FLYING LESSONS for March 18, 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:

The risk of a gear collapse in retractable-gear airplanes is extremely high during the rapid reconfiguration required to do a touch-and-go. Experience reveals that landing gear squat switches do not protect against a touch-and-go gear retraction, and accidents like this one confirm it.

See www.thomaspturner.net/Squat%20Switches%20and%20Gear%20Collapse%20Mishaps.pdf

Unless a second pilot is aboard to divide the duties, and one pilot is responsible only for power and control with the other in charge of reconfiguration, my opinion is that touch-and-goes in retractable-gear airplanes are not worth the risk. Land to a full stop, reconfigure the airplane, debrief the landing and prepare for the next departure, and then take off again.

It's good practice following even a "no damage" taxiway departure to have the landing gear system thoroughly inspected by an expert. I suspect a lot of later gear collapse events follow a seemingly "uneventful" stress on the landing gear system.

Focus solely on aircraft control while moving on the ground, adjusting technique and speed to the conditions, and deferring system checks and navigation set-up until stopped on the ramp or in the run-up area.

Most airplane owners tend to replace or overhaul system components on condition...they wait until failure, or at least imminent failure, before addressing systems, usually motivated solely by the cost.

Historically, however, landing gear systems fail quickly when they reach a fatigue limit, and the first indication of overstress is a complete failure. This applies to fixed-gear airplanes as well as retracts.

The average repair costs $60,000 or more following even a "minor damage" gear mishap in a single-engine airplane. The typical twin can cost $80,000 or more. In many, many cases the aircraft is totaled not because of the extent of damage but instead the cost to repair it--I venture that landing gear-related mishaps are the leading reason retractable-gear airframes are retired from the fleet. That's why most mechanics recommend proactive overhaul or replacement of landing gear components based on time-in-service as indicated in manufacturer's manuals, even if they believe in replace-on-failure for less critical aircraft systems.

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There have been a number of cases in the last couple of years where the pilot followed common engine guidance and left a lean-of-peak (LOP) setting selected through the landing, with the plan of advancing the mixture first in the event of a go-around. In the heat of the moment, however, pilots sometimes forget to advance the mixture and follow their first instinct, putting the throttle forward to go around. This drives the mixture even leaner and the engine quits, usually at an altitude that it's too late even if the pilot realizes the mistake and moves the mixture control forward.

I teach advancing the mixture to well rich of peak EGT (ROP) as part of the set-up prior to entering the pattern and/or before passing the FAF inbound on the approach, specifically as a technique for avoiding a repeat of this sort of accident history.

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

Debrief: Readers write about recent *FLYING LESSONS*

Reader Dave McConeghey writes about last week's *FLYING LESSON* on crosswind takeoffs:

> If you neutralize the aileron as liftoff is occurring then you are not banking into the wind at liftoff at the same angle as is required to hold the centerline at touchdown during landing and the aircraft will begin drifting downwind. You should be striving to lift the downwind wheel off the runway and continue with the upwind wheel on the ground for a second or two before liftoff. When you lift off in this attitude you are prepared for any sudden reduction in wind velocity that might cause the airplane to settle back down on the runway. After gaining a few feet of altitude and a little more airspeed reduce the rudder required to keep the aircraft pointed straight and it will make a coordinated turn into the wind to establish the crab. If the ailerons are neutral at liftoff there is no control authority to counter the crosswind.

Dave continues about my point to "use care to remain firmly on the ground until established at the normal liftoff speed" in gusty conditions:

> If this is over-emphasized the pilot will be pushing the nosewheel down causing the center of friction on the runway to be further forward giving the leverage of the wind on the tail a greater advantage. It will also make it more difficult to keep the airplane straight because of the wheelbarrow effect of reducing the weight on the main wheels.

Frequent *FLYING LESSONS* debriefer Dave Dewhirst adds:

> Crosswind technique is the biggest single problem we see with general pilot skills. It is always an issue on Flight Reviews. Here in Kansas, the wind blows all the time; it is just a question of direction and velocity. Crosswind training is always an issue. Pilots never learn the idea of flying the airplane to and from the runway. Without correct training, the pilot will hold the airplane on the ground until well above flying speed and then yank it into the air. The same pilot will plop all three wheels on the ground as soon as the upwind wheel touches the runway. That pilot will eventually be blown off the runway.
>
> Some time ago, we developed a training routine for people who do not understand the concept of a sideslip. It is called the one-wheel touch and go. We need a crosswind component of at least 10 knots and a high wing airplane. We use approach flaps and keep the speed up at touchdown so that the downwind wing never comes down. The pilot must use aileron to correct for side drift and rudder to maintain runway alignment. The idea is to run the airplane down the runway for at least 2000 feet on only the upwind wheel. It takes a competent CFI to do the training. It sure grinds up tires, but any pilot who can do this will not get blown off the runway.
>
> You can tell if the pilot understands the concept if he can answer the question, "How do you know if you have exceeded the crosswind limit"? The correct answer is not a specific airspeed. The correct answer is that he does not have enough rudder to bring the nose in to alignment with the runway. Multi-engine pilots can help the rudder situation, especially at lower airspeeds where the rudder is less effective, by carrying power on the upwind engine. The pilot better be on top of his stick and rudder skills to do this. Let us also not forget the wind gradient. Glider pilots know the wind will move 20 degrees, usually counterclockwise, and decrease

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> 10 knots in the last 500 feet of descent. The airplane may be within its crosswind limit at 500 feet and out of the limit at the runway.

