# *FLYING LESSONS* for October 8, 2009

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.

**If you wish to receive the expanded weekly *FLYING LESSONS* report emailed directly to you, email "subscribe" to mastery.flight.training@cox.net.**

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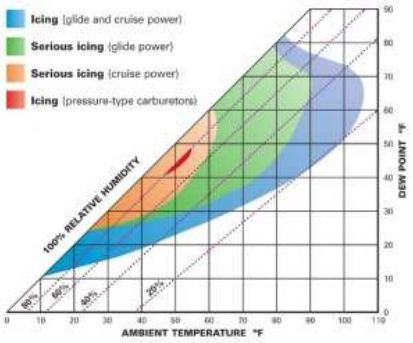
## *This week's lessons:*

**Fuel, air and ignition** are the essential elements of combustion in virtually any engine. If an engine falters and the cause is something you can fix in flight, it'll be by manipulating the fuel, air and/or ignition controls. As long as the propeller keeps spinning you'll have access to fuel flow, air and spark—use the engine and fuel controls correctly and in many cases it will restart.

**Carbureted engines** most commonly run rough or quit unexpectedly because of carburetor icing. In humid conditions at glide power, serious carb icing is most likely at temperatures as high as 80℉ (~25 ℃), while in cruise the carburetor may ice up at as high as 60℉/15℃.



Carburetor Icing Probability Chart

**Power loss** with a carbureted engine? Apply FULL carb heat. If this fixes the problem:

- *First*, the engine will run even rougher as hotter, denser air enters the induction system.
- *Then*, power will smooth out and increase after carb ice melts away.

For more see "The Carb Heat Test You Don't Know" at www.ipilot.com/learn/article.aspx?ArticleID=154.

**Fuel injected engines** that run rough or fail most frequently do so because of a fuel issue. Verify the mixture is near full rich, or lean the mixture for smoothness if you lose turbo boost to a turbocharged or turbonormalized engine. If combustion does not resume, switch to another main fuel tank. If that still does not work, use the auxiliary fuel pump, if installed, in case the failure results from a broken engine-driven pump or a vapor lock in the fuel lines.

**In multiengine airplanes** we teach aircraft control and then "mixture, prop and throttle" [fully forward] at the first sign of an engine failure. Turbocharged/turbonormalized engines may need significant leaning to create combustion after failure. After these initial steps, we teach positively identifying the failure and then if time permits, attempting a restart.

**We don't usually teach it this same way** in single-engine airplanes, but perhaps we should. Fly the plane, maximize potential power, then troubleshoot as workload permits.

**Don't get bogged down** in trying to figure out precisely what caused the failure. If fuel, air or ignition controls won't fix the problem, then you can't fix it from the pilot's seat. In that case it's not important *why* the engine quit, not at least until the airplane is in the hands of mechanics (or

investigators). Aviate—Navigate (toward a landing spot)—Communicate—Restart—Diagnose…in that order, and as time permits.

**If the fuel pressure drops and flow stumbles** when a tank empties out, and the pilot quickly switches to a tank containing fuel so that fuel flow is never interrupted, in most cases pressure should return and the engine should continue to run. If fuel flow is cut off, however, "*running a fuel tank dry*" quickly becomes a "*pilot-induced engine failure*," and may have to be treated as such. Air may be sucked into fuel lines, preventing a restart; the pilot may act incorrectly and make matters worse. Simply switching tanks may not cause the engine to restart; you may then have to deftly manipulate fuel, air and ignition to avoid an unintended landing.

**Should an engine quit** or run rough in flight, remember these priorities*:

| Priority | Carbureted | Fuel Injected |
|---|---|---|
| 1 | Carb heat ON | Mixture FULL RICH** |
| 2 | Mixture FULL RICH** | Switch Tanks |
| 3 | Switch Tanks | Auxiliary pump ON |
| 4 | Auxiliary pump ON | Magnetos CHECK |
| 5 | Magnetos CHECK | Alternate Air ON |

*Turbine engines have different characteristics. See the approved flight manual.
*Or leaned significantly, in turbocharged aircraft with a loss of manifold pressure

Do whatever is appropriate to the airplane you're flying. Not all types will have all listed controls. **The aircraft's flight manual checklist takes precedence**, but very likely it is summarized by the steps listed above.

Learn more by reading "Fuel, Air and Ignition" at www.ipilot.com/learn/article.aspx?ArticleID=434.

Questions? Comments? Email me at mastery.flight.training@cox.net

## Coming events

Plan to attend these upcoming *FLYING LESSONS* presentations:

- **Saturday, October 17th, Gatlinburg, TN:** Beech Aero Club BACFest. Topic: "When Your Airplane is Older than You Are: Safely Flying Aging Aircraft." Contact BAC for convention registration.
- **Saturday, December 12th, Denton, TX:** *FLYING LESSONS* hosted by Aircraft Precision Maintenance. Check here for complete details.

