FLYING LESSONS for December 8, 2016

FLYING LESSONS uses recent 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 airplane have little direct bearing on the possible causes of aircraft accidents—but knowing how your airplane's systems respond can make the difference as a scenario unfolds. So apply these *FLYING LESSONS* to the specific 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:

Former test pilot, current pilot examiner and flight instructor, and frequent Debriefer Dale Bleakney wrote in last week's Debrief:

> I have been fortunate to have survived 14 engine failures; nine in singles, five in twins…about one every 1000 hours. When you read my article, you will see how I have dealt with that.

See http://www.mastery-flight-training.com/20161201-flying-lessons.pdf

Here is Dale's article, reprinted with his permission in its entirely. It appears exactly as he sent it to me, except for formatting:

Dead Stick

by Dale Bleakney

As we continue to work our way through the economic upheaval of the past few years, not to mention a long, dark, and maybe cold winter, a number of you will be taking to the skies again to take part in one of the greatest feelings known to mankind, Pilot-in Command of your own or rented airplane.

What would you do if the unthinkable happened? Your single engine airplane had an engine failure.

I have been fortunate enough to survive 4 engine failures at night in single engine airplanes. I have also had 3 engine failures in twins but I will not discuss those here.

Some of you are probably wondering what airplanes/engines have been the culprits: Bonanza (Continental Engine), Cessna 150 (Continental Engine), Mooney 201 (Lycoming Engine), and Cessna Cardinal RG (Lycoming Engine). So as you see, no prevailing tendency is obvious. I will discuss all of these engine failures in detail to maybe give you some insight into things you can do to hopefully prevent: but if not prevent, at least survive, an engine failure.

Engine Failure No. 1 (Bonanza Fuel Starvation)

In August 1980, I departed Wichita, KS for Moultonboro, NH, in a fairly new Beech A36 Bonanza. The flight was conducted under IFR flight rules, as there was some fairly significant weather between Wichita and Moultonboro. I departed Wichita at approximately 1500 CDT (**mistake no. 1)** and expected to get to NH at about 2330 EDT. This was extremely optimistic. I landed in Ohio for fuel at and was comforted by the fact that although I would still be IFR for the remainder of the flight, I was on the eastern side of the cold front, and anticipated no serious weather. Due to unavailability of line service personnel, it took much longer to obtain fuel than anticipated. I departed the Ohio airport at approx. 2130 for the 3.5-hour leg to NH I climbed to 11,000 feet, turned on the autopilot and anticipated a smooth, on-top, high tailwind culmination to a long day. About 1 hour into the flight, over Cleveland, OH (CLE), my Horizontal Situation Indicator (HSI) started doing about 50 rpm. Weather was approx. 300/2 with heavy rain. Without my HSI, I would have no autopilot, but I decided to continue on after notifying ATC and

discussing my options (**mistake no. 2)**. Over Syracuse, NY (SYR), I lost my no. 2 Nav. Weather at SYR was approx. 100/1 (below minimums).

Due to the fact that the weather at my destination was 1500/5, I felt that this would be a better option considering the fact that I was in the clear with a 30-knot tail wind.

At approx. 0200 EDT, I initiated a descent into Laconia, NH (LAC). I looked at both fuel gauges and saw that they were both indicating ½ tanks, so I chose not to switch tanks (**mistake no. 3).** I executed a partial panel NDB approach to runway 08, and proceeded across Lake Winnepesaukee to Moultonboro, NH (**mistake no. 4**).

Halfway across the lake, the engine quit. It took me a few seconds to realize what had happened (denial phase). The reason it took me a while to recognize the problem is because I was not prepared for the lack of a serious reduction of any of the power indicators. Manifold pressure stayed about the same (since it went to ambient pressure), and rpm was steady (since oil pressure was nominal and airspeed was still normal).

I realized what was going on and then followed the emergency procedures. I switched tanks, got the boost pump ON and managed to restart the engine. I turned the boost pump OFF, and the engine died again. Since I was unsure of what was going on, I switched tanks, (remember both gauges indicated ½ tanks) (**mistake No. 5)**, turned on the boost pump, and restarted the engine. I left the boost pump ON (thinking engine-driven fuel pump failure), seconds later the engine quit again. Not knowing what was going on and running out of altitude I proceeded to dead stick the airplane close to the LAC airport. If I had another 100 feet, I could have made the runway, 100 less feet and I would probably not be writing this article. The airplane was totaled (but is now flying again under US Gov't registry). There were only minor injuries to my two passengers and me. One of the passengers became my wife in 1981 and has stuck with me through all my flying adventures over the last 33+ years.

