FLYING LESSONS for November 15, 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

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

This week's lessons:

The pilot of a twin-engine Cessna had been flying the airplane for about two years when he took it several states away for new paint and a refurbished interior.

Understandably proud of his reinvigorated twin and likely anxious to get it home to show his family and friends, the pilot didn't wait for good conditions before test-flying his airplane.

"Challenging weather conditions," including a "dense fog advisory," prevailed as the trained aeronautical engineer/owner-pilot took the turbocharged twin aloft on a solo test hop. We don't know what happened, but the Cessna soon impacted the ground and erupted in a fireball, killing the pilot.

An airplane owner phoned me today asking about engine break-in procedures following installation of a remanufactured engine on his high-performance single. He had information from the engine manufacturer stating he should maintain 75% or greater power and a Best Power mixture setting during the first hours after installation.

The owner was concerned that the maintenance facility installing his airplane did not have anyone on staff to test-fly his engine. What did I think about him picking up the airplane and flying it home at 75% power if it had not been tested? he asked.

I replied that the unavailability of a pilot at the engine installation shop did not obviate the need for an engine test flight. For over a year, I told the owner, I had been a production test pilot for an engine modification firm, and although it was not always the case it was not unusual for a cylinder cooling issue or fuel flow discrepancy or an oil pressure problem to crop up in the roughly five hours of flight test I gave every modified engine.

In other words, I suggested, he should plan on making two or three flights, all remaining within gliding distance of the runway, checking engine parameters and fuel flows at various power settings before he flew away with from the airport, with detailed engine compartment inspections between each flight. He should be in position to land if the engine quit, and able to provide indications to the installation shop if minor adjustments were found to be necessary during tests.

Further, I explained when the pilot asked how long he needed to watch for unusual situations, that historically an engine is most likely to fail early in its operating life, usually within 50 to 100 hours of manufacture and installation. Why? If anything is out of tolerance or any of the materials has a defect that will lead to failure, the high stress of operation will probably cause that failure in the first 100 hours of operation.

Consequently, I continued, although we must *always* monitor the engine closely for signs of trouble, we should be especially conservative and cautious in the first 100 operating hours following installation. This means higher personal limits for operation, and perhaps total avoidance of conditions like night IMC or long flights over water or wilderness during that time.

That the pilot earlier told me he only flies 50 to 100 hours a year raised another point on which I advised—he may have to be extremely conservative about how he operates the aircraft

©2012 Mastery Flight Training, Inc. All rights reserved.

for the first year or two after new engine installation, to get through the “infant mortality” stage history shows applies to piston aircraft engines.

Along with two well-known maintenance experts, I addressed the issue of post-maintenance aircraft acceptance and test flying in this short collection of articles aimed at owners of Beechcraft airplanes being accepted after painting, but equally applicable to all airplane types being accepted from any type of aircraft or engine maintenance or repair.

See http://bonanza.org/documents/ABS%20After-Painting%20Articles.pdf

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

---

Thanks to AVEMCO Insurance for helping bring you *FLYING LESSONS Weekly*.

See www.avemco.com/default.aspx?partner=WMFT.

Contact mastery.flight.training@cox.net for sponsorship information.

Debrief: Readers write about recent *FLYING LESSONS:*

Reader Bill Stenson writes:

> I was interested to read the comments about crosswind landings in your recent *FLYING LESSONS* and I would like to remind your readers that the crosswind limitations [that] are usually shown in the POH (Pilot’s Operating Handbook) have been calculated and tested by an experienced company test pilot prior to certification. I always emphasise in pre-flight briefings that this limit was arrived at by an experienced pilot who was current on type. If you are not current or have not recently practiced a crosswind landing I would strongly advise a pilot to secure the services of an instructor for some refresher training. This will hopefully prevent an expensive visit to maintenance.

Hi, Bill. You’re correct that most of the time the skill of the pilot, not the design of the airplane, is the limiting factor in the amount of crosswind that is manageable. Most runway loss of directional control mishaps, in fact, involve crosswind components under 10 knots—well less than the maximum demonstrated crosswind listed in most POHs.

