

# The Engine Clinic

**W**ith the arrival of warmer weather—and attendant high-density-altitude conditions—many plane owners find that their engines suddenly run “extra-rich” on the ground, at idle. The tipoff is, first, a very noticeable rpm gain on pulling the mixture control to idle cutoff (ICO)—maybe as much as 100 rpm or more. Secondly, you can tell that your spark plugs aren’t happy. They foul in the few minutes it takes to go from tiedown to runup apron.

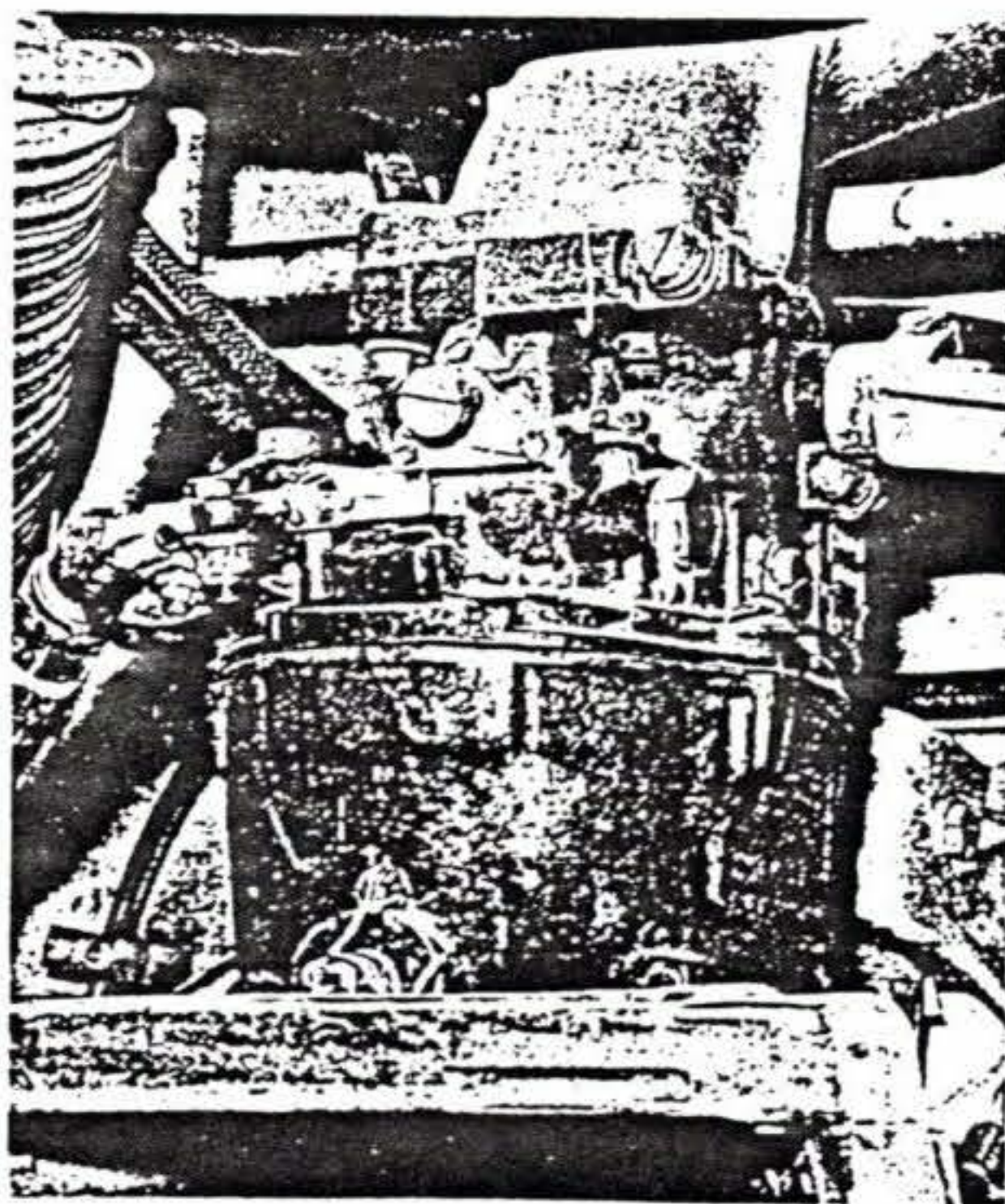
The obvious remedy: Adjust the idle mixture. Every carburetor-equipped aircraft should be checked for proper idle mixture adjustment at least once each calendar year (although few actually are). Lycoming even suggests resetting idle mixture on a seasonal basis, if you live in an area with wide swings in density altitude. This advice is primarily intended for carb-equipped engines, which have a mixture adjustment that affects the idle range only; injected types have a rich/lean adjustment in the arm that connects the butterfly to the fuel metering valve, but changes made at idle will also affect off-idle mixture. Be careful if you own an IO- or TSIO-series engine.

