FLYING LESSONS for March 8, 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:

Cockpit ergonomics design did not really begin to appear in light airplanes until the 1980s…arguably even later than that. The vast majority of piston-engine airplanes, and a fair number of turbines in the fleet, predate the design shift to more pilot-friendly cockpits. Sometimes airplanes of earlier design had forward-thinking designers who put some effort into what we'd now call low-workload cockpits and controls.

A *FLYING LESSONS* reader filled in some details of a Bellanca Citabria "landed short" crash during a training flight in this week's FAA preliminary reports. Luckily, injuries were minor—cuts, scrapes and one broken bone—and the airplane was not deemed destroyed [although it may be totaled by its insurer]. According to the reader, the instructor pilot reports the airplane was on final approach when the student adjusted the nose trim fully down instead of increasing the throttle to correct for descending below glidepath.

A look at the power controls of the type show how it would be easy to make the mistake. The throttle control is a large lever on the airplane's sidewall. Immediately beneath it is the carburetor heat control, a somewhat smaller version of the same thing (circled in the picture).

But there's another control, very similar, further down on the sidewall—the trim control (arrow). The arrangement of throttle, carb heat and trim is duplicated on the rear left sidewall for the back-seat occupant (the blue knob is the propeller rpm control in this aircraft).

I believe the original designers of the Aeronca family line were actually forward-thinkers. I think they purposely designed the power and trim controls to be immediately "at hand" of the left while the pilot was holding the control stick in the right. But it also makes it possible (perhaps even likely) to reach down and move the trim control instead of the throttle, especially if focused on a landing approach or some other complex maneuver. I have a hundred hours or so in a Citabria and can attest to making some trim/throttle mix-ups myself.

Similarly, many airplanes of 1940s – 1980s design have multiple but similar power controls extending from a subpanel between the pilot's seats, such at those in this picture of a wonderful Beech Sierra I co-owned for about six weeks a decade ago (a story for another day). The headset is hanging on the throttle control; the propeller control is on its left and the mixture control is the red knob immediately beneath the throttle.

More than one pilot of an airplane with this power control arrangement, myself

included, has reached for the throttle when wanting to adjust the mixture or, more potentially hazardously, pulled the mixture control out when intending to reduce throttle on final approach. I had one nervous student pull the mixture control to idle cutoff, killing the engine, when meaning to cycle the propeller in the run-up area during a Commercial checkride.

A pilot who does this on final approach may initially get the response he or she expects, a reduction in power (from lack of fuel, not the intended reduced throttle) and increase in rate of descent. The hazard comes if the pilot lets go of the mixture, then needs to advance power for glidepath control or a go-around/missed approach and gets the correct handle the next time. The engine will surely quit from an increase in air with insufficient fuel when the pilot opens the throttle. The airplane will either descend below glidepath or be unable to attain climb in a balked landing or missed approach.

And yet the design philosophy of push-pull and vernier engine controls (verniers, especially, make precise adjustment possible) placed in this tight cluster can actually make power management quite easy, your hand having to move only slightly between power controls.

This week's *FLYING LESSON* is to spend some time in the cockpit of each airplane you fly and look for the potential "gotchas" of the intentional or unintentional ergonomics of its design. Each airplane has its own logic, and in most cases no one design is "right" or "wrong." It is what it is…and you need to be familiar with whatever the type gives you.

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

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Debrief: Readers write about recent *FLYING LESSONS:*

Reader and frequent Debriefer David Heberling comments about the March 1st AOPA Air Safety Institute report on the (lack of) safety improvement that has resulted from the proliferation of "glass cockpit" aircraft. David writes:

> Thanks for your hard work. We all learn from it and appreciate it. The quote from the AOPA press release was:" What you have on the panel doesn't matter nearly as much as what you're flying and how you're flying it." I would change only the last part of that quote to: "...doesn't matter nearly as much as **what you're flying with between your ears**."

Thank you, David. Reader Lew Gage adds his experience to our discussion of tailwind takeoffs and landings:

> Your discussion about tailwinds during takeoff and landing will draw many comments. All I can say is that very early in my career with Pan American World Airways (gone but not forgotten) a wise old Captain told me "Lew, everything is wrong with a downwind takeoff or landing." Of course, at some mountain airports in the "back country" there may be reason to do so, but **if there is any question about aircraft performance or runway length, always use any headwind advantage** that is available.

