

Part Five: Optimising Ride and Handling

Suspension: Britpart air springs, Bilstein dampers, SuperPro performance bushes and STS Tyre Pro Alignment



SO, THE TIME HAS COME TO refresh and upgrade Project P38's 110,000-mile, tired, soggy, standard suspension. To be fair, I'm quite amazed how well the old bird was still handling with cracked, sagging air springs, worn-out standard dampers and fading rubber bushes, especially as (inexplicably at this stage) the air suspension seems to only want to function in jacked-up off-road mode – with optimum ride height, and associated body roll. One more job for the ever-expanding Project P38 'to do' list!

Suspension optimisation and tuning is something I've done a lot of on my fast road performance, rally, sprint, track day and other speed-based projects – and always found quite easy. A good set of uprated springs and dampers from a quality brand always helps, as does the less popular, but mightily effective route of upgraded polyurethane bushes, anti-roll bars, strut braces and, of course, an all-important wheel alignment, for optimum geometry set-up.



By Phil Royle

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But this is only my second off-road project car and the decisions and application (as with everything to do with the P38) were more protracted and complex.

The main debate I had to wrestle with was do I stick with the air suspension, or switch to a coil spring conversion kit. Initially, I was all for the conversion to mechanical springs – ridding me of any leaking, sagging, erratic air suspension horror stories and woes. But, I have grown to like the P38's ride and handling and the adjustability in ride height the air offers (when it was working properly!). As such, I have decided to stick with the air – as Land Rover intended the P38 to be by design – refreshing with a brand new set from quality Land Rover parts experts, Britpart, whose parts range and customer

service I have found to be exceptionally good and useful.

But I do want to improve the standard set-up. As such, I have bought a set of much-respected Bilstein dampers to optimise grip levels and lower roll tendency. And I've also opted for a new Bilstein steering rack damper, for added control. Plus, I'm fitting a set of SuperPro polyurethane performance suspension bushes – to future-proof the suspension, whilst simultaneously providing better traction and stability, more responsive steering, increased tyre life (via constant steering geometry) and added off-road capability.

Finally, I learned long ago that a suspension set-up is only ever as good as its wheel alignment settings, so the final piece of the suspension jigsaw was a trip to my local STS Tyre Pros, for a four-wheel laser alignment on its state-of-the-art Hunter rig – to maximise the (hopefully) positive effects of all of these upgrade parts.

Following is a bit more detail on the new suspension parts selected, and the effects they have had on Project P38.

SUPERPRO PERFORMANCE BUSHES

I've had a lot of success revitalising worn out bangernomics cars like the P38 in the past by replacing the worn rubber OEM bushes with uprated, long lasting, durable polyurethane elastomer performance bushes – from Australian suspension gurus, SuperPro.

The rigorously researched, developed and tested bushes make a huge difference to how your car feels, drives and handles – with no negative loss of ride quality or increase in NVH levels. They are great value too (£199 plus VAT for this kit). In fact, the only downside in my experience is fitting them is a bit of a PITA and takes time – especially on the seized up, worn-out, heavyweight P38!

But the huge list of benefits far outweighs the pain/time/cost of the fitment, offering “sharper more communicative and responsive handling (on and off-road) with increased durability and longevity without significantly increasing noise, vibration and harshness”.

In short, SuperPro promises improved handling and stability, much longer life, low maintenance, no increase in vibration and road noise, and increased tyre and suspension life. They are even precision engineered for an exact fit, with no component modifications required for fitting. Plus, these SuperPro bushes are guaranteed for 36,000 miles or three years!

The SuperPro radius arm, panhard rod, anti-roll bar and shock bush kit I bought is designed for Land Rover Range Rover P38 models from 1995 to 2001. It includes the following:

- **Front radius arm to chassis mounting bush kit: four bushes and assembly grease.**
- **Front radius arm to axle mounting bush kit: four bushes, two steel tubes and assembly grease.**
- **Rear radius arm to chassis mounting kit: two bushes, two steel tubes and assembly grease.**
- **Panhard rod bush kit: four bushes, two steel tubes and assembly grease for front and rear.**
- **Shock absorber bush kit: four bushes and assembly grease for front and rear.**
- **Front anti-roll bar to chassis mounting (31mm bar): two bushes and assembly grease.**



Box of tricks: SuperPro bushes work wonders

SuperPro says: “Worn radius arm bushes can cause adverse handling and alignment problems on Land Rovers. This can lead to premature tyre wear, accelerated suspension component wear and a tendency for the vehicle to follow tramlines and wander. Our bushes provide a positive location for the radius arm; this in turn keeps the axle in the correct position maintaining the correct alignment.