Cause of Accident: Fuel Mismanagement. I ran a fuel tank dry and didn't know it.

Mistake No. 1. I took off after a full day's work for a long flight into marginal weather. I was fairly young (22) at the time and never really considered whether I was exceeding my capabilities. Fatigue played a factor in the accident; how much is hard to determine. Fatigue is one of those insidious things that by the time you recognize that you have it; it is too late to do anything about it. I also consider the fact that I spent a lot of the flight at night, at 11,000 feet, a contributing factor to the accident.

The military has pilots on oxygen when they are above 10,000 feet (day) and 8,000 feet (night). Perhaps oxygen use or a lower cruise altitude would have been warranted.

Mistake No. 2. I continued the flight after the loss of the HSI. The HSI provided the no. 1 Nav information, heading information, and autopilot/heading approach bugs. I should have acknowledged the severity of this malfunction and diverted to a suitable landing site.

How many of us factor in a full-functioning autopilot into our flight planning without the thought of what happens if we lose it?

Mistake No. 3. I chose not to switch tanks. During the last 1.5 hours of flying, I continued to add aileron trim to reduce the workload associated with flying the airplane. This trim increase should have been an indication to me that the fuel was not burning evenly or that my gauging system was in error. Due to the distractions of the other failures, I missed the fuel tank switch and the fuel gauge error only made the situation worse. How many of us remember to switch tanks using our watches and confirm with gauge indications?

Mistake No. 4. I chose to proceed across the lake to a short, not-well-lit runway after a long, tiring flight. I should have landed at LAC and rented a car when I had the chance.

Mistake No. 5. I switched from a fuel tank with about 25 gallons in it, to an empty tank. At the time I was unsure of where the fuel was but should have tried the boost pump one more time. The reason the engine died after switching tanks was that I sucked some air into the system (vapor lock) and didn't give the auxiliary fuel pump enough time to purge the air from the system.

I don't recommend running fuel tanks dry before switching tanks as this will introduce air into the system and may lead to engine restart difficulties.

I learned a great deal from this experience. I learned about my own limitations, the importance of knowing your airplane systems and design limitations, and the affects of hypoxia and fatigue. I was fortunate enough to survive this valuable learning experience.

Lessons Learned

Although I have dwelled a bit on my mistakes, I think I did do a couple of things right: (1) I continued to fly the airplane all the way to the ground; and (2) I never gave up. If you fly the airplane to the ground, you have a much higher chance for survival. From this experience I learned about **risk factors** when planning a flight:

1.	Day/Night	Night is worse
2.	VFR/IFR	IFR is worse
3.	SE/ME	Single engine can be worse. ME airplanes less than 6000 lbs. are not required to have a single climb rate that is positive. Even in ME airplanes > 6000 lbs. you should take into account the SE service ceiling when flight planning.
4.	Mountains/Water	Both are bad. Even over flat terrain, one should choose the flight path that maximizes options should something bad happen.

Some years ago I was preparing for a presentation on engine failures, I uncovered the following statistics pertaining to the fatality rate after engine failure in a single-engine airplane:

Chance of fatality after engine failure in a single-engine airplane:

Day:	15%
Night:	35%
Night & IFR:	85%

Make a conscious decision on how many risk factors you are willing to assume. I choose to get up at 5:00 a.m. and fly until about 3:00 p.m. so that I can be in a hotel by 6:00 p.m. I don't work all day and then fly from 3:30 p.m. until midnight. Stay hydrated (drink plenty of water) and use oxygen if flying for prolonged periods above 8,000 feet.

A final thought on this engine failure

I now only combine two of the mentioned risk factors at a time. I won't fly night, IFR, single engine unless the IFR choice is only to get me on top and there is good VFR below the clouds in the event of an engine issue. I also don't fly night, IFR, mountains (or water). This engine failure was night, IFR, single engine, mountains. Luck and divine guidance played a part in surviving this. I have faith but I try not to have faith or hope be my only strategy.

Another important lesson that I learned from this accident had to do with the recognition of an engine failure. In the case of a fixed-pitch propeller airplane, the first indication will be loss of engine rpm, not so in the case of a constant-speed propeller airplane.

