FLYING LESSONS for December 8, 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:

We hear the term a lot, but it's not precisely clear what is meant by a "stabilized approach." The strict definition of a stabilized approach is somewhat elusive; most educational materials focus more on what is "not stabilized" than what is.

The Flight Safety Foundation (FSF) calls unstabilized approaches those "conducted either low/slow or high/fast." It provides a recommendation that the airplane be stabilized within 1000 feet of the ground in IMC or 500 AGL in VMC. FSF cites unstabilized approaches as being a "causal factor in 66 percent of 76 approach-and-landing accidents and serious incidents worldwide in 1984 through 1997."

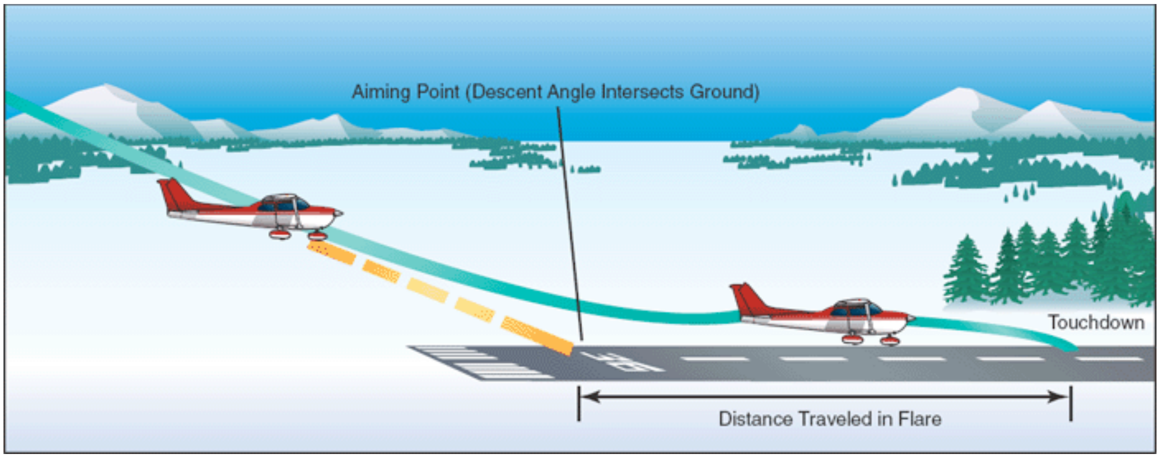
The airline pilot chat lines show that even the pros are confused about what the term means.

To most pilots a stabilized approach means the aircraft is put into landing configuration (gear down and flaps set) prior to reaching the let-down point (final approach fix, or leaving the traffic pattern altitude), and airspeed is reduced to V_{REF} or some target just above V_{REF}. When time comes to descend, the pilot adjusts attitude and power to establish a descent while maintaining airspeed. The aircraft is flown in this configuration and attitude all the way to touchdown (no wonder airliners often have such "firm" arrivals).

Although this technique may be desirable in large turbine airplanes, small airplanes don't fly like large jet transports. And weren't we taught something about a "round-out" and flare that is more appropriate in light aircraft? The FAA's **Airplane Flying Handbook** (AFH) provides this definition of the stabilized approach:

> A stabilized approach is one in which the pilot establishes and maintains a constant-angle glidepath towards a predetermined point on the landing runway ... the point on the ground at which, if the airplane maintained a constant glidepath and was not flared for landing, it would strike the ground.

The AFH is giving us a different concept of what it means to be "stabilized." This is not a criticism of airline operations or the stabilized approach concept -- as we'll see in a moment, it saves lives -- but instead points out that the concept as commonly described does not apply directly to flying light airplanes. AFH's Figure 8-9 shows how an approach may be flown stabilized to the point where the flare begins.



Airline-style or lightplane-appropriate, why does everyone talk about stabilized approaches? The concept evolved to meet these goals:

- Predicting aircraft performance by using the same technique every time;
- Increasing situational awareness by allowing the pilot to focus on instrument or outside references, as appropriate to conditions, instead of diverting attention to changing trim, power and configuration settings during final approach;
- More easily detecting and correcting for glidepath deviations;
- Increased ability to establish crosswind corrections; and
- Landing in the touchdown zone at the proper speed to ensure landing performance.

