

FLYING LESSONS for October 13, 2011

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. You are pilot in command, and are ultimately responsible for the decisions you make.

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This week's lessons:

We had another midair collision during formation flying this week. Two amateur-built airplanes ran together during a recreational formation flight. Happily, the pilots of both airplanes were able to land without injury. Very frequently the result of in-flight contact, even at slow relative speeds, is far less encouraging.

Recreational formation flight is enjoying a great deal of popularity among civilian pilots over the past several years. Possibly as a result of high-profile formation arrivals at airshows, including formation fly-overs in memorial services of military members lost in battle or our ever-shrinking supply of fellow pilots, or simply as a new means to achieve an old goal, camaraderie and excitement in personal aviation, more and more pilots are flying formation without the benefit of military training.

The U.S. Federal Air Regulations are mostly silent on civilian formation flight. 14 CFR [91.111](#) tells us:

- (a) No person may operate an aircraft so close to another aircraft as to create a collision hazard.
- (b) No person may operate an aircraft in formation flight except by arrangement with the pilot in command of each aircraft in the formation.
- (c) No person may operate an aircraft, carrying passengers for hire, in formation flight.

There are additional rules about formation flights in Class D and other airspace, and as demonstrations during airshows and/or below altitudes required for "normal" flight activities. But the main rule is that formation pilots are responsible to avoid each other, they must "arrange" the formation flight before joining up (no peeling off and settling in off some unsuspecting pilot's wing), and that pilots can't be charging passengers for any flight that includes "operating near other aircraft."

See <http://tinyurl.com/formationflight>

In practice, safe formation flying requires significant planning, including join-up, lost contact ("I can't see you") rules, and pre-arranged rules for changing the formation, turns, navigation, communication, takeoff and landing, as well as what to do in the event of an emergency.

The civilian formation pilots I know spend far more time briefing for a formation flight than they do actually flying it. They then spend that much time again de-briefing after the flight to learn its lessons while they are still fresh.

Dissimilar aircraft in the same formation present their own unique risks. In addition to differences in performance and safe airspeeds, there may also be big differences in visibility from one type to another, and significant "blind spots" that pilots of all airplanes in the formation must accommodate.

Further, some airplane types put out far more wake turbulence than their size and weight might suggest. An individual airplane type may be externally quite similar to others yet produce a

much more energetic and hazardous wake. Adding a new airplane type to a formation, even if that type is very similar to the others, might be done following this sequence:

- First, fly the airplane with another pilot from the formation in the right seat, to see if the new type has performance compatible with the rest of the formation. If it does, work out power settings and airplane configurations with the other formation pilot as observer on board, so the new airplane's pilot does not need to try to come up with techniques for maneuvering with the formation during his/her first flights in close proximity to other aircraft.
- Next, put the new airplane type in the rearmost position in the formation, to provide its pilot experience in maneuvering with the formation. Identify any issues about blind spots or other hazards.
- Afterward, experiment in two-ship formations with the new airplane in the lead position. The wingman, a highly experienced (and preferably, military-trained) formation pilot with a lot of recent time logged in the airplane flown, should experiment with different positions relative to the new airplane, including cross-overs and positions not normally flown in the formation. The goal is to detect any unusual wake turbulence given off by the new airplane type, and to map out where relative to the lead airplane any unusual wake turbulence is encountered. The wingman is truly a test pilot, and should have experience recovering from unusual attitudes and Emergency Maneuver training in the type of airplane being flown.
- Only after the characteristics of the new airplane are known to all pilots in the formation, brief any unusual wake patterns, then launch with the new airplane in multi-ship formations, and taking its turn in the lead position.

Why so much bandwidth to formation flying in this week's *FLYING LESSONS*? First, to remind pilots that formation flying is a very challenging task, requiring great skill. Consider this: if I'm off by 10 feet or 10 degrees heading at Decision Height when flying an ILS approach, what does it really matter? But if I'm off by 10 feet or 10 degrees heading during formation flight, I can be an extreme risk to myself, other pilots, and persons on the ground beneath me.

