

## **Race Car set up the easy way**

Your probably reading this thinking "Race car set up?" We race off road, not on poncey tarmac, our cars spend most their time off the ground to worry about the likes of tracking, camber etc.... WRONG!

Our sport has seen an increase in speed over the past few years as well as a rise in the performance of the cars, suspensions are becoming more sophisticated with adjustable shocks and springs common in every class.

The set up of an off road car is something that has no magic formula's or cribs, the individual drive train and suspension type will determine how a car handles and more importantly feels from the drivers perspective. It's no use having 350 BHP under your right foot if the car won't drive in a straight line down a tree lined track.

This article is predominantly for independent suspension cars as that is all I have ever raced, beam axle cars can apply some of the techniques, especially the front axle geometry. Spring rates and shock absorber valving also make a big difference to ride and handling, this subject would fill the magazine and send everyone to sleep so won't be covered.

The starting point for setting up the car is put it on a flat surface or floor, if there is a big hole or dip in your workshop floor then use wood to get things level; all four wheels need to be level. If plates or wood is being used, mark them so they can be used in the same place next time.

Another vital point is the wheels on the car. Make sure they are straight & not buckled or hammered back to nearly round after that rock at Walters Arena flattened the rim!

If there is play in any wheel bearings, track rods, or pivots then these should be changed so the figures set stay that way when the car is in motion, it also keeps Vic Palmer happy...

### **Ride height**

This is the starting point for set up, more so for independent cars than axles. You know the next course is fast, flowing and fairly smooth so why have 16 inches of ground clearance? OK the car looks like a proper off roader but at what cost? The centre of gravity is much higher so the car is more likely to roll, there is very little droop in the suspension so traction will be poor and the front has the aerodynamic properties of a yacht in full sail!

If the opposite approach is taken then you are in for a painful ride, no-one has successfully made a ground effect safari racer! If the car bottoms out in ruts, then the skid pan hitting solid ground tends to limit your forwards speed by sending a painful message up your back to the brain!

Back to the settings, ride height is now set and written down for further use, next is

### **Tracking**

I use a tape measure to set tracking, measuring the distance between inside to inside at the front of the wheel rims and then at the back; the difference obtained should be greater at the rear of the rims than the front, giving toe

in. The effect of toe-in differs front to back, more toe in on the back makes the car less twitchy at speed, and can be used to counteract over steer when turning in. Toe in on the front has the opposite effect and can be used to make a car turn in sharply. With beam axles the front only can be adjusted easily, it is worth checking the rear though as a bent axle can cause all sorts of problems!

Toe out should be avoided at all costs, this causes the car to weave and feel unstable.

The figure for the difference front & back of the rim should be in the range of 0-8mm on a 16 inch rim, again make a note of the value for future reference.

### **Thrust line**

OK, the tracking is now set, trouble is the wheels are pointing to one side, meaning the car will crab. Simple solution, after the tracking is set is to use two cheap laser spirit levels bolted to a piece of box section that fits on the wheel rim, but inside the tyre. Use bungee cords to fasten them on and you have a means of measuring which direction the car is pointing. You can also do this with a string line pulled taught across the face of the tyre, the laser gives a more high tech approach and also is good for teasing the cat with!



The distance from the line to the centre of the front hub should be measured on both sides.



You will probably find that the wheels are showing an offset to one side. This is corrected by adjusting the rear tracking in and out so the thrust lines are both the same.

The same procedure can be applied to the front, the main benefit here is that the steering wheel can be set in the right position and not at an angle!

### **Camber angle**

The best device invented for measuring camber angles is a digital angle gauge; you can even use it for DIY if your mind is warped enough or the pain from the missus to put up the shelves/dado rail is finally too much to bear!

If you are building a car then it can be used to check shock absorber angles, tube angles etc etc.

Make sure the car is flat on the setup patch, ie the main or windscreen hoop is level, then put the gauge on each hub in turn, again on top of a piece of box section across the rim (see photo)



The numbers for camber again are found by trial and error, I would avoid any positive (wheels tucked in at the bottom) camber, excessive negative camber only puts a small patch of rubber on the road.

A word of caution however; if any adjustments are made to the camber, usually by changing top wishbone lengths or shimming of the stub axle this alters the tracking so the tracking procedure has to be carried out again! Go back two paragraphs, do not pass go.

Another benefit of checking camber regularly is that any problems with the stub axles, bearings pivots etc will tend to show as an increasing number, this can be checked out and the stub axle with the crack starting replaced before it fails. Keep a check of the numbers, I check things after every race to make sure nothing is on the move that shouldn't be.

This set up procedure may seem like making small adjustments when the cars tend to ride like hovercraft, but how do you know what difference it makes to the cars handling unless you try it? Problems that could come to light on the track can also be found and put right before they cause a more serious problem. As a closing note to this article, after our little "mishap" at Sweet Lamb involving a cartwheel at speed that resulted in a wheel being ripped off and the steel hub being bent, I had to fit a new upright as the crashed one had been damaged as well. The new part was fitted using the same shims etc and went back to exactly the same settings as before the accident. This confirmed that there had been no further damage to the wishbones or the chassis.