We had several reader contributions to our ongoing discussion of fuel management. Robert Thorson writes:

> Seems to me that with all the techniques that people have for tracking fuel...time...tank level...flow parameters... they still run out. This indicates that they never keep an adequate reserve. Then there is "contingency fuel" for runway problems, deteriorating weather, other en-route catastrophes. **If the regulatory amount is 30 minutes make that in[to] the chocks shut down. Then add a margin for all the**

> **things that could go wrong. What remains is what is available for the trip**.
>
> Your comments last week stated that pilots run out of fuel just short of the destination confirms this assumption. **Always pushing limits is a bad attitude for a pilot**. The comment that fuel gauges are most accurate near empty leaves a cold chill on my spine because that surmises someone would allow the fuel to get below a predetermined level and that a gauge failure could nor occur.
>
> **Make the 1/4 tank [mark] as low as you will go**. Make the extra stop and stretch your legs... meet new people at the fuel pump. As they say in New York...."I have to tell you this?"
>
> **Too many pilots start fuel planning with the length of the leg instead of starting with the amount they need when they land. The variable is how many fuel stops are required not how far can you go. This just seems to be lost in the training message**.

Excellent points, Robert. I believe you're right—instead of planning fuel required for a flight, then deciding how much fuel you'll have left on arrival, take your reserve out first, then decide if you have enough fuel for the trip.

For example, say I'm flying a Bellanca Super Viking that experience tells me burns 14.3 gallons per hour at my typical cruising altitude, power setting and leaning technique. I'll round that up to 15 gallons per hour, telling me I need 15 gallons of fuel on arrival if I am to adhere to my standard of one hour of fuel remaining at the conclusion of my trip. If the BL17-30A holds 75 gallons of fuel, then deducting the 15 gallons reserve means I have 60 gallons remaining for my flight.

But there's more. According to the Pilot's Operating Handbook (POH), three gallons of fuel in each main tank (30 gallons each) and one gallon in the 15-gallon auxiliary tank is placarded as unusual. Now, I know it's popular in some circles to refute the concept of "unusable" fuel as a mere legal construct with no operational impact. In reality unusable fuel is defined in the rules of airplane certification:

> **§ 23.959 Unusable fuel supply.**
>
> (a) The unusable fuel supply for each tank must be established as not less than that quantity at which the first evidence of malfunctioning occurs under the most adverse fuel feed condition occurring under each intended operation and flight maneuver involving that tank. Fuel system component failures need not be considered.
>
> (b) The effect on the usable fuel quantity as a result of a failure of any pump shall be determined.

Regardless of whether you feel you can access unusable fuel from one or more tank, my recommendation is that you **do not include unusable fuel for flight planning purposes**.

Continuing our illustration, if I have a total of seven gallons of unusable fuel between the three tanks of my Bellanca, added to the 15 gallons it takes to fly one hour at my selected altitude and power setting, then I have a total of 53 gallons with which to conduct a trip. That's 3.5 hours' endurance at cruise power or, considering the higher fuel burn for takeoff and climb, call it 3.3 hours endurance. That's it. Unless I choose a different power setting and/or altitude, 3.3 hours is the very farthest I can fly in that airplane.

I made a deliberate decision, when not under the external pressures of conducting a specific flight, to make one hour of fuel on arrival my inviolate personal minimum. **Personal minimums are worthless unless you have the discipline to adhere to them even when it's inconvenient.** Consequently, if I'm flying that Bellanca and reach three hours aloft, I need to begin descent for a landing to maintain the level of safety I've established under calmer circumstances.

Reader and flight instructor David Loewen chimes in:

> On the fuel exhaustion problem, **I know of people that believe the numbers in the POH as gospel**. I teach my students that those numbers are based on ideal conditions, i.e., new airplane, clean filters, new engines, and a test pilot flying it. Many airplanes have been bent, have worn or over sized cylinders, dirty filters, weak mags, worn carburetor, along with other such items. My [Cessna] 152 has the [150 hp] Sparrowhawk conversion, and it has no data changes for the increased horsepower and compression.
>
> Another thing that is not taken into consideration is that **the instruments in the airplane may not have been checked for proper calibration**. Even a new instrument has an acceptable range to considered to be in

> spec. A tach may be indicating 2400 RPM and the engine may be turning closer to 2475 changing the actual fuel burn. Another thing is **how close do you have the engine leaned to what the book says**.
>
> I tell my student to increase the fuel burn by 20% and that **forecasts are just that, an educated guess. Any winds from FSS have errors in them**. A wind that is given as 090 may be anywhere from 086 to 094 because of the way it was obtained. It is better to get there with five gallons more than planned then wishing you had one more pint.

