



FLYING LESSONS for December 7, 2017

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:

FAA Cautions on Commercial Checklists

From AIN Online:

The U.S. FAA is warning pilots of the potential risks of using either commercial-off-the-shelf (COTS) or personally developed checklists. The agency recently issued a Safety Alert for Operators (SAFO 17006), noting COTS or personal checklists might not contain all the pertinent information included in the manufacturer's pilot operating handbook (POH) or airplane flight manual (AFM).

This warning stems from an accident in which a pilot was unable to fully lower the aircraft's landing gear. The pilot referred to a COTS checklist for the specific type of aircraft, but was only able to partially extend the landing gear. The gear collapsed on landing, and the aircraft was substantially damaged.

An accident investigation revealed that the COTS checklist did not match the manufacturer's checklist regarding landing gear failure and manual extension procedures, the FAA said. "The omission of steps within the COTS checklist significantly contributed to the pilot's inability to fully extend the aircraft's landing gear." The list used by the pilot had also omitted a key caution statement regarding the landing gear, the agency added.

The FAA is thus advising pilots using COTS or personally developed checklists to "meticulously compare them to the manufacturer's checklist and placards contained in the POH/AFM to confirm they are consistent. This action will ensure the pilot has all pertinent manufacturer's information during aircraft flight operations."

I agree that all checklists should include *at a minimum* those items that are contained in the Aircraft Flight Manual (AFM), Pilot's Operating Handbook (POH) or similar documents. In most cases, however, those checklists are only the beginning. There are indeed hazards in using a checklist that has not been checked for accuracy. I contend, however, that with the SAFO's caution in mind virtually *everyone* need to develop airplane-specific checklists. Here's why:

First, most AFMs/POHs are contained in binders that are hefty and hard to use in the cockpit. One option is to make copies of the AFM/POH checklists and bind them separately for ease of use.

Second, virtually all airplanes have some optional equipment or modifications that require their own checks. Additional checklist steps for those additions are contained in the POH or AFM Supplement—it's very unwieldy to flip back and forth between the "main" checklist and the Supplements.

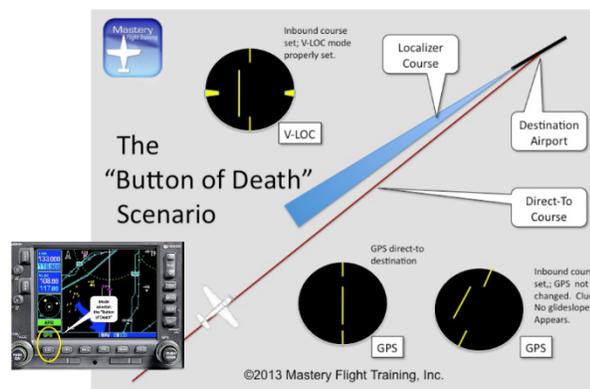
Third, modern avionics make it virtually impossible for manufacturers to address all needed operating steps, even the avionics manufacturers themselves. Not only do specific makes and

models of equipment require specific operation, that operation may vary when *other* types of equipment are also installed in the same aircraft. For example, a Garmin GNS530W requires two unique button-pushing inputs to program for a coupled instrument approach when a Honeywell/Bendix King KFC225 autopilot is also installed—two steps that are not required with any other model of autopilot (even the other KFC-series models).

Fourth, most AFM/POH checklists are written as *training* checklists, that is, they include checklist actions in great detail...detail that makes the overall checklist lengthy and unwieldy. The old-school airline model was to use these detailed training checklists during transition training until the pilot learns the procedures well, then to move to a shorter, reminders checklist after familiarity is achieved and the transition is complete.

