



THE EXPERT STEWART SANDERSON

Having worked as a tuner for 17 years, Stewart 'Stu' Sanderson is one of the most-respected names in the business. A Level 5-trained fuel-injection technician, Stu has worked for a Ford Rallye Sport dealer, a well-known fuel-injection specialist and various tuning companies.

Eight years ago he joined forces with Kenny Walker and opened up Motorsport Developments near Blackpool (01253 508400, www.remapping.co.uk), specialising in engine management live remapping, as well as developing a range of Evolution chips which are now sold all over the world.

He is the creator and administrator of www.passionford.com, which he started in 2003. It has grown rapidly from a few friends contributing, to one of the biggest Ford communities on the web.

Stu's enviable knowledge of the workings of modern-day Ford performance engines means that every month he's just the man to explain how and why things work, and importantly how they can be improved.



Words: Stewart Sanderson and Will Pedley

TRACK DAY PREP

PART
TWO

GET YOUR HANDLING, ENGINE AND INTERIOR SORTED FOR YOUR NEXT TRACK DAY BLAST.

Last month we looked at preparing your car for the track, specifically at what is required to get your wheels, tyres and brakes up to spec for the punishment they will take as you hurtle around your local race circuit. This month we will finish the feature by discussing suspension, corner weighting, aerodynamics, interior, engine prep and more.



Getting suspension geometry spot on is the key to a great track car

SUSPENSION/ GEOMETRY

This is an often-overlooked area and more important than most people give it credit for! The first thing to check for is play in any of the components. These include wheel bearings, track rod ends, steering rack, bushes, top mounts etc. A failure here could kill you and others.

Then it's time to inspect the suspension struts for signs of fluid leaks or damage. With everything checked and serviceable, make sure all four wheels are pointing where you want them! If you have ever hit a pothole or clipped a kerb, it's more than likely that the alignment will have been compromised.

The rear wheels follow the front wheels when your car is

being driven, which is known as the 'thrust axis'. If you imagine drawing a line down the middle of the car, from the middle of the front axle to the middle of the rear axle, you want this thrust axis to be as close to that centre line as possible. If there is a difference between the thrust axis and this centre line, it will cause the vehicle to 'crab' and pull to one side when travelling in a straight line. Entering a corner with alignment like this will make for very unpredictable handling and potential oversteer.

By having your toe, camber and caster (where applicable) set up properly to centralise the thrust axis, you should be able to optimise the driveability and handling of your car.



Upgrading your suspension components will be one of the first things to consider when the track beckons!

NOVICE/OCCASIONAL TRACK USER

Upgraded road springs: A set of stiffer, upgraded springs should both lower the car and the centre of gravity. Stiffer springs should also help reduce body roll through the corners, inspiring a little more confidence and control.

Bushes: Track use places a lot of strain on the factory suspension components, many of which are fitted with rubber bushes. These rubber bushes are designed for comfort, ride quality and generally more sedate road use. An upgrade to polyurethane bushes will reduce movement within the attached components, which in turn will make the handling sharper and give greater feedback.

EXPERIENCED/ REGULAR TRACK USER

Dampers (also known as shock absorbers): As you get more familiar with your car and its handling characteristics on track, the natural progression is to upgrade the dampers.

Damper selection is a tricky one to summarise; it is a personal choice and very much budget based. You need to establish how finite the adjustment required is, how easy the adjustment is and what the car will be used for as a bare minimum. There are plenty of kits out there ranging in price from a few hundred pounds up to tens of thousands of pounds! An off-the-shelf kit from one of the big names will have received a considerable amount of development and should offer a noticeable improvement over your standard set-up!

Anti-roll bars: When a vehicle turns into a corner, the ARB transfers the load from the outside of the turn, where it naturally tries to move, into the suspension on the inside of the turn and helps counter the roll. The ultimate aim is for the body of the car to remain stable and flat through a turn so that the weight stays evenly distributed across all four tyres.

Corner weighting: The amount of pressure or weight exerted onto a tyre directly affects its grip. Uneven weight distribution tends to exaggerate braking, as well as traction, under acceleration on

the heavier side. However, the lighter side is rendered almost useless because of this. Instability results and the car requires more driver interaction to perform what could be perfectly simply cornering manoeuvres. In an ideal world the distribution would be 25% over each corner resulting in perfectly neutral handling.

Vehicles with adjustable spring platform shock absorbers can have additional compression dialled into or out of the spring in order to help distribute the weight around the car more evenly.

