

## SPARK PLUG CLEANING THE RIGHT WAY

-OR-

*"HOW TO RUIN A SPARK PLUG"*

Glass beads are not good when it comes to cleaning aircraft spark plugs. Let's understand why and, importantly, what's right.

Cement fills the space between the center electrode and the ceramic insulator in massive electrode spark plugs.

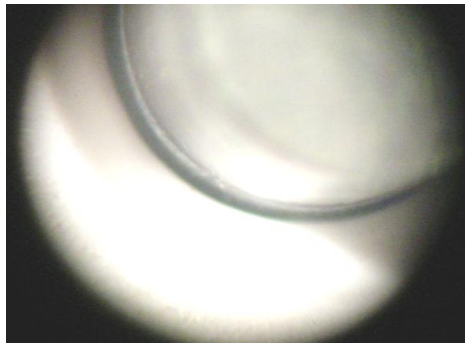


Figure 1

Figure 1 shows the gap between the insulator and electrode before cementing.

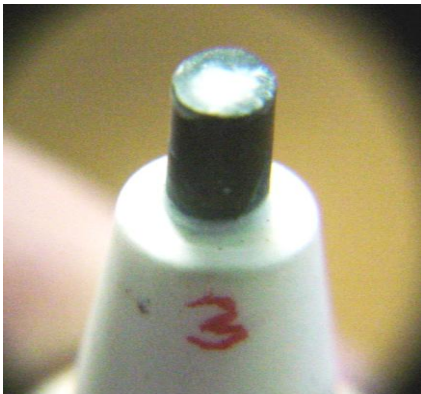


Figure 2

Figure 2 shows an insulator assembly after cementing. The cement transfers heat to the insulator, then the insulator transfers the heat to the cylinder head. Eroding the cement opens the gap and makes a place for glass beads to lodge.

Figure 3 shows a competitive spark plug with glass beads jammed in the gap.



Figure 3

Figure 4 shows a TEMPEST<sup>®</sup> spark plug with glass beads jammed in the gap. It doesn't matter who made the spark plug, using glass beads will create the problem and ruin spark plugs.

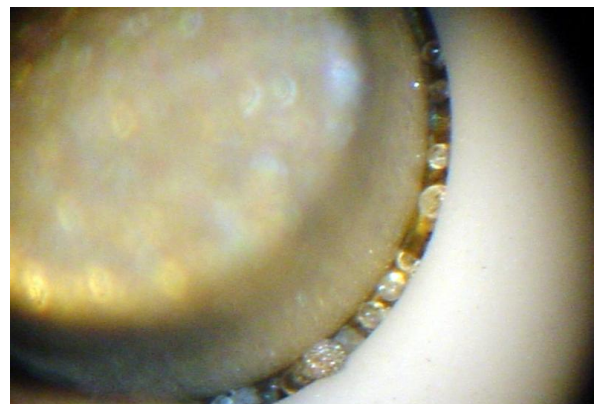


Figure 4

The glass beads will either melt, leaving a conductive lead film on the insulator that may lead to misfiring, or they'll fall out in the cylinder, doing damage there. You wouldn't put sand in your engine. You don't want glass beads in it either.

Glass beads break up into fine particles during use. Shop blast cabinets can propel the tiny particles at tremendous velocity.



Figure 5

Figure 5 shows microscopic bead particles stuck to a .011 inch diameter reference rod. Other beads and bead particles are in the background.

Those tiny particles erode away the cement and create a gap in which beads will stick.

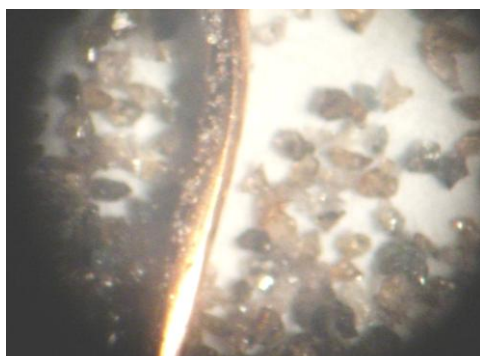


Figure 6

Figure 6 shows the same tiny particles on the reference rod. In the background is properly sized sparkplug abrasive.