Thanks for your insights, David. Reader Tom Allen continues the fuel reserves discussion:

> I have flown in the DFW [Dallas/Fort Worth, Texas] area most of my life. I regularly make short trips to pick someone up. On several occasions the intended destination was unavailable because of accidents, heavy traffic, etc. I have been told [by Air Traffic Control] I can circle, or go away and try again in an hour or so. One night, on my way back from dinner with a VFR forecast, the controller said "DFW has just closed due to thunderstorms, you will not make ADS [Addison, the reader's home airport], please advise". We landed at [a third airport] just as it was starting to rain. We spent several hours in the pilots' lounge just a few miles from my home. The point: **Have a alternate plan no matter how short the flight.**
>
> On a recent trip to Florida, VFR [was] forecast over the entire route. After a fuel stop in Vicksburg [Mississippi], the controller says "A line of severe thunderstorms is ahead on your route. Everyone else is diverting to the south. Do you want to divert?" I was diverted south to New Orleans. Now, I am off my flight plan. Cleared waypoint by waypoint to Tallahassee [in northern Florida]. It added an hour to the planned flight time. Controllers were outstanding and helpful. The points: **Things often do not go according to plan**, and **having plenty of fuel provides more choices and reduces anxiety**.

Good *LESSONS*, Tom. Thank you. Frequent Debriefer Woodie Diamond relates this experience:

> A few years ago I sat down with a flight instructor for a semi-annual flight review. During initial discussion, I told him that I would like to concentrate on the basics, those skills we learn at the beginning but don't practice all the time. He unfolded a sectional chart of the area and pointed to a distant remote airport saying "…let's do a total flight plan to fly to this airport." Pencil, paper, and E6B in hand, I carefully calculated winds, weight & balance, fuel burn, time, heading, etc. Feeling particularly proud of myself, I explained all of my flight planning to the instructor. He remarked, "…**looks great, everything is technically correct, but we are headed for disaster**." Brandishing an A/FD [Airport/Facility Directory], he turned to the page for the destination airport and suggested that I call them. Sure enough, the airport was out of fuel and not expecting a load for another week. The nearest airport from our destination was almost 30 minutes away. "The only thing you will be able to fill the fuel tanks at that airport is *hope*. You will try to take off counting on the *hope* in the tanks will clear the trees, the *hope* in the tanks will take you to where there is fuel."

Thanks, Woodie. As I've written many times in *FLYING LESSONS* (and elsewhere), "**hope" is not a good risk management strategy**.

Very early in my flying career I took my father on a long trip in my Cessna 120, no-radio, pre-GPS ded. reckoning/pilotage/"I Follow Roads" from near Kansas City, Missouri to Detroit, Michigan. One of our planned stops was in central Illinois. When we landed there was no one at the airport and a padlock on the cinder block, run-down-FBO door. There was a phone number on the fuel pump to call for service but the number was disconnected (at least the pay phone worked; pre-cell phones). Luckily I had personally calibrated a stick at various fuel levels, and the zero-dihedral of the wings permitted an accurate measure of gas remaining when the 120 was on level ground (calibrated in its tailwheel stance). I found I had plenty of fuel to get to the next airport up the road with a comfortable reserve. And, I pulled out the A/FD in my airplane (yes, I actually bought them for the trip!) and phoned ahead to see if they had fuel there. I can see, however, that if I had not had good instruction I, too would have been flight planning on the hope that I was going to be able to get somewhere where I could add fuel.

An anonymous reader writes:

> As a very conservative pilot I find it hard to believe fuel exhaustion exists in small plane GA -- we're going so slow over short distances; just stop and chalk up another airport. This comes from a family pilot with a Cessna 206 and kids and dogs [that] can only deal with 2.5 hours, and if [if] stretches to 3.0 hours they're climbing the walls and howling.

And a final word of wisdom reported by reader Lorne Sheren:

A friend of mine related that he was flying with his 6-year-old daughter when he told her they would have to stop for gas. She said to him, "Good, Dad. I'd hate to get stuck up here." 'Nuff said.

Thanks, everyone. Readers, your inputs are always welcome. mftsurvey@cox.net.

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

Flying has risks. Choose wisely.

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