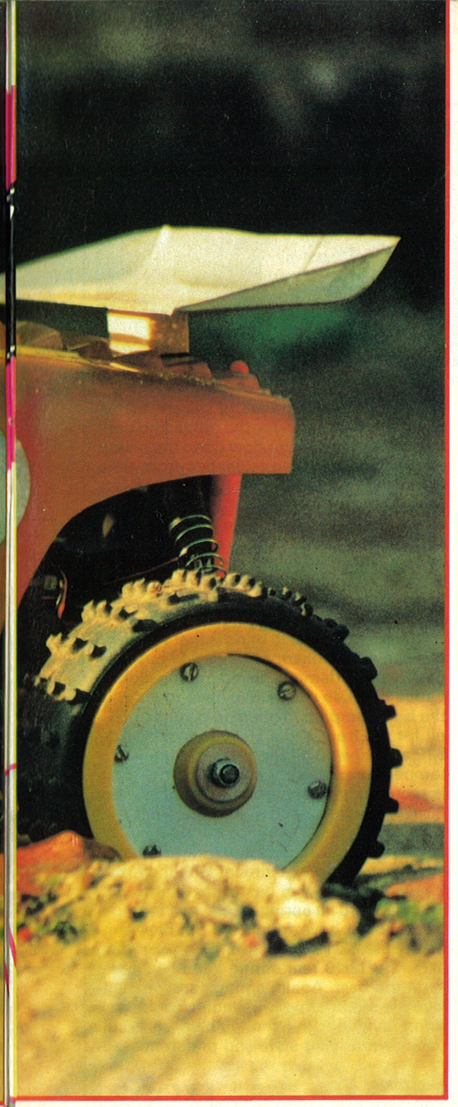
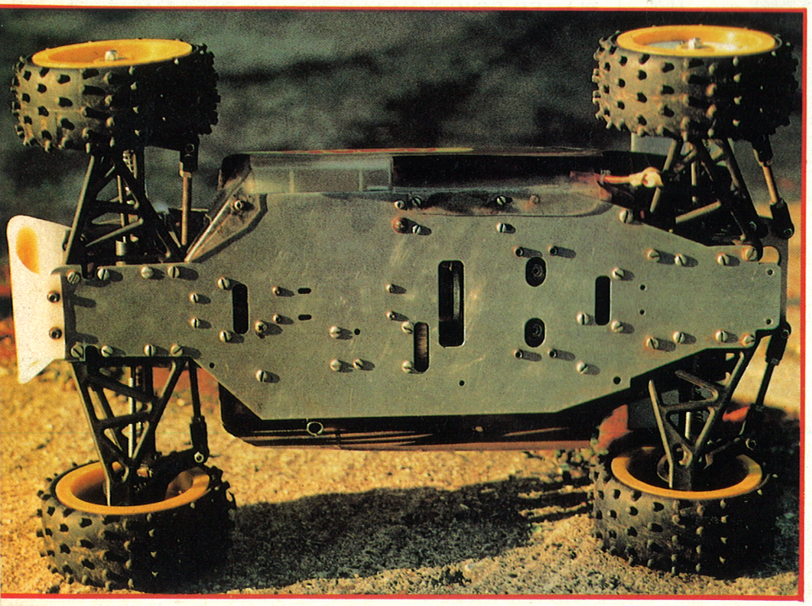
SICCOM MAGNUM



