

# corner weights and flat floor set-ups

One of the important items that should be checked when trying to optimise the handling characteristics of your Seven are the corner weights, in order to ensure that each tyre is carrying its proper share of the overall weight of the car. This can be done by one of the many Seven specialists who advertise in Low Flying or, with the right equipment and plenty of patience, you can do it yourself. Because I am interested in how my car does what it does so well I recently attempted the job myself, but whichever route is taken, this article should at least give you some understanding of the subject.

Firstly, what is corner weight? The corner weights of a car are the weights which you would see if you placed a set of scales under each wheel whilst the car was on a flat level surface with the driver sitting in the car.

In order to understand the subject of adjustment it will help if you have a grasp of the concept involved. Imagine for a moment that you drive your car into the garage and someone has left two one-inch thick planks of wood on the floor exactly corresponding to the positions of your front offside and rear nearside wheels when at rest. When you get out of the car all four wheels are still touching the ground (surprise surprise!) although the front offside and rear nearside are actually one-inch higher from the floor than the other two.

What has happened here is that the front nearside and rear offside wheels have dropped by one-inch to touch the floor and in so doing the weight that was exerted on their springs by the vehicle has been reduced. Because the car still weighs as much as it did when we started, if the weight on two wheels has reduced then it follows that the weight on the other two wheels has increased. You can liken the car to a four legged chair which in the above example has had two legs shortened by a clumsy carpenter and now has most of the weight of the occupant resting on its two longest legs. It will pay to think a little about these two examples before moving on.

On a Seven the corner weights and the ride height (which is the distance that the bottom of the car is above the surface of the road) are adjusted by moving the platform on the shock absorber upon which the road springs sit. You should take note that when

you are adjusting the ride height this way you are automatically changing the corner weights as well and vice versa.

It should be said at this point that in order to easily adjust your corner weights you need to have adjustable spring platforms on your shock absorbers. This adjustment is usually (but not exclusively) carried out by screwing the spring platforms up or down the threaded outside of the body of the shock absorber. Some Sevens are fitted with non adjustable platforms and whilst it is possible to adjust these (by fitting purpose made shims under the springs) it is not very practical.

In order to successfully carry out corner weight adjustment certain conditions must be met. Firstly, all weighing must be done on a flat level floor (which is where the term "Flat floor set up" comes from) this is because readings taken on a non-level floor will wrongly understate the weights taken at the high end of the car and overstate the weights at the other end (think of the car parked on a 45% hill, the weight over the rear wheels will be a lot greater than if it was parked on the flat). Second all weights should be taken with the driver in the car and with an average load of fuel. Third you should ensure that all suspension pivots are correctly adjusted and that they are not stiff or binding. (It is a good idea to slacken off to finger tight any suspension rubber mounting points in order to ensure this). With this in mind also wind your shock absorber rebound adjustment to fully soft if this is possible on your units. Fourth you should disconnect any anti roll bars as any pre-load (caused by twists in manufacture or wrongly adjusted drop links) will affect the corner weights. Next, make sure

that your tyre pressures are correct (this will affect ride height) and finally wire brush and lubricate the spring platform threads on the shock absorber bodies (it makes the job a lot easier).

You should first of all set the ride height of the car by adjusting the spring platforms. Different people have different points at which they check their ride height measurements and any ride height discussion is valueless unless you define these positions. I used a point between the heads of the bolts holding the engine mountings at the front of the car and a point just in front of where the rear mudguard fixes to the body (by the front A frame bolt) but you can use whatever points you like as long as you record the positions ready for the next time you set the ride height.

You will find that adjustment is a lot easier if you jack the car up to take the weight off the springs, oh, and please invest in or borrow some proper C-spanners, using a punch to move the spring platforms is slow and leaves very unsightly marks on the adjusting nuts (or the car body when you slip!)

