FLYING LESSONS for June 30, 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.

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:

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We'll deviate from the usual format this week to focus on our ongoing discussion of the most common causes of fatal general aviation accidents, as identified by the U.S. Federal Aviation Administration late last year. For the past five weeks *FLYING LESSONS* has solicited reader input on Top 10 Cause #6, Aerodynamic Stalls on Initial Climb. Our questions have centered on eight scenarios presented by the FAA as representative of this reason people die in general aviation aircraft.

In this week's wrap-up, I'll review each scenario, then list the main points of readers' comments about each. We didn't have a lot of response; perhaps you were all out practicing stall recognition and recovery and didn't have time to write. Afterward I'll provide my own insights into cause factors and possible methods to teach risk management to avoid similar tragedies. I invite your additional comments at mastery.flight.training@cox.net.

Scenario 1: Mooney M20C

The pilot, who had recently purchased a half share of the airplane, and two passengers were on a local area flight and had stopped at the airport for dinner. The accident occurred as the flight was departing to return to their home airport. A witness reported that once airborne the airplane was "porpoising" up and down as it flew towards him. As the airplane neared the end of the runway, he saw it make a steep climbing left turn. The airplane then rolled inverted and descended towards the ground in a near-vertical nose-down attitude. The airplane impacted a palm tree and a vehicle that was parked on the residential street located just south of the airport. After the airplane impacted the ground, the witness saw an explosion and a fire ball. A postcrash fire largely consumed the wreckage.

An examination of the engine showed no discrepancies that would have precluded power from being developed prior to impact. There was no evidence of structural, powerplant, or systems failure. All of the airplane's primary structure and flight controls were accounted for at the accident site. Primary flight control system continuity was established. The fuel selector valve was selected on the left tank. Flaps and landing gear were retracted and the tail trim was measured and found to be set for takeoff.

NTSB Probable Cause: The pilot's failure to maintain airspeed and aircraft control, resulting in an aerodynamic stall.

Reader comments:

- It is possible that the second runway was a different size than he was used to. It is easy to get conditioned to expect lift off at a certain point on the runway at your home airport. When using a smaller runway, it can cause you to rotate early. If the airplane was a new type for him, this could also be a factor.

My observations:

The report does not tell us the weight of the airplane's occupants, or where they were seated in the aircraft. In airplanes like the Mooney series, however, fuel is contained near the leading edge of the wing, and as fuel is burned off the airplane's center of gravity moves aft. As the c.g. moves rearward stability decreases, making precise pitch and angle of attack control more challenging. The aft-c.g. airplane has a tendency to nose up prematurely on takeoff, and to pitch up excessively in response to the "normal" pilot inputs for takeoff. This makes the airplane more likely to stall, and increases drag to reduce initial climb performance. See my article "Achieving Balance."

Almost all flight training occurs with only two people on board, with fairly full fuel tanks—at a somewhat far-forward center of gravity. Yet accident scenarios suggest airplanes that stall on climbout tend to do so at heavier weights and further-aft centers of gravity. Stall training and practice should occur at higher weights and more rearward c.g.s (but still within the envelope) to more accurately portray the scenarios that contribute to deadly stalls, and the handling of airplanes near the aft end of their certified loading envelope.

See www.avweb.com/news/leadingedge/leading_edge_18_achieving_balance_197851-1.html

Scenario 2: Lancair IV-P

Air traffic controllers reported that shortly after takeoff, about the time the landing gear was being retracted, they observed smoke trailing from the airplane. The controller advised the pilot of the smoke, but did not receive a response. Additional witnesses reported that the airplane made an abrupt climbing left turn with the wings rocking back and forth before it nosed down and descended in a near-vertical attitude to ground impact. All flight control surfaces were accounted for at the accident site and all airplane components were found in the immediate area of the impact location. Due to fire and thermal damage to the majority of the composite airframe structure, establishment of control continuity was not possible. Teardown inspection of the engine did not disclose any evidence of a mechanical failure or malfunction. Investigators were unable to determine the cause or origin of the reported smoke during departure.