JOHN CHAMBERLAIN reviews the controversial 1/8 scale IC Siccom Magnum 4 x 4

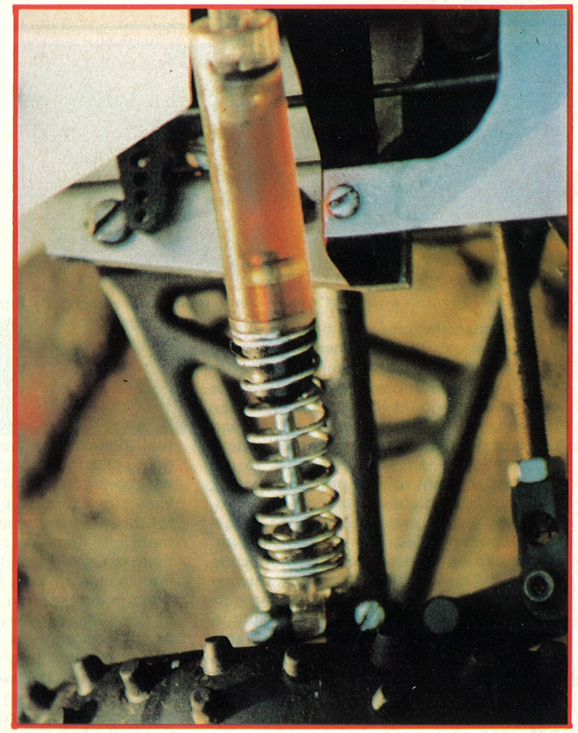


From time to time all car manufacturers introduce a new product that attempts to re-write the rule book, thereby totally upsetting the status quo. In full size racing, Lotus have done this in Formula one sometimes succeeding brilliantly and at other times being legislated out of the track and into the history books.

French Manufacturer Siccom introduced their totally new Magnum 4 x 4 in March 1986, and immediately set the alarm bells ringing in the camps of rival manufacturers across Europe. Although not radically different conceptually from its contempories, offering all independent suspension, four wheel drive, triple differentials and disc brakes front and rear, it was in the execution of these features and some lateral thinking in their design, that was to cause such consternation. From the outset, the Magnum 4 x 4 was designed to fit the rules exactly. For maximum stability the chassis and suspension design was to make use of every one of the rules stated 310mm maximum width, and 330mm maximum length. The suspension system was designed by Alain Lyon of Siccom, who has a French university graduate with an Automotive Engineering degree (full size!), put to work all his considerable understanding of the suspension needs of a rally cross car, to evolve the layout now raced with such success.

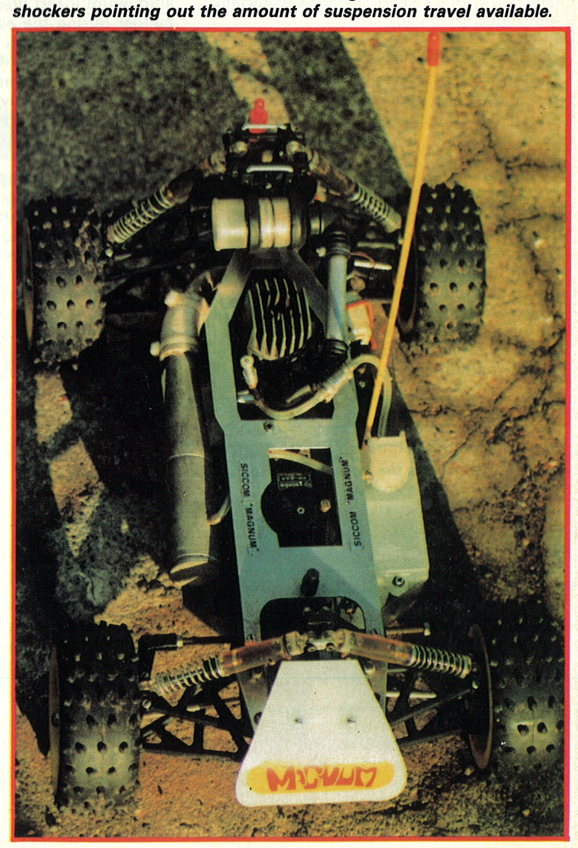
General Design

However, before we examine the suspension system in detail I believe it would be of interest to clarify the general design features of the car. Handling balance was to be the byword throughout the design and starting with the basics it was deicded that the engine was to be bolted onto the centreline of the chassis to preserve even weight distribution from side to side. With the front and rear gearboxes also fitted about this centreline an offset drive system was developed to transmit the power from front to rear, as well as enable centre differential to be installed with a ring gear driven from the engines clutch bell, the centre drive has provision for simply changing the gear ratio at either the front or rear of the car by substitution of the plastic drive gears with one of a different size. The centre differential is also unusual in two ways. Firstly, it incorporates a torsion one way roller bearing on one output shaft and secondly features an adjustable friction device to enable one differential to be 'stiffened up' and allow it to transmit more torque.



