Glow Plug Mini HowTo

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Compilation of several Pages I found on the Internet

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Introduction

The glowplug is used to provide ignition for the fuel/ air mixture in a similar manner to a spark plug in a petrol engine. A spark plug could also be used in our model engines running with our special fuels but would then require added equipment and complexity with the possibility of interference with the radio receiver. However, glowplugs cannot be used with an engine running on petrol (likewise without added equipment).
A glowplug is the ignition system for your nitro powdered RC vehicle. Instead of a spark-ignition system such as those found in automobile engines, the remarkably simple glowplug is what we use to ignite the fuel in our engines. It doesn't have a single moving part or adjustment; its only functioning component is a simple, stationary coil of wire. A glowplug is the ignition system for your IC-powered engine. Instead of a spark-ignition system such as those found in full sized race engines, the remarkably simple glowplug is what is used to ignite the fuel in our engines. It doesn't have a single moving part or adjustment; its only functioning component is a simple, stationary coil of wire.

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Background Information

The content of this section exists only to describe, the function, use and selection of a glowplug in general

While surfing the Internet and reading lots of forums I noticed that RC model Helicopter pilots always ask what glowplug to use. There is not much to be found about glowplugs and RC model Helicopters on the Internet. I hope this mini HowTo can help the RC model Helicopters pilots selecting their optimal glowplug.

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Why this HowTo

This HowTo is mainly written so RC model Helicopter pilots can understand there model engine and glowplug. In my opinion one of the most important parts of the RC model Helicopter. You can fly like Curtis Youngblood but is yore engine is not running smooth you still fly like crap ;-D.
This mini HowTo is compiled of several pages I found on the Internet and I asked permission to use their knowledge for this mini HowTo. The original pages are listed in Appendix B.
Only with the knowledge of the original writers I could make this HowTo. I herby thank them for there knowledge.
This HowTo is by no means complete; there is probably more on glowplugs than mentioned in this HowTo. If you have more tips ore information about Glowplugs or comments on this HowTo let mail to me at postmaster@helisonly.freeservers.com.

Is this How-To available in other languages?

Not at the moment, Kurt from www.flyheli.de wants to translate it in German.

What is a Glowplug

Every RC model Helicopter engine needs a glowplug for the ignition. Depending on things like the percentage of nitro used in the fuel, the outside temperature and the humidity you might need to select the right glowplug.
Without the benefits of electronic ignition, the two-cycle engine in your RC model Helicopter has to rely on the physics of the two-stroke principle. Upon initial start-up, the glowplug needs a little help - in most cases, a glow battery. When the engine is running, the heat generated by the combustion process continues to keep the glowplug lit.
What actually happens to the plug during the whole cycle? It actually gets hotter at the instantaneous combustion point, and then cools as the new mixture arrives from the intake. Too cool and the engine misfires or dies. Too hot, and the mixture detonates prior to the complete compression. This is called pre-detonation.
Glowplugs are numbered 4, 5, 6, 7 or labelled with names like HOT, MEDIUM or COLD.

All glowplugs are not created equal. The housing, wire element, type of plating and hole size determine the relative temperature range of a glowplug.

How does it work

As every manufacturer uses different names or signs for their glowplugs, you cannot say that a no. 6 from brand A is the same as no. 6 from brand B. To start the motor we must first heat up the element (the small coil of wire inside the plug) by connecting it to a battery. Most plugs are

designed to use 2 volts but some can only handle 1.5 volts. Make sure which one you have! A 2-volt plug will not get hot enough on 1.5 volts for easy starting while a 1.5-volt plug will burn out on 2 volts (the coil melts). Once the motor is running the battery can be disconnected. However, the plug will continue to glow with an orange heat to provide ignition. How does it do this without a battery?

The general rules to follow are: The faster you run the engine, the cooler the plug. The higher the Nitro content the cooler the plug. The higher the compression, the cooler the plug. If you use a tuned pipe choose a cooler plug. The Very Hot plugs are for four-strokes. If your 2-stroke engine needs one of these, then it's time for a rebuild.

With model engines, you can alter the ignition timing by changing the heat range of the plug. It's not an exact science, but without changing to spark ignition, it's the best you can do. Essentially, the quality plugs are supplied in the following heat ranges. Very hot, Hot, Medium/ Warm, Cold, Very Cold.

A warmer plug will advance the ignition; a cooler plug will retard the ignition. If you run an engine with too cold a plug, you'll get less power, an unreliable idle and an engine that's a pig to start. If you run an engine with too hot a plug you may get pre-ignition which can also result in less power, overheating, damage to the plug and in extreme cases damage to the engine.

Starting an engine is one of the functions of a glowplug. When a glow igniter is attached to a glowplug, it causes the glowplugs coil to "glow" white-hot. This ignites the air/ fuel mixture in the cylinder when the engine is started. Once the engine is running, the heat generated during compression and combustion keeps the glowplugs element hot enough to continue igniting the fuel mixture on it own without help of an external power source. In the simplest terms possible, that's how a glowplug works.

Contrary to what many has previously been lead to believe the following is an explanation of how a glowplug functions in a motor. The plug is initially heated by applying a voltage (typically 1.5 volts) to it. This is to cause it to glow so as to ignite the fuel at compression and start the internal combustion cycle. Once the cycle has started, the power source can be disconnected, as with the heat generated at combustion the CATALYTIC Reaction generated between the methanol and platinum in the plug coils become sufficient to keep the process going.

