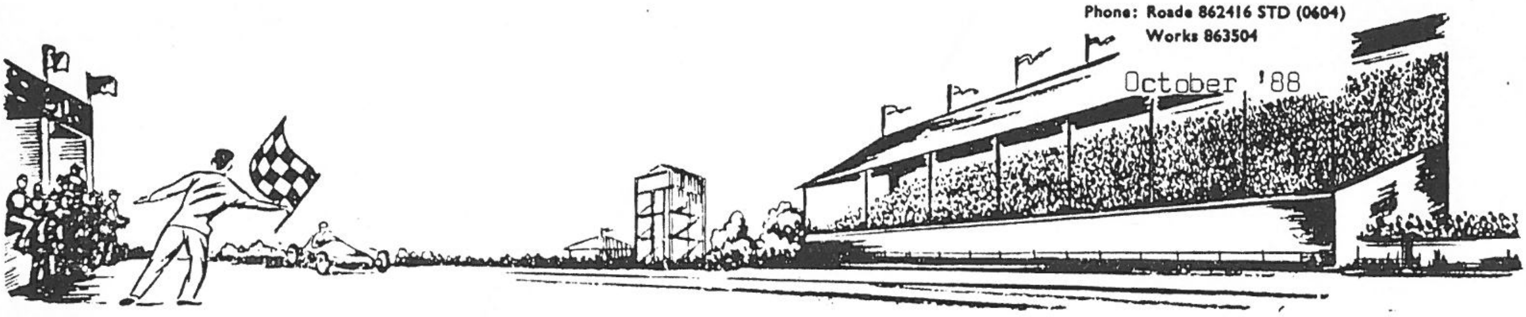
Mallock Racing

Partners:
ARTHUR MALLOCK
RICHARD MALLOCK

V.A.T. No. 120 5964 85

MILL COTTAGE
THE GROVE
ROADE
NORTHAMPTON
NN7 2PB
Phone: Roade 862416 STD (0604)
Works 863504



October '88

1989 Technology

With Richard running a quasi Work's car in a few events and with help from customers Barry Webb and Tony Bridge, many useful lessons have been learnt from 1988 which will be incorporated in the Mk 28

1/ Front suspension

Barry Webb demonstrated the gains to be made from running the front as low as possible. At first this resulted in a weird 'wobble' effect which was traced to the front roll centre moving through ground zero and hence violently from side to side. It was cured with a simple spacer change to raise the R.C. to 5/8" above ground.

This inevitably increased the camber change, which was already more than we would like, but Barry was better-off than most using the old Reynard based uprights.

During 1988 we made three modest moves in the right direction, but really the constant trend to larger diameter tyres, lower rides, more anti-dive and higher roll centres means that the old Triumph upright that has served so well for 20 years is now beyond the limits of acceptable compromise and we are introducing an entirely new fabricated unit versatile enough to optomise the geometry for any choice needed.

Unfortunately, experience with past fabricated uprights has prompted us to keep the weight the same as the Triumph but the design is altogether more robust rigid and 'sanitary' than early attempts.

For example, the bearing carrier is machined from solid and has no welding, so that the bearing 'nip' can be carefully controled.

Apart from allowing the correct camber change curves, the king pin inclination has been reduced from 9^{o} to 6^{o}. In itself, this gives lighter steering, less adverse camber on the outer wheel and better bump-steer on lock

Front roll stiffness is now so high that the tyre spring rate of some 800 to 1000 lbs/" is starting to get close to the wheel rate in roll.

This invalidates the 'Wooden wheel' calculations used in the past and call for a longer top wishbone.

The lower K.P.I. means the top wishbone is some ½" longer to help achieve this.

1988 ventilated discs proved rather 'over the top', so for '89 we will be following F.3. technology with 11" solid units with larger diameter Bells for best rigidity, cooling, weight saving and mechanical advantage.

For Class 'B' a similar approach will be used, with large bells, larger o.d. but thiner than in the past.

Steering arms are simple bolt-on flat plates to allow quick, cheap change of Akerman to suit different circuits and applications.

The lighter steering offers the possibility of a still higher rack ratio from a new precision R and P as an option for those who prefer a faster response. Indeed, the bolt-on steering arms allow steering ratio to be quickly adjustable to suit driver's choice or circuit requirement.

2/ Drag.

To parallel Patrick Head's Williams quote: "On aerodynamics, while we may not always have been brand leaders, we have mostly been there, or there abouts".

Next year we plan to be brand leaders.

A sobering thought from Richard points out that whilst there are 1001 ways a driver/car package can be uncompetative, if drag can be reduced without sacrificing down-load then, for the life of the car, no human element can compromise the advantage.

In Class B, where so many corners are taken totally flat, there is a limit to how much improvement can be achieved with better handling, so that any improvement in maximum speed relates closely to lap times. In the Vauxhall class, lower drag will be needed to prevent 'A' cars overtaking on the straight.

Several days testing on a two mile run-way, using our 'talking rev counter' has helped show the way.

