Thomas P. Turner's
Mastery of Flight™

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FLYING LESSONS for October 3, 2024

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 most 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 the 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.**

This week's LESSONS:

A friend and *FLYING LESSONS* reader began a phone conversation by saying, ***it's the insidious failures you don't notice.*** He called to tell me about his recent experience in his piston twin, asking me to help others learn from his experience. I'll try to do his description justice.

> **Beginning a flight** in cool temperatures (50°F/10°C) and flying toward warm, after a stop I was taking off on a **hot day** (85°F/30°C). There were numerous training aircraft in the pattern and it took almost 20 minutes before I was cleared to take off. During my takeoff roll **the right engine's propeller RPM didn't come up** as fast as the left. **Acceleration down the runway felt slow too**…but ***it was hot out***.
>
> **Climb was anemic.** But after all, the ***density altitude was high***.
>
> **Leveling at 7000 feet** I leaned the mixture. Although normally the fuel flows and exhaust gas temperatures are very close between my engines in cruise, this time **the right engine's fuel flow was noticeably higher. So were the EGTs.** But it was **well above standard temperature** at altitude.
>
> There was also a **vibration**. The indicated **airspeed was low**. I re-leaned the mixture hoping for a different results, but it turned out the same.
>
> If the airspeed is low, **it has to be either the power or the drag**. I checked landing gear, flaps and cowl flaps, and nothing was hanging out. I scanned the cockpit in a flow check to see if there was anything I could have missed. ***And I saw it***.
>
> The magneto switches in my airplane are mounted vertically. The left engine switch is at the top of the left forward sidewall, under the window; the right engine's magneto switch is below it. As I scanned that part of the panel it struck me: ***the left mag switch was angled at the two o'clock position, but the right switch pointed to one o'clock***. Sure enough, the left switch was on both mags, but **the right switch was selecting only one magneto.**
>
> ***This explained* all *the indications I'd seen.*** The right engine was developing less power. RPM reached redline, but slower than normal. Acceleration was sluggish. EGTs were higher than normal. Climb was poor, and it took more fuel to get the expected cruise indications. Even the vibration could be explained by the magneto selection.

I moved the right mag switch to BOTH and leaned once more. All indications became what I've come to know as normal. So what did I learn from this experience?

1. Until now **my RTO [Rejected Takeoff] criteria required too catastrophic a change**. I never considered that more subtle indications also require rejecting a takeoff.
2. **I made multiple excuses** for performance not being as expected. It was hot. The density altitude was high.
3. [*and this is a direct quote I wrote down as my friend spoke*], **"I've failed at decision-making my entire flying career."**

Powerful *LESSONS*. They're even more valuable when you realize that, although my friend asked to remain anonymous, he is a highly experienced multiengine pilot and national award-winning aviation safety expert. Thank you, anonymous reader.

Imagine you're aligned with the runway, cleared for takeoff. You smoothly move the throttle(s) forward as the airplane begins to roll down the runway centerline. You have to jab the rudder more than usual to stay in alignment. The airplane accelerates less rapidly than normal. Manifold pressure, RPM, fuel flow, oil temperature, oil pressure, cylinder head temperatures (CHTs) and/or exhaust gas temperatures (EGTs) are not what you expect. Something just doesn't sound right. **What will *you* do?**

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

Debrief

Readers write about past *FLYING LESSONS*

Reader Robert "Captain Bob" Katz writes about last week's *LESSONS*:

> You say: "*I have to think he/she was skilled at correlating general and aircraft-specific knowledge to choose a course of action that resulted in a safe outcome.* "I say: I could NOT disagree with you more!
>
> This airplane approached Rwy 4L @ BOS. The runway is 150' wide and it appears the LEFT main wheel touched down on the LEFT Aiming Point Marking approximately 25' LEFT of centerline. That gives this airplane only 100' of lateral runway *width* to drag itself *on pavement.* The airplane stopped somewhere between 2,000 and 2,500 feet downfield. We have only the Yellow (hash mark) Stripes seen on the parallel taxiway "M" spaced at 125' intervals for longitudinal scale.
>
> It does appear that this pilot was more interested in protecting the LEFT propeller and engine than he was at maintaining centerline and he clearly anticipated the 'YAW' to the RIGHT as the airplane dragged itself along its RIGHT wing tip and underside. However, there is NOT a pilot among us who can say with any degree of reasonable certainty and to what EXTENT the airplane *will* drag itself laterally to the RIGHT (in this case). Notice how close that RIGHT wing came to (or possibly DID) strike the Runway Edge Light stanchion when the airplane finally stopped. Those stanchions are spaced at 200' intervals and it is impossible to see from the fidelity of the video *if* another stanchion was actually struck *first.*

The 402C has a *Wet Wing* meaning the ONE and ONLY *tank structure* in the RIGHT wing with its approximately 100+ gal capacity, could have easily been *ripped open* by striking a stanchion or the underside of the wing *punctured* by running over the remnants of the stanchion. All of which is both reasonable to predict and impossible to know to what extent by *allowing* the airplane to drag itself *uncontrollably* over the ground.

Did the RIGHT wing tip, under wing surface etc. generate metal-on-pavement *SPARKS* as it was dragging to a stop? Who knows? Did the metal-on-pavement friction create enough heat to ignite fuel vapor venting from an intact *tank structure*? Who knows ?

More importantly: The potential for such possibilities is perfectly reasonable *to anticipate*. Our obligation is to safety by maintaining *positive control* as Bob Hoover says: " *All the way into the crash.*" Allowing the airplane to drag itself *uncontrollably* over the ground is providing for an unacceptable and entirely preventable *wildcard* to compromise our safety to an unpredictable degree.

That's why, although it's tempting to want to save the LEFT propeller and engine from damage; It's hardly worth the risk of a catastrophic FIRE when that risk could be reasonably mitigated by landing FLAT on the belly and on an entirely FLAT surface (Centerline Lights not withstanding although I believe the bottom surface area of the nacelles will protect the undersides of the wings).

You discuss: " *Think about **things that might happen**, even wildly unusual scenarios, and correlate what you know into ways you might respond.* " That's good advise [sic] and it appears your big iron buddies have already done that: "*A quick sampling of a few current and former airline pilots I know told me that air carrier airplanes don't address the issue; the overriding philosophy appears to be that if all the gear legs are not down it's preferred to get them all back up if able and make an intentional belly landing*. " That pilot should do likewise.

You do NOT make any mention of the fact that the 402C has a *Gull Wing* style crew door next to the LEFT seat. I was surprised and *very disappointed* to see that pilot emerge from the clamshell door meaning he had to clamber *past,* if not *over,* a *not* entirely calm and docile *slug of cattle* (I can't resist) eager to exit as well. That pilot SHOULD HAVE egressed from his crew door to traverse an *unobstructed* path, in far less time to open the clamshell door from the OUTSIDE especially after his *heroic* effort to save the LEFT side of the airplane. Apparently, he was not thinking about that, to *stay ahead of the airplane* all the way to the *safest* conclusion, for everyone. You say: "*Well done!* " I say: "Not quite."

Every incident is a *teachable moment* because it sets an example of what we *could and should* do differently. The first lesson is to *never* be afraid *to question* the judgement and ADM of another pilot. When we choose to NOT take that initiative; We squander a golden opportunity by *failing* to learn from the mistakes of others (and our OWN past experiences).

My evaluation of the pilot's response to landing gear failure is based on the fact that only one gear leg was down, and the issue was known far enough in advance that a helicopter was in place to take video of the landing. Almost every scenario in which only one strut is extended and the others are up is the result of a jammed or broken extension mechanism that can't be undone in flight (I say "almost" because there may be a possibility, however remote and which I can't imagine, where the extended strut could have been retracted for a gear-up landing). I don't think the pilot had the option of the airline-preferred gear-up landing, which I've also taught for years as the better solution than landing with some but not all of the landing gear down.

