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Another Look at Hydroplaning

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In 1968 TAC ATTACK went all out with a series of articles designed to expose the evils of hydroplaning. All manner of charts, graphs, photographs, and illustrations were used in hopes of implanting some of the knowledge gained through testing and unfortunate experiences.

However, four years have streaked by, people have come and gone, and the emphasis on hydroplaning seems to have decreased somewhat.

There have been no scientific breakthroughs that have eliminated the hazards of hydroplaning. Runway grooving would help but this was known in 1968, and as of today very few runways are grooved.

It still rains, water still collects on runways, and airplanes still land on these wet surfaces . . . sometimes without the greatest success.

So let's make another trip around the pattern and review some of the factors that make up the phenomenon of hydroplaning.

Full dynamic hydroplaning means simply that the aircraft tires are not in contact with the runway surface, rather that they are being supported from beneath by a wedge of water. There are other factors, such as force vectors, inertia, and other goodies that go into the technical explanation of how a tire hydroplanes but the guy in the hot seat doesn't think in terms of formulae, so the statement that a tire is being supported by a wedge of water, while not completely and technically accurate, is adequately descriptive.

Whether or not an airplane will hydroplane depends almost entirely upon three factors: (1) ground speed, (2) tire pressure, (3) water depth vs tire tread depth.

Surprisingly, aircraft weight doesn't have any bearing on the ability of an aircraft tire to hydroplane except in indirect association of aircraft weight to touchdown airspeed.

SPEED

There's a simple formula for determining the speed at which a tire will hydroplane. Determine the square root of the tire pressure and multiply it by nine (10.3 for mph). Uh, oh – sorry – the point was just made about pilots not thinking in terms of formulae so to be consistent, a quickie chart has been provided to pick off the total dynamic hydroplaning speed.

A couple of things to remember about the speed. First, you must apply the wind factor in order to come up with a touchdown ground speed. Second, the chart speed is for total hydroplaning. Below that speed it is still possible to partially hydroplane; however, some area of the tire footprint will be in contact with the runway surface, making some braking action possible.

TIRE PRESSURE

Since the whole bit is based upon tire pressure, it goes without saying (almost) that if you don't know your tire pressure, you can't compute the hydroplaning speed (a true nugget of wisdom). A point to remember here is that because of the difference in tire pressures, the nose gear tire will hydroplane at a different speed than the mains (nice to know if you're trying to use nosewheel steering).

WATER DEPTH VS TIRE TREAD DEPTH

Hydroplaning occurs when the fluid depth exceeds the depth of the tire tread. Other factors such as runway surface texture and tire design also enter the picture. A smooth tread tire will hydroplane in less fluid depth than a ribbed-tread tire. But looking at it realistically, the pilot rarely flies around with the tire tread depth figures in his pocket and rarely does he have complete information on the runway fluid depth. The runway information the pilot receives will be limited and may only be a radio transmission, such as "RCR – wet runway." That should be the cue for super-caution . . . for decision and action.

THINGS TO DO

What action? There are several options, one of which is available to the jock. The best, but sometimes the least likely, is to go somewhere else (another jewel wrought from many hours of introspection). If that option is not possible, plan on an approach-end barrier engagement, assuming the airplane and the runway are so configured (and is recommended by the flight manual). Barring those two choices, use minimum run landing airspeeds and touch down firmly with as much runway ahead as possible.

If a crosswind is present along with hydroplaning conditions, things get sporting. Upon landing, the nose of the airplane will weathervane into the wind but the airplane will drift downwind. The airplane will be pointing toward one side of the runway and drifting toward the other. Aerodynamic controls can stop the crab but not the drift. Asymmetrical power (if available) may keep you on the runway long enough to make a mid-field barrier engagement (if available), or a departure end barrier engagement. If your machine has reversible fans, asymmetrical power will not only keep you on the runway but will slow you down below hydroplaning speed. So in a crosswind give yourself more runway by landing on the upwind side.

The evils of hydroplaning are still lurking around, still as treacherous, and still as vengeful on the unwary. A lot of thought and planning are just as "in" today as they were four years ago . . . still some of the best preventive medicine around. ➝