FLYING LESSONS for September 3, 2020

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 in your success 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:

It's far less common, but far better to have stories of success than to learn all our *LESSONS* from accounts of failure. This week we hear from *FLYING LESSONS* reader, Beech Bonanza owner/pilot and—not inconsequentially—President and Chief Executive Officer of premier simulator-based training company SIMCOM Aviation Training Eric Hinson.

> [I've sent] a summary of my power loss incident and some thoughts I have. I am sure you have some thoughts as well so please feel free to comment, or add as you wish. Photos taken immediately post flight of the bottom of the aircraft and the aircraft at the end of the runway (you can see the tire tracks in the grass if you zoom in). I think there are some good *LESSONS* to share here.

Here is Eric's account:

Summary of N3699G loss of power incident

Aircraft: 1981 A36TC Beechcraft Bonanza
1920 hours total time, approximately 150 hours on factory remanufactured Continental [TS]IO-520[UB]

Airport: KSFB [Sanford, Florida]

Pilot: Eric Hinson. ATP MEL, 5400 TT, 1700 hours in Bonanzas

Background: Flight prior to incident flight:

- Aircraft was refueled in KSUA [Stuart, Florida] to the detent in the tabs (visually confirmed) in both tanks (64 total usable gallons) and then flown to KSFB, 45 min[utes flight time]
- Last annual completed in October 2019 with no fuel system discrepancies noted.
- Most recent replacement of fuel bladders was 2007.
- Pilot attended recurrent training (Piper Meridian course) in Dec[ember] 2019. Multiple engine loss after take-off scenarios conducted at various altitudes during training.

Incident: Flight was VFR from KSFB to KSUA (110 nm, 40 mins). Total fuel required was 20 gallons. Preflight was normal. Fuel caps opened and no fuel was visible in either tank. That was expected given there should have been approximately ½ tank remaining in each tank after previous flight. After powering up the [aircraft's] fuel was verified at between ½ and $^{2}/_{3}$ tank on the left side and slightly less than ½ tank on the right. Total fuel on board was approximately 40 gallons. After starting the tank selector was switched from right to left in order to burn from the fuller tank.

Run up and pre-take-off checklist was completed without incident. I elected to take an intersection take-off from A3 intersection on 9L. Total [runway] distance remaining is 5800 foot. The aircraft is based near this intersection and I use the intersection for takeoff on a regular basis.

Takeoff was uneventful. At 300 feet [above runway elevation] I lowered nose and accelerated to 120 knots for climb. The lower climb profile was used because of the Orlando Class B airspace overhead KSFB and the desire to stay clear of traffic. Power was set to 30" [manifold pressure; 36" is red line and maximum continuous power—TT] and RPM to 2500. At approximately 800 feet MSL [745 feet above field elevation--TT] the engine abruptly quit. The aircraft started to decelerate rapidly and after two or three seconds (surprise factor) I started a left (northerly) turn to return to the airfield. While in the turn the engine momentarily fired and then quit again. At this point I called SFB tower and declared an emergency.

While in the turn I traded airspeed for an increased turn rate to get pointed back to the field as quickly as possible and hit my target glide speed of 100 knots (yes the POH calls for 110 knots for the A36TC but I try to use easy numbers to remember and have always told myself to target 100 knots). Also, while turning I checked my fuel indication and I was still showing about ½ tank on each side. Thinking it might be an electrical [ignition] problem, I switched my magnetos from left to right. Nothing happened so I returned the mag switch to both.

Once the aircraft was pointed back toward the field ([Runway] 27R) I was at approximately 500-600 fteet and two things became apparent: (a) I was going to make it inside the airport perimeter and (b) I was ***not*** going to make it all the way to my only runway option, 27R. At this point I pulled my RPM to low [to reduce drag for maximum glide per the emergency checklist—TT] and also decided to pull my mixture all the way to lean and then increase it in the event I had [a] mixture problem. I started searching for possible places to land the aircraft.

I'm now approaching 27R from a heading of approximately 230 (I elected to turn to the north to return). As I approached the perimeter fence of the airport, I noticed a large ditch on the north side of 27R running past the approach end and out beyond the threshold. My desire was to get to the south side of the ditch as a considerable amount of the long grass has been mowed before the approach end of 27R. There is also about 800 feet of pavement that extends beyond the approach end of 27R.

