Hydrolastic/Hydragas repair.

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- Mini - various
- 1100, 1300, 1500, Nomad - all
- Apache, Victoria, America - all
- 1800 - all
- Metro - all 4 cylinder models
- MG-F - most
- Maxi - all
- Allegro - all
- Princess 2200 - all
- and many, many more...

Of all the vehicle manufacturer's that have ventured down the fluid suspension path, only one got it right and that's Citroen. Runner up is BMC and its descendants with Moulton Hydrolastic and Hydragas. Citroen's hydro-pneumatic on a bad day is

usually compared to good Hydrolastic. It can probably be argued that BMC et al did manage to provide the car of the future (which floats on fluid) to the masses. All the rest, which includes Ferrari, Mercedes Benz, Jaguar and others, had their own array of short and long term problems. Other manufacturer's forays into air suspension have been just as successful.

Much has been written about Hydrolastic and Hydragas. A lot of which is more fantasy than fact. Hydrolastic and Hydragas are nothing new and in no way complex. The following pages are essentially a collation of information that I've found useful over the years. This paper does not represent repair procedures for any specific vehicle. In every instance, refer to the correct workshop manual for your vehicle before commencing repairs!

Service units:

There are three basic designs of genuine service unit;

A. original 18G703 (Dalek) including the Australian version 18GA703, pressure and vacuum, no longer available (NLA) new,
B. portable service unit 18G685 (grease gun), pressure only, NLA new,
C. the 1980s replacement 18G703V (rectangular box that sits on floor with one lever on top), pressure and vacuum, NLA new,

three after market;

D. typically looks like a cylinder on the floor with a lever on top (Alba), pressure only,
E. essentially a copy of 'C' (Liquid Levers), available as either pressure, or pressure and vacuum,
F. other proprietary brands such as Sterling Hydraulics,

and;

G. whatever homebrew creations countless people have knocked up over the years, typically pressure only.

'A' is pretty well as pictured in most BMC workshop manuals. Typically in black, grain finish exterior (Marviplate) and sold through V.L. Churchill. Except for the Australian version, these units are portable. The four legs plug in and are secured by 3/16 bolts and nuts. Once removed, the unit becomes surprisingly compact and remains fully functional. Operating levers (in front) for pressure and vacuum also unscrew for stowage. The Australian version (hammer finish blue) has a local frame with fixed legs and usually two wheels. Gauges are typically by Floyd. Internal workings are UK made, essentially allowing for local content to be applied to the external structure. I suspect these were created by AUSTALOY (Healing Industries), as they were the BMC Australia contracted tool supplier of the time. Some do in fact bare an Austaloy label. Both versions were sold in Australia.

The 18G703 Dalek design is current through to the early 1980s with the introduction of Minimetro. Within UK production all Daleks are not exactly the same.

This is probably indicative of different production runs. Gauge colour, ID plates and specification placards are some of the obvious differences.

'B' is decidedly rare. Essentially a grease gun in appearance and operation. However the pump plunger is considerably larger than that of any grease gun. The head assembly also includes a pressure relief valve. These are set to a notional 230 psi. Therefore limiting the unmodified tool to an onsite, emergency role.

'C' is a big tin rectangle that sits on the floor. No legs, all controls on top and black finish. From memory, the original item was a Churchill product.

'D' and 'E' are as previously described. At the time of writing both are still available. 'C' or probably the Liquid Levers version 'E' would have been in Australia as a mandatory tool for MG-Rover dealerships selling MG-F.

A, B, C, D, E and F are suitable for use with Hydragas and Hydrolastic. A and B use a quick disconnect (QD) fitting on the pressure side. This makes system repair dramatically easier. I suspect this part may have been custom made by or for V.L. Churchill, as I've not located anything close. Air conditioning QDs (for R12) possess the right concept but are considerably bulkier and don't always have the valve core depression screw. What is generally used today are American made, aircraft grade fittings, with a screw thread connection. Connecting to the system is problematic due to the fine Schrader thread and general valve access. This current design now makes a spanner a mandatory part of the service tool. Whereas earlier units were truly standalone.

The vacuum side of 'A' is also QD but of a different design. Essentially like the flip-lever arrangement found on most domestic tyre pumps. The original part screws on to the valve stem for better sealing, with the flip lever only controlling the core of the Schrader valve.

