Mallock Racing

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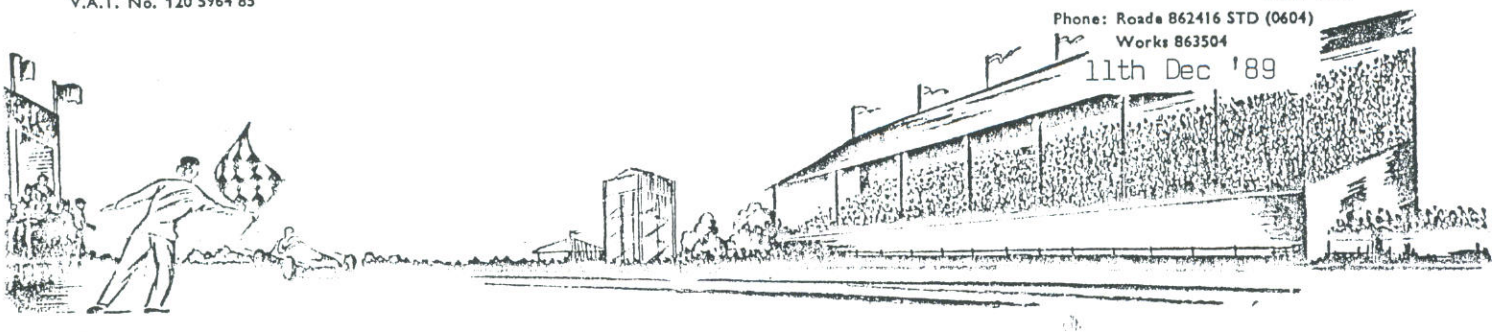

Forward to the Past

Tweaks galore for 1990

I predicted last Winter that the introduction of a control engine and tyre in 1989 would result in rapid development.

Any development is only meaningful if carried out on 'State of the art' cars and the durability and equality of tyres and engines made it seem likely that several runners would come into this category.

So it turned out. By mid season at Mallory, the whole front row had identical times. With our 'Works' car joining-in for the last few races.

In this situation, it was easy to evaluate many parameters that had never been possible before.

Some of these were quite elementary, such as caster, camber, weight distribution, ride heights, brake compounds, chassis rigidity and comparison of high or low down-force.

Others were more subtle such as roll entres, suspension geometry and ground effect and drag evaluation.

1/ The first important discovery has already been recorded and came to light at the end of 1988 when Vernon Davies observed rapid wear in the Rose joints in his trailing arms.

Another clue was that top spec cars which often proved quick 'straight from the box' never seemed quite to show the same form again.

We spotted some dubious joints on Nick Bridge's car and a simple test revealed a truly horrific movement. Changing to new nylon joints was a complete, but very short lived cure, but the Works' assisted car of J.R. which used P.T.F.E. joints showed no problem after a full season.

At first, Hill climb contenders were dubious. They suggested that their milage was too low to cause wear, but in fact movement checks revealed that their situation was the worst of all.

It seems that exhaust heat is melting the nylon in the nearest joints, resulting in rapid wear in the others. In Hill climbs, there is much warming-up

while standing still and running at full power at low air speeds. Older cars using rubber bushes do not suffer as badly.

2/ Chassis rigidity. Over the years we have continually developed our space frame rigidity from 300 lb ft/^{o} to ten times this number to keep it a brand leader. Some sums based on Batho's formula revealed that a simple alli tube of the same cross section area would give a truly massive rigidity and this formulae allows the substantial loss due to the open top frame to be calculated.

Measurements with different cladding thickness revealed that theoretical results could be achieved almost exactly. They also revealed that the space frame structure was plenty stiff enough to prevent the dreaded 'Critical buckling' even with 24 s.w.g. cladding, so that honeycombe sheets offered no advantage.

The bottom line is that we can double the rigidity to 6000 lb ft/^{o} with no weight penalty. This is far superior to the best single seater monocoques and well into honeycombe technology.

