FLYING LESSONS for March 12, 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:

Keeping the airplane on the runway during takeoff and especially landing continues to be a challenging prospect for many pilots, according to mishaps reports and contacts in the insurance industry. Runway directional control is 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)

Mention runway directional control and most pilots naturally (and correctly) zero in on the effects of wind, and especially crosswinds.

Most airplanes have a maximum demonstrated crosswind component. Not a specific measurement of the maximum control authority the airplane has against off-centerline winds, it is the maximum that was *demonstrated* to be controllable during the aircraft's certification. "Max crosswind" is usually in the 12-17 knot range although I understand the Cessna T303 Crusader's demonstrated crosswind is 27 knots!

Most runway directional control loss occurs at much less than the airplane's maximum demonstrated crosswind component. So other factors must be in play.

By far the pilot is the determinant of the maximum crosswind that can be safely accepted. It's a pilot training and currency issue, not strictly a matter of airplane design.

Two schools of thought exist on how to compensate for crosswinds on final approach. The techniques are:

- The crab method: This technique involves maintaining wings-level on final approach while holding a heading that compensates exactly for wind drift.
    - Advantages: Reduces the chance of dragging a wingtip on touchdown. Essential technique in airplanes with very long wings and/or engines in pods beneath the wing, consequently the preferred technique for many air carrier pilots. Passenger-friendly attitude.
    - Disadvantages: Requires constant re-evaluation and changes to the crab heading as wind direction and speed changes with altitude. Requires the pilot expertly time a "kick out" during the landing flare to touch down with the airplane's longitudinal axis aligned with the runway centerline. Does not provide positive indication whether the pilot or aircraft has the control authority or skill to compensate for winds until in the low-altitude kick-out maneuver.

- The wing-low method: This technique calls for maintaining a forward slip with the upwind wing held low into the wind, with opposite rudder as needed to maintain runway alignment.
    - Advantages: Ability to maintain runway alignment from well out on final approach through and including the flare. If unable to hold alignment at any point on final, the pilot knows to abort the landing attempt from higher in the air.
    - Disadvantages: Increased stall speed on approach as a result of uncoordinated flight in the slip. Unusual flight attitude for nervous passengers. Incompatible with airplanes with long wings and/or engines in pods beneath the wings.

Keep current with crosswinds by purposely seeking out progressively greater crosswind conditions. On a day with winds nearly aligned with your home runway, fly to a nearby field with a slightly greater crosswind component. Remember you can always go around and fly somewhere, perhaps home, with less crosswind.

After a couple landings and takeoffs there, fly to one with more crosswind yet. As much as possible add to your crosswind practice with greater crosswinds until you begin to feel uncomfortable with the approach and go around. Compute the crosswind component at the last airport where you comfortable landed; take two to three knots off that crosswind and consider it your current maximum (you only flew comfortably at the higher crosswind after considerable recent practice with crosswinds building up to that point). Reduce your "personal maximum" by two knots for every month you go without flying a significant crosswind.

Next week: Runway, dynamic aircraft forces and aircraft malfunctions as they relate to crosswind control.

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

Debrief: Readers comment on recent *FLYING LESSONS:*

Regarding last issue's discussion of an off-airport landing that occurred when a pilot ran one fuel tank completely dry and the engine would not restart on the other tank, reader Steve Zeller writes:

> I have run tanks dry in my [1956 G35 Bonanza] several times when pushing range. It was always done at altitude and always when there was LOTS of other gas on board. I would time the tank down and watch for the first twitch of the fuel pressure gage to tell me when to switch tanks. Sometimes center would call, distract me for a minute and the motor would quit (oops!). The engine always fired right up as soon as I switched to a full tank. I never even had time to get my finger on the boost pump switch…. The whole idea is to end up at the end of the trip knowing exactly where and having access to all of your usable fuel. If you leave a couple of gallons in each tank, you really can't safely go back and get at it if you really need it. An extra 6 gallons (2 gallons X 3 tanks) could make a big difference in a real emergency. That's a full 30 minutes flying time...

Thanks, Steve. Running a fuel tank completely dry is a controversial technique, with pilots in both camps citing pros and cons. My opinion is that if you can tell when a fuel tank is just about to empty, then you can also tell when it has a certain amount of fuel remaining, say 15 minutes' worth in the case of a main fuel tank, five minutes in the case of an auxiliary. This allows you to switch *before* the engine starves for fuel…which despite being immediately reversible under most conditions nonetheless regularly creeps into engine-failure accident reports. If the difference of a few minutes' flight makes the difference in making it to destination with adequate fuel reserves, then frankly in my opinion you need to reduce cruise power, fly at a higher altitude for increased fuel efficiency, change your mixture leaning technique, add additional fuel tanks or plan shorter trips. But it's your choice as PIC.

Readers, what do *you* think? Is it better to drain a tank completely dry for absolute maximum range, or to manage fuel to get the maximum out of the tanks without causing power interruption? Let me know your thoughts at mastery.flight.training@cox.net. I'll publish the results next week.

See
www.ntsb.gov/ntsb/brief.asp?ev_id=20090221X93659
www.thomaspturner.net/Fuel.htm

Recent *FLYING LESSONS* focused on pitch control during an engine failure just after takeoff. Reader/CFI Dale Bleakney writes:

> When training in a high performance single/twin, practice pulling an engine(s) to idle right after takeoff and see what the student does to try to establish best glide. The amount of nose down pitch required is normally beyond what people think. The push required to establish best glide is impressive at first.
>
> If someone is climbing at Vy and is at about 500' in an A36, 210, 310, Baron 55/58, then you will have barely enough time to get to best glide before impact. This is everything is done perfectly. If you are slower than best glide, the descent rate typically increases exponentially and you may not have enough elevator authority to arrest the descent much before impact.
>
> My experience demo'ing this to CFI candidates is pretty humbling the first time or two. It is a lot different than what is seen in a low wing loading airplane like a Sundowner or 172.

When I demonstrate this (at a safe altitude, as I'm sure does Dale) I show the pitch attitude necessary to maintain best glide speed with the failed engine(s) propeller(s) in the takeoff position—not yet pulled full aft in the case of a controllable-pitch prop single-engine airplane, not yet feathered in the case of a twin. In the Bonanza/C210/C310/Baron-class airplanes this is a roughly five degree nose down pitch attitude dependent on density altitude, airplane weight and the position of the airplane's center of gravity.

In the case of an engine failure immediately after takeoff, some Pilot's Operating Handbooks (POHs) stipulate a "least descent" or "emergency landing" airspeed for final approach—engine out that is somewhat lower than "best glide". Least descent/emergency landing speed will result from a slightly higher pitch attitude, about 2° to 3° nose down in the same class of airplanes. The relationship is similar to the difference between a V_y and V_x climbout, where best glide is to V_y as least descent is the V_x. In other words, if you're trying to get from *here* to *there*, "there" being a landing site, then fly at best glide. If you're on final approach to your landing site (or the ground ahead, if you have no other choice), then fly at least descent/emergency landing, if such appears in the Emergency Procedures section of your POH.

Unless obstacle clearance or noise restrictions require otherwise, I teach climbing out at a V_y attitude or even a bit shallower, to provide more control during the "oh, %#$&*" phase of recognizing the engine failure, and (as Dale correctly states) a significant push forward on the controls to attain the proper control angle for glide or emergency touchdown.

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