The U.S. rules for aircraft certification have only this to say about crosswind control capability:

> **§ 23.233 Directional stability and control.**
>
> a. A 90 degree cross-component of wind velocity, demonstrated to be safe for taxiing, takeoff, and landing must be established and must be not less than 0.2 V_{SO} .
> b. The airplane must be satisfactorily controllable in power-off landings at normal landing speed, without using brakes or engine power to maintain a straight path until the speed has decreased to at least 50 percent of the speed at touchdown.
> c. The airplane must have adequate directional control during taxiing.
> d. Seaplanes must demonstrate satisfactory directional stability and control for water operations up to the maximum wind velocity specified in paragraph (a) of this section.

Determining the maximum crosswind component, then, is as much a mathematical exercise as it is a flight test. Let’s look at some sample maximum-weight stalling speeds (V_{SO}) and the minimum crosswind component that must be tested during certification:

V_{SO}	0.2 V_{SO}	50% V_{SO}
40 kt	8 kt	20 kt
50 kt	10 kt	25 kt
60 kt	12 kt	30 kt

The airplane must be directionally controllable without braking (or in multiengine airplanes, asymmetric power) down to the 50% V_{SO} speed. POH values for maximum demonstrated

©2012 Mastery Flight Training, Inc. All rights reserved.

crosswind are generally higher than these minimum certification values…but the manufacturer is not required to test anything beyond the minimum capability.

In practice, then, the maximum demonstrated crosswind component is simply the maximum crosswind encountered during the certification flight test process. An airplane certified in Wichita, Kansas may have a higher maximum demonstrated crosswind component than a similar airplane tested in, say, Lock Haven, Pennsylvania, simply because the winds are generally stronger in Kansas and test pilots were more likely to encounter a stronger crosswind.

FAR 23 adds, in the section dictating what must be contained in the POH:

> **§ 23.1585 Operating procedures.**
>
> a. For all airplanes, information concerning normal, abnormal (if applicable), and emergency procedures and other pertinent information necessary for safe operation and the achievement of the scheduled performance must be furnished, including—
>
> (2) The maximum demonstrated values of crosswind for takeoff and landing, and procedures and information pertinent to operations in crosswinds

In other words, whatever the maximum crosswind encountered during testing may be, it must be listed in the POH…along with any special procedures necessary to get that performance.

The *LESSON*? Maximum demonstrated crosswind component has nothing to do with the maximum the airplane is engineered to handle. What's the maximum crosswind component **you** can currently handle without applying any brakes or differential power? *That's* the airplane's current maximum crosswind component as it exists right now, with you at the controls.

Bill (who lives in the UK) continues:

> As a matter of interest what is the current thinking in the U.S instructional world about the technique for effecting a successful cross wind landing in a single engine aircraft? I have always taught wing down with a high wing and a crabbed approach for low wings. This is a subject that normally raises a hot debate on a non-flying day. What do you and your readers think?

Readers are welcome to chime in; the argument rages on this side of the Atlantic as well. Personally, I learned early in my instructional career that some pilots do a better job slipping to landing in a wing-low position and others are more proficient landing in a crab, "kicking out" to runway alignment just before touchdown. When I was doing a lot of primary instruction I'd present both techniques and let the pilot determine through experience with works best for him or her.

Personally I prefer the slipping, wing-low method. Controlling drift with bank and alignment with rudder as I come down final approach, I can tell for some time whether I'll have enough control authority to land (winds generally get lighter near the surface, too, so it may get a little easier). Using the crab technique, I won't know until I kick out in the flare just how much control input it will take, or if I'll have sufficient control authority to align the airplane before touchdown. Some pilots, however, get very good at the crab technique. Watch them and you'll see it often is a transition from a wings-level crab to a wing-low slip just before touchdown.

Either way, the goal is to land on the upwind wheel first with the airplane's longitudinal axis aligned with the runway centerline. High wing or low, it matters not. The only real restriction is in transport category airplanes with pod-mounted, underwing engines. Land such an airplane in a wing-low condition and you may drag an engine nacelle on the ground. Consequently air carrier pilots tend to land out of a crab.