In the case of a constant-speed propeller airplane there will be little change in engine rpm (unless you lose oil pressure, then rpm may go up), there will be little change in Manifold Pressure as the MP will revert to ambient pressure (sea level reduced 1" per thousand feet). There will only be a slight difference (if any) between cruise MP and ambient. Look at the MP before engine start and you will see what I mean. Fuel flow will only change if there is fuel exhaustion or starvation.

As instructors and pilots, do we think about what the indications will be on our airplanes when we lose the engine, vacuum system, electrical equipment, etc?

Engine Failure No. 2 (Cessna 150 Carburetor Failure)

One night in the summer of 1985, I was providing dual instruction to a student in her Cessna 150 in preparation for her Private Pilot's license. We were completing the 3 hours of night time by doing the last thing on my syllabus: Stalls. Her airplane had just come out of an annual and we were looking forward to finally finishing. During the pre-start checklist, I noticed a smell of gasoline, but ignored the smell (**mistake no.1)** as I assumed it was due to some primer leakage (not uncommon in older 150s, 152s and 172s).

We flew to the practice area and did some power-on stalls followed by a power-off stall. When the power-off stall was completed, the engine failed to respond. We were high enough and close enough to an airport to successfully complete an on-airport emergency landing.

Mistake No.2 The lesson learned form this engine failure was: Don't assume everything is okay with an airplane. Be a guarded pessimist and assume that the worst thing will happen at the worst possible time. I am an optimist in life but a pessimist with an airplane. If something isn't quite right, stop to investigate. I haven't always followed this axiom but try very hard to do so.

The other thing I learned is that altitude is your friend. I would often do stalls in Cessna 152/172 airplanes at 3000 feet (1700 AGL) with no real thought about what could go wrong. I now do all my stalls at 3000 AGL to give me plenty of time to react to a bad situation. If you have altitude, you have time. If you have time, you have options.

I was once told the 4 most useless things in the air are: (1) Runway behind you, (2) Altitude above you, (3) Air in your tanks/fuel left at the airport, and (4) A high ranking navigator (sorry military guys, just repeating it).

Engine Failure No. 3 (M20J Fuel Tank Switching Failure)

In 1993, I was flying a Mooney 201 from Wichita, KS to Hutchinson, KS (HUT) for a quick night flight/dinner with my wife, son, and daughter (same wife as Dead Stick no. 1). On approach, I went through the pre-landing checklist and switched to the fullest tank. As some of you may know, on the older Mooneys you need to shift from right to left tanks by going through OFF. As I moved the selector from right to left, the handle came off and the selector was stuck in the OFF position. With some work, I was able to get the handle back in the Left position and successfully execute the landing at HUT.

After further investigation it was determined that the fuel selector was corroded/worn and needed to be replaced. Since then, I make sure that as part of my preflight of the airplane, I move the fuel selector through all the available positions before takeoff.

In Cessna 150/152s, do you see if you can turn the fuel OFF and then back ON every flight? On 172s or other multi-tank airplanes, do you make sure that the fuel selector can be moved to all the available positions as part of your preflight?

In older Mooney airplanes, the fuel selector is in a position where you can't see it at night and need to go through OFF to get form left to right fuel tanks. This does not meet current certification requirements and is especially challenging for Beech and Cessna pilots not accustomed to going through OFF when switching from one tank to the other.

Again, this is meant to illustrate the importance of understanding the systems on your airplane and how they all work. Try not to complain too much if the checkout in a new airplane is thorough as this knowledge may be very useful later on. As FlightSafety states, "There's nothing safer than a well-trained pilot".

Engine Failure No. 4 (Cardinal RG Crankshaft Bearing Failure)

On July 3, 1999, I departed Jabara Airport, Wichita, KS, for Topeka, KS, to pick up a friend's airplane. The friend had called me earlier in the evening and stated he was in the hospital and would like to get the airplane back to Newton, KS (just north of Wichita). I agreed to do the favor for the friend.

I picked up a rental airplane (Cardinal RG) at Wichita Jabara Airport and had asked a fellow pilot to come along so we could get the two airplanes back to Wichita together. When I preflighted the Cardinal RG, I noticed it was 2 quarts low on oil, but figured the oil hadn't been properly checked by the previous renter (**Mistake No.1)**. We agreed to fly together to Topeka, pick up the airplane, fly separately to Newton, then fly together back to Wichita.