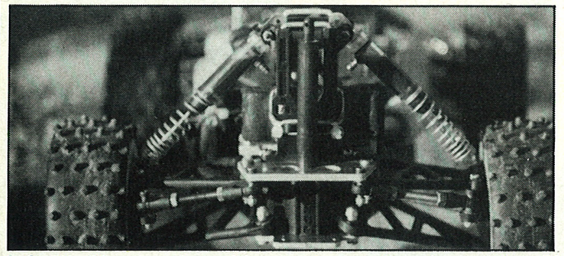
Above: The Siccoms clear shockers make sure you don't ignore regular checks and top ups.

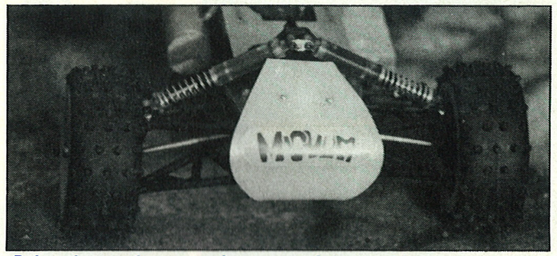
Below: The bare bones, note the rake angle of both front and rear shockers pointing out the amount of suspension travel available.



Above: Magnum force, massive amount of ground clearance shows up well in this picture.

Far left: An objection was raised earlier this year on the grounds that at full deflection, the suspension units took the Siccoms maximum width over the limit. This car has been used all season and looks none the worse for wear!





Left: The Magnum shows it's very clean, well engineered lines. Right: Polycarbonate bumper takes most of the hard knocks.

In practice the one way bearing allows the rear wheels to rotate faster than those at the front through the differential. The installation of the one way bearing however ensures that should the front wheels lose traction, and begin to rotate faster than those at the rear, for example during hard acceleration when weight transfer to the rear causes them to lose grip, the bearing locks up immediately, ensuring the minimum of power and time wasting wheel spin, combine this with a 'diff-stiffener' which can be adjusted to vary the torque split between the front and rear transmissions and the result is much the same as the Ferguson Formula viscous coupling in full size four wheel drive competition transmission systems, favoured by many of the leading group B rally contenters.

A further refinement of the Siccom transmission is the provision for changing the front and rear transmissions drive gear ratios at will. In practise it has been found that overdriving the front transmission by 4% makes the car more stable and particularly fast in long sweeping bends, especially if the traction is low.

Gearboxes

The front and rear gearbox assemblies are very compact incorporating differentials driven by machined steel pinion and bevel gears to transmit the drive. The pinion gear itself is of larger diameter than normally used in this class of car and offers excellent gear mesh and very low wear rates. The steering servo saver is neatly incorporated into the front gearbox housing maintaining the compact and neat layout. Drive is taken from the gearboxes out to the four wheels through one piece drive shafts which feature ball and pin drive on the inboard end and integral universal joints at the outboard end for absolute reliability and efficiency.

Suspension

Returning to the suspension system this really is the feature of the whole car that offers

Manufactured and distributed worldwide through Siccom BP 129 91004 Evry, Cedex, France

Available in the Uk from Windsor Model Shop, 45 Albany Road, Windsor.

real benefits in performance when the going gets tough. Very long unequal length wishbones are fitted front and rear with provision for anti roll bars now being provided for those drivers who would like to experiment with them. We have certainly not tried them in England, and in fact only one of the French team drivers, Pascal Gueye has used them in competition. On the outboard end of the wishbones are unique hub carriers, which incorporate a separate axle bearing holder inserted into them. Because of the angle in which the two axle bearings fit into their holder, rotating it in the carrier alters the angle that the axle itself assumes relative to the hub carrier, enabling adjustment to be made to each wheels camber angle.