Adjust these heights to your own requirements (to be equal on both sides of the car) bearing in mind that you need to be able to drive over speed ramps in the supermarket car park as well as around Brands Hatch! The rear height as advised by Caterham in their build manual should always be about 15mm higher than the front whatever the measurements. After every adjustment you should roll the car forward and backwards and bounce the suspension in order to settle the car to its true position. Having set the ride height (with the driver in the car remember!) you can now start to adjust the corner weights.

First you need a method of weighing the car. If you are related by birth to Mr and Mrs Fatwallet buy a set of corner weight scales from someone like Demon Tweaks. This will make the job very easy as you weigh all corners at the same time. More realistically you will buy or borrow a Pace or ADA type corner weight gauge which although not as accurate as corner weight scales will suffice with careful use for most needs. I know that the use of bathroom scales is sometimes suggested (and in fact my first attempt at corner weighing was done with just such apparatus) but I can say from experience that it is not very satisfactory as the scale mechanisms tend to seize up if any sideways loads from the suspension is put on them.

My Pace Gauge was not supplied with any instructions but as with all equipment there is a right and a wrong way of using it. You should insert a thin stiff card under the wheel to be weighed, place the gauge (which is basically a lever on a post with a weight read-out dial) under the wheel rim and carefully lever the car off the ground to a point where the card can be just slipped out from under the wheel (like a feeler gauge). Note the weight reading, then roll the car forward and backwards and bounce the suspension in order to settle the car to its true position. Repeat this four or five times on the same corner and average your readings in order to get a more accurate result. Repeat this procedure for all four corners.

Having got your starting corner weights recorded you now need to decide what weights you would like to see when the job is complete (your ideal finishing weights). Here, in order to make things a little easier to follow, I will give a working example:

#### Recorded starting corner weights:

Front left	150Kg	(A)
Front right	165Kg	(B)
Rear left	185Kg	(C)
Rear right	197Kg	(D)

From these figures you can establish that the total weight of the car and driver is 697Kg (A+B+C+D), you can also establish that 45.2% of the overall weight is on the front wheels by the following arithmetic: Total weight on the front of the car of 315Kg (A+B), divided by the overall weight of the car and driver of 697Kg. Likewise you can establish that 54.8% of the overall weight is on the rear wheels by the same method. Total weight on the rear of the car of 382Kg (C+D) divided by the overall weight of the car. (As a check on your arithmetic the two percentages when added should give 100. If not, stay behind after lessons!)

Now for the clever bit! If the car was a single seater with all components (including the driver) placed on the centre line of the car then both front wheels should be set to the same weight which is exactly half of the total weight sitting on the front wheels (in the example above 315Kg divided by 2 which is 157.5Kg). However in a Seven the driver sits to one side and so the centre of gravity of the car is also offset to that side.

In order to cope with this, the total weight on the right hand pair of wheels should be split 45.2% to the front and 54.8% to the rear to establish your ideal finishing weights. In my example the total weight on the right hand side of the car is 362Kg (B+D) and so your front right ideal finishing weight will be 45.2% of that (163.6Kg) and the rear right ideal finishing weight will be 54.8% of it (198.4Kg). Carrying out the same arithmetic for the left hand side of the car

## corner weights and flat floor set-ups **cont...**

gives an ideal finishing weight for the front left of 151.4Kg and the rear left of 183.58Kg

Now compare your recorded starting weights with your ideal finishing weights

	Recorded Starting:	Ideal finishing:
Front left	150Kg (A)	151.4Kg
Front right	165Kg (B)	163.6Kg
Rear left	185Kg (C)	183.5Kg
Rear right	197Kg (D)	198.4Kg

You will notice (given my very clumsy rounding of decimal places) that all corners are 1.5Kg out, with two corners being light and their diagonal opposites being heavy.

Now, if my corner weights were within 1.5Kg first time out I would definitely leave them alone, but as you are doing the job yourself you must be a bit of a perfectionist, so start with a heavy corner (in this example front right for instance) and wind the spring platform down to reduce the weight on it by 1.5Kg. Move to the other wheel on the same axle (front left) and wind its platform up to increase the weight by 1.5Kg. Now work on the corner diagonally opposite the last corner and wind the spring platform down to reduce the weight on it by 1.5Kg. Move to the other wheel on the same axle and wind its platform up to increase the weight by 1.5Kg.

