FLYING LESSONS for January 14, 2010

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.

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:

Most aircraft cowlings do not open far enough to permit a real inspection of the engine compartment before flight. We're left to depend on operational checks and indications to determine everything's all right under the cowl. One critical safety check for piston engines is that of magneto grounding.

During your Before Takeoff checklist look not only for indications, but for the *proper* indications when you switch from one magneto position to the other. At the run-up propeller speed you should see between 50 and 175 rpm drop when you go from BOTH to any single magneto position—THE ACTUAL TOLERANCE VARIES, so be sure to use the published range from your airplane's POH, not just what your past experience or some CFI or an aftermarket checklist tells you to expect.

There needs to be *some* drop when switching to a single magneto. The engine runs more efficiently with dual spark, so by definition there will be an rpm drop at run-up speeds when you select a less-efficient, single mag position. "No drop" on a single magneto is not indicative of a "really good" magneto. Lack of any rpm drop tells you either

> (1) something is preventing the "off" magneto from really turning off, or
> (2) one magneto was never working in the first place, so the entire test to that point was run on a single mag.

If (1) is the case you'll see a "normal" drop when you test the other mag position. If (2) is the case the engine will quit when you select the other magneto.

The magneto primary-, or P-lead is the connection between the starter switch and the magneto, and allows the magneto to ground out when you switch it off. Any time a mechanical magneto spins it will generate electrical sparks. If the cockpit switch is OFF and the P-lead is attached, any spark created in the mag will go safely to ground. But if the P-lead is broken that spark has to go *somewhere,* and that somewhere is down an ignition wire to a spark plug in one of the cylinders. If any residual fuel is in that cylinder this errant spark can cause the propeller to spin more, possibly pumping fuel and permitting continued combustion.

Since a P-lead or cockpit switch can break in operation, it's a good idea to include a "magneto grounding check" in your Shutdown checklist so you know the engine is safe until your next start. With the throttle *fully* aft, very briefly switch the magnetos to OFF, the back to BOTH. The engine should begin to quit as soon as you move the switch OFF. Do this check with the

mixture significantly leaned to avoid putting a lot of unburned fuel into the cylinders and manifolds during the "off" period, to prevent a damaging backfire when spark returns.

If you delay beyond the very first sign the engine is quitting before moving the magneto switch back to BOTH, *let the engine quit*, then complete the rest of your Shutdown checklist.

If you're going to pull a propeller through by hand, do so only with the airplane tied down and/or the wheels chocked…just in case. Turn the fuel selector OFF and pull the mixture to IDLE CUTOFF before pulling the prop, and make sure the throttle is at idle in addition to confirming the magneto switch is OFF.

Instruct anyone who will be on board on how to quickly make sure the mixture and throttle are at IDLE as a last-ditch defense against this not-terribly-uncommon sort of mishap.

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

DEBRIEF: Readers comment on past *FLYING LESSONS*

Reader Kent Lewis adds his experience to recent *FLYING LESSONS* on contaminated runway operations:

> A few observations from experience regarding hydroplaning. I experienced one event in a King Air 200 after a heavy rain at a military jet base. While the runway was grooved and the rain had stopped over 15 minutes prior, there was still some standing water on the runway, which we found on the takeoff roll, and add in a little bit of a crosswind. There is a small region between where the tires begin to dynamically hydroplane during acceleration and when the rudder becomes effective, and I certainly felt it as the aircraft began to weathervane a bit on the take off roll. Fortunately we passed through that region quickly and were airborne. [It was] a learning experience for me, and a scenario that is not discussed much.
>
> Another experience was when I was braking a MD-88 in Atlanta, planning on the second high-speed exit. A light rain shower had come through earlier and left just enough moisture on the far end of the runway that we got viscous hydroplaning at slow speed prior to the turn off. The solution there was to abandon the attempt to make the high-speed, keep [going] straight while slowing further and just roll out to the end. So it is important to watch out for the "pebbles" at the end of the runway where rubber deposits are heavy as well as during the initial touchdown, where dynamic hydroplaning occurs at a lower speed due to the tires not rolling at touchdown.
>
> And just to round out the hydroplaning triad, we steam-cleaned a nice little stripe down the runway in Spokane after a light rain, reverted rubber hydroplaning at low speed that resulted in a tire change for the trusty King Air.
>
> The message is that not all of the slip-and-slide events involve massive amounts of snow, ice or water, sometimes there is not a pot of gold at the end of the rainbow.

