FLYING LESSONS for April 2, 2009

suggested by this week's aircraft mishap reports

FLYING LESSONS uses the past week's mishap reports as the jumping-off point 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.

FLYING LESSONS is an independent product of MASTERY FLIGHT TRAINING, INC. www.thomaspturner.net

This week's lessons:

For much more on flying safely see www.thomaspturner.net.

FLYING LESSONS for April 2, 2009

suggested by this week's mishap reports

FLYING LESSONS uses the past week's mishap reports as the jumping-off point 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.

Feel free to forward this message for the purpose of pilot education. *FLYING LESSONS* is also available in PDF through a link in the left column at www.thomaspturner.net.

FLYING LESSONS is an independent product of Mastery Flight Training, Inc.

FLYING LESSONS is featured on the FAA's safety website!
See www.faasafety.gov/gslac/ALC/lib_categoryview.aspx?categoryId=21.

This week's lessons:

We've been discussing runway directional control as a function of controlling the effects of:

1. Wind
2. Runway surface
3. Dynamic aircraft forces (propeller tendencies, tail design, tailwheel, wing loading, etc)
4. Aircraft malfunctions (tires, brakes, engines, controls)

See:
www.thomaspturner.net/2009.0312%20FLYING%20LESSONS.pdf
www.thomaspturner.net/2009.0319%20FLYING%20LESSONS.pdf

You can read about wind and runway surfaces in previous *FLYING LESSONS* reports. This week, we'll move on to the directional control effect of dynamic aircraft forces…those that result from ***aircraft design***.

Airplane design plays a major part in that airplane's reaction to crosswinds. Airplanes with large, broad tails and flat-sided rear fuselages will naturally be pushed by winds more readily than those with smaller stabilizers and slicker, thinner waists.

It's a tradeoff—If the vertical fin area is too small it may not be effective against crosswinds. If it's too great even a narrow fuselage or large rudder may not compensate.

A narrow aft fuselage and large, effective vertical stabilizer and rudder result in a 20-knot demonstrated crosswind component for the Diamond DA-40, 25% or more greater than most light airplanes.

The Stinson 108-3 "Flying Station Wagon's" large vertical fin and flat-sided fuselage (to say nothing of its tailwheel configuration) gives it a reputation for being a handful (or would that be "foot-ful"?) in even a fairly light crosswind. Master this classic and you're a true crosswind-craftsperson.

Landing gear configuration is a big factor in an airplane's ability to handle crosswinds. Tailwheel airplanes (FAA no longer calls this the "conventional" arrangement) tend to pivot in from the direction of movement when encountering wind from the side. Because their center of gravity is behind the main gear, and because most tail wheels are free-castoring after they go beyond a narrow steering range, a little movement to one side will be exaggerated and the tailwheel lets it go. This is why larger tailwheel airplanes have tail wheels that the pilot can lock straight ahead for takeoff and landing, and unlock for taxiing.

Nosewheels, conversely, tend to resist movement caused by winds against the aft fuselage and tail—the primary reason tricycle gear airplanes are easier to control on the ground.

Propeller turning tendencies also affect directional controllability. Most single-engine airplanes have several factors that tend to pull them to the left—torque from the propeller, gyroscopic motion as a function of spinning mass, the asymmetric thrust of ascending vs. descending blades, and the spiraling slipstream pushing against the left side of the aft fuselage and vertical tail. Forces are naturally greater on takeoff, when power is greater; tailwheel airplanes have even more dynamic gyroscopic motion effects, with an increased left-turning tendency any time the airplane's pitch attitude change—such as when "picking the tail up" and again when raising the nose on takeoff, and when letting the tail down on landing The opposite occurs for pilots of airplanes with propellers that turn counterclockwise when seen from the cockpit, like one *FLYING LESSONS* reader who owns five DH Tiger Moths.