The first and second parts of the flight were uneventful. We joined back up at Newton at about 2200 (CDT) and were glad to have only a short 20-mile flight back to Jabara. The takeoff was normal. Since it was such a short flight, we only climbed to about 2500 AGL (remember what I said about altitude being your friend). About 5 miles north of Jabara, we began the descent into the airport. I was in the right seat of the airplane and it appeared to me that the engine was at a very high rpm. I looked down at the tach and saw the engine was at approx. 3600 rpm. I moved the prop lever all the way to low rpm and the rpm stabilized at about 2700 rpm (redline). This didn't last long as the airplane began to vibrate until a loud bang was heard. Knowing that the engine was gone, the pilot in the left seat relinquished control to me. I noticed a car moving east below us (we were approx. 800 AGL) and decided to attempt an off-airport landing on the road.

Fortunately for us, the road was a 4-lane highway (although you can't really see it with your landing light until you are a few hundred feet above it). The lights for the car gave me ample means to line the airplane up with the road and we executed a successful emergency landing (the airplane wasn't scratched). I learned a lot about crew coordination as the other pilot on board did everything except fly the airplane. He handled the gear, flaps, spotting for wires, watching airspeed, flaps, curves in the road, etc. Crew coordination, in a multi-crew environment, is essential to a successful outcome. Luck was in our favor as we picked a 3-mile stretch of road that had no power lines or other obstructions that would hurt us.

We landed the airplane going east when the wind was from the south at 18 gusting to 26 knots. Why did we do this, probably the best answer is divine inspiration. It seemed like the best thing to do at the time. Some of you may be asking why we didn't put the airplane into the wind, slow to best glide speed, squawk 7700, etc. The answers to these questions are as follows:

1. **Airplane into the wind:** In the heat of the moment, the road seemed like the best alternative. It was night with no other visible alternatives. There wasn't a lot of time to consciously decide the best alternative, this was purely a reaction and I got lucky. Had I turned south into the wind I would have probably gone through some 70-100 ft. high power lines that were about a ½ mile south of the road we landed on. As I told the Sheriff's officer, I don't know what God has planned for me but he has my full attention.

2. **Slow to best glide speed:** The propeller was still in a slight case of over speed due to the loss of oil pressure. I didn't know the affect of the flat plate drag caused by the high rpm propeller on the tail surfaces so chose to maintain a moderate airspeed (100 knots) until I was in ground effect. I also used this speed to go over the top of the car and get far enough in front of it to prevent a collision from the rear.

3. **Squawk 7700:** The primary mission was to fly the airplane. The desire to divert my attention from flying the airplane to change transponder codes, never really crossed my mind. I have been taught from a very early age to aviate, navigate, and communicate, in that order. The necessity to maintain 100% airplane control, in my opinion, took precedence.

The most important lessons I have learned from all these experiences are as follows:

Practice, practice, practice

You can never practice enough. If you have not had a chance for sufficient practice, consider flying with an instructor who may be able to provide some constructive feedback on some areas to emphasize. In my case, I am fortunate to have been very proficient at simulated emergency landings and crosswinds at the time of all my emergencies.

Partial Panel/Hood work

I have had 4 vacuum failures as well as the engine failures (there's something about the number 4). Be prepared to cover up defective instruments with round suction cups or other suitable device (post-its can be used in a pinch). You can imagine how fatiguing it is to have a defective instrument still in your scan.

Be a guarded pessimist
I mentioned this already, but it is worth repeating. Expect something to go wrong at the worst possible time and it will help you make better go/no-go decisions. Weather forecasts should always be assumed worse than forecast, weather at the destination worse than expected, fuel consumption higher than anticipated, and performance worse than expected, etc. This will always give you an extra margin of safety when things go wrong. I hope that they won't. Do we practice partial panel procedures? Do we carry partial panel covers so that we can cover up inoperative instruments? Do we teach recognition as well as procedures?

Best Glide RPM
Some manufacturer's data for best glide assumes that you move the propeller lever all the way to low rpm. If you have never tried this, you should, as you will be amazed at the difference it makes.

Learn from others
Read articles in flying magazines to gain experience from the mistakes and good fortunes of others. These data will pop into your head at opportune times and can save you in some of these situations.

