FLYING LESSONS for January 13, 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.

FLYING LESSONS is an independent product of MASTERY FLIGHT TRAINING, INC. www.mastery-flight.training.com

This week's lessons:

Imagine this scenario… You're flying a well-equipped, IFR airplane, on a "direct-to," southwesterly heading nearing your destination, when you learn the weather there is below minimums. You decide to go to your alternate, which is along your route of flight and about 10 miles off your nose, and you dial your new destination into your IFR approach-certified GPS.

Listening to ATIS, you learn the ILS 24 is in use, with a 300-foot ceiling and 2 miles visibility. Sure enough, ATC gives you a vector to the right to put you in position to intercept the final approach course. As you busily prepare for the approach, you select and activate the ILS 24 on your GPS and spin your HSI course needle to the inbound course…which is only a few degrees different than your en route course toward your original destination. *But in the rush of a close-in deviation you forget to change the sensing mode from* GPS *to* VLOC.

The airport is now southwest of your position and you are cleared to intercept the approach. The HSI's course needle points toward the airport, and the deviation indicator shows a slight "fly left" condition—which makes sense, given your mental tracking of your position in the dark clouds, and it's more or less consistent with your GPS' moving map, which you've not had time to scale in from a long-range view you were using en route.

Turning to the inbound course, the localizer looks just a hair to your left. So you angle a little in that direction, the stress of this last-minute change in plans in nighttime, low IMC increasing because things are just enough "off" to distract you from the approach. To make things worse, ATC now radios that you appear to be south of the localizer. That's not what your instruments say, and you become more confused.

You pass the final approach fix, the course nearing center but still slightly left...but the glideslope hasn't come alive. You're less than four miles out with no glidepath, but the course needle's centered now so you choose to drop down to localizer-only minimums. Except you'd not had time to thoroughly brief for the approach, so you're scrambling to find the minimum descent altitude on the chart or in the GPS database even as you continue your descent toward the ground.

Suddenly ATC gives you a heading to intercept the missed approach procedure. But the heading is right, not left as you expect…and the GPS mileage countdown says you're still not at the missed approach point. That's really confusing. You hesitate, you fiddle with the GPS, but you don't arrest your descent. And you fly headlong into the ground.

Something I've seen manifested again and again when providing recurrent instrument training, is GPS input error. I treat the GPS/VLOC button as seriously as I treat the landing gear indicators in retractable gear aircraft...check the GPS/VLOC is set as needed after every GPS

input, and double-check it several times before beginning any instrument let-down. I set the localizer and say out load, "*Localizer approach, Localizer mode"* on the GPS.

The greatest argument for an in-flight checklist is the proper set-up for an instrument approach at night and/or in IMC. Since there is little avionics standardization among even the same model of most airplanes, it's up to you to create the checklist that works in each airplane you fly. Set up the approach, then reference your checklist to ensure you haven't missed anything.

Diverting to an alternate is not an emergency, so you have—and need to take—time to prepare for it properly. Don't accept vectors for the approach if you've not fully prepared to fly it. Take the time to review the procedure beforehand…that's what holding patterns are for, so ask for one if you need the time. Don't begin your descent if you don't have the glideslope guidance you expect. If there's a discrepancy between what you see on your instruments and what ATC says, get some altitude and get things resolved. And listen to your instincts—if they tell you something's wrong, pay attention, because your "gut feeling" is probably right.

Modern navigation is a high-workload exercise, and it's very easy to miss something vital when you're rushed and flying "behind the airplane." Don't put yourself in that position. Prepare, plan, and double-check for the changes as if they were the original plan all along.

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

We've begun reviewing the FAA's Top 10 causes of fatal general aviation accidents, not just for the usual review of causes, but to take a much deeper look at the Aviation Decision Making (ADM) and what I call STick And Rudder Training (START) suggested by each cause category. We've found no real new ways to kill ourselves (or our passengers, or people beneath us on the ground)…the NTSB reports are depressingly consistent from year to year and even decade to decade.

What's that tell us? As we discussed in the December 30, 2010 *FLYING LESSONS Weekly* report, it is going to take a different approach to ADM/START training and practice to make any meaningful reduction in the rate of fatal mishaps (per estimated flying hour; the *number* of mishaps is down primarily because flying activity is down over previous years). As promised, we'll look closely at one of the Top 10 each month in 2011…and for January we'll look at the list's Number 10: "Low Altitude Flying; Maneuvering Flight (Non-Controlled Flight into Terrain)".* Seven accidents met this definition in the two-year FAA study timeframe.

It's simplistic to say: "Don't maneuver at low altitude and you'll avoid these types of mishaps." That simplistic admonition doesn't really give us anything to work with as teachers of flight (whether teaching ourselves or others). But look at the actual circumstances of the seven mishaps:

1. Weather was good VMC both at the departure airport and at destination. But witnesses report an overcast sky was obscuring the mountaintops in the vicinity of the crash. The pilot appeared to be trying to follow a highway through a narrow canyon when it "hit very hard" in an extreme nose-down attitude.

