

FUTURE SHOCK

Often, new buyers of 4WDs are horrified by the ride the vehicle offers, being used to the more luxurious feel of a standard sedan car. Experienced four-wheelers who miss sedan car ride know that they'll have to fit aftermarket suspensions. WAYNE CANTELL reports on a new suspension.

Since the first days of the four-wheel drive vehicle's rebirth as a recreational vehicle, there has often been one problem which has been paramount — that of a harsh, bone-jarring suspension.

As people left the relative comfort of their sedans and traded four doors, soft seats and small, soft riding radial tyres for the versatility and, in many cases, the rugged macho appeal of a four-wheel drive, they began to experience the harsh realities of the

cross country vehicle.

Sophistication was replaced by simplicity; flexibility and compliance by raw, brute strength; and the trappings of interior fitness replaced by utilitarian function.

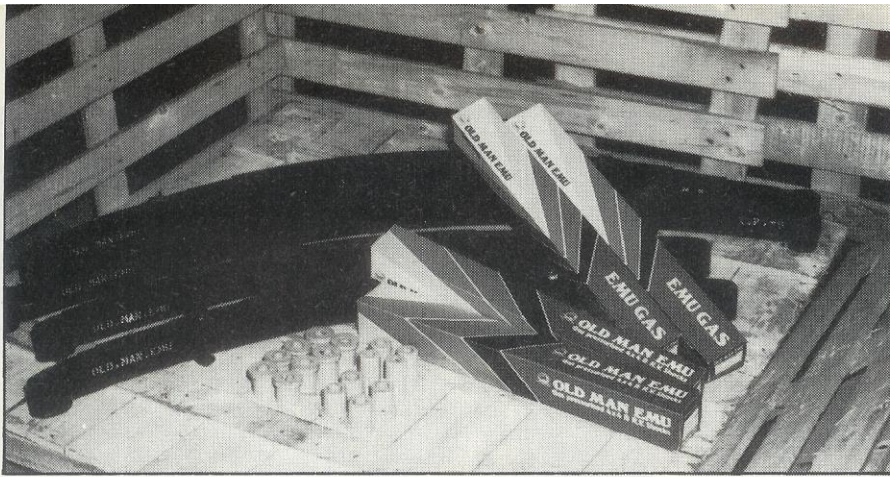
Aspects of four-wheel drive utilitarianism could be augmented with, or replaced by, a variety of 'bolt-ons', but still the problem of the harsh ride remained.

While a wide variety of suspension modifications has been available for all kinds of vehicles — shock absorber

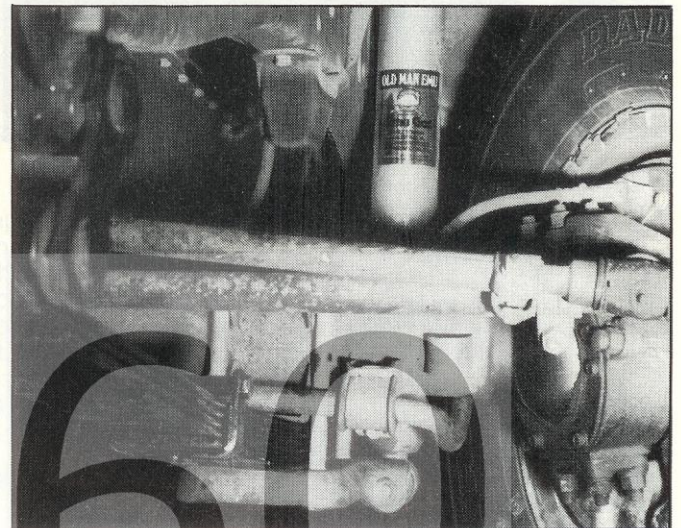
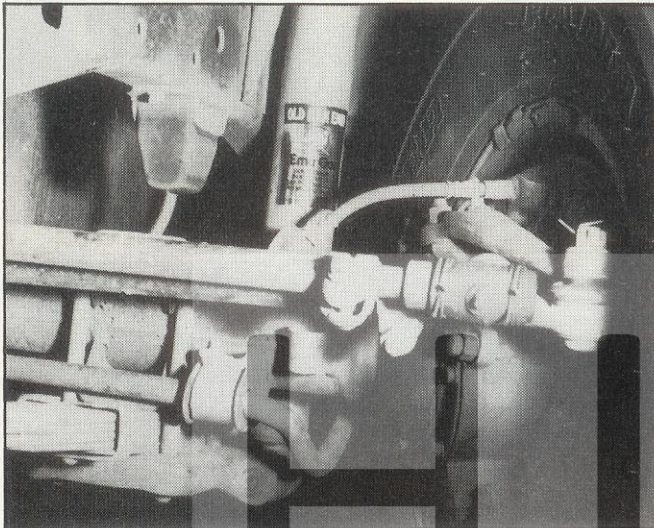
kits, overload springs, variable rate rubber bump stops — only a few have tackled the real problems head-on.