The catalytic reaction is a reaction whereby platinum will glow in the presence of methyl alcohol vapor. This will happen without any external power source being applied.

With a glowplug engine, ignition is initiated by the application of a 1.5-volt power source. When the battery is disconnected, the heat retained within the engine's combustion chamber remains sufficient to keep the engine running. Ignition timing is 'automatic': At higher rpm, the plug becomes hitter and, appropriately, fires the fuel/ air charge earlier; at reduced rpm, the filament became cooler and ignition is retarded.

Idle Bars and Other Stuff

Again, contrary to what many believe, the idle bar on a glowplug is not necessarily what its name would suggest. It is in tact to stop any fuel not vaporized from dousing the platinum coil of the glowplug by dispersing it away from the coil. Why are plated coils not as good as platinum alloy coils? Plated coils suffer from very quick degeneration as the plating breaks down under operating conditions. As bits of plating come off, the plug is effectively becoming a hotter and hotter unit until in a comparatively short time it is no longer able to perform its function.

Conversely, a platinum alloy coil will still degenerate, but as it is platinum alloy throughout, the surface remains as platinum alloy and the plug continues
giving much the same characteristics for quite a long time.

Plated coils are very poor value when compared to platinum alloy coiled glowplugs.

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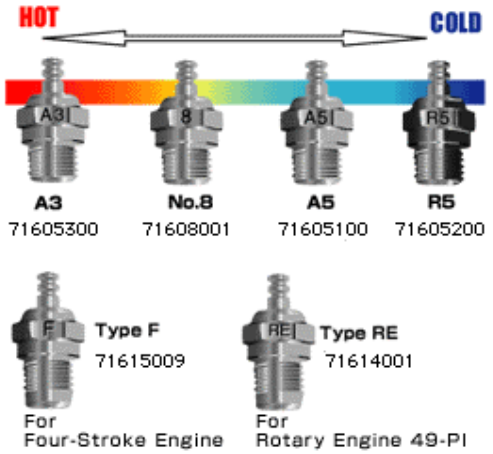
What is a Turbo plug

Glowplugs are available in two configurations: standard and turbo. Most engines come with a standard plug. They feature a straight, threaded housing that thread through the cylinder head into the combustion chamber. Turbo plugs feature a different type of housing; the end that goes into the combustion chamber is tapered. The tapered end mates with a head that is specially designed for use with turbo plugs. The head is also tapered to accept this type of plug. The supposed advantages are less compression leakage around the glowplug and less disruption of the gases in the combustion chamber. The hole in the cylinder head that exposes the glowplug to the air/ fuel mixture in the cylinder is much smaller, and there are fewer rough edges to create unwanted hot spots.

The turbo plug on the left uses its tapered housing to seal it to the cylinder head. The standard plug on the right uses a copper seal.

Which type of glowplug should I use?

Knowing HowTo control all of this has seemed to be a black science, especially to the novice. If all things are equal - the same pipe, same fuel, same engine, and same clutch - then it is possible to balance three areas to achieve the maximum performance from each of your model engines - heat range, nitro percentage, and pipe length.



OK, you've blown the glowplug that was included with you engine, so it's time to get a new one. Which one do you buy? You could try to find the same plug, if information about its brand and type was included with your engine. More likely, you will have to choose from the brands and types of plugs that are available at your local hobby shop.
It all hinges on the fuel we use (or part of the fuel) and what the element is made from. The working part of the fuel is methanol, which is a type of alcohol, but not the drinking kind, it is quite poisonous. The element is made from several metals alloyed to make it strong enough to handle the heat and vibration. The metal we are interested in is the platinum. When platinum comes in contact with alcohol there is a catalytic reaction between the two, which heats the platinum while causing the alcohol to ignite. So one helps the other.

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Heat range

Since the engine's timing is dependent on the size of the element in the glowplug, it has become very important to choose the correct heat range glowplug for a given engine.
Turbo plugs are a type of plug with a cone shaped seat that fits into a specially designed head insert. They require no extra sealing washer and have been proven to increase power over the entire power-band of the engine. They are available in ranges of numbers 5 through 8. In most brands, they are even further subdivided as "C"-hotter or "F"-colder. If you don't speak Italian or Spanish [in those languages, C stands for Caliente (hot), and F stands for Frio (cold)] then the easiest way to remember is that f is associated with freezing, therefore it stands for cold). So you have, in order from hottest to coldest, 5TC, 5TF, 6TC,..... down to 8TF.
Standard plugs fit most engines. They require a copper-sealing ring, and are available in heat ranges from 5 through 9, with 9 being the coldest. While these plugs are substantially different, the same basic principles apply to both types of glowplug.
Using different HEAT RANGE plugs controls glowplug temperature. Just like motorcar spark plugs, glowplugs come in different heat ranges from hot to cold with maybe half a dozen steps in between. If in doubt, use the plug specified by the engine manufacturer. Using a hotter plug than normal will advance the ignition point and a colder plug will retard the ignition. The only way to determine exactly the right heat range plug is by using an accurate tachometer. The plug that gives the highest rpm (for the same fuel and propeller) is the correct plug.
What about the pressure of the fuel/ air mixture? This is determined by the compression ratio of the engine and normally is fixed by the manufacturer with possibly some small change allowed for by fitting or removing shims under the cylinder head. Not something to play with unless you know what you are doing.