Common accidents where a stabilized approach is not flown include controlled flight into terrain (CFIT), landing short, landing long and running off the far end of the runway, and stalls. Stabilized approaches, especially in heavy, inertia-ridden transport aircraft, save lives.

Notice that these causalities are related to distraction and improper airspeed control -- two things a stabilized approach are designed to avoid. The stabilized-approach philosophy in airline operations appears to have saved lives.

So how can we gain the benefits of the stabilized approach concept while flying with the characteristics of light airplanes? First, consider that the goal is to arrive at a known position relative to the touchdown zone while at a known configuration and airspeed. We want to be established in the known configuration and on that known airspeed in time to reach that final, known position where the flare begins.

> **Instrument Approaches:** On an instrument approach, fly in a stabilized condition from just inside the final-approach fix (FAF) to the missed-approach point (MAP). You may decide to become stabilized outside the FAF -- the difference is primarily when you'll extend the landing gear in retractable-gear (RG) airplanes. I personally teach extending the gear at the FAF as the means of initiating final descent. So many times pilots forget to extend the landing gear, and if you're conditioned to initiate descent with a power reduction, on the day you forget the landing gear you'll have nothing to directly remind you at this point (in all fairness, almost no gear-up landings happen out of an instrument

approach). You may fly a type of airplane that extends gear asymmetrically, with varying drag causing yawing motions when the gear is in transit. In such airplanes, it's probably better to extend the gear outside the FAF to be stabilized for the remainder of the approach. That's OK, too. What's more important is that you remain in a single configuration as you descend down the glidepath until you either break out to land visually or power-up to miss the approach.

When "going visual" out of the approach, you'll be in a known configuration at a known speed, as well as a known (from the instrument approach procedure flown) position relative to the runway. If you have enough altitude to transition to a new, stable, visual, approach configuration, that's great. Some pilots like to maintain the configuration used for the approach all the way to landing to minimize pitch and trim changes before beginning the flare. That's fine, and may even be the best way to go if you break out right at minimums. Remember: You'll probably use more runway than in a visual landing if you use this technique.

Visual Arrivals and VFR Traffic Patterns: When arriving visually, whether as part of an instrument arrival or by flying a VFR traffic pattern, aim to be stabilized on configuration and final-approach speed within 500 feet of the ground. This is the usual height when rolling out onto final approach, unless a control tower directs a wide pattern or a straight-in approach. This is the point where I'll usually extend the last notch of flaps, confirm my gear is down (in RG airplanes), and aim for the "book" final approach speed.

Are we concentrating too much on a buzzword, or is a stabilized approach -- as defined for lightplane flying -- a better way to go? Flying on speed and configuration from the FAF to the MAP when in IMC makes it far less likely you'll deviate from the approach course or bust altitude. Once going visual -- or if you're making a VFR arrival -- establishing a stable final-approach speed and configuration from when about 500 feet above the ground until the point you begin your flare makes it far easier to touch down where you want at a speed that permits easily stopping on the runway. If you find you are unstabilized inbound from the FAF or within a few hundred feet of the ground when visual, miss the approach or go around and set up for a stable approach next time.

Flying stabilized approaches in all classes of airplane results in smoother, easier, more passenger-friendly flight. More importantly, it's safe.

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

Debrief: Readers write about recent *FLYING LESSONS:*

Several readers commented on last week's discussion of Controlled Flight into Terrain when flying in the vicinity of Class B airspace at night. Several told me I was far too lenient on the pilots in the three cited crashes. I prefer to think that *FLYING LESSONS* is more about risk management and looking forward than pointing fingers and assessing blame for specific events. Readers, your point is well taken, however…we can't absolve these pilots of responsibility either.

Reader Kent Stones wrote:

> I don't see how you can minimize the value of SVT in the cockpit of a plane flying towards rising terrain at night. I have SVT on my Aspens and I just cannot visualize continued flight into "red" terrain. The depiction of terrain above the flight path of the plane would demand that the pilot either divert with a heading change or a pull up into Bravo airspace being preferred vs. continued flight into clearly defined terrain.

