Classic engines

Graham Robson analyses Rover's all-alloy V8

SOMEONE must have made a mistake, surely? In 1960 General Motors introduced a new light-alloy V8 engine for use in various compact models, but in 1963 it dropped the entire project. Rover, inspired by managing director William Martin-Hurst, bought the rights to the engine in 1964, put it on sale in 1967, and it has been a cornerstone of the company's range ever since. So — was it short-sightedness by GM, or sublime optimism by Rover? Perhaps what was right in cost and production volume terms for Rover was all wrong for the North American giant.

Engine ancestry

As mentioned, it was originally conceived by GM (at its Buick division) in 1950, but the all-aluminium concept was stalled for years while Buick made wear characteristics acceptable, and struggled to get the costs down to 'GM' levels.

Eventually, GM gave in to the inevitable — at the time it could not run pistons in alloy cylinder bores and adopted cast-in iron liners to deal with that problem. From that point, progress was rapid, and the engine made its debut in the autumn of 1960 in the Buick Special, later to be used in the Pontiac Tempest and Oldsmobile F85 Cutlass cars as well. It was remarkably light at only 318lb.

By 1964, however, GM had abandoned all further development, as the company had discovered ways to make thin-wall iron castings, not quite as light, but far cheaper; just 750,000 engines had been built.

Men behind the engine

William Martin-Hurst 'discovered' the engine when on a visit to see Carl Keikhaefer at Mercury Marine in Wisconsin, contacted Ed Rollart of GM, and secured a licence to take over the design. Apart from drawings and engines, Martin-Hurst also secured the services of Joe Turley, Buick's chief engine designer, who was about to resign, so that he could have a Buick 'expert' on the ground at Solihull.

Martin-Hurst was a forceful fellow, but he still had to 'sell' the idea of a new engine to his chairman, George Farmer, and to Peter Wilks who was the design chief. The two cars which needed more power were the P5 3.0-litre and P6 2000 saloons. No alternative engine was available for the P5, but Wilks' team was considering squeezing straight-six, or straight five-cylinder engines into the P6's base-unit shell.

However it was Wilks' engine designer, Jack Swaine, who liaised most closely with Turley on the modifications needed to make the ex-GM engine more suitable for British use, and production by British companies and machines.

Rover re-development

Martin-Hurst had acquired the GM design purely because it was so light and compact and seemed to have enormous potential locked inside. In fact it weighed just 12lb more than the four-cylinder P6 2000 unit, and was 200lb *lighter* than the P5's cast-iron 3.0-litre engine.

Since GM had converted its existing tooling to make cast-iron V8 engines, Rover had to undertake not only the modification, but the productionisation of the engine. In the end the tooling bill was £3 million (a bargain by any modern standards of the day), and all manner of new techniques were needed to produce a cast-alloy cylinder block with press-fit centrifugally cast iron liners, while the heads, too, were sand core diecastings with no machining of the combustion chambers (the GM engine had originally had fully machined chambers).

Other changes from GM to Rover specification included the use of twin opposed SU Carbs instead of a fixed-jet multi-barrel American component, and a Lucas distributor instead of the GM engine's AC-Delco design.

Rover's managers had great and grandiose ideas for their new 'toy', which involved fitting it in machines as different as the Rover 3½-litre saloon (P5B according to its project code, 'Great Auntie' to some of its affectionate fans) and the 101in wheelbase Land-Rover for the British Army, the mid-engined sports-coupé P6BS project, and the vast but elegant Range Rover. They realised that, if properly marketed and diligently developed it could have seen into the future and found it to be useful to Rover and its business partners for so many years to come?

It was, after all, not only light in weight for its capacity (3.5-litres from 318lb is a remarkable achievement by most standards), but it was almost laughably de-tuned for Rover's requirements. Even with 160bhp net (or around 145bhp (DIN) perhaps), it produced an amazingly reliable 46bhp/litre. The strength and flatness of the torque curve can be imagined. It was such factors which not only made it attractive to Rover in the first place, but to smaller companies as well.

