FLYING LESSONS for October 29, 2009

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.

FLYING LESSONS is an independent product of MASTERY FLIGHT TRAINING, INC. www.thomaspturner.net

This week's lessons:

Disparate incidents in the recent media share a common theme. Consider:

- A commercial airliner overflies its destination by 150 miles. The professional flight crew's claim is they were distracted while using laptop computers to work on personnel issues related to a company merger. Given the airlines' concern for aircraft weight management (airplanes heavy with excess fuel require more costly fuel to fly), it's amazing the airliner had enough fuel to fly back to its intended destination, including a series of ATC-commanded turns to confirm the crew was in fact (once again) in command of the aircraft.
- A private aircraft continues toward rising terrain even as weather conditions worsen. Disaster is missed by mere inches as the plane's wing strikes bushes on a cloud-obscured hill. Afterward the airplane's occupants laugh on tape while videoing impact damage on the airplane's right wing.

See:
www.youtube.com/watch?v=8Nm8pNgqBAk
www.cnn.com/2009/US/10/27/airliner.fly.by/index.html

The common thread is that the pilots in these airplanes blindly trusted cockpit technology. Coupled to an autopilot or following a terrain-displaying moving map, they unknowingly passed decision-making along to unthinking electronics, with potentially disastrous results.

In my experience alone I've had a highly experienced engineering pilot admit to nearly busting Class A airspace without a clearance during an autopilot climb while he focused on engine management; listened to a presentation from the chief of training for an aircraft manufacturer who talked about refining his Powerpoint presentation while flying alone to the conference; received frequent texts and emails from airline pilots while they were en route at the helm of a passenger airliner; and even received unrepentant confession from the pilot of a pressurized twin who routinely set an alarm clock and napped in cruise in the flight levels. Not all transgressions are as bad as others, but each points to a growing culture of abdication of pilot-in-the-loop command responsibility as we become more and more reliant on automation.

Delegation is not abdication. The modern concept of flight as management of automated systems can greatly increase safety. But it also carries the great risk of developing complacency, of pilots deciding they don't need to actively participate in flight even if it is being done automatically, that they need to skeptically monitor and cross-check these fabulous cockpit aids to benefit from this potential increase in safety. Delegation of hand-flying tasks to an autopilot, or finger-on-the-sectional mountain flying to a moving map, so the pilot can focus on the

larger picture is a wise use of cockpit resources. But ignoring our role in the process is not delegation, it is abdication of our pilot-in-command responsibility.

Passion and skill alone are not enough to succeed as cockpit managers. We're not natural managers--hands-on ability and passion alone don't prevent 80% of all business start-ups from failing within the first five years (source: U.S. Small Business Administration). People have to *work* at managing a business, and when you're at the controls of an airplane your business is *flight*.

So engage your autopilot, and use your moving map. But do *not* avert your attention from the same progress of your flight; even when coupled to automation take only short moments to look at charts or attend to passengers or cockpit chores. The first rule of aviation is to *fly the plane.* It cannot safely fly you.

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

FLYING LESSONS comes to North Texas

Saturday, December 12th, Denton, TX: *FLYING LESSONS* is hosted by Aircraft Precision Maintenance, Inc. The day-long program includes:

- Running out of fuel: Lessons from three case studies
- Keep it on the runway: The lost art of directional control
- A pilot's guide to aviation insurance
- Those who won't: Avoiding gear up and gear-collapse mishaps
- What *really* happens in IMC

Check here for complete details. Contact Aircraft Precision Maintenance at 940-765-7975 or Wesley@amptx.com to enroll.

See www.thomaspturner.net/Denton%20Dec%202009.pdf

Watch for additional *FLYING LESSONS* events in 2010. Contact mastery.flight.training@cox.net if you'd like to arrange a presentation at your conference, FBO, safety meeting or flying club.

DEBRIEF: Readers comment on past *FLYING LESSONS*

Concerning recent *FLYING LESSONS* on the effect of center of gravity location on takeoff and initial climb performance, reader Dave Van Horn writes:

> > heavier and more rearward loads will inhibit takeoff performance...
>
> Shouldn't that be "heavier and more FORWARD loads"? Forward CG will increase elevator downforce, which adds to the amount the wing has to lift, increasing induced drag.

I replied:

> Hi, Dave:
>
> You're entirely correct from a theoretical standpoint. I thought quite a bit, and replayed a lot of instructional experience in my mind, before writing that statement. To see where I'm coming from, let's look at three takeoff scenarios. All three assume the airplane is at a given weight. The only thing that changes is the distribution of that weight, and the pilot's technique.

