FLYING LESSONS for September 6, 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:

According to an NTSB preliminary report, the VFR-only pilot of a single-engine, retractable gear airplane reported he was in cruise flight above a solid cloud layer. The pilot indicated he was going to climb to 10,500 feet, presumably to remain above the cloud tops.

Moments later the pilot declared an emergency, stating the airplane's engine had quit. After eight minutes of gliding descent through cloud layers, the airplane struck terrain. The pilot perished.

The fuel tanks were intact, and about one pint of fuel was drained from the left tank while 10 gallons was drained from the right. The fuel selector was in the right tank position. Continuity of the entire fuel system was confirmed. The gascolator was removed and disassembled. It contained no fuel, was completely dry, and was absent of debris. The fuel boost pump switch was destroyed in the instrument panel, and the boost pump was destroyed by impact. The engine showed no sign of preimpact mechanical failure.

If the final investigative report (still many months away) follows typical patterns, the fatal crash will likely be ruled to involve fuel starvation, which is in fact what appears to have directly led to impact.

That makes sense, but I think the fuel starvation was a symptom, not the cause. Consider this possible chain of events:

- The VFR-only pilot plans a cross-country flight. Scattered to broken cloud layers are reported along his planned route. The pilot launches and climbs to a cruising altitude above the haze and lower cloud layer.
- As the flight progresses, the haze below thickens, and the lower clouds begin to merge into an opaque layer—a solid overcast.
- Continuing along his route, the pilot notices the cloud tops are rising, so he begins a climb to stay in clear air. Eventually he reports to controllers he is at 9000 feet and climbing to 10,500 feet.
- Suddenly the engine quits. The pilot has been so distracted by the task of remaining in VMC, and concerned with the prospect of being atop a solid layer of clouds with no obvious way to safely descend, that he has ignored his fuel management plan. The engine sucks the last of the fuel from its left wing tank.
- The pilot declares an emergency as the airplane descends into the clouds. Somewhere along the way the pilot attempts to restart the engine by switching to the right fuel tank, which was later found to hold 10 gallons of fuel.
- But for some reason the engine does not restart after the tank selection switch. For seven long minutes the airplane descends into terrain. Luck is not with the pilot; the impact was not survivable.

Fuel starvation may in fact be the eventual probable cause ruling. But I believe the fatal mishap actually occurred long before the engine quit—it was almost inevitable that something bad was going to happen much earlier.

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The fatal event was the decision to continue en route when the clouds began to bunch into a solid undercast. It may have even begun sooner—it's not yet certain whether the pilot obtained a weather briefing (or self-briefed using online information that does not leave an official record). It's unknown if the pilot merely checked surface observations in an abbreviated pictorial format that showed the surface weather was VMC, but did not provide detail of conditions aloft.

Ultimately, it was the pilot's responsibility to continually evaluate the weather as he flew. The first link in the judgment chain was failure to turn around as soon as it appeared he could no longer descend between the clouds while maintaining VFR separation.

The pilot apparently thought to climb, but it appears from preliminary information he did not consider making a 180-degree turn, back into the clearer air he'd just left.

The desire to fly home (was that the trip took place on a Sunday been a factor?) may have lulled the pilot to continue onward. But I think it's just as likely that the pilot never considered the 180-degree turn.

How likely are you to give up on a trip, already begun, because conditions gradually worsen to below you personal limits? Never forget that the 180-degree turn is an option—whether it's VFR into IMC, flight into icing conditions, attempted penetration of a line of storms, or anything else that's beyond your capabilities or those of your aircraft.

At least as importantly, a turn away from the hazard is a huge stress relief, making you less likely to miss critical tasks or make additional, poor decisions that have a tragic end.

