

How to reduce r/c engine noise

Help with how to reduce noise levels in radio control model aircraft glow/petrol/nitro/gas engines

"How do I get my model quiet?"

Well here are a few pointers to assist you along the way

The main problem that our beloved hobby suffers is, Noise. If a club has a noise complaint made about it the local authorities are obliged to investigate, and if any model is found to be over the guideline of 80dBA at 7m, then it is entirely possible the club could lose it's flying site. A solution is to make sure models are as quiet as possible. Although it is not possible to make every model quiet every time, there are 5 main topics which we can look at in order to reduce noise, and these are...

1. Full Throttle Flying

*If you operate at full throttle at all times, it's difficult to meet an 80 dbA requirement. Flying your plane at 2 clicks down from full throttle should help to reduce propeller, exhaust as well as vibration noise. Try to adapt your flying style so as to consciously **not** fly at full throttle.*

2. Exhaust Noise

Previously thought to be the only source of noise from engines, the exhaust noise is also one of the most easily silenced. Early engines ran without any form of silencing and this led to many noise complaints so silencers were adopted. These were more like expansion chambers than silencers and the engines were barely silenced. Modern mufflers have a baffle inside to reduce noise and you should never run the engine without a silencer. Extra baffles are available in 'Mute' sets but be careful, it is possible to 'kill' an engine by over silencing it. A full tuned pipe can be very effective (Carbon-Fiber pipes can have less resonant noise and a less harsh sound compared to a metal pipe). Another additional measure you could use is the grey rubber exhaust expansion extensions at around £4.00 each

3. Propeller Noise

Only recently has this been shown to be a source of noise and what a source of noise it is too! Independent research has shown that is order to keep under the 82dB BMFA guideline, propeller tip speed has to be kept to 350mph or below. Apart from being hard to achieve, this testing was done with traditional shaped propellers (i.e. flat tips) that make lots of noise, do little work and are inefficient. The new rounder and thinner tips like APC use are a lot quieter and so the maximum limit can be raised to around 400mph. Every additional reduction of around 50mph extra tip speed reduces the noise by approx. 2dB, so an lowering the tip speed by 75mph means roughly reducing the noise level by half!. In order to keep noise down the tip speed must be reduced. The way to do that is to use a higher loading propeller. e.g. a 60 size engine using an 11"x7" prop turns at 13,500rpm and has a tip velocity of 442mph. Change the prop to a 12"x8" and the rpm will drop to around 11,000rpm with a corresponding reduction of tip speed to around 393mph, around 50mph reduction in tip speed and therefore a reduction of around 2dB – not brilliant but a good reduction in noise levels and performance will barely suffer. An alternative to a bigger propeller is the same size propeller but with 3 or 4 blades instead as this again puts more load on an engine and therefore reduces the rpm, therefore prop tip speed, and the end result a reduction in noise.

While all engines produce power, the propeller is essential to transmit this power into forward thrust. A more efficient propeller will transmit more thrust/power. Below is listed the most common model aircraft propellers for IC engines.

APC, Master Airscrew, Graupner, Bolly, Kyosho, Precedent (Smart & Airflow), Menz 'S' and 'Ultra', Mejlzlink

APC propellers are the most common for sport and "pattern" flying. They are made out of a composite material and are excellent for general use. Graupner and Kyosho propellers are also composite propellers. Kyosho props are quieter than Graupner. Master Airscrew props are noisy and inefficient propellers, their only redeeming feature is their strength against ground impacts.

Menz 'S' and Precedent's 'Smart' range are intended for large engines. They are of wooden construction so tend to break easily compared to glass, composite or carbon props. Mejlzlink propellers are also suited to large engines and are of carbon fiber construction.

What prop should I use? I hear you ask

Choose a propeller that allows the engine to achieve an rpm just above maximum torque/power, for most engines up to 1.00cu.in this is approx. 10,000rpm. This allows the use of a larger and more efficient propeller. A large propeller spinning slower can produce as much thrust as a tiny prop wizzing away. Did you know that a "real Spitfire prop turns at 1,250rpm flat out, and just look at that performance! A larger loading prop is almost always quieter on the same engine, because it is turning slower and this equates to lower prop tip speed.

4. Vibration

Any hollow space will act like an amplifier for sound and an wooden hollow airframe is excellent for just this purpose, just think of the noise a drum makes. A shock isolation mount isolates the engine so vibration is kept within the engine mountings so the airframe vibrates less. Depending upon the quality of the mount system used and the size of the airframe, up to 3dB(A) can be achieved.

Shock isolation mounts can either be:

Rubber mounts between the engine mount and the firewall such as Nexus rubber mounts. This is a simple system that gives a reasonable noise reduction level and allows you to utilise your own style of mount. The only problem is that it will increase engine length by ½" so the firewall needs to be set back ½" if possible, or mount the engine further back on the engine mount if possible. The decision to use these mounts must be made at the start of the construction process. Price is £6.00 for a set of four – Effective and cheap!

Apache Aviation makes a similar system to Nexus but for larger models and these are the only mounts that work well with Laser Engines apart from the Parc Amber mounting system. They are suitable in set of various sizes for engines up to 70cc (Petrol) and used in groups can even be used for larger engines still. They are fitted in a similar way to the Nexus mounts. Prices range from £6.75 to £20 depending upon size of engine.

Parc Amber make perhaps the most intricate soft mount and possibly one of the most effective. By using various sliding parts and aerospace grade materials their mounts are adjustable for an engine an are locked in place using grub screws, and clamps. No drilling or tapping is needed.

Dubro make some excellent mounts that are used in a similar way to a normal engine mount but the attachment points to the firewall have rubber mountings inset to isolate the engine – effective and not particularly expensive. They add no length to the model. There are four mounts in the range. The 4-Stroke mounts have long arms to account for rear mounted carburetor.

Weston uk make the smallest and neatest mounts. Conventional T-Mounts they have an inset metal piece called the 'Bearer Raft' and this is bonded to the main mount using a rubber compound. These are very effective. These can be bored and tapped for your engine for an extra £5.00. A mount no bigger than an normal 40 size mount will suit all engines from 25 size to 1.80 size, at a cost of around £30

Rubber Rawl nuts can be used, but these provide little noise reduction and vibration is still transmitted as there is nothing in the firewall hole itself to dampen vibration.

5. Induction Noise

Most general noise comes from the carburetor sucking in air. Fitting an air filter eliminates this and also it is good for the engine! All 4-Stroke and most 2-Stroke can be fitted with an air filter to reduce noise levels and protect the engine. Reducing the "Nitro" content of your fuel will also reduce noise as Nitro reduces the temperature at which fuel ignites and makes it burn rather than explode so burning is still taking place when the exhaust port opens.

CONCLUSIONS

In order to quieting a model we need to...

Choose your exhaust system very carefully

Use rounded tip propellers like APC...

Select the correct propeller for the engine to keep the tip speed below 400mph

Soft mount your engine

Use fuel with little or no "Nitro" content

If all the above doesn't work then you can always fly electric!