

LAND-ROVER '85

JRA'S EXTRA BIT OF CHOCOLATE

The 6x6 Land-Rover isn't a thing of great beauty but it could well be great. ALLAN WHITING drove it and came away impressed.

THE trick used to be getting little boy chocolate babies when the bag was handed 'round — because with the little boy babies you got a bit more chocolate. JRA's equivalent to the extra bit of chocolate is another driving axle on the 110 Land-Rover.

The logic is pretty simple, really. If you can put one tonne on the back of a standard 110 ute, then adding another axle and a bit more length will whack the payload capacity up to three tonnes. At the same time, you have maximum commonality.

In practice, there's much more to do than meets the eye. If it hadn't been for the Australian Army's Project Perentie — a search for a two-tonner, to the non-military mind — JRA's stretch exercise may never have got the green light.

For a start, cross country vehicles defy the normal engineering rules of weight distribution, because they climb steep slopes, descend the same and achieve ridiculous side slope angles. All this means that at some stage, a cross country vehicle will have very high point loads at the front, rear and sides of the vehicle. Axles and suspensions are the first items which need strengthening to cope with these loads.

The original JRA idea was to simply stretch a standard 110, add another drive axle and load sharing suspension, plus some chassis reinforcement. But very soon, it was a bigger production than Ben Hur.

The chassis was an early casualty. Modifying the original chassis involved just too many compromises, what with change in overall length from 4600mm to 6023mm and altering the rear suspension from coils to four leaf springs. In place of the standard section frames, the 6x6 gets a tubed structure built up from

square tube and channel section 350MPa (50,800 psi) steel. After completion, the chassis is hot-dip galvanised for unrivalled corrosion resistance.

The front axle and suspension looks outwardly little different from the 110 4x4, but subtle changes have been made to cope with the extra loads.

The axle is externally identical, but stiffening tubes have been pressed inside the housing. The standard differential has been replaced with a four pinion model and the fully floating axle shafts are heavier. Constant rate coils replace the 4x4's dual rate units — lifting the front end 25mm in the process — and longer telescopic dampers are fitted.

The back end is the result of experiments with different layouts. Coils and leaves were tried, with and without load sharing, before a load sharing, leaf-spring design was chosen. A word on load sharing suspensions. Load sharing between the two close-coupled rear axles is desirable for two main reasons: optimum traction and a higher legal payload.

The traction advantage of load sharing axles is obvious when the 6x6 is seen traversing rough terrain, and the legal reason is obvious when you look at other six-wheel conversions that do not load share — no increase in the maker's gross vehicle mass is possible in any State without 50:50 load distribution between close-coupled axles.

Most four leaf suspensions which load share use a central rocker to interconnect the back of the front spring to the front of the back spring. Get it? JRA engineers came up with something different. The central rocker is retained, but the springs overlap each other and are coupled to the "wrong" ends of the rocker. This

allows longer springs to be used, with a corresponding improvement in unladen ride quality. Clever, huh?

The dual rear axles are basically standard 110 units — Salisbury 8HA full floaters — but have extended track width for additional stability, plus stronger axle tubes.