“SuperPro Polyurethane suspension bushes are engineered to provide outstanding performance over any terrain while maintaining reliability. While improving your vehicle’s handling and stability, SuperPro bushes will not cause harshness or vibrations, which are associated with other manufacturers’ Polyurethane products. This is due to the

unique design features and materials that are used in our manufacturing process.

“Shock absorbers and their bushes can have a hard life – especially on off-road vehicles. Over compliant or worn shock absorber bushes can transmit unwanted road noise and vibrations into the car giving an uncomfortable ride. SuperPro has designed a bush kit to cope with the extra stresses put on these bushes while maintaining an acceptable ride quality. SuperPro’s unique design features and materials also mean that these bushes will outlast standard or aftermarket rubber bushes significantly.”

Steve at John Kemp and I fitted the bushes in about four hours – with most of the time spent un-seizing old bolts (thanks Duck



Getting old bushes out requires double muscle



Vice had a hard day's graft, removing old units...



And then pressing in the new SuperPro units



One in, one going in; all greased-up



The SuperPro bushes fit so snugly



And are much easier to re-fit than get out

Oil!) and removing the old stuck bushes (and metal tubes) from the awkward to remove and even more awkward to re-bush radius arms and panhard rods, one at a time (so as to avoid axle movement). Thankfully, the anti-roll bar bush replacement is easy as pie and the shock lower bushes easy too.

The radius arm and panhard rod bushes are a proper fitting mare. Indeed, some of the old bushes would not be removed on the press or in the vice and needed burning out with a blow torch. It's then a question of greasing up the arms and rods and the

bushes, and easing the new (snug, perfectly designed) SuperPro bush into them, using a (strong) press. They are a seriously tight fit, thanks to great design and manufacturing techniques.

With the bushes in place and everything greased up, re-assembling the P38 was easier than stripping it and all the parts slotted neatly into place. And John Kemp also supplied me with new anti-roll bar drop links, a new track rod and drag arm, as these were worn out and knocking. P38's underneath is now as fresh as a daisy!

I fitted the SuperPro bushes before the new air springs and Bilstein dampers, giving me a chance to test these independently. And the difference is instantly, dramatically noticeable. The P38 is a lot less prone to wandering, feels a lot more accurate, is a lot sharper – changing direction easier and not wobbling while steering and braking – offers greater driver feedback and feels fresher, stronger and tougher. And there's no increase in NVH levels. It's all win, win, win fitting SuperPro – if you can live with the minor fitting hassle.



BRITPART AIR SUSPENSION

Looking at the P38's service history and cracked, sagging, leaking state of them, three out of the four air springs on Project P38 appear to have never been replaced. As a result, the rubber seals have dried out and the air leaks out of them when the car is standing. I think it's fair to say they have done their time and are due for retirement.

So, I contacted quality Land Rover parts supplier Britpart, which offers a direct replacement (Dunlop-manufactured, like OEM parts) air spring unit, which claims to halt leaks and firm up the suspension no end. And I'm optimistically hoping (by a strange quirk of fate) the new springs also fix the air suspension's desire to be in jacked-up off-road mode too, as the air leaks should be eliminated. Maybe the EAS system will go back to working in all four modes properly again. Maybe...

Currently, we can't communicate with a diagnostics machine and the EAS, as a

relay under the passenger seat appears to have failed. Until that's bought, fitted and potentially fixed (more cost!), there's no way of knowing what's causing the permanent off-road mode. It's odd, because most P38's won't inflate, not won't deflate: a typically P38 weird issue.

Anyway, I digress. The Britpart air springs arrive (like all its gear) the next day after ordering, in four neat boxes. They look very smart – all fresh, black, tight, whole and new – which is the exact opposite of what the current factory units look like: old, grey, sagging and cracked. And I'd forgotten just how light the air springs are, contrary to every other P38 part – great for unsprung mass.

Fitting is a simple enough task – for the highly experienced, super-nice Steve at John Kemp Land Rover. It takes just four hours to do both the Bilsteins and dampers together, with most of that time struggling with seized bolts or the awkward air spring retaining clips. But this is a very specialist job (like many on the P38), requiring real know-how, care and skill. Things can go very badly wrong if you do things in the wrong way, or wrong order and there are certain tricks of the trade to make life a lot simpler. Leave this to the professionals I'd say – especially the

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front, which is a far more complicated job than the rear.

The new air springs have really livened up the feel of the suspension (in conjunction with the Bilstein dampers and SuperPro bushes), with bumps smoothed out faster, body roll reduced (even in off-road mode), body control vastly improved and a fresh, youthful feel to the ride and handling. They're also quicker to inflate and the air does not leak out of the P38 system anymore either, thanks to the new solid Britpart units, which will give the air compressor a happier life.