If you adjust all corners instead of trying to work on just one or two you will avoid dramatic ride height changes (remember that altering the spring platforms also changes the ride height!). The secret with this work is not to adjust too much at once, a little on each corner is the way to go

When all adjustments have been completed check both your corner weights and ride height (just to be sure!) and refit your anti roll bars one at a time. Check the corner weights again. If they have changed you either have a twist in the anti roll bar which must be straightened or if that is not possible adjust the mountings so the pre load can be removed, or in the case of bars with adjustable drop links one of the links is too long.

The result of all this work (given that all other parts of the car are functioning correctly!) is that you will be able to take both right hand and left hand corners with the car behaving predictably.

Finally, and most importantly, corner weight work like this gives you a perfect armoury of technical excuses with which to baffle your friends when your driving is not up to par! **ROGER SWIFT**

**Next in the series: Quantum Physics, an exploration..... With recommendations and acknowledgements to "How to make your Car Handle" by Fred Puhn**

## grey mist?

**Regarding your requests for technical questions, here's a simple one but surely one we all encounter, but one that I've not been able to cure.**

When the auxiliary gauges have warmed up they mist up with condensation on the inside, obviously caused by long periods of inactivity in a damp garage. I've tried to dry the gauges out (a week in the airing cupboard!) followed by trying to seal the gauge body with a silicone sealant, but to no great avail.

I've heard of people filling the gauges with silica gel (a drying agent). Firstly I can't figure out how to open the gauges without damaging them and secondly, where can you get silica gel?

I hope you or the other readers can help. Yours sincerely, **CHRIS BURRIDGE.**

*I've had that one as well, but only in the water and oil combo gauge. I'd like to believe that driving faster blows the condensation away, but I've no doubt someone will write in and suggest another more plausible theory! Ed.*

## "it can't be **corrosion**"

At the beginning of last summer I noticed a small 'bubble', for want of a better word, appear under the paint work on the lower side panel, around the area where the drivers pedal box meets the engine bay, I initially assumed it was a small stone chip. I thought "it can't be corrosion, the engine bay is spotless, especially where the side panelling meets the chassis rail".

## how wrong could I have been!

Over the remaining summer months and into winter this 'bubble' got progressively larger, it had reached about a penny diameter when I finally plucked up the courage to scratch it off, to my horror a white powdery substance was underneath. I cleaned the corrosion away and found it was more extensive than I had at first thought, was I P—ed Off!

My car is a 95 K-Series and what I had failed to appreciate was the amount of road crud that had got in the gap behind the Charcoal Canister (anybody know what it does?) and the inner side panelling/pedalbox area. Four years of damp grit, mud etc. on the inside of the chassis rail had manifest itself on the outside of the aluminium!

Having removed the charcoal canister and coil, I set about removing the dirt that had impacted itself in this unseen gap, quiet unbelievably three handfuls were scooped out. The aluminium was cleaned up with emery cloth and then a trip to a local paint supplier yielded some Etch Primer, which was copiously sprayed in the general area to seal the aluminium, followed by some topcoat.

That was all three months ago and to date I've found no new signs of corrosion, I think I caught it just in time. Had I not bothered, the consequences according to Guru Len Unwin down at the Caterham factory, would have been removal of the side panel to treat the ally/chassis rust - no thank you!

## the good old sticky clutch problem!

So, to all you Seveners out there, especially if your pride and joy is a K-Series, get outside NOW, and check this area for crud, especially behind that damn charcoal thingy, before it's too late! (Of course, if you don't care about rust, just remain seated and take it easy).

Well the subject of corrosion continued this week whilst having my MoT done, the tester was telling me that they have had to replace a lot of K-Series cylinder heads on Metros, 214's, etc. due to pitting caused by Galvanic corrosion between the ally heads and the copper head gaskets. Seems plausible I suppose, any of the membership come across this, maybe Caterham would like to comment? His solution was to simply run an earthing strap between the head and the block.

