



# FLYING LESSONS for February 28, 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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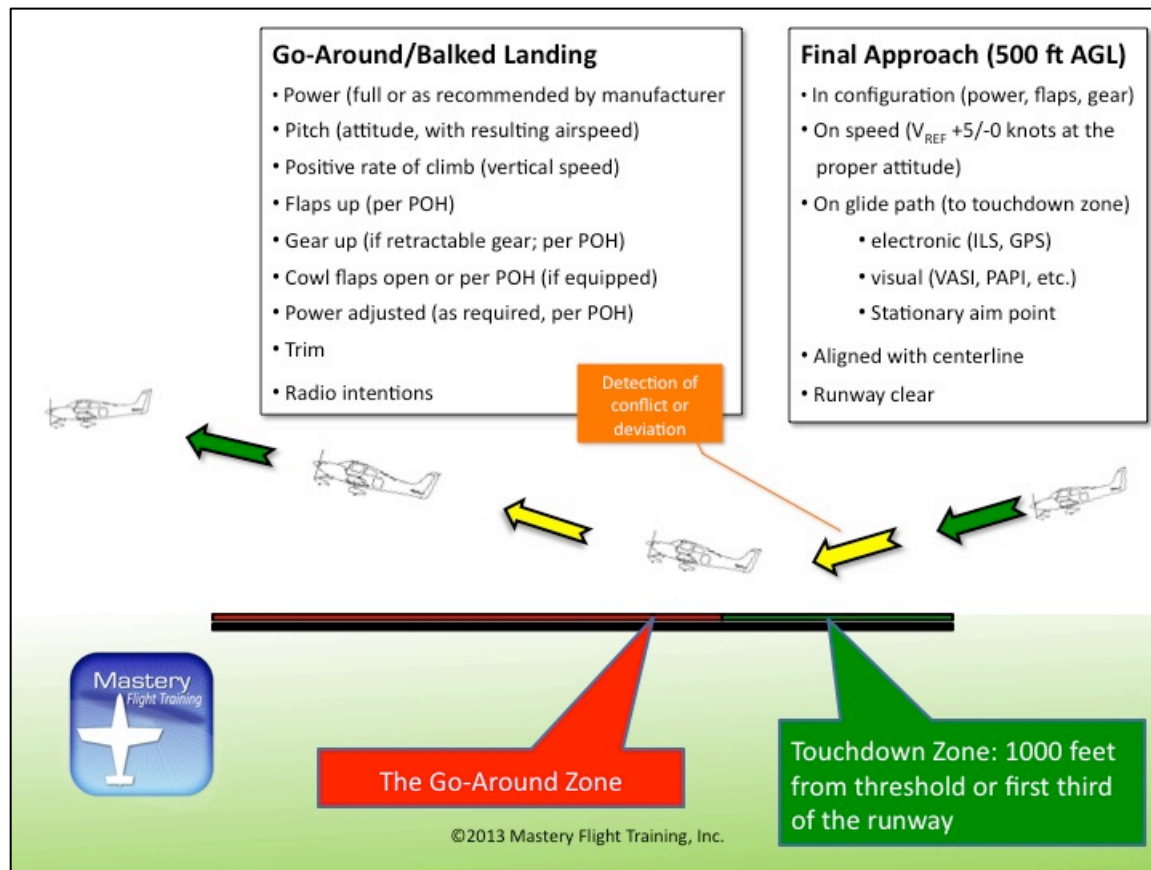
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## This week's lessons:

**Power, pitch, positive rate...**this is the mantra of the go-around or bailed landing procedure. Once established in climb, clean up the airframe (flaps up, gear up as appropriate) and configure it for climb (cowl flaps open if equipped).

**When should you go around?** The need for a go-around can be obvious, or it can be a very personal thing. Is an airplane, animal or obstacle on the runway? Is the airplane too fast, or descending too rapidly, or aimed too far down the runway? Are you having difficulty maintaining runway alignment in a crosswind? Does the landing simply not "feel right"? Any of these indications call for breaking off the landing, going around and trying again...or perhaps diverting to another airport.

**Going around** is as natural a part of flying as landing or taking off...or it should be, if you occasionally practice the task.



