FLYING LESSONS for September 13, 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:

From the NTSB:

The certificated flight instructor sustained serious injuries, and the pilot-rated student was fatally injured, when the twin-engine airplane in which they flew went out of control on landing.

The last recorded transmission from the accident airplane occurred a few minutes prior to the accident, when [its crew] reported simulating an engine failure. Several eyewitnesses reported that the airplane appeared to have touched down and while on the ground, veered to the left, "cartwheeled," and then came to rest about 500 feet from the edge of the runway.

Other witnesses reported that the airplane was approximately 20 feet above ground level, rolled to the left, climbed, then nosed over, impacted the ground and cartwheeled.

Nine times out of ten in multiengine instruction the MEI simulates failure of the airplane's left engine. Why? Because the left engine is considered the "critical" engine in most multiengine designs. Under conditions of power on the "good" engine the airspeed at which control authority becomes insufficient to counter asymmetric thrust (V_{MCA}) is a higher speed than what gives the same result if the other, non-critical engine has failed.

This doesn't mean there's not a loss-of-directional-control speed for a failure of the non-critical engine. It just means the speed is slightly higher for the critical engine.

In multiengine airplanes with counter-rotating propellers either engine's loss of directional control speed is the same value. There's still a critical airspeed, it just doesn't vary from one engine to the other.

At reduced power output, either from throttling back the engines or from the effects of altitude on naturally aspirated powerplants, V_{MCA} drops because there's less asymmetry to the thrust. Frequently the wing will stall before loss of directional control occurs. This is extremely hazardous because many light twins will fall into an unrecoverable spin (perhaps a flat spin) if stalled on one engine.

Any number of factors may have contributed to the fatal loss of control in this week's example. Perhaps the pilot was using insufficient rudder and aileron to counter asymmetric thrust as the airplane decelerated on the runway, and eventually he could no longer control the airplane.

From the witness account of "cartwheeling" and the death and serious injuries, however, I suspect the pilot (or instructor) had advanced the power on the "good" engine, and the pilot (or instructor) was not swift enough on the controls to compensate for asymmetric thrust.

It might have even been an attempted touch-and-go from a zero-thrust condition. My first multiengine instructor flew what I now know to be that homicidal/suicidal technique with me during training. If the left engine didn't respond, or did not respond as quickly as the right, the airplane would have gone out of control as it did in this example.

***LESSONS* to learn from this example** include close attention to rudder and aileron control through the entire landing roll, especially in an asymmetric thrust condition, and to bring all simulated single-engine landings to a complete stop, then reconfigure for the next takeoff before applying power for flight. Only if there are thousands of feet remaining ahead of you on the runway should you perform a stop-and-go; otherwise, taxi back for a full-length departure.

From a local news account:

"No injuries occurred in a plane crash…with four passengers on board including the pilot and copilot. They [were acting as volunteers in] a non-profit organization that transports financially strapped medical patients to hospitals. They were returning a woman…from Houston where she had undergone treatments and surgery for mouth cancer."

The pilot said he "was coming in too fast on the landing." He "tried to lift up again at the end of the runway to come around for another approach but was afraid he would not be able to clear some powerlines past the end of the runway. He veered left off the end of the runway and crashed through a barbed-wire fence."

"**The [aircraft] came to rest** in the middle of [a] road… [The local] Fire Department arrived and doused the area with foam due to gallons of fuel leaking from the plane."

Approaching the runway threshold on final approach, ask yourself three questions:

- "Is the airplane configured properly for landing?", including flaps and landing gear as appropriate.
- "Am I on the proper airspeed as recommended in the handbook, adjusted for weight and any gusty wind?
- "Am I on the proper glide path to touch down in the first third of the runway, unless intentionally landing long on an extremely long runway?"

If the answer to any one of the three questions is "no," power up, go around and set up for a better approach next time. Don't wait until you've overflown most of the runway before deciding to go back up and give it another try.

It's the pilot who tries to "salvage" an approach whose airplane may eventually end up as salvage itself. Establish configuration, speed and glidepath targets for final approach, evaluate your state relative to those targets when almost to the threshold (say, 300 to 500 feet AGL), and call off the landing attempt if you cannot attain all three targets simultaneously.