NTSB Probable Cause: The pilot's failure to maintain an adequate airspeed during climb out resulting in an aerodynamic stall/spin.

Reader comments: None.

My observations:

For a little over a year I was the chief pilot for an engine modification firm that installed aftermarket turbochargers ("turbonormalizing") on Beech Bonanzas, Cessna 177RGs and Cessna 185s. The engine modifier liked to "crank up" the fuel flow for additional cylinder cooling on takeoff and climb. The result was a mixture setting so rich that power output was reduced, and more important in this case, it was not unusual for controllers and other observers on the ground to advise me by radio that the airplane was trailing smoke on takeoff…the result of such an excessively rich mixture.

It's now in vogue for a great many pilots to arrange to have the full-power fuel flow of more powerful engines to be increased a few gallons per hour. This delays the combustion event, reducing power and therefore helping keep temperatures down. And I've seen many a 285-350 horsepower engine (normally aspirated as well as turbocharged) trailing black smoke on takeoff as a result.

What's my point? This engine set-up is especially common in high-horsepower, turbocharged engines such as are usually installed on the Lancair IVP. The scenario that led to the stall may well have been simple distraction by a supposed engine problem, when in fact there was nothing wrong at all except for an excess in fuel flow and a trail of smoke behind the airplane as a result. The *LESSON* here is that regardless of indications, basic aircraft control is paramount. Instructors: help pilots avoid repeating this scenario by introducing distractions at high angles of attack…under controlled conditions and at a safe practice altitude, of course.

Scenario 3: Grumman American AA-1C

The instructor and student pilot had completed one touch-and-go landing and the airplane was in the departure climb, when the pilots were instructed by an air traffic controller to "make right traffic." The airplane entered a right turn, and was observed at a "high angle of attack" just prior to entering a descending 90-degree right bank. The airplane struck a parked trailer and skided [sic] across the ground, coming to rest under a row of parked trailers. A post-crash fire ensued. Examination of the airplane and engine revealed no pre-impact mechanical anomalies.

The Pilot Operating Handbook (POH) for the airplane listed a stall speed of approximately 65 mph at a bank angle of 20 degrees, and 90 mph at a bank angle of 60 degrees. The POH listed a rotation speed between 60 and 65 mph and a normal climb speed of 95 mph.

NTSB Probable Cause: The flight instructor's failure to maintain airspeed which resulted in an inadvertent stall.

Reader comments:

- What is it about flight instructors???!!! They are supposed to take over **BEFORE** things get too out of hand. You have to take over by *anticipating* what the airplane *will* be doing, not when it is doing it.
- Any bank over 30 degrees in the pattern is time for a sharp reprimand, followed by a take over if voice commands are not followed **immediately**.

My observations:

An airplane can stall at any attitude and at a wide range of indicated airspeeds, depending on the g-load at the time. One element of stalls that's not widely taught, however, is that assuming the airplane is anywhere near properly trimmed, in order for the wing to stall *the pilot must be actively resisting the airplane's natural tendency to pitch toward a lower angle of attack*. He or she must be pulling back on the yoke/stick for a stall to occur—the amount of pull doesn't have to be great, but there has to be resistance to the airplane's tendency to seek the trimmed angle of attack. If you're not pulling something else bad might happen (in seeking its trimmed AoA the airplane enters a spiral or noses into the ground), but it the wing won't stall.

An autopilot, of course, can drive an airplane into a stall under certain conditions. A radically out-of-trim airplane can stall without the pilot's input. An aerobatic aircraft, and especially airplanes not certificated under Normal Category rules (including many amateur-built designs and Light Sport airplanes) may have less stability and/or lower stick forces, meaning the airplane may stall with less "pull" on the part of the pilot. Regardless, one element that should be introduced to initial and recurrent training (or re-introduced, if it was once part of the conventional wisdom) is that if the airplane is properly trimmed, regardless of the airspeed or bank angle, there is no stall without aft pressure on the controls. If the airplane begins to stall, first *release the back pressure*, then complete the recovery.