Which service unit to buy?

Despite the international nature of Hydrolastic/Hydragas and the wide diversity of applications, there is little support today for the service equipment. Essentially it's everyone for themselves. Some people have claimed to offer certain parts as direct replacements but in most cases this is little more than hype. Major service (seal kits) are NLA and no one has created replacements.

As per service bulletin ST 41 (29 June 1964);

- Major repair kit for pumps, 18G703A
- Minor repair kit for connectors, 18G703B

For today's user and prospective buyer; age and neglect usually mean that the vacuum side will not be working. Most sundry fittings will also be broken or missing. Any example of 'A' you locate today will probably be knackered. You have more chance of being struck by lightning than finding a fully functional 18G703. Primary pump seals for the vacuum and pressure sides of 18G703 can be found from specialty seal and pump outlets. However to fit correctly, the brass retaining plates of both pumps need to be machined, or replaced with bespoke items. Essentially the crush depth of the new seals is different. Just trying to locate imperial Dowdy washers (not metric sold as imperial,

which don't seal), can be a time wasting endeavour. Excessive linkage wear, corrosion and perished reservoirs are also common features of surviving 18G703 units. There is a considerable amount of plastic in each unit. Plastic which doesn't like a protracted environment of alcohol, oily hands and UV light exposure. Liquid levers still offer parts for their later products and a rebuild service within the U.K. Though I doubt too many people have the forethought to be acquiring reserve stock for the future.

Having serviced and rebuilt genuine V.L. Churchill units in the past, I can clearly state that the would-be buyer is better off saving up for a brand new Liquid Levers item. This even includes the cost of international freight. Trying to properly repair most of what's wrong with the average classic unit is extremely expensive. For all pump designs, sedimentation of the fluid (essentially contamination) will cause filter blockages. Certain fluids have more floaty bits than others. To make it worse, what comes out of many older cars isn't always bright green. I now have two pumps; one for my own cars and one for everyday dogs-body Hydrolastic vehicles. My 18G703 and 18GA703 both contain several new, inline fuel filters. I also keep spares on hand in case of blockage.

I'd further suggest removing the factory gauze strainer at the bottom of the reservoir. They are a bugger to access at the best of times. Hence, you may well encounter older units which have most of their panel work missing. Internal repairs are not complex but they are time consuming.

Using the Australian example, Hydrolastic ceased in 1971. New service units didn't reappear until the late 1990s with MG-F. Even then, they appear to have been limited to mandatory dealer purchase and nothing more. So far I haven't seen any of these in private hands. Other markets continued through these years with anything from Apache to Victoria. Thus new pumps continued to be available and evolve. Grandmother's pump, which she never used and polished every Sunday do pop up. Though it is more likely that you'll find; a well used, never maintained, ex-dealership unit that ended up in the local garage as a general purpose shelf for brake fluid bottles.

What to buy today will most probably be influenced by why and how many times you want to use the unit.

A. 18G703 (any older genuine pump):

Personally I wouldn't turn down any reasonably priced genuine pump, if only to salvage for parts. However I recognise that I will be buying a problem and nothing more. As I already have a 18G 703 I'd like to keep it alive, even if at the expense of other units.

B. 18G685:

Very few out there. Pressure only and really needs to have the limiting valve replaced with a gauge to improve usability.

E. Liquid Levers:

Expensive, unless you are in the UK. Factory rebuild service and parts support is a big plus. My choice would be to buy new, new or new. If you are considering used, then check with the manufacturer to see if it's a model they still

cater for. Whatever you do, don't penny pinch and buy one without vacuum. Otherwise you could have bought an 18G685 copy.

G. Home-made (with the exception of recent 18G685 copies):

I haven't encountered any home-made unit that hasn't been a; one-off, scrap iron, improvised, pressure only, 'creation'. If they are such a god-send and not a penny pinching short cut, why did no one start producing them? Take from this what you will.

Home-made 18G685 (typically advertised on the internet in recent years):

So surprising that no one was doing this sooner. If you intend to use this more than once then expect to spend another $200 AUD replacing all the cheaper parts (gauge, flexible line, end fitting...). Not a bad 'get out of trouble' answer but no vacuum. I take one of these on long trips.