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

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Debrief: Readers write about recent *FLYING LESSONS:*

FAA Safety Team ("FAASTeam") program manager and *FLYING LESSONS* reader Bobby Reed responds to last week's *LESSON* about the chain of events that led from a VFR flight over clouds to a fatal fuel-starvation engine failure:

> You hit on a point that we [in the FAA] are now focusing a great deal of effort towards in data analysis and trending. That is, **"Where did the accident actually happen?"** The accident certainly *ended* at the point of

impact, and evaluation of the forensics evidence many times can tell us why it ended *when* and *where* it did. However, as you and others already know, accidents are vary rarely occur out of the blue due to catastrophic intervention. We in the FAASTeam have been crunching data, focusing on the trail of the accident from its beginning and the chain of events to its conclusion.

> As an example of what the data are telling us to date, on average **about 70% of the accidents that happen in a FSDO district are piloted by an airman that is not domiciled in that district.** While this may seem trivial it uncovers a flaw in our mitigation strategies. If one of our primary tools to lower the accident rate is through accident prevention seminars and one-on-one safety guidance with airmen, *who is it [we] should be talking to?* Case in point, the AG [agricultural aircraft] accidents in Iowa are mostly out-of-state pilots. What are the chances of those pilots getting up-to-date information on the local MET [meteorological] issues or environmental challenges at a seminar in Iowa? Nil I'd say. Lets take that a step further, regarding the accidents that end due to Loss Of Control[LOC] but begin due to a mechanical failure. Where did that accident originate? Chances are if it was a faulty or improperly maintained part, the accident could have started a thousand miles from the accident. Yet our accident numbers in both cases, Pilot Error and Mechanical Error, reflect on the local FSDO statistics. Once again, **[the location] where the accident occurred may not be the place where we should be targeting our prevention strategies**.

> Statistically in our [FAA Central] region, over 30% of accidents have been identified as having a mechanical [cause]. We believe that in reality an even higher number have a mechanical origination, and end up as an operational failure [i.e., "pilot error"]. As we continue to trend the data and do additional investigation we will have more information to support our prevention efforts, which we can share with airmen and mechanics. When we look at accident prevention from the standpoint of system safety I think we come ever closer to putting our energies and prevention strategies at the right place when we ask the question: **Where did the accident begin?**

> Thanks again for the thought-provoking dialogue you offer in your newsletter, Tom. Your contribution to aviation safety cannot be measured, just as we will always be challenged to know why an accident happened and how we can prevent it. Consider an alternative to support that end: perhaps if we had more stories about the accident that *didn't* happen we can add this to the data of those that did, and together this may provide the missing piece of our data to suggest mitigation strategies which may truly lower our accident rate.

See www.mastery-flight-training.com/20120906_rev_1flying_lesson.pdf

I, too, believe we are just beginning to learn what it'll take to encourage better risk management and mishap avoidance, so we can all enjoy flying more and our industry will thrive. Later in this issue you'll see an example of an accident that was about to happen, submitted by a reader/mechanic who almost certainly saved lives this week. You'll also be referred to the latest Aviation Safety Reporting System (ASRS) *Callback* which, as you know, gives us a quick peek into the world of "what if." Thank you very much, Bobby.

Frequent Debriefer Dr. Lorne Sheren chimes in:

> One factor not mentioned [in last week's report] is the human factor. Although not often investigated, **a lack of sleep, personal stress** (recent life change, change in circumstances, etc…see AOPA's excellent online presentation on this) **or just anxiety about deteriorating weather will have a profound effect on a pilot's ability to handle an abnormal situation.** While the pilot under "stress" may self evaluate to "OK" status, under pressure or stress the ability to recognize, trouble shoot and solve a life threatening situation will simply evaporate. Here the cascade is obvious in retrospect, but was very tangible and threatening in real time. The pilot, perhaps not thinking as well as he could, failed to realize he was in an emergency situation until the engine quit. Then it was too late.

Excellent point. Perhaps we can put it another way: good decisions reduce stress and tend to lead to continued good decision-making, while poor decisions increase overall stress and may lead to cascading poor decision-making. If you start a flight with your decision-making ability already degraded by fatigue or external stress, it's only going to get worse in flight. The key is to make decisions so you never have a "there I was" hangar story. Thanks. Lorne.

Reader Jim Quinlan also comments on last week's *LESSON*:

> Nice job on the *FLYING LESSONS*. I look forward to them every week!