Thanks, Bill.

Reader Anthony Johnstone responds to *FLYING LESSONS*' recognition of his efforts at improving basic airmanship skills among pilots through his presentation "Stick and Rudder Flying in a Glass Cockpit World," as recently reported by FLYING Magazine. Tony writes:

> Thanks for the kind words, I've been meaning to thank you for getting me to put that presentation together. I have got a lot of mileage out of it!

©2012 Mastery Flight Training, Inc. All rights reserved.

I only suggested the topic and the title, Tony. You did all the work!

> *FLYING LESSONS* continues to be an excellent read, I look forward to Thursday mornings, always read it before the [Wichita] Eagle [newspaper]! I do have a couple of comments, one relating to preflight inspections. I echo your comments about distractions during preflight. I do it myself when instructing, it is very easy to get sidetracked with a teaching point while you are doing the walkaround. **Sometimes you just need to stop, go back and start over**. I have a strong sense of self-preservation, and really have an interest in making sure the airplane is intact before giving an aerobatic lesson.
>
> The other habit I try to instill in all my students, aerobatic or otherwise, is to do a POSTFLIGHT walkaround to be sure nothing is bent, broken or has fallen off. I have picked up a couple of fabric wrinkles, lost inspection covers, and a prop hub oil leak doing this. **Better find out then, than have to cancel the next flight** for a problem that could have already been taken care of.
>
> The discussion regarding gear-up landings continues! I don't believe you can verify enough times that the gear is down, I always teach GUMPS on downwind or at the FAF, then gear down confirmation at 500'. We have a Garmin 495 in our Twin Comanche which has a sweet female voice who pipes up "five hundred", perfect time to check the green light and the wheel in the nacelle mirror. In Canada, by the way, at a towered airport, they always say "Cleared to land, check gear down", not a bad thing at all.

I understand that U.S. tower controllers used to issue the “check gear down” advisory but stopped because of radio frequency congestion. I believe military airfield controllers still make the “check gear down” advisory to this day. Thanks, Tony. You echo the suggestions of several other readers when it comes to “sterile cockpit rules” preflights, and the wisdom of a post-flight inspection. I might add that after completing a major portion of the preflight (the right wing, for example, or the empennage), referencing a printed checklist to ensure you have not missed anything on that part of the aircraft is a good defense against preflight distraction as well. If something draws your attention away from the inspection, go back and pick it up at the point after your last reference to the printed checklist.

Frequent Debriefer Tom Allen adds to the on-going discussion about preflight inspections:

> Recently I volunteered to help a Scout troop earn their Aviation merit badges. Each of us observed 2 Scouts at a time preflight a plane using a check list. Earlier the volunteer pilots were familiarized with the airplanes and the checklist. Imagine my surprise when one of the boys in my second group asked “Is that screw supposed to be sticking out?”. It was one of the fasteners on the wheel fairings. No one had noticed it during several inspections. At the end of the each preflight, the Scouts were asked if they would fly the plane and this boy responded “Not until that screw had been fixed” The plane was repaired and later, after sitting out some weather, the Scouts all got to go on a discovery flight. The Scout Master gave this young man special recognition at the end of the event.

Interesting, Tom. Sometimes experience creates too much familiarity, and a fresh, unbiased look is more revealing. Perhaps more importantly, the Scouts were preflighting for the purpose of inspecting the airplane, not as a “formality” to complete under the temptation to go out and fly.

We all need to focus more on the inspection itself, because we’re doing it for a reason. Further, airplane owners should consider budgeting an hour or so once a month when they are *not* going to go fly, to give the airplane a thorough check and catch anything that may happen between required inspections, without the pressure of passengers or flight plans or schedules on the other end of a flight. See my article The 30-Day Inspection for ideas on making this extra safety check.

See www.ipilot.com/index.php/learn/5-pre-flight/772-the-30-day-inspection. You will have to register free at www.ipilot.com to read this article.

