FLYING LESSONS for August 4, 2011

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.

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This week's lessons:

This week's *FLYING LESSONS* will be abbreviated somewhat as I get back on schedule after my annual 12-day odyssey to Oshkosh. Thanks to everyone who came to my presentation in the FAA Safety Center, or said hello in the American Bonanza Society tent or elsewhere on the AirVenture grounds.

This week's lessons:

Four events this week cause us to focus on wet-runway overruns and the possibility of hydroplaning: The highly publicized Guyana 737 runway excursion pictured here, after landing in a rainstorm; an equally public F-16 runway overrun at Oshkosh; and two lesser-reported Oshkosh events on the same runway and the same day: a vintage FJ-4 Fury that later went off the end of the runway very near where the F-16 dug in, and a Beech Bonanza whose pilot told me that while landing he slid uncontrollably off the side of the runway, luckily causing only very minor scratches to the underside of the wing when it impacted a runway light.

Local reports said there had been over four inches of rain at Oshkosh in the preceding 36 hours, and the grounds (and likely the runway) were still quite wet. The FAA's Airplane Flying Handbook tells us:

Dynamic hydroplaning occurs when there is a film of water on the runway that is at least one-tenth inch deep. As the speed of the airplane and the depth of the water increase, the water layer builds up an increasing resistance to displacement, resulting in the formation of a wedge of water beneath the tire. At some speed, termed the hydroplaning speed (VP), the water pressure equals the weight of the airplane and the tire is lifted off the runway surface. In this condition, the tires no longer contribute to directional control and braking action is nil.

(left) A vintage FJ-4 Fury joins an ANG F-16 off the end of Oshkosh's Runway 36.

Dynamic hydroplaning is related to tire inflation pressure. Data obtained during hydroplaning tests have shown the minimum dynamic hydroplaning speed (VP) of a tire to be 8.6 times the square root of the tire pressure in pounds per square inch (PSI). For an airplane with a main tire pressure of 24 pounds, the calculated hydroplaning speed would be approximately 42 knots.

It is important to note that the calculated speed referred to above is for the start of dynamic hydroplaning. *Once hydroplaning has started, it may persist to a significantly slower speed* depending on the type being experienced.

Reverted rubber (steam) hydroplaning occurs during heavy braking that results in a prolonged locked-wheel skid. Only a thin film of water on the runway is required to facilitate this type of hydroplaning. The tire skidding generates enough heat to cause the rubber in contact with the runway to revert to its original uncured state. The reverted rubber acts as a seal between the tire and the runway, and delays water exit from the tire footprint area. The water heats and is converted to steam which supports the tire off the runway.

Reverted rubber hydroplaning frequently follows an encounter with dynamic hydroplaning, during which time the pilot may have the brakes locked in an attempt to slow the airplane. Eventually the airplane slows enough to where the tires make contact with the runway surface and the airplane begins to skid.

The remedy for this type of hydroplane is to release the brakes and allow the wheels to spin up, then apply moderate braking. Reverted rubber hydroplaning is insidious in that the pilot may not know when it begins, and it can persist to very slow groundspeeds (20 knots or less).

Viscous hydroplaning is due to the viscous properties of water. A thin film of fluid no more than one thousandth of an inch in depth is all that is needed. The tire cannot penetrate the fluid and the tire rolls on top of the film. This can occur at a much lower speed than dynamic hydroplane, but requires a smooth or smooth acting surface such as asphalt or a touchdown area coated with the accumulated rubber of past landings. Such a surface can have the same friction coefficient as wet ice.

When confronted with the possibility of hydroplaning, it is best to land on a grooved runway (if available). Touchdown speed should be as slow as possible consistent with safety. After the nosewheel [or tailwheel—ed.] is lowered to the runway, apply moderate braking. If deceleration is not detected and hydroplaning is suspected, the nose should be raised (in tricycle-gear airplanes) and aerodynamic drag utilized to decelerate to a point where the brakes do become effective.

Apply brakes firmly until reaching a point just short of a skid. At the first sign of a skid, release brake pressure and allow the wheels to spin up. Maintain directional control as possible with the rudder.

In a crosswind, if hydroplaning should occur, the crosswind will cause the airplane to simultaneously weathervane into the wind as well as slide downwind.