I believe that's pretty much what I was saying in least week's report when I wrote:

> **Would a Synthetic Vision Technology system** have made any difference? Possibly, but it's not certain. The Twin Commander pilot would very likely have angled to the south and we would never have heard about him, his friends or family. The T182T pilot, equipped with a G1000 that would today be compatible with SVT, would probably have diverted away from terrain as well. The Hawker crew, if SVT had existed in its cockpit, would likely have survived only if the captain had the courage and discipline to climb and violate the Class B airspace when approaching the ridge. Unfortunately, only a very few airplanes have this technology even today…and even SVT is not a panacea for Controlled Flight into Terrain.

SVT is a lifesaver if it's installed and the pilot heeds its warnings.

Reader David Heberling adds:

> An excellent analysis of these CFIT accidents. It is amazing what lengths pilots will go to avoid an artificial obstacle such as Class B airspace. What is the worst thing that would happen to a pilot if he violated Class B airspace? Death? Dismemberment? When it comes to avoiding a real (as in physical) obstacle like a thunderstorm or rising terrain, the real trumps the virtual (airspace constraint like Class B). I would also argue that my violation of the airspace constraint was an exercise of my emergency authority as PIC. Of course, preflight planning would go a long way toward avoiding the real obstacles out there. As much as people want to believe that paper charts are so last century, they are still readily available and far better than no terrain information at all. And, because the internet is all ubiquitous, there is no excuse for not downloading the chart(s) you need. We all need to realize that a straight line is not always the safest course of flight. We all want to "go direct", but is it safe to do so?
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> In the case of the Cessna, you have to wonder if the pilot calculated the minimum rate of climb necessary to clear Mt. Potosi from the outer ring of the Class B airspace. Also, why climb out over the highest peak in the area? I think this accident speaks to no consideration to those issues at all. In the case of the Twin Commander, I believe that this was a new airplane acquisition. Distraction from unfamiliar systems or even simple conversation could have caused the pilot to miss the end of the Class B shelf for the beginning of his climb. Rate of climb would not have been an issue in an airplane such as this, but the point of where that climb would begin is critical. I knew of one of the pilots on this accident flight, as he was a pilot for my airline based in Phoenix as I am. I heard that he had picked his kids up from his ex-wife, and that one of his daughters asked him to fly in back with her as she was scared. The owner of the airplane was up front in the left seat.
>
> All CFIT accidents are preventable. It takes a thorough preflight to identify the biggest threats to the flight and determining how you will reduce those threats to a manageable level. When it comes to ranking or prioritizing threats, ATC airspace boundaries should rank lower than physical threats like thunderstorms or rising terrain.

John Townsley gives some learned advice:

> This is a great article with several insightful suggestions. I've seen the [Civil Air Patrol T182T] and Hawker [125] accident reports discussed several times in various articles. This is the first instance I've seen where the crucial link between airspace design and human factors has received significant attention. It is interesting that each of these three aircraft was well equipped, and flown by very experienced and capable pilots who were acutely aware of the airspace above…much more so than the terrain along their course.

> The **Below-the-base mitigation strategies** you suggest are very helpful. Let me suggest another: **If IFR at night, climb over the light**. Climb until your airplane is above the terrain within a 10-nm corridor along the centerline of your route climb. Circle back if necessary, but don't venture back into the black until you *know* you are above obstacles and terrain. Light is life; do not leave it until you reach a safe en route altitude. This rule should apply regardless of the airspace that overlies your departure airport.
>
> Descents into terrain also occur. A corollary to "**climb over the light**" is "**VFR at night? Descend over the light!**" We can't get around it. Pilots must know the terrain over which we fly. How many aircraft have become a CFIT statistic because their descent started too soon? Unless we're IFR, we need to use the lights of a city, town, or rural buildings to our advantage.

Thanks, John. This strategy would have worked in the case of the T182T but not the Hawker, which was below a low airspace base, and the Turbo Commander, which was outside the boundaries of the Class B but had delayed climb to remain at an altitude that was below the airspace's outer shelf yet insufficient to clear the higher terrain to the east. The mere fact that the attempted departure would not have permitted a "climb over the light," however, should have been sufficient to warn each pilot to plan out a different terrain avoidance strategy.