Thanks for your valuable insights, Kent. *FLYING LESSONS* will look deeper into hydroplaning in a future issue. Until then, see my 2006 article on hydroplaning considerations.

See www.aero-news.net/news/featurestories.cfm?ContentBlockID=5E605106-F4CC-4572-B342-AE545D9785AD&Dynamic=1

Reader and avionics author George Wilhelmsen writes about a recent *FLYING LESSON* on testing and monitoring ice protection equipment:

> You wrote: In an electrically powerful single-engine airplane you may actually have to turn off the alternator before individually turning on the pitot heat for the ammeter/ alternator loadmeter movement to be noticeable. In flight, when the alternator is developing rated power, there may not be any ammeter needle movement at all.
>
> Most singles use alternators. Alternators have a low speed cut-off (generally less than 1000 rpm) where the speed isn't sufficient to generate a voltage. If you have a voltmeter installed, you can see this point as you

> throttle back your engine. The voltage will drop off (based on the loads on line, such as traditional (non-LED) strobes, landing lights, etc.) I'm not aware of an alternator that doesn't have this characteristic. Thus, if you throttle back to idle, you should be able to see the pitot heat turn on by a change in the bus voltage or the ammeter. Unless by "electrically powerful" you meant a plane with a very coarse ammeter, with divisions so wide that you can't see the change from turning on the pitot heat. Is that what you meant?

Thanks, George. You're right, if you throttle all the way back to idle and then check the electrical ice protection systems individually, you should be able to see a slight rise in the alternator load and/or a greater discharge on the ammeter. In my experience won't see an instantaneous drop on the voltmeter; it'll continue to read 12 or 24 volts as applicable unless you leave the equipment on long enough to draw additional power from the battery. As I remember, our rationalization when creating the FlightSafety International checklists for Bonanzas and Barons was that the engine(s) should remain at ground-idle power during the pre-takeoff checks. Beech stipulates 800 to 1200 rpm depending on the model. By momentarily turning off the alternator(s) you can immediately check the pre-takeoff electrical draw of even small loads like the pitot heat and (if installed) heated fuel vents and stall warning while keeping the engine at ground-idle. Note it's entirely possible those checklists have been changed since it is nearing 20 years since I helped write them.

New Rules for Reporting

Something went wrong. Do you need to report it? If you're flying a U.S.-registered airplane, NTSB 830 tells us what requires an incident or accident report, and the rules are changing. EFIS, Primary Flight Display (PFD) and Primary Navigation Display (PND) outages will now require a report to NTSB, as the agency seeks more data on increasingly prolific "glass cockpit" devices. Some collision avoidance system advisories also require an NTSB report. Propeller failures and uncontained turbine failures prompt reporting too. For the full list of reporting requirements see the NTSB 830 Final Rule, which becomes effective March 8th.

See http://edocket.access.gpo.gov/2010/E9-30398.htm.

The Human Element

FAA Aviation News this month focuses on human factors research—fatigue, workload management and cockpit technology.

See www.faa.gov/news/updates/?newsId=60107

A Buffalo, NY newspaper creates a surprisingly well-informed investigative report on cockpit technology and the loss of flying skills, all the more compelling because of the credentials of aviation professionals quoted. Although it focuses on regional air carrier operations, try reading the article from the perspective of a pilot whose profession is something other than a full-time pilot, and who flies with the technology significantly less that a professional flight crew.

See www.buffalonews.com/home/story/906334.html

Fly safe, and have fun!

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