**On short final approach**, say, 500 feet Above Ground Level (AGL), check that *all* the following apply:

- **The airplane is properly configured.** This means the power is set as normal or expected, the flaps are in the planned landing position and retractable landing gear, as applicable, is down.
- **The airplane is on speed.** At the proper landing attitude (this is an important configuration cross-check), the airspeed is at your final approach speed  $\pm 5/0$  knots— $V_{REF} = 1.3 \times V_{SO}$  or as recommended by the Pilot's Operating Handbook (POH), including added speed for a gust factor or if landing with partial or no flaps.
- **The airplane is on glide path.** This may be an electronic glideslope from an ILS or derived by GPS, a visual glide path following a VASI, PAPI or similar guidance, or simply a stationary aim point on the runway that is within the touchdown zone. The touchdown zone is  $\pm 100$  feet of an identified spot (U.S. Commercial Pilot standard), approximately 1000 feet from the runway threshold or one-third of the total runway length from the threshold, whichever is shorter.
- **The airplane is aligned with the runway centerline**, and you are having no trouble maintaining alignment.
- **The runway is clear** and, at a tower-controlled airport, you are cleared to land.

**If any of the above criteria** is *not* the case, immediately initiate a go-around or balked landing procedure. Do not try to “salvage” an out-of-tolerance approach within 500 feet of the ground.

**“On the go,”** satisfy these criteria:

- **Power.** Advance the power to full or as recommended by the airplane manufacturer. This includes leaning the mixture for best power at high density altitudes in most normally aspirated, piston-powered airplanes (some engines do this automatically).
- **Pitch.** Establish the proper pitch attitude. In general, start with the attitude that results in  $V_X$ , or Best Angle of Climb speed. If you have no obstacles you can establish  $V_Y$ , or Best Rate of Climb speed, realizing that the airplane will cover more ground to reach a given altitude. In multiengine airplanes you should establish a shallow climb attitude and accelerate to  $V_{YSE}$ , or “blue line” speed, before pitching up further to  $V_{YME}$ —*unless* you have to clear an obstacle, when  $V_{XME}$  attitude is appropriate at the beginning of the go-around.
- **Positive rate.** Use the Vertical Speed Indicator (VSI) to confirm the airplane is maintaining a positive rate of climb.
- **Flaps up** as recommended by the POH.
- **Gear up** as applicable, as recommended by the POH.
- **Cowl flaps open**, if equipped, as recommended by the POH.
- **Power adjusted**, as necessary, if the POH mandates or recommends a power reduction for climb.
- **Trim** the airplane for climb.
- **Radio your intentions** to other airplanes and/or ATC as appropriate.

**Beware the somatogravic effect**, or the “[false climb illusion](#).” As an aircraft accelerates, the sensory hairs in the pilot's inner ear bend rearward under inertia. This is the same movement that occurs when an airplane pitches upward steeply. If the rate of acceleration is great, and the outside visibility is limited by darkness or obstructions to vision, the pilot may interpret the somatogravic effect as a steep climbout and instinctively push forward on the controls, reducing

the climb or even putting the airplane into a descent. There are many instances when an airplane impacted obstacles far beyond the departure end of the runway during takeoff or go-around at night or in severely limited visibility, and the “false climb illusion” is suspected as a contributing factor.

**Your defense** against the somatogravic effect is to establish the proper attitude, through the combination of visual references backed up by the attitude indicator when visibility is impaired but fairly good, and solely by reference to instruments on a dark-night departure or go-around, or when taking off or executing a balked landing in instrument conditions.

See <http://aeromedical.org/Articles/dnt.html>

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## **Debrief:** Readers write about recent *FLYING LESSONS*:

Reader and active flight instructor Daniel Ramirez writes about [last week's FLYING LESSONS](#) on mode confusion when setting most GPS units for an instrument approach:

The ol' “button of death,” that's what I call it as well. I'm glad you put that out in those terms because I have been noticing lately that so many of our pilots forget to push that button...from GPS to VLOC.

**Simply don't forget. You can die if you don't!** Harsh terms, but reality.

I use the audio panel common in most planes as an IFR checklist. Starting from left to right:

- COM 1: Do I have it set to the freqs I'm using?
- COM 2: Do I have that set to freqs I may use?
- NAV 1: Is it set up and identified? Have I pushed VLOC or is it still on GPS?
- NAV 2: Do I have it set to back up or missed approach?

You can add or delete [to this technique] to customize what fits your style.

Lately I have also experienced a few good pilots [who have] become complacent in their IFR skills. Do come to an IPC prepared. If you are not ready, hire a qualified CFI to spend a few hours of IPC preparation. Practice with a safety pilot regularly. Get yearly (or more frequent) checks if you don't use your skills regularly. But **come prepared!** Safe flying to all!

See [www.mastery-flight-training.com/20130221flying\\_lessons.pdf](http://www.mastery-flight-training.com/20130221flying_lessons.pdf)

Thank you, Dan. Good reminders.

