FLYING LESSONS for November 8, 2012

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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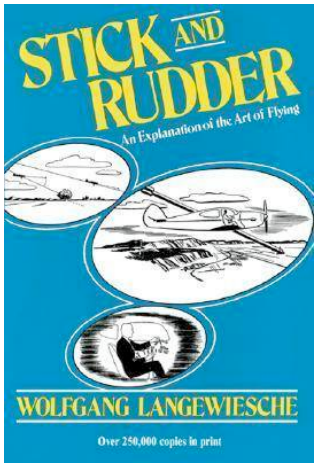
This week's lessons:

This week's *FLYING LESSONS* features frequent Debriefer, airline pilot and general aviation enthusiast David Heberling as a guest columnist. David sent me this email in response to last week's discussion of angle of attack and spin awareness following an engine failure immediately after takeoff. He's sent it to other aviation outlets as well, but I think David's comments should spark a good conversation here as well. David writes:

I realize it may be hard to believe, but I just finished reading *Stick and Rudder* by Wolfgang Langewiesche. I have to credit my wife for bring the book home from the library. She wants to understand flying better.

See http://www.bing.com/shopping/stick-and-rudderan-explanation-of-the-art-of-flying/p/55C3BB2F0A2563FF5009?q=stick+and+rudder&lpq=stick%20and%20rudder&FORM=HURE

I have read many flying books and magazines during my 40 years of flying, but I have never had it presented quite like it is in this book. I actually learned something new. The primary message of the book is that the elevator directly controls Angle of Attack of the wing ONLY. My training spoke only of "pitch and power" being the totality of our flying experience. It is easy to understand why he hammers at this theme. Too many loss of control accidents occur as spins out of turns.



Langewiesche presents many examples of spins out of steep turns, the engine failure scenario being one of them. We also know about the take off and departure scenario and the base turn to final one as well. He attributed all of them to pilots cheating with the bottom rudder to quicken the turn. This cheating leads to a cross-control situation and high angle of attack. It is the attempt to raise the low wing that gets them into trouble. That the aileron can cause the section of wing ahead of it to go beyond the critical AOA is something I never thought of. The surprise and puzzlement must be extreme when the low wing goes even lower instead of rising. The spin soon follows and time is running out.

All of this cheating with the rudder was a revelation to me. I have never ever thought of doing the same thing myself. Coordinated turns were pounded into me relentlessly during my extended student pilot pre-solo period (3 years, from 13 to 16). Now, I understand why airline upset training wants us to PUSH first (unload the wing/reduce AOA), then roll level, and power as necessary. Now I understand how pilots spin out of turns. I have tried it in my aircraft at altitude. All I ever achieved was a very high pitch attitude and a turn so steep it made me dizzy. It is not the turn itself that causes the problem, it is the attempt to return to level flight when turning all cross-controlled.

This book was written in the 1940s. *Everything talked about in this book is still true today*. Pilots still spin out of turns. Why have I never heard about this in aviation safety circles until reading this 1940s book? Langewiesche talks about how pilots are poor judges of AOA,

especially in a turn. In our airplanes, we do have a handy AOA indicator. It is the yoke. You could actually color code the shaft if you wanted to. The first half could be green, the next third could be yellow, the last couple of inches would be red. The green would be closest to the control wheel, the yellow further out, and red next to the panel when the yoke is fully extended.

I find it incredible that today we are wringing our hands over the stuck value of GA accident rates. We are all agog over scenario-based training to solve this problem. Back when this book was written, the author and Leighton Collins thought that rudderless (no rudder pedals) were the answer to this problem. This idea has never caught on in any appreciable way and I can understand why. I do think Leighton had the right idea about exposing students to this phenomenon. Yet, this never happened. Where do we go from here? How do we bring AOA back into the forefront of training? How do we inculcate students against cross controlling (except in crosswind landings) and cheating with bottom rudder in turns? How do we demonstrate this exact scenario so the student can see how you can actually stall just a portion of the wing (an extremely important portion at that) and cause a spin?

Maybe your column is not the place for this kind of discussion. Do you know a suitable place? I would like to participate in it wherever it happens.