> With regard to the single-engine VFR-only pilot who flew into terrain, there's certainly a lot of conjecture here. He didn't seem to be in violation of any FARs, though his judgment was certainly questionable. I think it would be instructive, however, for a discussion about what to do in the same situation, even as an IFR-rated

> pilot, if the engine quits and restarting is not an option. Proficiency at partial panel is, of course, essential. Am I correct in assuming that the first priority is to maintain coordinated flight at best angle of glide until impact? It is possible that in doing so, visual reference to the ground could occur, even if only at tree-top level, during the final moments so that a more favorable crash site could be found? This is a scenario many of us rehearse over and over again from the comfort of our living rooms, but brings into question the most important ingredient of emergency preparedness: *presence of mind*. How will we know how we'll perform in an emergency, even one so innocuous as switching fuel tanks when the engine gets rough?
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> Chesley Sullenberger addressed this issue in his New York Times best-seller *Highest Duty,* outlining the events of his landing in the Hudson River. **He attributed his proficiency to training, training, and more training. This is even more incumbent upon the General Aviation pilot, whose recurrency training is minimal at best.** As a flight instructor, I am more often than not shocked at the lack of proficiency candidates demonstrate during a [Flight Review], especially when I pull off the power to simulate an engine out. In any event, ***presence of mind*** **trumps all other considerations, and can only be assured through training to the point that the skills are second nature.** I'd like to hear your take on this is future *FLYING LESSONS*, especially with regard to which specific skills, if any, need more emphasis and how to train for them. *Keep up the good work!*

Thank you also, Jim, for writing and for your dedication to flying safety. Regarding an engine failure in IMC in a single-engine airplane: If you have a specific landing zone in mind, e.g., you are attempting to follow course guidance or a vector to an airport, or you know flatter terrain is close by in a particular direction, you are best served by configuring the airplane for Best Glide—generally and as applicable to the specific airplane: coordinated flight with flaps up, gear up, cowl flaps closed, and propeller to lowest RPM. Check the Emergency Procedures section of your Pilot's Operating Handbook (POH) or Approved Flight Manual (AFM) for the specific technique in the aircraft you're flying.

While you're in the handbook, look at the beginning of the Emergency section for something labeled Emergency Landing Approach or Minimum Sink Rate airspeed. You might also see such an airspeed referenced in the Emergency checklists for Landing Without Power, Off-Airport Landing or Power-Off Landing. In any location the speed may be expressed as a range of airspeeds, and may or may not be correlated to airplane weight. Let's settle on one term, the Landing Without Power speed, for this discussion. The Landing Without Power speed is the speed that results in the lowest rate of descent. It is also a slower forward speed than Best Glide and, since the force of impact varies with the square of velocity, the Landing Without Power speed gives us the best of both worlds—minimum vertical speed *and* minimum impact force when we encounter (ok, I'll say it, collide) with terrain.

Think of Best Glide as analogous to V_y airspeed, where you cover the greatest distance over time, while Landing Without Power speed is similar to V_x, which doesn't get you distance, but it gets you the optimal angle with the ground for your needs.

As examples, the Beechcraft F33A Bonanza POH lists Best Glide speed as 105 KIAS and Emergency Landing Approach (what we're calling Landing Without Power speed) as 83 KIAS. In the MAXIMUM GLIDE CONFIGURATION checklist the F33A calls for 105 KIAS; in the LANDING WITHOUT POWER checklist the POH gives us a range from 78 to 83 KIAS. The Cessna 172S AFM tells us Best Glide is 68 KIAS and Landing Without Power speed is 65 KIAS with flaps down, and 70 KIAS with flaps up. It does not provide any adjustment for airplane weight.

Back to our scenario: if you are trying to get to a specific landing zone that is some distance from the aircraft, use Best Glide speed as adjusted for airplane weight—very roughly, about a 2% reduction from the "book" speed for every 100 pounds below maximum takeoff weight. Make a table of weights-vs.-speeds for your airplane now, and commit it to memory or a small placard on your panel or kneeboard, so you don't have to do math in an aerial emergency.

If however you do not have a target, and are descending in the clouds without power, trim for the Landing Without Power speed (also adjusted for airplane weight). If you have used Best Glide to get to a better landing spot, transition to Landing Without Power speed for final approach or when within a few hundred feet of the ground if still in IMC with no prospect of a visual landing.