The thickness of the glow wire will make the difference between a HOT, MEDIUM or COLD. Each manufacturer offers a range of plugs; a plug is usually identified by a code that indicates its effective operating temperature; not the operating temperature of the engine or the outside air, but the relative temperature of the glowplugs coil. Each manufacturer has its own unique temperature-rating system; the process can be confusing, however, because a universal rating system does not exist for glowplugs. So what should you look for in a replacement plug?
Some general rules about plugs are determined by the size of the engine and the type of fuel used. Smaller engines usually require hotter plugs, while larger engines favour cooler plugs. Engines that run fuel containing a high percentage of nitro favour the cooler plugs as well, while those that run on less nitro prefer hotter plugs (nitro fuels for car engines typically include 10 to 25 percent nitromethane). For example, a small, .12 Size engine that burns high-nitro fuel would favour a warm plug in a mid-range temperature (small engine = hotter plug; high-nitro fuel = colder plug). The same plug might also be suitable for a .21 Size engine running low-nitro fuel (large engine = colder plug; low-nitro fuel = hotter plug).
The size of your engine and the type of fuel are easy enough to determine, so these guidelines should get you pointed in the right direction. For racing nuts who want to get maximum power, however, another element that's not easily determined—yet should be taken into consideration—is compression ratio. The compression ratio of an engine will also be a factor in choosing the proper plug. High-compression engines favour colder plugs, while those with lower compression favour hotter plugs. Engine manufacturers rarely disclose an engine's compression ratio, so it may be difficult to use this information to select plugs unless you know how to calculate compression or can measure it with a compression gauge.
What makes the subject of choosing a glowplug a little confusing is the variety of types that available. Each manufacturer offers a range of plugs, from as few as three or four up to 10 or more. A plug is usually identified by a code that indicates its effective operating temperature, not the

operating temperature of the engine or the outside air, but the relative temperature of the glowplugs coil. Each manufacturer has its own unique recommendations are sometimes included to try to steer consumers towards the correct plugs for their needs. The process can be confusing, however, because a universal rating system does not exist for glowplugs. For example, an O.S. R_5 plug is not the same as a McCoy MC-9, although both are considered "cold" plugs.

Nitro percentage

Now that the engine is running decently, what changes to the plugs have to be made if the nitro percentage is increased?

To do this you need to understand a little more of the theory behind the process. In glow fuel the catalytic reaction is generated between the methanol and platinum only. Castor oil, synthetic oil, nitro methane etc do not generate a catalytic reaction with the platinum.

Next you need to understand that a certain surface area of platinum is required to generate a sufficient catalytic reaction to keep the internal combustion process going. Also it is necessary to allow extra surface area for the reaction to be great enough when it diminishes with the available methanol dropping as in the case at motor idle. Simply put, cold plugs are manufactured using a thicker wire to give greater surface area to facilitate a greater and thus the required catalytic reaction where less methanol is present in the fuel mixture.

So! More nitro means less methanol, which in turn means a greater surface area to platinum will be required to generate a sufficient catalytic reaction.

Suddenly it all makes sense! To work out which temperature plug to use, you need to know how much methanol is in your fuel, not how much nitro or oil.

As a rough rule of thumb;

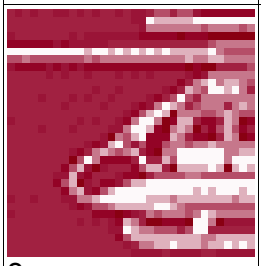
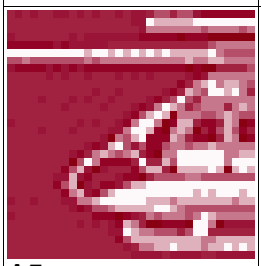
- 80%: methanol or above, use a hot plug.
- 70%-75%: use a medium plug.
- 60%-75%: use a cold plug.
- 65% or less: use a very cold plug.
- Nitro-methane burns hotter than methanol, the other principal ingredient in fuel. Because of the additional heat, which is produced when changing to a higher nitro content fuel, the easiest way for a glowplug to withstand this higher heat is to change to a glowplug that uses a thicker element, in other words, a "colder plug".
- For engines with a nitro percentage below 10% a HOT plug will do OK when the outside temp is 15/ 20 degrees Celsius.
- For engines with a nitro percentage between 10 and 25% a MEDIUM or COLD plug will do OK when the outside temp is 15/ 20 degrees Celsius.
- For engines with a nitro percentage above 25% (for fools only) a COLD plug will do OK when the outside temp is 15/ 20 degrees Celsius.

A lot of testing and experience has yielded the following formula that seems to work pretty well. For every 10% increase in nitro over what is normally used, a corresponding change in plugs of one range colder is required. So if the engine is running well with 30% using a 6TF plug, then it will probably make more power at 40% using a 7TF plug, providing that the weather hasn't changed too much, and provided that the head clearance has been adjusted properly.

Exhaust pipes

The third item to consider is the effect of pipe length on the glowplug. After some runtime, the plug's condition will determine the proper pipe length. If the element is pushed up inside, then a hotter plug is required or the pipe should be lengthened. If the element is gone, then the opposites are true - use a colder plug or a shorter pipe.

