FLYING LESSONS for April 29, 2010

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.

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:

Pilot-induced oscillation (PIO) occurs when the airplane begins a departure from the desired flight path, and the pilot applies inappropriate, excessive or mis-timed corrections that result in ever-increasing excursions that threaten to force the airplane out of control. In short, the pilot is "behind the airplane" and his/her attempts at regaining control only make matters worse.

PIO can occur in any phase of flight, but it is usually associated with pitch excursions on landing. As this NASA flight test video shows, PIO can rapidly develop to catastrophic proportions, even in the hands of an experienced test pilot. Stresses can rapidly damage landing gear and other airplane structures. It can force the airplane off the runway, or out of control in roll or in a stall. Propeller strikes are common in propeller-driven aircraft.

See www.youtube.com/watch?v=XHPv0qt03aA

Bounce a landing and PIO becomes a real possibility. As the video shows, once a PIO begins your only real option is to power up and go around.

Add go-arounds after the main gear touches the ground to your recurrent training regimen. Be well-practiced in establishing the right pitch and angle of attack, while firmly holding the proper attitude to prevent PIO.

Instructors, there are two kinds of go-around, and most only teach one. It's comparatively easy to power up, pitch up and clean up from a point a couple hundred feet above the runway lights. It's quite another task to go around once the mains have touched, the speed is low and the angle of attack is very near a stall.

My first instructors presented touch-and-goes as pseudo go-arounds; it wasn't considered a touch-and-go if the nosewheel of the Cessna touched the ground. We were learning the skill of aerodynamic braking, because some of us would go on to fly Air Force fighters. But we were also learning the art of the on-runway go-around, with a liftoff in a condition that necessitated a firm push forward on the controls with power application, then finesse as flaps were retracted and flying speed restored. In short, we learned how to recover from PIO.

If the propeller strikes, it's another story. Prop strikes can cause immediate, catastrophic engine damage or propeller damage that makes a go-around incredibly risky. They can also cause internal overstresses that will become a catastrophic failure at some point dozens or hundred of hours in the future, usually without warning.

Most engine manufacturers recommend engine tear-down inspections after a propeller strike. One manufacturer considers a tear-down mandatory if the propeller speed is seen to drop any at all when the strike occurs, and even if a prop strike occurs when the propeller isn't turning (for example, a towing accident) if the damage is substantial enough the propeller must be removed from the airplane for repairs.

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

Debrief: Readers write about recent *FLYING LESSONS*

Major Amnon Shmueli of the Israeli Air Force [Beech] Bonanza Training Center writes about recent *FLYING LESSONS* about attempting to return to the airport after an engine failure:

> I think it is important to know how to turn back, but there are a lots of buts: You should know the theory behind it well, practice it at high alt before doing it "really after t.o", and also the risk in this exercise against the chance to meet this situation: well, I think it is very risky and should only be practice with extreme care.

Thanks, Amnon. For several years I taught late-model Bonanza pilots in a simulator-based training program at the Beech factory airfield. The third simulator session in Initial training included a series of engine failures shortly after takeoff, which permitted me to gather a great deal of information about the "typical" pilot's reactions and abilities by placing dozens of individuals of all experience levels in the scenario.

As part of the pre-brief for the session I'd ask the client how much altitude above ground level he/she thought would be needed to turn around and land on the reciprocal runway after an immediate, catastrophic engine failure in a climb attitude. Most pilots would tell me 800 feet—several very knowledgeable authors have written that this is a good "decision altitude." Some pilots told me as little as 600 feet, while others were more conservative, estimating 1200 to 1300 feet. We discussed optimum bank angles and pitch attitudes for the "turn-back maneuver" so the client was perfectly clear on how to address an engine failure immediately after takeoff.

So I'd position the pilot for takeoff in the "sim," let him/her take off and establish climb, then "fail" the engine at the altitude the pilot had selected—and almost to a person they could not get back to the reciprocal runway, even knowing ahead of time precisely when the engine would quit, having one hand on the propeller control to pull it fully aft to reduce drag and maximize glide, and with active coaching from the instructor (me) on exactly how to get maximum performance.

After the first attempt the pilot would again take off, and repeat the exercise from 200 feet higher. As needed, we'd increase the altitude until the pilot successfully returned to the runway. In almost all cases this took between 1200 and 1300 feet above ground level (a few of the pilots got that right in prebrief). However, I'd note that they achieved that performance *only* when knowing the engine was going to fail, and when, and with significant practice in the optimum technique immediately prior to the successful outcome. The likelihood of repeating the performance in the real world months or years later is remote, in my opinion.

