

MORE ON IGNITION SYSTEMS

Published in the July 2006 issue of FlightPlug, the newsletter of the Southern California Ignition Flyers, Mike Myers, Editor

Here's something that some other newsletter editor lifted from something written by a Mr. Bob Arnold of Worchester (presumably Australia since it first appeared in the SAM 89 newsletter there). In any event, with thanks to Mr. Arnold and the intervening editors, here's what he had to say about operating spark ignition engines.

Operation of Spark Ignition

There is an essential difference between spark ignition and diesel or glow plug ignition. A spark motor will only fire when the spark occurs, and only then when the spark is strong enough and the fuel air mixture is within the required limits. Both diesel and glow fuels will fire over a much wider range of fuel to air concentrations than petrol. This means that for spark ignition the set-up must be much more precise and in particular it means that if a spark motor fires at all, it actually means it. So do not get your fingers in the way. This is not to say that flicking a spark motor is dangerous. It isn't, just do not take any liberties.

How Strong a Spark do you need?

A free air spark of .08" (2 mm) is more than sufficient; most 2-3 cell circuits will give 1/4" at least. To test the spark don't try holding the plug lead near to the engine because it is difficult to guess the precise gap and if the gap is too big the spark may short out the coil, which is harmful. Make up a tester with an ordinary small plastic terminal block comprising two connectors of the sort that come in a long strip. From one side of the block have two short steel or copper wires coming together with a gap of 2 mm between the ends. From the other side have one lead with a clip that can be attached to the engine or other earth-point, and another lead that can be attached to the plug lead when it has been detached from the plug.

Contact Breaker Points

I do not believe that any model engine runs long enough to show wear at the points. The gap should be between .012" and .018" on normal engines, with some racing engines down to .007" to .0010" to reduce bounce at speeds over 20,000 rpm, (McCoy says .004" to .006"). Note — 6000 miles in a typical car equals 66 hours at 10,000 rpm on a model engine at 1/4 the voltage and current = 1/16 power at the points.

What Plug Gap?

The .010" plug gap often quoted as normal for model spark motors in fact refers only to the high performance engines produced at the very end of the spark ignition era, e.g. McCoy, Dooling, Hornet etc. The size of the gap depends on the compression ratios and poor cross-flow porting will not run properly on small plug gaps. A gap of at least .018" is needed to get a clean 2-stroke run from most of the old style motors, e.g. Mechanair, early Ohlsson etc. If a motor starts on a rich mixture and runs well 4-stroking, but will just not lean out to a good 2-stroke but cuts out, try increasing the gap a

few thousandths at a time. The upper limit of spark gap is set by the strength of spark available so try it and see. (In the January/February 96 issue of SAM Speaks, Charlie Bruce quotes Dick McCoy as saying plug gaps are .015" to .018".)

Ignition Timing

Do not use more ignition advance than will give maximum power with the particular airscrew you are using. Too much advance can cause significant damage. Use a tachometer if you want more power — do not rely on the sound. Over-advance gives a sharper note which can be misleading. Most engines start readily at about half the maximum power setting. Starting at full advance is quite possible; I do it all the time, but don't try flicking a Dooling 61 with a maximum advance of 55 degrees with a small prop.

Fuels

All high performance engines will perform best on a mixture of methanol and castor oil, preferably in the ratio 3/1 with or without nitromethane (nitromethane not allowed under US SAM rules, ed.) added in place of some of the methanol. Too much nitro will cause overheating of the spark plug (NGK plugs are rather susceptible to this). This can cause damage and is to be avoided. If the motor continues to run even briefly, after the ignition is switched off, you have a potential problem. Find a more tolerant plug or reduce the nitro content. Most old engines will run on glow fuel but may not develop full power. Good quality old engines e.g., Ohlsson, Bantam, Cyclone, Forster etc. will run fine on the normal 3/1 mixture of petrol and mineral oil. If the engine is a bit worn, castor oil may be better.

Starting

Do not overprime. If you prime a spark engine like most people prime a glow engine you will wet the plug and it will never start, until you empty it and dry it out, and remove the plug and wash it. The key to good starting is a good spark and just the right amount of prime or choked flicks. If the settings are known then open the needle 1/2 turn from the running setting, spark at 1/2 of full advance and two or three choked flicks should be sufficient. NOTE: All choking and priming must be done with the ignition switched OFF. You may remember the careful ritual associated with the hand starting of full size aero engines where the mechanic will not touch the airscrew without getting the response "Switches off" from the pilot. They were not wrong. If it does not fire with the first few flicks, give just a dozen or so, then switch off and rechoke. With the correct settings and the right prime, spark engines start more easily than diesels or glow plugs. It should be first or second flick.