FLYING LESSONS for June 2, 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, much-expanded *FLYING LESSONS* report each week, email "subscribe" to mastery.flight.training@cox.net.

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This week's lessons:

This tragic case reminds us what needs to be done at the first sign of a fire: get the affected equipment (engine, avionics) shut down, and then get the airplane on the ground ASAP. Although the Piper Tri-Pacer's pilot suffered serious burns in this particular event, his quick off-airport landing spared his passenger any injury, and probably saved his own life.

See www.ntsb.gov/aviationquery/brief.aspx?ev_id=20110523X15125&key=1

One of most pilots' greatest fears is a fire in flight. Although the chances of an engine or electrical fire in a well-maintained airplane are remote, you need to be ready to act—and act fast—at the first sign of an engine, fuel or electrical fire.

An engine fire is usually the result of a fuel or exhaust system leak. Stop the fuel and you'll stop the fire, in most cases. That's why virtually all airplanes' Engine Fire in Flight checklist starts with some way to stop fuel flow to the engine…Fuel Selector OFF, Mixture control IDLE CUTOFF is the usual sequence of steps.

Your airplane's checklist may call for closing air passageways from your engine(s) to the cabin. If the aircraft is pressurized you may need to close a pressurization control (cabin pressurization usually comes from compressed engine or turbine bleed air that is pumped into the cabin).

Deal with an electrical fire in the same way, which is by removing the "fuel" by turning off electrical power. Battery and Alternator(s) OFF, then allow the affected equipment to cool. If the fire stops, turn on *only that equipment absolutely necessary* to get the airplane on the ground at your earliest opportunity. If it's VMC and you're in airspace not requiring contact with Air Traffic Control, you may not need to turn *anything* back on before you land. Practice so you're ready for a no-flap landing, if you are flying an airplane with electrically operated flaps; if the landing gear is electrical you may need to turn the battery on just long enough to power down the gear (if it is electrical, or hydraulic if the hydraulic pump is electrically powered). Here's a time when intimate knowledge of systems in the airplane you're flying is essential.

As the fire is squelched, ventilate the cabin. Open fresh air vents. If flying a pressurized airplane, open the Cabin Pressurization Dump (or similarly labeled) valve.

So much for what most Pilot's Operating Handbooks tell you. If there's still smoke in the cabin, open a window or a cabin door. Forget about airspeed limitations, you need to see…and breathe.

Enter an emergency descent and land at the first practical spot within glide range of your airplane. This may be an airport…or it may not. History shows that fires sometimes smolder, and re-light. Engine fires have burned through engine mounts and critical aircraft structure, and in twin-engine airplanes have weakened wing spars to the point of failure. Electrical fires can

release toxic chemicals that can affect your ability to control the airplane over time. Even if the fire appears to be out, you need to get the airplane on the ground *now.*

If time and aircraft control permit, attack any remaining flame with a hand-held fire extinguisher. The U.S. Federal Aviation Administration has recently updated its Advisory Circular on aircraft fire extinguishers and how to use them. Chapter 4 (at least) is worth a read now, and as part of your regular review of emergency procedures. Advisory Circular 120-80 also addresses how to fight in-flight fires, and is worthy of your time.

See:
www.faa.gov/documentLibrary/media/Advisory_Circular/AC%2020-42D.pdf
http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgAdvisoryCircular.nsf/list/AC%20120-80/$FILE/AC120-80.pdf

Time was when all light airplanes had a fire extinguisher properly mounted in a bracket where it was accessible while seated in the pilot's seat. Such is no longer always the case, it seems. If you have one, be sure to keep baggage clear of the extinguisher so you can reach it in a hurry. If you own an airplane but don't currently have an installed fire extinguisher, read the AC and talk to your mechanic about an installation. If you rent or borrow an airplane talk to the owner(s) about installing a fire extinguisher.

Make it a goal to sit in the airplane and move through the steps of the Engine Fire in Flight and Electrical Fire in Flight checklists ***this week***. Practice until you have the flow of steps committed to memory. Actually move the levers and controls as you practice so you develop some "muscle memory" about how you'd deal with the sudden onset of fire indications.

Then practice how you'd ventilate the cabin, and rehearse the Emergency Descent checklist. If your airplane does not have such a printed procedure, talk to an instructor experienced in that airplane type and develop a procedure of your own.

Like most emergency procedures, chances are very good you'll never be called upon to deal with an engine or electrical fire in flight. But like all emergencies, you need to be ready to respond *correctly* and *immediately* if you're to be as successful as the pilot of that Tri-Pacer.

Comments? Questions? Tell us what you think at mastery.flight.training@cox.net.