See www.beechaeroclub.org, www.thomaspturner.net/Denton%20Dec%202009.pdf

Watch for additional *FLYING LESSONS* events later this year and in 2010. Contact mastery.flight.training@cox.net if you'd like to arrange a presentation at your conference, FBO, safety meeting or flying club.

# DEBRIEF: Readers comment on past *FLYING LESSONS*

Retired international airline captain and aviation elder statesman "old" Bob Siegfried wrote about last week's *FLYING LESSONS* concerning running a fuel tank dry in flight (an accident factor that unfortunately appeared yet again in this week's reports):

> Could you expand on your statement concerning an inability to get a restart after running a tank dry? It would be nice if you could tell us what caused the problem. I have NEVER been unable to get an engine restarted after running a tank dry. As I am sure you are aware, I recommend that all pilots regularly run their tanks dry so that they will know for sure just how much fuel in each tank really is usable. More information

from those instances where a restart was not possible or where difficulty was encountered would sure be appreciated.

I cited some data I've collected on fuel mishaps in one brand of airplane, and replied:

We don't know the particulars of why the engine would not restart in these cases, and I suspect botched restart attempts are a bigger factor than we know for certain, but the risk obviously exists.

To which Bob responded:

I am still not convinced. While turbine engines have different problems, there is no reason the engines in question should not have restarted. Turbine engines have restart problems, consequently we have learned to design the fuel systems to eliminate the problem. However [most of us] are flying airplanes that have old-fashioned multiple fuel cell systems. With these systems, running a tank dry intentionally is a piece of cake and entails no danger at all.

Just because the NTSB report says it was reported the engine could not be restarted does not mean that it could not have been. In my book, what those reports tell us is that those pilots were not properly trained and that the NTSB reports are seriously flawed. So many people are petrified about running a tank dry that they do not take proper action for the restart. What your figures do is re-enforce my feelings that all of us should run our tanks dry so that the proper restart techniques will be as natural as lowering the nose to regain flying speed after experiencing a stall. We need to be trained to handle a stall recovery and we need to be trained how to run a tank dry.

Intentional stalls are a piece of cake, but not all of us manage to make a stall recovery properly when a stall is encountered that was not expected. It is the same way with running a tank dry. If one runs out of fuel a hundred feet short of the runway on a power approach to a short field landing he will be in just as bad a shape as if he stalled at the same point. Will the NTSB log that as a failure to get a restart?

Figures don't lie, but liars can figure. Those NTSB figures leave a LOT to be desired. I think they reflect a dangerous inaccurate conclusion! A pilot who regularly runs the tanks dry is much more likely to be able to get a timely restart than someone who never runs a tank dry.

Flying is inherently dangerous. We attain an acceptable risk level by adequate training and operating within carefully established parameters. Training is the key to safety in aviation. We need to train people how to safely get a restart when they accidentally run a tank dry. What better way is there to train for that eventuality than to routinely run a tank dry?

I continued the discussion:

I know you're impassioned about this particular issue, so I appreciate the depth of your response. Please take another look at these two statements from [the cited] *FLYING LESSONS* report:

> ***FLYING LESSONS* has seen many instances when a tank was run completely dry in flight and the pilot was unable to get the engine restarted on a tank containing fuel.**

Like it or not, that's a true statement [one that was repeated this week]. I've seen it in NTSB reports, and I've heard first-hand accounts from pilots that have gone down from fuel starvation. Now from the masthead, the reason I do these weekly 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.**

That is consistent with everything you said. Pilots should not take running a tank dry lightly, but need to be proficient just as they must be proficient in stall recognition and recovery. But the sad truth is that airplanes *have* crashed because a fuel tank was run dry and, as I said, "the pilot was unable to get the engine restarted" for whatever reason. Hence the need for awareness, not fear, if a pilot chooses to put him/herself in that position.

The reader replied:

Thank you for giving me the opportunity to bring my point to the table!

Thank you, Bob. I always value learning from your experience. Thanks for reading, and participating in, *FLYING LESSONS.*

See www.thomaspturner.net/Fuel.htm

**Apology:** In last week's DEBRIEF I mis-identified a reader who not only provided great commentary on the Before Takeoff flight control check, but also was recently accredited as a Master CFI-Aerobatics. The reader's correct name is Tony Johnstone. Sorry, Tony; thanks and congratulations again.

# Call to Action

*"Being a professional pilot is a mindset, not a paycheck"*—Susan Parson, special assistant in the FAA's Flight Standards Service's General Aviation and Commercial Division and editor, *FAA Aviation News*

Last June FAA held a Call to Action on Airline Safety and Pilot Training conference that identified four areas of pilot human factors that need improvement. Ms. Parson (a *FLYING LESSONS* reader) notes these focus areas are relevant to general aviation pilots as well. She challenges pilots, flight schools and general aviation organizations to commit to improving:

- **Training standards and performance,** especially the use of realistic scenarios in pilot training. "Train the way you fly, and fly the way you train" is the mantra of this approach.
- **Professional standards and flight discipline**, which promoted Ms. Parson's quote at the beginning of this section of *FLYING LESSONS.*
- **Mentoring.** Find a mentor to help you gain experience in new areas. If you have a special expertise, reach out to other pilots. FAA's *Best Practices for Mentoring in Flight Instruction* is a good guide.
- **Education and support.** If you own or operate a flight school, consider what you can do to ensure your flight instructors have the knowledge, skills, attitudes and support they need to nurture safe pilots.