Fifth, there may be some items you just want to include on your own checklists. Or you may want to write additional checklists of your own. For example:

- A former employer of mine lost his cell phone several times after he set it on the airplane's wing during his preflight inspection, forgot it was there and took off. Only somewhat tongue-in-check, I penciled the step "Cell Phone – REMOVE FROM WING" into his Before Start checklist. Guess what? He never forgot it again!
- If your airplane is capable of entering the Flight Levels (18,000 feet in the U.S., or wherever your regulatory agency defines it), you might create a short Flight Level checklist to use when climbing or descending through the change to standard altimeter setting/QNH. This short check includes setting the altimeter and confirming the proper quantity and flow of supplemental oxygen, if required.
- There is a lot to do between Top of Descent (the point at which you leave cruising altitude at the end of a flight) and the Before Landing checklist. There is also frequently a lot on the Before Landing checklist to do in the high-workload approach/pattern environment, and that can be done sooner when workload is less. You might write an Approach checklist that combines items from the Descent and Before Landing checklists, and adds specific items to set and confirm avionics set-up for an arrival (I mention one in the next bullet point). This is analogous to the In Range checklist employed by airlines.
- A common GPS user mistake is to forget to use the VLOC mode when flying a ground-based approach, or to return to GPS mode in a missed approach when you can return to satellite-based navigation. I have an only somewhat fasciesiously labeled "[Button of Death](#)" checklist step on my Approach and Missed Approach checklists, to remind me to activate and verify the correct operating mode.



See <https://www.faa.gov/files/gslac/library/documents/2013/Feb/74571/130221%20FLYING%20LESSONS.pdf>

And sixth, Experimental/Amateur Built Aircraft (E/AB, or "homebuilts) and many older aircraft types may not have any "manufacturer" data or checklists at all. If you own of fly one of these it's up to you to make a set of checklists that works for you.

My opinion is that *shorter, more user-friendly Normal Procedures checklists are much more likely to actually get used* by pilots, while long, detailed and unwieldy checklists tend to

be ignored...contributing to mishaps when the pilot has *no* reminder to accomplish required actions.

For example, the Beechcraft Bonanzas I usually fly have a long series of actions for the preflight check of the electric pitch trim system. Now that I know how the full check, all I need is a step on my Before Takeoff checklist that says “Electric Trim – Check.” That reminds me to do the check without taking up half a page in checklist explanations about *how* to do it. Some manufacturers (including Textron Aviation for the current production G36 Bonanza and its G58 Baron sibling) now include a short, reminders checklist for normal use in addition to a detailed training checklist in the AFM/POH.

Abnormal and emergency procedures, which must be more detailed because

- 1) there is usually a specific order to actions in addition to the actions themselves; and
- 2) they will be accomplished by a pilot who is under pressure and stress from having to perform the abnormal/emergency action in the first place,

remain in the longer, “training” checklist format in the AFM/POH binder (including Supplements). In an Abnormal situation the pilot has time to look up the longer procedure in the handbook. In Emergencies, the pilot must usually perform some steps from memory ([The Bold Print](#) or memory steps items), after which he/she has the luxury of opening the handbook for the “clean up steps” to finish the procedure.

Wrapping this up, I believe aircraft owners not only might, but *should* create personalized checklists specific to the airplane, its options and its operations, making the checklists concise and usable. Leave the Abnormal and Emergency checklists alone, and keep the AFM/POH (or in the case of airplanes without them, any expanded checklists and notes you have or create) reachable from the pilot’s seat while fully restrained by seat and shoulder belts.

As the SAFO warns, when you make your personalized checklists, ensure you do not contradict or leave out any critical information from the original factory checklists.

See:

https://content.govdelivery.com/attachments/USAFAA/2017/04/27/file_attachments/808068/SAFO17006.pdf
<http://www.mastery-flight-training.com/mft-the-bold-print.pdf>

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

My [notes and comments on Chapter 4](#) of the classic *Stick and Rudder* are now posted on the Mastery Flight Training home page. Took me long enough! Watch for Chapter 5 and beyond as soon as I find the time to continue what (at least for me) is a valuable and interesting review.

See <http://www.mastery-flight-training.com/stickandrudernotesch4docx.pdf>



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See <https://www.pilotworkshop.com/nto-ifr?ad-tracking=turner-nto-ops>

Debrief: Readers write about recent *FLYING LESSONS*:

Frequent Debriefer John Townsley writes about last week’s *LESSON* concerning preparations for the sparks of a gear-up landing:

Excellent reminder! The video, the reader (pilot's) actions, your comments about sparks and the danger of a post-crash fire... superb! Thanks again for your very insightful, very useful, very welcome commentary.

I've not seen stats for gear up experiences that would offer insights into mechanical failure vs pilot oversight. What have you seen? What might be the trends for mechanical failure? Are there correlations with the inventory-adjusted numbers for our relatively aged fleet of retracts?

