Thomas P. Turner's
Mastery of Flight®

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FLYING LESSONS for June 26, 2025

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:

Of the 81 FAA-reported mishaps involving propeller-driven fixed wing airplanes in the last two weeks, **23** are initially reported to be preceded by engine failure—1.6 per day on average. We don't yet know what might have caused the loss of power. However, **by knowing and following the engine failure checklist, many reported failures can be remedied in flight**—providing at least enough power to make a safe landing, on airport or off.

Most engine failure checklists are very similar from one aircraft type to another. ***How can you easily remember what to do*** to try to get a balky engine restarted in flight?

Fuel, air and ignition are the essential elements of combustion in virtually any engine. If an engine falters and the cause is something you can fix in flight, you'll do it by manipulating the fuel, air and/or ignition controls. As long as the propeller keeps spinning you'll have access to fuel flow, air and (assuming traditional magneto ignition) spark. Use the engine and fuel controls correctly and ensure combustion air is available, and in many cases a dead engine will restart.

Carbureted engines most commonly run rough or quit unexpectedly because of carburetor icing. In humid conditions at glide power, serious carb icing is most likely at temperatures as high as 80°F(~25°C), while in cruise the carburetor may ice up at as high as 60°F/15°C.

Power loss with a carbureted engine? Apply FULL carb heat. If this fixes the problem:

- ***First***, the engine will run even rougher as hotter, less dense air enters the induction system.
- ***Then***, power will smooth out and increase after carb ice melts away.

The key is to be patient enough to allow the added roughness to smooth out. Don't give up too quickly and fail to give carb heat time to work.

Fuel injected engines that run rough or fail most frequently do so because of a fuel issue. switch to another main fuel tank—this may have fixed as much as 80% of all piston engine failures that resulted in an NTSB report over the past decade. If combustion does not resume, verify the mixture is near full rich, or lean the mixture for smoothness if you lose turbo boost to a turbocharged or turbonormalized engine. If that still does not work, use the auxiliary fuel pump, if installed, in case the failure results from a broken engine-driven pump or a vapor lock in the fuel lines. Use whatever fuel controls you have in the aircraft you're flying, in the order most logical to fuel-related issues: ***quantity*** (fuel tank), ***delivery*** (mixture) and ***propulsion*** (fuel pump).

In multiengine airplanes we teach aircraft control and then "mixture, prop and throttle" [fully forward] at the first sign of an engine failure. Turbocharged/turbonormalized engines may need significant leaning to create combustion after failure. After these initial steps, we teach positively identifying the failure and then if time permits, attempting a restart.

We don't usually teach it this same way in single-engine airplanes, but perhaps we should. ***Fly the airplane, maximize potential power, then troubleshoot*** as workload permits.

Don't get bogged down in trying to figure out precisely what caused the failure. If fuel, air or ignition controls won't fix the problem, then you can't fix it from the pilot's seat. In that case it's not important *why* the engine quit, not at least until the airplane is in the hands of mechanics (or, hopefully not, investigators). **Aviate**—**Navigate** (toward a landing spot)—**Communicate** (to get help as needed)— **Restart**—**Diagnose**...in that order, and everything after Aviate as time permits.

If the fuel pressure drops and flow stumbles when a tank empties out, and the pilot quickly switches to a tank containing fuel so that fuel flow is never interrupted, in most cases pressure should return and the engine should continue to run. If fuel flow is cut off, however, "*running a fuel tank dry*" quickly becomes a "*pilot-induced engine failure*," and may have to be treated as such. Air may be sucked into fuel lines, preventing a restart; the pilot may act incorrectly and make matters worse. Simply switching tanks may not cause the engine to restart; you may then have to deftly manipulate fuel, air and ignition to avoid an unintended landing.

Should an engine quit or run rough in flight, remember these **power priorities***:

Priority	Carbureted	Fuel Injected
1	Carb heat ON	Mixture FULL RICH**
2	Mixture FULL RICH**	Switch Tanks
3	Switch Tanks	Auxiliary pump ON
4	Auxiliary pump ON	Magnetos CHECK
5	Magnetos CHECK	Alternate Air ON

*Turbine engines have different characteristics. See the approved flight manual.
*Or leaned significantly, in turbocharged aircraft with a loss of manifold pressure

In any aircraft the first step of the Engine Failure checklist should be **FLY THE AIRPLANE**. The second step should be **AIM SOMEWHERE**—an emergency airfield in a single-engine aircraft, to a safe altitude in a multiengine if it's able to fly or climb on one engine under current conditions. You may be able to restore power, but you don't want to spend time flying away from your best option during a restart attempt if the restart does not work.

Only then, and if time permits, **do whatever is appropriate to the airplane you're flying.** Not all types will have all the controls listed above. The aircraft's flight manual checklist takes precedence, but very likely it is summarized by the steps in the **power priorities** table.

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

Debrief

Readers write about recent *LESSONS*:

Reader Jim Piper adds to our recent Debrief discussion about descent planning:

> Nice issue of Mastery of Flight®. I took particular interest in the contributions about descent planning and execution.
>
> Having retired from the airlines in 1998 most of the legacy aircraft I flew had no FMS [Flight Management System] so descent planning was "manual". As jet fuel prices began to soar (no pun intended) the whole cost equation for a flight began to change. Early in the jet airliner era fuel was around 11 cents per gallon and the most economical flight was the quickest flight from departure to destination with some captains operating on the "barber pole" the whole flight. Eventually American [Airlines] adopted a cruise Mach descent until the Mach/airspeed crossover (around FL 290 [roughly 29,000 feet]), then 280 knots to 10,000. [feet].
>
> Typically based on **tripling the altitude to lose for the mileage from beginning of descent *and* adding or subtracting 2 nautical miles for every 10 knots of headwind/tailwind *plus* another 5 miles to slow to 250 knots at 10,000** [feet the regulatory maximum speed at or below 10,000 feet above sea level].
>
> These descents were to be carried out at idle power once the descent rate was fully established. As a check airman during that period I observed a lot of variation in that procedure. What I came to realize was that probably **the most important factor was not starting the descent too early** and getting into the lower flight levels where true airspeed began to drop off and to compensate a lot of power had to be added which was almost like pouring raw fuel out the tailpipes! You'd be amazed how many pilots couldn't be bothered to properly plan their descents.

Great insights, Jim. Thank you.

See:
https://thomaspturner.com/flying-lessons-weekly/flying-lessons-for-june-5-2025/
https://en.wikipedia.org/wiki/Barber%27s_pole#:~:text=The%20airspeed%20Indicator%20on%20aircraft,Operating%20Speed)%20of%20the%20aircraft.

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

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NEW THIS WEEK: Ed Shapiro

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