Even before Rover bought the manufacturing rights, the design had already proved itself in motoring racing, with Traco (of the USA) being able to produce engines with up to 350bhp on demand; one of the first successful racing applications was in Roger Penske's mid-engined Cooper-Oblsmobile. However, while Rover was actually redevelopingthe engine for its own use, Jack Brabham picked up the racing conversion by Repco (of Australia), in which single overhead camshaft cylinder heads were applied, found it ideal for his purpose, and used it to power his successful Grand Prix cars of 1966 and 1967; the results were exemplary — in 1966 he won the drivers' championship, and in 1967 his team-mate Denny Hulme did likewise!

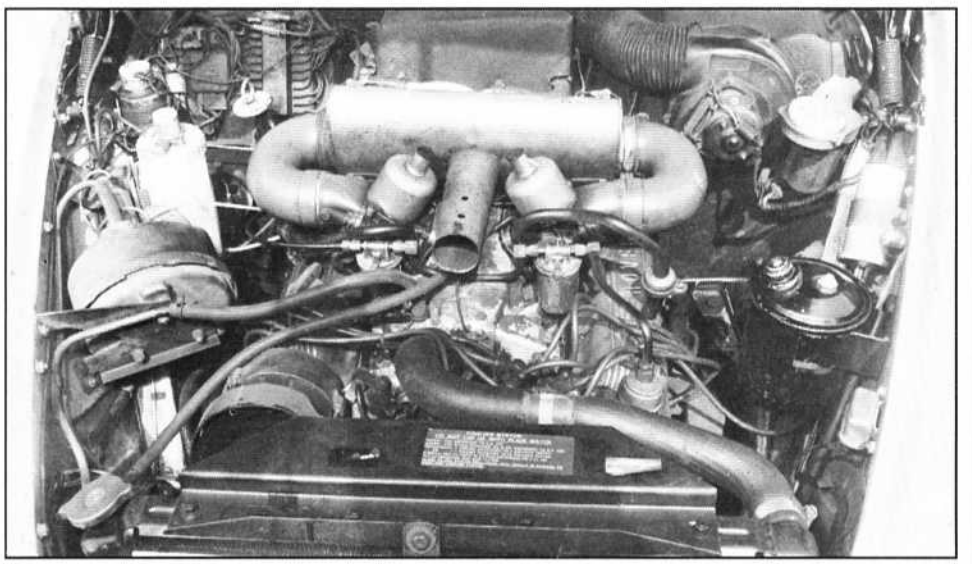
Rovers using the engine

At first, Rover concentrated on developing a single, all-purpose, private-car tune. In this form, with a self-rev-limiting hydraulic tappet installation (the only parts, incidentally, to be manufactured in North America), and a compression ratio of 10.5:1, it was rated by Rover at a very precise 160.5bhp (net)at 5200 rpm — not really extending itself at all, for GM engines built in the USA had produced more than this in certain forms already.

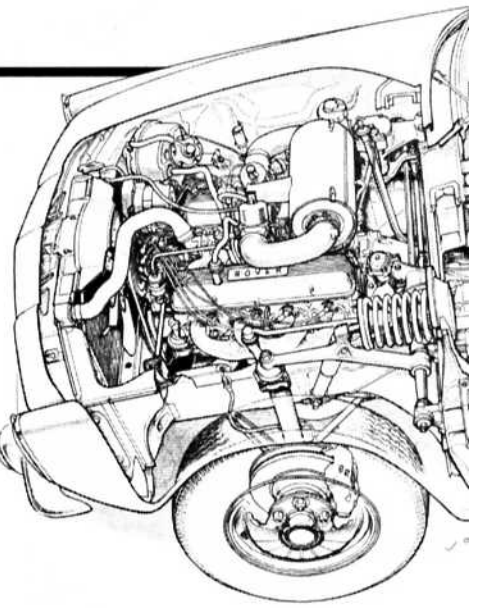
The very first car produced with the light-alloy V8 was the big 3.5-litre saloon and its closely-related coupé, always known at Rover as the P5B, where 'B' stood for 'Buick engine'. Within months, however, the same engine had been shoehorned into the 2000's structure so that the P6B, or Three Thousand Five (soon renamed 3500), was born. In both cases the transmission was by courtesy of the Borg Warner Type 35 automatic — not only because Rover managers thought this suited the image, but because they did not yet have a manual transmission able to withstand the lusty 200+lb ft torque delivery of the engine itself!