At approximately 300 feet AGL, I realized I had not switched fuel tanks and reached down to select the right tank. At approximately 200 feet AGL I decide I needed to adjust my glide profile in order to assure I would clear the ditch. I selected approach flaps and adjusted the nose to capture 70 knots. After clearing the ditch and at approximately 100 feet AGL I lowered the gear and landed in the grass, and rolled out to stop on the pavement at the approach end of 27R. I called tower and let them know I had arrived.

The SFB fire department met me at the end of 27R as I exited the aircraft. Post-flight aircraft inspection revealed blue staining from the 100LL between the left wing and fuselage [*right*]. Fuel was available at both sump drains. After being cleared by the local FSDO [FAA Flight Standards District Office], I attempted to restart the engine and after several minutes was able to do so (on the right tank which I had switched to at 300 feet). I taxied back to the hangar and then switched tanks (the gauge was still indicating half a tank in my left tank) and ran the engine for another five minutes at 1000 RPM and the motor continued to run.

After shutdown the left tank was drained and the total fuel remaining in the tank was ½ gallon. Subsequent maintenance revealed that the section of the fuel bladder where the exit nozzle (to the engine fuel line) mates with the bladder had torn and become completely porous, and fuel was leaking out before it would enter the fuel line. Other than that location (where the exit nozzle mates to the bladder, not where the nozzle mates to the fuel line) the fuel bladder appeared to be in excellent condition. The fuel bladder in the other tank showed no signs of wear. I also asked maintenance to look at the fuel indicators, as post-incident the plane was still indicating ½ fuel in the left tank when we knew now that it was completely empty. The inspection revealed a faulty fuel sending unit. As the armature was moved from full to empty, erroneous output was occurring below ¼ indication. I had never noticed any erroneous fuel indications on prior flights, but I seldom fly the aircraft to a point where there is less than ¼ fuel remaining in the tank.

LESSONS

"Aviate, navigate, communicate" and "Any landing you can walk away from…." are two old aviation adages that immediately come to mind. In retrospect, though I am obviously pleased with the outcome (no damage to me or the airplane), there are several good lessons to take away from this incident. Let's start with decision making:

DECISION #1. I elected to fly the aircraft on a 40-minute flight with, by my best estimate, 2.1 to 2.3 hours of fuel on board. While it probably did not affect my outcome (fuel was no longer entering the engine fuel line due to the leak), you should ***consider what happens if the fuel in one tank becomes unusable***. In my case I would have about an hour

of fuel, not the 2.1 hours I thought I had. That's something you should keep in mind when you are flight planning and may have long legs with limited alternate landing options.

DECISION #2. I elected to take an intersection takeoff. I enjoy flying my Bonanza in the back country and often use fields with less than 2500 feet. 5800 feet seems very generous. However, had I elected to taxi to the departure end of 9L I would have had 11,000 feet of runway. ***My options for a loss of power after takeoff would have been significantly greater had I used the entire runway.*** In my case I would have been able to easily return to the runway instead of landing short in the grass. Another adage comes to mind here: "Superior pilots use their superior judgment to avoid situation which require the use of their superior skills". I could have made the entire problem more manageable had I used the entire runway.

DECISION #3. I elected to use a shallow climb gradient after take-off. While there is a lot of traffic in the Orlando area, the class B airspace over KSFB does not begin until 3000 feet MSL. Furthermore, KSFB has class C airspace and KSFB tower controls that airspace up to 2,999 and out to 5nm. ***A normal climb gradient would have placed me sufficiently closer to the field and most likely I would have been able to make back to the runway.*** Climbing at Vy would have meant a lower airspeed when the failure occurred, however, my altitude would have been higher thereby improving my overall chances of getting back to the runway.

DECISION #4. ***I performed the bold-face engine failure checklist out of order***. Ok, this was not so much a decision as it was a reaction to the circumstances. Nevertheless had I had the presence of mind (and believe me nobody has it more drilled into their head than me that **99.9% of all engine failures are due to fuel starvation**) to switch tanks immediately and turn on the boost pump I most likely would have succeeded in restarting the engine before being forced to land. Based on ADS-B data my total flight lasted 2 minutes and 30 seconds so perhaps I'm being over critical. Nevertheless, once I had solved the immediate "aviating" problem of getting the aircraft turned back towards the field, I should have attempted to switch tanks first rather than last.