Do all Cessna 402s have the forward crew door? Even if this airplane was so equipped, this was a scheduled commercial passenger flight. The airplane is small enough that a flight attendant is not required, and I doubt very much one was aboard. In that case it is the captain's personal responsibility to facilitate the passengers' evacuation, in almost all scenarios best performed through the main boarding door. What if the passengers perceived the captain's exit through the forward door as abandoning them to some unknown fate? I bet there would be panic in the cabin. It may well be official company policy *not* to use the crew door unless a fire or other conditions prevent using the main door. Anyone out there ever fly for Cape Air who can tell us for sure?

Your final paragraph—opening "every incident is a teachable moment—is exactly why I write *FLYING LESSONS Weekly.* On that we agree. Thanks, Bob.

See https://thomaspturner.com/flying-lessons-weekly/flying-lessons-for-september-26-2024/

Frequent Debriefer Lorne Sheren addresses another aspect of last week's report:

> Interesting column. I was intrigued at the SR22 flat tire landing procedure. I would think it unusual to know you had a flat tire prior to landing. Can you discuss the procedure for handling a landing/ roll out once the flat tire makes itself know?

I wonder about that too. Unless you knew you blew a tire during takeoff just as you lifted off (so you didn't reject the takeoff), or less likely someone outside your airplane was close enough to see an obviously damaged tire (not just low on air, which wouldn't be noticeable), you probably wouldn't know you needed the Flat Tire checklist until it was too late. Thanks, Lorne.

Reader Thomas Cedel goes to the larger *LESSON*, the need to "wargame" unusual scenarios:

> Great point. During my time in the Air Force we called these "What If?" scenarios. I like to practice them during a proficiency flight or tabletop thinking. What if I lose "X"? What capabilities do I have left? The scenarios are useful for everything from avionics to mechanical issues. I just did several of these dealing with avionics for my [Flight Review].

That's a practical way to brainstorm scenarios. Thank you, Thomas.

Reader and corporate pilot Michael Friedman wraps up this week's Debrief with a personal experience:

> My copilot and I came to a related conclusion about the value of **actually practicing emergency procedures instead of just reciting them from memory**.
>
> We had a "door open" light come on in a King Air at FL220 [approximately 22,000 feet] and after a quick troubleshooting including verifying the pressurization, decided it had to be the microswitch. Nevertheless, since we had no passengers on board, **we decided to practice the loss of pressurization procedure.** What we discovered was that **the old-style quick donning O_2 masks in the plane are anything but** quick donning. Apparently, they were designed for a time when no one used headsets and **required a lot of steps to get them on including removing the headset and using two hands** to spread the spring-loaded metal headband which, besides being a certified torture device, actually prevents you from just putting the mask to your mouth and then securing it. **On the first try, neither of us were able to get a mask on within two minutes.**

Time of Useful Consciousness (TUC) at 22,000 feet, based on a healthy, military-age nonsmoker pilot in military aviator physical-passing shape, is five to 10 minutes. Deviations from that test subject profile from which TUC times were determined will likely be much lower. Mike continues:

> After that experience, **we decided to modify the procedure** figuring that two passed-out pilots wouldn't do anyone any good. Now, we are in agreement and brief that if there is a pressurization issue, ***he will follow the book emergency "mask on" procedure*** and ***I will set the altitude hold for 10,000 and start the plane down before turning to my mask***. He can then help me with my mask if I don't have enough conscious time to get it on myself. From there, we can deal with the passengers, ATC, etc.
>
> **But for practicing, we would never have realized the book procedure wouldn't work in the real world.**
>
> Interesting side note is that [major training provider] CAE stopped practicing sudden depressurizations during recurrent training as a result of Covid. They didn't want everyone putting on the same mask. In our case, it wouldn't have made any difference since the CAE simulator has the newer version of the masks with a very different method of securing it to your head and any practice in the simulator would have resulted in negative learning.

What an impactful way of filling low-workload enroute time by wargaming scenarios and practicing what are otherwise academic emergency procedures. Great example, Mike. Thank you.

More to say? Let us learn from you, at **mastery.flight.training@cox.net**

See https://nafisummit.org

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