Multiengine airplanes may have even more, or less, left-turning tendency, depending on the airplane type. The distance between props and tail is typically less than in a single, so there's often less slipstream effect (the upward, inward spiral of air is behind the airplane as it reaches tail height). Twin-engine propellers are often shorter diameter than those on singles, resulting in less rotational and asymmetric force. Airplanes with counter-rotating propellers, naturally, have neither left nor right turning tendency when both engines are developing the same power at the same propeller rpm.

Some airplanes can be directionally controlled on the ground by use of ailerons. Especially if ailerons are not differential, i.e., the amount of deflection "up" is the same as the amount of deflection "down" on the other side, they create adverse yaw that is actually helpful in keeping the airplane on the centerline. Remember "climb into the wind, dive away from the wind"? In the

right airplanes this will have a big effect on directional control in addition to keeping the 'plane on the ground in gusts. Try it: with a little taxi speed on a wide runway, at least until you're experienced with the technique, move the stick or turn the control wheel one way or the other and see that the airplane does in fact turn.

Wing loading, too, has bearing on crosswind controllability. Wing loading is the ratio of airplane weight to wing area (pounds per square foot, kilograms per square meter, stone per acre, whatever). Lighter airplanes with long wings have a lower wing loading, and are bounced around more dynamically by winds. For example, our friends in the insurance industry report unusually high rates of runway loss-of-control mishaps in Light Sport airplanes, even when flown by experienced pilots, in part because of their low wing loading compared to more traditional airplane types.

An airplane's published maximum demonstrated crosswind component is just that—the maximum that was *demonstrated* as the airplane was certified. It is not a limitation nor is it the crosswind where it takes maximum control deflection to maintain runway alignment. It's merely the highest crosswind value that was tested at the time.

By far the biggest limitation on crosswind capability is the currency and alertness of the pilot. If you've not practiced strong crosswinds in a while, place a personal limitation on the crosswind component you're will to accept for takeoff or landing. Airplanes may be more or less directionally stable, but it's *you* who is responsible to "keep it on the centerline."

More *FLYING LESSONS* from recent mishap reports:

Airspeed and glidepath control are critical to touching down with enough runway remaining to come to a stop, with sufficiently low inertia to stop in the expected ground-roll distance.

Dusk and night conditions can create visual cues that can contribute to a pilot's misjudgment of final approach glidepath; often low-lying fog develops shortly after dusk that can add to the disorienting effect.

Unless you're in very mountainous locales with rising terrain immediately off the departure end of the runway, a go-around should always be an option all the way down to and even including after your wheels are on the ground.

And unless the runway is extremely long, if you don't touch down in the first third of the runway at a speed at or just above a stall, your best option usually is to go around and try it again. This is especially important when runway length leaves little margin for error.

Deer and other wildlife are often attracted to the relative warmth of pavement at dusk and again when the first of the sun's rays hit at dawn. At particularly animal-prone airports many pilots make a precautionary pass down the runway in a balked landing maneuver to check for animals, and perhaps scare away any that are in the way.

Note this long-used safety technique has inadvertently come under fire of late, as FAA reasserts its prohibition against "low passes" over a runway as low-altitude flight not required for takeoff and landing, in other words illegal "buzzing". I submit that a low pass for the purpose of detecting and clearing away obstacles on the landing surface and animal-prone airports, if done safely and for that specific purpose, is in fact "required for landing" in periods of dawn or dusk.

Switching to a tank containing fuel in the airport pattern sometimes does not permit the engine to restart before the airplane hits the ground. Plan your flight to have enough fuel remaining in a single, main tank to select that at Top of Descent (just before beginning descent

from cruise) through approach, landing, and a go-around/missed approach climb if needed. Do *not* plan to switch tanks in the pattern (except in an emergency); time and again we see that such attempts do not provide enough time or altitude to get the engine restarted.

Excess speed on final approach should clue even a student pilot into checking the gear position. Instructors, *you* are the ones who need to teach these things, which may not be obvious to persons new to flying.

