Spark Ignition Troubleshooting

by Bob Angel

Let's assume you have an erratic engine run. If you have a mechanically solid spark ignition engine there are usually just two causes of ragged running-fuel or spark. A trained ear can usually identify the stuttering miss of an intermittent spark. The engine runs almost at full speed with an occasional complete cutout. Expect anything from a plug change to complete dissection of the ignition system to find the cause.

A weak spark will often imitate a fuel problem by responding temporarily to needle valve tweaking but won't hold a steady setting, and it can be hard to tell the difference. So we'll keep an open mind when the symptoms appear to be fuel related.

The biggest single source of problems is failed solder joints. I've had very few failures of coils, transistors, or even condensers. I recently had my first failure of a microswitch. And NiCd batteries go out, but usually just by dying slowly. We'll make up a first law of ignition systems right here: "A wire never breaks in the middle."

Wiring failures occur at unsupported stiff sections around solder joints. Vibration is the main culprit. If you solder good joints and support each one, it will be much stronger. That 10K ohm resistor in the high tension line to prevent radio interference has been the most consistent failure, so I've worked on improving it.

I've gone from 1/4 or 1/2 watt resistors to 1 or 2 watt because they have larger wires. 1 install the resistors with at least a 1" section of flexible wire between them and the spark plug clip. I splint the resistor with a length of toothpick extending past both solder joints, potted and encased in clear shrink tubing.

Spark plugs suffer from vibration, and you need to protect them and the resistor. Those old Champion plugs will shake their center electrode loose if you use a heavy alligator clip on them, so use a lightweight wire clip.

When the high tension in-line resistor fails, the engine will often continue to run, with the spark jumping two gaps, one at the resistor break, and another at the plug gap. The engine may run, but it's likely to be intermittent, causing severe radio interference.

An intermittent connection anywhere can cause radio glitching to the point of control loss. Luckily the cutoff switch will usually function well enough to shut down the engine.

An ohmmeter is useful in detecting the resistor failure. Make an end to end check of the high tension wire, while you pull and wiggle the connections. If you can't get access at the coil end, push a pin into the wire and connect to that. If your ohmmeter blew out and your eyeballs lit up, you should have turned the system off. Serious contest fliers carry a spare high tension lead.

Resistors can also fail internally. It would be rare, but the resistor could possibly show both continuity and proper resistance when cold, and open during a run. Substitution would be about the only way to find this problem. The higher wattage resistors mentioned above would be less subject to internal failure.

Robert Shoebridge, New Zealand. Schmaedig Stick is one of the author's favorites because it makes good test bed for different engines. Photo by the author at Eldorado Dry Lake, 1997 SAM Champs.

Continuity light. Here's the first handy tool for the troubleshooting kit:

Make up a simple continuity light consisting of a C or D cell with a 1.5v flashlight bulb wired in series and taped to the cell. Solder it all together with a pair of 10" lead wires with alligator clips. Touch the clips to a pair of wire ends and if there's continuity, the bulb lights. You could use an ohm meter for this, but in field conditions the light is much handier.

The main use of the continuity light is to see if the points are working and the timing is correct. With the ignition system off, clip one lead of the light to the insulated point and the other to engine ground. You can usually get a close idea of the piston's top center position by pulling the prop up on compression. Note the position of the prop, then move the blade backwards and stop when the light comes on.

You've just found where the points will break, and you can estimate the prop's angle between points breaking and top dead center. Some basic information: the plug fires when the points break (open), not when they close. The prop should show a difference of 20 to 45 degrees (spark advance) for the engine to be expected to start. If you're hand starting as you should with most sparkers, you'll want to retard the spark below 45°.

Using the test light, I've quickly found drive washer cams installed in the wrong position. A Brown Jr. cam can be installed in 4 positions, 3 of which are wrong.

A Super Cyke, being a more advanced engine can have it's cam installed in only one wrong position of two possible. You can also estimate degrees of dwell by rotating the prop and noting positions as the light flashes on and off.

And if you're setting the advance on an engine such as a McCoy, where the points will be locked down and a starter used, the continuity light becomes even more essential when you're watching a degree wheel while at the same time setting a precise advance to let's say 44°.

Here is a simple test to see if the airplane's ignition system is the problem. Just install a glow plug and see if the engine runs. If it runs on a glow plug, you just might be onto something. It may not run as fast on glow as ignition, because you can't control the timing as precisely.

We'll describe a clip-on ignition set in a later installment. It can be used for engine break-in or for field testing to see if the on-board ignition system is at fault.

We welcome reader contributions of any peculiar experiences or tips you'd like to share. RLA