In both cases the head clearances should be adjusted but that will probably be the subject of a future articles.
HowTo select a suitable glowplug in each category
Example with OS plugs

 A3		For R/C Helicopter Running-in, Smaller than .32 capacity engines (for beginners) Engine types: 32SX-H
 8		For R/C Helicopter With higher nitro fuel, to reduce overheating Engine types: All O.S. helicopter engines
 A5		For R/C Helicopter With higher nitro fuel, to reduce overheating Engine types: All O.S. helicopter engines
		Engine types: All Four-stroke engines

Particularly in the case of very high performance engines, glowplugs have to be regarded as consumable items. However, plug life can be lengthened and performance maintained as follows:

Fit a plug suitable for the engine.

Use fuel containing a moderate percentage of nitromethane unless essential for contest use.
Do not run the engine lean, or leave the plug connected while adjusting the needle valve.
Use a fuel containing as low nitro as possible
What happens if you use the wrong plug?
If you have used a plug that is too hot or too cold for your application, this will be revealed in one of two ways. If the plug is too hot, the engine may suffer from detonation, pre-ignition and high running temperatures. Detonation occurs when the fuel mixture explodes quickly rather than burns. You don't want this to happen because it can damage the engine. The telltale signs of detonation are a "miss" in the exhaust tone at high speeds and a pitting of the cylinder head around the glowplug and the top of the piston. Severe detonation can cause the coil element of the glowplug to come loose, and this can severely damage the engine. The primary cause of detonation, however, is excessive compression. Simply using a hot plug will not usually cause detonation; so

don't be afraid to experiment. If you're using high-nitro fuel and have increased the compression by reducing head clearance, however, a hotter plug may just push the engine too far and cause damage. At the very least, an excessively hot plug will cause pre-ignition, in which the fuel mixture begins burning well before the piston reaches the top of the cylinder.
Using a plug that is too cold will result in a loss of acceleration and top speed and will cause poor engine idle. If the plug is much colder than it should be, you might notice an excessive raw-fuel discharge from the exhaust pipe. Don't confuse this with an excessively rich fuel mixture.
What makes a glowplug hotter or colder?
Many elements influence a glowplugs temperature range, but primary is the thickness, length and composition of the wire used to form the coil. Other factors that affect a glowplugs temperature include the size of the hole in which the wire is installed; the type of plating used on the glow-plug housing and the material the glowplugs housing is made of.

These glowplugs have very different electrode designs, but despite the visible differences, electrode design has no bearing on plug performance.

Many elements influence a glowplugs temperature range, but of primary importance is the wire used to form the coil – its thickness, length and composition. It will be impossible to find out anything about the composition of the wire because most manufacturers keep it a secret, but the wire can certainly be measured. Other factors that affect a glowplugs temperature include the size of the hole in which the wire is installed; the type of plating used on the glow-plug housing and the material the glowplugs housing is made of.
The best way to keep track of your glowplugs is to store them in their original packaging; the plug type is printed right on it. A visual inspection won't help you much, since some plugs don't have any temperature information printed on them; that's why the original packaging comes in handy.
Is one type of plug more durable than another?
If the fuel mixture is properly adjusted, one plug should last as long as any other. When the fuel mixture is on the lean side, the hotter plugs tend to be more susceptible to damage as a result of their typically thinner elements. The quality and consistency of the material within the glowplugs element can also affect durability, and this varies among manufacturers but can be sorted out with experience. So yes, within the various brands, there are slight advantages to colder plugs, but these advantages are not enough to justify choosing them if the result is diminished performance.

Tips

If your glowplug fails, always check if the coil is ok. If the coil is missing do not start the engine again, but clean it first thoroughly, so the broken coil want do any harm to the rest of the engine. A

repeat of glowplug failure is pointing to too much compression or dirt particles in the engine. If you do not use your engine for a long time (more then a week), put some after run oil in the engine. The layer of oil will prevent the metal parts from rusting. A better solution is to run the engine first on a methanol/ oil mixture (no nitro!) for 30 seconds and then apply some after run oil. Nitro is the part of the fuel that is adhesive for moisture and therefore creating possible rust forming. Rust particles can cause premature glowplug and engine failure!

Helicopter:

If you can buy three plugs:
For example; an Enya No. 3, No.4 and No.5 and try them all, starting with the No.3 plug, and see which one works best for your particular set-up (i.e. provides the most power at the top end combined with a reliable idle and smooth transitions).
The following is a list of engines using different fuels and silencers and the plugs:

- OS32SH 16000rpm with 17% oil, 10% nitro and a muffler, runs best on a Hot plug (Enya No.3)
- OS32SH 16000rpm with 15% oil, 16% nitro and a muffler, runs best on a Hot plug (Enya No.3)
- OS32SH 16000rpm with 15% oil, 16% nitro and a tuned pipe, runs best on a Medium plug (Enya No.4)
- OS32SH 16000rpm with 17% oil, 10% nitro and a tuned pipe, runs best on a Hot plug (Enya No.3)
- OS32SX 17000rpm with 17% oil, 15% nitro and a muffler, runs best on a Medium plug (Enya No.4)
- OS61SX 16000rpm with 17% oil, 10% nitro and a muffler, runs best on a Medium plug (Enya No.4)
- OS61SX 16000rpm with 17% oil, 15% nitro and a muffler, runs best on a Medium plug (Enya No.4)
- OS61SX 16000rpm with 22% oil, 15% nitro and a muffler, runs best on a Hot plug (Enya No.3)

