

# TEE-ONE TOPICS

Number 71 January, 2008

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## GETTING IT UP AND KEEPING IT UP



The Silver Shadow was the first Rolls-Royce to use rear coil springs. They were nothing new although as far as I can remember they were not very 'English'. Before the taunts of racism commence there does seem to be national tastes in car design about which we could write for reams. Rear coil springs though seem to be the province of the Buick and the Oldsmobile for two examples. They are certainly simpler than leaf springs with all their bits and clips and need for spreaders and shackles etc.

Coils must be lighter overall and are simpler to make. They do however have one feature that falls behind their leafed example in that they sag. ALL springs sag with age, but coils do it better than others. As we all know with the Shadow the rear end and initially the front end, is provided with levelling mechanisms. The spin merchants of course lauded this as a design to maintain the car's dignified appearance regardless of the weight in the vehicle. Citroen had used the idea starting with their magnificent Goddess but there the car actually rode directly on pressurised nitrogen. The drawback to this was when the pumped up pressure in the nitrogen filled accumulators was exhausted through normal bleed lines, the car appeared to repose on the ground. As the things aged this got worse and I have often seen drivers of these normally lovely lined cars, practically climbing into their steeds on their hands and knees.

If of course you happened to park over a particularly vicious rock on the roadway, your Citroen could quietly perform Hari Kari during your absence if you left it long enough! But the ride was without peer. Hopefully you will have the experience of seeing a Goddess dash over a speed hump. It barely moves!



This is the common attitude of many Shadows. If the levelling valves and rams are still working by the time the car has dropped this far they will be working all the time. The usual reason levelling stops is that the accumulators are on the way to be exhausted and there is simply not enough oomph to lift the car. If you have just bought the car, lack of levelling will often be explained by the system having been blocked off.

OK back to the drawing boards. The Factory (R-R) decided crouching cars was not the image they wanted to adopt with the Shadow, so they simply

suspended the car on coils all round and moved the mounts on which the coils sat, up and down to compensate for internal loads. This movement was achieved per medium of hydraulic rams. Senior management at the time of production of the Shadow would, given the slightest opportunity, opine that they would never ever introduce another car as different from the previous model as they did with the Shadow. For years motoring writers would quietly question why the Silver Cloud for instance was not fitted with disc brakes! All sorts of reasons were offered which allowed those people who believed that the design and considerations relating to it of their beloved steed was never ever to be questioned, were then able to quietly sneer at their questioners whenever the subject arose.

It was a bit of a shock then when out came the Shadow complete with the vilified callipers and amazingly, a braking system that didn't work until you started the engine! How the local RTA was talked into the last feature has always been a matter of wonder to me. OK so the brakes worked well and that system with a fair few mods served the chassis' until the demise of the enterprise! But the suspension with its coil springs proved to be an area that sorted cars into those maintained and those that were not. A combination of age and the degree of usage contributed to the units slowly giving up the battle to keep a couple of tons off the road and reasonably level.

I have not mentioned front levelling again. This was discontinued at about car 3000 from memory. As well as adjusting for height it also had a sensor for body roll and counteracted that by jacking up the outer side to compensate. There were two problems. As you know you need to have at least two 25 stone people on the front seats to make any noticeable movement in the front springs. Most owners and passengers are lighter than this. The front rams had only 1" of travel compared with 4 inches for the rear. So as the rams were seldom called upon to do their stuff the seals on the ram shafts often stuck to the shafts and when the next movement occurred, the seals were torn and out ran the hydraulic fluid. Another problem was stability in that if the car was cornering at high speed say on a left hand bend and the road then swung around so that the car had to abruptly change direction, the suspension did not react fast enough to balance the car. Co-incidentally the same problem occurred years later with the early Spirits.



And here is where it all happens. Most owners have peered behind the rounded carpet mouldings in the rear corners of the boot (trunk for the US) and found the ram cylinders which lift the rear of the car. It is sobering to think that the weight of the car is taken on three bolts passing through the flange of the cylinder which is why the manual quietly points out not to use other than the bolts supplied! The actual ram can be seen disappearing into the cylinder in this picture. The serrated flange at the bottom of the ram screws into the spring holder. To remove the ram having disconnected the pipes simply unscrew this flange from the holder. Unfortunately some operators screw the rams into the holder to prevent the car being flung into outer space. Add to that tension some rust because the same operators are too lazy to put plenty of never seize grease on the threads, you can have a real problem.