Debrief: Readers write about recent *FLYING LESSONS:*

Readers write:

> Congrats on your work with this newsletter. It's a good one.—Tom Haines, Editor-in-Chief, Aircraft Owners and Pilots Association

Thanks very much, Tom. I'm honored by your comment. Reader Rob Kerr sent this in:

> Hi Tom, I read the items on unusable fuel with great interest and have no issue with the items discussed. My question is whether it is safe in cruise, to drain one only tank (say in a Bonanza)below the usable level to gain extra range. My experience is that Beech for all the reasons in the items you discussed specify unusable fuel

> quantities that are well above what can be pumped out in straight and level coordinated flight and an additional 3-4 gallons can be pumped out in this scenario. However, to be safe the unusable fuel quantities in the other tank must be adhered to and you are committed to using this tank for landing. I cannot see no additional safety value in keeping the first tank drained only to the unusable level and loosing an additional 15 minutes of range, keeping in mind that if you drained the first tank only to the unusable tank level then you cannot legally use the tank for any other flight operations i.e. landing. Many readers probably do not realize that in [Beech] Bonanzas, if the fuel pick up line is allowed to suck air below the unusable fuel level there is a real possibility that the line will not re-prime and suck fuel even though the line is now back in the fuel. I would appreciate your thoughts on this issue I have often agonized over.

Hi, Rob. First, I'm not going to declare draining a fuel tank completely in flight to be patently unsafe. However, my first response when asked this question (and I'm asked it *a lot*) is does that extra 15 minutes of fuel (30-45 miles in your G36 Bonanza depending on winds) make the difference in whether you attempt the flight nonstop, or whether you'd plan a fuel stop? In other words, are you cutting your trip so close that this really matters?

With that in mind, I wonder if the risks of a pilot-induced engine failure (which is what happens when you run a tank dry in flight, even momentarily) are worth the slight increase in range. A few years ago I did some research into fuel-related mishaps (*FLYING LESSONS* readers, roughly 70% of who fly something other than Beech airplanes, please excuse that my data are type-specific). The results show there is a demonstrable chance an engine may not re-start after fuel starvation. Although the risk may be mitigated by training and familiarity with the procedure, I always come back to my first response: Does the scant extra endurance you gain make a real difference in your flight planning? If your answer is "yes," I suggest you re-evaluate your overall risk management strategy.

See www.thomaspturner.net/Fuel.htm.

Reader Mike Dolin talks about another investigation, and a subject I cannot stress enough—that specific information in *FLYING LESSONS* and elsewhere must be tempered by knowledge of the specific airplane involved. Writes Mike:

> It is very important to note that a non-issue procedure in one airplane may be a dangerous item in another. I think that one whole *FLYING LESSONS Weekly* could be devoted to just that subject to warn pilots flying different kinds of airplanes [I will indeed do so in the near future, Mike—TT].
>
> For example, I recently ferried a Bellanca Viking between two local airports for maintenance. Both the fuel system and landing gear were not like any I had seen before. I selected the fullest tank for the short flight and made sure my time aloft would not stretch the range. I also flew with the gear down.
>
> Fuel starvation must be a subject dear to your heart, and rightly so considering the horrible accident records.
>
> In reading the current *LESSON*, I recognize a large variation in general aviation airplanes. The lessons are making me aware of the different airplanes I fly and warn me to be careful. I had heard about fuel cells with anti-sloshing baffles that you mention. I believe the (relatively) newer Bonanza has them, the ones with long leading edge tanks, and I'd suspect the same on any other airplane with a long tank. Perhaps the 182 Skylane has them too, but [I'm] not sure.
>
> Once more you bring up the importance of vapor lock in flight, which reminds me that when I get into an airplane with a fuel injected engine (that particular Bellanca) I had better be more careful than in airplanes I generally fly equipped with carburetors.
>
> The topic I want to mention in this reply is that of testing.
>
> A couple of ICS [International Comanche Society] members had heard many pilots talk of the same admonitions you warn; that of Fuel unporting due to slips or practice maneuvers with low fuel levels and heaven forbid, turning-type takeoffs with a low fuel tank selected. Many pilots merely parrot what they've been told, and we well know the issues may become clouded as the stories progress. Do pilots really test the issues, rather than just talk about them without really knowing for sure?
>
> So we came up with a simple test using a typical Piper Comanche 250 placed on jacks. It's good to have a set of jacks so pilots can go through an emergency or manual gear extension, on any airplane, in the safety of a hangar rather than the noisy classroom in flight [note: the added workload of flying the airplane, and in some airplane types, the significant force required to overcome air load during a manual landing gear

extension make practicing in flight advisable in some airplane types—TT]. Should the process go wrong, the situation can be examined without the panic of having an actual emergency. Further, peculiar to the Comanche, after a manual gear extension, the airplane goes right into a shop to reconnect the transmission mechanism [a requirement that's a great example of the need for very type-specific knowledge in flight instruction—TT].

