

FLYING LESSONS for September 17, 2009

suggested by this week's aircraft mishap reports

FLYING LESSONS uses the past week's mishap reports as the jumping-off point 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 expanded weekly *FLYING LESSONS* report emailed directly to you, email "subscribe" to mastery.flight.training@cox.net

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This week's lessons:

Aircraft stability varies noticeably with changes in the location of center of gravity. Just as the airplane's weight affects performance, so does the distribution of that weight impact our ability to control the aircraft.

Even within the loading envelope the difference is apparent. Load toward the *forward* end of the envelope and you'll find:

- Stability increases
- "Breakout force" (the force needed to make the airplane change movement in pitch, roll and yaw) increases
- Takeoff distance increases (you have to accelerate to a faster speed to have control authority to change pitch)
- Initial climb rate decreases (you have to increase elevator up movement to hold a climb attitude, increasing drag and causing the airplane to fly at a higher angle of attack, increasing drag further)
- Cruise speed decreases (because at 1g elevator up-deflection and angle of attack increase for any given power setting)
- The airplane is harder to flare and may suffer a hard landing on the nose wheel (or nose over if a tailwheel design)

Load the same airplane nearer the aft end of its approved envelope and:

- Stability decreases
- Controls become "lighter"—it's more difficult to maintain precision
- Takeoff distance decreases and initial climb rate increases
- Cruise speed increases (because 1g flight at any given power setting is at a lower angle of attack)
- The airplane tends to pitch up excessively, making a stall on takeoff, landing or go-around more likely
- The "usual" control input to flare for landing may cause excessive pitch-up and a high flare or stall in the flare, with a subsequent drop hard on the nosewheel (or the nose, if a tailwheel airplane).

Spend some time with the airplane's weight and balance information. Calculate some normal and unusual-for-you loading problems and see not only whether the c.g. is within limits, but *where* it's located within the range of the approved envelope.

See also what happens to c.g. location as fuel burns. In some airplanes you may drift perilously close to (or even beyond) the c.g. limits before all the fuel is burned from the tanks, depending on your passenger and baggage load. Derive rules of thumb for your airplane such as "If all four seats are occupied I must have at least half-full fuel tanks to stay within limits" or similar. Use the results of these calculations as new airframe limitations—because they have verifiable basis in reality.

Consider center of gravity' effect combined with weather conditions. Strong or gusty winds, for instance, will be harder to negotiate with an aft-loaded airplane. A forward-c.g. airplane might collect more ice on its belly because of its higher angle of attack in cruise. Turbulence will be more uncomfortable, and cause more control difficulty, in an aft-c.g. airplane. There may be conditions you'd fly in solo or with only two aboard that you should avoid when you have passengers or a lot of baggage in the back.

Try a controlled experiment. With a flight instructor experienced and current in your make and model of airplane, manufacture conditions so the airplane is loaded near the forward c.g. limit, and then near the aft end of the loading envelope. In each configuration (and in good weather) take off, climb, level in cruise, practice stall recoveries, maneuver at pattern speed, fly a rejected landing (go-around) and finally land. Note the differences in performance and trim settings.

Do this before you put yourself (and passengers) in a near-the-edge-of-the-envelope situation "for real" to better decide if weather and other conditions make the risk one that's worth taking.

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

DEBRIEF:

Commenting on last week's *FLYING LESSON* about launching into poor weather conditions hoping to pick up an instrument clearance in the air, reader Lorne Sheren writes:

I used to think that, as an instrument rated pilot, I was immune from the VFR into IFR accident scenario. Not so! Even sharp IFR skills will not keep you safe when dodging radio towers (as you mentioned), when encountering a low bank of ground fog on short final or circling around "VFR" while waiting for a clearance. One of the worst decisions I ever made- I was departing late at night to attend (because of a meeting I had to attend), of all things, [type-specific pilot training]. My field didn't have a control tower, the phone line to TRACON went unanswered and flight service was useless. So I decided to take off under the 1200' ceiling and call TRACON on the radio. How busy could they be at midnight? The answer: very busy. I was told to stand by, and I headed west toward my destination, slowly descending to stay under the overcast. I did so until the screen on the GARMIN flashed a bright red "Terrain" warning. That was it, preferring to violate the laws of man (which you can sometimes get away with) over the laws of physics (which are rigidly enforced) I climbed into the murk just as TRACON called with my clearance. Not the best decision ever, and if it wasn't for the Garmin I probably would have been mentioned further down in [your] newsletter. VFR into IFR conditions- by an instrument rated pilot. It can happen to you, and it happens insidiously.

Thanks for letting us learn from your chilling experience, Lorne. Your response to the tight predicament is one I teach as well—if faced with the choice of descent into terrain or entering IMC (or busting airspace), and you have the skills and equipment to safely climb, then *do it* and apologize later...even if it means accepting certificate action (it would be hard to argue regulatory immunity using the emergency clause if you put yourself in the tight spot to begin with).

Referring to last week's discussion of high density altitude takeoffs in turbocharged airplanes, aviation safety consultant and retired air traffic controller Norm Scroggins, who is also a flight instructor, writes:

[The] lesson of the week is outstanding FIRC [Flight Instructor Refresher Clinic] material. Something that many (like me) have seen, but never really understood....especially the risk factor.

Norm also draws from his ATC experience to correct a *LESSON* from last week:

Tom, your advice for a pilot to become acquainted with the local ATC situation is on target. However, you may have a bad input on requirement to climb to MVA before receiving a clearance. In the USA I believe the emphasis should be "you must be able to remain VFR and be able to identify your exact location to the controller before receiving a clearance." MVA's vary with the location of the radar [facility] and in situations outside "major terminal areas" may be much higher than the cloud base. Believe it or not in some of our Northwest Mountain states [it is] beyond reach [to many airplanes]. Radar service cannot legally be provided below MVA, but NON - RADAR service is, so long as it can be applied with required separation from obstructions and other IFR traffic.

