▶ has an offside weight bias which puts about 15lb extra on the driver's wheel. This is plenty in order to keep traction the equal to the very best IRS. Symmetrical two-seaters, such as Westfield, Caterham and Phoenix models, carry over 20lb.

The problem is that this wheel-lift depends directly on the position of the driver's right foot and, hence, varies every time he moves it. The springs and dampers take a finite time to respond to the load change, so pedalling the throttle can produce a "threepenny-bit" effect. The cure is torque-cancelling (see panel) which involves reacting the axle torque against that of the propshaft.

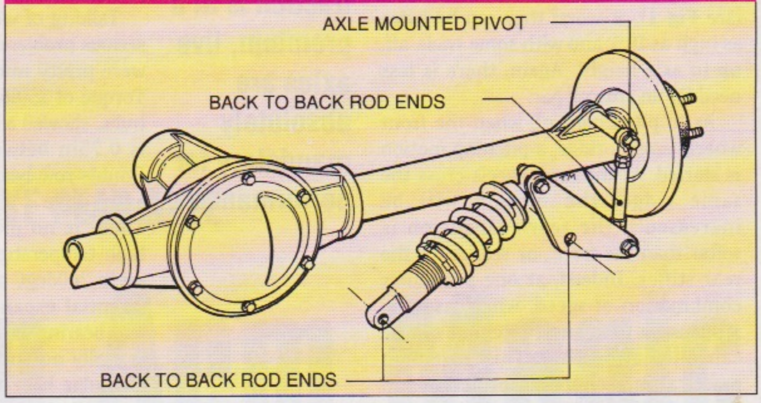
This technology has been known for decades. It was used successfully on the C Type Jaguar. Jaguar's 1953 Le Mans win was attributed in some measure to superior brakes, but tests on a bumpy surface revealed a braking instability, which was put down to the torque-cancelling. The sums certainly say that, and change on drive must be reversed under braking. In practice, however, the result is different.

Normally, the race driver only brakes once for each corner, and the forces involved are relatively constant. This allows the suspension to settle down over a fair time. In any case, there is always some engine braking. Up to the percentage when this is cancelled, there must be a positive gain on both drive and brakes.

SHORT TAKE

"Judged against most of the important parameters, the live axle offers significant gains."

FIG 2: PULL ROD REAR SUSPENSION



The Jaguar race results would seem to vindicate the system. I suspect that the bumpy surface failure could more likely be put down to a severe case of "stagecoach effect", due to the massive rollcentre height (close to 20in).

