guest lecturer in his flight instructor ground school class at Middle Tennessee State University a few times. I always benefit from my discussions with Paul.

See:

www.beechtalk.com

www.amazon.com/The-Killing-Zone-Second-Edition/dp/0071798404

Frequent Debriefeer Jim Herd adds:

Your "short" list of critical safety items that are the root causes of most piston G.A. accidents should become the standard curriculum for Flight Reviews - even if not "FAA Approved". Tom Rosen's comments seem relevant, also. May I suggest that you convert your work into a handy-dandy checklist sheet for all instructors?

That's where we're going with this, Jim. He continues:

It is tempting to "pile on" and end up with a comprehensive list that covers all eventualities, but then we would be right back at the FAR/AIM. No, **the idea is a relatively short manageable list that addresses 80% of the risks we all face. If we all get these risks "down-pat" there would inevitably be a great reduction in carnage. Wow - what a legacy!** And you could present a draft to *FLYING LESSONS* readers to refine it with perhaps a few additions, revisions, and deletion. When satisfied, get it published much more broadly than *FLYING LESSONS*.

All part of the plan, Jim (although the *FLYING LESSONS* distribution is nothing to sneeze at!). Reader Robert Thorson wraps it up:

Thanks Tom. I don't see how you do so much. Its great to have an advocate for GA like you.

Sometimes I wonder as well, Robert <g>. Thank you for your efforts too. I want to see general aviation thrive and for people around the world to realize the joys and convenience of personal flight. I believe that:

- the tragic loss of pilots and their families,
- the cultural disincentive to fly that results from the public perception of danger, and
- the attrition of our already aging and declining fleet through crashes and mishaps that result from needless repetition of the same accident causes again and again,

are the greatest threats to that continued enjoyment. **Flying can be safe if flying is approached safely.** That's what I'm trying to promote in everything I do.

Comments? Mastery.flight.training@cox.net

"Great weekly reading. Thanks!!!" Don Elliott, ex FedEx, retired US Naval Aviator

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day. The 2013 winners will be selected by AOPA's [Center to Advance the Pilot Community](#) and announced at AOPA Aviation Summit in Fort Worth, TX in October. Nominations will kick off during Sun n' Fun next week. The [2012 award winners](#) include *FLYING LESSONS* reader Tim Miller of Utah. Recognize your flight instructor and flight training provider with a vote through AOPA.

See:

www.aopa.org/sunfun/2013/130410poll-probes-students-flight-training-experiences.html

www.aopa.org/CAPComm/

<http://flighttraining.aopa.org/fsb/news/121010ft-excellence-awards.html>

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Thomas P. Turner, M.S. Aviation Safety, MCFI
2010 National FAA Safety Team Representative of the Year
2008 FAA Central Region CFI of the Year

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