Scenario 4: Talon XP

During the takeoff, the experimental light-sport airplane flew level, about 50 feet above the runway, until about 900 feet of runway remained. The airplane then pitched up "sharply," and climbed to about 150 feet before it entered a stall and pitched nose down. The airplane impacted the ground at a near 60-degree angle and "exploded." Examination of the wreckage revealed no obvious mechanical deficiencies with the airframe or engine. The pilot held the necessary pilot certificate required to operate the airplane, and had accumulated 225 total hours of flight experience, with 142 hours in the accident airplane make and model. Doxazosin, a prescription medication that lowers blood pressure and can reduce G-tolerance, was found on post-mortem toxicology testing. No definitive determination could be made as to any role of the medication in the accident.

NTSB Probable Cause: An inadvertent stall during the initial climb.

Reader comments:

- This looks like a stunt gone bad.
- It seems that pilots have lost the mental picture of what normal climb pitch looks like. Look out the window and see what the nose of the airplane is doing.

My observations:

The last two issues of *FLYING LESSONS* (still available through links in the left column at www.bonanza.org) covered the issue of what I call the "Airshow Pass," which during the warm-weather months contributes to one or two fatal crashes every week in the United States. There's more discussion on "The Airshow Pass" in this week's *Debrief*, below. The maneuver seems to be at the heart of this "accident."

Scenario 5: SAL 2/3 P-51

The owner of the amateur built, automotive-engine-powered airplane decided he lacked the experience in tailwheel-equipped airplanes to perform a maintenance flight, and arranged for another pilot to fly the airplane after resolving a rough running engine issue. A review of video footage of the flight revealed that after capturing the takeoff and initial climb, the videographer announced "he's close to a stall," and lowered the camera. The descent and impact were not captured, but the sound of the engine was recorded. Review of the audio track of the video revealed smooth, continuous engine sound until the sounds of impact.

According to one witness, the tailwheel was raised almost immediately, and the airplane was airborne after a brief ground roll. The climb was "poor" and the airplane's altitude above the ground reached only 200 feet, after a 4,000 foot-long initial climb. He said, "The [pitch] attitude of the aircraft was quite high and seemed close to a stall condition." He added that the engine did not "falter" or change power/rpm throughout his observation of the flight. Examination of the wreckage by Federal Aviation Administration aviation safety inspectors revealed no evidence of any preimpact mechanical anomalies.

NTSB Probable Cause: The pilot's failure to maintain adequate airspeed during the initial climb, which led to an aerodynamic stall.

Reader comments: None.

My observations:

All takeoffs, but especially flight tests, should be done with a clear plan for aborting the takeoff if there's a problem. If the airplane gets airborne but cannot climb, execute your plan and set it back down. Certainly, flying two-thirds of a nautical mile at 200 feet above ground level in a climb attitude and maximum available power should call for lowering the angle of attack, reducing power and landing under control. If airplane damage occurs, well, that sure beats dying after a low-altitude stall. Instructors, quiz your students on the indications that call for aborting a takeoff , and their options for abort on the next takeoff.

A possible contributing factor is suggested by this and a lot of accidents involving "homebuilt" airplanes. Especially when the builder is doing the flying, but even when a borrowed or "hired gun" test pilot is flying the airplane, there is a lot of pride in the product that can cloud the pilot's judgment. Sometimes it comes down to "the airplane or me"; the builder's pride could get in the way of making a conscious decision to sacrifice the airplane, because we'd all like to believe that somehow we can "pull it off" and get the airplane to fly or, barring that, that we will survive the result. Builders and pilots of amateur-built airplanes, recall that your pride and joy is just a "thing," and things can be replaced if needed.

Scenario 6: Beech A55 Baron

The commercial pilot was attempting to land the twin-engine airplane on a 3,594-foot-long and 49-foot-wide asphalt runway. Witnesses said the airplane appeared to be too fast on the approach and was "floating" down the runway, and never touched down. When the airplane reached the end of the runway, the witnesses heard the sound of power increase on both engines and saw the airplane begin to climb. The airplane then banked to the right and nosed over into trees located adjacent to the runway. An examination of the airplane and its engines showed no mechanical deficiencies.