Frequent Debriefers and airline pilot David Heberling comments:

Another very important topic for today's sophisticated navigation systems. **Knowing which mode of navigation you are in is a matter of life and death** as you point out so well. This applies to the big iron too. When I first trained on the Airbus, it was drilled into us how important the Flight Mode Annunciator (FMA) was. This is the top bar of information displayed across the top of the PFD. FMA, FMA became our mantra as we progressed through training. **If you ever have to ask "What is it doing now?" you have not been paying attention** to the FMA.

Even my lowly Bonanza has a sophisticated enough autopilot that it sports its own annunciator panel right on the face of the unit (Century 2000). I sometimes think that our modern avionics have gotten too sophisticated for the casual flyer. **In order to really know these systems, you have to fly with them often.**

In the Airbus **we have flow charts for every type of approach** we use. I find this makes it much easier than trying to memorize all of the steps required.

Thanks, Robert. There seems to be a fear that standardization would stifle creativity. Engineers learned extremely early in aviation, however, to standardize the basic pilot inputs for aileron, elevator and rudder. There are minor variations--stick, wheel, side stick--but in all you push to pitch down, move it left to bank left, etc. The basic function is standardized and intuitive, even if the specific design varies to meet operational needs or a manufacturer's preference. We have not yet reached that level in advanced avionics function. I agree that until we do, advanced avionics systems management requires a great amount of training and currency, and unintentionally supply a number of traps that can conspire to erode the potential safety improvement.

Reader and frequent Debriefing Robert Thorson adds:

[Last] week's article is a good example of risks created by automation, to which training and manufacturing have not adequately considered the unintended consequences. The current methodology for switching between linear navigation (GPS) and angular navigation (VOR/ILS) needs to be corrected. **Every GPS or FMS equipped aircraft I have flown has some similar "trap" in mode changing.** These are systems designed by engineers, and not pilots. **If [we] ask the pilot to be the "last chance filter" for every engineering deficiency we will never lower the accident rate.** The hazards of automation are observable. There is no standard for symbology or methodology in automation. Lets get the manufacturers to engineer out these hazards!

George Boney chimes in with a possible mitigation:

I liked the discussion on the "the button of death" last week. I wonder if we could get the controllers involved in fixing this. If you land at a military base, it is always "cleared to land - check gear down", even if you are flying a Cub. Could the controllers say "Established on the approach - Check navigation set to approach"?

I enjoy [*FLYING LESSONS*]. Thanks for all your efforts.

Thanks, George. I'm told civilian controllers stopped insuring the gear advisory long ago because of frequency congestion. Maybe that should be revisited, and the navigation mode added too. George responds:

Maybe. I thought the tower/approach frequency might be less busy because it would be IMC and less folks would be flying [when actual approaches are in use]. But I suspect unless they think it is a significant problem, nothing will change. It would be interesting to get a controller's take on this.

Any controllers out there who wish to comment?

Kent Stones suggests another "approach":

I am an avid reader of *FLYING LESSONS*. Thanks for this resource. Just some background for what I am about to write: I am casual IFR pilot. My personal minimums are higher than those published. I do have a new glass panel in my refurbished [Beech] E33 [Bonanza] I have owned for 27 years. And finally, I am 65 years young and really focusing on remaining a safe pilot for the balance of my flying days.

With that said, I am following the advice of a CFII friend who suggested that I limit my approaches to GPS only. This is working out very well for me with the proliferation of GPS approaches around the country and the FAA's stated goal of having GPS approaches to every public airport by the end of 2014. Where I live and do much of my flying, rural Western Kansas, many of the airports don't have an ILS. By adhering to this personal IFR minimum, the "button of death" is not a factor.

That's certainly a unique mitigation strategy, Kent. Something to think about, really.

Reader Mike Munson takes the incident-based but hypothetical scenario a step further:

I really enjoy your *LESSONS* each week, but had a question about the bottom right indication. When in GPS mode for most the dial will act the same as a localizer, i.e, you can spin the dial, but the needle says where it is. Only if he accidentally hit his OBS mode would the course indication move, but that still would give an approximate correct course. If that is the case, my guess would be that he missed entering approach mode

after being in heading mode on the autopilot, which would also explain why he was high if he thought the autopilot would intercept the glide slope. However, that would be very sloppy flying as missing more than a button push. Not only would the GPS indication still show he needed a course correction, he also had no clue on where he should be on altitude. Still would be a button of death scenario, just a few more buttons.

That's a possibility, Mike. Thank you.