Instructions:

Despite over thirty years of production, it would seem that Rover Group never standardised procedures for wet suspension. Typically, later training publications consolidated the diversified instructions for various vehicles or components, into one generic approach. Fluid suspension appears to be the exception. Mini shop manuals don't cover pump maintenance whereas Maxi does. F introduces the concept of settling time and ambient temperature variations. Fluid types continue to evolve as the years pass by... but still no reflective approach to a common design. Not even a compiled specifications chart to hang off the side of a dealership pump.

I would certainly recommend having the period correct shop manual for your vehicle. However this needs to be supplemented with the later in-service changes to specifications. Such information continues to evolve, even after vehicle production ceases. Service bulletins are usually the best source of updated data.

Owner's handbook for your vehicle:

READ IT! What more can be said. The amount of owner dramas that have been caused by owners failing to take the simplest of actions can not be comprehended. The handbook includes at what speed and distance the car can be driven, in the case of suspension failure. There is no need to abandon the car in the extremely rare instance a problem occurs.

Service:

Apart from checking trim height and inspecting the system for damage, there are no scheduled service procedures for Hydrolastic or Hydragas.

Pre-repair inspection:

This is usually where the whole thing falls down. Most wet suspension faults are owner diagnosed. With the misconception that 'pumping the car up' will fix everything, they book the car in. Few repairers actually challenge 'owner logic' and usually just add fluid and take the money. What should occur is a full inspection of the steering suspension and brakes. Most ride faults will be found in the remainder of the

suspension and not specifically within the fluid/gas components. Common ‘actual’ faults are usually in the knuckle joints and suspension arms. These components are covered well in Death through Dehydration (Paget, 2010).

Repair:

Any mechanical faults need to be addressed first. This may well require the system to be deflated to enable repairs. In which case you’ll need a service unit to complete the repair but not to start or perform them. If this work involves anything to do with the knuckle joints, then you should look at applying shims in order to reduce the final operating pressure (refer to your shop manual or service bulletins).

The reuse of old displacers is always a gamble. No guarantees can be made before, during or after. This is one of several age related issues that aren’t covered in the manuals or subsequently reviewed by BMC or Moulton. If you are pressurising for a client you may need to beat this into them beforehand, lest they start pointing the finger of accusation afterwards. Just getting up the street on the test drive is a gamble.

The rest comes down to common sense and therefore commonly ignored. Anything to do with a Hydrolastic displacer, then have spare dust boots on hand. Not so much a problem with Hydragas but early Metros (Minimetros) aren’t equipped and should be. So retrofit where required.

Anything to do with displacers then expect the knuckle joint. Anything to do with knuckle joints then expect the arm. New knuckle joints should always be inspected for grease content before installation. Their stem should be plastered with an anti-seize compound. This is now moving into the solely mechanical area, so refer to the other material as referenced and/or you workshop manual. Age and previous ignorance may well see the job blowing out, so be prepared from the outset!

Sudden leaks (catastrophic failure):

Most of us notice immediately when our car droops and start looking for leaks straight away. We may not spot the exact point but can narrow down the general area; open the bonnet, look under the car, front, rear, left, right... The system contains several pints of chemical and corrosion enriched fluid to spray out over the vehicle and ground. A look at workshop manual pictures can further narrow the likely cause if still not obvious.

Some of us do seem to be able to not notice their car listing for a week or three after failure. Stains from the fluid will still remain. Though not dripping in front of you, tell-tale marks can still be followed back to their source. One way to confirm the fault is to re-pressurize the system and observe for leaks. You may not possess a service tool but can get around this with a tyre pump. Unless you have a constant supply of air, find someone else to keep pumping while you look. Air and any remaining fluid should be expelled from the opening.

Knowing where the leak is can help predict required parts, down time and cost. Being prepared means being back on the road quicker and keeping your car alive for many more years. As expressed elsewhere, expecting the bare minimum is a false economy. Standing around admiring how half full the glass is doesn’t stop the leak, it just reserves your spot for viewing the next problem.

Evacuation:

In addition to what your workshop manual states, I have found the following useful. Wear gloves and safety glasses! Due to the contamination issue, I have;

- an old clear plastic bottle,
- length of fuel hose,
- several old fuel filters, and
- a conventional tyre chuck, assembled in that order as one tool.