The fuel tank unporting test on jacks is next.

Since nearly all of these Comanche 250s are equipped with carburetors, several seconds of fuel unporting will go unnoticed. I realize the same is not so with a fuel injected engine, but testing different airplanes is certainly worthwhile. (Makes me wonder what percentage of GA aircraft have carburetors vs fuel injection.)

By placing a jack under one wing of the airplane, it was raised as high as the jack allowed. This looked like quite a severe angle but the dihedral of the wing proved greater than the amount of tilt that could be achieved. Can it be compared to an extreme skid or slip anyway? It appeared to be so extreme an angle, that one would not easily repeat it in flight for any length of time.

With one gallon of fuel in either the main or aux wing tank, all of it drained out at the fuselage belly drain.

Here we concluded that a pilot could not slip this airplane to any extent where the fuel can be unported from the gas line. Nor we assumed, could turbulence prevent all the fuel from draining to the engine. (Carburetor)

The next was the nose down test. By raising the airplane with two jacks under the wing jackpoints, the nose down attitude appeared to be not enough to demonstrate a steep dive in flight. By removing the air from the nose tire, the nose down attitude was increased but still not enough to exceed the angle of incidence of the wing mounted on the fuselage. We felt it safe to let air out of the nose tire, but did not want to mess with the nose strut to achieve any more nose down angle.

By testing the fuel drain anyway, all of it drained out of the fuselage sump, similar to the tilted wing test.

A conclusion for this scenario was more difficult, but decided that a pilot would not point the nose down far enough, for a long enough time that fuel can be unported from the gas line. Even with the combination of slip/skid, nose down and turbulence, it's a good bet that all the fuel would eventually get to the fuel drain line.

Overall this kind of testing is worthwhile. We learned that testing the aircraft showed the VFR minimum fuel required by regulations (91.151) will drain from the tanks in any attitude that we could replicate. To what do we attribute the worst case scenario? Diving toward a runway? Diving to a lower altitude when oxygen runs out? An unusual "upset" attitude? We must ask, in what hypothetical situation is a pilot going to drain the last drop of any fuel cell?

Another airplane I fly regularly is the Cherokee which has a greater dihedral and about the same angle of incidence. Probably a Cherokee tank will not become unported either. Except for the [Cessna] 210 I believe, the Cessnas can drain both wings at once.

But what happens when transitioning to a Bellanca, Bonanza or Mooney? As you write, it's good to become familiar with different airplanes a pilot may fly.

Excellent observations, Mike. In the absence of personal testing I always have the published airplane limitations to fall back on (not to mention the legal obligation to do so, and the moral obligation to teach adherence to aircraft limitations). From there, as you've seen, I look at the accident and near-accident (Aviation Safety Reporting System and personal testimonials) record which, to the extent we have accurate post-incident information, sometimes confirms the wisdom of the legal requirement. Your information appears excellent and your admonition that "we don't know what we don't know" about other airplane configurations and types is well founded. As you suggest, I will devote a future issue of *FLYING LESSONS* to discussion of aircraft type specificity in study and training. Thank you very much.

See:
www.comancheflyer.com/NS/
http://asrs.arc.nasa.gov/

Piper Comanche guru Omri Talmon adds more that goes to the premise of type-specific training:

I refer to a message you got from my friend Mike Dolin (which proves that at least one more Comanche driver reads your valued weekly messages) I like to add that unporting the main or tip tanks in the Twin

Comanche is not possible under normal operation conditions. The auxiliary tanks, however, will unport on a descent, when low on fuel.

Readers, what's *your* opinion? Tell us at mastery.flight.training@cox.net.

We often gloss over training to avoid the sixth most common cause of fatal general aviation accidents (as identified by the FAA): stalls on initial climb. "Wait a minute," you might say, "we practiced power-on stalls for my checkride." That's true, but the conditions under which you practiced for departure stalls likely differed in significant ways from the scenarios that resulted in fatalities off the departure end of the runway.

FAA has published eight case histories for fatal initial climb stalls. To get the discussion going, read one or more of the scenarios and send your response to these items:

1. List the scenario number you're addressing.
2. What factors do you think might have contributed to the initial climb stall?
3. What conditions were different from the way pilots typically practice power-on (departure) stalls?
4. How could pilots better train and practice stalls to be able to recognize and avoid these real-world scenarios?

Send your insights and suggestions to mastery.flight.training@cox.net. Thanks!

See www.mastery-flight-training.com/top_10_number_6.pdf

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