

FLYING LESSONS for April 5, 2012

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:

A while back a friend of mine was contemplating moving up from a high-performance, single-engine airplane to the twin-engine variant of the same airplane. My friend is a risk evaluator, and as part of that evaluation he asked his valued local instructor, a professional turboprop pilot, about the relative safety and hazards of a multiengine airplane.

That instructor, also a *FLYING LESSONS* reader and ground school student of mine, asked me for my opinion as a multiengine instructor and student of mishap causes and outcomes. This was my response:

Considering a Twin

First, I will never try to talk someone out of purchasing a twin-engine airplane on the basis of number of engines alone. Most twins perform better and carry a greater load than most singles. Although modern single-engine airplanes are frequently equipped with redundant systems, most twins have more redundancy than singles. Mainly because of their size and weight-carrying capability, many twins have more equipment than singles, including things like radar and ice protection devices. In capable hands twin-engine aircraft are obviously safer, because they provide at least the potential option of continued flight in many situations in the event one engine fails.

The issue, then, is not telling you a twin would or would not be a good thing for you. The question instead is:

1. Will you commit to the initial and recurrent training necessary to take advantage of the increased safety, and
2. Are you willing to invest what it takes to safely operate the twin? I won't address the financial side, except as it relates to the cost of training, below.

Training and experience

Flying a multiengine airplane is much higher workload than a comparable single. When everything is working properly, you have two of almost everything to manage and monitor. More importantly, if one engine begins to act up, it may take significant pilot skill to keep things going satisfactorily. In a single-engine airplane, if the engine quits the airplane will tend to remain wings level and yaw straight; as long as the pilot does not resist the airplane's natural nose-down tendency following a power loss, a single will tend to keep flying straight ahead unless the pilot commands otherwise.

Conversely, if an engine quits in a twin, the aircraft will immediately and dramatically begin to diverge from controlled flight in all three axes. It takes *prompt, correct* and *aggressive* pilot action to prevent the airplane from going out of control. The slower the airplane is at the time of failure, the more aggressive the pilot must be. If the airplane is lightly loaded it will become completely uncontrollable well before the wing stalls, because of insufficient airflow over the control surfaces to counter asymmetric thrust.

So how is this safer? If the pilot is **well trained** and has **relevant, recent experience**, he or she will be ready in the unlikely event of engine failure. Where we are trained to consider emergency landing spots for every takeoff in a single, in a twin it's *mandatory* to consider the options for abort or flight for every phase of takeoff, every time you line up to depart. I teach this "line-up" briefing: "If the gear is down we're going down, if the gear is up, three degrees up." Before feathering a propeller near the end of the Engine Failure memory checklist items, a level to three-degree-up pitch attitude results in approximately "blue line," or best rate of climb on one engine speed, in every light twin I've flown. It's a good target to hold to assure enough airflow to maintain control authority, and the best rate or climb (actually, usually the least rate of descent) in this configuration.

Explained, if the gear is still extended when an engine quits in a piston twin, the airplane will decelerate so rapidly there is no option for continued flight. Pull both throttles and land straight ahead. Although there is probably an "accelerate-go" chart in the POH to give guidance for climbing out if an engine fails on takeoff, you'll note that in most realistic combinations of airplane weight and environmental conditions the airplane does not have any climb capability, even if flown perfectly. Hence, if the gear is down, you must go down—land straight ahead, reducing power on the good engine so you can maintain direction control to the ground.

Likewise, if the gear is up, it takes a very shallow climb attitude in most light twins to fly at the speed for best single-engine climb—"blue line", as identified on the airspeed indicator. As I've said, in many piston twins it's about a three-degree nose up attitude while the "dead" engine's propeller is still windmilling. That's the initial attitude necessary for best climb (or least descent) immediately after an engine quits. After properly identifying the failed engine, exhausting restart attempts if altitude and time permit, and feathering an unrestartable engine's propeller to reduce drag, it takes about a seven degree nose up attitude in most piston twins to hold blue line.

When that happens, at very best you'll see 250 to 400 fpm climb rate while covering two miles across the ground for every minute flown. You'll be 4.5 to five miles from the airport before you make it to pattern altitude if an engine quits shortly after gear retraction and you do everything perfectly. In many twins, and under many conditions, single-engine climb will be even worse.