Reader Guy Mangiamele chimes in:

> What an excellent article…I wish I could quote it on my Bellanca chat group. Earlier today (after seeing the video of the explosion from the airport camera) I had made a post titled "Why do pilots insist on flyng VFR at night in this kind of terrain?" I took a bit of a beating for this, with some basically using the argument "Mountains at night don't kill pilots, pilots do." My point is simple…you use all the tools available to you. If you're lucky enough to be high-time, you use that experience. If you're lucky enough to be IFR rated, you file. If you get the bicycle out and have a helmet in the garage, you wear it.
>
> The other question that doesn't seem to come out in anything I've read (and it seems that the controllers in that airspace are more restrictive than they are in the LA basin) is why not ask the controllers for a Class B clearance and vectors to climb? Class B just means you have to have permission before you can enter, and you have to remain in contact. It doesn't mean you can't ask and they'll never grant it, right?

Hi, Guy. Feel free to quote this on your Bellanca group. Include a link to the report at www.mastery-flight-training.com and encourage others to subscribe.

You *and* the chatters who objected to you posts are both right—the mountains aren't lethal, it's how the pilot plans to avoid them.

I'm told by many readers that the PHX Class B controllers have a reputation for refusing VFR entry into the controlled airspace. I alluded to that in last week's report. So the pilot may have been conditioned to avoid even trying. I suspect, however, that in the interest of expediency the pilot simply saw a quick exit by flying under the base of the airspace for a few miles, programmed his GPS to fly direct to his destination, and assumed he'd climb as soon as he got clear of the Class B. He'd probably done it many times before, given he was picking up his kids. But something happened this time--distraction, loss of position awareness, trying to avoid another airplane witnesses reported in the area and visible in the video of the impact (its landing light, anyway)--and he didn't start his climb soon enough.

The NTSB preliminary report provides another clue:

> The flight was cleared for takeoff on runway 4R, and was instructed to maintain runway heading until advised, due to an inbound aircraft. About 90 seconds later, the ATCT local controller issued a "right turn approved" clearance to the flight. Review of the preliminary ground-based radar tracking data revealed that the takeoff roll began about 1826 MST, and the airplane began its right turn towards SAD when it was about 2 miles east of FFZ, and climbing through an altitude of about 2,600 feet above mean sea level (msl). About 1828, the airplane reached an altitude of 4,500 feet msl, where it remained, and tracked in an essentially straight line, until it impacted the terrain.

The two miles would have made all the difference in avoiding the mountain. Perhaps the pilot had not ever had to go that far northeast before turning on course, and didn't grasp the significance of the turn restriction.

See www.ntsb.gov/aviationquery/brief.aspx?ev_id=20111124X85300&key=1

Thanks, readers, for your contributions to the discussion.

AVweb's Jeff Van West has a good blog on the Phoenix crash that started this *FLYING LESSON*, including some excellent reader comments. It's worth a read.

See www.avweb.com/blogs/insider/Technology_Not_Fixing_CFIT_205825-1.html

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Thanks to everyone who attended *FLYING LESSONS: The Deciding Factor*, December 3rd at Denton, Texas. Thanks especially to program sponsor Aero Kinetics at KDTO. We're already making plans for Mastery Flight Training's fifth annual safety stand-down at Denton next year. See you there!

See www.aerokinetics.com

It's taken us a year, but we've now come to the most common cause of death in general aviation airplanes: **Loss of Control in Maneuvering Flight.** "Maneuvering flight" is anything that is takeoff, climb, cruise or landing, and encompasses everything from VFR traffic patterns (circuits) up to but not including pitch, bank and yaw excursions just shy of meeting the definition of "acrobatic."

How can we avoid loss of control in maneuvering flight? To get the conversation started, consider these three examples:

Cessna 320

A commercial pilot and a private pilot/owner departed on a maintenance test flight in a multi-engine airplane that the private pilot had spent the last four years restoring. The flight departed and completed one circuit around the traffic pattern and then initiated a second circuit. While on the downwind leg of the second circuit, witnesses observed the airplane enter a steep nose down attitude as it was turning onto the base leg followed by the sound of an impact. Radar data revealed that that the airplane's ground speed had decreased throughout the maneuver and was near stall speed at the time the accident occurred. The commercial pilot had a history of hip pain treated with nortriptyline (a prescription antidepressant also used for pain control), and symptoms of post-traumatic stress disorder treated with fluoxetine (a prescription antidepressant also used for other psychiatric conditions) and trazodone (a prescription antidepressant also used for insomnia). Toxicology findings were consistent with the ongoing use of all three drugs. Nortriptyline has adverse cognitive and performance effects, particularly with higher blood levels, and fluoxetine may interfere with its metabolism, potentially raising the blood level of nortriptyline. It is possible that the pilot was impaired or distracted by his hip pain, or impaired by nortriptyline. The private pilot occasionally used diphenhydramine (an over-the-counter sedating antihistamine) for allergy symptoms, and toxicology findings were consistent with recent ingestion of the drug. In typical doses, diphenhydramine commonly results in drowsiness, and has measurable effects on performance of complex cognitive and motor tasks, even in individuals who feel normal after ingesting the drug. It is likely that the private pilot was impaired by recent ingestion of diphenhydramine. Neither pilot had indicated the use of the detected medications or conditions for which they were used on their last applications for Airman Medical Certificate. It was not possible to determine who was flying the aircraft at the time control was lost. Examination of the airplane and both engines revealed no pre-mishap mechanical deficiencies. NTSB probable cause: The crews' failure to maintain adequate airspeed, which resulted in an aerodynamic stall close to the ground.

Turbine Lancair

Shortly after departure, the single-engine, turbo propeller equipped airplane was observed in a spiraling descent before it impacted the center median of a major interstate and exploded. An on-scene examination of the airplane revealed that the only identifiable parts of the airplane that remained were the propeller, the engine, a flap, a section of the vertical stabilizer, the elevator, the landing gear and both wing spars. The three-bladed propeller remained attached to the engine; however, one blade had separated from the hub. Examination of the blades revealed that they were curled aft, exhibited leading edge damage and deep gouging from impact with the concrete barrier. The pilot had a history of anxiety, depression, muscle pain, severe headaches, obstructive sleep apnea (OSA), and memory loss, and had recently and regularly been using multiple prescription medications, including three medications for pain, two antidepressants, and a sleep aid, each of which had the potential to adversely affect performance. The pilot was likely suffering from medication-overuse headache, in which overly frequent use of pain medications to control intermittent migraine or tension headaches over time results in a continuous or very frequently recurring headache; his medication combination may have substantially increased his risk for seizure activity; and his OSA may have raised the likelihood of accident involvement. The pilot had not admitted to most of the medications he was using or the medical conditions with which he had been diagnosed on his applications for airman medical certificate, though on one application the pilot had indicated occasional use of a prescription pain medication, and no additional detail was pursued by the FAA. NTSB probable cause: The pilot's failure to maintain control of the airplane for undetermined reasons. Contributing to the accident included his extensive use of medications and/or his multiple medical conditions and the failure of the FAA to follow up on his reported medication use.

Cessna 170

The private pilot departed on a personal cross-country flight with a load of groceries. The flight was reported overdue by family friends, and an emergency locator transmitter signal was detected by search and rescue satellites. The airplane was located in a forested area, having collided with trees and snow-covered terrain in a near vertical, nose down attitude. Visual meteorological conditions prevailed. Post-accident examination of the airframe and engine revealed that the engine was developing power at the time of impact. No pre-impact malfunctions of the airframe or engine were discovered. The position of the airplane was indicative of a stall while maneuvering at low altitude. NTSB probable cause: The pilot's failure to maintain adequate airspeed to prevent a stall while maneuvering, which resulted in an uncontrolled descent and collision with terrain.

Astra HKS Light Sport

Witnesses reported that the airplane was flying from north to south over the airport. One witness, who was an instructor and builder of the accident airplane make and model, observed the airplane "initiate a steep climb and then an approximate 60 degree bank turn." He described the bank as "non-sustainable, too much slide." Another witness reported that while maneuvering for the landing, the airplane entered a "hard left bank at low altitude and went into the ground." Witnesses reported the sky was clear and the wind was calm. Post-accident examination of the airplane revealed no anomalies with the airframe or engine. Toxicology test results were consistent with the recent use of diphenhydramine, a sedating and impairing over-the-counter antihistamine often known by the trade name of Benadryl. The extent to which impairment from the medication may have played a role in the accident could not be determined. NTSB probable cause: The pilot's failure to maintain control of the airplane while maneuvering.