Good pointers on crosswind technique, both Daves. Thanks.

Avemco Insurance president Jim Laurerman adds:

> Our analysis indicates that if everyone learned to handle directional control issues that General Aviation losses could be reduced by at least $10M per year. Imagine what impact that could have on insurance costs over time.

Not to mention the reduction in damage, risk of injury and airframes retired before their time. Jim continues:

> These *FLYING LESSONS* just keep getting better and better.

Reader and flying safety consultant Norm Scroggins adds:

> Great *FLYING LESSON* plan... and the invaluable insight you've shared is outstanding. It definitely provides a path for improvement for all.

Thank you very much, Jim and Norm.

Reader John Townsley adds his insight to last week's *LESSON* on the relative safety of glass cockpit aircraft:

> All of the points raised in your article on glass cockpits are good and valid. An additional point that I've only seen tangentially addressed is the lack of standardized displays for PFD, MFD etc. Combine this with vastly different button sequences to manage the equipment and it means training from one system to another has to be individualized and unique. The implications for this lack of standardization are huge. From the CFI to the pilot, information transfer becomes a much greater challenge. Combine this with pilots who may have high time, but rusty or perhaps never learned basic skills and the potential for an accident is huge. We also must remember that pilots, as a group, tend to be very capable people who are extremely goal oriented. A goal oriented, otherwise capable person, faced with a box that might or might not be well known and a trip they just "have to make"? Not a good picture if anything goes wrong. And finally, there's the gizmo effect. A big, bright panel right in front of your nose is hard to ignore. So who is looking outside? ASRS has several reports of pilots poking buttons instead of flying the airplane. Loss of situational awareness is a major link in most accident chains. In my opinion, introducing an element of standardization to glass cockpits would result in measureable reductions in accidents. Combine that with redundancy (back up instruments) and more recurrent training and perhaps we might realize the dream…a real reduction in the GA fatal accident rate.

And reader Lorne Sheren chimes in:

> It would be interesting to see if those pilots trained exclusively on glass had a different accident rate than those who transitioned from steam gauges. Or compare accident rates in comparable glass/ non- glass aircraft (Beech, early Cirrus). Some of this may be Cirrus' not so stellar safety record, that I think comes from aggressive marketing of a high performance aircraft to people with not so much flying time but lots of money. ("Hey, it looks like your Lexus, the machine flies itself, and if you really screw up just pull the big red handle and float safely to earth.").

Thanks, Lorne. I mentioned last week that I did such a study of so-called "similar mission aircraft" in 2006-2007, using NTSB accident data from 2000 through 2005. I specifically compared Beech Bonanzas and Barons to Cirrus airplanes, on the assumption most Cirrus are glass cockpit airplanes, and most Bonanzas/Barons are not. After taking landing gear-related mishaps out of the Beech record I found the Cirrus airplanes to be nearly three times as likely to be involved in a weather-related mishap. I conclude it's not the airplane, it's the pilot that increases the glass cockpit accident rate. It's important to note that the Cirrus fatal accident rate has improved noticeably in recent years. I credit this to the Cirrus Pilot Proficiency Program (CPPP), which has

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made great strides in teaching safe operation of these airplanes, and also the Cirrus Owners and Pilots Association's forward-reaching "critical decision making" program—proving again that it's not the airplane or its equipment, it's the pilot that determines safety.

See:
www.cirruspilots.org/Content/CPPPHome.aspx
www.cirruspilots.org/Content/CDMGeneral.aspx

More on glass cockpits and the NTSB

2008 Flight Instructor of the Year (and *FLYING LESSONS* reader) Max Trescott adds some insight into the NTSB's recent report on glass cockpit aircraft safety. One area *FLYING LESSONS* speculated on last week was the different utilization between glass cockpit and traditional-panel airplanes. Max puts some numbers to it in his recent Trends Aloft email.

See www.maxtrescott.com/max_trescott_on_general_a/

AVweb's Paul Bertorelli also blogs about the NTSB's study, and ponders the greater picture of personal responsibility as it applies to flying safety.

See www.avweb.com/blogs/insider/AvWebInsider_EFIS_202157-1.html

As of March 8, 2010, the National Transportation Safety Board requires immediate notification of some glass cockpit system outages, even if no accident occurs. From 49 CFR 830:

> 830.5 Immediate notification.
> The operator of any civil aircraft, or any public aircraft not operated by the Armed Forces or an intelligence agency of the United States, or any foreign aircraft shall immediately, and by the most expeditious means available, notify the nearest National Transportation Safety Board (NTSB) office, when:
>
> (a) An aircraft accident or any of the following listed serious incidents occur:
>
> (9) A complete loss of information, excluding flickering, from more than 50 percent of an aircraft's cockpit displays known as:
>
> (iv) …a primary flight display (PFD), primary navigation display (PND), and other integrated displays….

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

Fly safe, and have fun!

Thomas P. Turner, M.S. Aviation Safety, MCFI
2010 National FAA Safety Team Representative of the Year
2008 FAA Central Region CFI of the Year

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