- David Heberling

Indeed I believe *FLYING LESSONS* is the perfect place for such a discussion, David. Last year (2011) we devoted many issues to Angle of Attack awareness, including but not limited to the introduction of AoA indicators in general aviation cockpits.

I think your idea of color-coding the control shaft in control wheel-equipped light airplanes (as opposed to stick or sidestick controls) is intriguing and a great exercise at least in training airplanes. If air engine quits and/or the airplane stalls, *push to the green*, then level the wings with rudder and press on with the recovery.

Our 2011 series called The Alpha Pilot explored the concept of AoA with the hope of increasing awareness. Let's kickstart the discussion again by challenging all readers to respond to David's first two questions:

- Where do we go from here [with AoA training]?
- How do we bring AoA awareness back into the forefront of training?

Readers, what do you think? Thanks, David, for returning this vital concept to the front pages.

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

Debrief: Readers write about recent *FLYING LESSONS:*

Reader Mark Jamieson writes about last week's *LESSON* about airspeed targets on takeoff:

> I am glad to see someone agree with the procedure we have been using for quite some time. There are a lot of proponents out there who encourage increasing the take-off pitch attitude higher than the go around bars. My feeling has always been that unless there is an obstruction in your departure path, I would rather have airspeed (better rudder authority & stall margin) than altitude. I believe that this makes a safer departure should you encounter an engine or control issue.
>
> That being said, we still stay proficient and practice climb outs at Vx (best angle of climb) for those situations

> that require it for safety - obstructions, etc. in the departure path. Thanks for your observation and input.

See www.mastery-flight-training.com/20121101flying_lessons.pdf

Thank you, Mark. Reader Stu Spindel adds:

> For several years, our group of [Beech] Baron pilots have been annually training together at SimCom Orlando, using their two Baron training devices.
>
> One part of our training gives each pilot a double engine failure shortly after liftoff. After crashing, the pilot is given the information that he will suffer another double engine failure after the next liftoff. Even armed with advance knowledge, most of us crash. That an unprepared pilot would successfully land his high performance single engine airplane following an engine failure soon after liftoff is doubtful. With a thoughtful pre-takeoff self-brief, his odds would improve. For one, he would be less inclined to use maximum performance techniques with his high performance airplane.

Thank you also, Stu. Reader Charles Lloyd chimes in about last week's preflight inspection discussion:

> Preflight is a serious activity. In the past I worked for Raytheon Aircraft (sadly its hard to keep up with the name changes) and had the opportunity to fly both A36 [Bonanza]s and Barons. One preflight item not mentioned is the confirmation that the manual gear handle will rotate out of the heavy plastic trim opening. If the folding handle was not placed properly before installing the trim then the handle will not extend and you cannot lower the gear manually. Its better to find out before you fly and get in the air and get surprised and forced to make a gear up landing. This squawk is certainly a good reason to cancel a flight until a this squawk is removed.
>
> The other preflight item I carry out on my fixed gear aircraft [a Cessna 182] is the check the wheel fairings. Fasteners tend to loosen after time and disappear. When you tap the fairing a loose fastener with create a thunk type sound. I also carry a screwdriver and extra fasteners in case one goes over the side. The rear stinger has PK screws as well as regular fasteners that will loosen over time. Inspection covers are another place to check for missing PK screws.
>
> Sure one may not cause a problem but will possibly be part of a chain of events leading to an unhappy ending.

Charles has an important point—these items may not have any meaning to pilots of airplanes other than Beech Bonanzas/Barons and Cessna 182s, but for pilots of those airplanes the preflight checks are vital. Further to his point, sometimes critical inspection items are not mentioned in the Pilot's Operating Handbook because they were not anticipated by the airplane's designers and manufacturers. They have only been discovered through the experience of those who have flown the airplane. Full disclosure: as many readers know, I'm employed full-time by an aircraft owners' organization, a "type club." That said, contact the club for the type of airplane you fly for the tribal knowledge about inspecting your aircraft.