After a great deal of research and fieldwork, Old Man Emu (which first developed, with Monroe Wylie, an Australian-made gas pressurised four-wheel drive shock absorber) has now made available a 'Emu Spring System'. Here there has been a total integration of spring and shock absorber combination that has not been done previously with Australian-made shock absorbers.





Previous page: Toyota HJ60 on the left before new suspension. Sags at the rear, then to one side, often appear. New suspension raises vehicle at right only 1-1½ inches, with rear sag cured and roll centre not excessively raised. Left: New suspension system consists of new springs, new bushes and shock absorbers of a matching valve code. Below left: Toyota HJ60 front — note lack of suspension travel between axle and rubber bump stops before new suspension is added. Below right: Each new leaf is thinner, more flexible and progressive, with extra suspension travel now available for the Tojo.



The system depends upon a developed 'mating' of shock absorber valve coding (and you will remember previous *Overlander* stories about the internals of shock absorbers) and completely new spring rating.

Unlike some other systems, which rely on a soft spring coupled with a soft riding shock absorber, the Emu Spring System rationale is to offer an integral system which gives soft riding characteristics and better handling, without sacrificing the rugged durability and strength demanded by genuine four-wheel driving.

The main cause of complaint in four-wheel drive suspensions — the stock item, that is — is the use of an extremely strong setup with few leaves. This spring is used to locate the axles and to 'hold' the vehicle up. Coupled with shock absorbers which provide heavy compression control and heavy rebound control, this creates a situation which allows minimum suspension movement.

The shock absorbers developed for these springs are valve coded to 'control' this massive spring. In other words, the strong spring is controlled by a strong shock and although that does in fact theoretically 'cure' the problem, it's a bit like shutting the

stable door after the horse has gone.

Add to this a relatively high weight factor, big solid bump stops to prevent bottoming and a heavy load of equipment for a weekend away and you have the classic 'no ride' situation — a suspension which has little more movement than that of a box dray, and a ride with all the comfort of a billy cart.

The Emu Spring System approaches the problem from a new angle.

The replacement spring is in fact stronger than the original, but is a multi-leaf spring which offers progressive travel, softer riding down low and greater support as the spring compresses.

With the total redesign of the spring, the ride height is also increased marginally (ride height increase varies from vehicle to vehicle) allowing more movement in the shock absorber and also greater spring travel before encountering the bump stops.

The springs are virtually hand-made to ensure compliance with performance specifications, and are 'scragged' (that is, compressed during manufacture) before leaving the factory, to minimise sagging once they are fitted to the vehicle.

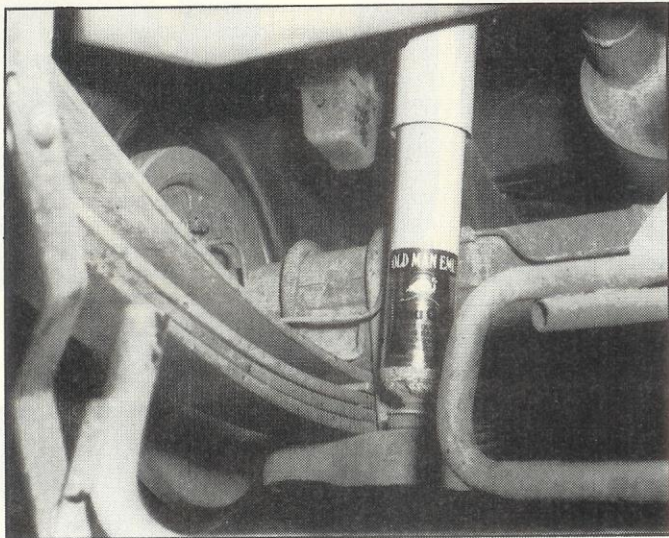
The Emu Spring System — which will include updated replacements for Range Rover coils and torsion bars for Mitsubishi's — entirely replaces the standard springs and does away with the need for overload or helper springs.

Equally important as the springs are the Emu Gas Shocks — again carefully re-calibrated to integrate with and enhance the performance of the springs.