A twin-engine pilot needs to train on engine-out procedures regularly in order to enjoy an increase in safety should an engine quit. In fact, the pilot who does not maintain an advanced training regimen will be *less* safe in a twin than in a single, because a he/she may not be prepared to immediately detect and properly respond to an engine anomaly. Two engines mean twice as much a chance one engine will quit for a given amount or flying time, so there is even a greater increase in risk to the unprepared pilot.

How much should you train? No one really knows, but I'll pass along my experience. Back when I was teaching in a factory-approved piston twin simulator, I noticed that pilots who had never trained in a realistic simulator frequently had difficulty flying critical engine-out-on-takeoff maneuvers to Private Pilot-AMEL standards, even by the end of the five-day training week. At best we were able to get pilots back up to the minimum FAA standards for the worst-case scenarios in the time available. Pilots who came back about once a year or so tended to be marginally capable of flying to minimum standards at the beginning of refresher training, or at least were fairly easy to get back up to standards as the training progressed. The pilots who came to simulator training every six to nine months tended to be pretty much on top of their game at the beginning of training, and were able to actually *progress* in their skills from one training session to the next (instead of having to work just to get back up to standards every time they came to train).

I noticed also that the total flying time in the 12 months previous to training, and the pilot's total time overall, had very little to do with their ability in the simulator for engine-out work. **The deciding factor was currency in simulator-based training.** Insurance sources subsequently told me they are also suspicious of multiengine pilots who fly less than 75-100 hours each year, because of currency in twins. Some underwriters may not renew policies on twin-engine airplanes if the pilot does not log at least that much multiengine time in a policy year.

I do occasionally instruct in twins. I do so, however, as an adjunct to my clients' simulator training. And I only do it when I've had the opportunity to get into a sim myself for a little engine-out work. You simply cannot accurately or safely practice engine-out scenarios in the actual airplane; in my opinion it takes simulator training to be truly safe. Do so, every year without fail, and you can enjoy the safety benefits of the second engine. Do not, and no matter how frequently you fly and even how frequently you train in the airplane, you're fooling yourself if you think you're safer because you have a twin-engine airplane. In most respects the opposite is true.

One more thing—as you transition into the twin (i.e., while you have less than about 100 hours in make and model), it's highly unlikely you'll be able to get more than \$1 million liability with a \$100,000 per passenger sublimit for coverage.

So...

- If you continue to average 60 hours per year [as the pilot to whom I was writing had maintained], you're marginal to low in terms of experience levels generally considered necessary for safety in twins.
- In my opinion, you should plan to train in a type-specific simulator immediately upon transitioning to the multiengine airplane, at six months after moving into the twin, and no less than annually thereafter. Note this is just part of the cost of safely flying a multiengine airplane.
- You can (and should) supplement, but not totally replace, simulator-based training with in-aircraft training when flying a twin.

If all this is realistic to you, then yes, go get yourself a twin. If not, my advice would be to stick with your very capable high-performance single.

I hope this has been (brutally) helpful. I never want to have to write about you!

My friend and student thanked me profusely for my advice. He chose not to purchase a twin, but instead upgraded to a much newer version of the same airplane he owned, complete with a turbocharger and modern avionics. I've trained him (and his wife) in that airplane, and they couldn't be happier.

The turboprop captain/local instructor thanked me as well, writing this insightful note:

As I was gathering experience as a Flight Instructor, I was often asked (and tempted) to get the multi-engine instructor rating. Pilot friends put me in the copilot seat as much as possible. (I was an Air Traffic Controller at the time, striving to become an airline aviator.) Flight schools were in abundance in [my] area, thus providing loads of opportunity...but then, as now, I observed the "bad" side of little experience, currency, proficiency and common sense.

I observed low-time Multiengine Flight Instructors building time via training other multi-engine students. Most turned out alright...but somehow, I best recall those that didn't.

The proliferation of PC-based simulators mated to fairly realistic visual and even full-motion Flight Training Devices has made it far easier and less costly to get a good, simulator-based training experience. I had the opportunity to (again) fly a full-motion [Redbird Flight Simulations](#) device at Sun n Fun this year. Redbird has emerged as the industry leader in light airplane simulations, even debuting its own [experimental pilot training laboratory](#) last year to test the full integration of simulation in all phases of pilot training (I hope to have the chance to see and report on this some day). The device is certainly realistic enough to teach pilots the habits—and outcomes—of one-engine transitions in critical phases of flight in light twins.