Simply remove the valve cap, press the chuck into the stem and allow the car to deflate. Hold in position until no more escaping pressure is found (fluid or air). This will allow some of the contaminants to be removed. You can then decide whether you want to reuse the partially filtered fluid. I guarantee some clients won't be bothered.

The design of the Schrader valve should allow you to remove most of the fluid and air from the system with this method. The weight of the vehicle needs to be applied to all connected wheels at the same time for this to work.

Vacuum:

In addition to what your workshop manual states, I have found the following useful. Wear gloves and safety glasses! Also, sample the system's contents before you connect. Your service unit only has one reservoir! You may have filled it with nice new fluid but whatever is in the vehicle is about to be mixed in. Don't forget that the original Dalek design requires the top of the vacuum pump to be lubricated.

The pump should be filled with SAE10 oil through the filler hole with the pump piston at the top of its stroke (Svc. Bul. ST41). With a little practise you can get by without a vacuum pump. If you know air is in the system and don't have vacuum, fill the system as explained. Then rapidly deflate the system into a catch tank similar to what has been expressed in 'Evacuation'. Continuing to hold the chuck in place will let most of the air vent with the last of the fluid. Repeat as required.

Flush:

This isn't a factory procedure but is realistic considering the age of the average system. Wear gloves and safety glasses!

Follow 'evacuate' as above then pressurise with clean, clear methylated spirits. Evacuate again and inspect the expelled fluid. Repeat this process with clean fluid until you are happy with what's being expelled. At this point you can apply vacuum if available and then move on to pressurising the system with new suspension fluid. Clean, clear meths is compatible with either water or alcohol based suspension fluids.

After being driven you may find that the fluid has darkened with contamination. A certain amount of debris will have coated the insides of the displacer and has only started to dislodge with operation. A small amount of fluid also remains in the system regardless of how much vacuum is applied. Either drain and repeat the flush procedure or accept this as normal and wait for the next repair to flush and replace the fluid again.

Purging the pressure line:

The original pump and fittings allow you to purge the fill line before you inflate the vehicle. Otherwise you will force air into the system! A bleed screw (knurled knob or 'T' handle) is fitted just before the Schrader connector. This is covered in your shop manual.

If you have replacement line fittings such as the currently popular aircraft grade connector, the bleeder may not be present. Liquid Levers don't fit this to their pumps or replacement lines. The alternatives are;

A. Holding your finger over the connector's end while pumping, should allow you to purge. Your finger acts as a one-way valve and pressure is not adequate to penetrate the skin. Quickly connect to the vehicle.

OR

B. With the screw-on type connector; unscrew the core depressor fully and connect to the Schrader stem by three turns. The majority of the connector should be obviously loose. Rapidly pump to purge the line, while fluid is still dribbling, tighten the fitting to the Schrader valve's stem.

OR

C. If fluid pressure is still present in the vehicle; connect your line and open the pump's valve. Screw in the core depressor and allow the vehicle to purge the line in reverse. Close the pump valve while fluid is flowing.

Pressure:

In addition to what your workshop manual states, I have found the following useful.

- Wear gloves and safety glasses!
- Allowing for the age of the average vehicle I would have already put shims on each knuckle joint so as to reduce the final operating pressure (a mechanical repair not covered in this paper).
- Weight of the vehicle needs to be applied to each connected road wheel. Otherwise there is a possibility that some suspension components may disconnect while suspended and unpressurised.
- Confirm actual ride height and pressure specifications with the latest workshop manual before you start.
- A nominal amount of fluid and pressure will be lost as you disconnect from the system.
- If the ride height ends up notably higher than it was before you started, you will probably have upset the steering geometry. Therefore a wheel alignment will be required once you've finished.

If you have the original workshop manual for your car you may well find that the specifications are out of date. Most of the range has had in-service changes to specifications in subsequent years. Similarly, if there is a pressure placard on top of your 18G703, many quoted pressures were out of date before the pumps were delivered.

Scragging:

This is a factory term you'll find in your service bulletins. Essentially grab the roof gutter with clean hands, midway alongside the car. Rock the car vigorously! This will allow the car to settle and let you to take trim height measurements. The vehicle needs to be on level ground with correct tyre pressures and normal kerb weight.