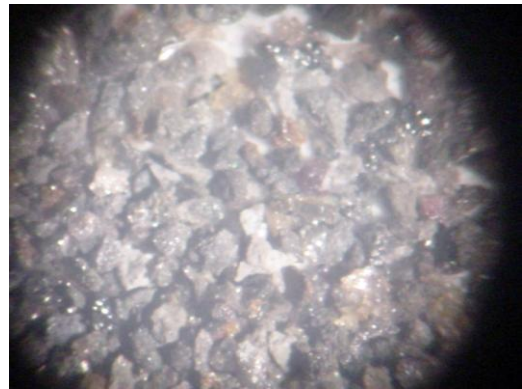


Figure 7

Figure 7 shows appropriate spark plug cleaning abrasive. Properly sized grains cannot get into the narrow gap and erode the cement.

Spark plug abrasives also break and wear during use. When they get small enough they will erode the cement just like glass beads do. That's why you should never add new spark plug abrasive to worn abrasive in your spark plug cleaner. Throw out the used abrasive and replace it with new. Check every few spark plugs with a 10X loupe. If the abrasive is attacking the cement the abrasive is worn out. Change it. It's cheap.

Expensive spark plug cleaners aren't necessary for small shops.



Figure 8

Figure 8 shows an inexpensive cleaner available from aircraft parts distributors and tool suppliers. It works well. A small, dedicated blast cabinet will work too, see Figure 9, if its reserved for spark plugs and used only with spark plug abrasives.



Figure 9

The rule to remember is: Always use the lowest air pressure that will work. For small blast cabinets that's usually 15 to 30 psi. For cleaners designed for spark plugs use the manufacturers recommended pressure. The purpose designed nozzles do not create excessive velocity at the recommended pressure.

A few two-second blasts while rotating and wobbling the spark plug in the machine are usually sufficient. Get the heavy deposits off the electrodes and insulator tip, then stop. Don't focus on getting the insulator snowy white. You're just eating away the electrodes and insulator and wasting your time!

"Getting the lead out" isn't the spark plug cleaning machine's job, see Figure 10.

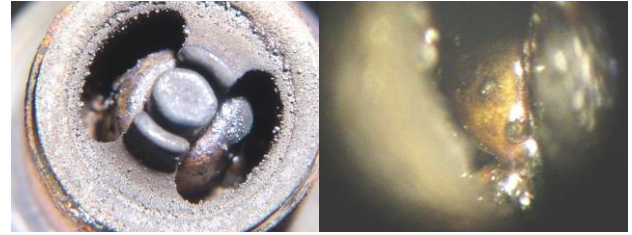


Figure 10

Remove heavy lead deposits in the insulator well with a pick or vibratory cleaner, see Figure 11.



Figure 11

Don't pry against the insulator or electrodes. If you have big lead balls, work them gently until you can free them. Then use the abrasive for a quick cleanup.

A few seconds of blasting in a glass bead box can ruin a spark plug. Three minutes spent doing it right can return the spark plug to service for another run.

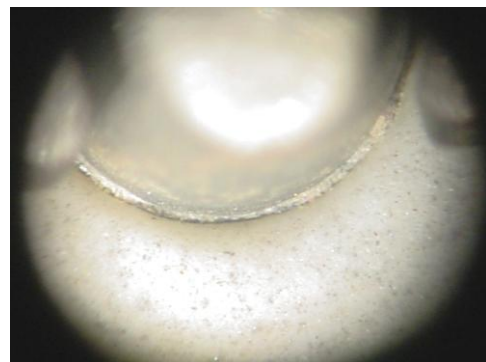


Figure 12



Figure 12 shows a properly cleaned spark plug. Notice that the cement is still in the gap.