Plug conditions

The term “reading a plug” is commonly heard in the pits, but how is this done? In addition to the conditions that have been previously mentioned, the plug should be visually inspected for colour. The simplest accessory to check is the glowplug but it is also the one that gives you the exact image of the engine health. The thread is silver colour but is made with an alloy composed by Platinum and Rhodium! To keep a constant look at glowplug will help you to understand HowTo make the carburetion. In the following way:
Take the glowplug away and look at the thread:

- If the thread has a dark colour and the plug seems humid, the carburetion is too rich and the engine does not work at its best. You have to lean the carburetion closing the full speed needle.
- If the plug body (the part surrounding the element) is wet and the element is shiny, and in its original location, then change to a “colder plug” (assuming that your engine temperature is on the cool side).
- If the plug body is dry, and the element is shiny, the plug is correct for the conditions.
- If the spiral of the plug is a little bit pressed and bent it means that the engine is too compress. If you are racing on a sea level track, with 25% or more nitro could be the main reason. Than you need to check under head shims and in case insert a tenth.

- If the plug body is dry, and the element is a dull grey, the engine is running too lean - change to a “hotter plug” to correct the condition.
- If the thread has a dull, as sanded, it means that the carburetion is too lean (poor of fuel) and you can damage the engine. You run the risk to break the thread and to make it fall down on the top end of the piston, damaging also the sleeve. In both these cases, we suggest you to replace the old with a new plug.

Apart from when actually burned out, a plug may need to be replaced because it no longer delivers its best performance, such as when:

- Filament coil has become distorted.
- Filament surface has roughened while.
- Foreign matter had adhered to filament or plug body has corroded. Engine tends to cut out when idling.
- Starting qualities deteriorate.

Rules of thumb.

You can only “Read” your plug in a nearly new state [Wire like new and shiny] a grey plug can still operate well. But after it has totally gone grey performance can start to fall off. To test just put in a new plug and if there is no difference in performance save the gray one or put it back in. If your engine does not feel or run right tray a new plug before making major tune changes

- Wire and surrounding bottom of plug wet, with like new shiny wire = rich side of optimum power 85%
- Wire and surrounding bottom of plug starting to dry and wire starting to gray = Very close to optimum power 95%
- Wire and surrounding bottom of plug dry, wire totally gray but not distorted optimum power 100%
- Wire and surrounding bottom of plug dry, wire distorted = slightly lean DANGER
- Wire and surrounding bottom of plug dry, wire broken and distorted or burnt up = extremely lean possible engine damage!

For ultimate power a competition modeler will juggle combinations of plug, compressions and type of fuel (mainly nitro methane content) but this is way beyond the needs of the sporting flyer.

The pro’s best kept tuning secrets

One of the best-kept secrets of the most experienced nitro racers and engine tuners is that you can net some serious horsepower gains by experimenting with various glowplugs. As mentioned earlier, a glowplug is the ignition system for a nitro engine.
Anyone who has ever worked with spark-ignition systems knows that ignition timing can have a profound effect on engine performance. “Ignition timing” is when the fuel mixture is ignited in relation to the position of the piston and crankshaft during the compression stroke.
When the piston is at top deal centre (TDC) of the cylinder, the crankshaft’s journal, to which the connecting rod is attached, is pointing straight up. This puts the piston at the highest point of its travel in the cylinder; therefore, the crankshaft is at “zero” degrees. The crankshaft must rotate a full 360 degrees to make a full cycle, so the amount of crankshaft rotation in degrees is used to measure the events that take place inside the engine; for example, ports opening and closing and ignition. Although you can’t measure or definitively set when ignition takes place inside a nitro engine, it helps to be able to visualize what’s happening when you experiment with different plugs.

Example 1:

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The fuel mixtures ignition is precisely at the moment the piston reaches the very top of the cylinder. This would effectively mean the ignition timing is taking place at zero degrees of crankshaft rotation. Installing a hotter plug in the same engine makes the fuel ignite sooner because less compression is needed to heat the plug's element to the point that the fuel will ignite.

Example 2:
The ignition occurs to degrees before the piston reaches TDC. In ignition-engine-speak, that would mean that the timing is set to 10 degrees advanced, or 10 degrees BTDC (before top dead centre).

What does all this mean?

Simply knowing that plug temperature will affect when combustion takes place will, hopefully, help you understand why choosing the proper plug will improve performance. Generally, it's best to try to advance the timing or flash point of the fuel – in the case of nitro engines, as much as possible without going too far. If the mixture is ignited too early, then performance is lost and pre-ignition and detonation may occur.
Picco's engineers don't use plug to tune the engine; they simply find the proper plug for the application and stick with it. They haven't seen much difference in performance from changing to a slightly hotter or colder plug. They do, however, admit that getting too far away from the ideal plug temperature will have a negative effect on power production.
To choose which plug is correct for the weather, fuel, and pipe on a particular day, start with what you normally set-up. Warm up the engine, fly for 5 minutes and get a head temperature. Tune the engine by sound and sight on the field until it seems to be "on the pipe" and flying cleanly, hopefully not too lean.
Be sure to check it periodically to keep from getting too hot a temperature. If it seems very hot, (over 250 °F, ca.120 °C) on a Raytek temp gauge, or over 215 °F (ca.100 °C) on an Exergen temperature gauge), then you need to change to a hotter plug. That's right, a hotter plug. The engine is running too lean in order to keep the colder plug lit. Remember you're trying to get the plug to fire earlier so you need a thinner element, which will light quicker. The general rule is - the hotter the engine runs, the hotter the plug, the colder, the engine the colder the plug.