This is difficult on an F as there's nothing to grab hold of. In which case refer to the shop manual and roll the car forward and backwards. Some manuals also state that new displacers should be slightly over pressurised in order to settle them, before lowering to the correct pressure.

Test drive:

If you have to slow down to negotiate your driveway then the car is too low. Go back and check the actual specifications for your vehicle!

After warming the engine and an initial timid drive to confirm all is OK, make the system work! Drive the car as hard as you possibly can with spirited acceleration, cornering and braking. Settle down before you return to the garage and try to glide to the final halt. Otherwise the last tab of the brakes may upset the car's resting position. Scragging or rolling the car backwards and forwards can be used to settle the car. At which point you need to recheck ride heights. If adjustment is needed then repeat the previous steps as required and recheck again. If all is good, then inspect for leaks and move to clean up.

Note, later manuals state the vehicle should be left for at least two hours to cool and settle. Then check trim height and correct as required. It is assumed but not stated that the floor needs to be absolutely level. This isn't being overly fastidious and shouldn't be disregarded. However allowing for the age and wear on the average car, you can be a little less precise. I would favour the level floor over cool off time in every instance.

Clean up:

Wear gloves and safety glasses! Fluids may cause staining/discolouration to vehicle paintwork. I fit clean sheets to surrounding areas before commencing work. A bucket full of clean warm water and dishwashing liquid will deal with most spills. Having a clean rag and car polish on hand is also worthwhile. You will have at least left paw prints on the bodywork from trying to balance yourself while connecting to the system.

Fluid:

I haven't found any of the suppliers (including MG-Rover) providing MSDS for their products. Not that any of them should be overly hazardous to your person but I wouldn't go bathing in it. While it's still available, I'll use and stock genuine, genuine and genuine part.

Despite various published claims people have made about what the formula was, none acknowledge that there were several fluids. At one point BMC had two available at one time; one for normal use and another for competition. As with vehicle specifications, fluid evolved as the years passed. Add to this what the oil companies and other manufacturers were selling at various points in time and anywhere around the world. Most of the big names have ceased production, though the odd 'mystery brand' product

still pops up. So back to my point, while genuine is still available... This isn't cheap and once you have a price you'll be less likely to want to mix your new fluid with the rancid muck that comes out of the average Hydrolastic vehicle. I have experience of two cars that were filled with brake fluid!

Some of what was available in Australia:

- BMC/BMC-A, (BL et al), fluids under various part numbers, all NLA,
- Golden Fleece suspension fluid, NLA,
- Penrite suspension fluid, NLA unless you wish to order 10000 litres or more,
- The mysterious 'Suspension Fluid Type B', (green 20 litre drum) NLA,
- MG-Rover suspension fluid – clear concentrate (add water) NLA in Australia, and
- MG-Rover 4Lt (bright green fluid).

System faults:

Hydrolastic has one common problem throughout most of the range. This is an age related issue. Corrosion attacks the swaged connection between the flexible hose and the displacer. Quite literally the hose ends up blowing off. Due to the pressures involved, a high pressure hydraulic repair needs to be made. As this fitting (swage) typically sits in a recess, you need an offset chuck to install a new one. Such tools are rare. Surprisingly, a lot of hydraulic repairers are too narrow minded to see another option. The displacer can be threaded to accept screw-on fittings and a new flexible hose made to suit.

A swage is a tin ring which is crimped (squished) in place with a big tool. This is not unlike how electrical terminals attach to wire. The rim (lip) at the top of the displacer stops the average tool from fitting in place.

It is also possible for any vulcanised part of a displacer to suffer sudden catastrophic failure but this is far from normal. Other problems are model specific such as front hoses on the 1800 range rubbing on the body. Age of course affects each and every displacer. Any assurances your supplier might give about a part being 'new' needs to be taken with a pinch of salt. You have a choice of used, used, or if you can find one, unused old stock. Production of Hydrolastic and Hydragas units ceased years ago. As the system ages, increased fluid pressure is required to attain the correct ride height. Hence the need perform proper inspections, mechanical repairs and shim procedures, to try and obtain the best compromise between pressure and ground clearance.

Displacers are also known to squeak. This is in addition to any noises the remainder of the suspension may have and there is no definitive cure. It will however need to be a pretty quiet car on a smooth road for you to notice.