Well that's your lot, it's taken me two hours to type this much, happy motoring. **ANDY PERRY.**

*Well spotted Andy. Not sure what the charcoal thingy is for, apart from maybe being left over from last years BBQ? (Come to think of it, do you remember those bits I published once regarding recipes for cooking on the engine - perhaps you ought to try a bit of mobile cooking to dry out those damp patches, eh?). Anyway, have those nice people at Caterham got any thoughts on the matter? Ed.*

**Part 1:** I remember reading in an American Lotus magazine many years ago about a way of releasing the plate.

You jack the rear of the car up and securely place it on axle stands. Stick it in one of the higher gears, depress the clutch and start the engine (make sure that the wheels are off the ground!). With the rear wheels turning and the clutch pedal on the floor, gently apply the brakes. (It helps if you have someone else in control of the throttle to keep the thing running). After doing this a couple of times you should find that the clutch will release itself. Remember to apply the brakes as gently as possible to minimise the stress on the drivetrain but with enough force to overcome the corrosion on the clutch.

After doing this get the thing off for a good run and slip the clutch on a hill to clean off the rest of the garbage. (If you live on a hill - just start the car in gear and the clutch will usually free itself in seconds after braking or changing gear).

My Europa used to suffer the dreaded clutch seizure problem - even when not used for just a few weeks. The solution was really simple, just place a length of timber between the seat and (depressed) clutch pedal. Result: no more seized clutch and a dent in the seat that comes out in about ten minutes! **DAVID MIRYLEES.**

**Part 2:** Like yourself, work and family commitments mean that the Seven isn't everyday transport any more so your seized clutch query

struck a chord. (See, people do read your column - makes it all worthwhile doesn't it! - No? - oh, OK then). Here's the method I devised, which I am sure can't be original but being a lazy git I like it because it works and it involves absolutely no major physical effort:-

- Jack up the back of the car securely onto axle stands so that the rear wheels are off the ground - check the fronts.
- With the handbrake off, select any gear and start the car.
- Get the wheels spinning nicely with plenty of revs on them, push in the clutch and stamp on the brakes - the torque of the engine will do the rest.
- Take it off the axle stands and go "Sevening".

Hope the above is of some use, I've used it many times and it hasn't failed me yet. **ADRIAN LEMMON.**

*There's good old Dave telling me to "apply the brakes gently" and Adrian says "stamp on 'em!" - guess which I did? Thanks for the advice both of you, but here's another way that I find usually works. My car has the engine fan on a dashboard switch, so I run the engine up without it on until it gets nice and hot, then turn it off to cool down. Repeating this hot and cold process (see why they are likened unto women?) the clutch will eventually free itself.*

*So, for those of you who don't use your Seven enough, you now have a couple of alternatives to try. Ed.*

## a-frame brackets

**This letter is courtesy of Caterham cars, with regards to the broken A-frame bracket in 'Aidans Update'.**

In order to allay any fears members may have regarding the integrity of the rear A-frame bracket on the live axle cars:-

The axles in 1982 were modified in small numbers by a fabricator in Caterham. Since 1984 they have been modified by Arch Motors (who also manufacture the chassis and the majority of suspension

components/bracketry). Whilst we have heard of this problem on a live axled car of this era it has not arisen since Arch started modifying them.

In addition, this failure has never shown itself during extensive competition use - the multi discipline Caterham Scholarship cars do not have any additional bracing than a road car in this area.

The advice we would offer would be to inspect the bracket and look for any sign of corrosion or cracking around the weld. If this is

the case then the problem should be rectified immediately. In addition, levering the bracket open to make changing the bushes an easier task should be avoided - this will weaken the bracket. **TECHNICAL DEPARTMENT - CATERHAM CARS.**

*Thanks for the warning guys. Having had a similar problem on my 1980 car I had the bracket beefed up by James Whiting and it has survived many a hard mile since. But I still keep checking it just the same! Ed.*