SOME ADDITIONAL OBSERVATIONS:

1. ***Nothing prepares you better for a non-routine event than practice.*** I had the good fortune to practice the exact scenario that occurred to me several times over the past few years during annual recurrent training. I have conducted that training in simulators and in the aircraft and knew what decision to make based on my altitude. These number work for me in my aircraft but, working with an instructor, you should determine what numbers are right for you: **800ft AGL or higher-** return to the field; **600ft to 800ft-** depending on winds, climb angle, available runways, return or only look 90 degrees either side of the plane; **below 600ft-** 45 degrees either side of the nose of the aircraft.
2. ***When the engine quits during climb the deceleration of the aircraft is very pronounced***. In my case I had extra airspeed giving my shallow climb profile, so I had more margin to work with as the aircraft slowed. Hitting your target engine out airspeed is critical if you want to maximize the performance of your aircraft. ***If you are climbing at Vy or Vx you need to lower the nose quickly to maintain optimal glide speed.***
3. ***Startle factor is real and you need to account for it.*** I've been flying for more than 40 years and I've had various emergencies in the past, but none that have required immediate decision making. It's hard to put an exact number on it but, at minimum, it was 2 to 3 seconds after the motor quit [before] I initiated the turn back to the field.
4. If you are trying to stretch your glide ***in an engine-out scenario there is a strong urge to raise the nose of the aircraft*** which, of course, reduces your airspeed and soon results in a greater rate of descent or, even worse, a stall. As I approached the ditch I was only partially successful forcing myself to maintain my glide airspeed. I did let some speed bleed off as I raised the nose of the aircraft to "stretch" my glide. I would estimate I was at 90 knots when I selected approach flaps knowing this would give me additional stall margin and would decrease my rate of descent temporarily as I raised the nose to capture 70 knots. That momentary decrease in my rate of descent was sufficient to ensure I cleared the ditch.
5. The fast extension speeds of the landing gear in the A36 Bonanza is a real asset in this type of emergency. It allows you to maximize your glide range before lowering the drag inducing landing gear. It also allows you to make your final decision (gear up or down) only when you are assured you can make it to a surface that allows you to use the landing gear.

See www.simulator.com

Well done, Eric. Per your request I'll comment, but there's not a lot to add except:

- Your experience mirrors that of many well-trained pilots—you got most things right, but you wish in retrospect you had done better. That's natural. Most importantly, however, ***you flew the airplane***. And as status changed, you quickly reevaluated your options and

made conservative decisions. Could you have restarted the engine? Maybe. Was of control of the aircraft ever in doubt? I don't think so.

- As you said, the well-trained pilot of a single-engine airplane may be able to safely make a return to the airport after an engine fails, especially if the training includes surprise events in a simulator. I found it interesting that you phrased it like this: "**800ft AGL or higher**- return to the field…." Because that's very close to what I teach as a result of putting hundreds of pilots through this scenario in a simulator: you can return to the ***field***. That is, you may be able to get back to the airport grounds—the flat ground, the grassy area, perhaps a parallel taxiway or runway, maybe even as you did a paved overrun. It's extremely unlikely, however, that after a total engine failure you will turn around, line up, touch down on the departure runway, roll to a stop and then radio the FBO to come tow you back in. If your expectation is that you will fly under control to land on what's available, and not think in terms of getting back to *the runway*, you will be able to fight that very strong temptation to "stretch the glide" and make a successful landing.
- Quoting from the top of every issue of *FLYING LESSONS Weekly*, "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 in your success as a scenario unfolds***."

Great *LESSONS*, Eric. Thank you very much for letting us all learn from your experience.

Questions? Comments? Experiences of your own to relate? Send them to mastery.flight.training@cox.net.

Debrief: Readers write about recent *FLYING LESSONS:*

Readers responded to last week's *LESSONS* that stem from the crash of a Grumman AA-5 that we've been discussing the last couple of weeks. Reader and air crash investigator Jeff Edwards writes:

> Great piece, Tom! This accident was the result of a poor GA safety culture that explicitly and implicitly endorsed these actions. Certainly, many people knew what was happening from the co-owner to the airport manager. Until the pilots on the side of smart safe flight operations step up and apply some positive peer pressure this conduct will continue.

Thank you, Jeff. Reader and career instructor Dave Dewhirst adds:

> What a great article. All those responses are eye-opening. I have also heard some of those things, but I had no idea how widespread those thoughts are. We share the air, friends, and the insurance industry with these people. Keep up the good work, my friend.

Thank you, Dave. I fear these things are far more widespread than we'd like to believe. I'm going to delve just a bit further into the sociology of this in a moment, hopefully without losing my audience.