Second, to remind readers that even military pilots extensively trained in formation flight and regularly re-trained and evaluated in its practice occasionally collide in flight. Formation flying is not something to be doing on anything other than your very best days as a healthy and proficient pilot, in the best-maintained aircraft. The difference is that military pilots usually have an ejection seat if they need it—a parachute that is an "out" not available to almost all civilian pilots.

And third, because some airplane types have decidedly stronger wake turbulence than other very similar types. Don't be fooled into thinking that just an airplane looks like another type you've flown alongside or behind, that it does not present a hazardous wake turbulence signature. Be cautious, and always give yourself a way out if you encounter the wake turbulence of any preceding aircraft. I expect some specific information from a reader on this topic soon.

Remember, no civilian pilot needs to be flying formation. It's a popular recreational sport and a source of great pride for many pilots. But formation flying needs to be approached with military discipline and precision, regardless of the type of airplane you're flying.

Questions? Comments? Let us know, at mastery.flight.training@cox.net



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Debrief: Readers write about recent *FLYING LESSONS*:



Several readers responded to my musings about the probable demise of a 1946 Cessna 120, NC89954. I was privileged to be the caretaker of this little 85-horsepower, two-seat trainer for seven years. First, let me apologize—my writing was a stream-of-consciousness, and I find I allowed a few typographical errors to get by when I sent out last week's report.

Reader Bob Siegfried writes:

Just out of curiosity, did your 120 have the main gear extensions that placed the main gear units a few inches further forward? I would imagine that you are aware that the extensions did for the early 140s what Cessna did on the later ones by modifying the gear legs themselves. Made the wheel landings a bit less elegant though.

I did not care for them for my personal flying, (I kinda liked being able to taxi around with the tail in the air<G>) but they sure made it a LOT less likely to be nosed over. I think that IF I was to put one on the flight line as a rental airplane, I would install them.

Yes, '954 had the four-inch wheel extenders. I took some ribbing from the Cessna 120/140 purists, but I thought they did the trick. I never had any trouble with wheel landings, either, but that's what I had when I learned to wheel-land, too. Word was the extenders made it impossible to nose the plane over (yeah, you can't stall an Ercoupe or a canard-equipped airplane, either). I wonder if taxiing around with the tail in the air was the "taxi technique" reportedly being taught when '954 nosed over all the way onto its back.

Reader Don Bowles wrote:

[I] couldn't stand not acknowledging your C120 comments in *FLYING LESSONS*. We too had a fly low and slow taildragger from '78 to '93- N9131A, a '49 170A. She was wonderful-traded my interest in a '41 J3 for her right after finishing Air Force duty. 900 or so tail wheel hours later-coast to coast, Canada to Mexico-lots of camping under the wing and introducing our kids to the joys of VFR flying, we sold her to buy our '80 T210/N which we're still flying! Your comments brought back great memories! Thanks.

Reader Mike Massell adds:

So sorry to hear about the fate of your 120. I had a similar opportunity to purchase a Luscombe back in the 80's and and for the same amount. Must have been the going rate back then for two seat taildraggers. I did get a title search no pre purchase inspection. My title search did show it as collateral on a loan but as soon as the bank realized that it was still on the books they removed it immediately. I was fortunate enough to own it and restore for some 20 years until it was taxied into by another aircraft that destroyed it. It became a ward of the insurance company for the same reasons as you stated regarding N89954. I ended up in court and won the battle but lost the war. I ended up selling the bones to someone that indicated that they would get r flyin again. I have never searched the registry to see if she is or not. I still have a painting of her hanging on my wall. She taught me more about flying and finesse than any spam can, no disrespect intended. I had the opportunity to fly her to Nova Scotia and my next trip was Alaska but alas not meant to be. Also, wanted to teach my wife and sons how to fly in her but those dreams are gone too. Again sorry to hear about N89954 and keep up the great publication.

Ron Koyich suggests:

What a bummer, Tom - sad to hear of your ol' 120's brush with the unforgiving earth! Let's hope it can donate enough organs to keep some other 120 in the air. Perhaps more ab-initio training on tail draggers, with knowledgeable instructors, would go some way to reduce accidents!