INTERIOR

It may sound simple, but have a clear out. The last thing you need is your CD collection flying around at the first corner. Any loose items are at risk of distracting you, hitting you or finding their way under the pedals.

Once you've taken out all your loose accessories, you may want to remove additional weight in the form of your spare wheel and jack. By taking this weight out, you are increasing your power-to-weight ratio, which will make your car faster and brake better.

A fire extinguisher is a good investment for your vehicle at any level. Try to get the best one your budget will allow and make a note of its service life.

Whether your car is new to track or a veteran, a roll cage should be a strong consideration. Not only will it stiffen the chassis up further, it will offer crucial protection should things go horribly wrong. However, you must consider the additional risk of head injuries in the event of an accident on the road if you're not wearing a helmet, and be aware that some insurers won't insure a vehicle at all with a cage fitted.

WEIGHT SAVING

As we have talked about already, by removing weight from your vehicle you are increasing the power-to-weight ratio. After the previous simple steps, it's time to get serious...

Exterior body panels can be replaced with carbon-fibre or glass-fibre, suspension components replaced with magnesium etc.



Have a look at page 10 and see why fitting a roll cage is a VERY wise idea



AERODYNAMICS

Most people think of boffins with calculators and so decide that more power is the key to better lap times. Wrong! A car with less power can be as fast on the straights and through the corners if it is efficient and stable.

At a basic level, check there is nothing loose and flapping

over the vehicle. It is worth trying different angles of adjustment to find the balance between the angle of attack-aiding downforce but without causing excessive resistance (drag).

Chassis: I'm pretty sure you've heard people talking about the 'ground effect' used in F1. A

by flat panelling the underside of the vehicle, encasing all those things. To go further, the addition of a diffuser will help the high-speed, low-pressure air under the car match the normal speed air travelling over the car. By easing the transition we achieve more downforce without causing drag.

"THE AIR UNDER THE CAR IS MOVING FASTER AND SO GENERATES DOWNFORCE."

around. Check to make sure there are no areas at the front of the car that are going to act like a parachute, even if a duct doesn't go anywhere, make sure that air can go through it or around it.

Now we've covered the basics, let's go a bit deeper. The same principle of aerodynamics that keeps planes in the air keeps your car on track. The only difference being that aeroplanes are interested in lift, whereas we are interested in downforce. By flowing air around an object at different speeds, the slower moving air will exert more pressure than the faster moving air as it travels over the object. The object will then be forced toward the faster moving air.

The air under the car is moving faster and so generates downforce. It is this downforce that allows you to maintain stable high speeds through the corners as it is pinning the car to the track.

Front of the car: This area guides the air towards the body and rear of the car, the smoother we can make this happen, the better! The fitment of a splitter is a good starting point, after that fitting canards onto the bumper can help direct airflow

variation on the same theory can be applied to your car. The underbody of most cars currently is not a particularly easy place for air to pass through; sumps, gearboxes, propshafts, driveshafts etc are in the way.

A track car benefits hugely from smoothing out these restrictions. This can be achieved

Rear of the car: This area deals with the air that's travelled over the car, and has one last chance to help you. By using a spoiler or rear wing (vehicle dependant) you can use the airflow to generate downforce over the rear wheels. This doesn't work well on fwd cars as it encourages the front end to lift and in turn induces understeer. Rwd and 4wd cars do benefit, but again if there is the option of adjustment use it to balance downforce gains over drag losses.



ENGINE

Your engine will be pushed hard on a track day, so you need to make sure it's running 100%. Whether the engine is standard or modified, a fuelling and detonation check under load is essential.

The engine should also be run on super unleaded fuel (where applicable) for track use, as its quality seems to be less variable than normal unleaded. On forced induction vehicles it may pay to use an octane booster product alongside super unleaded fuel. Take the advice of your mapper as it can be a hindrance instead of a help depending on your map.

NOVICE/OCCASIONAL TRACK USER

An oil and filter change should be a routine part of track day preparation. Choose your oil carefully depending on mileage, state of tune and whether oil temperature is a problem.

If you are running a standard air filter and it is showing signs of age, it would be wise to replace it. If it is reusable, clean it and re-oil as appropriate. Whilst in the engine bay, ensure everything is secure, especially the battery. Cambelts and auxiliary belts should be inspected for signs of perishing and replaced if showing any signs of wear or age.

The ignition system should be thoroughly checked; misfires tend to ruin a track day. Spark plugs should be checked to ensure they are of the correct heat range. HT leads should be checked for breakages and poor engagement. Rotor arms/distributor caps should be checked for wear.