2. Witnesses report a VFR cross-country airplane flying at "low altitude" before entering an area of ¼ to ½-mile visibility in smoke from a forest fire. The aircraft then impacted trees.

3. The pilot was performing a low-level maneuver above the bay when the aircraft made contact with the water and crashed. One witness, a friend of the pilot, reported that the pilot commonly performed the low-level maneuver as a greeting to the local residents in the area.

4. While on a VFR cross-country flight, radar data indicated the airplane circled in the accident area at low altitude. The last radar return, which was in the immediate vicinity of a bluff, indicated an altitude that was lower than the elevation of the top of the bluff. Wreckage was later found wedged in the cliffs and also at the base of the bluff.

5. The pilot had taken four friends that were attending an outdoor working group on a local flight. The airplane made two to three passes over the working group. On the final pass, witnesses reported that the plane was slightly above the tops of the local houses. The airplane made a sudden, steep climbing left turn, appeared to decelerate at the top of the turn, then dropped towards the ground nose first and impacted a field. Witnesses consistently reported that the airplane appeared to be in 90 degrees angle of bank just before it descended. The engines could be heard "running perfectly" throughout the maneuver.

6. The pilot flew with a passenger on a sightseeing trip. The flight included low altitude maneuvers, including low altitude flights into canyons. Photographs provided by the passenger revealed the airplane was flown at low altitude through the canyons, and very close to the canyon walls. The pilot then landed and disembarked the passenger. Shortly thereafter, the pilot departed with another passenger in the direction of the accident site. Witnesses observed the airplane flying low within a canyon shortly before a power failure occurred in the local town. Damage to the airplane revealed the left wing struck the power transmission lines.

7. During a low-altitude flight for rounding up stray cattle on a ranch, the helicopter collided with a power line and descended uncontrolled to the ground.

*Although it may seem that some of these mishaps would meet the definition of CFIT, for consistency with the FAA's report *FLYING LESSONS* will use the same breakdowns, which come from NTSB categorization of the accident reports.

Readers: For any or all of the seven mishaps:

A. Suggest 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. List the START skills that could have helped the pilot avoid, and ultimately, escape the likely threats; and

C. Recommend 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.

I warned you I was going to need ***your*** help to make a difference! Do your part by emailing 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.

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

Debrief: Readers write about recent *FLYING LESSONS:*

Reader Richard Willis writes about Sparky Imerson's recommendations for landing on a wet runway, to avoid hydroplaning:

> I teach the way I fly and with the problems with weight on wheels as soon as possible , well yes and no. In

some cases I see the point to put as much as possible as soon as possible, but with the old saying "wait until clear of the active before you do anything " still makes a good practice to me.

Thanks, Richard. I'd alluded to the risks of changing airplane configuration during the landing roll when I first quoted Imerson's recommendations.

Reader Tom Rosen writes about last week's Angle of Attack discussion:

Once again an excellent *FLYING LESSONS Weekly*, Tom. Enjoyed it. The following reader comment hit home:

I have been flying the back country of Idaho, Montana, and Alaska for 28 years. I have used AOA indicators in light aircraft, only a few times in a 260 horse Maule. Found it to be more distracting than helpful. This of course is edge of envelope, maximum performance flying, where the airspeed indicator is not very helpful either, eyes must be focused on the landing area, very little attention is paid to instruments, and the aircraft is flown by feel. All you numbers folks are cringing I know! But this is how it's done, to successfully operate on a 300-foot gravel bar for an entire day.

While instruments are always there for support, a light plane pilot must have a feel for angle of attack, and lots of experience, to make an aircraft perform in its full range of operation. A 1000-hour pilot is not going to be able to do what a 15,000-hour pilot can do, [it's] just a fact in bush flying.

I realize we are a small segment of the aviation picture, but this is my experience with AOA indicators in light planes, and you asked for input. If we are talking heavier, faster IFR-type flying, angle of attack indicators are a tremendous tool. I just hate to see too many light plane pilots rely on too many gizmos. Some will say "but it makes flying safer." Well, I do not agree. A pilot still needs to be a pilot.

This would have been me talking last June 16th. And I would bet that my pals [who passed away in a turn-to-final stall last summer] would have said the same. For all of the same reasons the reader mentioned. The PIC, owned and flew daily (weather permitting) an Eagle and a Champ, and used his Glass Air for cross country flying. He flew weekly into the most remote and challenging back country strips in the Idaho wilderness during the summer months. He soloed in the mid 50's, and had been flying constantly ever since as both an airline pilot and GA pilot. I had flown with him many times and he was a GREAT pilot. I have never flown with a better one. Just like the author of the above comment, he would say a pilot needs to be a pilot.