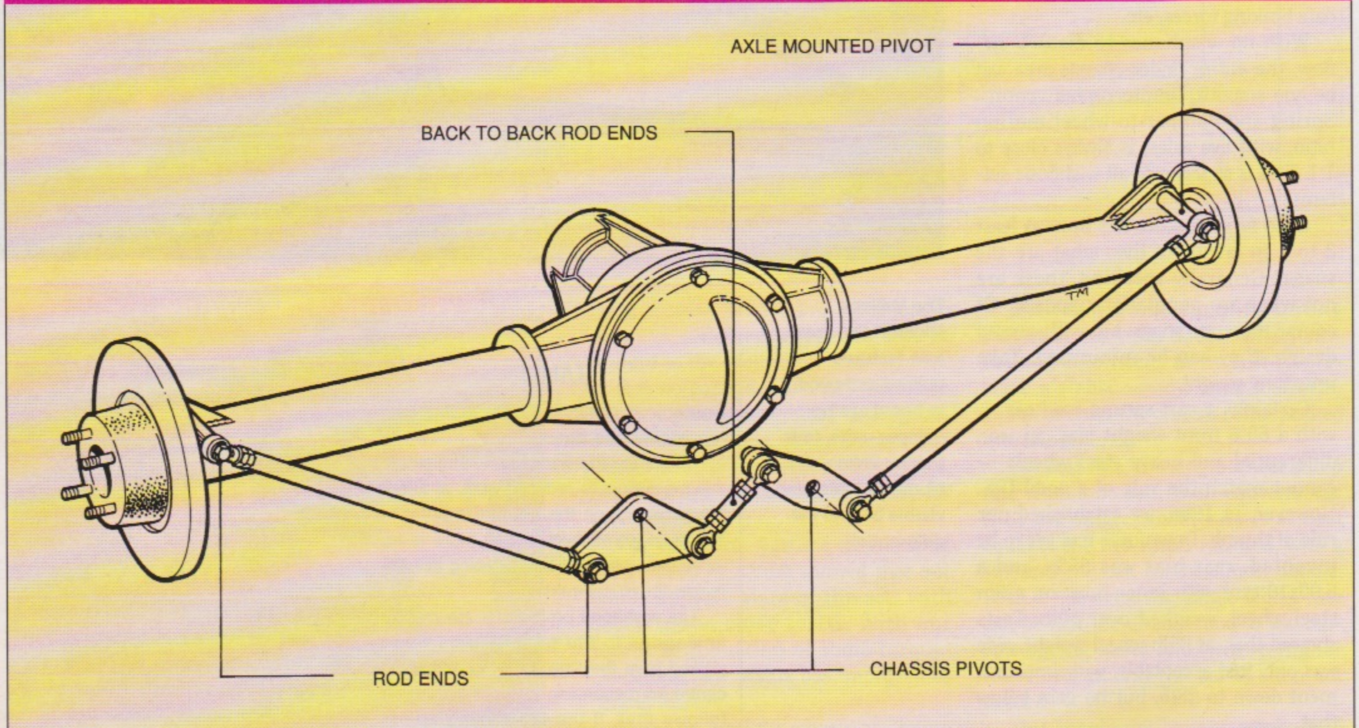
Until recently, the engineering has always defeated us (it seemed you needed a rod through the driver's back), but we have now achieved some 35% cancelling (see TAM-3), giving a significant improvement.

This has involved some geometric quarrel, which can be measured easily enough, but is difficult to quantify in terms of track performance. TAM-4 halves the quarrel, with no noticeable change in behaviour, so we need to try increasing the percentage cancel.

Damping is always difficult with very short suspension movement, and the high unsprung weight and narrow damper base add to the equation. But we are working hard on damper theory, and have already made significant progress, particularly with the pullrod. The superior motion ratio helps.

Judged against most of the important parameters, the live axle offers significant gains. Such problems as do exist can be minimised by careful design. ■

FIG 3: SIDEWAYS LOCATION USING THE MUMFORD SYSTEM



WE HAVE TRIED NINE DIFFERENT SYSTEMS of sideways axle location. The requirement is to provide a rollcentre which stays constant relative to the chassis with suspension travel.

In this respect, the popular, axle-mounted Watts linkage is the worst. By mounting the Watt pivot on the chassis, the rollcentre cannot move, because it has a bolt through it, and the rods do not move in roll. For clearance reasons, it is often convenient to mount the pivot left-of-centre. If the rod lengths and pivot ratios are changed in proportion, Watts geometry is still maintained. This is an excellent system when super-low rollcentres and ground clearance are not considerations. For a lower rollcentre, the system can be mounted horizontally.

For best compromise with "stagecoach effect", however, the rollcentre height should be about 3in — and for the optimum ground-effect, the whole mechanism must be above the venturi.

This is where the Mumford axle location system comes into its own. By carefully calculating the pivot lengths, the rollcentre movement can be kept to less than 0.1in. As it is invisible, it can be set to any desired height (even below ground).

Michael Mumford's system, illustrated by the diagram, offers the advantages of nil spurious vertical loads, and excellent rollcentre control. Very low rollcentres are practical, well below ground clearance, and thus the system offers excellent bump scrub. On bump, the ground clearance actually increases.