Using shims into Nova Rossi factory engines:

Cubic Capacity	Shims in mm
2,1cc	0,3 mm
2,5cc	0,3 mm
3,5cc Start	0,3 mm
3,5cc Short stroke	0,6 mm
3,5cc Short stroke 1B 7 ports	0,3 mm
3,5cc Long stroke	0,6 mm
3,5cc Long stroke Marine	0,3 mm
8,3cc	0,2 mm
10cc	0,2 mm

Very important:
During the installation of a turbo glowplug on the under head verify that no dust or any other material come inside because they could make precarious the seal of this glowplug during the compression

Engine manufacturers rarely disclose an engine's compression ratio, so it may be difficult to use this information to select plugs unless you know how to calculate compression or can measure it with a compression gauge.
This information is best used when adding or removing head shims. More or thicker shims lower the compression; fewer or thinner shims raise it. Remember: when adjusting head clearances with shims, a plug change may be necessary.

The final analysis

I hope you know more about glowplugs and what to do with them. Most people don't think about glowplugs until they don't work. It's precisely then that this information should be most useful. Just keep in mind that there isn't a magic glowplug that will suddenly make your engine scream as it never has before; glowplugs are one of many elements that factor into overall performance.
While most of this may sound like it is a lot to remember, it is important to realize that getting the most performance out of your engine takes a little patience and thought. But with a little practice and maybe a little "cheat sheet" it can become second nature to 'know your glow-plug'.

Appendix A: Available glowplugs and application

COX

Cox
1295 H St.
Penrose, CO
81240

Type	Classification	Application
		Cox Glow Head Pee Wee & T.D. .020
		Cox Glow Head Td .010
		Cox Glow Head .049 Med,Bw,DF,Baby Bee

DuraTrax

1610 Interstate Drive
Champaign, IL
61826-90
TEL: 800-637-7660
FAX: 217-398-1104
EMAIL:
WEB: http:/ / www.duratrax.com/ index.html

Type	Classification	Application
Silver Sport Glowplug	Hot	Ideal for low-nitro applications
Carbon Speed Glowplug	Medium-hot	Designed for informal racing and sport uses
Gold Racing Glowplug	Cold	Competitive racers and higher nitro fuel mixtures

Enya

FAX:
EMAIL:
WEB

Type	Classification	Application
3	Hot	Small engines
4	Medium-hot	Universal, Low Nitro
5	Medium	Universal, Nitro
6	Cold	All ranges, high Nitro

Fox Manufacturing Co

5305 Towson Ave.
Fort Smith,
AR 72901
TEL: 501 646 1656
FAX: 501 646 1757
EMAIL:
WEB: http:/ / www.foxmanufacturing.com

Type	Classification	Application
Standard Short 1.5 Volt		
Standard Long 1.5 Volt		
RC Short 1.5 Volt		
RC Long 1.5 Volt		
Miracle Plug 1.5 Volt		
Gold STD Long Plug 1.5 Volt		
Gold RC Long 1.5 Volt		
Standard Short 2 Volt		
Standard Long 2 Volt		
RC Short 2 Volt		
RC Long 2 Volt		
Pro 8 Short		
Pro 8 Long		

Hanger 9

FAX:
EMAIL:
WEB

Type	Classification	Application
		Hanger 9 2-Cycle Performance Plugs (2)
		Hanger 9 Extra Life Sport Plugs (2)
		Hanger 9 4-Cycle Performance Plugs (2)
		Hanger 9 # 9 Ducted Fan Perf. Plugs (2)
		Hanger 9 # 3 Performance Plugs (2)
		Hanger 9 4-Cycle Super Plug (2)

HPI

HPI
15321 Barranca Parkway
Irvine, CA
92618
TEL: 949 753 1099
FAX: 949 753 1098
EMAIL: frank@hpiracing.com
WEB: http:/ / www.hpiracing.com

Type	Classification	Application
(C.3)	Hot	

K & B Manufacturing

K&B Model Products
P.O. Box 98
Sierra Madre, CA 91025 U.S.A.
Tel: 626.359.9527.
FAX: 626.301.0298
EMAIL: tech@mecoa.com.
WEB: http:/ / www.modelengine.com/ kbindex.htm

Type	Classification	Application
R/ C Long Plug		Idle Bar
R/ C Short Plug		Idle Bar
HP Long Plug		
HD Severe Service		
IL Long Plug		
IS Short Plug		
4-Cycle Plug		

Lion Electronics Taipan

8 IRWIN STREET,
BELLEVUE.
WESTERN AUSTRALIA

Tel: 61 8 92501929
Fax: 61 8 92744423
EMAIL: lion@tnet.com.au
WEB: http://www.tnet.com.au/~lion/

Type	Classification	Application
T HB Blue ring	Cool	High nitro content fuels. High compression engines. Hot fuel
T HG Green ring	Medium	Excellent R/ C idle. Faultless throttle pick up. Medium heat range coil
T HP Purple ring	Cold	Competition use glowplug. Extreme R.P.M. engines and Competition fuel
T HR Red ring	Hot	Standard or FAI 80/ 20 methanol and oil fuel. Low compression engines.
T HS Silver ring	Medium	Specialty for Four Stroke Motors.
T HY Yellow ring	Medium	High performance good R/ C idle. Low nitro content fuels.

