FLYING LESSONS for January 20, 2011

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.

If you wish to receive the free, expanded *FLYING LESSONS* report each week, email "subscribe" to mastery.flight.training@cox.net.

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This week's lessons:

Runway overruns continue to appear frequently in general aviation accident reports. Going off the far end of the runway is the result of one or a combination of several factors:

- Excessive airspeed on final approach.
- Improper configuration for landing, especially landing with too little flap extended for the landing technique you use.
- Mis-judged glide path…aiming for a point too far down the runway to permit stopping in the remaining distance available.

If you try to "force" the airplane onto the ground at too great a speed, you risk overloading the landing gear and other structures…and you're *still* going to need the room to decelerate to a stop on the remaining runway.

Adding a few extra knots in gusty conditions is a proper way to maintain a safe stall margin. But adding speed when the conditions don't require it, because you *think* the added speed provides an increased margin of safety, is a false assurance.

Land at the *proper* speed for conditions and the airplane's configuration and weight. Otherwise, you risk running off the far end of the runway.

If the runway is contaminated with water, ice or snow, it's especially important to land at the lowest safe speed, touching down as close to the arrival end of the runway as safely possible, because you may not have effective braking. You may depend entirely on friction to slow the airplane to taxi speed, friction that is in short supply on a contaminated runway.

Touch down in the touchdown zone…the first 1000 feet or the first third of the runway, whichever is shorter. If you can't smoothly land in that zone (without "forcing" it down), make an early decision to go around, climb out, and either try it again or divert if conditions warrant.

Even if the runway is very long, unless you're intentionally trying to "land long" (with sufficient runway remaining), remain disciplined to land in the standard touchdown zone.

After the wheels are on the ground, remain ready to power up, trim it up and go around if it appears you can't get stopped in the distance remaining…but *only* if you're assured you have enough runway to get safely back in the air and clear of obstacles off the runway's far end.

Although in general I recommend against touch-and-go landings, to avoid the high risks associated with changing airplane configuration rapidly while moving along the runway, practicing T&Gs with an instructor experienced in the maneuver in your type of airplane is the best way to

prepare for a "landing abort" once the airplane is on the ground. Don't touch flaps and landing gear unless specifically required by the airplane's handbook or flight manual—most will at least begin to climb at high power and full flap configuration, except at high density altitudes.

Power, pitch, airspeed (or angle of attack) and then flaps, landing gear and trim, is the sequence for an on-runway landing abort, unless a technique is specifically recommended by that airplane's manufacturer. If you've practiced this a few times since your last flight review you'll be ready should you ever find the end of the runway coming at you faster than your rate of deceleration can arrest.

Comments? Questions? Tell us what you think at mastery.flight.training@cox.net.

Last week we looked at seven fatal accident scenarios that, grouped under the NTSB's category of Low Altitude Maneuvering—Non-Controlled Flight into Terrain comprise the 10th most common cause of fatal general aviation mishaps. *FLYING LESSONS* challenged readers to think about the scenarios, and for one or more address ways to teach recognition and avoidance of the underling causes by:

A. Suggesting ADM factors and "decision points" that presented themselves prior to the accident, and the information the pilot might have had with which to make go/no-go decisions;

B. Listing the START skills that could have helped the pilot avoid, and ultimately, escape the likely threats; and

C. Recommending specific *FLYING LESSONS* we can learn from each tragic experience, to incorporate in checkride-preparation and recurrent flight training so we can noticeably reduce the fatal general aviation accident rate.

To date no one has expressed any ideas for reducing one of the most common causes of fatal GA crashes. Take another look at the scenarios in last week's *FLYING LESSONS* report. Think about it some more, and email your ADM/START observations and recommendations to mastery.flight.training@cox.net. Identify your responses by the accident number (1 through 7). I'll compile, edit (as necessary) and publish your responses (anonymously on request). And I'll add my thoughts from the exercise as well. By the end of January we should have a series of recommended additions and modifications to the traditional way of training pilots…changes that may be our best hope of reducing the rate of fatal accidents.

See www.mastery-flight-training.com/20110113flying_lessons.pdf

Debrief: Readers write about recent *FLYING LESSONS:*

Actually working out the results of "special" techniques is helpful in managing risk. Reader David Heberling writes about recent *FLYING LESSONS* on crosswind control on takeoff and landing, and the oft-quoted notion of landing at a slight angle across a runway, pointed more into the wind, when the surface winds become strong:

> I have never actually sat down and looked at a wind component chart to see how much is gained by landing a few degrees off of the runway heading into the wind. Now that I look at it, you do not gain much by doing so. If the wind is 90 degrees off of runway heading, even a 10 degree reduction [in angle between airplane heading and the wind] only decreases the crosswind component by half a knot. In fact here are the rest of the changes down to 40 degrees off of runway heading:
>
> 80 - 70 = 1.5 knots
>
> 70 - 60 = 2 knots