Some airplane manuals do not list the Landing Without Power speed. I hesitate to provide specific guidance here because there are so very many different airplane types of all configurations and glide characteristics. You might notice that the published Landing Without Power speed in some airplanes is close to the published V_x speed, and try a controlled experiment at altitude to see how vertical speed varies in a power-off glide at V_x compared to Best Glide speed. Whenever possible, seek out type-knowledgeable guidance for the appropriate speeds in your airplane type when data are not provided in the POH/AFM.

Jim, I'll save discussion of the need for frequent and, at least as critically, knowledgeable and relevant practice and flight instruction in future issues of *FLYING LESSONS.* Suffice for now to say that you are not doing yourself, your passengers, your prospective survivors or anyone under your aircraft on the ground any favors if you opt for the quickest, easiest means to meet minimum instructional and currency standards.

Comments? Questions? *LESSONS* of your own? Send 'em in, to mastery.flight.training@cox.net.

Half an Hour Short of a Tragedy

A reader/mechanic sent this account, and photos, of a fatal tragedy barely averted in a Beechcraft Baron. He is distributing this cautionary tale through Beechcraft circles but specifically asked me to include it in *FLYING LESSONS* this week. Thanks, Reader.

The aircraft is a C55 Baron with 1100 hours on both engines. Pilot stated there were no abnormal indications except the right engine's fuel flow needle was fluctuating slightly. After landing we noticed the engine making strange noises like an air compressor.

Upon opening the right cowling we found the entire engine covered with exhaust stain. The #2 cylinder had a hole the size of the end of a pen above the exhaust valve. A thin jet of hot exhaust gases had burned completely through the fire sleeve to the fuel pressure line that takes fuel to the cockpit flow gauge. It had also burned about halfway through the fuel line itself. Additionally there was significant damage to the cylinder and its cooling fins. Because the mechanic heard and investigated the unusual engine noise, there was no additional damage to the Baron and no one was injured or killed.

The mechanic estimates that it would have taken less than 30 minutes of operation for the exhaust to burn the rest of the way through the fuel pressure line. When that occurred, he suggests, the engine would have exploded.

The photos posted here are of the #2 cylinder on this Baron's right engine. The *LESSON*: investigate any anomaly, no matter how small. Don't accept "abnormal" as a normal condition. If you can't find the problem youself, have a qualified mechanic take a look. And if fuel is involved, have that look before further flight—even if you need to bring a mechanic to the airplane from another airport.

See www.mastery-flight-training.com/half_an_hour_short_of_a.pdf

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Texting and Taxiing

This month's NASA Aviation Safety Reporting System (ASRS) takes on the topic of taxiway and runway incursions and excursions as a result of "head-down" fixation on cockpit technology. Read Callback #392 for more accidents-that-weren't…but that according to anonymous reporters, very nearly *were*.

See http://asrs.arc.nasa.gov/docs/cb/cb_392.pdf

NBAA Cites Concern About Pilots' Readiness to Receive Training

The National Business Aircraft Association (NBAA), an advocacy group for pilots and operators of business-type aircraft (including its nascent Light Business Aircraft division), "wants business pilots to think differently about how they prepare for both initial and recurrent training," according to a report published on Air International News (AIN) Online. "Although the accident rate for business aviation has been very low…a number of accidents have occurred in which pilot training has been identified as a contributing factor," the committee reported in an August 22 seminar held at the National Transportation Safety Board HQ.

Steve Charbonneau, the committee's secretary, says that one identified weakness is the gradual shift away from training that provides pilots with learning and toward a process of simple recertification. "The industry needs sound leadership that believes **complying with the regulations [on initial and recurrent training] is not enough** … just not acceptable," he told **AIN**. "The environments in which we operate today are much different from the way we train."

Charbonneau maintains **it is time pilots become more engaged during training sessions and not sit passively waiting to complete the course.** The safety committee is currently talking to subject-matter experts from all NBAA committees, as well as individual association members, Part 142 training providers and regulators, to gather ideas before making its final recommendations [to NBAA].

See http://www.ainonline.com/aviation-news/ainsafety/2012-09-10/nbaa-safety-committee-speaks-pilot-training-concerns

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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