Reader Lorne Sheren suggests this about preflight inspection distractions:

> I have always considered the preflight a kind of "private time" between me and my airplane; when we get to be alone without outside distractions. I try my best to not get involved in extraneous tasks or discussions because I appreciate that many of the discrepancies we look for are rather minute (a missing cotter pin, a loose spinner, an unsecured exhaust). Sometimes I like to watch another, experienced, pilot preflight the same make and model, or even a "cousin" (e.g. I fly a Bonanza but I've learned a lot watching a professional pilot pre flight his King Air). But the key to a meaningful preflight is concentration. Otherwise you might as well skip the whole exercise.

Thanks, Lorne. Reader and FAA Safety Team Program Manager Scott Landorf asks:

> I would like to use your recent *FLYING LESSONS Weekly* article about "How seriously do you take your preflight inspection?" This really was as great statement about the Piaggio missing elevator and the discussion about the human factor aspect of the preflight was great.
>
> I will be doing several advanced preflight inspection programs around Illinois and would like to incorporate your information into the program while also crediting your for your content. Would like to know if that would be OK with you as I see the content is copyrighted.

Absolutely, Scott. All *FLYING LESSONS* readers are welcome to use material from these

reports. I do ask that you cite Mastery Flight Training as the source, and that you invite all who read or hear your presentation to subscribe to *FLYING LESSONS* through the SUBSCRIBE link in the left column at www.mastery-flight-training.com.

See www.faasafety.gov

Another FAA employee, who asked to be anonymous, adds:

> [Last] week's *LESSON* did a good job of explaining why a preflight is important: to find something wrong or broken on your aircraft before a flight. I have also been an advocate of the importance of using the post flight [inspection] to evaluate the aircraft after a flight. By performing a post flight, damaged or broken items can be found and reported to maintenance so they can be addressed before the next flight or find something the next preflight may miss.
>
> This would increase safety when multiple pilots use the same aircraft, mores eyes on the equipment. A post flight also insures if damage did or didn't occur during your flight (bird strike for example). A good post flight may also keep the next flight from being delayed because discrepancies can be address early.
>
> And speaking of reporting damage to maintenance, do you or your FBO have a procedure so discrepancies are reported in writing? I am not talking about writing something down on a napkin and hoping it gets fixed. I am talking about some type of status sheet where a discrepancy can be written down so an accurate record is on file. I have seen operations where word of mouth reports or those written on a piece of scrap paper somehow disappeared and never were adequately addressed.
>
> Thank you for your support of aviation safety.

Thank you, anonymous. You're correct—a quick post-flight evaluation of the airplane gives you plenty of time to address any discrepancies before the next flight. It significantly reduces the temptation to launch with a known discrepancy because you've just found the problem during preflight and you're under pressure to fly somewhere now.

I know you were asking the larger readership about discrepancy reporting. In my case, I'm a member of a large flying club that owns several aircraft. We have a scheduling program (www.flightschedulepro.com) that includes a mechanical discrepancy reporting system.

I received another request from a reader this week:

> We are a small start-up training private pilots (online) radio telephony in Germany. One important part of it is teaching aviation English. While searching for text samples I came across your *FLYING LESSONS*. I really like that format and would like to take some of your articles to let them be translated in our classes. This way they also learn a lot about safety and safety culture. I would be very grateful if we could use your articles in *FLYING LESSONS* as a basis for translation exercises. Of course we would be referring to you as the author and actually even strongly encourage our students to read your column.

I'd be honored for you to do so. I hope it helps achieve your training goals. Good luck.

Reader James Badgett writes, with past *LESSONS* about brake fires as a starting point:

> Hello, Tom. The October 17, 2012 *FLYING LESSONS Weekly* Article about a post-landing accident caused by an inoperative brake prompted me to write this letter now.
>
> I suspect the airplane in the article was a Grumman Traveler or a Grumman Tiger, but it could have been something else [the aircraft that prompted the report was an early V-tail Bonanza without nosewheel steering—TT]. However, there are a number of other airplanes flying - including several relatively new designs - that have no nosewheel steering at all. Several relatively new singles come with free-castering nosewheels: Diamond DA-40, the Cessna Skycatcher, the Cessna Corvalis, and Cirrus airplanes.
>
> Ground operations - taxiing, the takeoff roll, and the landing roll - are probably the most challenging things a new pilot must deal with when he starts flying. Strong winds and or bad taxiway and runway conditions are a challenge to any pilot. An airplane's features can mitigate or aggravate these conditions.
>
> Most airplane manuals include a demonstrated crosswind limit. There may be other airplane manuals with a maximum recommended wind limit (I haven't seen one), but the Cessna Skycatcher manual does recommend a maximum surface wind in any direction relative to the airplane -- 22 knots. Most of us do have our own maximum surface winds for the airplanes we fly, but they don't come out of a manual. Our limits are either self-developed from our experience or dictated by the airplane's owner/operator. The primary concern most of us have is being tipped over by a strong or gusty wind, but there are other concerns as well.

It's safe to say that with wheels on the ground, all airplanes handle best directly into the wind. A tailwheel airplane is more limited when facing into the wind because its wing has an angle of attack close to its stalling angle on the ground. Therefore, a tailwheel airplane's absolute wind limit is less than its stalling speed when taxiing upwind.

A tricycle gear airplane's maximum wind limitation may occur taxiing crosswind or downwind. Most airplanes have a tendency to weathervane, or turn into the wind. As the crosswind component increases, taxiing degrades from manageable to difficult to impossible.

After landing our university flying club's Cessna 140 in a strong wind, we often requested help via the unicom and then waited at the end of the runway for people to come out and hold onto the struts when we taxied to parking.

After landing into a light wind, all airplanes pass through a speed where the flight controls cease to have any effect.

Stopping distances are usually viewed as the riskiest part of a downwind landing, but diminished directional control on rollout is often overlooked. During rollout after a downwind landing, the airplane transitions through a speed where the airplane still has forward groundspeed but airspeed goes from zero to negative, extending the time and distance flight controls have little or no effect.

A major appeal (if not THE major appeal) of a tricycle landing gear is that kind of airplane's natural tendency to track straight as opposed to a tailwheel airplane's natural tendency to depart from a straight track. (A good tailwheel design can go a long way towards mitigating the tailwheel airplane's undesirable turning tendencies.)

Many runways are crowned - that is, higher in the middle than at the edges. Despite its good characteristics, in the absence of some kind of control input, a tricycle gear airplane will go off one side or the other of a crowned runway. If a tricycle gear airplane turns to a new course, it will not return to its original course on its own.

Airplanes with nose gears have three different kinds of nosewheel steering: Free castering (none), a spring between the rudder pedals and the nose gear (some) and a solid linkage (direct).

The amount of control for airplanes with power steering is usually pre-programmed, or selectable. The Learjet 35 and F-4 Phantom have powered nosewheel steering that is limited to about 45 knots. The F-15 has powered nosewheel steering at all speeds.

A single wheel brake failure on an airplane with nosewheel steering is tolerable. Airplanes with spring-loaded steering systems like Cessnas and [most] Bonanzas need differential braking in strong winds and in tight quarters, but are controllable to zero groundspeed in light to moderate winds.

Airplanes with direct steering seldom need differential braking, but may be limited to larger radius turns.

To me the PA-28-151 Warrior and PA-28-181 Archer probably share the best unpowered nosewheel steering system: a very stiff spring.

Every airplane type with a castering nosewheel has an airspeed below which the airplane is not controllable without power and/or differential braking. To me it is short-sighted to design a $500,000 airplane with a castering nosewheel.

Other than philosophical aerodynamic purity objections, some pilots don't like the transition from direct nosewheel steering to aerodynamic rudder on takeoff and are concerned about landing with a nosewheel that may be slightly turned. Cessna nosewheels remain aligned with the fuselage centerline anytime the nosewheel is off the ground. The nosewheel steering spring becomes a rudder-centering spring when a Cessna is off the ground.

Piper and Mooney retractable gear airplanes are designed such that the rudder pedals are actually or effectively disconnected from the nosewheel when the landing gear is retracted.