60 - 50 = 3 knots

50 - 40 = 4 knots

By doing some trigonometry, it is obvious that the benefit gained is small but not so small to make this technique useless. The only part of the landing that needs to be off of the runway heading is the part from the approach to touchdown of the nosewheel. Then you can turn the aircraft back toward the centerline of the runway. This is only advisable in a tricycle gear aircraft. They are more stable [than tailwheel designs] on the ground in strong winds. From my calculations the benefit is gained from aiming for a point on the opposite side of the runway that is at least 5 runway lights further down the runway. For a 150' width runway, this gives you almost 17 degrees of crosswind component reduction. On a 75' width runway, the reduction is half of 150' value. The intent is not to make this a difficult exercise. With practice, it is just another tool in the toolbox.

Thanks, David. It's still most advisable to divert to a different runway unless unusual circumstances make using this technique the better option, especially since the wider runways that make this technique most usable are at large airports that will almost certainly have a crosswind runway option.

Several readers comments on last week's *LESSON* about the "button of death," the GPS/VLOC button on approach-certified GPSs, and the need for a pilot-derived, airplane-specific checklist to ensure the system is set up properly before an instrument approach. Ed Livermore writes:

I read your *FLYING LESSONS* mailing this morning and totally, absolutely agree that getting the GPS/VLOC buttons set right is critical. In one of my earlier training flights, I made the very error you cite. Coincidentally, just this week, I've updated my own personal Do List and Check List for departures and approaches. We have all three Aspen panels [in our Beech Bonanza] along with a GNS 430 and KLN 94 [GPSs] installed. Beyond the GPS/VLOC button, there's a lot of setup to be ready for a successful approach...or [standard instrument] departure [procedure] if one is prescribed.

As you wrote, a pilot really should compose his own for the airplane and panel being flown. [Mine is] detailed, and I'm a lot more comfortable with these "glass" approaches than what some of the steps might indicate. In the past several months, I've flown no less than 75 or 80 approaches with the new gear, now to a point where it's as old hand as the previous analog gages.

[I've read] recently about the need to train hard when making the switch. [That's] right. Last March, when our plane came out of the avionics shop, I purchased the Sporty's training DVD on the Aspens and Garmin and watched them two or three times. Then I put a power cart on the plane, shut the hangar doors to darkness and thus converted the Bonanza to a simulator. I sat in the pilot's seat for about 3 hours with my laptop playing the DVD, read the manuals and punched buttons. That really helped.

This was followed by flying with the Aspen field engineer…and the area sales manager (who coincidentally was flying through [Ed's home town] right at that same time) for an hour each. I then flew with a local CFI for 2 hours. We did a lot of approaches. Following all this, in VFR only, I "signed" myself off for more air work.

I found the conversion to [vertical readout] tapes for air speed and altitude was VERY difficult. Alone, in VFR, I made 25 approaches over two days before setting off on the first cross country...which interestingly involved a real ILS at Addison [Texas]. Over the ensuing months, I routinely made approaches for practice on almost every flight. Though some have been for real, most of these were [under] pretty high ceilings. The payoff came last week coming back into Kerrville from Tulsa to a 400-foot ceiling. Using my checklist, I made perhaps the best approach ever to a clean breakout on the LPV here. This fall, I passed an Instrumental [Proficiency Check] ride with a rather demanding CFI here...with the glass.

Anyone converting to glass should realistically crank in a couple thousand dollars into the budget for fuel for training. It'll keep them alive. Thanks for what you do for us.

See www.sportys.com/PilotShop/category/962/2

Thank you, Ed. Airline pilot Dave Heberling also addressed this topic:

Thanks again for another excellent *FLYING LESSONS*. Single pilot IFR is not for the faint of heart. I think one thing pilots forget in the ATC environment is that the pilot is in control of the aircraft, not ATC. Even the big boys in the heavy iron have these issues. In the Airbus, we have an FMA (Flight Mode Annuciator) at the top of our PFDs [Primary Flight Displays]. It is pounded into us in training, FMA, FMA, FMA. Every

time we do something with the autopilot, we look at the FMA to confirm our actions. Another tool we have is a QRH (Quick Reference Handbook). It has blue pages that describe the setup for each kind of approach we do. We use it like a checklist to make sure every thing has been done right.

In some ways, I think our GPS boxes have set us back. In the old days, you set a particular radio frequency in a particular box, turned the OBS to the inbound course on the HSI, reviewed the chart, and you are done! With GPS, no two boxes are the same. Each has its own protocol [that] the pilot has to know stone cold. There is no half-knowledge. It is all very heads-down and I would hate to be hand-flying and trying to program the box at the same time. In fact it seems there are some pilots out there who feel like they are less than a pilot if they do not hand-fly the approach. It seems so illogical to handicap yourself that way. Thanks again for a great *FLYING LESSON*. I will be sending you my thoughts on the [January "Top 10 GA Fatals"] accident scenarios soon.