Performance boosts were startling. In the P5 structure for instance top speed rose from about 102 to 108mph, 0-90mph acceleration plummeted from 54.9 to 31.5 sec, and fuel economy actually improved from 15.6mpg to 19.2mpg. In every way, it seemed, the use of the engine was a resounding success.

But that was only the start, for the next Rover application was to be in a bulky but graceful four-wheel drive application, the Range Rover. In this case, the engine had to be redeveloped for more rugged use, particularly so that it could run on two-star fuel, and keep going when the new model was at extraordinary attitude angles. For this, a combination of lowered (8.5:1) compression, and Zenith-Stromberg CD2S



Above, the Buick-derived Rover V8 as fitted into the P6 giving the car performance and refinement never seen with the 2000 and 2200 models. The later 152bhp 3500S model, first introduced in 1971, had a four-speed manual gearbox replacing the three-speed automatic of the standard 3500



carburettors produced 135bhp (net) with great low-speed mud-plugging ability.

Soon the quoted power outputs became confusing as Rover, now a part of British Leyland, converted to the more rigorous DIN measurements. Accordingly, the original 160.5bhp rating became 147bhp (DIN), the Range Rover tune, 132bhp (DIN), and the newest tune of all, in the manual-transmission 3500S (P6B with a four-speed manual gearbox), with a more efficient exhaust system, was rated at 152bhp (DIN).

A period of stability then followed, until Rover announced the sleek new five-door SD1 hatchback in the summer of 1976. For this application, as in all such engines built in the UK, the capacity remained unchanged at 3528cc, but there were extensive development improvements which included larger valves, different porting, more efficient inlet and exhaust manifolds and Lucas electronic ignition, resulting in 155bhp (DIN) at 5250rpm, compared with 143bhp (DIN) at 5000rpm for the last ECE emission-affected versions of the old car; the latest cars had a compression ratio of 9.35:1.

The most dramatic changes, however, came at the beginning of the Eighties when the big SD1 cars began to contest, then to win, saloon car races all over Europe. It was soon clear that up to 300bhp could be produced by leaning hard on the outer limits of the regulations. However, for Group A racing in 1983, for which the limits were to be more strictly applied, Tom Walkinshaw, whose team prepared the cars for BL, requested a more powerful 'homologation special' to be produced, the result being the Vitesse of 1982.

By picking up a Lucas fuel injection system already to be found on Australian-market SD1s (and, previously, for the USA in SD1s and Triumph TR8s), mating it to a higher compression ratio, reprofiled inlet ports and more ambitious camshaft timing, the peak was pushed up to 190bhp (DIN) at 5250rpm. The result, in spite of controversy surrounding the sporting legality of the cars used, is well known.

In the meantime, Rover had gone to the other extreme, by supplying drastically de-tuned engines to Land-Rover Ltd for the Land-Rover V8 introduced in 1979. By the simple expedient of fitting breathing restrictors in the inlet passages of the Range Rover unit, the power was reduced to a mere 92bhp (DIN) at 3500rpm, but the slogging ability was almost unimpaired.

By the end of 1983, however, there were many applications special to a particular model or a particular market that it would be impossible to list all here.