See www.faa.gov/library/manuals/aircraft/airplane_handbook/media/faa-h-8083-3a-4of7.pdf

Note the main wheel tire pressure for the airplane you're flying, and compare that pressure to the actual touchdown speed (which should be very close to the stalling speed as adjusted for airplane weight). You may find that your normal landing puts you close to a hydroplaning speed. For example, the Beech A36 Bonanzas I usually fly have a nominal main gear tire pressure of 33 to 40 psi. At light weights, such as at the end of a trip, the computed stalling speed is 52 knots.

TIRE PRESSURE (psi)	HYDROPLANING SPEED (kts)
30	49
40	57
50	64
60	70
70	75
80	81

(*above*) Tire Pressure versus Hydroplaning Speed (NASA)

What's this mean? It's imperative to slow down to land on a wet runway. If you land even a little bit faster than "book" you may have reduced (or no) braking ability.

To avoid hydroplaning when landing on a wet runway:

- 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. Don't try to "grease it on" if the runway is wet.
- Lower the nose or tail wheel as soon as possible to maximize steering capability. But don't push the wheel down and cause the airplane to wheelbarrow, or set off a pilot-induced oscillation.
- Avoid applying brakes at or above the NASA critical speed for your airplane. Land at a speed and with remaining runway distance that permits coming to a stop with little or no braking.
- Divert to a more suitable airport if a wet runway is combined with a significant crosswind.

Some pilots advocate retracting flaps to put more weight on the wheels, increasing braking and directional control. Attempting to retract flaps during the landing roll is a common cause of inadvertent landing gear retraction in retractable gear airplanes, however, so I recommend against this practice in retractable gear airplanes.

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

Debrief: Readers write about recent *FLYING LESSONS:*

> I just wanted to say thank you for your great forum and all that you do. I am a relatively older but newer pilot. Your newsletter is helping me to constantly keep thinking about and practicing the lessons I read. Flying should probably be called the "practice of flying" because no one ever really knows it all, but you just have to keep "practicing" every moment you are in the air and always thinking about flying when you are on the ground. Thanks again, Ron Knapel

Thank *you*, Ron, letting me know that perhaps *FLYING LESSONS* really is making a difference.

Several readers commented on the discussion of human factors after an engine failure on initial climbout. Reader Vic Copeland writes:

> I have been flying for 42 years and have practiced simulated engine failures while performing short take-offs, at altitude only. I totally agree a pilot must "jam" the yoke forward instantly and get the nose way down to prevent a stall. We also must not overlook getting instantly off the right rudder. The tension associated with engine failure can cause a pilot to reflexively keep shoving on the right rudder and thereby decrease the much needed glide.

Reader Kelly McBride adds:

> When I was a young sprout getting my license at the young age of 19, I was with an FAA Examiner (this was 1975), and he had a mission to fail me. We flew the checkride out of Hayward and he took me to Livermore to do my landing series. Understand that I had been flying since I was three, started my training at 14 and probably had 100 hours at the time, so I was pretty good with the "stick and rudder" aspects, but shortly after takeoff on the last of the touch and go's (it felt like 50 feet at the time), he yanked the power back. I will never forget my astonishment that he would do this barely over the end of the runway and admittedly hesitated, but lowered the nose and fully intended to land in the fields beyond the airport, thinking to myself that he was the FAA, so I guess this is what we will do. As the cows were scrambling away, he reached over and shoved the throttle full and told me to take him back to Hayward.
>
> After the checkride, he scored me a 78, barely passing, and told me that he nearly failed me for hesitating on lowering the nose. (I had scored a 98 on the written, so maybe he thought I was an arrogant kid). Anyway, the lesson was learned and I will never hesitate again.

And reader Robert Thorson reminds us:

> Excellent advice. You may want to add that the push reduces wing loading...."G"...an aircraft won't stall at zero G.

Good point, Robert. Thanks, everyone.

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

We'll close out discussion of the fifth most common cause of fatal general aviation aircraft, Controlled Flight into Terrain/Cruise Flight, in next week's report.

Please send your insights to mastery.flight.training@cox.net. Thanks!

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

Flying has risks. Choose wisely.

Thomas P. Turner, M.S. Aviation Safety, MCFI
2010 National FAA Safety Team Representative of the Year
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