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

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Debrief: Readers write about recent *FLYING LESSONS:*

Reader Dave Horn writes about a recent *LESSON* about patience when faced with weather:

> "Almost always, if you wait just a couple of hours the weather will get better." Really? Do you have some data to back this up?
>
> A few years ago, mine was the last flight in or out of our (ILS equipped) airport for over two days, due to fog. This last winter, my Monday morning IFR departure was canceled by weather that didn't allow me to depart until Saturday morning. And it is commonplace to read of mountain search and rescue helicopter operations to be held up by bad weather for days at a time.
>
> I have come to suspect this old wives' tale is one of those cases where the weather in America's flat heartland is blithely extrapolated to the rest of the world. While it may be true in places where "weather" is understood to be synonymous with "thunderstorms", it is a dangerous assumption in parts of the world where "weather" may mean something else entirely.

Hi, Dave. I once spent four days waiting out a snowstorm when 30 air miles from home in the southern Rockies. And I've seen days-at-a-time weather issues here in Kansas, in California, and when I was flying very frequently in Tennessee and the southeast. I may have overstated it a bit, but most of my experience in all of these places is it was still common for conditions to improve from "no way" to "flyable" after a few hours' wait. I'll take your lead, Dave, and restate it thus: If conditions are lower than the regulations permit, your personal limits require, or your comfort level demands (whichever is higher), relax for a few hours, try to find something enjoyable or productive (or both) to do while you wait, and then re-examine the conditions

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objectively as if you were looking at the go/no-go decision for the first time. You may indeed find, when giving yourself the time to keep your gotta-get-there stress level under control, that conditions often *do* improve enough to satisfy your limitations and comfort levels. If not, wait a couple hours more and evaluate the weather (and your fatigue state) again.

Reader Marty Vanover returns to our discussion of engine temperatures as they related to power management:

> While it is true that you could lean to a specific EGT and be close to correct mixture for a given power setting, I'm not convinced it's a good way to set power. If you had an engine analyzer to determine what EGT you should have at a predetermined power and mixture setting, why not just use the analyzer to set power? The answer will follow.
>
> I know there are a lot of opinions on engine leaning. But, for me there are only three places to set mixture, best power, peak EGT and best economy. I use best power mixture for climb (sometimes take-off) and peak EGT for 75% cruise power as I get about a 2 gph fuel savings over best power mixture with just a 4% drop in power. So, my airspeed doesn't suffer much and with 100LL mostly North of $6/gal, I'm content with the cruise speeds and fuel savings. I have been recording EGT/CHT along with OATs, RPM, MAP, F/F, altimeter settings and altitude since my engine overhaul in January. EGTs are almost never the same for the same power settings under similar conditions. EGT will decrease only 90 degs on the lean side of peak EGT (LOP) but drop 350 degs on the rich side of peak EGT (ROP). Best power starts at 100 ROP and the power curve is flat for another 60 degs ROP with power dropping off slowly to 5% at full rich.
>
> The reason to use a single reference to set power and mixture is convenience. Fiddling with the power and mixture levers, focusing on the analyzer or even choosing a cylinder to set EGT takes some time and not something I like to do in a target rich environment. I use a cruise climb airspeed as it is generally warm outside in these parts. I set my climb mixture to best power by using the fuel flow gauge. I have found that using fuel flow I can pretty much be in that 160 range of best power for the second segment of the climb (I don't touch the mixture until clear of my class D airspace). Fuel flow is probably just as good of indicator of power during climb. From my POH I can determine the maximum available power for a given altitude and OAT. So when you first grab the red knob, you know you are ROP and what approximate power you should be generating. Matching the fuel flow with that power does take some time to determine what it should be but you can pretty much set it once (if you know where 100 deg ROP is) and still be pretty much in the best power band for the remaining of the climb, unless you are going to O2 levels. Sorta like taking the time to determine what the EGT should be. Of course, any method you use will be determined by your confidence in your indications. My JPI incremental temperature indications are now suspect, so I only use it for peak EGT determinations. I have "calibrated" my fuel flow gauge (the stock Beech pressure gauge) at 11 gph. It is within ounces. I have not calibrated it at other fuel flow settings, but figure it is pretty close on either side where I generally set my basic mixture settings.
>
> Not all airplanes are fuel injected, have constant speed propellers or are equipped with engine analyzers and fuel flow gauges. However, there are methods for determining power and mixture settings for these airplanes too. I have extrapolated chart data to show the BSFC for best economy, best power and full rich. So IF you know your installed horsepower, you could determine what your full flow should be at any data point. While maybe not 100% exact, I think it is probably pretty darn close.