Many pilots don't realize that an airplane is really a ground vehicle as long as its wheels are on the ground. An airplane on the ground may be pointed by the rudder, but side loads at the main landing gear are required to turn the airplane. Additionally, the rudder puts a side load on the airplane trying to push it sideways away from the desired turn. Nosewheel steering cancels out the rudder's side load and adds to the rudder's turning moment.

We frequently flew our university flying club's Cessna 140 off packed snow - which was closer to sand than to ice. It was enough to convince me and my fellow club meembers that snow wasn't so bad, as long as it wasn't too deep, and ice probably wasn't a challenge either. We were convinced that airplanes aren't tied to

the same limitations as wheel-driven vehicles. The propeller pulls the airplane across slippery spaces and the airplane's controls react with the air.

In December of 1966 I departed Springfield, Missouri for Lambert Field in St. Louis in a Cessna 172 that I owned at the time. The taxiways and runways were covered with glazed ice. I didn't have any real difficulty taxiing to the runway, but I had to do a very quick magneto check on the roll because the brakes couldn't keep the airplane from moving at run-up rpm.

The rudder was overly effective on takeoff. The nose made large swings left and right as the airplane accelerated. The airplane steered like a boat without a keel. The airplane literally had to be crabbed to correct the track down the runway. Fortunately, I was alone and the airplane was well below gross weight, so transition from ground vehicle to flight vehicle didn't last very long.

I don't think I could have kept an airplane on the same runway after landing. If you have to taxi on a slick surface, exercise the same caution you would with a wheeled vehicle. Today I have a very low no-go threshold for snow and ice in any form on runways and taxiways.

I agree with the unnamed writer from October 24 that some failed-brake training is in order. This can be done with an instructor, or alone with caution. You can do this on a taxiway or a runway, but I recommend doing it on an airport with low traffic and a large paved ramp.

Another way to avoid post-landing steering problems is to pass any runway exit (except an angled high-speed taxi-way or the very last exit on the runway) when your speed is so high it would preclude coming to a complete halt before the exit.

Astronaut Worries About Skills of Today's Pilots

From Aviation International News (AIN)

Apollo 17 commander Gene Cernan said he worries about the flying skills of pilots today. The type-rated Learjet 45 pilot, who was the last man to walk on the moon, commented to **AIN** at last month's Bombardier Safety Standdown in Wichita [Kansas], "I worry about the complacency that technology is imposing on pilots. **Pilots tend to become overwhelmed with all the lights on these glass panels and forget they still have a responsibility to fly the airplane**."

Cernan believes that **part of the solution is pilots being honest about their flying skills and their shortcomings**. Reflecting on his own skill level, he said, "Just because you've gone to the moon doesn't mean you're exempt from making stupid decisions. I've made a lot of them in my life." Cernan, who now flies a Cessna 421, hopes honesty about his own vulnerabilities will allow other pilots to see their own a little more clearly. He said his 421 has a glass PFD and MFD and terrain avoidance technology that's "supposed to keep me from killing myself; but **if that technology fails, I still need to fly the airplane** and miss that mountaintop." He added that attending the Safety Standdown has forced him to be more introspective when he flies. "It's easy to preach and a little more difficult to do," he said. "I always feel a little guilty now when I'm flying if I take a shortcut that I told someone else not to try. I call it the standdown effect."

See:
www.safetystanddown.com
www.ainonline.com

Uploading Overrconfidence

Received this week from Bruce Landsberg of the AOPA Foundation:

One of the great advances in general aviation over the past decade has been the widespread availability of in-cockpit weather. The ability to see exactly where the weather is-rather than having to rely entirely on your eyes and ATC guidance-is a major step forward, and a real confidence booster.

The problem is, sometimes it leads to overconfidence.

In the latest installment in AOPA Air Safety Institute's Accident Case Studies series, we take an in-depth look at a 2011 crash that dramatically highlights an often-overlooked limitation of datalink radar. If you use Nexrad to navigate around convective activity, this is one video you shouldn't miss.

See www.aopa.org/asf/osc/loginform.cfm?course=acs_timelapse&project_code=&

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Thomas P. Turner, M.S. Aviation Safety, MCFI
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