Woodie Diamond, a good friend of *FLYING LESSONS*, has a lot to say this week:

> Great weekly *LESSONS*, covering such a wide range of topics! I have a few comments:
>
> Avanti Elevator: My first question is “Really?!” OMG! Please don’t make me wait 6 months to find out “who shot J.R.”: Where is the elevator and how long did this condition exist?

According to the report, the elevator was located in the maintenance shop at the point of departure, Camarillo, California. The crew flew the airplane from Camarillo to Los Angeles, and then on to Las Vegas, where the missing elevator was noticed.

©2012 Mastery Flight Training, Inc. All rights reserved.

> Preflight: Just another one of those things that we learn early on in our flight training, and if taught correctly, is practiced throughout our flying days. My first "real" flight instructor taught that the **preflight is "…a personal time between the pilot and the airplane, and should never be shared with anyone!"** He would often walk over to the airplane while I was doing the preflight and ask me a question, then chastise me when I answered him with anything other than "…please move away; this is not the time." During preflight, passengers belong in the terminal, not in or near the airplane. That includes anything that will interfere with the airplane/pilot time; cell phones, flight bags, etc.
>
> Uplock spring: I am so happy that you publicized this! I have had so many discussions about this very topic, one just the other day. I was going for a ride with a friend in his aircraft. After I watched him do his preflight I walked over, crawled under his airplane and checked the uplock mechanism including the retention spring and roller bearing. Of course he asked what I was doing, and crawled under the wing with me. Sure enough, the left roller bearing was dry and stiff. I continue to be surprised by owners/pilots who do not know about the known condition where a malfunction of the uplock will prevent the gear from extending. This was recognized years ago, and resulted in the AD requiring the uplock roller bearing (that would seize) to be replaced with those having grease fittings. That, however, is not a permanent fix. The roller bearing can still seize, especially if it's not greased. The retention spring is very small and will break. This item should be on everyone's preflight checklist. Don't want to get dirty? Bring a small mat to lay on.

That's a very type-specific comment, but the *LESSON* is that every airplane model requires type-specific knowledge on the part of the pilot. Woodie continues:

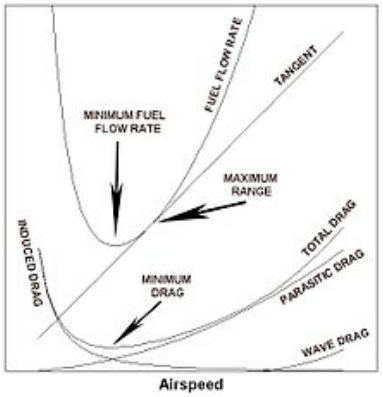
> Gear Down Check: Totally agree that "gear" is item 1 on the 3 checks prior to landing (gear down, base, final). Something my current flight instructor has taught me, and I practice, is the "over the fence check". This is also known as the "**go around check**", which helps eliminate the "I'm going to land" mind lock and replace it with the "I'm going around" way of thinking. There are actually only 2 items on this checklist: gear and power. Quick final check of gear condition and a gentle bump of the throttle(s). The "bump" ensures that you have engines on the wings, and not dead weight. Reaching the over-the-fence position, power settings are so low that it is often not possible to know whether the engines are actually producing power. A gentle bump confirms they are.

Good ideas, Woodie. Thank you.

Reader Bill Horan made me think quite a bit before I came upon what I beleive is the correct answer (although I definitely invite discussion by *FLYING LESSONS* readers). Bill wrote:

> Regarding Vcc vs. Vy for initial climb to an arbitrary altitude such as 800 or 1000 ft: I can remember reading somewhere that drag increases as the cube of the airspeed increases. Therefore it seems that the greater the airspeed the more rapid will be the deterioration of airspeed in a power loss or failure. Excess altitude rather than excess airspeed above Vy seems to be the most desirable commodity. Regardless, the first thing pilots need to have in mind in a power loss is to get that nose down to a best glide pitch attitude!