In the first scenario the pilot does everything precisely correct. Trim is set for takeoff as appropriate to the weight distribution (many airplane handbooks recommend different takeoff trim positions for different load distributions). The pilot holds the airplane at a relatively neutral angle of attack during the ground roll to minimize drag, and applies control pressure just prior to attaining the indicated liftoff airspeed applicable to the airplane's weight. As you correctly state, if the airplane's center of gravity is further forward it will require additional lift to establish the climb attitude, which increases angle of attack and therefore drag. Assuming the pilot does everything right, the further forward c.g. loading will increase ground roll and decrease initial climb compared to the same weight at a more rearward c.g.

In the second scenario, the pilot does everything right except at "rotation" speed (rotation is perhaps not necessarily a correct use of the term for light airplanes, but it is common parlance). he/she applies the "normal" amount of control force to lift off and aim for the proper climb attitude. In other words, the pilot does not consciously alter the amount of force exerted based on the c.g. position, but instead pulls "normally" and then adjusts pitch as necessary after seeing the initial result. With a more rearward c.g. the pilot will likely over-rotate initially because the aft c.g. causes the airplane to pitch up more for a given control input force. For a brief moment (until the pilot compensates) the airplane is at an increased angle of attack, increasing induced drag and lengthening the distance needed to attain climb attitude and therefore clear the ground and obstacles.

The third scenario is probably what happens most frequently in piston airplanes. At the beginning of the takeoff roll the pilot holds a little back pressure on the controls and lets the airplane accelerate until it lifts off smoothly on its own. If the c.g. is aft this control pressure will raise the angle of attack and increase drag through the entire ground roll. The airplane may "skip" a few times before lifting off, with each drag of the tires slowing the airplane slightly and making the takeoff run even longer. The aircraft may lift off into ground effect at a speed at which it cannot yet climb out of ground effect, and the pilot's reluctance to lower the nose to gain speed results in a much longer takeoff run or even a collision with obstacles off the end of the runway. The mishap that prompted the *FLYING LESSON*, reported first-person to NTSB by the pilot, fits this scenario precisely.

There's no doubt that airplane weight is the biggest determining factor on takeoff performance, because for takeoff and initial climb thrust-to-weight ratio is everything. Weight distribution is a lesser but still significant factor. Without adjusting technique for c.g., however, even a rearward loading can increase takeoff and obstacle clearance distance.

Thanks for writing, and for reading *FLYING LESSONS.*

Gear down or up for an off-airport landing? Last week's reader response to a *FLYING LESSON* on putting retractable landing gear down to absorb the shock of an off-airport landing elicited more reader mail. I'd invited air safety investigators to (anonymously) relate what they've seen in the field to point to gear up or gear down as the preferred technique. What I received were some first-person accounts from pilots who'd been there.

One reader wrote:

Okay, Tom, you can't have it both ways. A reader comments he has participated in aircraft recoveries with the gear up that resulted in little damage. Of course, we have no facts about these events that were most likely on a runway with the gear up. I personally put a Bonanza in a soft cornfield with the gear down with only a small mark from the shoulder harness and wounded pride. There is no doubt in my situation that the field was neither smooth nor long, and it is a fact that the nose gear failed and the right main uplock failed, putting the plane sideways. Survival of an off-airport landing is all about dissipating energy over time, so it would seem to me that anything that accomplishes that is a good thing. The gear is aft of the fuel cell in [many airplanes], so is that really a factor? Wouldn't exposing the leading edge to impact at ground level with the gear up be more of a risk to a fuel fire with rupture and spark ignition from impact?

Another reader reports:

My read on the landing gear question is that the gear is the one structure designed to absorb the loads associated with returning to earth. Granted a soft field may result in a nose over with gear extended but I can't help but think that those things sticking down there can absorb a lot of energy. Of course in a water landing they should stay up (ask Sully...). Unfortunately comes from the experience of putting the plane into a tree. Of course, being in the landing configuration, the gear was down. Although two gear sheared off one main actually remained intact.

And yet another writes:

> The gear up/down for off airport landings could depend on a lot. However, I'd put it down, in all cases unless there was a reasonable chance that it would flip over with the gear down... like a swamp or really soft muddy terrain, if I could determine that.
>
> I've had just one such landing, and it was down with the gear up, which I feel could have been a mistake. I landed crossways against rows of a crop field, like a washboard, that I though would flip me, but it was a quick last minute decision. When we hit the rows it was hard, and caused substantial damage and injuries. Perhaps the gear would have cushioned it somewhat... but flipping would have been worse.
>
> I hope I don't get any more experience with this stuff.... I'll rely on the experience of others.

Learning from experience is what *FLYING LESSONS* is all about. Thanks, everyone, for lending your experience to help us all better consider our options.

Do you have a question or comment? Email me at mastery.flight.training@cox.net.

Fly safe, and have fun!

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