Questions? Comments? Email me at mastery.flight.training@cox.net

UPDATE

AOPA's Air Safety Foundation has released this year's edition of the Nall Report, highlighting and commenting on the causes of general aviation mishaps in 2008. According to AOPA's press release,

> 2007 saw an increase in the number of fixed-wing general aviation accidents (1,385, up 6.3 percent from the prior year) but a continued decrease in both the number of fatal accidents (252, down 5.6 percent) and the number of fatalities (449, down 9.7 percent). Maneuvering flight remained the leading cause of fatalities with 51, 20.2 percent of all fatal accidents, but the number of fatal accidents in descent and approach dropped from 37 (13.9 percent) to 22 (8.7%).

See www.aopa.org/asf/publications/08nall.pdf to download the entire report.

DEBRIEF: Readers comment on recent *FLYING LESSONS:*

We've had a great number of reader comments in the last few weeks, far more than I've been able to print in *FLYING LESSONS*. I greatly appreciate your input and the spirit in which you offer it—the improved safety, performance and flying enjoyment of your fellow pilots. I'll include a few recent comments here now, but if you've responded to a call for information or have offered experience or opinion for other's benefit, know that I'll get your comments posted in the near future, perhaps in a special issue of *FLYING LESSONS* devoted solely to Debrief items.

Formation flight instructor and *FLYING LESSONS* reader Mike Babler comments on setting up for a crosswind landing:

> Hi Tom. Just a quick note from observing many pilots trying to lead a formation in on extended runway center for the initial approach to an overhead break. It appears many do not know how to tell when they are on exactly the extended centerline. Look at the far end of the runway and visualize a straight line from there to your cockpit. If it does not pass directly over the near (approach) end if the runway, you are not on centerline. It is difficult to find the correct [crab] heading amount or wing down-angle to fly if you cannot tell when you are on centerline. This could be part of the problem in crosswinds.

Interesting way to correlate one issue (formation breaks) with an observation that benefits us all. Thanks, Mike!

Reader Richard Graham adds another note to the issue of runway factors affecting directional control:

> Thomas, I really enjoy reading your weekly articles. I would have added one more thought about stopping on contaminated runways that I learned from flying at American Airlines. At airports that handle large aircraft, the rubber contamination that builds up over time and is evident at both ends of a runway can easily cause loss of friction. Even on grooved runways that are wet, the rubber

> contamination significantly causes loss of braking action. I realize your articles are geared to the smaller airports that don't experience this problem. Keep up the good work in getting the word out!

Thanks, Richard, I appreciate your comment. More and more *FLYING LESSONS* readers *are* using busier reliever airports frequented by heavier turboprops and jets, and at least smaller air carrier airports, either of which may have reverted-rubber runway contamination. Yours is a good reminder to land long of the airliners' touchdown spot for better runway control. This is consistent with wake turbulence avoidance as well.

Frequent *FLYING LESSONS* debriefer Lew Gage chimes in on crosswind control:

> I made it a common practice when I was learning to fly, and regularly thereafter, to take the crosswind runway for takeoff and landings. "Practice in private makes perfect in public" as my old piano teacher admonished me. (To no avail with the piano performance, though). I would also fly down both a straight or curving road or fence line at very low altitude in a slip, changing from right to left while staying over the desired track line. This practice paid off. When I took my probationary check ride in the 707 at Pan American it was a dark and rainy night at Stockton, California with a fairly stiff crosswind. I only had about 70 hours in the 707 and maybe 25 landings. That brought my total flight time to about 575 hours, a fair percentage of which was practicing those crosswinds in my T-Craft and Cessna 150/172s, Stinsons, etc.
>
> We used the crab method, at PAA until short final, and then smoothly transition to a side slip. This was for passenger comfort since a long final in a slip would not be as good in this regard. All airplanes require the same method for crosswind landings except those with special crosswind landing gear (B-52, C195, etc.). I passed with a nice write-up in my training folder and stayed for another 25 years at PAA. Regards, Lew

Thanks as always, Lew.

Questions? Comments? Send your insights to mastery.flight.training@cox.net

Fly safe, and have fun!

Thomas P. Turner, M.S. Aviation Safety, MCFI
2008 FAA Central Region CFI of the Year
