FLYING LESSONS for March 19, 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.

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This week's lessons:

As we began discussing last week, 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)

Last week we reviewed some issues related to crosswind landings. This week we move on to the directional control effect of ***runway surfaces***.

Smooth, flat runways at first seem optimal for directional control. In practice, however, a completely smooth surface presents little resistance to movement. If the pilot permits the airplane to drift sideways for any other reason, the completely smooth runway will not resist the excursion.

Tailwheel pilots know it's easier to take off and land on grass runways. Tricycle to tailwheel, grass surfaces provide more friction, and consequently more resistance to directional deviations. It takes more wind (or poorer piloting) to go off a grass runway than a paved one, all else being equal. If winds are near your personal crosswind limits and fuel is critical, perhaps a nearby turf airport is a better option for landing than the home 'drome or your original, paved destination.

Runway contamination can contribute to loss of directional control. Puddles of rain "grab" at wheels, imparting forces that can alter the airplane's directional path. Slush or snow patches are even worse. A coating of ice makes a runway virtually unusable in a crosswind; don't mix icy runways and anything more than a very slight off-heading breeze. Muddy or wet grass often provides no braking resistance at all; wheels can lock up with braking and the airplane loose all directional control when speed decays below that where flight controls are effective.

According to the National Aeronautics and Space Administration (NASA), hydroplaning occurs when a thin film of water builds between a tire and surface, and actually lifts the tire from the runway. Tires are no longer in contact with the ground; braking looses its effectiveness, and you may not be able to steer the airplane at slow speeds.

Research shows that hydroplaning can occur in as little as one-tenth inch of water. NASA identifies the hydroplaning critical speed as nine times the square root of the tire pressure. This means most light airplanes can hydroplane at as low as 50 knots. Here's a table of NASA-computed critical hydroplaning speeds:

Tire Pressure (psi)	Hydroplaning Speed (kts)
30	49
40	57
50	64
60	70
70	75
80	81

Critical Hydroplaning Speeds (source: NASA)

Notice that common airplane tire pressure specifications are such that typical landing speeds are at or near the critical level. Compare your airplane's main tire pressure and the airplane's stall speed (which you should approximate at touchdown) to see if the aircraft you fly is susceptible to hydroplaning on wet runways.

Aviation legend Sparky Imeson provides this guidance for avoiding hydroplaning on wet runways:

- Touch down as close to the approach end of the runway as possible, to maximize available landing distance.
- Plan a firm arrival, to put the tires solidly against the pavement.
- Lower the nose wheel as soon as possible to maximize steering capability.
- Avoid applying brakes at or above the NASA critical speed for your airplane.
- Retract flaps to put more weight on the wheels, increasing directional control [Note: attempting to retract flaps during the landing roll is a common cause of inadvertent landing gear retraction in retractable-gear airplanes, and I normally recommend against the practice—tt].
- Divert to a more suitable airport if a wet runway is combined with a crosswind.

See www.mountainflying.com.

And of course runway width is another factor not in directional control itself, but how much an airplane is allowed to drift off centerline before it becomes a potential safety factor. Most pilots these days are used to runways 75 to 100 feet or more in width, with pilots at more rural airports used to narrower runways, often around 50 feet wide. It's not terribly uncommon, however, for smaller airports to have runways as narrow as 35 feet. Consider the wingspan of many airplanes approaches (or surpasses) this figure and you can see the extreme need for centerline alignment and directional control.

The primary *FLYING LESSON* is that we have to *choose* our landing surface in concert with winds. Don't let the pilot attitude of resignation make you "give it a try" because you feel you have no other option. Delay takeoff until conditions improve, or divert to another airport if already airborne. **Be pilot-in-command** and make a decision based on actual conditions and an honest evaluation of your own abilities as well as those of the aircraft.

Next week: How features of airplane design affect runway directional control.