McCoy products

McCoy
2117 N. Second Ave
Upland, CA
91784 TEL: 909 982 3888
FAX: 909 946 6823
EMAIL: n2plugs1950@msn.com
WEB: n/ a

Type	Classification	Application
MC14		GLOWPLUG, MC-14, 4-CYCLE ENGINES
MC4C		GLOWPLUG, MC-4C, 4-CYCLE ENGINES
MC50		MC-50 GLOWPLUG
MC55		MC-55 GLOWPLUG W/ IDLE B
MC59		GLOWPLUG, MC-59, HOT LOW TO MED NITRO
MC8		GLOWPLUG, MC-8, MED-COLD, NITRO FUELS
MC9		GLOWPLUG, MC-9, COLD, NITRO FUELS

Model technics

Model Technics
Vanguard Way Shoeburyness
Essex SS3 9QY
Tel +44 (0)1702 292244 –
Fax +44 (0)1702 298744
EMAIL: motec@modeltechnics.com
WEB: http:/ / www.modeltechnics.com/

Type	Classification	Application
Fire Power F2	Extra Cold	
Fire Power F3	Cool	
Fire Power F4	Cool	

Fire Power F5	Medium	
Fire Power F6	Warm	
Fire Power F7	Hot	
Max Flash M3	Cold	
Max Flash M4	Cool	
Max Flash M5	Medium	
Max Flash M6	Warm	
Max Flash M7	Hot	
Max Flash M8	Extra Hot	

NELSON COMPETITION ENGINE

121 Pebble Creek Lane
Zelienpole, PA 16063
Tel: 724-538-5282
FAX:
EMAIL: **nelcomp@fyi.net**
WEB

Type	Classification	Application
Cone	Cool	

NovaRossi

NOVAROSSI di Cesare Rossi & C s.n.c
Via Europa 20/A
25040 Monticelli Brusati
BRESCIA
FAX:
EMAIL: info@novarossi.it
WEB: http://www.novarossi.com

Type	Classification	Application
C1	Extra hot	0,8 to 2 cc.
C2	Hot	2 to 3,5 cc.
C3	Medium	3,5 to 6 cc.
C4	Cold	6 to 10 cc.
C5	Extra cold	Nitro fuel and RC Nitro 5%
C6	Cold	Nitro 10% from 10-13 cc.
C7	Cold	Nitro 15% from 13-15 cc.
C8	Super cold	Nitro 22% from 15-30 cc.
C.5/RC	Hot	2.5 to 6 cc. with protection band
C.7/RC	Cold	6 to 15 cc. with protection band
C.4/A	Average	Aluminum
C.6/ A	Cold	Aluminum
C.8/ A	Cold	Aluminum
C.4S Special	Hot	Special 3.5cc 10cc

C.5S Special	Average	Special 3.5cc 10cc
C.6S Special	Cold	Special 3.5cc 10cc (till 25% nitro)
C.7S Special	Cold	Special 3.5cc 10cc (over 25% nitro)
C.8S Special	Cold	Special ultra
C.5TC Turbo	Hot	
C.6TC Turbo	Hot	
C.7TC Turbo	Hot	
C.8TC Turbo	Hot	
C.5TF Turbo	Cold	
C.6TF Turbo	Cold	
C.7TF Turbo	Cold	
C.8TF Turbo	Cold	

OS

OS Max
1610 Interstate Dr
Champaign, IL
61822
TEL: 217 398 8970
FAX: 217 398 7721
EMAIL: enginesupport@greatplanes.com
WEB: http:/ / www.osengines.com

Type	Classification	Application
No. 8		Most widely used O.S. glowplug. Recommended for most current O.S. (and many other) 2-stroke engines
Type F		Special long-reach plug recommended exclusively for O.S (and many other) 4-stroke engines
Type RE		Special long-reach plug designed exclusively for O.S. Wankel rotary engine
A5		Recommended for most current O.S. (and many other) 2-stroke engines particularly for 1/ 10th & 1/ 8th scale off-road car engines
A3		Dependable O.S. quality makes A3 the most durable and longest-lasting glowplug available at an economical price
R5		Recommended for high-nitro fuel and high r.p.m. Engines, particularly 1/ 8th track racing car engines

Paris Racing

Paris Racing
4254 Independence Street
Chino, CA
91710 TEL: 909 465 1189
FAX: 909 465 0089
EMAIL: tech@parisracing.com
WEB: http:/ / www.parisracing.com

Glow Plug Mini HowTo

Type	Classification	Application
T6-TC		Paris Racing Top Turbo Plug for .12 (hot)
T6-TF		Paris Racing Top Turbo Plug for .12 (cold)
T7-TC		Paris Racing Top Turbo Plug for .21 (hot)
T7-TF		Paris Racing Top Turbo Plug for .21 (cold)

Swanson Fireball Glowplugs

FAX:
EMAIL:
WEB

Type	Classification	Application
Red	Hot	
Short (Red)	Hot	
Long (Red)	Hot	
Standard (Yellow)		
Std, Short (Yello)		
Std, Long (Yello)		
Fireball (Blue)	Super Cool	
Fireball, Short (Blue)	Cool	
Fireball, Long (Blue)	Cool	
Fireball R/C Idle Bar		
Fireball R/ C Short		
Fireball, R/ C Long		
Fireball Car/Racing (Silver)		
Fireball Silver Short		
Fireball Silver Long		