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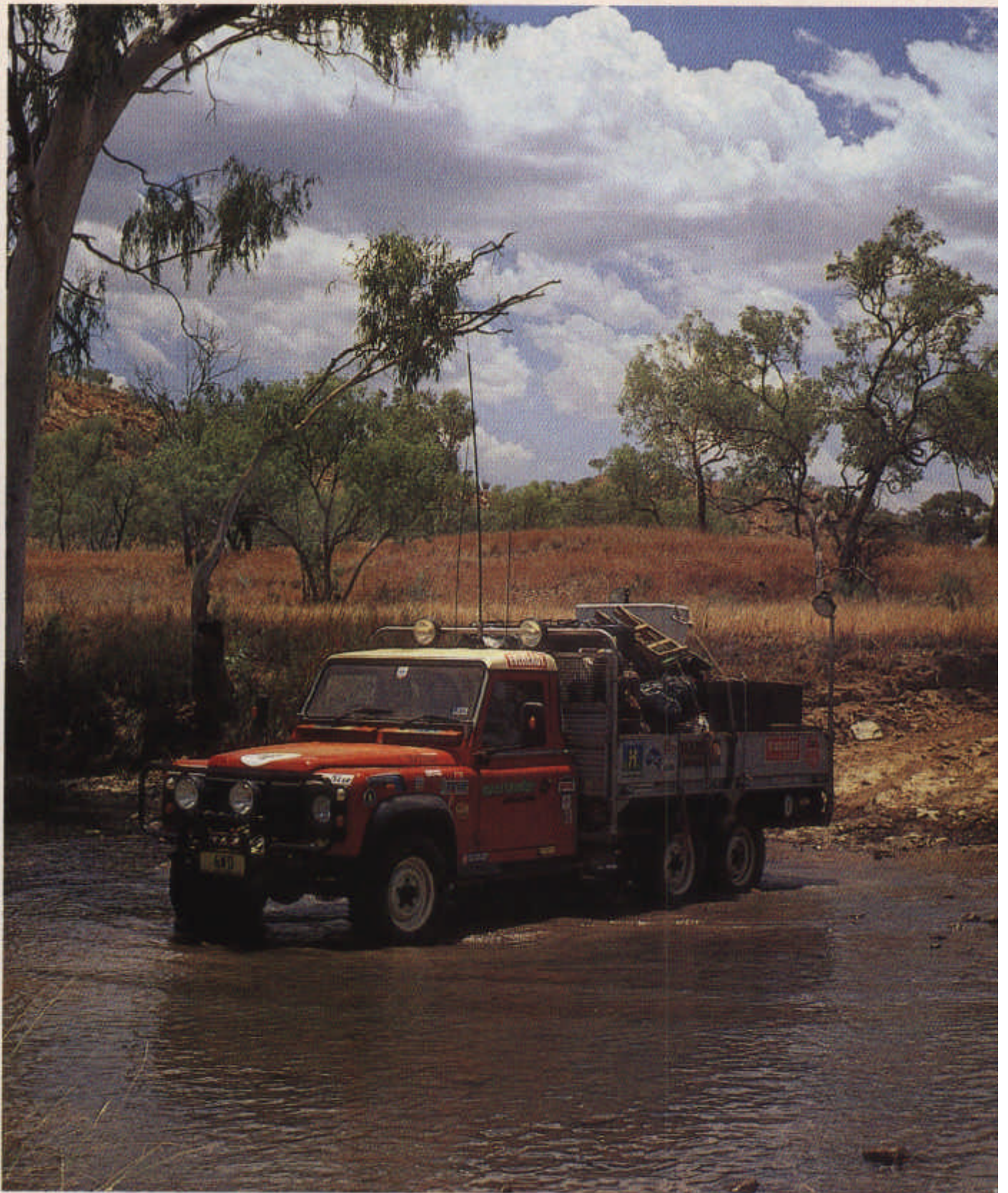
At first sight, the naked 6x6 Land-Rover seems to have more propeller shafts than the Queen Mary, but closer inspection reveals why. The normal 4x4 drivetrain remains untouched, save for a slightly longer propeller shaft to the first rear axle, to accommodate the longer primary wheelbase. The 4x4 110 has a 2794mm wheelbase, while the 6x6 measures 3040mm between the first and second axles.

The really interesting bit comes next. The current Land-Rover transmission was designed with driving a powered trailer in mind. This means that the power take off at the back of the transmission is concentric with the transfer case input shaft, meaning that it can be used while changing gears.

This "hot shift" PTO is used in military P101 Land-Rovers to drive a towed trailer, making the combination an articulating 6x6 in effect. The concentric third axle drive flange is locked onto the transfer case input shaft by a simple sliding dog clutch, actuated by a vacuum switch.

From the output flange, drive passes through a propeller shaft to a centre bearing mounted on one of the chassis cross members, and then through a double Hookes-jointed shaft to the rear axle.

Land-Rover 6x6 on Overlander's O'Donnell Expedition, late last year. The vehicle was driven more than 7000km on the expedition then scrubbed up for Whiting's road test.



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This profusion of propeller shafts may look cumbersome but solves several major problems inherent in powering close coupled axles. The major problem is angularity in the interaxle shaft, if a conventional through-driving axle is used. It's bad enough in road-going 6x4 trucks, but is a real headache in cross country vehicles, with their much greater suspension deflection. By splitting the drive at the back of the gearbox, JRA has eliminated the interaxle shaft.