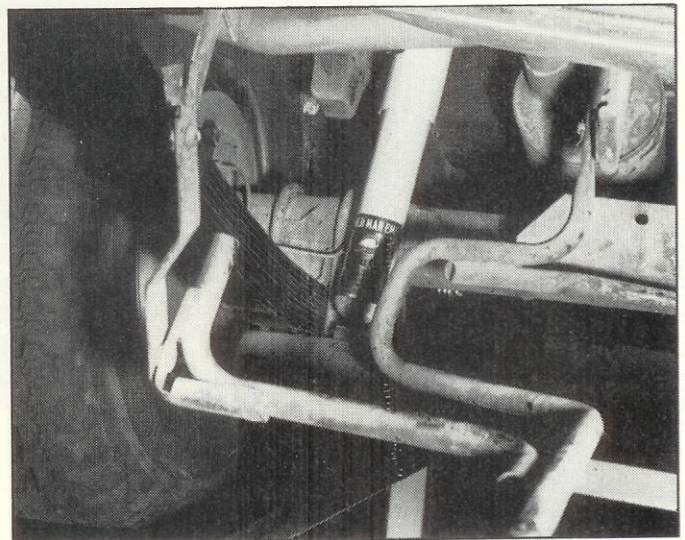
Naturally, when using a stronger spring, whether progressive or not, the immediate 'contra' effect will be greater rebound. This in turn translates to a need for greater 'control' of the movement of the spring/axle assembly.

While the Old Man Emu Gas shocks have, until now, been available as replacement units *per se*, it was found that in their standard replacement valve codings they were not fully complementary to the newly developed springs if full advantage was to be taken of the multi-leaf construction employed.

Because of longer suspension travel, progressive compression rate and stronger 'top end' performance of the springs, the shock absorbers themselves required careful re-calibration of the valve codes — the



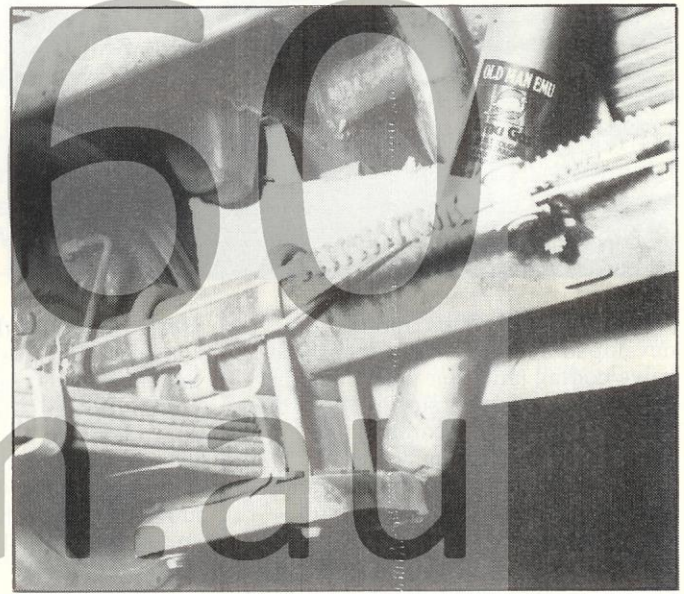
Unprogressive design of original rear suspension on the MQ Patrol; a rugged 'tank' spring to control movement. Here the giant helper (the second one) has been cut to reduce the catapulting 'crossbow' effect.



After new suspension, the Patrol's rear spring has twice as many leaves, with greater flexibility and progressive give. The shock will not have to be coded to fight a violent spring.



Rear of Toyota HJ60 before new suspension. Note thick rigid spring leaves and lack of rear suspension travel.



After new springs, the rear of the Toyota HJ60 actually has an extra leaf. Note more suspension travel and staggered spring lengths.

factors which determine the compression and rebound rates of the shock absorber itself.

Being infinitely variable, due to gas pressurisation — which ensures full oil viscosity under any load and a total absence of 'foaming' or aeration of the hydraulic fluid — it was a relatively simple task to recreate the performance of the springs on a shock absorber dyno, then match the appropriate valve codings for optimum 'system' performance.

The result is a series of Emu Gas Shocks carefully matched to the appropriate replacement spring, coil or torsion bar set to ensure maximum benefit from the system.

The shock absorbers have an

extremely soft low speed compression and softer than standard mid-range compression.

At the other end of the scale, however, the rebound valving has also been modified to increase rebound control, preventing sudden 'kickback' as the spring compresses, then releases the load.

This allows greater suspension travel and a soft, smooth ride which absorbs bumps effortlessly and transfers the main damping effort to the rebound sequence.

The overall effect of installing the system is said to give a soft ride which reduces impact harshness while allowing greater and easier suspension movement, to absorb and

cradle both high and low frequency bumps and rugged corrugations.

As a result, maximum tyre contact is said to be made with the travelling surfaces at all times, improving traction, road holding and general handling.

Overlander will roadtest this system in a later issue.

Installation is a straightforward swap over, though attention must be paid to front end camber and castor because of the increases in suspension travel.

The Emu Spring System is said to offer genuine sedan ride and handling without sacrificing four-wheel drive capability.

We'll see.