As a digression it is generally not known that the principal reason for keeping the car as near as possible to a datum height was not to improve the image of Lord Fauntleroy alighting but to avoid in the rear end the situation where the outer universal joints on the drive shafts were bent to an angle for which they were not designed. One way to demonstrate this is to take a Shadow that has had the rear levelling blocked off, and heavily load the rear end. Drive carefully over a speed bump or similar obstacle and you will hear a bowel wrenching sound from the rear which is/are a universal joint forcibly rotating when it is beyond its maximum operating angle!

For those that make a study of such dimensions, the correct standing height of your car is clearly laid out in the workshop manual, available to all in our Technical Library on the World Wide Web <http://rrtechnical.info/>. To make these measurements accurately requires a very level surface and ability to measure vertical heights under the car. A four poster hoist seems to be ideal. If you don't have one of these a good rule of thumb is that you should be able to see the top of the rear tyre tread or be able to slide your hand across the top of the rear tyre with the back of your hand dragging on the underside of the fender. This shortcut is only applicable to the Shadow and not the Spirit or indeed the Cloud!





And here is the means by which the ram, now removed, is unscrewed from the spring holder. Note the very coarse thread. Early cars used a fine thread which often spelt doom for the system. The problem is that applying whatever force to the ram, if the thread was locked, turning the ram simply turns the spring holder! Fortunately I have not had this happen to me but if it did there would be a way to bolt on a finger to one of the mounting holes that would project down and engage one of three 'ears' cast into the top of the holder to prevent it turning. If that fails cutting the ram out may be the only option.

This height should be there with the car unladen and standing on level ground. For some years slaving owners have turned up on my doorstep to show off the leather and the ashtrays and complete tool kit of their new purchase. My nasty mind always prompts me to pump the brake pedal until all the lights come on and then some and, on level ground, roll the car back a forth a few feet. Horror! The beautiful rear end complete with immaculate small tools has descended some four to six inches. What has happened is that the cunning former owner – usually an unscrupulous dealer, has adjusted the rear levelling valves to lift the car to the correct height. As soon as the accumulators which supply the pressure to lift the car are exhausted down she goes. This is an extreme case but there is a basic rule and that is that the rear levelling is not

there to compensate for sagging springs!

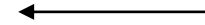


The ram screwed into the spring holder. Note the damage to the serrations from indiscriminate bashing which (blush) all of us have had to resort to at times to get the blasted things to unscrew. When you do get these out please tidy the serrations up with a file for the next bloke (or so help me, gal) use plenty of never seize grease and simply nip them up. They do not have to contain a nuclear explosion!

The cure is to replace the springs. Fortunately there are a couple of sources of aftermarket springs which you can shop around for. The preferred one from my experience is a spring manufactured for R A Chapman P/L in Melbourne which is an improvement on the original design having an extra coil. The original rear springs which were I understand made in Scotland are very long and require considerable care in manufacture to avoid distortion under load. Australian springs in my experience have always improved both the ride and stability on corners. In the good old days the practice was to remove the spring and have it re-set using formulae detailed many pages ago in this series.



Only a couple of weeks ago I came across a Shadow II that had suffered my efforts to lift it by resetting. I remember with horror with the wheels on the ground after the first trial only to note that it was sitting up like a praying mantis! The owner was not in the least fussed being a resourceful fellow and organised a very heavy plate of steel to be cut to fit the floor which when loaded brought the car back to datum height!



This gives some idea of the length of the spring. Note the fabric collar at the top. A similar one fits at the bottom. These help isolate road noise from the car interior.

After some weeks the plate was removed the springs had a bit of the new found height knocked out of them and the car then sat at the correct height. It was rather a thrill to note that the car still sits at the right height after some 20 years!