Another great benefit of the split-drive design is independence between the two bogie axles. Should a propeller shaft or universal joint fail, the 6x6 propshaft turns the vehicle into a front wheel drive 6x2.

Commonality

Apart from the special chassis and rear suspension, there is much in common between the 110 4x4 and the 6x6. The most obvious bits are the cab and what powers the thing.

Having anything in common with a Land-Rover cab is something of a

curate's egg — good in parts. The good bits are aluminium and galvanised steel construction, a flat windscreen and cloth-covered seats. The bad bits are everything else, including wipers that leave too much of the tiny screen uncared for; insufficient engine heat repellent; awful mirrors; a recycled herring tin instrument panel without tacho; and door handles that go the wrong way and must be locked by the world's tiniest key.

Under the bonnet, it is all good news. The willing 3.9-litre Isuzu 4BD1 diesel remains and — joy of joys — is surmounted by a nice little cast iron snail, a turbocharger. The blower lifts maximum power from 72 kW to 86 kW, but, more importantly, maximum torque goes up from 255 Nm at 1900 rpm to 320 Nm at only 1800 rpm.

Other major components are also common to the 4x4 and 6x6. The main four speed transmission and transfer case, the brakes, the rear dampers and the fuel tank.

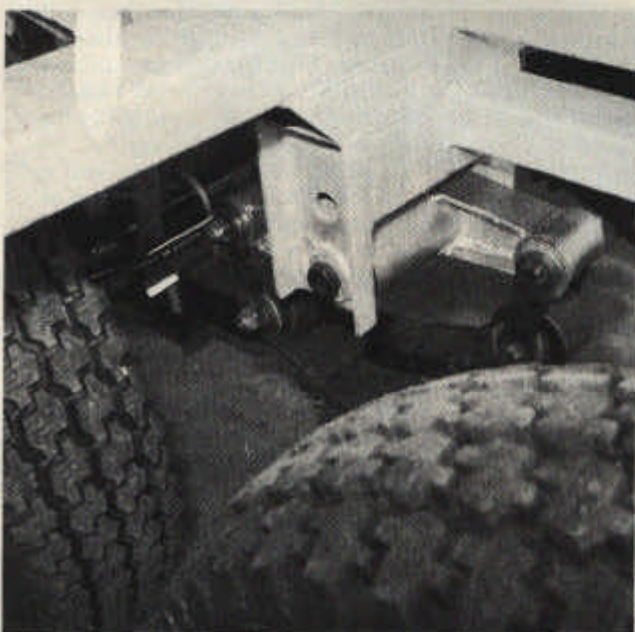
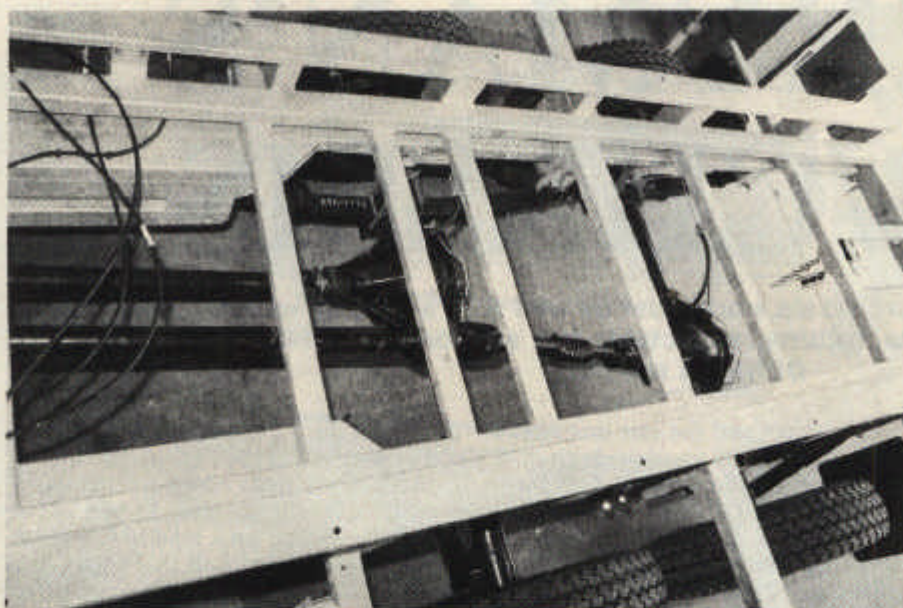
The standard wheels look the same but are thicker in the nave area. Options cover 15 and 16-inch tyre sizes and there is a locally-made split-rim wheel available as well.

