Thomas P. Turner's Mastery of Flight

www.thomaspturner.com

FLYING LESSONS for October 26, 2023

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.**

FLYING LESSONS is an independent product of MASTERY FLIGHT TRAINING, INC. www.thomaspturner.com
Also available in a downloadable pdf

Pursue ***Mastery of Flight***™

This week's LESSONS:

The National Transportation Safety Board (NTSB) has published its preliminary report on the crash of a Cessna 177RG that killed AOPA ASI's Richard McSpadden and retired NFL player Russ Francis in upstate New York October 1st. The "prelim" includes many details, but as is normal at this phase of an investigation, no firm answers as to what might have happened. Undoubtedly the full investigation and final report will provide more conclusive evidence. It usually takes a year or more for the NTSB to thoroughly evaluate all available evidence and publish its determination of Probable Cause.

See https://thomaspturner.com/wp-content/uploads/2023/10/2023.1001-C177RG-NY.pdf

Whether it turns out to be true and significant, witness reports in the NTSB posting are that:

> During taxi out, witnesses heard the engine of the accident airplane running when the Beech A36 [camera airplane] pulled up next to it. The accident airplane's engine then shut off, and about 10 seconds later, the engine restarted. During the takeoff roll, a witness described that the engine sounded as if the propeller was set for "climb" and not takeoff, then he heard the engine surge. During the initial climb, the witness further described that the engine did not sound as if it was running at full power. The accident airplane then made a gentle left turn while it was 300 to 400 feet above ground level to join with the Beech A36. As the accident airplane closed to within about 1,000 feet of the Beech A36, it suddenly made a hard right turn back toward the departure airport. During the turn, the pilot of the Beech A36 heard the passenger in the accident airplane transmit on the common traffic advisory frequency, "We have a problem and we're returning to the airport."

Of course, witness reports, even from experienced pilots, are not always definitive. They may only seem true from a certain point of view, the witness' vantage point. Engine and propeller sounds in particular are often misleading at certain angles and distances from an accident aircraft. Other sounds and distractions, and the trauma of seeing a nearby airplane go down, might affect a witness' perception. We'll have to wait for the investigation to run its course to know for sure.

In the spirit of *FLYING LESSONS*, using initial reports of an event we're all talking about to suggest things we should think about on every flight we make, let's delve into one thing we might learn from this crash that shocked and saddened so many…including myself.

Takeoff Targets

Lining up and advancing the throttle(s) for takeoff, pilots tend to be optimists. Expectation bias lulls us into believing and even "seeing" all is normal and power is full, while complacency and familiarity might prevent us from crosschecking indications at all. **We might not detect** a loss of performance or power…remembering that a landmark Australian Transport Safety Bureau study found that **partial power loss occurred** in piston airplane ATSB accident reports ***three times* more frequently than total power loss**, creating a hard to quickly identify, demanding, and time-critical threat to those aboard.

See:
https://skybrary.aero/articles/flight-crew-expectation-bias
https://www.atsb.gov.au/sites/default/files/media/4115270/ar-2010-055_no3.pdf

To better evaluate our takeoffs in real-time it's helpful to identify five **takeoff targets**, and how to use them for a safe takeoff or perform a Rejected Takeoff (RTO) abort if needed. **Fail to meet any one of these Takeoff Targets and you must *immediately* reject the takeoff attempt**…quickly reducing remaining power, maintaining control and runway alignment, applying maximum braking without locking the wheels if needed, and (if time permits) shutting off fuel and electrical power if it appears the airplane will not stop before departing the prepared runway surface.

Pre-takeoff Target

A successful takeoff begins even before you board the airplane. This is when you evaluate aircraft, pilot technique and environmental factors that affect takeoff performance. How much distance will your takeoff require, and how long is the available runway? Are obstacles or rising terrain on your departure path? What's the airplane's weight? How strong is the wind? What specific technique will you use for this particular takeoff? Should you use flaps, or not? Evaluating these questions, and knowing and planning to achieve the goals of your takeoff, needs to be made *before* flight, in the pre-takeoff phase.

Power Target

Are you getting maximum available power from your engine(s)? You won't know for certain unless you establish some specific power targets. Flying a **fixed-pitch propeller** airplane? You should know the static rpm (tachometer reading at full throttle with no forward motion) and compare it to what you see at the beginning of your takeoff roll. Same goes for the expected rpm further into the take-off when airflow often permits a fixed-pitch prop to spin faster.

In airplanes with **controllable-pitch propellers**, know the expected manifold pressure and rpm at takeoff power. Most naturally aspirated (non-turbocharged) engines will read about one inch below ambient pressure at full throttle. At sea level, that'll be around 29 inches of manifold pressure; while taking off at Cincinnati you'd expect about an inch below that (ambient pressure drops about one inch per 1000 feet above sea level in the lower atmosphere). Taking off from Denver, full throttle will net about 24" MP. Turbocharged engines should achieve their full, rated manifold pressure regardless of airport elevation.