Here’s what to do: First be sure your engine is warmed up, needles in the green, etc. Also, any defects in mag timing, harness or plug condition, and/or the carb itself should be corrected before attempting the test. (You can’t expect to make a meaningful adjustment if, for example, the carb has a saturated float or is leaking internally.) Next, with carb heat off, a clean air filter in place, and all systems “go,” face the plane 90 degrees to the wind and adjust the throttle to give minimum rpm. (This should be about 650 rpm.) Secure the throttle to keep it from creeping. Now begin moving the mixture control toward

idle cutoff, and monitor the tachometer. As you come to the last inch or two of mixture travel, you should notice a 25 to 50 rpm rise in engine speed before the engine falters from lean misfire. (Keep it running.) Jot down the actual rpm rise, whatever it is.

If your leanout gave more than a 50 rpm rise, your carburetor (or fuel injector—the same test applies) is set too rich and needs to be compensated in the lean direction. Conversely, if you saw little or no rpm rise, your idle mixture is set too lean.

The idle mixture adjustment on a Facet Aerospace (Marvel-Schebler) carburetor is in the form of a large knurled screw (or small slotted knob)



*Lycoming says that carb idle mixture may need to be adjusted seasonally, on some engines.*

on the throttle casting, high on the carb. On MA-3 and MA-4 series carbs, find the bowl drain plug; then run your finger (or eyes) straight up the side of the carb until you come to a slotted knob with arrows on it pointing to ‘R’ (rich) and ‘L’ (lean). That’s the idle mixture adjustment. Give this screw a turn in the desired direction,

then repeat the leanout procedure described above.

Of course, alterations in idle mixture have an effect on idle speed as well. If your engine was set too rich—e.g., 150 rpm rise on shutdown—and you corrected this by turning the idle mixture screw as needed to give the desired 50 rpm rise, your engine will now probably idle about 100 rpm faster than before. Accordingly, you’ll want to adjust the idle speed to put it back in the 650-750 rpm range.

On a Marvel-Schebler carb, as on an automotive carb, the idle speed adjustment comes in the form of a setscrew on the low-rpm stop at the throttle arm on the carburetor. Adjusting the setscrew (with a Swiss Army knife, say) just increases or decreases throttle travel at the low-rpm stop. Make adjustments as needed to bring your idle rpm back to 650-750. Then repeat the idle mixture leanout check. You want no more than a 50 rpm rise on leanout.

Obviously, several iterations of the basic procedure may well be necessary to get the carb set up correctly for both idle mixture and idle speed, since one affects the other. Try not to idle so long on the ground, however, that CHT reaches inflight indications. Also, be aware that with prolonged ground operation at full-rich mixture and low rpm, plug fouling is encouraged, even with a perfectly adjusted idle mixture. (That’s because the plugs operate too cold at 700 rpm to burn clean.)

Tip: Once you’ve got the basic procedure down (and everything adjusted the way you want), start noting the rpm rise on every shutdown, as a routine procedure. That way, if float saturation or internal leakage (or carb heat maladjustment) should start to become a problem, you’ll know it—long before most pilots (or A&Ps) would detect it.