But sometimes that isn't enough. [His flight ended] about a half mile short of the runway at Truckee, CA. The point is, no matter how much experience you have, or how good you are, instant death is always very near when you are flying a plane near the ground. A little bit of warning when you are getting very near might very well be the difference between attending another party or never being around again. And that's not the only value of an AOA.

Our job is simply to explain the value of AOA as one might explain the value of seatbelts. 40% of people riding in cars doin't wear seatbelts. I suppose an equal amount will never admit the value of AOA. But at least we can try to get the message across to those who don't know, and who want to listen to be a safer pilot.

AOA indicator advocate Fred Scott adds:

Tom, further comments to your *FLYING LESSONS*. You may quote: Mr. [Jim] Hurd could not possibly be more correct about a One Last Warning [to student pilots making their first solo flight] that "Dragons Be *There:"*

"…. speaking of base-to-final stall-spins, taking off over-gross on a high density altitude day, Jet-A in an avgas tank, VFR into IMC, etc. Each … is insidious, has virtually no warning, and is not aggressively emphasized in primary training."

That is EXACTLY why I believe an Early Warning AOA-sensing indicator—a **"Get Back in The Game, You Idiot",** whether a horn, beeps, whoop, voice ... or even a simple needle—would be SO VALUABLE. You will surely be very surprised to read that I also agree with the Idaho pilot who writes:

"While instruments are always there for support, a light plane pilot must have a feel for angle of attack..... I just hate to see too many light plane pilots rely on too many gizmos. Some will say 'but it makes flying safer.' Well, I do not agree. A pilot still needs to be a pilot."

OK, I DO think an Early Warning of Stall device "makes flying safer" but not particularly so in the ultra-

max-performance scenario he referred to. I have mountain sheep and other North American big game trophies as warm reminders of great times in the Canadian Rockies and Arctic mountains (when those hills were not as tall as they are now). That's when I, much younger, knew and flew with many bush pilots myself. Gratefully, I learned a lot from them. Since then (sometimes with a very simple AOA needle), I routinely fly into short strips that many pilots avoid. The Idaho man clearly knows his stuff and I sense no "macho" attitude. I totally understand his point. I don't look at the AOA in the midst of a max effort landing either (nor for that matter, the airspeed).

But NEITHER of us are SURPRISED; we are fully loaded and cocked.

It's **when WE DON'T EXPECT a stall; the AOA is massively helpful**. Some warning devices are a lot better than others, but the latest Legacy with its audio will bring our brains back to business when we are circling a moose, elk...or a sunbathing beauty...or when the family dog pukes on our shoulder and kneeboard, just as we turn base-to-final. And THAT DOES "make flying safer"

Back to Mr. Hurd's excellent point on training for the "Dragons Be There": AOA is also a terrific TEACHING TOOL, and especially so for recurrent training. Long after our initial training is over, at the point we really begin to understand: if we have an AOA sensor, there is NO WAY to bank an airplane without being reminded that G-Loads increase with Bank Angle...and HOW MUCH! Even for us who are very slow learners, it teaches on every flight. Yet it's not a nag; after a while it gets to be really interesting and we really DO learn the "Idaho feel" for the airflow we can never see.

My son is learning to fly now. He's already a gilder pilot. I made only ONE request of his powered-flight instructor, when the time comes. "Please take him on at least TWO one-hour dual cross country trips that—after a normal takeoff—are to be flown so that the aircraft NEVER exceeds ~1.05Vso, preferably lower. To include full circles, turns on points, climbs, descents, etc. Stall horn goes quiet? He flunks the test."

She grinned her "Great idea! I will do that." (I will be forever grateful to James Thomas, my Initial instructor, who challenged me to do that 50 years ago). Hint: It is NOT EASY. Try it.

It the SURPISES that kill the very best of us. Rarely will an alert pilot (skilled or less so; high time or low) stall an aircraft unintentionally. The latest AOA warning devices are rapidly evolving to include good audio outputs...so as to get our distracted minds back in the game.

I don't much care if you look at it. We quickly learn when to snitch a glance.

Reader Tom Wilkinson writes about in-flight emergency procedures:

Firstly, your articles are presented very well and I enjoy reading them. I have recently begun to teach my students to identify all emergencies that dictate "land as soon as possible," and to see that [in POHs] in nearly all cases the "land as soon as possible" step is listed *last*. It does no good to be heading away from an airport or heading outbound over water dutifully performing a checklist, only to get to the last step and have to [turn] around. It's become my practice to have students pencil in the "land as soon as possible" step as Step 1.

Please keep up the good work with your articles!

Thanks, Tom. I've always told my students to "aim to a landing zone as the first step of a power loss. But I like your more thorough approach.