NEVER use glass beads to clean a fine wire spark plug. There is no cement in fine wire spark plugs, see Fig. 13.

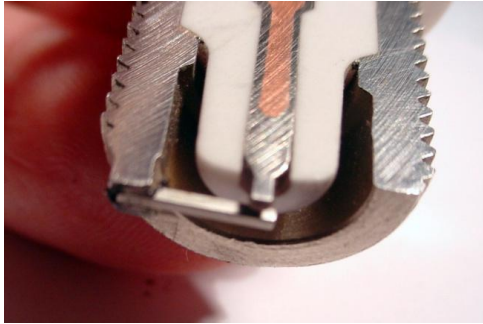


Figure 13

Glass particles will wedge between the electrode and the insulator and can crack the insulator.

Fine wire spark plugs normally don't need much cleaning. However, if you do need to get the lead out don't pry against the electrodes or insulators. If you blast the spark plug, use only high grade, new, spark plug abrasive. Use the lowest pressure possible and blast for only a second or two.

Check the resistor value before cleaning. **Military Specification MIL-S-7886, establishes specifications for aircraft spark plugs and directs that spark plug resistance should be measured at less than 10 volts.** Measure between the terminal inside the lead well and the spark plugs center firing tip. The **TEMPEST® AT5K™** tester, see Figure 14, does the job quickly and efficiently. The green LED means the sparkplug's resistance is excellent. If both the green and red LED's light up, the resistance is serviceable. If only the red LED illuminates, replace the spark plug with a new TEMPEST® spark plug.



Figure 14

**"AT5K™"** means: "AT 5k Ohms, replace the spark plug". **TEMPEST®** resistors are stable. **TEMPEST®** spark plugs help prevent misfiring, wasted fuel, pollution, and expensive spark plug replacement due to high resistance problems.

The lead terminal in **TEMPEST®** spark plugs is nickel plated metal alloy, see Figure 15.

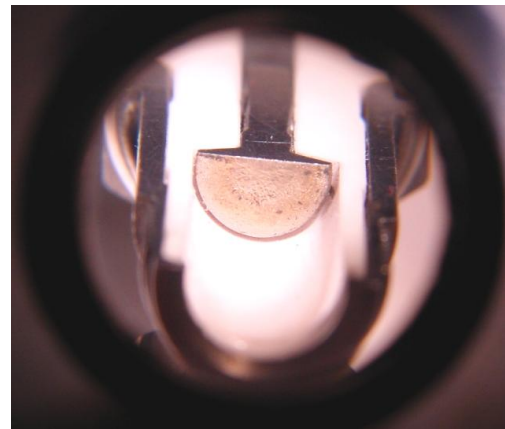


Figure 15

The coloration on the terminal's end is nickel oxide. It comes from pressing the stud into place while it's red hot. It's conductive and provides a low resistance connection from the ignition lead to the resistor. **TEMPEST®** spark plugs are better spark plugs, see Figure 16.

Figure 16 shows the aluminum cap used in competitive spark plugs that captures the 'moving parts' carbon pile resistor. When aluminum corrodes it forms aluminum oxide, an electrical insulator which can compound high resistance problems.