Thunderbolt

Global Hobby Distributors
18480 Bandilier Circle
Fountain Valley, CA 92708 TEL (714) 963-0133
FAX:

Glow Plug Mini HowTo

EMAIL:
WEB: http:/ / www.globalhobby.com

Type	Classification	Application
No. 3 Platinum Plug		Excellent for helicopters & aerobatics. Best mid-range. Smaller coil. Ball top stem for ignition system hook-up.
Four-Cycle Glowplug		For four-stroke engines. Works especially well in larger displacement and Magnum brand four-strokes.
H.D. Competition Plug		For high performance two-stroke engines with pipes. Great for RC cars, or if you burn out plugs quickly.
R/ C Long Glowplug		Low Price! Use in all sport 2-cyc. engines above .10-.15 size. Idle bar improves idle and transition response.
Standard Long Glowplug		For pattern engines and other "hotter" running engines without idle and transition response trouble.
R/ C Short Glowplug		Use in all sport 2-cycle engines with thin heads (typically below .10-.15 size). Idle bar for idle & transition.
Standard Short Plug		For "hotter" running small engines with thin heads

Tiger Shark

FAX:
EMAIL: http:/ / www.hobbycraft.com/ ts.html
WEB:

Type	Classification	Application
3	Hot	3.5-6cc
3s	Hot	0.8-6cc
3i	Hot	3.5-6cc
3is	Hot	0.8-6cc
4	Medium	6.5-15cc
4i	Medium	6.5-15cc
5	Cold	Nitro Fuel
5i	Cold	Whit idle bar for Nitro Fuel
6	Very Cold	High RPM and Hi-Nitro fuel
7	Medium Cold	Boats
8	Medium Cold	Boat and Hi-Nitro Fuel
S	Medium	4-Cycle and Large Engines
H		Heli Engines

Traxxas

Traxxas
1100 Klein Rd.
Plano, TX
75074
TEL: 800-818-3381
FAX: 972-265-8014

Glow Plug Mini HowTo

EMAIL: traxxas@airmail.net
WEB: http:/ / www.traxxas.com
1-888-T-R-A-X-X-A-S for customer service 8:00 a.m. to 4:00 p.m. Central Time Their customer service dept is very friendly and will answer any questions you may have

Type	Classification	Application
Std Long		Nitro
HD		Piped Eng

Trinity

Trinity
36 Meridian Dr.
Edison, NJ
08820TEL: 877 380 0040
FAX: 732 635 9410
EMAIL:
WEB: http:/ / www.teamtrinity.com

Type	Classification	Application
R5	Hot	
R6	Medium Hot	
R7	Cold	
R8	Extra Cold	
R12 Pixi	Glowplug Head	
TP6S	Average	

Webra

WEBRA MODELLMOTOREN GmbH & Co. KG
Eichengasse 9
A-2551 ENZESFELD
AUSTRIA
Tel: ++43 (0)2256-81122-0
Fax: ++43 (0)2256-82306
e-mail : mailto:webra@webra-austria.at
Web: http:/ / www.adis.at/ webra/ fra_mot.htm

Type	Classification	Application
Webra-2	Hot(short coil)	For small engines
Webra-3	Medium	3-20 cc universal
Webra-4	Hot	10-20 cc (Low Nitromethane)
Webra-6	Extra Hot	4-stroke or low RPM for 20-23 cc no or Low Nitromethane
Webra-7	Cold	Universal High Nitromethane

Glow Plug Mini HowTo

Appendix B Internet Links

Used Internet Links:

- IC online
  WHAT IS A GLOW PLUG?
  Explanation and tuning of a glowplug
  http:/ / www.ic-online.co.uk/ glow1.htm
- O.S. T Series glow plugs
  Explanation of a glowplugs and turbo glowplugs
  http:/ / www.os-engines.co.jp/ english/ line_up/ plug/ plug.htm
- FlyHeli
  List of several glowplugs
  http:/ / www.flyheli.de/ gluehkerzen.htm
- The Worlds finest 1:8 scale buggy page
  The Glowplug story
  Explanation of glowplugs and relation with Fuel and exhausts
  http:/ / www.twf8.ws/ new/ tech/ tip/ glowplug.html
- Warringah Radio Control Society Incorporated
  Glow Plug Selection
  By Brian Gardiner, and Central Coast Model Aero Club Inc.
  http:/ / www.wrcs.org.au/ articles/ 10.htm
- Hobbytech & Models Inc.
  ALL ABOUT GLOW PLUG by Steve Pond
  http:/ / www.hobbytech-models.com/ tips/ tips/ glow.html
- Grandpas-hobbies
  Russell Aisbitt
  list of engine, fuel and Glowplugs
  http:/ / www.grandpas-hobbies.com/ glowplug.htm
- Bennett-Racing
  How to “READ” your glow plug.
  Rules of thumb
  http:/ / www.bennett-racing.com/ modem/ techtips/ nitro/ glowplug.htm
- HOLDFAST MODEL AERO CLUB
  howglowplug
  catalytic reaction
  http:/ / www.holdfastmac.com.au/ howglowplug.html
- Novarossi
  Give a look to your glow plug
  Shimming your glowplug
  http:/ / www.novarossi.com/ avvertenze/ ing/ look_glow.html