Sadly (and predictably), the new air spring fitment did not remedy the EAS system fault. It's still stuck in high mode, but the handling



Old OEM Vs New Britpart: Night & day

is radically improved and future-proofed. The new springs will really extend the life of the P38 – which was due a catastrophic failure judging by the state of the knackered old units. Another job well done, perfectly aided by the superb Britpart and John Kemp.

BILSTEIN DAMPERS

I have rated Bilstein dampers (and its spring and damper coilover kits, which I have on a track day Audi S4) for decades – having been around its factory in Germany years ago, test driven and rallied countless cars with them fitted and having watched countless Bilstein-equipped race, rally and off-road vehicles win in motorsport around Europe. Bilstein is also the OEM damper brand for countless top name car manufacturers – hence I had no fear about ordering a set of uprated B6 off-road dampers and a steering damper for Project P38, 99.9 per cent sure they would radically improve the car’s handling ability – on and off-road.

Bilstein claims its B6 suspension dampers “add precision, reducing unwanted and uncontrolled suspension movement and offering increased steering precision, greater suspension load carrying ability, improved

vehicle control and ultimately more grip and manoeuvrability”. This should manifest itself in sharper turn-in, less understeer, reduced body roll, better change of direction and safer, more stable handling, crucially with no loss of ride quality.

Bilstein has a different approach to damping from other suspension brands, using gas pressure technology (not oil) to fill the dampers and using mono-tube, upside down internals (not twin tube and upright). It says: “The gas technology involves keeping the oil in the absorber under pressure, which prevents it from foaming when temperatures and loads are increasing. As a result, full damping power is retained even when the system is placed under extreme stress, a feature that can be observed in the self-lowering piston. This ensures a high level of traction and more precise handling, is a must-have for powerful sport suspensions and provides added safety in all dynamic driving situations.”

And referring to mono-tube technology, it adds: “It’s the original and best: the original mono-tube gas pressure shock absorbers bore the Bilstein name, and we’re still responsible for producing the best there is. Bilstein’s mono-tube technology is the number-one choice in motorsports and



New Britpart air spring in position with Bilstein damper



Fitting Bilsteins was easiest part of the day



New steering rack damper in position



Old, worn, tired dampers come off...



And new, fresh, upgraded Bilstein magic goes on



OEM dampers Vs new upgraded Bilstein units: Night & day

series-production sports cars: no other type gives engineers the same freedom to choose the perfect installation location or position (eg Upside-Down technology). It offers a large effective surface on the working piston, creating increased damping power and better handling, improved dissipation of thermal energy outwards, enabling a consistently high level of absorber performance and a sturdy structure for added safety in."

It's the same damping technology in the Bilstein steering damper, which was a breeze to fit and is another superb product – making a noticeable difference to steering accuracy and control, far beyond my expectations really.

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open. Thankfully, with us fitting new Britpart air springs at the same time as the Bilstein dampers and with John Kemp's mechanical skill, this was not an issue.

Fitting time is about four hours for the suspension (Bilstein and air) and just a few minutes for the steering damper, with the removal of just two bolts required. The method for fitting the suspension dampers

is more protracted and time consuming, but essentially quite simple... again with the rears being easier than the fronts. But again – while not as specialist as the air spring fit – I'd say this is a specialist job, not DIY, as they are best done in conjunction, and always as a set of four.

The test post Bilstein (and air) fit reveals a marked improvement in handling ability and ride, a noticeable reduction in body roll, greater direction change ability and a LOT less banging and crashing and chassis shudder over rough ground. The dampers react so much faster than OE units to bumps and surface imperfections – offering far greater control and ability. And the same is true off-road on a quick foray – to an even greater extent actually. Accuracy, poise, balance and ability are radically improved. They may not be cheap, but by God these Bilstein dampers are good gear.



STS WHEEL ALIGNMENT

Following any suspension fitment – especially a large scale spring, damper and bush overhaul – and after a short period of time to allow the parts to ‘bed in’, a wheel alignment to set up the car (and get it running straight, accurately and true) is essential.

I’ve been preaching about the importance of the right wheel alignment/suspension geometry set-up for decades as a car hack, with various project cars and features. It’s absolutely vital for whatever you use your car for – on or off-road – making the most of the suspension and tyre package you have and setting it up for your car’s specific type of use.

The right set-up – done by the right, talented operative – can literally transform how your car drives and is possibly the best £30-£100 you can spend on handling tuning for your car. You can dial out handling characteristics you hate (understeer) and dial in handling characteristics you like (neutrality, and maybe even a bit of oversteer!), not to mention saving you money on incorrect tyre wear. It’s a total no brainer. And a correct four-wheel alignment (to OEM specification, not just within tolerances) is especially critical to any 4x4’s handling.

