FLYING LESSONS for December 24, 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 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.**

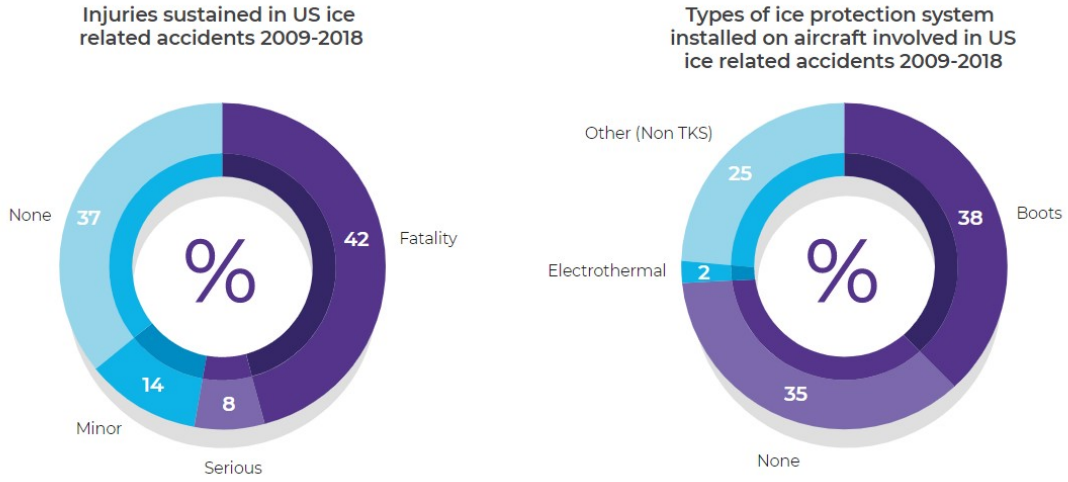
FLYING LESSONS is an independent product of MASTERY FLIGHT TRAINING, INC. www.mastery-flight-training.com

Pursue ***Mastery of Flight***™

This week's LESSONS:

Three quick items before we go to readers' comments in the Debrief:

While doing some research to answer a friend's question today I came across an interesting graphic from CAV Systems, manufacturer and Supplemental Type Certificate holder for aftermarket ice protection systems:



Takeaways:

- Half of all reported ice-related accidents result in death or serious injury.
- More ice-related accidents occur in aircraft equipped with deice boots than happen in aircraft with no airframe ice protection at all.

What do *you* see in the data?

See https://www.cav-systems.com/icing-conditions/

"Pilots continue to have unreasonable expectations of their own personal performance, and the performance of their aircraft, which has contributed to fatal general aviation (GA) accidents," according to a Fact Sheet posted by the FAA Safety Team. "The General Aviation Steering Committee's (GAJSC) working group on system/component failure (powerplant) suggests that reasonable performance expectations, based on realistic data from flight data

monitors, can help forecast system/component problems before they reach the point of failure, resulting in safer flight operations." Learn more, and watch videos on performance monitoring, on a dedicated blog site.

See:
https://www.faa.gov/news/safety_briefing/2018/media/SE_Topic_18-12.pdf
https://medium.com/faa/aircraft-performance-monitoring-24eaaaaf6b42

Flight in Snow: Assessing the Risk of Flight in Wet Snow Conditions, Especially at Low Altitudes is the topic of a new Safety Alert from the U.S. National Transportation Safety Bureau. Going beyond simply describing the threat, this Alert provides specific suggestions for pilots and dispatchers.

See https://www.ntsb.gov/safety/safety-alerts/Documents/SA-082.pdf

With apologies that two of those three items don't currently apply to my warm-weather readers, let's go to the Debrief.

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

Debrief: Readers write about recent *FLYING LESSONS:*

Time to catch up on my Debrief backlog:

Declaring an emergency?