At bottom left you are looking up through the right hand rear suspension arm. Since it is a free agent there needs to be a stop to prevent the arm dropping down so far that the spring pops out. This is done by a strap seen here bolted to the under floor beneath the rear seat. The cable neatly bracketed is the main battery supply cable on its way to the starter solenoid and the hose is one of fourteen used in the hydraulic system to cut down noise and



where necessary to provide some flexibility between items!



Above. This is one of four points that need to be disconnected before the rear wheels can be dropped right down. The levelling valve can be seen here with suitable encrustations indicating some leakage of brake fluid. On its right side is the operating arm bolted to the lower suspension arm. It is at this point that the 'levelled height' – i.e. using the rams) is adjusted. If this link is not disconnected and the wheels are allowed to drop down the levelling valve itself may be damaged.



## GREASING AND ADJUSTING MINOR BALL JOINTS

Where the load is not great and there is a need for much flexibility, demountable ball joints have been a feature of Factory design for many years. The basic joint consists of a hardened ball jammed between two concave surfaces, the whole lot encased in a rubber boot!



This is one application, the links connecting the rear suspension arms to the levelling valves mounted on the rear sub frame. The two small screws at upper right at first glance seem simple slotted headless bolts but closer examination displays intricate hardened spherical seats on one end (see inset).



The object is to capture the ball and hold it lightly between the small screw and the hardened pad in the main member. Below is a common mistake especially when the rubber boot covers the joint. The ball is shoved too far through the main shaft and misses the hardened bearing seats. You can feel this through the rubber boot, ease off the adjusting screw pull the ball back and retighten it,





All together. A good check for tightness is that you should be able to swivel the main shaft around the joint. Before fitting the rubber boot clean it and give it a birthday with a good dose of ArmorAll inside and out.

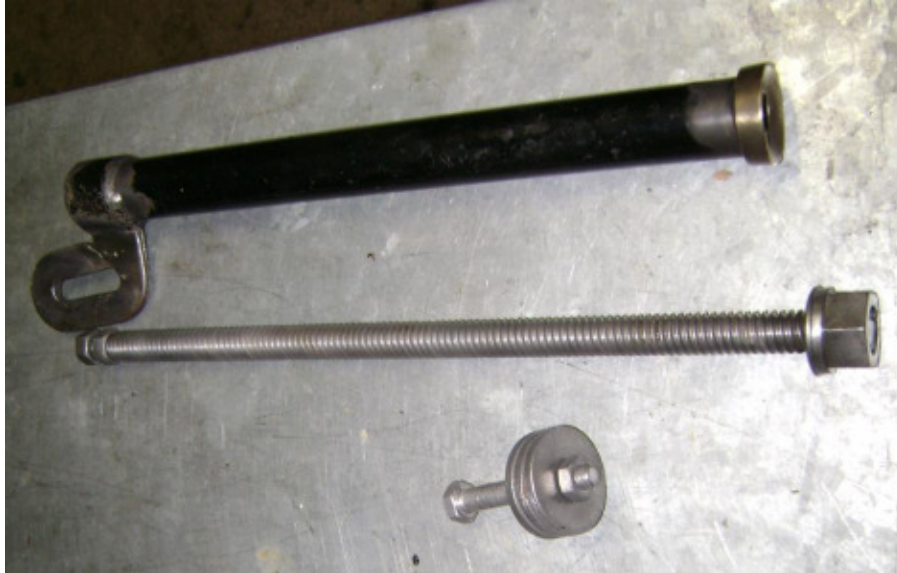
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## **THE GERMANS WERE WORRIED**



When you are boring along the Autobahn at over 250 kph flanked by other cars, it is very distracting to suddenly find a spare wheel lying on the road in front of you. Whether this has

actually occurred is open to conjecture but as you know if you give a body of people statutory powers they feel compelled to use them. In 1966 Rolls-Royce devised a neat way of storing a spare wheel under the back of the car. I do not recall any case of a spare dropping out the back which is a bit of a feather in the old corporate cap for the designers as the overall design did not change for about 90,000 cars.



This is the business bit of the spare wheel carrier. It is supposed to be wound down during servicing and the thread wiped and greased. It is so easy to simply remove these bits, clean them lubricate and refit them. Simply undo the two nuts at the bottom of the threaded shaft and screw it up and the other bit down... The latter bolts straight to the carrier.