While a wheel alignment can be done by a real expert using fishing line and simple measuring equipment, this is a time-consuming process and not really recommended. Geometry experts say that correct adjustment requires an alignment ramp on which all movements can be fully relaxed and an optical measuring rig. And while a laser rig has no particular advantage over a cross-hair mirror rig (the critical factors are the skill and dedication of the operator) it does make life easier. We’ve chosen a brand new Hunter laser alignment machine for the job – at my local STS Tyre Pros (there are branches across the UK).

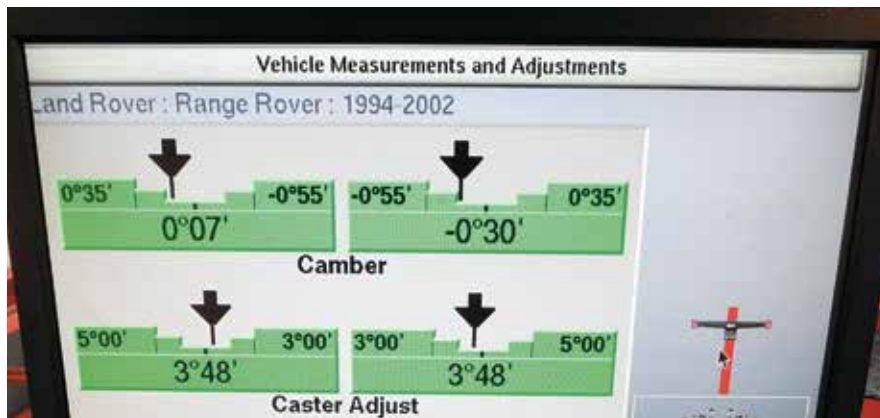
STS Tyre Pros have a state-of-the-art Hunter Pro Align laser wheel alignment machine and (crucially) a first rate,



Wheels are fitted with laser alignment hubs



Wheel geometry is programmed in



Camber and caster alignment all nice and straight



Project P38 is in fabulous form after all this superb suspension fitting

experienced operator – perfect for Project P38. STS is a great place to go for this service, batteries and tyres (as I recently had fitted to Project P38 here). The lads pride themselves on speedy, efficient, professional service and their smiley customer service and (transparent) waiting room facilities are the best in the business, in my view, especially at my local Wymondham branch in Norfolk, under Kieron's superb management. They make everything easy, fun and relaxed, and do a great, efficient job, at a great price. What more can you ask for?

Following the alignment, Project P38 is sharper and straighter than ever. All the money spent on new springs, dampers and bushes is fully optimised and brought together by the STS wheel alignment (which

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was easy, thanks to all the new, greased-up bolts). The Range Rover now drives direct and true, doesn't track left or right or wander, turns-in much more accurately, changes direction faster and smoother, rolls less and feels a whole load more nimble. Highly recommended.

THANKYOU . . .

Paul Myers at Britpart (air suspension)
www.britpart.com
Tel: 01588 674200

Aaron and Paul at Bilstein (shock absorber and steering damper)
www.bilstein.com
Tel: 0116-2478930

Jim and Richard at SuperPro (performance bushes)
www.superpro.eu.com
Tel: 01823-690281

Kieron and David at STS Tyre Pros, Wymondham (wheel alignment)
www.tyrepros.co.uk
Tel: 01953-603102

John Kemp (and Shaun and Steve) at John Kemp Land Rover (fitting and parts)
www.kemp4x4s.co.uk
Tel: 01953 601440

CONCLUSION

Wow! Project P38 is barely recognisable to drive now. It always impressed me from the off, given its age and 110,000 miles, but there was a feeling of exhaustion, fragility and a lot of inertia. The difference the bushes, dampers, springs and alignment have made is genuinely astonishing. Project P38 genuinely feels like new – only better as it's now reaching new (better than standard) heights of agility, ability and reaction on and off-road. It's stable, happy to change direction, wants to turn-in (even at daft speeds), doesn't wash out or wander, eats up bumps and bad surfaces and generates massive grip, all with a superb ride quality. Fantastic!

All of these suspension upgrade modifications may not come cheap – at over a grand spent on parts and a fair chunk on labour all in – but they have radically transformed a 12-year-old vehicle into a youngster. Indeed, the tuning has improved Project P38 way beyond its OEM factory-new specification. I can't rave about these superb products enough, and John Kemp's labouring skills and expertise. Coupled with the great Marshal rubber, the suspension tuning has made the P38 superbly tractive, given flatter handling on the road – wet and dry – and they've all combined to make the Range Rover a lot more capable and controlled off-road too. A truly amazing transformation.



NEXT MONTH

Project P38 V8 is either going to get some fix-its done (of which there is a growing list!), or have a minor exterior and/or interior 'jush-up' – depending on which parts arrive first and finances!