Hi, John: I don't have any definitive information, but I think I have the beginnings of a good hypothesis. For two decades I have tracked known Landing Gear-Related Mishaps (LGRMs) in piston Beechcraft airplanes—gear up landings, when the wheels were fully up at touchdown, and gear collapse events, when the gear was not fully down or did not remain down for landing, takeoff or taxi. For over a year I extended this study to [all LGRM reports in piston-powered airplanes](#). Looking at the data, it appears that overall, **gear collapse events slightly outpaced gear up landings**. In some airplane types gear collapses were as much as twice as common as gear up landings. **Known mechanical failures of the landing gear system accounted for a small number of the reports, 10% or fewer.**

Now, some gear up landings result from known mechanical failures. That's when we see news crew video of a belly-slide...the pilot knew the gear was broken in time for a news crew to overhear the tower frequency scanner and move a video team in place to capture video for a Breaking News report. But most gear ups appear to fall into the "oops, I forgot" category, for reasons we've explored in *FLYING LESSONS* many times.

Gear collapse mishaps, especially gear retraction during the landing roll, are generally dismissed as pilot error—the pilot moved the wrong cockpit control when "cleaning up" the airplane after landing. The longer I am in the industry, though, the more I believe a larger percentage of the gear collapse events are mechanical. One data point: a large aviation Type Club with which I happen to be very familiar hosts several aircraft inspection programs around the country every year. The particular program in question usually inspects 20-24 airplanes over a long weekend. And it's highly unusual to have fewer than two airplanes at any one weekend event for which the inspector recommends having the landing gear tensions returned to proper tolerances (the gear tensions hold the gear legs down against friction forces from the runway). Most of the time in these cases the gear tension is not set strongly enough to guarantee preventing retraction; sometimes the tensions are *too* strong, and the gear system undergoes excessive strain that will eventually lead to an overload. Add to this the many times inspectors find corroded, cracked, or bent gear pushrods and rod ends, and other gear rigging issues that could lead to failure, and I conclude that **proper landing gear system maintenance is likely to be a major cause of gear collapse mishaps.**

Note that my informal study used conservative insurance industry estimates to suggest the US aircraft insurance industry overall pays out over \$1 million in LGRM insurance claims *every month*—raising insurance costs for everyone, even owners of fixed-gear airplanes as underwriters raise prices to make a deserved profit. In a large majority of cases even a benign LGRM event results in potential repair bills that causes the insurance company to total the airplane and part it out. This makes LGRMs the single biggest threat to the longevity of the retractable-gear airplane fleet—the most likely reason an "RG" airplane will be totaled.

I conclude: There are some systems that don't necessarily need to be addressed precisely as recommended by the manufacturer. The landing gear system isn't among them. ***Don't skimp on landing gear maintenance and inspection, and follow manufacturer's recommendations*** for inspection, overhaul or replacement of landing gear system components.

See <http://www.thomaspturner.net/LGRM%20ongoing.htm>

Frequent Debriefer Robert Thorson has insights into the highly-publicized Icon A5 crash that prompted the *LESSON* "[It's In the Way That You Use It](#)":

Just an aside on the Icon A5: There are few seaplane pilots around with experience anymore. The picture of the aircraft upside down looks to me like the hull was ripped apart. Seaplane hulls have a maximum speed above which touching the water surface is not going to produce a good outcome. This might be an issue here. All my experience is in the Grumman [Flying] Boats and the Catalina, not float-equipped or LSA with a hull.

Could be that hull hydrodynamics have improved or in the case of an LSA they may not even be considered. [This is] something to watch for as the investigation unfolds.

See <http://www.mastery-flight-training.com/20171109-flying-lessons.pdf>

Reader Tommy Fankhauser writes:

I started the IMC Club in our EAA Chapter 302 here in Conroe [Texas]. They are very active builders and flyers and support the learnings we together bring to the meetings and those who don't attend read the notes I send out from the meetings. Myself and Mike Barnett choose the meeting topics for the meeting agendas.

I worked in the oil business for 36 years and I too have seen the same mistakes repeated time after time in the 8 countries and 7 or so states I've worked in. My early exposure to flying and my dad's belief in continual training, following procedures, processes, checklists, and audit/monitor from his time flying B-26 Marauders and others has been in my tool kit since I was a kid.