See:

www.redbirdflightsimulations.com/

www.redbirdflightsimulations.com/2011/redbird-flight-simulations-announces-grand-opening-of-redbird-skyport/redbird-flight-simulations-announces-grand-opening-of-redbird-skyport/#more-1162

Aviation fuel is expensive. It's extremely tempting to try to arrive with minimum fuel at a location where fuel is less costly, to tank up in the most economical fashion. With depressing regularity, we read about pilots who try to cut it too short, possibly in the name of economy. Almost making it to the destination airport, only to run out of gas within sight of the airport, has been a recent topic of significant discussion in *FLYING LESSONS Weekly*. Sometimes you just have to buck up and buy some gas, whatever the price.

Many *FLYING LESSONS* readers also read the [Beechcraft Weekly Accident Update](#) on my website. Curiously, all four fuel exhaustion events reported in Beech airplanes so far this year have occurred in twin-engine airplanes. Are multiengine pilots especially sensitive to fuel prices, and trying to stretch their range?

See www.mastery-flight-training.com/beece-weekly-accident-updat-2.html

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



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Debrief:

Readers write about recent *FLYING LESSONS*:

I just wanted to say thank you to Mastery Flight Training, Inc for your continuing efforts to help us all be safer and make General Aviation Safer. I often read your articles but seldom acknowledge the great contributions that you and others in the community make towards our mutual safety goal. No, we are definitely not where we need to be yet, not by a long shot, specially looking at the current fatalities that have already happened this year. However I take some comfort in seeing that we are not just accepting of these fatal accidents as business as usual and that you and so many in the community continue to push forth the message and lessons to make us all safer.

Thank You

Mel O. J. Cintron
Manager
General Aviation and Commercial Division (AFS-800)
Flight Standards Service, FAA

Thank you, sir, that means a great deal to me. I'm honored you took the time to write...and that you're a long-time reader of *FLYING LESSONS*. Thanks also for the time you had for me at Sun n Fun. Please let me know if there is anything more I can do to help achieve our mutual goal.

Frequent *FLYING LESSONS* debriefer Woodie Diamond writes:

The [latest issue of *FLYING LESSONS*](#) was, as usual, superb and filled with important "eye opening" lessons. There are two items in the issue, both of which are related, that caught my attention: the article written by [John] King, and the note from Wuzzy. It seems to me that "intervening" for the sake of flying safety is a double-edged sword. Not only should a flight instructor have an avenue and intestinal fortitude to keep a student on the ground, but the student (licensed or not) should also have an avenue and intestinal fortitude to keep an xxxx [substitute the word "bad"] flight instructor on the ground. As you are aware, my very first flight instructor was a nightmare. Sure wish I had an avenue to have reported his behavior; hate to think of the number of students that have died because of him.

My first flight instruction job was as the lone CFI at a small-town airport, about 40 miles from the closest full-time instructor who was not tied to a Part 141 university program. I had a lot of

unofficial technical instructor experience in the U.S. Air Force, and I had met (minimum) Federal standards for my instructor certificate (including a nearly eight-hour oral exam). But as a flight instructor I was on my own.

I read, and I spoke to as many instructors as I could, but for the most part I made it up as I went along. Luckily I must have done something right, and although of course I'd like to go back and re-teach all my earliest students (a common professional CFI comment), it would have been good to have a structured mentorship program in place. More importantly for my students, it would have been tremendous if there was some sort of counseling/referral services for new-out-of-the-box CFIs, and a way to stop the insanity if I was unable or unsafe in teaching pilots who put so much trust in me.

Happily, at least some of this is now a reality. The somewhat redundantly named Society of Aviation and Flight Educators ([SAFE](#)), of which I was/am an early member, now offers the [SAFE Aviation Educator Mentoring Program](#). The Program "matches expert aviation educators with those seeking assistance or improvement to become world class educators themselves by providing an effective framework for the mentoring process. The Program is available to current educators or educators-in-training who are members of SAFE, whether in flight, ground, youth, college, maintenance, or other aviation areas. Even experienced educators may occasionally want or need insights when teaching in new aircraft, or with new technologies and techniques."

This still isn't a "whistleblower" system to report dangerous flight instructors. But short of calling the FAA (or your country's regulators) to report a CFI (how would an FAA Operations Inspector or FAASTeam manager respond to such a call, anyway?), you may be able to find a way to encourage such a CFI to contact SAFE for information...and, if the system works, for counseling that makes us all safer.

