

Alongside the growing pressure for cars to be 'greener', there is one environmental impact that currently effects track use in particular—noise. **Derrick Rowe** shares the experiences of DPR Motorsport quietening down the original R500.

# The art of noise (reduction)

IN TERMS OF day-to-day work in motorsport, most people would fix on performance and, with a little more thought, reliability as being the key deliverables. However recent engineering experience with the original—and still pretty awesome—incarnation of the Caterham R500 came up with a new 'green' target—to quieten the beast!

It is not quite ten years since this impressive model was first unleashed, powered by a Minister-tuned 1.8 litre K-series engine and delivering a 0–60 time of under three-and-half-seconds. The car topped the *Autocar* 0–100–0 records (time taken to get from rest to 100mph and back to zero) in 2002, with 11.44 seconds—even the Radical SR3 could only manage fourth (13.20 seconds). (And the new Ford-engined R500 currently sits at fifth place in the *Top Gear* test track lap times.)

However, all of this raw power comes with a 'green' price—a good deal of noise. As we have seen with the recent legal case surrounding Croft circuit, during this decade 'NIMBY' tolerance of noise has diminished with the result that all UK race circuits now face enforcement of strict noise compliance requirements.

The R500 is pretty noisy in all departments. Thanks to the roller-barrel throttle bodies there is very considerable induction noise. The road legal exhaust system may do something to reduce emissions (on a good day) but is not so effective at noise reduction. This may have something to do with the separate catalytic converter being almost as large as the exhaust box. In this particular instance, an R500 owner wanted to drive on his local circuit, Goodwood. As most of you will know, Goodwood operates strict noise testing with several drive-by sites in addition to an initial static test.

## Induction noise reduction

The logical place to start the exercise was at the front—the first target being the induction noise. Caterham supplies an induction-

silencing kit that pipes air from a scoop under the radiator into an airbox surrounding the throttle bodies. However, this is quite an expensive solution and there are some concerns about clearance under the air scoop, for example the consequences of the scoop meeting a puddle of water or other obstruction at speed out on the open road.

This aspect was relatively easy to fix thanks to a *Bernard Scouse* carbon airbox that bolts directly to the original backplate; this is a work of art in its own right and is a precision fit under the bonnet.

Filtration was achieved by fitting a K&N air filter cone to the front of the box. The result was an immediate reduction in induction noise and also improved filtration over the 'production' solution. This approach may lack the cold air feed of the original system, but it's much cheaper and easier to fit; and the loss of a few bhp doesn't seem too significant in the R500 scheme-of-things.

## Exhaust noise reduction

Attention was paid to the exhaust with the fitting of a non-cat 4-into-1 collector, connected to an R400 Caterham exhaust box where the rear fixing bracket had to be reversed to allow for passenger side fitment.

It did seem quieter but the next step was a sound test at Goodwood. Being based at Guildford, the benefit of the sound test was the opportunity (or perhaps the excuse!) for an R500-mounted blat through the country lanes towards the south coast. Fortunately a trackday was in progress and the always-helpful Goodwood pit crew provided access to

their testing equipment. However, despite all our efforts the noise level was still a wobbly 105dB, which was only just reduced to 103dB by the fitting of a *Super Trap*. Clearly a rethink was required!

## A bigger boat?

I am sure that there is immense engineering science to noise reduction but we had neither the time nor the money to instigate a comprehensive R&D project. This left us with what is best described as the "Jaws" approach (as in the film *Jaws...*), ie: we needed a bigger boat! As a next step we approached Raceco, who manufacture tailored noise reduction silencing systems. These are truly sexy silencers being repackable and made out of titanium.

We approached this from a practical, rather than theoretical, perspective. The box specification was the maximum diameter that would leave some clearance between the exhaust and the car, and the length was the maximum that would fit between the shortened 4-into-1 collector and the rear wing. To put it simply, in this instance size really is everything!

We set off to Goodwood to get tested again. The initial results were disappointing with noise reduced to 103dB, but with some dramatic exhaust 'popping' that took it over the all-important 105 limit.

Inspection revealed air leaks at the collector joint and also around the silencer—illustrating the downside of a repackable, but not fully sealed, design. After application of an exhaust sealant the level was reduced to 103dB and a subsequent tests gave a reliable 101–102 once fully sealed.

Given the exponential nature of the dB scale, a reduction from over 105dB to 103 or 102 dB is very significant—and noticeable—in terms of noise reduction and also in allowing the more highly developed and noisier Sevens to take part in trackdays. ■