Perhaps you're right, Ron. Scott Snider wraps it up:

Thank you for your '954 piece. Very eloquent. I'm sure many of your readers will have deep empathy for you and your "old friend". While from a purely logical perspective airplanes, bicycles, vehicles, etc. are simply a collection of metal, plastic, rubber and so forth, these "bucket of bolts" do become dear friends after the many hour we spend with them. Your article reminded me of a few of my dear friends some of whom are still with me and some of whom have departed.

Thanks, everyone. NC89954 may yet be rebuilt...and if she's not, then she had a great, 65-year run.

Reader Dr. Dave Rogers, one of the founders of the U.S. Naval Academy's aeronautical engineering program, writes about the recent *FLYING LESSON* on spiral entries:

This statement in the recent *FLYING LESSONS* is not quite correct "A spiral, on the other hand, is the natural result of an excessive bank angle, left unchecked, in a stable airplane."

The dynamic stability mode known as the Spiral Mode is typically dynamically unstable (see Etkin Dynamics of Flight). In fact, it is unstable in a Bonanza. The time to double the amplitude, i.e., the bank angle, is typically long enough that the pilot notices the increase in bank angle and corrects. However, the time to double the bank angle is the same from 30 degrees to 60 degrees as from 10 degrees to 20 degrees.

But, the APPARENT time to increase from 30 degrees to 60 degrees is perceived as much less. If the pilot is distracted, is late in noticing the increase in bank angle until the bank angle is, say beyond 30 degrees, the apparent very rapid increase in bank angle causes the pilot to "panic" and pull on the stick, which, of course, only makes the bank angle increase more rapidly.

The proper corrective action is to simply level the wings. With the wings leveled the aircraft will "zoom" because of the increased lift component. Forward stick is now required to "prevent" the zoom. In the traffic pattern, the aircraft is now no longer pointed at the runway, the pilot uses bottom rudder in an attempt to realign the aircraft with the runway, asymmetrical wing lift results, one wing stalls and the aircraft "spins" usually on the way to inverted. In my view, this is a more likely scenario for the turn to final spiral-stall-spin accident.

You may indeed be correct, Dave. But I may be talking about a different thing. I regularly demonstrate the very stable Beech Bonanza's tendency to enter an incipient spiral by simply asking the pilot to bank the airplane about 35 degrees, then to let go of the controls. The airplane will very rapidly bank more steeply on its own, and as the airplane "tries" to return to the trimmed airspeed by pitching "up" (relative to the airplane), it will only turn more steeply into the spiral. Or maybe I'm calling this tendency to try to return to trimmed speed "stability" when it is indeed something else, and should defer to your professional engineering expertise.

You are exactly right on the recovery technique from an incipient spiral. And your scenario of the pilot panicking into a cross-country stall/spin if this happens close to the ground is indeed possible. Either way, avoid the excessive bank to avoid the spiral. Thanks for adding your considerable expertise to *FLYING LESSONS*.

"Old Bob" Siegfried also commented on an answer to last week's reader input about extra requirements for night flying such as in Europe, where night flying requires an instrument rating. Bob writes:

I think the gentleman who feels we should not allow night flight by those who do not have IFR training has a point. While I hate having the government add any restriction to flight, I must recall how I taught my own children to fly. I cautioned them about the dangers of night flight including takeoff out of a small airport in the middle of suburban Chicagoland on a clear but moonless night. There was a big black hole right there in the midst of all those bright lights for the first two or three hundred feet after takeoff. I made sure they each experienced that big black hole before they flew solo at night.

One favorite technique of mine was to take a trip down to see the City at night. Once again, I chose a moonless night with excellent visibility for the excursion. We would go around the south side of Chicago to Lake Michigan. I would then have them fly north along the Lake shore about five hundred feet above the water. What a great sight seeing adventure that was! As we got north of the loop, I would make a position with my thumb for them to make a right turn and say: "It's getting late. Let's head for home."