If the pilot is able to define his/her exact position, ("I'm circling over the airport") many more experienced controllers may recognize the situation and give a "quickie" - [a] short clearance to get the airplane up-to-and-in radar coverage (MVA) i.e. "cleared to climb to and maintain four thousandexpect further clearance via route filed" IF AN EXACT POSITION CANNOT BE PROVIDED..... then a pilot in the air is faced with what he/she started with, [flying] " AT YOUR OWN RISK."

Thanks, Norm, I always learn from you. Certainly it would be difficult to get clearance below MVA if you are trying to fly "direct to" a waypoint or destination. You're right—it's up to the pilot to be able to remain VFR and to positively identify his/her exact location in order to pick up a clearance in flight...further substantiating the wisdom of obtaining an expect further clearance (EFC) time to launch IFR when conditions are marginal.

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

Coming events

See if you can attend one of these upcoming *FLYING LESSONS* presentations:

- Wednesday, September 23rd. [GAMA Air Safety Investigators](#) Advanced Technical Workshop, Wichita, KS. Topic: "What Really Happens in IMC." Event is by GAMA invitation only. See www.gama.aero/files/GA-ASI_2009_Final_Agenda_-_Final_Draft_0902.pdf
- Saturday, October 17th. Beech Aero Club BACFest, Gatlinburg, TN. Topic: "When Your Airplane is Older than You Are: Safely Flying Aging Aircraft." Contact [BAC](#) for convention registration. See www.beechaeroclub.org

Watch for additional *FLYING LESSONS* events later this year and 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.

FROM THE FAASTeam

The FAA Safety Team periodically releases *Safety Tips*. As the days shorten (for Northern Hemisphere readers) this week we have this *Tip* from the Federal Aviation Administration:

When landing at night, remember that aircraft holding on an active runway are very difficult for approaching aircraft to see. Research has shown that even large aircraft holding on a runway may not be seen by an approaching pilot until he or she is on very short final. Sometimes the only cue is the "missing" runway lights located under the holding aircraft. Always perform a final runway scan to insure your landing runway is clear.

U.S.-certificated pilots may subscribe to FAAS*Team Safety Tips* by registering at www.faasafety.gov (which also features *FLYING LESSONS*).

QUESTION OF THE WEEK

September Question of the Week #3

This week's question:

Do you see yourself transitioning to a new airplane type in the next year? If so, what type, and how does it compare to what you're currently flying?

Win your choice of a Mastery Flight Training hat or the instructional DVD [Those Who Won't: Avoiding Gear Up and Gear Collapse Mishaps](#). Answer this Question of the Week to be included in the random drawing for September. Copy and paste the questions with your response to MFTsurvey@cox.net...then come back to read the rest of *FLYING LESSONS*.

Last week we asked:

Do you use *FLYING LESSONS* when mentoring or training other pilots? How?

A reader replied:

As an instructor at the FlightSafety Hawker Beechcraft Learning Center, I find the information presented each week to be an invaluable resource, especially for our recurrent clients. I use the information to supplement our techniques and to demonstrate, with actual scenarios, why those techniques work and how to prevent issues from occurring. As an instructor with extensive systems knowledge and experience in Barons and Bonanzas, it is nice to have outside verification and/or corrections of/to the information we present in ground schools.

For example, all the information we have about TAS [Traffic Avoidance System] equipment states that automatic activation is a function of groundspeed (i.e., >30 Kts). After reading Tom's information concerning this and his findings that it is actually a squat switch-triggered item, I researched this extensively myself to find he was absolutely correct. I use this as a reason to affirm our procedure of not retracting flaps until clear of the runway, and as a reason to perform full stop landings instead of touch/stop and goes. Keep up the excellent work, Tom.

Sincerely, a dedicated follower/reader

Dylan R. Lamb
Instructor, Piston Program

Thank you, Dylan, that's extremely kind. I don't usually identify authors in the Question of the Week section, but the grammar you used shows you intended this for the larger audience and not just me. I'm glad to help and appreciate what I learn from you as well.

Another reader responded:

I just renewed my CFI and a good deal of the material was about the FAA's [safety.gov](http://www.faa.gov/safety) website so I went to check it out and came across your letter in the pilot resources section. I was looking for something similar to a type of lessons learned and causes of aircraft accidents section as I find it a good way to try to keep myself out of trouble by learning from other missteps. Right now, I am laid-off from the airlines. I was flying 737's.

Thanks! I hope you get recalled soon...but that you don't stop teaching flight as a result. Yet another reader writes:

I have been reading *FLYING LESSONS* for quite some time now and use it in training. I found *FLYING LESSONS* on the FAA website. I am a flight instructor, teaching in Michigan out of KOZW [Howell, Michigan]. I teach primarily in CE-172SP's but we also have a Piper Twin Comanche (PA-30-160) in our fleet. I also have been doing quite a bit of training in my students' planes (CE-206, T206H).

And thank you. I'm gratified that *FLYING LESSONS* is making a difference in the instructional community.

The August winner of the Question of the Week drawing is Mike Moskot of Baton Rouge, Louisiana. Mike's choice of the landing gear DVD may be well-timed, as you'll read:

I'm a renter, and the plane I most commonly fly is a Cessna 172. The retract interest is because I occasionally fly a friend's Cessna Cardinal RG, whenever he lets me. I'm also his safety pilot when he needs me to be. I'm not complex-endorsed, yet, and I'm about to do that in a Cessna 182RG. I'm also slowly working on an instrument rating.

Congratulations, Mike! I hope you'll remain one of "those who won't" have a landing gear-related mishap.

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



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