Instructor Dave Dewhirst says:

We see exactly the same things you see and have the same difficulties with pilot procedures. Lack of familiarity with GPS programming leads to GPS input errors.

Last minute changes in approach procedures are a routine part of instrument flying. One of the nice things about the G[armin] 430/530/1000 boxes is that the pilot can set up an approach to an airport without changing the original destination airport. Not all boxes will allow that.

We [Dave's instructors] have tried and tried to get people to use checklists. We have found they will use them until the instructor gets out of the airplane, then they go back to being lazy. We never give up on the checklists, but we also teach ways for the pilot to error-trap himself. Here is what we teach:

1. Plug the airplane into a GPU, outside where the GPS box can get a satellite lock. Go through a bunch of approach programming routines until the pilot can do them quickly and accurately.
2. Tune all avionics items in the airplane to something meaningful, even if it is redundant. In your example, the No. 2 Nav could be set to the LOC frequency. Use the RMI function on the PFD HSI to show the location of the airport, a VOR, or NDB.
3. Each time a change is made in GPS programming, check the display to assure it makes sense.
4. Use the same voice prompting you mentioned; GPS approach -- look for GPS-active indicators (LPV, VNAV, etc.), LOC approach -- no GPS annunciations and GS active.
5. Teach ways to correct a mistake in programming. Most are a simple fix.
6. Fly a bunch of approaches using these techniques. Keep changing the approaches without completing one. Emphasize the error-trapping procedures.
7. Always carry paper plates, even if Chartview [or other panel-mount, portable chart reader, computer or Electronic Flight Bag device] is available. That makes it much easier to rapidly search for alternatives to approaches to the same airport or different airports with a minimum of confusion and body movements. Do an approach to every airport on every trip, just to maintain the proficiency of programming the box.

Thanks, Dave. Reader Paul Hekman adds:

Excellent advice on the GPS/VLOC swap – [I've] been bitten by that, though not in approach mode. Another item connected with this is autopilot usage. If the autopilot is in GPSS mode and the GPS switches automatically to VLOC, as the 430W/530W can be set up to do, [first] do some VFR testing to see what the autopilot will do [in your installation]. My STEC 50 just wanders off, lost, unless I also switch the autopilot to approach mode.

That's another reason to follow Ed Livermore's advice to budget time and money for familiarization flying after making any avionics additions.

Avionics engineer and instrument flight instructor Bill Hale notes:

Per your [GPS] scenario...I'm beginning to believe the auto VLOC switching on the Garmins is a bad idea. We're teaching switching to VLOC as soon as the approach is set up to try to trap this serious error. Also: If there's no glideslope, you may be in the wrong mode. The map isn't [in the wrong mode, and] the magenta line isn't lost, so there's no downside. And autopilots like the KFC-150 don't get faked out when the glideslope appears if you manage it manually.

And reader Lorne Sheren reports:

> I actually did the same thing years ago coming into ICT. Fortunately it was VFR but I was completely puzzled as to why the localizer needle wasn't leading me to the airport. I eventually figured out that I was still in GPS mode. Tom- can you comment on the auto switching feature which is supposed to automatically shift to NAV/LOC mode on final approach when an ILS freq. is selected on the 530/430?

Hi, Lorne. There are human factors "gotchas" either way the VLOC/GPS button is wired. When IFR approach-certified LORAN first appeared on the scene, the software engineers felt that an automatic switch to VLOC mode when selecting an approach was an important safety feature. The way they attacked the problem was to give the processor the list of available localizer frequencies—they are distinct from any other in the FCC bands—and to program the unit to tune to VLOC mode any time a localizer frequency was dialed into active on the NAV side of the machine. It didn't matter whether you were receiving a signal on that frequency, or if the frequency was associated with your dialed-in destination airport...if there was a localizer frequency in the active side of the NAV you were in VLOC mode. Period.

This introduced a significant problem that I saw quite a bit back in the KLN90B era, and that spilled over into the time of GPS. Prior to that CFIIs had always trained instrument pilots to set up for the approach well ahead of time, including tuning the localizer frequency for an ILS well before entering the terminal environment. Do that with an auto-switching LORAN or GPS, however, and you'd unwittingly take your navigation box out of "Direct-To" mode. You have to remember to push the unit back into Direct-To mode, if your unit gave you that option. The course guidance would look right, at least to begin with, but you were no longer navigating along your cleared or desired route. This feature drove pilots to tuning, identifying and setting up for an instrument approach in a fast-paced event that happens only once your are on vectors to final or have passed an initial approach fix.