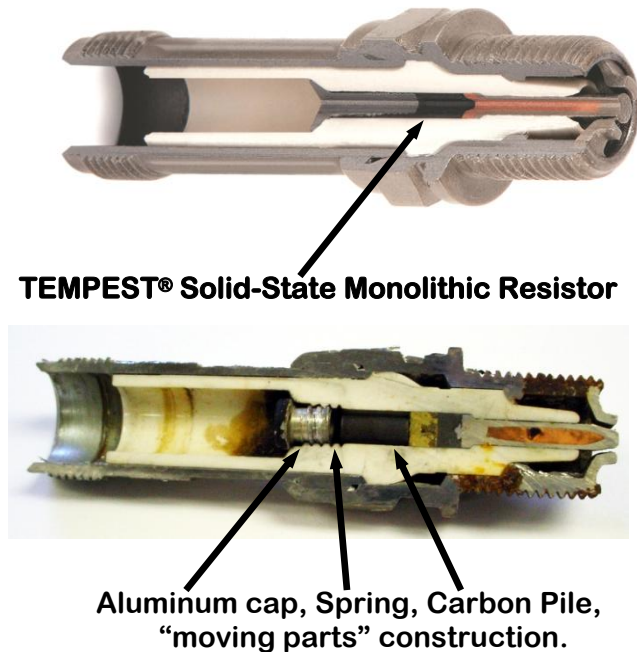


Figure 16

Dirty lead wells can cause flashover. Clean inside the lead well with lacquer thinner, similar solvent, or Bon Ami™ on a Q-Tip™. Use soapy water to remove the cleaning residue. Rinse the spark plug thoroughly. Washing with water won't hurt a TEMPEST® spark plug. The sealed resistor won't let water in. Blow the spark plug dry with compressed air.

Wire-brush the engine end threads to remove carbon and grime. Don't hit the electrodes or insulator with the wire brush. Then apply a coat of TEMPEST® T556™ spark plug thread lubricant to the engine end threads.

T556™ is an advanced product. It flows smoothly and dries quickly. It doesn't bead up like some other brands do. Don't get it on the electrodes or the insulator. If you do, wipe it off with a cloth dampened with water. Make sure the top sides (side away from the engine) of the threads are well coated. That's the side of the thread that will take the load when the sparkplug is tightened. Let the T556™ dry. See Figure 17.



Figure 17

Spray the outside of the spark plug with very light oil like LPS™ # 1, WD-40, etc. Then put the properly cleaned and preserved spark plug away for later use, or back in the engine and go flying!

Always install new Tempest® Aviation Spark Plugs with a new copper mounting gasket. The gasket provides a seal between the spark plug and the engine mounting surface. Each new Tempest® Aviation Spark Plug comes with one copper mounting gasket.

Tempest® recommends replacing the copper mounting gasket every time the spark plug is removed from the engine. Only one copper mounting gasket per spark plug should be installed. If a thermocouple gasket is used, do not install a copper mounting gasket.



**TEMPEST® AVIATION  
SPARK PLUG  
RESISTANCE TESTER  
P/N AT5k™**



**TEMPEST® T556™ SPARK PLUG  
THREAD LUBRICANT  
& ANTI-SEIZE COMPOUND**



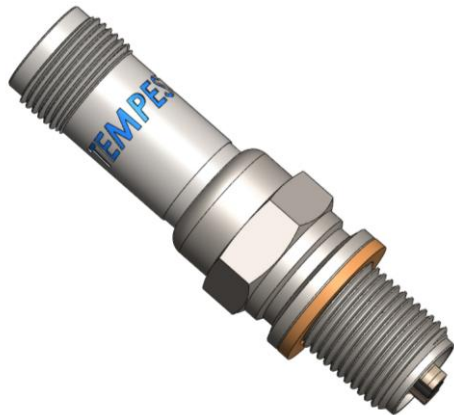
**TEMPEST® AVIATION  
SPARK PLUG GASKET  
SOLD IN PACKS OF 100 P/N UM-674PK**

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## *"Taking Aviation by Storm"*



*Appropriate spark plug resistor value is imperative for proper engine performance. High resistance values (above 5000 ohms) can lead to hard starting, misfiring, and engine roughness. Be sure to make the resistance check a part of your spark plug maintenance procedures.*

### AVIATION SPARK PLUG RESISTANCE

- 500 - 4000  $\Omega$  = NEW - GOOD
- 4000 - 5000  $\Omega$  = USED - GOOD
- 5000  $\Omega$  & UP = NO GOOD - HARD STARTING  
- MISFIRE - POOR COMBUSTION  
- POLLUTION

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