In all gasoline aircraft engines (as opposed to diesels or turbines) **mixture control** is vital to achieving takeoff power. Many pilots who learn to fly at near-sea-level airports never learn what needs to be done with the "red knob" before a higher altitude takeoff. As pressure drops, a corresponding reduction in fuel flow is needed for maximum available power. This is exaggerated in larger, fuel-injected engines as they tend to be set excessively rich (extra fuel flow) at the full-rich position. Check your airplane's Pilot's Operating Handbook (POH) for specific guidance but, in general, fixed-pitch propeller engines need to be leaned for maximum propeller speed at full throttle. Those with controllable pitch propellers should be **leaned per POH fuel flow** tables (often placarded on the airplane's fuel flow gauge) or for a **target Exhaust Gas Temperature (EGT)** setting. Know what indication you're leaning for, and lean the mixture for that setting before beginning your takeoff roll.

Turbine pilots may have torque and/or temperature limits for takeoff, and often will not be able to go "full forward" with the power levers and remain within one or the other limit. Flying a turbine, you need to know the limiting factors for a specific takeoff and ensure maximum available power within those limits.

Acceleration Target

You've made your pre-takeoff calculations and full power is available at the beginning of your takeoff roll. But are you accelerating as quickly as expected? If you are flying a large military airplane with multiple crewmembers you may have an acceleration chart that relates expected speed to time during the takeoff roll. For the rest of us, the measure of acceleration is subjective. Does it feel right? A better measure of acceleration is to visualize, beforehand, the point at which you expect to reach rotation speed. Pick a taxi turnoff, a runway distance-remaining sign, a tree alongside the runway's clear area, or some other feature to positively identify the spot by which you'll become airborne.

Some pilots like to use the **50/70 Rule**, which says that at 50% of the calculated takeoff ground roll distance (*not* the runway length, as is sometimes erroneously suggested) the airspeed should be 70% of the liftoff speed. Others modify this by stating the airplane should attain 70% of liftoff speed within a certain number of seconds after brake release. Both work at sea level; the second version will not be accurate as field elevation and density altitude increase…which may be precisely when you need this rule to judge acceleration the most. Some airplane type-specific guidance calls for a specific airspeed at the 50% ground roll point. For example, 50 knots indicated airspeed at 50% of the computed ground roll distance is close enough for safety at any density altitude in the A36 Bonanza I commonly fly.

See www.boldmethod.com/learn-to-fly/performance/how-to-use-the-50-70-rule-of-thumb-for-your-next-takeoff-hot-weather/

Liftoff Target

Reaching your liftoff speed target at the predetermined distance down the runway, raise the airplane's nose to the necessary **attitude**. Whether visually or on instruments, flying a heavy twin or light trainer, an aircraft has ***one attitude that provides optimum climb performance***. Achieve that attitude (Vx or, if runway distance and obstacles are no factor, a lower, Vy attitude) and the airplane will climb smartly. A few degrees more "up" and induced drag may seriously degrade climb performance; a few degrees down from optimum pitch, and climb rate may also be significantly eroded. Note that the airplane's **attitude is power-dependent**; it will be lower at higher density altitudes when power is reduced and the consequences of improper pitch are worse. On takeoff, especially when conditions require maximum performance, attitude is everything.

Initial Climb Target

For initial climb from takeoff to the transition to cruise climb (the transport-category folks call it "first stage" climb) you should have a pre-takeoff idea of your expected climb attitude and vertical speed. **Compare real indications to what you expect** to decide if your takeoff is going as planned, or if you need to re-check attitude, configuration (flaps and landing gear position) and power to safely climb away from the airport.

With knowledge of what you can expect in each phase of takeoff you can establish specific goals, or takeoff targets. **Achieve a takeoff target and you know it's safe to continue. Fail to meet a target and it's time to abort the takeoff without hesitation**.

The U.S. pilot certification standards do not require evaluating partial power loss scenarios in flight. There's nothing in FAA guidance to suggest flight instructors should train pilots for anything other than total loss of thrust. ***Have you ever been put in a partial power loss scenario by your instructor***, or presented partial power loss to students if you're a CFI?

Know your takeoff targets, and actively crosscheck actual indications and performance to your expectations as you charge down the runway. In most cases you'll detect an anomaly with plenty of time to abort the takeoff on the remaining runway—or at least go off the departure end under control at a slow and decelerating speed.

You can't completely avoid the possibility of sudden loss of power shortly after becoming airborne. But **if the genesis of engine failure occurs before you lift off, you should never find yourself in the air struggling** to find a survivable place to quickly put the aircraft down.