NTSB Probable Cause: The pilot's failure to maintain control of the airplane during an aborted landing for undetermined reasons.

Reader comments:

- The first and obvious thing that comes to mind is that an initial climb stall is caused by having your nose too high. [This comment and the two bullet points below came from reader Jay Graph, a 20-hour student pilot who shows true signs of "getting it," albeit with some of the miscommunications that seem to plague instructional aviation. I'm truly gratified to see a beginning participating in the discussions raised by *FLYING LESSONS*, and will address this specific bullet point's comment in my observations below—TT].

- Another factor is density altitude. When I was training in cool brisk December I had the nose higher. Then I took a weather-induced break during the winter. When I resumed training on a hot humid day, I found out that the airplane could not keep up with the same sight picture over the cowl. Other possible factors are overloading the airplane, turning too steep too soon after takeoff, and not paying attention.
- I'm guessing that [a factor is that stalls] are practiced at a safe (i.e., high) altitude. That's good in a way, but you don't get the full effect of the ground rushing up at you, causing you to panic. Another condition is that you know in advance that you are going to stall, which isn't the case in an accident.

My observations

A balked landing ("go-around") is a required FAA Practical Test Standards maneuver for all levels of pilot certificate. I would be extremely surprised if it was not required for all pilot certificates around the world. Going around should be a smooth transition in power, pitch and airplane configuration, moving from the nose-down of landing to the *controlled* nose-up you see on a normal takeoff. There may be a trim change—it may be big—but with just a little practice you'll know instinctively how much control force it takes to attain and hold the proper pitch attitude.

Trouble is, we don't have to do a lot of go-arounds in the real world. So we'll be even less well-practiced if and when the time comes. Another possible factor is that power development on one or both engines may not have been as expected, if the pilot had not placed the mixture control(s) in the proper, rich position for the go-around. Although many pilots train themselves to advance power by first advancing the mixture and then the throttle (a good technique, if you do it right *every time*, including when stressed or distracted), I teach advancing the mixtures prior to short final so that portion of the go-around is already complete should the need arise…just one less thing to have to do to transition to climb.

Although our student pilot reader has the right idea—an excessive pitch attitude may contribute to a stall—it's proper to note that a stalling angle of attack can occur at a much lower pitch attitude if the wing is under more than one g-load, either as a result of holding altitude/attitude in a bank or from a pilot pulling back on the controls as if panicking to get clear of the ground. Recent practice on go-around control and technique should prevent panic or jerky, improper control inputs that might contribute to a stall on climbout. Instructors, it's your job to ensure your customers receive this practice, and to encourage them to remain current with go-arounds between their scheduled flight reviews and recurrent training.

Scenario 7: Soneri II

The accident flight was the pilot's first flight in the amateur-built, experimental airplane he had purchased about 7 months prior to the accident. A witness reported that the pilot was taxiing up and down the runway while revving the engine. The witness stated that the engine was missing on at least one cylinder during takeoff. He stated that the airplane climbed and made a left turn directly over his house, clearing it by about 80 feet. While in the turn, the wings dipped to the right, and then the wings dipped to the left "real hard." The airplane rolled inverted and went down nose first.

A Federal Aviation Administration airworthiness inspector examined the wreckage at the accident site. The inspection of the airplane revealed flight control continuity. The engine was a Continental O-200 series engine, but the engine data plate was missing so the exact model and serial number could not be identified. The mechanical and electrical engine controls were present. The magneto P-lead wires were still attached to the ignition switch and magnetos. There was oil in the engine and the crankshaft could rotate but not "very far."

The pilot had a history of depression, anxiety, and sleep apnea, and had been prescribed multiple medications for the conditions. The level of a prescription antidepressant found on post-accident toxicology was more than 10 times higher than expected given the pilot's prescription for the medication. He had broken his left ankle, and had surgical screws placed for the non-healing fracture a week prior to the accident. He had recently taken narcotic and over-the-counter pain medications. The pilot had not reported any of his chronic health problems to the FAA, and it is unlikely that the FAA would have approved medical certification for him had complete information been provided.