The car will be run 1" lower, which chops a square foot from the frontal area. Work on the new bodywork is just starting.

3/ Handling (A)

The theme for 1988 was 'Through corner stability'. Rear toe control was improved 600%, rear bump-steer 1000% and T.A.M.1 gave constant anti-squat,

Our live axle development has now got to the point where it is superior to I.R.S. in all aspects except one.

It is common enough knowledge that propshaft torque must lift the O.S. wheel under drive and on some cars this can lead to inside wheel spin.

This has never been a problem on Mallocks. Indeed, if there is one area where out live axle shows a clear advantage compared to the very best I.R.S. it is in traction. What is of more concern is that this lifting tendancy is directly related to propshaft torque, so that every time the driver moves his right foot, weight is transfered all round the car. As the springs and shocks take a finite time to respond, a 'Threepenny bit' effect can develop.

The principal of torque cancelling has been understood for at least forty years. It is used on all American short circuit cars and helped Jaguar to win Le Mans in 1952.

We tested it in drag racing in 1965 with dramatic results. I won £50 for 43 secs running. Say £12 a second in today's money!

Up until now, the engineering for a circuit car has proved insurmountable, as most solutions involved drilling a hole in the driver's back, but T.A.M. 1 and T.A.M. 2 have shown the way.

What torque cancelling amounts to is using more anti-squat on the O.S. compared to the N.S. T.A.M. 2 has shown that bump steer can be completely eliminated by setting the top trailing arm at one particular angle in both planes. By putting the N.S. top trailing arm inside the chassis, the angle in the horizontal plane is revered, so that nil bump-steer can be achieved with it horizontal thus eliminating anti-squat on this side.

The first car has already been modified and will be tested, back-to-back, as soon as the Vauxhall engine is available. In the first instance 25% canceling will be tried, but as we seem to have invented a new system of pure straight line motion, there is nil geometric quarrel, and there seems no reason why the percentage can not be increased simply by further tapering of the O.S. arms.

It has been postulated that any gain on drive will be megated on braking, but this certainly did not seem to worry Jaguar, whose Le Mans success was attributed largely to better brakes and I can think of a good argument why braking should actually be improved. Certainly up to the point where engine braking is exceeded, there must be an advantage.

4/ Handling (B)

I have quizzed two quick customers who have driven I.R.S. cars for comparisons and they both said: "I.R.S. seems to put it's power down better". At first, this had be baffled. As already mentioned, the one point where a live axle is demonstrably superior is traction, but a study of a Harewood hillclimb video combined with more rigid de-briefing gave the answer.

Watching most single seaters such as F.Ford 1600 or 2000, or F.3. shows that the low cornering power inherent in I.R.S. can easily invoke oversteer and, in some circumstances, this can be an advantage. At Harewood, the track is very narrow, so that the conventional Mallock: 'wide in, clip the apex, wide out' approach has little scope. There never seems to be enough road. With I.R.S. however, the tail is out from the start. The inner front wheel simply hugs the inner corner radius and the corner is taken in an opposite lock drift, so the front wheels never go near the outside and the driver can accelarate from the corner sooner. Only one Mallock has achieved this controlable oversteer handling, but the technology is known and will be built into the car adjustments for 1989.

The 1989 cars can be used with either 22" or 20" rear tyres, but particularly in Vauxhall class, the main effort will be concentrated on 20".

This allows the back to be dropped 1" and the new front suspension maintains the rake.

Obviously, the C of G and unsprung weight transfer will be reduced. The Mumford pick-ups will be raised to maintain the same roll-centre, thus reducing the roll moment.

A sobering thought is that lowering the C of G by 1" has the same effect on weight transfer as widening the track some 5 to 6 inches.

Secondary advantages will be that the blisters in the venturi can be eliminated with less unsprung weight.

Thinking of wheel lifting due to propshaft torque, it could be unsurprising that the effect is directly proportional to torque input. If the tyre size is reduced 10% and the gearbox geared up 16% then the force is reduced 22%

Tests suggest that 22" tyres with 3.55 diff ratio will not exceed the Vauxhall rev limit on any U.K. circuit and although the massive power band makes top gearing less critical, on slower circuits a close alternative would make better use of the rev limit. Going to 20" tyres and a 3.777 diff, then to be equivalent to 3.555, the overdrive gearbox ratio needs to be 1.169.

We have settled for 1.1616 which gives an equivalent of 3.577 with 3.77, or going to 3.9 gives another 226 R.P.M.

The overdrive approach should also apeal to B.M.C. 'A' Series diff users, and using 20" tyres reduces the shock loading not 10 but 21% which should certainly improve diff reliability, and could even bring the B.M.C. diff back into contention, particularly with the lower Vauxhall power.

Long lasting control tyres and ever lasting control engines in Vauxhall should go some way towards making 'Other things equal'. The 1989 driver and engineering contest should be fascinating.

Roll-on March

Arthur

Arthur.