

Challenging the Regulations

An appraisal of the ingenious but complicated suspension designed by Ralph Broad for his Group 2 Ford Capri

TAKING as his motto "The race starts when the regulations arrive", Ralph Broad has designed a novel suspension for his Group 2 racing Ford Capri which is to contest the RAC British Saloon Car Championship. A second car is being entered in the Belgian Saloon Car Championship.

With this design, Broad has aimed at improving the ride - essential if adhesion is to be maintained on bumpy circuits - without affecting the handling. At the same time, dive and squat are reduced without the use of special linkages.

Because they are heavy and have high centres of gravity, racing saloons tend to roll much more than is desirable. To keep roll within reasonable limits, so that the tyres are not lifted off the road, and the camber angles of the front wheels are acceptable, very stiff springs are normally needed. Anti-roll bars, whose main function is to tune the front-rear handling balance, also help to limit roll, but if they are too stiff, they tend both to lift the inside wheels, and upset directional stability.

With these very stiff springs, the ride is inevitably so firm that on bumpy surfaces, the tyres are frequently lifted clear of the road for short periods. This obviously makes it difficult for the driver to keep control, and for the power to get to the road.

Unfortunately, with a normal beam axle, this situation is aggravated because the springs are mounted well inboard to clear the tyres. When the wheel is deflected vertically, the spring is deflected the same amount as the wheel. However, during roll, each spring is deflected less than the wheel, and the narrower the spring base - the closer the two springs are to the centre of the car - the less the springs deflect. Therefore, the effective spring rate on roll is usually 35-50 per cent of the rate on bump. So even with fairly stiff springs, the roll rate is quite low. So, the way to reduce roll without affecting the rate on bump, that is without affecting the ride - or alternatively to get a softer ride without affecting roll - is to alter the effective position of the springs so that the ratio of the roll rate to bump rate is increased.

In saloon car racing, regulations limit the designer's freedom. In Group 2, the existing suspension pick-up points must be used, but additional springs and dampers, with the necessary brackets can be used. With free interpretation of the word "bracket" you can get away with more or less anything.

Outboard springs

As shown in John Hostler's drawing, Broad has tackled this problem by mounting coil spring /damper units forward of the front wheels and behind the rear wheels. The basic arrangement is similar at the front and rear, and in either case the mounting of the spring is quite independent of the normal suspension linkage.

At the rear, the spring is attached to the outer end of a lever which pivots on the body. This is a relay lever, whose other end is attached to a shackle mounted as far outboard on the axle as possible. Therefore, movement of the bottom of the spring /damper unit is identical to that of the attachment of the lever to the axle - in fact, it is as if the spring were mounted at the end of the axle.

The result of this arrangement is that the effective distance between the two springs the spring

base - is much greater than normal.

Therefore, the roll rate is about 72 per cent of the bump rate, a 50 per cent improvement on the conventional design. What's more, Broad says that on the next car, the springs and levers will be even further outboard, and that the roll rate should be 90-100 per cent of the bump rate.

