

## Lean for Taxi

The following pages are from the "Airplane Engines" manual available at PilotWorkshops. [Learn more.](#)

Your airplane engine at full rich burns more fuel on the ground than it needs. This is primarily because you *want* extra fuel on takeoff and climb, so full rich errs to the excessive. (See “Increasing Cooling During Climb: Airflow, Fuel Flow, and Power Setting” on page 41.) This is simply a waste at idle, and can even cause problems due to carbon and lead building up on the spark plugs.

Many POHs recommend an idle speed of about 1100 RPM to avoid spark plug fouling. However, a super-lean fuel mixture is arguably better for achieving this. It also allows you to idle at a lower RPM, which saves fuel over the long haul. (If you have a floatplane, this is even more important as you probably need an extra low idle speed for water taxi.)

The fix is simple: Lean the mixture as aggressively as you can after the engine starts. The general process is to lean until engine RPM rises—and then continue until engine RPM falls, but not so much that the engine stumbles (or quits).

If the engine is cold (page 12), this may not be that far. In fact, as the engine is warming up, you might only lean to maximum RPM or peak EGT to

*A cold engine needs extra fuel at idle during the first few minutes of operation, but you can aggressively lean for taxi while the oil is still cold. The time from when you start the engine until you're ready for taxi is probably enough. Eventually, you'll learn the mixture position that lets you taxi, but will simply quit if you attempt a takeoff without enrichening.*



### TIP

For Rotax engines, mixture is completely automatic and you don't lean for taxi. They run richer than needed at idle, but their electronic ignitions at least help keep their spark plugs clean.

help generate extra heat and get things warmed up sooner. Your passenger wishing for more cabin heat will thank you. To be clear, this is done at idle speed, even if that's slightly faster than minimum idle speed as the engine warms up.

Within a few minutes of starting, however, you should be able to lean so much that opening the throttle more than the amount required for taxi speeds will cause the engine to stumble. That's important for safety because it prevents you from attempting a takeoff with the mixture still in this lean condition.

When it comes time for a runup, you'll need to set a rich mixture again. Make sure your checklist includes mixture rich in the runup because some engines will still run at the recommended runup RPM even if aggressively leaned.

After runup, aggressively lean again. So long as you lean so much you can't possibly take off, there's no danger. However, there have been many pilots who unwittingly took off with a fouled plug that tested fine at runup because they idled on the ground full rich after runup fiddling with their GPS or waiting for a clearance to depart from Tower.

*While it's seemingly the opposite of leaning for taxi, fuel-injected systems may need the boost pump on low when taxiing on a hot day to prevent vapor from forming in the fuel lines. Some need it during climb and early cruise as well. Others require the boost pump off for takeoff. See what your POH allows. (Yes, the airplane in the photo taxis just fine with the mixture that lean, even with the boost pump off.)*

## Rough Running Could be a Leak

If your engine is in good health, the RPM will rise a bit as you first lean, then drop a bit, and then drop precipitously as you go too far. It's a narrow band between happily leaned and not running.

However, the engine shouldn't run rough at any time after it's had a few minutes to warm up. If it does run rough as you lean for taxi, then you may have an induction leak (page 59). Almost all gasoline engines have two modes for getting fuel to the engine. One is for normal operation, and the other is just for idle. The details vary with carbs versus fuel injection, and each system, but that's not important here. What is important is that sometimes a leak of air getting into the engine other than past the throttle means the engine is too lean at idle.

This leak creates an uneven fuel-air mixture that causes the engine to idle roughly or not at all. To compensate for this unknown leak, a well-meaning mechanic enrichens the idle fuel setting. The engine now idles, but not as smoothly as it could. It also means that some cylinders are probably far too rich, which can lead to spark plug fouling and even lead building up on valve seats.

So if you lean for taxi and the engine just gets progressively rougher, that's a sign to check for induction leaks.

### TIP

Pilots often apply more power than they need to taxi. When it's time to taxi, try just releasing the brakes and waiting a moment. You might be surprised how the airplane moves forward smoothly on its own, especially if you have the throttle slightly open for a faster idle. While you're at it, test the brakes as soon as you get going—before you actually need them.



### TIP

Even if you choose not to lean for taxi, periodically test the idle speed for a warm engine. It should be at the minimum recommended for your engine. Anything higher is just extra energy on landing, which eats up runway (and potentially brakes and tire rubber).

## LYCOMING "MORNING SICKNESS"

Lycoming's sodium-filled exhaust valves do a great job of staying cool—so much so they sometimes get deposits that cause sticking valves and wear. The classic sign is a Lycoming engine that runs rough right after startup no matter what you do, but smooths out once it warms up.

This is common—and too often ignored because it "goes away." If left unaddressed, it could lead to a valve sticking open and even engine failure. Common.

There's a simple test outlined in SB 388-C that is done with the valve covers and springs removed and uses a custom tool. It's about an hour to do a whole engine. If your engine has this trait, get it checked out while it's still an easy fix.