It would be possible for someone to build a bench test unit but to what end? All this would achieve is a one off, static pressure test. The first bump the suspension encounters multiplies the forces through the displacer. How many bumps before the bag goes bang is anybody's guess. Therefore a reasonable external examination is all that's possible. This again reinforces the need to have the client in the correct mindset before committing to repairs.

Owner problems with reality, too frequently become repairer's problems with clients. Other silly problems occur with the simple nature of Schrader valves. Having a valve tool, cores and a bag of caps on hand, is well worth while.

Interconnection:

Where fitted, this will either be rigid or flexible lines. Early Hydrolastic cars are known to have encountered pipe damage on rare occasions. Rigid steel pipes typically run under the floor of the vehicle, exposed to any obstacles they may encounter. The rigid pipe is either pierced or crushed between road debris and the floor. Spot or small section repairs were and still are possible with the use of generic pipe couplings. Essentially a joiner, olives and nuts appropriate to the size of pipe used. A pipe cutter, smooth file and spanners are the major tools required to effect repair. Post 1968 Australian Minis were the only model to really address the matter of protection.

You are more likely to encounter pipe damage from poor panel repairs, corrosion or other workshop inflicted damage. In the case of Minimetro rear lines, they are no more difficult to manufacture than brake pipes. The line, complete with new fittings should be replaced whenever any damage is incurred. Most wet vehicles use significantly larger pipe diameters, however the manufacturing principles are the same. Exceptions are the Schrader connector on 1800 and other models. This 'T' piece appears to be silver soldered (or similar) in series with the line. Threaded joints are usually tapers and pipe fittings are fairly generic. There is no need for sealant but I would recommend some form of thread lubricant, especially with ageing components. Pipes are of course secured to the body and insulated at the same points.

Mystery brand lengths of high pressure plastic tube with loose fittings are sold as 'replacements' for the original steel pipes. Although this tubing is capable of achieving gentle bends, how it is secured in place is somewhat unexplained. This is essentially a short cut repair for the cheaper owners who are unwilling to remove sub-frames and source or manufacture the correct steel item. MG-F relies on preformed semi-flexible lines. In the rare case of failure or damage, either purchase a new or used genuine part, or default to your nearest hydraulic shop to have a copy made.

Once more, tapered joints are present and these only have to be tight enough to seal and no more. MG-F uses a small 'O' ring at each displacer. These aren't mentioned in the shop manual and don't come with new displacers.

Advice:

What to do if you have, or are contemplating a vehicle with wet suspension?

1. Forget all the twaddle and nonsense people insist on proffering about wet suspension. I'm afraid that verbal opinions will probably lead you astray and are generally worth the paper they are written on. If you want to learn about Moulton suspension, then do your own proper research.
2. Perform a proper mechanical inspection as covered elsewhere in this paper.
3. Perform as proper an inspection as possible on the wet components. (If required, adjust the suspension settings to as correct as possible to allow the vehicle to be driven).
4. Test drive the vehicle and drive it as hard as you possibly can; hard acceleration, hard cornering, hard braking. There is NO Moulton equipped vehicle in good condition, that won't relish this driving style.

The car of the future floats on fluid. If you haven't driven or been a passenger in one before then go and find one. Contacting any relevant car club should get you a ride in a car with little effort. If the car you are offered can't comfortably drive at speed (not crawl) over any anti-tank obstacle your local authority uses for traffic calming, then politely ask for another. Anything from F to Princess won't have a problem if the suspension is in good condition.

One consistent comment I get from new/prospective owners is 'how hard the ride is'. My response is always; 'how many other wet cars have you driven?'. The reply is always 'none'. Which brings about the ongoing issue of the uninformed, comparing the features of their current model, everyday drive car, with the used classic. Suspension is always a compromise between handling and comfort. There is NO Moulton equipped vehicle that doesn't handle.

Rules of thumb:

As a quick check of ride height:

- Drive shafts should be horizontal and not on an upwards slope towards the outer CV joints.
- You should be able to easily slide your finger between the upper bump stop and top front suspension arm.
- Using fingers as a unit of measure, you should be able to get a minimum of two between the top of the correct sized tyre and the wheel arch, at the engine end of the vehicle.
- If you have trouble negotiating your driveway or local traffic calming device, go back and check the ACTUAL specifications for the vehicle.