All the suspension pivot points are handled by moulded plastic balls which have an aluminium insert pressed into them by the builder during the assembly stage to prevent them distorting when they are bolted into their various fixing positions, the benefit here is that at around 30 pence per ball, they are relatively cheap to replace when they become worn, they are also of extremely low weight.

Shock Absorbers

Shock absorbers moulded from polycarbonate, and featuring very long piston stroke, control the suspension, with double sealing of the piston rod give very realiable, low oil loss operation over long periods of time. Coil springs are fitted onto the shock absorbers and there are several different spring rates available for both front and rear suspensions enabling the car to be set up for all types of circuit and drivers' preference, the dampers come pre-assembled and 'sealed for life' with a medium grade of oil, similar to 20/50 multigrade, this works in most conditions reasonably well, but in practice different grades of oil are sometimes more suitable for the prevailing conditions, and no matter how good the piston rod seals are refilling is needed from time to time. We achieved this by drilling a clearance hole in the top part of the damper body, tapping a 3mm hole and fitting the appropriately sized pressure nipple. This is easily blanked off with a piece of fuel tube, blocked with a blanking screw making refilling and topping up an easy and quick exercise.

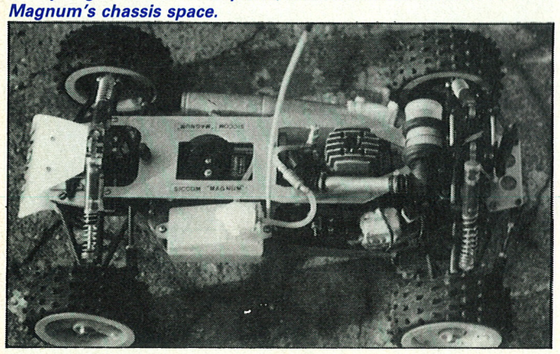
One point to bear in mind is that synthetic oils can affect lexan, so beware! I have experienced a damper disintegrating during a race because of this. We have found that the best damping medium is Wynns or STP oil for the front and a 50/50 mix of Wynns/STP and 20w/50 oil for the rear. Should the temperature be fairly cold softer damping is required and then a 50/50 mix of Wynns/20w50 would be suitable in the front and 25/75 of Wynns/20w50 for the rear. Naturally this is only a guide and individual drivers may wish to experiment with their own 'brews' to find what best suits their tracks. The standard kit springs work well for most tracks, but I have found the optional constant rate 12/10 front spring and progressive rate 12/10 rear spring suit my driving style the best. Again, springs are inexpensive so some experimentation could well bring dividends in handling balance to suit your own driving style and preferences.

Setting Up

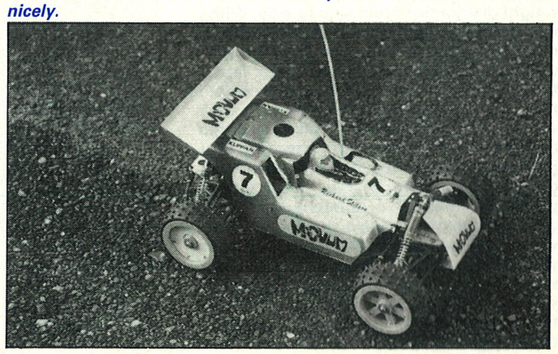
With the rolling chassis finished and ready to run, the suspension and geometry can be set. This is where the fun really begins! Firstly the ride height is quite exceptional for a ⅛ scale rallycross car. At full height, the chassis is some 65mm off the ground and makes the car positively tower over the opposition, most of whom can generally offer 'only' around 45mm of clearance! Rotating the axle bearing inserts in the hub carriers enables the wheels camber angles to be set, personally, I adjust these so that when the chassis is sitting at its normal running ride height (about 55mm front, 60mm rear, off the ground), all the four wheels are vertical to the ground. This alleviates excessive negative camber on the wheels during compression of the suspension, and maintains the tyres full contact with the track during cornering, without the outside wheel developing any positive camber during maximum roll of the chassis in the cornering mode. Adjusting the setting to give more static negative camber at the ride height brings two major disadvantages discovered during the 1986 racing season. Firstly it makes the tyres wear rapidly on their inside edges, secondly, it makes the car too wide to fit into the 3100mm maximum width allowed by the regulations! Lots of negative camber may possibly make the car even more stable during very high speed cornering manoeuvres, but boy, does it cause problems at scrutineering! So chaps, keep the negative camber to sensible amounts to avoid the race organisers wrath. Siccom Magnum drivers are not known as the "wide boys" for nothing!