What are your first impressions? Let us know…at mastery.flight.training@cox.net.

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

Cessna Leads the Way on Continued Operational Safety (COS)

from AVweb:

> Cessna Aircraft has launched an initiative to educate owners about [what it considers] required inspections for 100- and 200-series [single-engine aircraft] built between 1946 and 1986. The supplemental procedures will be added into the service manuals this month for aircraft in the 100 series, and in April for the 200 series. The added inspections mainly require checks of areas where corrosion and fatigue damage can occur. "The new inspection requirements we've developed are very simple, and are based on visual inspection that can be done quickly by a trained inspector during an annual inspection," said Beth Gamble, Cessna's principal engineer for airframe structures.
>
> "Corrosion and fatigue are inevitable," Gamble said, "but with early detection and proper maintenance, severity and effects can be minimized." Cessna has published a PowerPoint presentation and a short video to provide more details about the process for owners.

As all airplanes age they become more susceptible to damage from corrosion and fatigue. Cessna is leading the pack in an effor that will undoubtedly be echoed by other airplane manufacturers if their fleets are to continue to operate indefinitely.

See:

http://textron.vo.llnwd.net/o25/CES/releases/CessnaSID.zip

www.youtube.com/watch?v=-68AdXVHHI8

Question of the Week

This week *FLYING LESSONS* asks:

What do you consider to be your best personal example of airmanship in 2011?

Let us learn from you at mftsurvey@cox.net.

A reader responded to a recent Question of the Week about simulation in flight training:

> In the late 1980s my FBO's flight school had one of the first simulators in the area. I found I could teach VOR and ADF navigation in less than half the time using the simulator as in the actual aircraft. I required the students to do part of their training in the simulator. As your survey found, most students and Flight Review candidates prefer to work in the actual airplane rather than the simulator. Perhaps there should be additional credit or something to recognize the increased value of simulator training—some method of recognizing that often the simulated time is more valuable that that in the actual aircraft. Of course as in all instruction, much depends on the actual instructor.
>
> I also believe we should *not* allow students to "crash" in the simulator. We should treat it as seriously as we do the actual plane. We should not allow a conditioned reflex to develop that crashing is OK.
>
> Much later and in much improved simulators.... I was surprised to learn that even in a very realistic non motion simulator... vertigo and even motion sickness could be produced. In fact it was an important part of the "Preflight briefing" on the simulators.... "Please notify the instructor if you begin to feel ill" "A brief recess is much better than spending the rest of the day cleaning up the cockpit of the simulator". I watched the candidates as carefully in those non motion simulators [or Training Devices] as carefully as in the actual plane.

Another wrote:

> I am sorry I missed the survey about simulation devices. From my point of view I am flying the highest fidelity simulators available [in airline operations]. It is like the real airplane. I think other respondents are experiencing the limitations of the technological level of the simulating device [they are using]. Either way, you should always approach a simulator the same way you approach the real airplane. To do otherwise will shortchange you of the benefit of the simulating experience. If you give it your all, you will get a lot out of it.
>
> Also, it is really bad form to crash the simulator. It is something to really try to avoid. I agree with one of the respondents who complained that he was told he was going to have a V1 cut just before he got it. Simply being in a simulator puts you in the frame of mind of all sorts of bad things happening. So nothing is really a surprise.
>
> My current beef is about aborted takeoffs. All turbojet airplanes have the ability to climb out on one engine. Statistics show that most aborts are for flyable conditions. So, they want us spring-loaded to "GO". However, in the sim', what do they give you for a problem? A big, fat, red warning like an engine fire. And the reason they do that is so they can see you do an emergency evacuation on the runway.
>
> To me, this is negative training. I would rather see a yellow caution, or a strong vibration like a blown tire. Make me "GO" a few times before you make me abort. I can always get the emergency evacuation in when I finally land from a single-engine approach with the "good" engine on fire.
>
> This year we are also getting the "Aircraft Handling and High Altitude Stalls." Yes, we get to pay for the sins of others. That Air France accident reminds me of the Eastern Air Lines accident in the Everglades. No one was flying the airplane because they were all fixating on the landing gear indicator. I believe the pilots in the Air France accident succumbed to fixation on lack of airspeed indication and forgot to fly the airplane.

Thanks, readers!

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