



February 2013

Tempest Tech-Tip 0213

The “Right” Way to Check Spark Plug Resistors

Background

Discussion about the “right” way to check spark plug resistance can go on until the cows come home. While what happens when 10,000 volts is forced across a resistor under laboratory conditions is interesting, it is hardly relevant to resolving the problems faced by IAs, A&Ps and AEs. The question is; “What’s causing the rough running engine and how can we fix it?” Conditions on a blazing hot or freezing cold ramp aren’t laboratory conditions. What we, as aircraft technicians, need is a useful available tool to identify a spark plug that might be causing a rough running engine.

Military Specification MIL-S-7886 provides guidance for aviation spark plug manufacturers. It addresses checking spark plug resistance using a low voltage ohmmeter. Hundreds of millions of spark plugs later it’s safe to say that the MIL Spec’s advice is good. A typical low voltage ohm meter (or the Tempest AT-5k meter which relies on a low voltage circuit) can help identify suspect plugs. Although many volt meters use nine volts batteries, that’s close enough. The “low voltage” referred to doesn’t hinge on exactly 8 or 10 volts. It addresses the difference between a “megger” or high voltage resistance check, say 500 to 1000 or more volts, and a typical shop floor meter’s use.

Resistance checks DO NOT replace the familiar spark plug cleaner/pressure bomb test box that actually sparks the plugs under air pressure. However, the pressure bomb doesn’t check resistance, and as we know from experience, sometimes plugs that check good on the pressure/bomb test box still don’t work properly in the engine. Resistance checks supplement normal cleaning and pressure checking.

Why Use 5000 Ohms as the Cut-Off Point?

Five thousand ohms of resistance is a good cut-off point because it provides a value between where spark plugs are manufactured and where problems seem to appear with high resistance. Most reports Tempest receives about rough running engines associated with high spark plug resistance involve values of 7000 ohms or more. Nothing is magical about 5000 ohms, but using it as a cut-off point for spark plugs has proven to work well; just like using 80/60 for compression checks works well.

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New Spark Plug Resistance

Resistance values differ between manufacturers. Champion Spark Plug Company's Engineering Manual gives the nominal value for their resistor type of aviation spark plugs as 1000 - 1500 ohms (no +/- value is shown, but minus 400 and plus 1000 probably wouldn't be unreasonable). Tempest's "fired in resistor" nominal value is 2500, +/- about 1000 ohms. The absolute values for new plugs aren't too important as long as they are fairly low; say less than 4000 ohms and remain reasonably stable throughout the plug's life. Ask your spark plug salesman for the "as manufactured" resistance of his new spark plugs. Then you can compare that to new plugs as received and older plugs during cleaning and inspection.

Resistor Stability – Check Plugs Before You Install Them

Resistance *instability* is at the heart of high resistance spark plug problems. If resistance increases significantly after the plug is manufactured, what was once a good plug becomes a bad plug. Check resistance of all new and reconditioned/cleaned plugs prior to installation. Old technology "stack type" resistor design plugs sometimes come right out of the box with resistance values several times that at which they were manufactured. This type of resistor design is also recognized as sometimes drifting high in service. You'll save time and money by not putting high resistance plugs in an engine just to have to take them out when you find that they're causing the engine to run roughly. Resistor-drift is not a problem with the Tempest's "fired in" resistor design.

What About the Low Limits for Resistance?

The resistor's biggest job is to help provide a sharp, clean 'pulse' type spark. If the spark 'dribbles' across the gap in the beginning, it doesn't light the fuel/air charge properly. If it dribbles at the end of the spark, it eats away at the spark plug electrodes and other 'arc gap' components in the magnetos, shortening their useful life. The lowest spark plug resistance that seems to perform the task of chopping off the front and back "tails" of the spark is about 500 - 600 ohms. Fortunately, excessively low resistance is almost never a problem.

Serviceable Spark Plug Resistance

To help assure reliable and trouble free operations, Tempest recommends replacing spark plugs in service having a resistance value of more than 5000 ohms (5k ohms) or less than 500 (0.5k ohms). For new plugs, we recommend 4000 ohms as the maximum acceptable value.

Additional Information

For additional information on this Tempest Tech Tip and Tempest products, please go to www.tempestplus.com or call (800) 822-3200.