A reader who has previously commented on condition of anonymity, whom I know personally and whose experience and opinion I greatly admire, responded this week as well:

The "button of death"? Seriously?

I replied: I understand and appreciate your sensitivity, but this is a serious "gotcha" that applies to every GPS I know. A memorable if perhaps hyperbolic name may make pilots more likely to remember this critical step. The reader replies:

I'm not sensitive to it at all, I just don't agree that you should call things by inappropriate names to be sensationalistic or make a point appear more important than it is. You speculated on the cause of an accident and then used that unsubstantiated speculation to try to emphasize your point. If you have seen pilots habitually make that mistake, your writing should reflect your experiences and leave idle and non-fact based speculation out of it.

Perhaps true. Yes, this is a common mistake I've seen experienced pilots make during training flights. Perhaps the sometimes artificial urgency of training exercises, with multiple approaches flown in succession give less time than normal and interrupt a pilot's flow when setting up for the approach, is a factor. My point is that, if such an omission led to a crash, the evidence might be similar to what the NTSB preliminarily reports in the cited example. Hence the crash serves as a reminder to think about mode confusion as a possible factor in future crashes. The reader continues:

And even if you are right about the cause of the accident (really a contributor to it rather than the cause), it isn't a new issue. There are many, many accidents related to approaches being conducted with the wrong frequency selected, the wrong course selected, flying to the correct navaid but with the DME tuned to a different one (I investigated an accident on that one, a Beech 99 in Spokane). How is verifying the correct position of the "Button of Death" any different than verifying your DME is indicating the correct VOR when you're doing an approach in a non-GPS equipped airplane?

You have valid points:

1. If in fact the speculative scenario I described last week indeed applies to the cited mishap (I went out of my way to remind readers this scenario is merely *suggested* by the evidence in the cited crash), then the "button of death" is not the cause, just a contributing factor. As I wrote, the end result of such a speculative scenario is pilot confusion that results in loss of control...the "button of death" *scenario* is a killer because it may lull a pilot into loss of control (LOC) or controlled flight into terrain (CFIT), but it would be the pilot's LOC or CFIT from distraction, not the mode confusion itself, that would be considered the proximate cause.
2. There are many "gotchas" on the panel. The more modes available, and the more buttons to push, the greater the likelihood of an omission. All the more reason for recommending pilots develop and routinely use an Approach checklist to verify everything is set as needed—which was the *LESSON* developed from this speculation last week.

Both the [Garmin] 430 and the 530 have messages which say "Select VLOC on CDI for approach" and "Select appropriate frequency for approach". If the pilot is inbound and within 3 NM of the FAF, and the loaded approach is not a GPS-based approach (an ILS, for example), the pilot will get the message that says "Select VLOC on CDI for approach". How much clearer can that be? And when the pilot loads the approach, both these units will place the correct frequency in the NAV standby, then post the message "Select appropriate frequency for approach" when the airplane is within 3 NM of the FAF and the frequency doesn't match the published frequency for the approach. If they don't swap frequencies, what should we call the nav flip-flop button?

I wasn't picking on any one make of GPS in last week's report, but as you describe at least one

manufacturer, Garmin, anticipates the possibility mode confusion and provides multiple advisories that, if heeded by the pilot, should mitigate the hazard.

I've seen far more people mismanage their autopilot than I have seen mismanage the VLOC/GPS control. Should we start calling the AP engage button the "Super Button of Death" or maybe the sinister "'Button of Disaster'"? There also seems to be a lot of discussion about fuel mismanagement, and I've personally investigated fatal fuel starvation accidents. Shall we call the fuel gauges "Gauges of Life" so people refer to them more often? You'd save a lot more lives that way than by focusing on navigation selection controls.

Yes, you can make the case that we should use equal hyperbole in *LESSONS* about other controls and indications as well. I have indeed been accused of going too far about fuel management by equally passionate readers, despite the two to three fuel mismanagement crashes reported each week in the U.S.

I maintain, however, that my intention in using such a purposely outlandish nickname for the GPS/V-LOC button is precisely to make its use memorable. I doubt many *FLYING LESSONS* will push that button again without thinking about this facetious nickname, and more importantly, they're less likely to forget to engage and confirm the proper mode as a result.

I'm not the type of pilot who tells my passengers, post-flight, that we "cheated death again". Didn't think you were, either.

No, I'm not either. As I suspect you do as well, I do take a few minutes to critique my performance after every flight, and what I might have done differently to reduce risk and improve my flying.

Great discussion, all. Thanks!

What do you think? Let us know, at [Mastery.flight.training@cox.net](mailto:Mastery.flight.training@cox.net)

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