See:
www.faa.gov/news/aviation_news
www.faa.gov/training_testing/training/media/mentoring_best_practices.pdf.

# QUESTION OF THE WEEK

## October Question of the Week #2

This week's question comes from a *FLYING LESSONS* reader who asks:

> **How does your decision-making process proceed when there is a chance of icing in the forecast?**

Win your choice of a Mastery Flight Training hat or the instructional DVD *Those Who Won't: Avoiding Gear Up and Gear Collapse Mishaps*. Answer this Question of the Week to be included in the random drawing for September. Copy and paste the questions with your response to MFTsurvey@cox.net…then come back to read the rest of *FLYING LESSONS.*

Last week we asked:

> **Have you ever had a "near accident" as a result of GPS or other navigation system programming? What did you learn from the experience?**

Several readers replied; here's what some had to say:

- After getting my IFR rating, on my second actual instrument approach, I had to go missed. I hit the suspend button too early before the MAP and started reprogramming the GPS thinking I could fly and reprogram at

the same time. About the time my wife said, “I see the ground”, I heard the increase in RPM of the engine and realized I had rolled left and was diving. The recovery was fortunately uneventful

- Forgetting to change the HSI source from GPS to VLOC. The newer 430/530 Garmins are supposed to do so automatically but they do so pretty late into the approach, all the while I'm trying to figure out why the picture on the moving map doesn't match the picture on the HSI.

- No, I really haven't. Several times I have, however, had the GPS sequence to a waypoint I hadn't wanted or expected. In each case I caught it quickly and reset it to the correct waypoint, since I had a pretty good idea of what my distance and heading should be for the next segment.

- When GPS RNAV approaches were introduced in Australia some years ago I fitted my airplane with the then brand new Garmin 430. On a Sunday I was given my endorsement to fly the GPS approach and the chief instructor advised me to fly a few approaches in VMC to get used the then "new" approach. I heeded the advice and that day I flew three additional GPS RNAVs into unfamiliar airports on my way home.

  As luck would have it my home airport was socked in with bad weather down to the minimum of 1000'. It also had only a brand new GPS approach. I was granted the required IFR clearances and unbeknown to me the air traffic controller was watching my approach because he had never seen one done. Everything was going to plan and the Garmin was working a treat and I said to myself "how easy is this". Then the radio cracked to life and it was the ATC who advised I was 3 miles right of tract in very hilly country. I looked at my pilot passenger and I said it looked as though the Garmin was right on the GPS waypoints.

  I waited a few moments while we went over the next waypoint and Bang we went right over the top of it no more than 100' away. I reported to ATC I was right on top of the intermediate waypoint and at this stage I was less than 1500' with mountains 3000' around me. ATC growled back "Make immediate left turn-you are 3 miles right of track!" I looked over to my pilot buddy and said "I want to believe the Garmin, but either the data base is wrong or ATC has made a mistake. There is only one thing we can do and that is to immediately climb to the LSA [Lowest Safe Altitude] and sort out the problem later."

  It is a real scary situation…in IMC below mountains tops. We radioed our intention to climb to the LSA. Just as we started to climb we broke in to VMC with mountains on both sides of us, right on the GPS track.

  On the ground I rang ATC and asked what went wrong and they said I made a mistake. I requested we fly the approach the next day under their guidance to see what the problem was. The next morning our equivalent to FAA rang me and wanted all my pilot licenses, etc. and was investigating the first GPS approach stuff-up in Australia (a great achievement to be remembered for). Little did he know, two minutes before the chief ATC officer rang me to tell me his controller had made a mistake and displaced all the waypoints on the approach plate by one waypoint, making it appear to him I was off course. My GPS tracking was not in error!

  What I learnt from this was if ever you have any doubt over the integrity of your position in IMC using GPS guidance, climb immediately to the LSA and sort out the problem where it is safe. I am one of the lucky ones to live to tell the story.

  Footnote: The ATC officer concerned was taken off active duty to have remedial training and the Australian ATC computer was reprogrammed so that GPS overlays were automatically generated from verified data bases.

Thanks, readers, for your stories. The overriding *FLYING LESSONS* seem to be:

1. Attain, and then maintain, a high degree of familiarity with the GPS installed in the airplane you’re flying.
2. Cross-check GPS position with other sources, including expectations of headings from preflight planning and following your position on navigation charts, before blindly following the magenta line.

Do you have a question or comment? Email me at mastery.flight.training@cox.net.

***Fly safe, and have fun!***

Thomas P. Turner, M.S. Aviation Safety, MCFI
2008 FAA Central Region CFI of the Year