NTSB Probable Cause: The pilot's failure to maintain airspeed during initial climb which resulted in a stall/spin. Contributing to the accident was the degraded engine performance.

Reader comments: None.

My observations

Beginning or continuing flight with a known problem is a common theme not just in stall-related accidents, but in general aviation mishaps as a whole. Nothing is so important that you need to get into the air right now (military combat missions perhaps excepted). Instructors: drill this into your customers. That said, my discussion of the SAL 2/3 P-51 failure-to-abort applies here as well.

Scenario 8: Antares MA-33

A witness reported that the pilot departed from the grass airstrip in the weight-shift controlled aircraft about three minutes prior to the accident. He reported that the aircraft was about 100 - 150 feet above ground level. He stated, “The plane seemed to go up and then the left wing dipped, and then the airplane spiraled to the ground.” He reported that the engine was running. The impact damage to the aircraft was consistent with a steep, nose down attitude. The inspection of the aircraft’s weight-shift control system revealed no preexisting anomalies.

The inspection of the aircraft logbook indicated that the last conditional maintenance inspection was conducted on December 15, 2006. A review of the aircraft experimental operating limitations as of August 28, 2005, item #18, stated that, “No person shall operate this aircraft unless the preceding twelve calendar months it has had a conditional inspection performed, and recorded in the aircraft maintenance records.” The certificated Private Pilot had 1250 hours logged include 8 in the make and model.

NTSB Probable Cause: The pilot's failure to maintain adequate airspeed resulting in an aerodynamic stall.

Reader comments: None.

My observations

Several years ago I took an introductory lesson in a weight-shirt “trike”-style ultralight. The experience was wonderful! I never enjoyed such great aerial visibility (except a couple of parachute jumps in my youth). I recall the smell of wet earth, and waving at children (and even some adults) who stopped to look up at us as we passed. It was the type of flying we dreamt of as kids—skimming above the trees and lakes, seeing all, not worried about manifold pressures or CHTs or following a magenta line. We were *flying*.

But when I tried to control the aircraft, my experience was working against me. In a weight-shift aircraft you control by pushing or pulling a crossbar that causes the entire “fuselage” structure to pivot beneath the triangular wing. The change in center of gravity position then moves the airplane in pitch and/or bank. Push forward and your c.g. move aft, so the nose comes up. Pull back and the c.g. pivots forward and the nose goes down. Push right to make the craft turn left, and vice versa. Re-read this brief description of control inputs, and you’ll find they are *backwards* from a conventionally-controlled airplane.

On my initial lesson my instructor assured me that because of my “advanced” flight time (about 2500 hours at the time) he could have me signed off for solo in three or four hours. He’s probably right. I could have likely soloed in that time if I really concentrated on what I was doing.

But I declined to fly it any more. Not because of any fear of the aircraft—it was great—but instead, because I feared what *I* might do with it. Not today, not next month, maybe not even next year, but if one day I was thrust into a situation requiring doing precisely the right thing using split-second control, *every one of my 2500 hours would be telling me to do exactly the wrong thing* in the weight-shift machine. Conversely, it’s possible (though less likely) that the weight-shift experience would detract from me doing the right thing in a conventional airplane should the need arise. Now, readers, you’re probably a better pilot than I, but I simply didn’t want to put myself in the position where all my experience was a detriment to safely operating the aircraft I was in at the time. Perhaps it’s no different than a dual-rated, fixed-wing/helicopter pilot, and I’m completely wrong (it happens!). But it’s possible the pilot in the Antares accident simply did the wrong thing when the need arose, because his eight hours of time in the weight-shift machine could not overcome his 1250 hours of experience in airplanes where the opposite reactions are required.

Instructors: help your student guard against taking *LESSONS* from one airplane class or type and applying them to another model of aircraft. Instill in your customers the need to *fly the airplane you're flying*, including all requirements, limitations and thought processes that apply.