> While I am a low time private pilot, I have almost 1800 hours flying as a fighter backseater (navigator) in F-4s in the Air Force, admittedly quite a while ago. However, I was thinking about the process we were taught: ***If it's in the Emergency Procedures section of the Dash 1 (aircraft manual), declare an emergency***. I can't count the number of emergencies my pilots declared in 12 years of flying, from a generator out to engine fires and flight control malfunctions. We never felt it was wrong because **even something simple can progress to something complex very quickly**. A generator out could well progress to a major electrical failure. I'm currently flying a Piper Cherokee. Looking at the Emergency section of the checklist, the only thing I can see where I would not declare an emergency is "Carburetor Icing". But, I agree with the majority of comments in this weeks' *FLYING LESSONS*: **It's the pilot's responsibility to declare. -** Ian O'Connell
>
> Where in the Pilot's Operating Handbook do we find the engine out checklist? In the EMERGENCY section! That is called "A Clue" – Stu Spindel

More on losing an engine in a twin:

> Another thought on losing an engine on a twin: **You probably don't know *why* the engine failed**, and how do you know the other isn't about to follow suit? Reference the Aerostar misfueling accident in Indiana a few months back. The highly experienced pilot lost an engine shortly after takeoff, turned back towards the departure field, then lost control of what should have been a perfectly flyable airplane over a flat farm field. **We don't practice that in multiengine training (losing the other engine). *Maybe we should.*** The emphasis should be on getting the airplane on the ground as soon as practicable, declaring an emergency should be a no-brainer. But ***being ready for the second engine to quit should be on your mind*** also.
>
> - Tony Johnstone

Preparing for a missed approach:

> It is useful to treat the missed approach [briefing] line on the approach chart/lines in the nav data like every other line used for navigation...**just another part of a procedure**. As to piloting technique, pitch tendencies are specific to aircraft engine mounting positions. Most recip[rocating] aircraft have small pitch vector up or down, but must be trimmed up with flap retraction, which should also come as soon as speed and climb rate are established. Other aircraft may have engines on pods under the wing producing significant pitch up with GA power or tail mounted with thrust vector above the wing producing significant pitch down with power. The increasingly rare three engine aircraft, with one in the tail have nearly neutral pitch tendencies...a real plus at a busy time. Airline training is an obvious plus since multiple iterations in sims allow training to real proficiency, but **every pilot can anticipate and brief** to all occupied pilot seats the steps to be taken if a go around is required at any time for any reason. On any approach to a ceiling below 1000 feet, as part of my final briefing comments. I will reiterate, "if we go around, it will be, (as I add GA power), "Going Around, Flaps Approach, Positive Rate, Gear Up, Check Missed Approach Altitude, Heading or NAV" as appropriate, and probably Autopilot on. This removes most of the surprise from the PM and reminds him of the things they are both trained to do. Adapting this to single pilot operations is simple enough if you are both PF [Pilot Flying] and PM [Pilot Monitoring]. As always, situational awareness and preview of likely choices is helpful.
>
> – Jack Spitler

More about the multiengine airplane V_{MC} maneuver:

> I agree with your discussion of the V_{MC} demo. But FAA has added to the discussion of V_{MC} through an addendum to the *AFH*. That document supports your characterization of the V_{MC} demo as a "circus trick" of sorts, and it also adds detail to how the demo should be performed; excerpt:
>
> > …The foregoing refers to the determination of V_{MC} under "dynamic" conditions. This technique is only used by highly experienced test pilots during aircraft certification. It is unsafe to be attempted outside of these circumstances. In aircraft certification, there is also a determination of V_{MC} under "static," or steady-state conditions. If there is a difference between the dynamic and static speeds, the higher of the two is published as V_{MC}. The static determination is simply the ability to maintain straight flight at V_{MC} with a bank angle of not more than 5°. This more closely resembles the V_{MC} demonstration task in the practical test for a multiengine rating…
> >
> > During dynamic V_{MC} determination in aircraft certification, cuts of the critical engine using the mixture control are performed by flight test pilots while gradually reducing the speed with each attempt. V_{MC} is the minimum speed at which directional control could be maintained within 20° of the original entry heading when a cut of the critical engine was made. During such tests, the climb angle with both engines operating was high, and the pitch attitude following the engine cut had to be quickly lowered to regain the initial speed. Pilots should understand that attempting to demonstrate V_{MC} with an engine cut from high power, or intentionally failing an engine at speeds less than V_{SSE} creates a high likelihood for loss of control and an accident.
> >
> > The actual demonstration of V_{MC} and recovery in flight training more closely resembles static V_{MC} determination in aircraft certification. For a demonstration that avoids the hazard of unintended contact with the ground, the pilot selects an altitude that will allow performance of the maneuver at least 3,000 feet AGL. The following description assumes a twin with non-counter-rotating engines, where the left engine is critical.
> >
> > With the landing gear retracted and the flaps set to the takeoff position, the pilot slows the airplane to approximately 10 knots above V_{SSE} or V_{YSE} (whichever is higher) and trims for takeoff. For the remainder of the maneuver, the trim setting remains unaltered. The pilot selects an entry heading and sets high rpm on both propeller controls. Power on the left engine is throttled back to idle as the right engine power is advanced to the takeoff setting. The landing gear warning horn will sound as long as a throttle is retarded, however the pilot listens carefully for the stall warning horn or watches for the stall warning light. The left yawing and rolling moment of the asymmetrical thrust is counteracted primarily with right rudder. A bank angle of up to 5° (a right bank in this case) may be established as appropriate for the make and model.
> >
> > While maintaining entry heading, the pitch attitude is slowly increased to decelerate at a rate of 1 knot per second (no faster). As the airplane slows and control effectivity decays, the pilot counteracts the increasing yawing tendency with additional rudder pressure. Aileron displacement will also increase in order to maintain the established bank. An airspeed is soon reached where full right rudder travel and up to a 5° right bank can no longer counteract the asymmetrical thrust, and the airplane will begin to yaw uncontrollably to the left.