Data is a good thing, Marty. Thanks. The discussion of target EGT comes from material presented by Advanced Pilot Seminars (APS), which is generally considered one of the authorities on piston engine management. Fuel flow does not correlate to specific percentage of power when operating rich of peak EGT, according to APS, although there is a direct correlation on the lean side of peak.

Because, as you state, the difference in performance that results is relatively small with minor changes in leaning technique, I too favor simple rules of thumb for power setting—hence my adoption of the target EGT technique. Many pilots are more meticulous, but part of my personal justification, like you, I'm more concerned about other air traffic. In general I think we spend too much mental bandwidth on the minutia of mixture control when the record suggests we should put more mindpower into the basics of flying the airplane. Thanks, Marty, for giving us all more with which to make a decision

See www.advancedpilot.com

Australian reader Jock Folan checks in on the reports of Attitude Heading Reference System (AHRS) failures in turbulence with his experience:

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> I found your comments regarding AHRS systems being upset by turbulence. I have recently completed an upgrade to the instrument panel and avionics for an aerobatic F33C and I purposely chose the Aspen Pro units along with an electronic RC Allen Attitude Indicator (RC-2600-3) as a backup to remove all gyros from the aircraft. I particularly selected the Aspen as it is now a standard fit to Extra 300 aircraft. I understand that there were initial problems with upsets but these have now addressed via various software updates. I have also noted a number of ACA Decathlon aircraft (8KCAB) have been using Aspen units (also an option for new aircraft) and I am currently installing the 'Aspen Pilot' into my Super Decathlon.

Thanks, Jock. I had two other readers comment that turbulence-related AHRS failure seems to correlate primarily to older units ("old" being two or three years among today's avionics), installation in amateur-built aircraft (ABA) and those installed aftermarket and not as originally installed equipment. The implication, at least in other-than-OEM installations, that something other than the AHRS unit itself leads to "red X" or blank screen conditions when disturbed by turbulence. The NTSB report from which the *FLYING LESSON* was taken was an aftermarket Primary Flight Display unit installed in a legacy aircraft. Glass cockpit or not, OEM or not, it's always best to learn the *LESSON* and frequently practice controlled flight with reference to backup instrumentation.

It's been a while since we heard from "Old Bob" Siegfried, but I can always count on him to chime in when the subject of partial-panel flight comes up. Bob writes:

> As Always, really enjoy your messages and always learn something new. One old gripe I have is that our industry has strayed so far from basic aircraft control. I will beat that dead horse again for the lowly Turn and Bank [indicator]. It is old and not as cheap as it has been. It is undoubtedly true that a new electronic substitute could and should be designed. Nevertheless, stopping the turn is still the best way to get an aircraft under control.
>
> Including a turn device in our primary scan is the easiest way to maintain control, but we need to keep the back up device in our regular scan for it's benefits to be suitably available when the other stuff fails. The artificial horizon does not work as well. Using it requires that the pilot accept what it says about the attitude and then levels the wing to stop the turn. If a basic trim indication is accepted as the final arbiter of control, less thought is needed.
>
> No need to figure out which way is up. Just stop the turn and the airplane will become controllable.
>
> I know I am beating a dead horse and **our industry has gone away from using and teaching basic airmanship in favor of adding new fancy stuff to fly the airplane for the poorly trained pilot**. I still think twenty hours of Needle, Ball, and Airspeed is the best way to avoid loss of control.
>
> Old Guys never learn I guess. We just need to fade away!

Don't go anywhere yet, Bob. If I were privileged to own a glass-cockpit airplane, one of the first things I think I'd do would be to install a turn-and-bank needle with a slip/skid ball high on the pilot's side of the panel. This would be doubly important in a twin-engine airplane, in which precise bank and rudder input is critical in the event of a engine failure.

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Thomas P. Turner, M.S. Aviation Safety, MCFI
2010 National FAA Safety Team Representative of the Year
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