Behind the wheel

One of the great joys of driving a military-compatible vehicle is that t commitment to performance overrides almost everything else. Finish on the 110 6x6 is as rough as bags, but the important functions are all well covered.

Getting into the thing is a big more demanding than with the standard 4x4, because of the slight height increase and the cramped interior. With the real bucket seat back as far as it will go, legroom for a six-footer is adequate. Leg and lumbar support is very good, but slightly higher seat backs would be appreciated.

A back-to-front key brings the big diesel to life and it's about then that your eyes search in vain for expected instrumentation — rev counter, boost gauge and an exhaust gas pyrometer



Left: Poetry in motion — 6x6 wheel articulation is superb.

Above: Normal 4x4 drivetrain is untouched, apart from longer propeller shaft. Drive to rearmost axle passes through double Hookes-jointed shaft.

Left: Land-Rover engineers have devised a clever and effective suspension set-up for the 6x6's rear close-coupled axles. Longer leaves cross each other and connect to what would normally be the wrong end of the rocker, resulting in improved unladen ride quality.

are essential, but absent. "Idiot" coloured gauges give approximate information about coolant temp oil pressure and alternator performance and there is a big, easily-read speedo.

The gearlever is long enough to stir the cogs in a bonnetted Kenworth and is still too much of a reach if first and second gear are being used a lot. The gate is wide between first, second and neutral, but small between third and fourth. It's a little confusing after the much more ergonomic Japanese five speeds, but it works fine. There is a

bit of a gearing gap between second and third, but the fantastically torquey engine covers it well.

As with all but Mercedes-Benz' truck steering, the power-assisted Adwest Varamatic unit had too much servo and too little precision in the straight-ahead position, but it was no better or worse than Japanese power steering. The clutch pressure is light, with good feel of the friction point and nary a trace of shudder. Braking is powerful, with no nose-dive at all.

The test vehicle had already had a

hard life in its first 21,000 kms, but apart from a noisy transmission at idle, there was little evidence of the fact that it had traversed the continent. Many an inexperienced cross country driver had put hands its controls, too.

With its heavy military tray top body and 1.5 tonnes of water bottle the 6x6 was a little slower than car traffic, but quite happy to amble at 80-90 km/h on the open road. It'll do 100 easily, but is more economical at lower revs. JRA's Geof Stubbs claims about 17.6 l/100 km (16 mpg) on long trips.

Although having only four blacktop ratios and a rated gross mass of five and a half tonnes, the 6x6 does not miss an extra ratio — save, possibly for an overdrive at cruising speeds. There is heaps of lugging torque in that lovely Isuzu diesel, so you just let it hang on when climbing hills. More and closer ratios might be fun but they're not necessary in performance terms.

On rough surfaces, the 6x6's stability is without precedent. Potholes are soaked up by the coils front and tandem rear axles resist deviation from your chosen path. Front and aft pitching is completely absent. The only negative aspect of the three-axled vehicle shows up in tight turns, where the sideways scrub at back end washes off a lot of momentum.

Bush-driving, mud, rocky trails and sand running are the Land-Rover 6x6's real environment. It behaves like a half-track. Steep stone shelves fail to catch out the rear suspension and there was very little twist evident in the bodywork. The only disturbing feature of trail work was the groaning noise as the front coils moved about on their pads — grating on the nerves but harmless.

An idea of the cross country ability of the 6x6 can be gleaned from the fact that Geof Stubb's own cross-diff-locked 4x4 cannot keep up with it in severe terrain.

Setting the 6x6 up for cross country work is simple: first step is to operate the dash switch which locks the interaxle diff and brings in the three axle drive — if that's not enough, put it into low range as per normal Land-Rovers. With a low hole over a reduction of 65:1, I'll bet you can't stall it!