See:

www.mastery-flight-training.com/20120322flying_lessons.pdf

www.safepilots.org

www.safepilots.org/programs/safe-initiatives/mentoring-program/

Reader Guy Mangiamele comments on last week's *LESSONS*, and John King's cited article "Pilots Who Should Scare Us...and What To Do About Them." Guy writes:

Tom, a fascinating topic.

I've had two incidents that come immediately to mind, one in the past, and the other fairly recent.

The first was around 1996 when I was a lineman at the little airpark where I now hangar my plane. At the time I had just finished my instrument rating, and was working the line several days a week while between jobs. Most of us there were in fact quite knowledgeable, and it was one of those FBO offices (a modified double-wide trailer) where you could always find retired airline guys, off-duty military pilots and CFIs mixing it up on discussion of various topics. I tried to soak it all up like a sponge.

One Saturday we had a [Cessna] 172 land and taxi over to transient parking. Out stepped a young woman, around 18, and three males around the same age. The whole situation was strange because...well, I hate to say it, but she was very sloppy, unattractive, and it just didn't make much sense why these three guys would be hanging out with her. But that wasn't the only thing; she just didn't seem like "pilot material." As we were a friendly FBO, we always made small talk with our clients. None of them said much; they just came in to use the restroom. On the way out she asked for the fuel truck, so I pulled it around.

It was in the 80s [Fahrenheit] at our 2,150-foot strip, and the density altitude was probably approaching 3,000 feet. As I got out the ladder and asked her how much she wanted, she pulled some wadded up cash out of her front pocket, looked at it a second, and said, "About ten dollar's worth."

Trying not to sound too superior in my tone, I said, "You mean ten *gallons*?"

"Uh, no, ten dollars."

I watched the meter run up to \$10, and then I shut down the pump. She never asked me how much we charged per gallon, and I don't think she looked at the truck's meter to see how much her money had bought. I went back up to the office, which was on a little knoll right alongside the runway (fantastic for watching the action, but the FAA has long since mandated its removal). As I walked in I said to the group, "Do you think we should call emergency services now, or wait 15 minutes?" I told the story of what had happened.

Someone else in the room had evidently been talking to one of the other passengers, and they were headed about 2.5 hours north. Unfortunately, they never made it. They landed about 10 miles shy of their destination without death but with injuries. [so very common, in fuel exhaustion accidents...as we've discussed before—tt]

The next time was at a busy FBO last summer. There is always quite a turn of professional crews in and out of there, and it is a little intimidating to be there at first. They all seem so certain about their plans and abilities. There is always that feeling in the back of my mind that as they see me walking around to preflight, laying on my back to look up under the cowl, uncomfortably struggling with the wing drains on my Bellanca without a creeper, that they must think I look just a little "over the top."

On this day I had gotten my IFR clearance and was making a couple of changes to my flight plan in the GPS, and was looking out across the ramp. There was a Colombia parked there, with reflective solar shields in the windows. A guy walked out of the FBO and over to the plane. As I was fussing, the shields were removed and without any apparent preflight, the engine was started. The cold start came at about 1,700 RPM from the sound of it and as I was thinking, "God man, pull that throttle!" he instead released the brakes and just began a very rapid taxi! I could see him speaking into his mike as he passed in front of me, probably talking to Ground. Incredulous, I thought, "How does a guy like this get checked out on a plane like that?"

Aside from the quick answer "He's got money," **there had to be bad CFIs involved in both these instances.** Most I've ever known have been extremely honorable and knowledgeable. But at the scale they're paid, I think it's amazing that as a group, they're as dedicated as they are.

Unfortunately instances like this are not "incredible," in the literal sense of the word. Perhaps I've just become too cynical. We like to chide pilots of new, composite airplanes for their seeming lack of respect for preflights, run-ups and other highly necessary precepts of personal aviation. Although such airplanes, top of the line in terms of technology and 21st century pizzazz, probably attract this type of pilot more than others, the personality is not new. My first aviation employer (a WWII B-17 pilot) would come out to the airport on the very worst weather days, not having flown literally in months, and jump in his Cessna 310 with the most perfunctory of preflights (he was the only one to fly the twin Cessna, so it sat between his flights, too), run his engines up while taxiing the short distance to the runway, and launch. All I can say is, he didn't trust me to be his CFI so (except for not intervening in my early inexperience) I was not the "bad CFI," at least in that case.

Questions? Comments? Let us hear from you...at mftsurvey@cox.net.

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



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