Rover V8 engines — performance examples

Model	Engine tune	Transmission	Overall fuel consumption (mpg)	Max. speed (mph)
(Buick Special)	155bhp (gross)	Two-speed auto.	17.5	100
Rover 3½-litre saloon	160bhp (net)	Three-speed auto.	19.2	108
Rover 3500 saloon (P6B)	160bhp (net)	Three-speed auto.	17.2	114
Range Rover (1970)	135bhp (net)	Four-speed manual	14.4	91
Rover 3500 (SD1)	155bhp (DIN)	Four-speed manual	20.1	122
V8 Land-Rover	92bhp DIN)	Four-speed manual	13.9	81
Range Rover five-speed	125bhp (DIN)	Five-speed manual	15.4	96
Rover Vitesse	190bhp (DIN)	Five-speed manual	21.8	130
MG MGB GT V8	137bhp (DIN)	Four-speed + o/d	23.4	124
Morgan + 8	155bhp (DIN)	Five-speed manual	20.5	123
Triumph TR8 (USA tune)	137bhp (DIN)	Five-speed manual	18.5	120

Rover V8 engine

Car model first used	Engine size (cc)	Bore and stroke (mm)	Bhp (at rpm)	Year	introduced
(Buick Special — USA)	3528	88.9 × 71.1	157 (gross) @ 4600	1960	(GM designed, in a US 'compact' car)
Rover 3½-litre	3528	88.9 × 71.1	160 (net) @ 5200	1967	(First Rover-built engines, in first Rover model to use)
Range Rover	3528	88.9 × 71.1	135 (net) @ 4750	1970	(Rover's famous 4x4 estate car)
Rover 3500S (P6B)	3528	88.9 × 71.1	152 (DIN) @ 5000	1971	(In 'sporting' form in manual-transmission version of P6B)
MG MGB GT V8	3528	88.9 × 71.1	137 (DIN) @ 5000	1973	(V8 transplant in MGB GT structure)
V8 Land Rover	3528	88.9 × 71.1	92 (DIN) @ 3500	1979	(V8 transplant in LWB Land-Rover)
Rover Vitesse	3528	88.9 × 71.1	190 (DIN) @ 5250	1982	(With fuel injection, originally as 'homologation special')
Also: Leyland P76	4416	88.9 × 88.9	195 (gross) @ 4250	1973	(Australian saloon, using Australian-built version of engine)