In the mid eighties the spectre of spare wheels from Rolls-Royces strewn all over the road, exercised the minds of those charged with the upkeep and policing of European roads and the Factory were required to modify their long used design. This consisted of limiting the amount of 'drop' the spare wheel carrier could manage on the screw operated from the boot. In addition an extra safety hook had to be provided suspended from the floor of the boot that caught the wheel through the centre hole of the rim.



The straightened end of the screw mechanism seen here wearing a crack from its bashing was later welded. The slot allows the height of the carrier to be adjusted to ensure that when fully wound up the tyre is firmly squeezed to stop it moving.

The picture on the previous page probably justifies the stance of the wheel stowing politbureau if you notice the bottom of the winding

mechanism tied to the wheel carrier with some good electrical wire. I would guess this was brought about by a driver lunging up a steep driveway and forgetting that his bum would probably drag on the ground – in this case with considerable force.





Pristine! An area the judges might like to exercise their talents in.



## OVERLANDERS

Once again the Federal Rally is upon many of us. Host State people of course have little to worry about car wise, usually only making sure there is enough fuel in it to get there. But one very worthwhile adjunct has been the organising of ‘overlanders’ – treks in groups to the host state from major centres in Australia. I have to often remind myself that while these notes were originally directed to a small group of ‘tinkerers’ as we were described by the local owners at the time, they are now read in all sorts of places around the globe. To tell European readers that we are going to trek over 7000K this year to our Rally sounds a bit farfetched. Americans whose country approximates to the size of Australia are not impressed. Fortunately we do enjoy good roads which are always being improved

So why am I nervous? Well despite our corporate efforts here and on web forums and journals, it is still amazing how some owners will leap into their cars and head for the sticks without barely checking to see whether they have an engine let alone checking how it is running. Many of course give their car to 'their man' for 'attention' or 'a good check over' cross their fingers and hope for the best. Some at the other end of scale who will go nameless worry and fuss over their cars and check and repair everything in sight and finish up stuck on the side of the road with a failed fuel pump, a mobile phone and an NRMA membership!

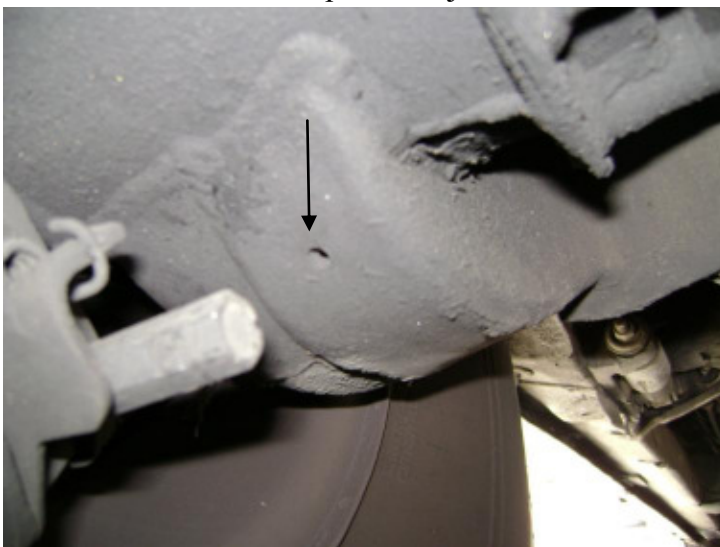
In these times I am reminded of the poem by Louise Haskins 'The Gateway' where it importunes us to 'put your hand into the hand of God', and when you have tried everything else faith seems to be a fairly potent tool. Let us not tempt the situation too much however and give preparation of your car for the long journey, a good deal of your attention.



## OMIGAWD 2!

My avid readers will recall this picture on page 975 in Issue 69 explaining that the cracks found in the main suspension arm at the back of a passing Spirit appeared to be the results of condensation within and the resulting rust working out a route to fresh air. It was all simply repaired and we, I am sure, resolved to keep an eye on these suspension arms henceforth. But only today in the dying days of our first month did

I hie me under a 1987 Spirit to adjust the hand brake and gazed blankly at the picture below.



