EXTREME FLIGHT

Basic RC Aircraft Engine Tuning....

VERY IMPORTANT! Read each step and follow exactly and move the sticks exactly as I indicate, there is no slow stick movement when checking the H and L needles. Since both needles work together, slowly throttling up or down will tell you very little when doing your base needle settings.
Don't omit any steps and don't do any steps out of order and IT WILL WORK, follow each step and do exactly as described:

Before starting the tuning process you will need to:

1 - Tune the engine when it is warm, and double check the tune after your first flight. Start the engine and run it for a good few minutes with varied throttle and some full throttle run ups to get it nice and warm.

2 - If you have not done so, adjust the servo travel for a consistent low idle, does not need to be perfect as long as it is as low as it will reliably run for at least 10 seconds or so. **You can not properly tune the low needle if it is too high!** Once you are done with tuning and after your first flight you will want to double check your low idle and high idle settings.

3 - For smaller engines set the low as low as it will reliably run and you can adjust after tuning. You will NOT use a high idle setting during tuning as you cannot tell exactly where the low needle is on a high idle. A good low idle should stand still on the ground while idling. An idle up should just make the plane want to roll on the ground.

Now that you have that set up, lets proceed with tuning:

4 – **If you have not done so already, look in the owner's manual for your engine and set your needles according to the settings suggested by the manufacturer.** These are always a suggested starting point, your tune should end up close but will most likely be different slightly. Even if the manufacturer runs the engine before shipping they likely did not tune it and even more likely the tune will be completely different for your location.
Keep in mind on a new engine you will need to re-tune after several dozen flights as the engine breaks in. You can tell this because the engine will begin to run noticeably richer on the low end. Generally you can't tell much difference on the high end after break in but always check it as well.

5 - **Tune low needle first.** Now run the engine up to clean it out with a couple full throttle run ups and then go to to low idle. **Listen to the engine**....how long does it take to start to "load up" or start to slow down in RPM? If it is rough right away you are likely way to rich. Remember, on gas carbs adjustments are VERY small, like the width of a screwdriver blade or 1/16th of a turn or less. Making large adjustments can make you go from rich to lean and then you'll be chasing your tail from there out. Small adjustments and sneak up on it.
A good "safe" tuning on the low needle you should be able to clean it out with some run ups, return to idle and it should have a nice steady low idle for at least 15-20 seconds before it starts to load up. If it does this it is still just a "touch" rich but will not die on you and it will run nice and smooth.

6 - **How Low should react**. Now that you have it running, clean out the engine and let it go to idle. Let it sit for 10 seconds or so and then slam the throttle to full, not slow, nail it!! Listen to what it does. If it dies or almost dies, you are too lean. If it stumbles and works it's way up (may see smoke in exhaust) you are rich. As tuned in number 5 above it should run up quickly with very little or no noticeable stumble. Check this several times before proceeding to the H needle.

7 - **Now tune the High needle**. There are several ways to do this with RPM but you can get in serious trouble tuning a gas engine for maximum RPM and likely end up with dead sticks!!! I do NOT recommend using a tachometer for the tuning process.
The simplest way for a safe needle setting is this. With the engine warm and the low needle tuned run the engine up to full throttle for about 5 seconds. Now chop it in one quick motion to low. Listen to
what it does then.
- If it returns exactly to a steady idle, you are very close, you may possibly a touch lean.
- If the idle goes way low and works it's way up to a steady idle you are too rich (engine has residual fuel from the top).
- If it stays at a high idle and then slows down you are too lean (engine got hot at the top).
- If it dies you are either way too rich or way too lean. With the H at 1.5 on a 120cc you should not be too lean.

8 - **How should the High react**. Ideally you will have at least some residual when quickly chopping from H to L. So in other words from a 5 second full run up and chopping to low the RPM should just barely dip, and then return to your normal low idle. That's nearly a perfect H tune that allows some residual fuel for high speed downwind passes and down-lines when the RPM's will pick up. This will also leave a little fuel left in the engine to compensate for atmospheric changes and elevation changes if you fly at various locations.

9 - **When H is set return and double check the L and then double check the H.** Then it's time for a flight. Listen to the engine carefully for all of the noted symptoms while you are flying. One engine test I do in-flight is for the H needle. Get the engine nice and hot, maybe a high speed pass or something. Now do a full throttle straight up line. Listen! Engine should be smooth and steady until you can't go higher. If it starts to sag at all, land immediately and richen the H needle just a tad and try it again.
NOTE: This fade can also be caused from overheating not tuning related so make sure your engine is properly baffled if you're now the tuning is correct. Also make sure you have adequate air exit from the engine and consider a low-pressure lip on the cowl to suck air out. Lack or air exit can cause the cowl to pressurize when effects the carburetor to pump too much fuel and be rich in the air.

There you go, pretty simple and really only takes a few minutes once you get the process down.

For further information on tuning, baffling and setup visit: https://www.facebook.com/groups/RCTEK

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