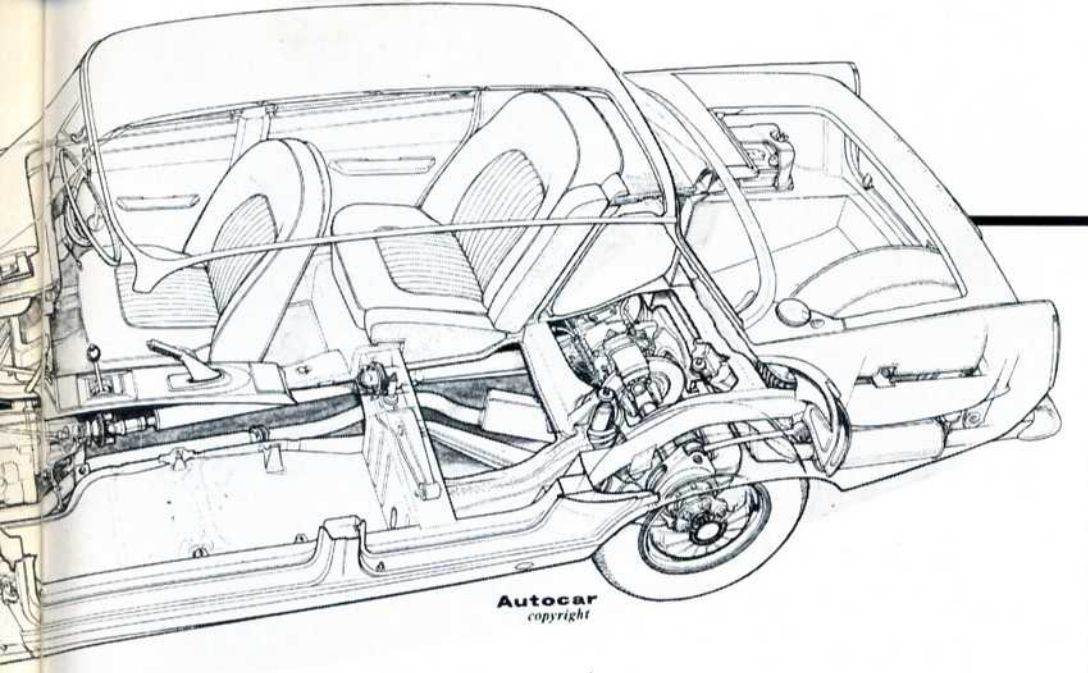
Non-Rover applications

The three most important sports car applications, in terms of numbers supplied, were in the Triumph TR8, the MGB GT V8 and the Morgan Plus 8. Chronologically the Morgan Plus 8 came first, for the first prototype was running even before the engine was in production, and sales began late in 1968, continuing to this day. Standard-tune engines, latterly of 190bhp (DIN) have always been used.

The MGB GT V8 was developed at Abingdon, really as an 'official' response to the Costello project. Few people ever really understood why the MG engines had to be de-tuned from standard whereas Morgan units were not, unless it was to differentiate the MGB GT V8 from the forthcoming TR8. The MGB GT V8 was never sold in North America; the TR8 was developed primarily with that market in mind. Without delays, management upheavals, strikes, and the wholesale moving of TR7/TR8 assembly from one factory (Speke) to another (Caney), the TR8 might have been on sale by 1978. Eventually it arrived in the USA in 1980 with a de-toxed engine having 133bhp (DIN) on Zenith-Stromberg carbs, 137bhp (DIN) on Lucas fuel injection for California, with an 8.1:1 compression ratio; the TR7/TR8 programme was cancelled at the end of 1981.

Another interesting customer, though not built in large numbers, was TVR, who introduced the Tasmin 350i during 1983, with a 190bhp 'Vitesse' engine tune and truly fearsome performance. Soon, no doubt, other specialist manufacturers may emulate TVR.

Out in Australia, British Leyland developed the large P76 saloon, and the exciting-looking Force 7 hard-top coupé derivative of that car, introducing the range in 1973. One of the engines for that front-engine/rear-drive design was a 2.6-litre 'six',



but the most powerful units were 4.4-litre derivatives, much modified in detail, of the Rover V8 design. These cars did not live long, and plans to use 4.4-litre engines in a new Rover saloon (the P8, killed off in favour of SD1) came to nothing.

P6BS — the exciting stillborn

In March 1968, Rover announced its sensational P6BS mid-engined sports coupé, not as a prelude to selling cars, but effectively to say: "We wanted to make these, but Leyland wouldn't let us!" This remarkable car was the brainchild of Spen King and Gordon Bashford, and had its V8 engine mounted in the classic racing car mid-chassis position. However, to link up with an intriguing transmission, it was turned 'back to front' so that the flywheel face was at the front, linked by Hy-Vo chain to the modified Rover 2000 gearbox, even though this then drove back through a channel in the special sump to the final drive unit mounted below and behind the rear (front really!) of the engine itself!

Rover V8 as a Classic

Not only is the light-alloy Rover V8 an amazingly versatile unit, light in weight and having a fantastic lusty torque delivery, but it has a phenomenal long-life record already. In spite of the fact that fuel injection (whose complexities frighten most rebuilders) is to be found on some versions, most are very simple derivatives to dismantle and rebuild, and parts are freely available. It has already sold widely, for the combined total of about 5000 TR8s and MGB GT V8s (not forgetting about 2500 Morgan Plus 8s so far) have been swamped by up to 100,000 SD1s and the same number of Range Rovers and V8-engined Land-Rovers.

Naturally the engines don't last indefinitely but, if their hydraulic tappets are kept clean, with regular oil changes, and they are never allowed to run short of water, they should all last for up to 100,000 miles before the first major rebuild is necessary, and even the 190bhp examples are relatively under-stressed and don't hammer themselves into oblivion.

Above, the P6 3500. Cutaway,* Autocar *drawing of the V8 showing the hydraulic tappets and twin SU carburettors