Those of you who are still awake will immediately notice the modification. No?? Observe the small hole drilled in the arm allowing the air inside to breath and hopefully minimise or prevent any condensation. The hole is about 3/16" in diameter. Sadly these sorts of modifications had to be done surreptitiously because in this day's litigious climate such news could well spark demands from customers that the arm be replaced on their car or better still the whole rear

suspension and then there is the matter of pain and suffering/.....

## A SIGNIFICANT DANGER

My favourite gynaecologist drove in concerned that he was losing water. Using phrases along the lines of 'physician heal thyself' did not help as it seems it was the coolant loss in his '87 Spirit which was the problem. The leak turned out to be from the plastic expansion tank beside the radiator. There it was, a fine squirting stream issuing from the side. Removal (carefully) of the 'radiator cap' and the squirt reduced to a strong trickle. This is because 1987 ushered in the pressurised system that included the expansion tank. In Silver Cloud days when the coolant expanded through getting hot it simply filled up a space at the top in the radiator top tank. This was virtually a universal arrangement. If there was too much fluid or steam needed to escape, a valve on the header tank blew off and the result squirted on the ground.



The bottle removed. The dirty mark was where the thing had sprung a leak. In fairness there had been some apparent abrasion from things unknown although there did appear to be moulding faults within the plastic. We did repair it with superglues and solid additives but given the hazard, a new one was later fitted.

**Into the Clouds.** The above arrangement was not favoured for serious engines because of the likely cavitation that occurred in the header tank. The water pump simply hosed the hot stuff from the engine onto the top of the radiator core and this in turn wandered down the core to be cooled. On the way it could pick up air and with a bit of chemical help from the antifreeze, there could quickly develop something resembling pretty viscous aerated slurry that was about as effective an agent for cooling as a milkshake. The solution was to fill the system brim full which meant the coolant was not only unaerated but was forcibly pushed through the radiator by the liquid behind it.



**Out of the Shadows.** But this system has the problem of expansion which is overcome by the header tank on the Shadow. Here the radiator and block are totally filled and in addition a supply of coolant in the header tank sits on top of the radiator to ensure that the system stays full at all times. When the coolant heats up and expands, the expansion takes place through the small hose at the side of the tank and the coolant is stored in the there until it cools down. When it cools it sucked back into the system.

**Spirits abounding.** That header tank on the Shadow was one of the financial indulgent anachronisms from the Factory probably very askance at the thought of a plastic vessel being trusted to do the job. The tank was beautifully made and was generally quite reliable but very expensive to make. The Spirit arrived and as they say 'needs must' plastic bottles it was. Here they pressurised the radiator with a double acting cap. The system was still solid water from the cap to the sump. As it heated up and expanded it lifted the plunger in the radiator cap and allowed coolant to flow to the plastic bottle beside the radiator which was not pressurised. Entry to the bottle was at the bottom. On cooling down a vacuum was created which opened a little valve in the first valve but in the opposite direction and coolant was sucked out of the plastic bottle back into the radiator.

There is one serious problem with this system. If the radiator empties with a blown hose or an incontinent water pump, the plastic bottle which you will remember has the low coolant level sensor in it, is still full! That is why people with these systems should have a low water warning system fitted to these cars. For locals (read Aussies) RA Chapman has these systems to fit which is a good investment compared with the \$30,000 engine rebuild!

**The final solution.** So 1987 saw this problem and pressurised the plastic bottle. If the coolant light comes on, the system is low on water period! All well and good but back to our nervous directors wondering what the Hell they were doing putting pressurised bottles in the cooling systems. No doubt the bottles are designed to handle the pressure and temperature which can well get some way above normal boiling point but should the bottle fail and you should be bending over it, half a bucket of boiling coolant in the face and torso is a revival of some of the pleasantries practiced in wartime Germany as a cure for tightlippedness!

Prophylaxis would appear to be caution. If you are working on or near a very hot engine probably throw a folded towel over the lethal bottle. Keep the towel in the boot.



## MILLENNIUM?

No big deal but you might like to note the page number below! Topics started out as a casual set of records six years ago. Perhaps it is time to stop! But thanks for your support and encouragement, it has been worthwhile.