The context of Bill's comments is the *LESSON* recently (not an original thought, but one already "out there" in pilot circles, especially in multiengine airplanes) that unless a takeoff obstacle demands a V_X or V_Y departure, that it's safer to climb at a faster airspeed to provide a buffer for the period of indecision that accompanies an unexpected power loss, and the airspeed decay that occurs during that period. As I put it in a recent *FLYING LESSON*, if altitude is your friend, airspeed is your BFF (best friend forever).



Yet Bill's comment made me stop and think, until I recalled that there are two types of drag acting on an airplane: parasite drag, which does increase with the cube of the airspeed, and induced drag, that is a function of angle of attack and decreases with airspeed under a constant G-load.

Recall the curve of total drag, the sum of parasite and induced drag. We normally think about this curve in the context of Best Glide speed after engine failure in single-engine airplanes, V_{VSE}, of Best Single-Engine Rate of Climb speed in twins, and the concept of being "behind the power curve" in short field landings (and mushing takeoffs). $V_{BEST\ GLIDE}$ and V_{YSE} occur at the Minimum Drag speed for the airplane's current weight (it's actually a function of Angle of Attack, with indicated airspeed the

©2012 Mastery Flight Training, Inc. All rights reserved.

best proxy in most airplanes). The total drag curve is pertinent to Bill's question as well, I believe.

Consider that V_x and V_Y speeds are usually below the Best Glide or V_{YSE} airspeed. Fly a faster departure as a cushion for engine failure and the period of denial, and the aircraft may actually be in a lower total drag state. In other words, at a faster airspeed the rate of deceleration following engine failure may actually be *less* than at the slower speed. Are you or someone you know looking for a dissertation topic for a master's or doctorial thesis? This may be one that, with some experimental and wind tunnel confirmation, may provide a useful confirmation (or refutation) of this potential safety technique.

Bill replied:

> Thanks Tom, I think this is very well explained. I'm always learning (or reviewing).

Thanks for making me puzzle it out, Bill. I did *not* have that answer on the top of my head. I, too, learn a LOT from the readers of *FLYING LESSONS*.

It costs a great deal to bring you *FLYING LESSONS Weekly*. Your donations help cover the expense of keeping *FLYING LESSONS* online. **Please support *FLYING LESSONS* through the secure PayPal donations button at www.mastery-flight-training.com.**

Thank you, generous supporters.

An Australian friend forwarded me the link to a blog by flight instructor and airline pilot Owen Zupp. Owen writes:

> As a flight instructor, I have always been aware that teaching the manipulative skills of flying is the relatively easy part. **Instilling airmanship, discipline and prudence is far more difficult**. That involves influencing the perspective and behaviour of another, and that is never an easy task.
>
> It can be tempting to make decisions and pass judgement in retrospect, but this is unhealthy. For the moment that we shake our head and assert that we could never make the same mistake, we have cracked the door for complacency to creep in. We have immediately asserted that we are 'better' than the pilot in question and 'above' such folly. **It is far wiser to lament the loss and remind ourselves that we are all human**. For whatever reason, the situation has conspired to bring down another aviator and we should respect their loss and remind ourselves of our own shortcomings.
>
> It is a joy to fly in the skies above, but it is a privilege that comes with our own human limitations. Our decisions mark the points at which we answer those challenges set before us and unfortunately those decisions can literally be a matter of life and death. **Opt for an early decision, on the conservative side of the fence and live to fly another day**.

I hope this is how *FLYING LESSONS* is perceived. Read more at www.owenzupp.com.

***FLYING LESSONS* will not be published next week while I travel with my family for the American Thanksgiving holiday. We'll return November 29. Safe flights to all.**

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

Personal Aviation: Freedom. Choices. Responsibility.

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

FLYING LESSONS is ©2012 Mastery Flight Training, Inc. Copyright holder provides permission for *FLYING LESSONS* to be posted on FAASafety.gov. For more information see www.mastery-flight-training.com, or contact mastery.flight.training@cox.net or your FAASTeam representative.

©2012 Mastery Flight Training, Inc. All rights reserved.