Debrief: Readers comment on recent *FLYING LESSONS:*

Last week *FLYING LESSONS* asked your opinion on draining fuel tanks completely dry in flight as a fuel management strategy, leaving, of course, adequate fuel in the final main tank for landing and diversion if necessary. As expected, the responses were split almost evenly, with only slightly more readers (about 55%) in favor of draining tanks completely dry, as opposed to burning fuel until tanks were *almost* dry but not quite causing the engine to sputter from incipient fuel starvation-which Mastery Flight Training, Inc.'s research indicates may be a factor in several fuel mishaps, when the engine will not restart when a fueled tank is selected before the airplane impacts the ground.

Many readers replied with a simple "yes" or "no", with the "yes" (running tanks dry) tending to be more detailed in their response. Selected reader comments:

<u>In favor of draining tanks dry</u>:

- 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.
- Just like everything else we do, burning a tank dry is a procedure. If a person has been properly trained in the correct procedure, it is a no brainer. I regularly burn my tanks dry not to stretch the range, but so that am constantly aware of how well my fuel system is operating.
- If it's a maximum-range, fuel-critical mission, I'm a strong believer in running tanks dry.
- As for running a tank dry in a pinch, that can be done safely. It is a way to convert unusable fuel in one tank to useable fuel in the remaining tank. The engine will always go again, and passengers can be forewarned.
- Regarding running tanks dry, occasionally (before the tip tank installation this past November) I would run a tank down to the first indication of fuel pressure drop. My right seater would keep a very close eye on the pressure and announce any fluctuation. The tank switch would be done at that instant and the engine would not miss a beat. This would allow about an extra 10 minutes of run time per tank from my usual time to switch method.
- I like [the draining-dry] method when max range is needed, or advantageous. For example, when it saves an enroute fuel stop [that] allows ETA at destination during near ending daylight w/ temp/dewpoint closing, or if weather is going down, and the fuel stop would cause landing in worsening weather later. Or, if enroute fuel stop is in worse weather conditions, whereas destination is much better weather. It allows better info on precise fuel burns at that same power setting and atmospheric conditions. So, now, if you know the exact useable fuel in each tank (which you should know), almost exact calculations of precise timing is available. I think even better than any fuel totalizer system. Now, admittedly, few times require, or even suggest cutting things that close, but I did, and would again, use that method under some few circumstances. But, I'd also want other airports available just a little short of the destination too, if the margin becomes too close in the ever changing flying environment. So to sum up.....I think it probably ill advised to cut things that close, but, I think it should be thought out in advance, the useable fuel known precisely for each tank, and the method in your bag of expertise if/when a situation presents itself to be of use, or needed.

<u>Opposed to draining tanks completely dry</u>:

- I like to leave fuel in tanks. I do not subscribe to the empty the tanks approach. I added tip tanks for my extra range.
- Running tanks down to the point of engine stumble is not being considerate of passengers. I don't do it. With a fuel totalizer it is easy to get to within a gallon remaining in a tank.

- If a few extra gallons of fuel are critical to completing a flight, then it's the pilot, not the airplane, that has created a fuel critical situation.

FLYING Magazine author Richard Collins wrote many years ago, **"The problem with most general aviation pilots is not that they have bad procedures, it's that they have no procedure at all."** Whether you like to burn a tank completely dry or not, do it intentionally, with forethought and planning. Don't allow yourself to be surprised by the sputter of an engine or a blank engine monitor.

As I've stated before, based on mishap history intentionally running a fuel tank dry in flight to the point of incipient engine failure (the engine sputters) is an unnecessary risk and at best is very passenger-unfriendly. If you are extending range to the point you need every gallon of fuel in almost every tank, you need to re-think you risk management strategy—and likely need a longer-range airplane, or to alter your techniques to extend the unrefueled range of the one you're flying. **But that's just my opinion.** What's yours? If you've not already responded, send me your thoughts at mastery.flight.training@cox.net.

Thanks to all those readers who have helped us thoughtfully consider the way we choose to fly our aircraft.

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

Fly safe, and have fun!

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