Everyone with who I used that technique would invariably lose it in the turn! The bright lights were behind them and they had absolutely no visual reference during the course reversal. After I took the controls and saved the day, I explained that such a case is why I did not want them to fly at night until they had adequate

instrument training. There will be cases in every pilots life time where even on a clear night, visual reference will be lost while at a low altitude. In mountainous terrain, I think it may be even easier to find that situation.

I hate to see new rules, but I do think some training in that area is good.

Thank you very much, Bob. I appreciate the great experience that lies behind your advice! Pilot-in-training (as are we all) Jay Graph discusses night flying further:

One of the responses you got to your question about what one thing would you add or remove from the PTS got me thinking. Part of the response read:

In an airplane, things look quite different when the sun goes down. ... and 85-hour, newly minted private pilots need to realize this fact before they launch out with their friends, spouses, or loved ones on a night time sight seeing or pleasure flight.

I hope to be a newly minted pilot someday, and I am considering that when I take my first passenger for a night flight, my flight instructor will be along for the ride. Why? Because having a passenger (other than my instructor) is a CHANGE from my usual routine. The change creates new risks such as a desire to impress on my part, nervousness expressed by the passenger, and inevitable questions despite the best "sterile cockpit" intentions. For about one-third the price of a hundred dollar hamburger, I can mitigate the risk of this change.

Thanks, Jay. With thinking like that, you should become a very good pilot!

Readers, tell us what you think, at mastery.flight.training@cox.net.

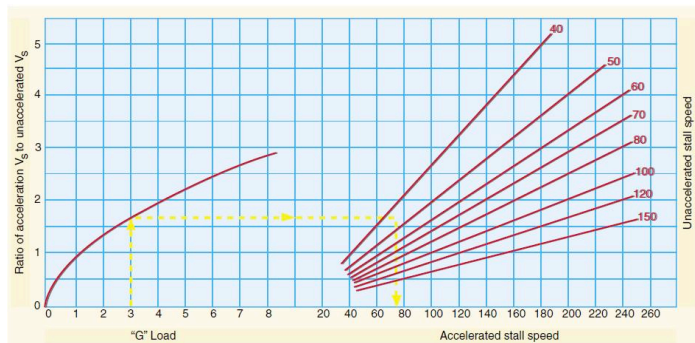


Number 3 of the Top 10 Causes of fatal general aviation accidents, according to the U.S. Federal Aviation Administration, is **stalls at low altitude**. A review of representative case histories from the NTSB record revealed a common contributing factor: an increase in G-load initiated by the pilot and, left uncorrected, causing an increase in angle of attack and a subsequent stall.

Several readers submitted insightful comments, most about instructor responsibility (some of the fatal accidents occurred during dual instruction), rudder coordination and division of attention.

Keys to avoiding a repeat of Top 10 #2 include:

- Practice in flying full traffic patterns, to instinctively compensate for wind conditions in order to fly the desired course along the ground and thereby avoid the need and/or temptation to steepen the bank angle in the turns.
- Practice in stall recoveries in level-altitude, banked attitudes, to enhance your ability to recognize incipient stalls and make corrections while in turns. Emphasize the need to unload the wing (i.e., reduce the G-load) by reducing back pressure or pushing forward as needed, and leveling the wings, at the beginning of your stall recovery.
- If your mission calls for flying circles around objects on the ground, regular practice in the technique, again to develop a sense for the wind's effects on ground track, and to avoid excessively steep banks.
- If at all possible, carry a dedicated observer if your flight involves maneuvering to survey objects on the ground. That way, you can focus on flying.
- Refresh yourself on the geometry of angle of attack. Even [some more lighthearted](#)



[presentations](#) provide excellent insights into the geometry of wing chord vs. relative wind.

See www.profpilot.co.uk/articles/videos/



- Whether or not your aircraft has an angle of attack indicator, try to visualize the angle of attack during takeoff, landing and as you maneuver, including the increase in angle of attack as you pull back on the yoke in turns or wings-level flight.

Next week we'll introduce the second most common fatal general aviation scenario: Loss of Control During Initial Climb.

Comments? Send 'em to mastery.flight.training@cox.net.

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Flying has risks. Choose wisely.

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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