Wet vs. Dry:

Another area where fiction is more prevalent than fact. This option is only available to Mini or F.

In the case of F, steel coil springs were produced for F series racing in place of Hydragas. Essentially this is a stiffer arrangement with less wash than the wet alternative. They don't appear to have been offered by Plus Parts (formerly Special Tuning) for road use. However you could probably argue the point to your local transport authority if you choose to convert. NONE of the aftermarket versions I have encountered make any direct reference to legal road use.

Similarly, the steel coil alternative has been available to Minis for over a decade. From what I gather, all such kits are targeted at Minis that already have dry suspension. They are not intended as a wet to dry (steel) conversion. Once more I haven't seen any brand that makes all the necessary declarations for legal road use, anywhere in the world. I haven't tried any of these in order to make a ride comparison.

Mini also has the rubber option but to perform this conversion properly is rather involved. Both sub-frames are structurally different. A wet front can be modified but the rear would require a dry donor unit for (welded) structural changes. Most conversions tend to be more than a little half hearted. The legal and safety aspect is a current day concern. Unless done to the letter, any wet to dry conversion can be considered unsafe and illegal. Conversion shortcomings basically come down to work ethic issues. In

Australia, owners still fantasise that they will be able to find a perfectly serviceable, used dry car for parts. This is thirty years after local Mini production ceased.

The potential is there for the owner/repairer to convert to dry with all new parts (including sub-frames). This would create a fix and forget situation. Something that can never be achieved with wet. In the late 1970s rubber springs were redesigned for increased comfort. These remain as the only genuine MG Rover spring available today. Moulton did design and release his own revised version of rubber spring. However I haven't read any notable long term reports on their use. Moulton, in his later book Bristol to Bradford-on-Avon (2009), avoids age issues with wet and dry and doesn't mention the revised rubber spring.

With the exception of certain competition use or sustained towing, dry has no benefit over wet. Hydrolastic Minis can have a wash affect under brakes or acceleration. Competition parts are available to control this without any notable loss of ride comfort. If the car of the future doesn't float on fluid then it definitely rides on rubber.

Competition parts:

Various genuine parts were available to change the characteristics of wet suspension. Over the years the names have changed; Special Tuning, ST, Plus Parts... However many of the items are still available as reproductions or N.O.S.

BMC and its heirs were unusual as a car manufacturer, in entering so many of their products in motorsport. Therefore competition parts exist for most wet suspension vehicles. A general purpose smart choice is to replace your standard bump stops with Aeon units. Though notably larger, the Aeon item is hollow and assists in reducing roll and wash, with nominal degradation of ride comfort. At the other extreme, many parts were never intended for road use. Similarly many never went into production and were virtual one-offs, such as vehicle mounted pumps; 18G685 for Mini and 18G703 for Maxi.

Other relevant papers by this author (suggested reading):

- BMC Australia Cooper S, suspension, steering and brakes, 1999.
- BMC Australia Cooper S Mk. 2, suspension, steering and brakes, 2001.
- Death through Dehydration, 2010.
- Hydragas for Dummies, 2010.
- Another 1800 Metro miles, 2011.
- Queensland Transport Vehicle Modification Approval Scheme, 2010.

Recommended reading:

- The owner's handbook/passport to service for your vehicle.
- Crossroads Alice, journeys with gelignite jack. Evan Green 1965 (out of print).
- How to Modify your Mini. David Vizard (HP Books or Haynes).
- BMC Australia, Service Bulletin ST41 (29/06/1964).
- Hydragas Register website.

Part numbers:

- 18G685 Portable service unit
- 18G703 Service unit V.L. Churchill
- 18G 703 Service unit Healing Industries (Austaloy)

- 18GA703 Service unit Healing Industries (Austaloy)
- 18G703A Major repair kit for pumps
- 18G703B Minor repair kit for connectors
- 18G703V Service unit V.L. Churchill
- 18G703Q Service unit Liquid Levers, pressure and vacuum
- Service unit Liquid levers, pressure only

If you have an original Dalek I strongly suggest you obtain a copy of Service Bulletin ST41 (or equivalent). This contains some very useful information and schematics.