The result is an improvement in road holding and spring and bar changes become far more effective.

This has opened up a whole new world. There is plenty of scope for further development.

3/ Trailing arm magic. T.A.M. We get rather tired of comments of 'sophisticated' IRS and 'primative' live axles.

In fact, there has only been detailed improvement in IRS over the past thirty years, as designers put new numbers on the importance of different parameters, whereas our development of the live axle has been sophisticated in the extreme. For example, we have tried eight different varieties of sideways location of which five have been unique and we now have the perfect system.

Live axles have several significant advantages compared to IRS. Apart from being some 25lbs lighter, unlike IRS, it is simple to achieve large anti squat percentages up to 100% and more. This makes it mandatory in any competition where traction is paramount e.g. trials or small circuit.

Obviously the tyres are kept upright to the track under all important conditions.

The limitations are not those popularly supposed. The area in which progress is now rapid is through-corner stability and this is where trailing arm geometry comes in.

For the technically inclined, T.A.M. 1, 2 and 3 are described in detail, but the bottom lines are:

T.A.M. 1 aims to keep anti-squat performance constant with ride. It helps straight line traction and reduces roll and understeer.

T.A.M. 3 is torque cancelling. This still further improves traction, both straight line and corner exit but most important, it makes balance much less sensitive to right foot position (Better through corner stability and reduction of 'Threepenny bit effect') It also improves braking. All of crucial importance in Hill climbs.

T.A.M. 2 eliminates rear bump-steer resulting in better road holding. Again crucial for Hill climbs.

T.A.M. is achieved simply by shortening the top trailing arms and moving the front pick-ups to achieve the best bump-steer and torque cancelling without excessive geometric quarrel.

With the Mk 27 series, we know the correct positions and modification is less than a days work. Older cars require careful measurement and this takes more than a day. Cars which already have a T.A.M. 1 to T.A.M. 2 conversion can be converted to T.A.M 3 in about half a day.

4/ Front roll centre below ground. The effect of this is that instead of the front jacking-up on corner exit, it jacks down.

The advantage has been well established and indeed all the premier racing formulae have run front R.C.s below ground for more than a decade. Up till recently, we have never been able to get it to work.

We have now solved the problem. There is a secondary advantage in that older cars using Triumph uprights can be run much lower without camber change becoming excessive.

The bottom line is less understeer, better turn-in and greatly reduced attitude change allowing stable ground effect.

5/ Use of progressive rate bump rubbers. This is much the same story as 4/. We have discovered why these never worked in the past. They now work very well indeed.

Better braking, turn-in, and less attitude change. Front springs should also be up-rated.

The overall bottom line is vastly improved attitude change, allowing stable ground effect, better brakes, turn-in, traction, road-holding and through-corner stability with less roll and understeer. In short, much easier to drive.

One idea we tried with mixed results was a drastic re-rating of the roll bars. 1988 results suggested that keeping front to back weight transfer ration proportional to weight distribution i.e. about 60% rear to 40% front would allow more oversteer which would be of particular value on narrow hills. It would seem that this IS valid in most Hill climb applications (Stiff rear bar and soft front) but on the circuits, cornering speeds are higher and more roll means more air under the nose on the inside of the corner and hence less grip.

Reverting to the old 1" bar sets front weight transfer to more than 50% for better traction, with only a small change in balance and in any case, we now have all the front end grip we ever need.

All the above tweaks have been tested individually, and have shown significant (sometimes dramatic) improvements. T.A.M. 3 is perhaps the tweak of the decade.

Taken altogether they represent 'Night and Day' Probably a second a lap.

Note also that they are very cost effective. About £500 in all and can be applied

to all wide track cars (Mk 23 onwards) and some to even earlier models.

In 1989, Clubmans times have been much the same as V.L.C. in 1990, they will be quicker.

Arthur