Eventually the design thinking changed to what it is now, to keep the unit in the previously selected mode until a new mode is manually selected by the pilot. Software updates to existing units may or may not have changed existing box settings, and newer units (including WAAS boxes) may not automatically change to VLOC. Now we do have the option of setting up for the approach further away from the airport, but we also have to remember to manually push the VLOC mode if we are using the ground-based VOR/Localizer system for approach guidance.

> Doesn't the 530W auto switch to NAV/LOC mode when you are within 30 degrees of the final approach course and with a certain distance of the FAF (10 miles?) when you have an ILS approach selected?

I believe that's the usual setup, yes. But it and the autopilot also have other requirements, including a need to intercept the glideslope from below, and to be established on the localizer for a certain number of miles or amount of time before it will couple for the approach. Again, it takes practice for familiarity with your specific airplane's configuration. It also takes some knowledge by Air Traffic Control that may not be included in controllers' training…if they vector you to intercept the localizer too closely to the FAF the avionics may not accept the fully requested functions.

Reader Leldon Locke emailed:

> Since I tend to not get very many actual... IFR approaches... I'm very guilty of not always getting the GPS set up correctly and forgetting that #%@! GPS/VLOC button. I guess that is why I like my two completely independent glideslope receivers... one via the simple... hard to screw up...KISS... KX 155. Down the localizer…the Garmin GPS and the King nav better be showing the same.
>
> Thanks for the good *LESSON*... I'm going to make it a point to improve on my GPS/VLOC button awareness.

Thanks, everyone who contributed to this week's report. The common experience appears to be:

- Spend a significant amount of time and effort learning the operation of the specific avionics configuration for the airplane you fly.

- Approach flight in Instrument Meteorological Conditions (IMC) very cautiously until you have significant recent experience with your avionics. Fly several VFR flights using the equipment as if you were in IMC before making an actual IMC flight.
- Write and use a printed checklist applicable to the avionics set-up in your specific airplane…departure, hold and arrival procedures included.
- Actively monitor all annunciators and indications. Do not "fire and forget" with advanced avionics.
- Double-check the indications on advanced avionics with information from simpler equipment, and immediately miss the approach if a discrepancy appears.
- Suspect the GPS/VLOC and NAV/SUSPEND selectors (or equivalent for the equipment you're flying). Check them after each GPS input, and check them *first* when you question what the GPS and/or autopilot is indicating or doing.
- By implication, if you fly an airplane other than the one you're used to, approach the avionics with the same caution.

Great discussion, readers. Anything more? Tell us at mastery.flight.training@cox.net.

Show some restraint

The latest issue of *FAA Safety Briefing*'s article, "Small Cost, Big Benefit: A Look at Lifesaving Aircraft Safety Enhancements," offers a variety of improvements that can have a positive effect on your safety and well-being. For more on how to outfit your aircraft with [relatively] low-cost, high-value safety enhancements, see the Jan/Feb 2011 *FAA Safety Briefing*.

See www.faa.gov/news/safety_briefing

Va Revisited

The U.S. Federal Aviation Administration has published a Special Airworthiness Information Bulletin (SAIB) advising pilots on the ramifications of airplane design criteria on maneuvering speed. SAIB CE-11-17 states:

> The design maneuvering speed (**VA**) is the speed below which you can move **a single** flight control, **one time,** to its full deflection, for **one axis** of airplane rotation only (pitch, roll or yaw), in **smooth air**, without risk of damage to the airplane. VA is applicable to part 23, CAR 3,and LSA airplanes. Also, even though experimental airplanes may not have a published VA , they will still have some maximum maneuvering speed associated with the maximum structural design loads.
>
> Therefore, the pilot should be aware of what speed this is, and adhere to the guidance herein. The regulations governing the design strength requirements for airplane structure require adequate strength for full control deflection (below VA). However, they do not require the manufacturer to make the airplane strong enough to withstand full control input followed by a full control input in the opposite direction, even below VA. Neither do they require the manufacturer to design the airplane for more than one simultaneous full control input such as full ailerons with full elevator and/or rudder.
>
> VA, as published in the airplane flight manual (AFM) or pilot's operating handbook (POH), is valid or operation at the gross weight stated, which is typically at max gross weight. It is especially important to note that VA decreases as the airplane weight decreases. As the airplane weight decreases, the allowable maneuvering speed must also decrease, to ensure that the airframe is not damaged.
>
> VA-NEW = VA √ (WNEW/WMAX-GROSS)
>
> [This i]s the way to calculate the corrected (new) maneuvering speed due to operating at a weight less than the maximum gross weight. NOTE: This formula is for calculating the VA change about the pitch axis; however, it can be used for all axes.

See http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgSAIB.nsf/0/3C00E5AA64A2827E8625781C00744393?OpenDocument&Highlight=ce-11-17

Share safer skies. Forward *FLYING LESSONS* to a friend.

Fly safe, and have fun!

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