> The moment the pilot first recognizes the uncontrollable yaw, or experiences any symptom associated with a stall, the pilot retards the throttle for the operating engine to stop the yaw as the pitch attitude is decreased. Recovery is made to straight flight on the entry heading at VSSE or V_{YSE}, before setting symmetrical power. The recovery demonstration does not include increasing power on the windmilling engine alone.
>
> - Bruce Williams

See https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/airplane_handbook/media/afh_chapter_12_addendum.pdf

On fuel caps and gear-up landings:

> This was a really good *LESSON*. It touched on two of my really "hot topics": gear extension and fuel caps.
>
> Like you, I **never take my hand off the gear switch until I confirm three green**. I have had students/clients do otherwise. When I see this, I cover the switch and lights and ask "Is the gear down?" The blank look speaks volumes. We then discuss the correct procedure including the sounds and feel of the gear extending. Usually this little discussion gets the point across.
>
> When fueling **I *always* install the fuel caps myself.** This is especially true if the lineman does it. I remove them and reinstall them. That way I know they are secure. If I suspect that the lineman is new I give them a short lesson on how to position the fuel nozzle so that it doesn't cut the bladder and so that it remains in contact with the metal tank opening to avoid sparks. Then I proceed to showing them the correct way to secure the caps, especially in aligning the locking tabs. Typically the lineman will tell me that he was never given this information during his "training".
>
> One last item. If I have been away from my Bonanza (or a client's) even for a short time I always do a cursory walk around just to verify that things are as I expect them to be. But, ***I always firmly check that the cowling is still latched and I always check to see that the fuel caps are secure***.
>
> - Dick Druschel
>
> The infamous gas cap incident…. My wife and I, departing Republic Airport on Long Island, KFRG, on our way somewhere a long time ago. As we're climbing out on the upwind the wife's says, " look at the right wing." Fuel is venting like a fire hose. Luckily, I was [operating from] the left tank but had the presence of mind to check. Declared an emergency and rolled into downwind, landed uneventfully.
>
> Cause? The cap locking ring at tank opening came out with the cap attached. There are 2-3 tabs on the ring the are tapped down/bent into the tank opening to hold the cap locking mechanism to the tank. Mine were not tapped down enough. Luckily the cap chain held it all until we landed Maintenance figured it out and repaired it in five minutes. [It] vented about 25 gallons. Another top off and we were on our way.
>
> Yes, I check them every time get fuel. – Jim Cear

…and fuel indicator accuracy:

> Maybe I can shed light on the fuel system I'm familiar with – the Comanche 250. Yes, the Comanche service manual has a fuel gauge calibration method. Is it just so much nonsense? Does it legalize the book because a method must be printed? This much I know, especially after having replaced my fuel tanks a time or two. The Comanche uses a float/resistor type system. The float doesn't reach the top or the bottom of the neoprene fuel bag. Thus the gauge doesn't begin to measure fuel used until the float is…well, floating. At the bottom end of the fuel quantity, the gauge has stopped measuring when the fuel level is below the float. To make it worse, the fuel sender in the scupper assembly at the top of the tank. Due to the wing dihedral, there's an awful lot of avgas in the lower inside end that never gets measured. The gauge always precisely meets the manufacturing spec. That is, when the tank is empty the gauge must read empty.
>
> So on long trips I do what I always did: measure the tanks with a stopwatch. Did I learn that in private pilot 101? – Mike Dolan
>
> I found the discussion on fuel tanks fascinating. I'm fortunate in that my aircraft (a Sling 4) can be operated with full fuel and my family of four on board so I seldom have to make the call to depart with less than full tanks. However, due to the design of the tanks and the wing dihedral the onboard fuel gauges read full with 50 litres of the 84 litre capacity loaded. This corresponds to the tank being dry under the filler cap, so I rely on dipping the tank for the level when we have more than 50l in the tank. Below 50 litres (2 hour endurance in the tank), I would have to rely on the gauges and the (mostly accurate) totaliser. I never dispatch with less than 50 litres in a tank for this reason.
>
> I would be extremely embarrassed to run out of fuel. I understand how it happens, but it kills me that this is such an easily avoidable issue and yet we're still running out. – Mike Blackburn

Aviation and life are full of examples of Normalization of Deviance. Driving and texting, flying just a little bit below minimums, cutting gas too close, programming avionics while we taxi, a less than complete preflight, and flying while excessively tired because we have done it in the past. These are just a few examples.

As to fuel gauges and pilots running out of gas, it is another one of those events (like failing to lower the gear and landing gear up) that a pilot must just ***make a vow to themselves that they will NEVER do it, and then put into place habit patterns to help ensure the correct outcome***. Having accurate fuel gauges is one of the necessary components that help ensure one does not run out of fuel.

Keep up the good fight. Pilots just need to wrap their heads around some facts, and one of them is having working/accurate fuel gauges. We've had accurate fuel gauges in cars for decades. It is inexcusable that we do not have that in aircraft as a norm. - Chris Ceplecha

Harry S. Truman said there is nothing new in the world except the history you do not know. Your discussion of the normalization of deviance is a perfect example. I thought this was a relatively new concept until I recently reread the pamphlet *Common Sense*, published by Thomas Paine way back in 1776. In its introduction he wrote:

> Perhaps the sentiments contained in the following pages, are not yet sufficiently fashionable to procure them general favor; ***a long habit of not thinking a thing wrong, gives it a superficial appearance of being right***, and raises at first a formidable outcry in defense of custom. But the tumult soon subsides. Time makes more converts than reason.

I'm sure there are more examples from farther back in history, but you get the point--this is not a new phenomenon. Readers who run away the first time a long-held belief is challenged will never be convinced by any amount of logic. - Mark Sletten

Thank you everybody. I'll get to more of the readers' Debrief backlog in future reports.

Questions? Comments? Send them to mastery.flight.training@cox.net.

Please help cover the costs of providing *FLYING LESSONS* through the secure PayPal donations button at www.mastery-flight-training.com.

Or send a check to **Mastery Flight Training, Inc.** to 247 Tiffany Street, Rose Hill, Kansas USA 67133.
Thank you, generous supporters.

See:
www.mastery-flight-training.com/be_a_master_pilot.html
https://www.paypal.com/donate/?token=E78wOSz-a-lWNuNMxHjQRZ4awYMDr8zvX2iJxHs_Cv-b7_6nFbhuIMAIJTU-lkBDsW160G&country.x=US&locale.x=US

Review your checklists and tech data before that long holiday cross-country flight. Merry Christmas and Happy Holidays to all!

Share safer skies. Forward *FLYING LESSONS* to a friend

Pursue *Mastery of Flight.*

Thomas P. Turner, M.S. Aviation Safety
Flight Instructor Hall of Fame 2015 Inductee
2010 National FAA Safety Team Representative of the Year
2008 FAA Central Region CFI of the Year
Three-time Master CFI