Seriously though, the car can be adjusted correctly to handle exceptionally well, and comply with the rules, so pay particular attention to this point.

Ready to go minus the bodyshell, clean efficient use is made of the Magnum's chassis space.



A different but not unattractive bodyshell finishes the car off nicely.



Brakes

All you drivers who have ever complained about a lack of brakes can tune in now! The Magnum features twin discs at the front and a single disc at the rear mounted on the input shafts to the two gearboxes, correctly adjusted and working in a grease free environment these brakes really do work. Because of the centre differential, the brake balance can be infinitely altered between front and rear to suit individual preferences. As in full size practice I set my brakes to have more power at the front, in fact when the car was first run applying the brakes hard from speed caused the rear wheels to lift clear off the ground, such was their effect! With the correct adjustment I can now brake hard for slow bends and really enjoy seeing the front wheels momentarily lock before bringing in the power hard and sliding the tail out around the corner, stirring stuff indeed, and all so easily controlled.

Racing

This really leads us to question of what is it really like to drive? To my mind when the car is correctly set up, it is the nearest thing to driving a ⅛ scale circuit car that I have encountered in ⅛ rallycross. That is to say it has very responsive and accurate steering response, coupled with superb suspension control that really does iron out the bumps to an amazing degree. The result is the more bumpy and slippery the surface becomes, the more advantages the Magnum offers, enabling the car to be placed to remarkable precision and utilise every opportunity to find a way past the other cars in the race. With the one-piece drive shaft assemblies incorporating the universal joint I have not 'lost' drive or indeed a drive shaft in a seasons racing, and I am still using the original shafts supplied with the kit, with this reliability and the ability to alter gear ratios independently front and rear, chassis balance under power can be tailored to suit perfectly. Accelerating the rear wheels to spin faster then the fronts and power slides are easy to induce and control. However, because of the one-way bearing in this differential, should the front wheels start to slip during hard acceleration or high speed, loose surfaces turns, the bearing locks up causing equal torque to be transmitted to both front and rear transmission producing both improved acceleration and less high speed understeer.

Conclusion

Finally, spare a thought for the poor old tyres! All the sophisticated chassis and transmission systems are to no avail if the wheels and tyres are not up to scratch. The Magnum has a two piece split hub design that features side wall flanges to protect the side of the tyre and maintain their location once assembled. With this design, to make the tyre maintain its profile and generate maximum ground contact is is necessary to cut a strip of foam rubber to the width of the tyre and of sufficient length to fit around the circumference of the hub, after experimentation, we have found the most suitable material to be black rubber pipe insulation that is available in 6 inch diameter length. With this fitted, the stability and profile of the tyre is maintained under even the most arduous cornering manoeuvres giving benefits of predictable and smooth handling.

The Siccom Magnum 4 x 4 certainly represents another step forward in the realms of competition rallycross cars, offering an outstanding blend of performance and handling that will appeal to both experienced competition drivers, who will revel in its sheer drivability, and novices who will be amazed at the sophistication and performance of the state of the art rallycross car today.

Lets hope they all join us in our exciting sport and really make for some memorable racing in 1987!