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

Debrief: Readers write about recent *FLYING LESSONS:*

I'll get back to your insights and comments next week. Meanwhile, catch up on these LESSONS *that were sent to subscribers but not posted online while the new* www.thomaspturner.com was being built:

FLYING LESSONS for September 7, 2023

FLYING LESSONS for September 14, 2023

FLYING LESSONS for September 21, 2023

FLYING LESSONS for September 28, 2023

FLYING LESSONS for October 5, 2023

FLYING LESSONS for October 12, 2023

FLYING LESSONS for October 19, 2023

The Beech Weekly Accident Update for August 31 through October 10 for the period the website was not available is also posted on the new Mastery Flight Training, Inc. website:

See:
https://thomaspturner.com/wp-content/uploads/2023/10/2023.0907-FLYING-LESSONS.pdf
https://thomaspturner.com/wp-content/uploads/2023/10/2023.0914-FLYING-LESSONS.pdf
https://thomaspturner.com/wp-content/uploads/2023/10/2023.0921-FLYING-LESSONS.pdf
https://thomaspturner.com/wp-content/uploads/2023/10/2023.0928-FLYING-LESSONS.pdf
https://thomaspturner.com/wp-content/uploads/2023/10/2023.1005-FLYING-LESSONS.pdf
https://thomaspturner.com/wp-content/uploads/2023/10/2023.1005-FLYING-LESSONS.pdf
https://thomaspturner.com/wp-content/uploads/2023/10/2023.1019-FLYING-LESSONS-3.pdf
https://thomaspturner.com/beech-weekly/beech-weekly-report-for-october-23-2023/

Thank you for your patience!

Lastly, **thank you** to my new friends at Cosmic Designs for designing the new www.thomaspturner.com. I highly recommend Kimberly at Cosmic Designs!

See https://cosmicdesigns.org

Comments? Suggestions? Supportable opinions? Let us learn from you, at **mastery.flight.training@cox.net**.

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

Thomas P. Turner's **Mastery of Flight**

Please help cover the ongoing costs of providing *FLYING LESSONS* through this secure PayPal donations link.

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

Special thanks to these donors for helping with the Mastery Flight Training Website Phoenix rebuild:

Karl Kleiderer, Jeffery Scherer, Ken Newbury, William Eilberg, Wallace Moran, Lawrence Peck, Lauren McGavran, Stanley Stewart, Stu and Barbara Spindel, Danny Kao, Mark Sanz, Wayne Mudge, David Peterson, Craig Simmons, John and Betty Foose, Kendell Kelly, Sidney Smith, Ben Sclair, Timothy Schryer, Bruce Dickerson, Lew Gage, Martin Pauly, Theodore Bastian, Howard Greenberg, William Webber, Marc Dullude, Ian O'Connell, Michael Morrow, David Meece, Mike Gonce, Gianmarco Armellin, Mark Davis, Jason Ennis, William Moore, Gilbert Buettner, Don Denny, John Kolmos, LeRoy Cook, Mark Finklestein, Rick Lugash, Tom Carr, John Zimmerman, Lee Perrin, Bill Farrell, Kenneth Hoeg, William Jordan Jr., Mark Rudo, Boyd Spitler, Michael Brown, Gary Biba, Meaghan Cohen, Robert Chatterton, Lee Gerstein, Peter Tracy, Dan Drew, David Larson, Joseph McLaughlin, Nick Camacho, Paul Uhlig, Paul Schafer, Gary Mondry, Bruce Douglass, Joseph Orlando, Ron Horton, George Stromeyer, Sidney Smith, William Roper, Louis Olberding, George Mulligan, David Laste, Ron Horton, John Kinyon, Doug Olson, Bill Compton, Ray Chatelain, Rick McCraw, David Yost , Johannes Ascherl, Rod Partio, Bluegrass Rental Properties, David Clark, Glenn Yeldezian, Paul Sherrerd

NEW THIS WEEK: Richard Benson

Thanks to our regular monthly financial contributors:

Steven Bernstein, Montclair, NJ. Robert Carhart, Jr., Odentown, MD. Randy Carmichael, Kissimmee, FL. James Cear, South Jamesport, NY. Greg Cohen, Gaithersburg, MD. John Collins, Martinsburg, WV. Paul Damiano, Port Orange, FL. Dan Drew. Rob Finfrock, Rio Rancho, NM. Norman Gallagher. Bill Griffith, Indianapolis, IN. Steven Hefner, Corinth, MS; Ellen Herr, Ft Myers, FL. Erik Hoel, Redlands, CA. Ron Horton. Robert Hoffman, Sanders, KY. David Karalunas, Anchorage, AK. Steve Kelly, Appleton, WI. Karl Kleiderer. Greg Long, Johnston, IA. Rick Lugash, Los Angeles, CA. Richard McCraw, Hinesburg, VT. David Ovad, Resiertown, MD. Brian Schiff, Keller, TX. Paul Sergeant, Allen, TX. Ed Stack, Prospect Heights, IL; Robert Thorson, Reeders, PA. Paul Uhlig, Wichita, KS. Richard Whitney, Warrenton, VA.

Pursue *Mastery of Flight*™

Thomas P. Turner, M.S. Aviation Safety
Flight Instructor Hall of Fame Inductee
2021 Jack Eggspuehler Service Award winner
2010 National FAA Safety Team Representative of the Year
2008 FAA Central Region CFI of the Year
Three-time Master CFI