EXPERIENCED/REGULAR TRACK USER

With all of the above areas covered, it's time to start considering the weak points of the engine that may fail under hard use. There's nothing worse than losing track time because of an avoidable failure.

If you are using slick tyres, the cornering forces will be exceptionally high, so a baffled sump is a must to prevent oil surge and the resulting damage of sucking air into the oil pump.

If available, high-pressure or billet-gearred items can increase reliability when used on vehicles sustaining high revs around the track.

> Drawing air into your oil pump is bad, but drawing air into your fuel pump isn't going to do it any favours either. At best causing misfire-type behaviour, at worst causing an engine meltdown. There are a few options available fortunately, all of which revolve around maintaining fuel supply to the pump. This can be achieved by fitting a swirl pot with a lift pump and the fuel return line feeding into it, then the main pump feeding the fuel rail from it. Another option is to use baffles or a special foam inside the tank to restrict the speed the fuel can move around inside.

Breather systems are another area that need investigation for sustained track use. Oil will be trying to force its way out with the extra crankcase pressure behind it. A good oil breather system will allow this pressure out safely, in turn reducing the chance of oil leaks and oil passing the piston rings that can lead to detonation in the combustion cycle.

Track driving does lead to far higher stresses on the engine,

so it can be worth moving onto uprated gaskets and fitting performance aftermarket fixings and fastenings. Uprating your con rod bolts is also advised if the vehicle is destined to spend long periods of time at very high revs.

COOLING

Whether your car is standard or heavily modified, it's going to get hot! Very hot! However, there's plenty you can do to aid cooling before getting on track. Keeping things running around their safe window of operation will give you the very best chance of reliability.

NOVICE/OCCASIONAL TRACK USER

Coolant should be changed if there is any question of its age or concentration. The thermostat should also be replaced if there is any doubt about its operation or age. The cooling fans should also be checked for operation as they will need to work the moment you come into the pits.

EXPERIENCED/REGULAR TRACK USER

Once you've optimised the cooling features the vehicle came with, it's time to start adding additional cooling in the form of ducting and airflow modifications. Exterior mods to the front bumper can allow far greater amounts of direct airflow to radiators, intercoolers, oil coolers etc. Ducting can be retro-fitted to provide additional cooling to brake calipers, which most vehicles not so equipped normally benefit greatly from.

TRANSMISSION

Your transmission will have a hard day out at a



track day so it pays to try and prepare it as well as possible. Make sure there are no leaks and that the clutch is not starting to slip. If it's starting to slip with road use, you'll be lucky to get anything more than a couple of laps on track. Replace it if you are in any doubt and move to an uprated item if you are running a tuned engine.

NOVICE/OCCASIONAL TRACK USER

With the basics covered, it's time to look at changing the oil in your gearbox and differentials (where applicable). If the oil has not been changed recently, or is running the cheapest stuff the motor factors could offer, it's well worth changing! A high quality, fully synthetic transmission oil will offer considerably more protection. The fitment of a magnetic oil drain plug will catch any debris and save it passing through the ratios/bearings and causing further damage.

EXPERIENCED/REGULAR TRACK USER

You may want to start looking into the possibility of changing your differentials to suit your driving style more. The fitment of 1.5-way or 2-way differentials can change the behaviour of the

car on throttle lift off, while items like an Automatic Torque Biasing differential can help fwd cars 'pull' themselves round corners.

Another option is to change the gear ratios inside the gearbox to suit your vehicle's powerband more. This job is best left to a specialist who will be able to advise you on what suits your needs.

On heavily-modified vehicles, especially with dog engagement gearboxes, a strip down is to be expected at regular intervals after track days to inspect or replace worn or damaged components.

COOL DOWN LAP

Hopefully after you have taken the time to prepare your car well you

will have enjoyed your time out on track. However, before you bring your car back into the pit lane, you should do at least one cool down lap. This will allow things to cool down gradually while still moving. It wouldn't do you many favours to sprint a marathon and sit down as soon as you crossed the finish line, and the same is very true of your car.

Keep your revs down to around half of your rev limit and use the brakes and the throttle lightly. While doing a cool down lap, make sure you stay off the racing line and let faster cars past. Even when you've finished your cool down lap, remember not to put the handbrake on in the pits as it can still warp your brakes!



You don't need to worry about fuel cells until things get a lot more serious

NEXT MONTH
INTERIOR GAUGES EXPLAINED