In the oilfield, certain incidents almost became part of a script I could rewrite every year from looking at incidents from other locations and past documented incidents.

I know one thing from that experience: once you think "you've seen it all," something comes along and proves you haven't.

Zero incidents is achievable if all dynamics of growth and change remain in a bubble. But we don't. So it's guys like you and others who get out there and spread the good word and remind people to do the right thing that saves lives.

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

Thank you so much for *FLYING LESSONS*! I have learned so much from your writing (and the insightful reader comments) each week! – Robert McCafferty

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A few recent emails from *FLYING LESSONS* readers reveal a wide variety of pilot experience, and uses for *FLYING LESSONS Weekly*:

I wanted to drop you a quick note to introduce myself as a new reader of your excellent weekly newsletter. I am a 40-year-old PPL [Private Pilot – Land] student in Johannesburg South Africa, training in the [Cirrus] SR20. A friend introduced me to your newsletter and I've been at pains to read as many past issues as possible. Even though I'm a low-hour, pre-solo student I find your insights and thinking points fascinating. I would be happy if my flying career was characterised by a continual awareness of the safety issues and performance above and beyond the required levels. Your newsletter will make that easier by creating awareness. I hope you are able to continue producing it for a long time to come.

Warm regards - Mike Blackburn

Please keep writing Flying Lessons! I'm new to being a licensed pilot, although I've loved all things aviation for a long time. Your (mostly) weekly lessons make a big difference for me, since I don't have a very big flying community around me. I learn as much from how you do your analyses as the recommendations you make.

Regards - Chris Larson

I read your most recent weekly debrief (11/8/2017) and would like to voice my personal thanks for your contributions to the safety of flight for all skill level pilots. I personally was able to finish my Private Pilot in tandem with my Ph.D. in aerospace engineering in 2015 and am currently working towards my IFR endorsement. I began reading your publications around the same time and found them invaluable for highlighting subtle habits and decision-making trends I suspect many of us make subconsciously. I consider your weekly *LESSONS* a key part of my continuing education and a superb means of staying mentally current

when the Ohio weather keeps my feet on the ground. Thanks, and I look forward to more insightful publications in the future! - Matt McCrink

I have renewed my donation to your weekly *FLYING LESSONS* cause. Frankly I was a little concerned that you thought these newsletters were not having any affect, so I thought I'd let you know that they are well received and often topics of discussion during my Wings classes (both as part of IMC Club and other venues). Please continue publishing these as long as you are able to do so, and thank you for all you do for aviation safety. - Jim Stover

I left the airline industry for a non-flying combat tour supporting EOD bomb forensics back in 2008 - 2009. Upon returning from Iraq, I decided to ground myself, which I still stand by as a sound decision. Staying in flying at the time would have potentially been a poor and selfish human factors-related decision. Since then, I have added a second Master's degree from ERAU and teach part-time at a brick-n-mortar college as an Adjunct-Professor. Very rewarding!

I just printed up your first three chapters of the book *Stick and Rudder*. After a long hiatus from the airlines, the flying bug has bitten me again. I credit this to finding your extremely focused and effective note writing style from the mentioned book. **SOMETIMES IT'S GOOD TO GET BITTEN!** This also ties into my desire to get back involved with simulator-based flight training and my goal to become involved with upset recovery training. Additionally, I plan on getting the B737NG Type Add-On to my previous B737 (Glass) Type-Rating, so I can possibly re-track back into aviation employment again; maybe at a FAR121/135/91 jet type rating schoolhouse or possibly the FAA as an ASI.

Keep up the great work! I am truly inspired again! Thank you, Thomas! - Shane Cuddson

Shane, I was seriously thinking about whether working on *FLYING LESSONS* was worth it, or if I should spend my time doing something else. Then your emails came in. You've reenergized me and I'm happy I was able to have the same effect on you. Thank you very much for writing. Best of luck to you, and please keep me advised on your progress.

Thank you, **everyone**, who has confirmed that *FLYING LESSONS* is important and useful to you.

Share safer skies. [Forward FLYING LESSONS to a friend](#)



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Thomas P. Turner, M.S. Aviation Safety
Flight Instructor Hall of Fame 2015 Inductee
2010 National FAA Safety Team Representative of the Year
2008 FAA Central Region CFI of the Year
Three-time Master CFI

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