Stress, Fatigue, and Hypoxia
All of these medical conditions are insidious and can lead to unsafe conditions. Know what your symptoms are, how you deal with them, and take corrective action to mitigate the risks.

Some last thoughts

I wrote this back in 2009. I have now had a total of 14 engine failures. 9 have occurred in singles and 5 in multi-engine airplanes. Except for the first one, I can honestly say that the rest were not directly a result of anything I did or didn't do.

Engine power loss No. 13 was on 9/27/2014 and resulted in an emergency landing to an airport. I was lucky to be close enough to land at an airport. As usual, I learned some things.

1. I was at 8000 feet, VFR on top of a broken/overcast layer when I had a sudden loss of engine power. I knew, from experience, that I had probably lost a turbocharger. In the airplane I was flying, that left me with insufficient power to maintain altitude (even at best glide speed).

2. Knowing this, I asked Kansas City Center to point me to the closest large airport. I had the nearest airport feature up on the G1000 system but thought it best to fly the airplane and ask for help. My words to center were approximately, "I have a problem, I'm declaring an emergency, and I would like a vector to the nearest large airport. This saved me valuable seconds. I could have done some of those things myself, but I found it better to have them working for me. I know it helped.

3. I managed the energy to arrive over the airport with spare energy. I circled on downwind and used the center of the 7000-foot runway as my aim point. I then used normal drag devices to land where I wanted to. I always aim for the middle of the runway. In my opinion, going off the end at slow speed is always better than landing short.

   The controllers authorized a downwind landing but it was not necessary. Sometimes down wind is your best way to make it to the airport. You end up with more energy on landing but you can use this to get to a better landing surface.

4. In recent articles, there has been some discussion about partial power loss. This can happen as I mention above. If you lose a turbocharger in other airplanes, you may be able to maintain some amount of power if you lean using the EGT. This may get you enough power (at low altitude) to choose a normal landing spot.

I always appreciate feedback from others. Please forward it to me as you wish.

Dale's experience may seem extraordinary. Whether or not an expectation of one engine failure per every 1000 hours of piston flight is realistic for most pilots, however, Dale's observations serve as a reminder that **engine failure can happen to *anyone* at *any time***. We can never let our guard down, because we have no way of knowing if our current flight is the one in which we'll be put to the engine failure test.

The outcome of engine failure is a matter of pilot ***readiness***, ***experience*** and ***mastery*** of the particular airplane under the conditions the pilot has chosen to fly. There's a certain amount of luck involved, too, but you cannot depend on luck alone to ensure your survival and that of your passengers and the persons over which you're flying should this flight be our "thousandth hour".

Thank you, Dale, for sharing your *LESSONS* learned from four of your dead stick landings.

Comments? Questions? Let us learn from you, at mastery.flight.training@cox.net

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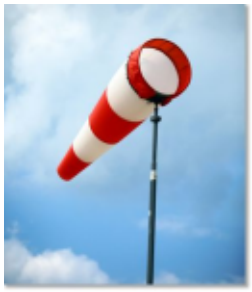
Because of the length of Dale's article I will defer my promised further focus on mechanical causes until next week's *LESSONS*.



What's the best way to estimate crosswinds?

Click here for a simple, effective, yet rarely taught tip.

See http://www.pilotworkshop.com/tip/estimating-crosswinds/turner

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It takes most people about five minutes to read an issue of *FLYING LESSONS Weekly*. That adds up to about four hours each year. If you've enjoyed at least the equivalent of one hour's worth of dual instruction from the approximately 50 *FLYING LESSONS* you've received this year, please consider donating what you'd pay an instructor for that hour in the aircraft you fly to help cover the expense of bringing you this free (and I'd like to think, valuable) resource. If you have benefited more please consider that as well. I'll use your contributions to make *FLYING LESSONS* even more meaningful to you and your family's safety and enjoyment of personal aviation in 2017. Thank you, and pursue ***MASTERY OF FLIGHT***!

I hope you get my check shortly and still think your readers should be given reminders to regularly, like every 6 months, agree to donate an amount they pick as 'thank you' for your ongoing efforts. It takes time and knowledge and dedication. – Jerald Duncan

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Flight Instructor Hall of Fame
2010 National FAA Safety Team Representative of the Year
2008 FAA Central Region CFI of the Year
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