I hope this review of Top 10 Cause #6: Stall on Initial Climb has been helpful. Thanks to all the *FLYING LESSONS* readers who added their insights to this discussion. Suggestions for flight instructors are also relevant to all pilots…as topics you should ask your instructor to include in your next training flight. Take my observations as one pilot's opinion; adopt my suggestions, modify them as you see fit, and throw away the rest. Whatever it takes to avoid repeating this common cause of fatal aircraft events.

Next week we'll begin review of the fifth most common reason people die in general aviation aircraft—Controlled Flight into Terrain during En Route/Cruise Flight. I look forward to your insights into the causes, and your ideas for teaching others to avoid repeating accident history.

Comments? Please send them to mastery.flight.training@cox.net

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Debrief: Readers writer about recent *FLYING LESSONS*

Reader Woodie Diamond writes:

> Just finished reading this week's flying lessons, and as usual, it was great! I do however, have a couple of comments…
>
> **"Air show Pass"**
>
> It may be a matter of semantics, but the very nature of the term "Airshow Pass" suggests that the maneuver is being conducted at an air show, within the approved cleared boundaries of the box. Outside of that situation, aren't we talking about a "Low Approach", particularly when the maneuver is conducted within the airport environment?
>
> The FAA clearly defines: "*LOW APPROACH- An approach over an airport or runway following an instrument approach or a VFR approach including the go-around maneuver where the pilot intentionally does not make contact with the runway."* [http://www.faa.gov/air_traffic/publications/ATpubs/PCG/L.HTM]
>
> For the most part, other references within the FAA library group both the "Low Approach" and the "Touch-and-Go" maneuvers into the same reference. The only difference is the "Low Approach" carries the intention not to land.
>
> Within the "Low Approach" arena lies two distinct "clearances": altitude restricted and unrestricted. JO 7110.65T [http://www.faa.gov/air_traffic/publications/atpubs/atc/atc0310.html] states: "*A low approach with an altitude restriction of not less than 500 feet above the airport may be authorized except over an aircraft in takeoff position or a departure aircraft."* There are also references when "unrestricted low approach" clearances should not be given, but none defining situations where it can/should be granted.
>
> As I remember the [Cessna] 337 accident, I believe it occurred within the airport environment. If the airport was towered, the only question is whether the pilot was granted an "unrestricted" low approach.
>
> Clearly, according to the FAA, unrestricted low approaches are legal and authorized. **The only question outstanding is whether the POC can issue himself an unrestricted low approach in the absence of other authority, such as at non-towered airports.**
>
> Ultimately the POC is responsible for the safety of the flight.

Great response as always, Woodie. Thanks. Semantics is right...an "airshow pass" may be a "low approach" maneuver, albeit with an abrupt pull-up and often a turn at the end. "Airshow pass" is my own terminology to describe this maneuver, and does not infer that it is necessarily flown at an organized airport event.

Obviously readers can argue the legal side of the question for weeks. My goal in writing about it in the first place was to cause readers to think about what the maneuver requires if they choose to perform it themselves, and raise awareness of the fairly high number if fatalities attributed to airshow pass-like maneuvers each year. My hope is that no one attempts the airshow pass without practice in the basics before committing to the maneuver at low altitude, and consideration of possible outcomes as part of their overall risk assessment for the flight. Like formation flying or accepting an ILS to minimums, it's not something to be done on the spur of the moment.

Fisk Inbound #3 & &4

Even more than most flights, the unique challenges of arriving at the world's biggest fly-in and, during AirVenture, the world's business airport, requires planning, a high level of pilot proficiency, and good a risk management strategy.

This week we'll look at two areas of pilot proficiency that you'll need to master before starting your Oshkosh arrival…skills you should be practicing *now* so you'll be highly proficient when you get to Wittman Field:

- Fisk Inbound #3: Airspeed Control
- Fisk Inbound #4: Tight Patterns, Spot Landings

See:
www.aero-news.net/news/genav.cfm?ContentBlockID=2AA8E421-F426-4450-A28A-E6A665891317&Dynamic=1
www.aero-news.net/news/featurestories.cfm?ContentBlockID=707D7B2B-8F23-477C-B509-82922D0727E9&Dynamic=1

Share safer skies. Forward *FLYING LESSONS* to a friend.

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