Thanks again, Amnon. Professional military aviators in your program, many of which have experience flying tactical jets, would probably perform better than the typical civilian lightplane pilot. Based on my instructional experience, for the rest of us I suggest caution--landing more or less straight ahead, or perhaps making a 90° turn to land on a different runway or taxiway or the airport infield, but discounting the likelihood of making it all the way around to the runway after an unexpected engine failure right after takeoff.

Tailwheel and aerobatics instructor Tony Poundstone took me up on a request for more information on wheel landings, in effect, why are wheel landings considered superior technique

for crosswind landings in tailwheel airplanes, when eventually the tail comes down and it becomes a three-pointer in the same wind at a speed where controls are less effective. Here's Tony's expert opinion:

> To weigh in on the crosswind landing/wheel vs 3-point issue, I spend a fair bit of time teaching folks to fly tailwheel airplanes in the continuously windy Kansas environment we share. I am a firm proponent of the wheel landing in strong crosswinds, providing the airplane can safely be wheeled on (the Pitts and some other airplanes don't have enough clearance between prop and ground and probably should always be landed 3-point).
>
> The advantage of the wheel landing is that the airplane can be actually flown onto the runway with a little extra speed, keeping the upwind wing down and touching on the upwind wheel. If you pitch to a 3-point full-stall landing, you have effectively surrendered the aircraft to the elements, the rudder is less effective, and, most importantly, the wing is sitting at a high angle of attack and more susceptible to the crosswind. In a wheel landing, the wing is flying at a much lower angle, presents less of a "sail", and will be much more stable on touch down. The rudder is also a lot more effective up in the slipstream than down on the ground. I know you have to transition to the 3-point attitude at some point, but the slower you are going, the more weight there will be on the wheels. The most important thing to remember is to be proactive on the controls, particularly keeping the ailerons deflected into the wind throughout the rollout, and keeping the feet moving to keep the airplane tracking straight.
>
> The most common error I see is not being aggressive enough with aileron input. Most pilots will get the airplane on the ground, then let the ailerons drift back to neutral and wonder why the airplane wanders off line. I actively demonstrate this with my tailwheel students, showing that the rudder input required to maintain direction is far less if the ailerons are used properly as the airplane slows down.
>
> Many pilots don't like wheel landings, usually because they are not comfortable with them, either through lack of adequate training or some bad experiences with bounced landings. I have bounced more than my share, (and am sure I am not done yet!), but as long as you know how to recover from the bounce or have a low threshold for a go-around, there is nothing wrong with that. It's a matter of touch and timing, and the application of a little forward stick at the instant of touchdown is what makes the wheel landing work. The natural instinct is to come back on the stick when the wheels touch which will increase AOA and lift and cause the airplane to go flying again (until it runs out of lift about ten feet above the runway). Like everything else, you need to practice
>
> A well-executed wheel landing is a thing of beauty. From personal experience I can tell you I have made many safe wheel landings in crosswinds well in excess of the placarded "demonstrated component". Getting the aircraft back to the hangar, however, may indeed present more of a challenge!!

I can attest to that, Tony! Some of my best flying memories are of wheel landings in the Cessna 120 I once owned. One logbook entry states merely "Squeaker wheelies at dusk"—and that says it all.

Reader and frequent debriefer Lew Gage, a Luscombe owner and retired Pan American Airways captain, adds:

> Regarding crosswind operations with tail wheel airplanes I would submit the following: One of the main considerations is runway width. Operations in strong crosswinds in any airplane, but especially tail wheel types, requires some considerations about runway width. In strong winds the takeoff should begin on the downwind side of the runway. This is especially true if the wind is from the left.
>
> The nose high attitude of the airplane when takeoff power is applied produces a "P" factor left turning force and together with the weathervaning of the airplane to the left may be more than full right rudder will overcome until the airplane gathers some speed to aid the prop blast over the rudder. Full aileron into the wind, especially if it is from the left, will aid the rudder effort to keep the airplane straight during the first portion of the takeoff roll. The down aileron produces quite a bit of turning force.
>
> As airspeed is gained the upwind wing should rise and the last part of the takeoff should be on the upwind main gear. At liftoff the airplane bank angle should be held just long enough to establish, with the aid of the rudder, a crab angle to maintain runway tracking with the wings level. The pitch attitude during the takeoff roll should be nose low enough that much lift is not generated. Of course there is some lift to raise the