Discussing the "Top 10 GA Fatals" discussion, and specifically practicing of stalls in recurrent training discussed last week, aerobatics instructor Tony Johnstone says:

[I] have to agree wholeheartedly with your first respondent [last week]- WOW! Ambitious undertaking, well worthwhile, hope you have the stamina to keep it going.

Multiple comments on lack of instructional proficiency or comfort with teaching stalls or flying close to the edge of the operational envelope: [When] a low-time, newly minted CFI teaches the guy one course behind him, the comfort level creeps ever backwards. The PTS [Practical Test Standards] doesn't help. Nobody ever has to actually stall an airplane after the Private checkride. Stall "Awareness and Avoidance" is now the standard. Unfortunately, this ultimately leads to "Afraidance" when getting near the edges, so nobody goes there.

There is no easy solution, but I do believe every pilot should undergo a spin recovery course at some point. Aerobatic training also goes a long way towards understanding control at all attitudes, AOA indicators are great in jets but in a light aircraft there is no substitute for the stick-and-rudder awareness that comes from intentionally flying to the extremes of the performance envelope and back again. [From] the back seat of my Decathlon the airspeed indicator (and pretty much all the flight instruments) are obscured by the student in

> the front seat. Any Decathlon or Citabria instructor learns very quickly to appreciate what the aircraft is doing by visual and auditory cues, and control feel. **I think we need to get away from trying to make flying safer by adding more gadgetry when we should be concentrating on improving our basic flying skills!**

Thanks, everyone who contributed to this week's report. Reader, what do *you* think? Tell us at mastery.flight.training@cox.net.

Late the other night I was skimming through YouTube and found a dated-looking but absolutely excellent video discussion of angle of attack as *the* cause of lift and stalls…in of all things a 1968 FAA training film featuring a new-looking Cessna 150 and a lot of thin neckties. The 15-minute video (most of it is worth the watch) includes visualization of angle of attack using airfoil sections in a "smoke tunnel" that uses parallel bands of smoke in a wind tunnel. And guess what—nowhere in the video does it say stalling is a function of *airspeed*, instead correctly labeling stalls as a function of angle of attack (AoA, or "alpha"). Budget 15 minutes for a quick pictorial review of AoA, and bookmark the video for those you mentor or instruct.

See www.youtube.com/watch?v=_LXW3pHNn_U&sns=em

The future of safety?

Cirrus Design has become the first piston aircraft manufacturer to win FAA approval for two Garmin safety enhancements: ESP (electronic stability and protection) and automatic descent. ESP is designed to prevent pilots from losing control of their aircraft while hand-flying. ESP recognizes when pilots exceed pitch, bank, and airspeed limits and nudges the controls to bring the airplane back from the edges of the flight envelope. Automatic descent recognizes signs of hypoxia in the pilot and, if hypoxia is suspected, flies the airplane under control to an altitude where supplemental oxygen is not required.

See http://news.cirrusaircraft.com/cirrus-aircraft-news/2010/12/cirrus-aircraft-faa-approval-awarded-for-both-perspective-esp-and-hypoxia-recognition-automatic-desc.html

Not too close…

AOPA's Air Safety Institute (ASI) is taking a new seminar on the road. "Close Calls: Lessons Learned" shares the true stories of five pilots who have had mid-air encounters. Check when the seminar will be presented in your area on the ASI website.

See www.aopa.org/asf/seminars/seminar.cfm

Show some restraint

The National Transportation Safety Board (NTSB) this week released the results of its study of shoulder harnesses and air bags as injury prevention devices in light general aviation aircraft. *FLYING LESSONS* has frequently advocated shoulder harnesses as one of the most effective and top-of-your-priority-list safety devices you should install in an airplane you own…for far less than you've probably spent on an avionics upgrades every few years. Air bags are much newer on the light-aviation scene, but appear to have additional lifesaving merit above even should harnesses worn alone.

As part of a larger set of recommendations about restraint systems, NTSB has made these recommendations:

> Require the retrofitting of shoulder harnesses on all general aviation airplanes that are not currently equipped with such restraints.
>
> Evaluate the feasibility of requiring airbag-equipped aircraft to capture and record crash dynamics data to determine whether the system performed as designed.

No doubt many airplane owners will brace at the thought of required safety equipment installation (ok, pardon the pun). And the NTSB can only make suggestions for regulation; it's up to the Federal Aviation Administration (and/or non-U.S. regulatory agencies) to publish and pass a rule before the recommendation would be a mandate. But there's nothing like losing a friend to a head trauma in what should have been a survivable mishap simply because he wasn't wearing a shoulder harness, to make you realize the wisdom of their installation and use, even if they're not required. Whether you *must* do this or you merely *should* is (at least for now) up to you.

See www.ntsb.gov/pressrel/2011/110111.html.

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