Reader and instructor Ed Wischmeyer adds:

> [You wrote]:

> What troubles me even more is that **many, it appears, knew of his habits.** Why did the airport manager, another pilot, or someone not talk with him? This is very sad and reinforces why **we must always approach the flying we do with professionalism** , even as a Private Pilot.
>
> This question turns up all the time in the experimental, amateur built community and elsewhere. The short answer is that accountability is not an American virtue, but freedom is. The stock response, heard all the time, is "mind your own business." The airlines and military have accountability in their corporate cultures to reduce accident rates. Also, they both standardize as much as possible to reduce accidents, whereas GA does not. Lotsa good feedback from your readers this week!

This brings up a line of thinking I've mused over for a long time, but have never fully developed. Here's the gist of it:

1. Military, airline and most corporate aviation is a team sport, with peer review and a team culture. Most general aviation including recreational, personal and owner-flown business flying is an individual sport without a team culture. Despite the social opportunities many find among other pilots, general aviation is conducted without peer review and with very little oversight and ample opportunity to avoid even the minimum legal requirements.
2. The primary way we sell flying to persons not already exposed to it (e.g., a family member who flies) is airshows and movies—which often portray very risky behavior with no outside indication of what it takes to manage that risk. After all, no one is going to pay airshow ticket prices to see a Cessna 172 make a 105-knot straight and level fly-by at a safe and legal 1000 feet AGL. "Movies" now includes YouTube and similar social media videos that often celebrate extremely high-risk flying activity. "Risk" is our primary recruiting tool. When someone enters the flying fold, we have to try to train out of them the very things we use to entice them to fly in the first place.
3. Only a small percentage of those persons who actively attempt to become a U.S. military pilot actually earn military pilot wings. Most never get past the medical exam or the interview/psychological assessment phase. Many are eliminated not necessarily because they don't have the aptitude, but because they can't develop the skills fast enough to meet the military training model. We can put a 250-hour pilot into an F-16 because of the eliminations put in place before he/she gets to that point. Airline and corporate pilots have an elimination process as well, although it's often based less on flying aptitude and more on other employment issue. Yet there is no washout in most civilian aviation. A pilot flies until he/she voluntarily quits, runs out of money, he/she can no longer pass a medical (now less restrictively in the U.S. under BasicMed), or the pilot crashes…often taking passengers along for the final ride. In any other case the pilot will find *someone* who will push him/her along to the minimum level, after which it's their choice whether to ever again be instructionally challenged in an airplane.
4. We market personal flying as easy. The basics *are* easy when the weather's good and everything works, given practice. But the mental work and dedication is more than most who start expect to be demanded of them. Then refer back to (3) above, that there is no elimination system for those who do not buy into the need for professionalism.
5. A Practical Test is often delivered as a "license to learn," but the industry provides little to no structure to a pilot after the checkride—no goals and no measurement of success. They're on their own.
6. Our industry advocates actively often work to prevent implementation of new safety standards, primarily on the basis of cost.
7. A small percentage of us see flying as akin to martial arts—we enter a whole new culture with high standards and an attitude of lifelong learning. Most enter flying as if they are riding a jet ski, a recreational activity with no obligations except to have fun.

The question: *Why are we surprised at the results?*

Don't get me wrong. Flying *should* be fun. I think the fun is in mastering the necessary skills, in the continual pursuit of perfection knowing full well we'll never attain it. I think most *FLYING*

LESSONS readers probably agree, at least to a point. We are the "reachable" pilots…those that are reached by the safety message.

We frequently describe personal aviation as the ultimate expression of freedom. In the big picture, flying *is* extremely safe, because most of us at least try to do the right thing. Occasionally someone takes that freedom to the extreme, however, and we end up with reports like the one we've been discussing.

This is probably a topic worthy of a PhD thesis in human factors or psychology, or even sociology. Maybe a retirement project…or more likely, for someone else to pursue. Thanks, Ed.

As I concluded last week:

> Somewhere between where each of is individually now and where that Grumman pilot was mentally on August 1 is the limit of what is acceptable. The *LESSON* from this accident discussion is for each of this to consider this question for ourselves: **Where do *you* draw that line?**

See:
https://www.mastery-flight-training.com/20200827-flying-lessons.pdf
https://app.ntsb.gov/pdfgenerator/ReportGeneratorFile.ashx?EventID=20200802X53946&AKey=1&RType=Prelim&IType=LA

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