> downwind wing, but not enough to take any great amount of weight off of the main gear wheel until liftoff speed is reached
>
> Unless the airplane has a locking tail wheel, and I know of no small airplanes that do [I flew a Cessna 185 with a locking tailwheel—tt], the real directional control is through the rudder. Using wheel brakes for directional control during either TO or landing is asking, in my opinion, for a ground loop. When the tail is lifted during the TO there will be additional "P" factor left turning force that must be countered with rudder. The advantage of beginning the takeoff on the downwind side of the runway lets one accept some mis-alignment with the runway into the wind until enough speed is gained to have full directional control. If the runway is narrow and the crosswind is strong, think again about taking off or landing.
>
> Ideally, the liftoff should be on the upwind main gear wheel, just as the landing should be on the upwind gear and on the downwind side of the runway to gain some wiggle room as the airplane slows and tries to weathercock into the wind. In a strong wind during the landing roll full aileron into the wind adds a considerable help to prevent turning as the airplane slows to taxi speed with no prop blast to aid directional control as it does during the takeoff. Once the tail is down, and in strong wind that might not be until about walking speed, the tail wheel steering will aid if the hardware is in good condition. Some tailwheel setups still have the tension spring connection between the rudder arms and the tail wheel steering arms. These are not as effective as the much better compression springs that replace the tension type springs. Also, the tail wheel pivot post should be vertical so there is no or little castering effect from the post angle, only effect from the trailing arm configuration of the tail wheel.
>
> Flying in areas that are prone to windy conditions and runways that do no align well with those winds can produce some interesting events. However, practice and working up to stronger and less desirable wind directions can overcome being stuck on the ground or not being able to get on the ground, at least up to a reasonable wind condition. If the last crosswind experience was when you took your private pilot or tailwheel checkout, do not try maximum effort operations until a few practice operations are done in milder conditions.

Thanks, Lew.

Good advice for single-pilot operators too

The Federal Aviation Administration has released an Information for Operators (InFO) letter calling for airlines to enforce “sterile cockpit” rules, and to put policies in place to reduce cockpit distractions in all phases of flight. The InFo, obviously tracing its origin to the highly publicized airline overflight of its destination while the crew was reportedly engrossed in working on laptop computers, has something to say to us all. Any distraction that diverts attention can “constitute a safety risk,” according to the FAA, including laptop computers and portable electronic readers used for activities unrelated to flight. “Every aviation professional needs to take the issue of distractions in the cockpit seriously,” said FAA Administrator Randy Babbitt. “Allowing distractions is unacceptable.”

See www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/info/all_infos/media/2010/InFO10003.pdf.

Question of the Week

> **Do you go out of your way to practice more challenging flight maneuvers, like go-arounds and crosswind landings, or do you tend to train for the same middle-of-the-envelope operations on every Flight Review?** Send your response to mftsurvey@cox.net.

Last week’s question was:

> **What’s the most important thing you’ve learned in flight from a pilot who was not acting in the capacity of a flight instructor at the time?**

Here's one response:

> You've asked what's the most important thing we've learned from a pilot other than a flight instructor. Well, I'll beg a little forgiveness and a lot of lattitude because it was actually my non-pilot daughter who taught me two of the most important lessons that I've learned.
>
> The first lesson was the importance of having an eagle-eyed observer in the cockpit, and having the wisdom to enlist their assistance in enhancing your "see and avoid" capability. She has eyeballs that can identify other traffic while I'm still thinking it's a dead bug on the windshield. When she spotted an airplane that I had missed seeing it really made me understand that four eyes looking out the window are always better than two. If two of those eyes happen to be young ones that can spot a gnat at half a mile, well, all that much the better!
>
> The second lesson she taught me was to slow down. While doing a pre-flight on our airplane (yes, I rely on her sharp eyes to spot defects in the airplane before we leave the ground, too!) she caught something I had missed - a small stress crack in need of stop-drilling. And she called me on it, telling me she'd watched me inspect that area of the aircraft but that I hadn't really spent the time to do a good close visual inspection. At 12 years of age she didn't feel any time pressures, resulting in her preflight inspection being more thorough than mine. While the defect she found in the airplane was something which could have waited to be corrected, the defect she found in my mental attitude was a major one that needed immediate attention.
>
> Isn't it funny how the clarity of eye and mind of a 12 year old can teach us older folks important lessons, if only we have the wisdom to listen and learn?

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
